AUTISM: COGNITIVE AND BEHAVIOURAL ANALYSIS IN RELATION TO INTERVENTION STRATEGIES

THESIS SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN PSYCHOLOGY

By

BINEESH. V

Research Supervisor

Dr. ANITA RAVINDRAN
Professor

DEPARTMENT OF PSYCHOLOGY
UNIVERSITY OF CALICUT
KERALA, INDIA

2008

DEPARTMENT OF PSYCHOLOGY
UNIVERSITY OF CALICUT

KERALA-673635

Certificate

I, **Dr. ANITA RAVINDRAN**, do hereby certify that this thesis entitled "**AUTISM: COGNITIVE AND BEHAVIOURAL ANALYSIS IN RELATION TO INTERVENTION STRATEGIES**" is a record of bonafide study and research carried out by **Mr. BINEESH. V,** under my supervision and guidance.

This research work has not been submitted by him for any award of degree or diploma in this or in any other university before. The thesis embodies the results of the investigation conducted during the period of his work as a Ph.D. scholar.

UNIVERSITY OF CALICUT
10.12.2008

Dr. ANITA RAVINDRAN
PROFESSOR

DECLARATION

I, **BINEESH. V**, do hereby declare that this work reported in the thesis entitled, "**AUTISM: COGNITIVE AND BEHAVIOURAL ANALYSIS IN RELATION TO INTERVENTION STRATEGIES**" is original and carried out by me in the Department of Psychology, University of Calicut, under the guidance and supervision of **Dr. ANITA RAVINDRAN.** I further declare that this thesis or any part of this has not been submitted for any degree, diploma, recognition or title in this or any other University or Institution.

CALICUT UNIVERSITY CAMPUS **BINEESH. V**

10.12.2008

ACKNOWLEDGEMENTS

I would like to thank my supervising teacher, **Dr. Anita Ravindran**, *Professor and former Head of the Department, Department of Psychology, University of Calicut for her scholarly guidance, encouragement, support, mentorship, patience and keeping me on the right track in times of hardship. This study would not have been accomplished without the expert guidance of my supervising teacher.*

I am grateful for Dr. T. Sasidharan, the Head of the Department, Department of Psychology, University of Calicut for his persistent motivation and support throughout the my research period.

Most importantly, I thank the children who participated and continually challenged me to become a better researcher. I also thank the families of the participants who kindly trusted me to work with their children and devoted their valuable hours to the success of this study.

I am very thankful to Dr. P.A. Suresh, Director of Institute for Communicative and Cognitive Neurosciences, Shoranur and the authorities of three special schools, Calicut for their cooperation during the time of my field work. I appreciate the teachers and staff members who kindly allowed me to collaborate with them, to use their space and materials, and patiently listened to me as I thought through this research.

A special word of thanks goes to Dr. S. Venkatesan, Professor and Head, Department of Clinical Psychology, All India Institute of Speech and Hearing, Mysore, who has provided expert opinions on my work and enhanced my limited knowledge at various stages of the study.

I would like to thank Dr .K. Manikandan, for the valuable help he extended in doing the statistical analysis of the study.

I express my gratitude to Dr. C.B. Asha, former Professor and other faculty members of the Department of Psychology, University of Calicut, for their support and co-operation throughout my student life.

I also wish to give special thanks to Dr. Ajilal.P for his speedy proof reading of the first draft of this document and for his feedback and suggestions.

I specially thank the librarian Mr. Gokul Raj and other office staff for their timely support and help during the course of study.

I would like to acknowledge Dr. Meena, Sunidharan, Shinoj, Ramprakash, Dr. Sunil, Dr. Aniljose, Rajith, Sajan, Sheron, Biju Mathew, and Mary for their timely help and cooperation during this work.

And finally, I acknowledge my parents, brothers, sisters and other members of my family with gratitude for their continuing understanding and support of my efforts. I thank them for their love and support.

BINEESH V.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABA	:	Applied Behavioural Analysis
ADHD	:	Attention Deficit/Hyperactivity Disorder
AS	:	Asperger Syndrome
ASD	:	Autism Spectrum Disorders
DD	:	Developmentally Delayed
DTI	:	Discrete Trial Instruction
HFA	:	High Functioning Autism
LEAP	:	Learning Experience, an Alternative Programme for Preschoolers and their Parents
NLP	:	Natural Language Paradigm
PDD-NOS	:	Pervasive Developmental Disorder Not Otherwise Specified
PECS	:	Picture Exchange Communication System
PRT	:	Pivotal Response Training
SST	:	Social Skill Training
TC	:	Total Communication
TD	:	Typical Development
TEACCH	:	Treatment and Education of Autistic and Related Communication Handicapped Children
TLC-E	:	Test of Language Competence Expanded Edition
VOCA	:	Voice Output Communication Aids

LIST OF APPENDICES

Chapter I

INTRODUCTION

The key to autism is the key to the nature of human life.

(Wing 1996, p.225)

Autism is a disorder occurring in childhood that interferes with the normal course of social, communicative, and cognitive development. Autism is necessarily a psychological disorder of very early childhood because of the diagnosis of autism is ruled out if the disorder is first manifested later than the third year of life. The other serious psychological disorders of childhood, attention deficit disorder, anxiety, and depression, begin later in life, although there may be precursors earlier on. Because autism begins so early, be disentangled from the predetermined systematic disturbances. Another characteristic of autism is its heterogeneity in terms of both symptoms and developmental trajectory. Because of this heterogeneity and presence of milder symptoms in relatives of individuals with autism and general population, autism is often described as a syndrome. A major variation in the population of individuals with autism is the co-occurrence or lack of co-occurrence of mental retardation (Sigman et al., 2006).

Acknowledgement of this variation occurred early in the history of the definition of the syndrome. Autism was described in the 1940s by two clinicians who were initially unaware of each other's work because of the disruption caused by World War II. Leo Kanner in 1943 identified the disorder in early childhood in children whose communicative development was mostly compromised; while a year later Hans Asperger described a clinical picture of less severity and with fewer communicative deficits (Sigman et al., 2006).

Autism spectrum disorders include the three diagnoses: autistic disorder, Asperger's disorder, and pervasive developmental disorder not otherwise specified (PDD-NOS). Here, the term autism refers to this group of diagnosis. No diagnostically informative biological test for autism exists. The diagnostic criteria are behavioural, including specific number and levels of impairment in the three core domains: social interaction, communication, and repetitive or stereotypic behaviour (Newschaffer et al., 2007).

Individuals who have some of these difficulties but whose behaviour does not reach criterion for the full syndrome are diagnosed with pervasive developmental disorders. The latter is diagnosed with no history of language delay, although the differentiation of Asperger disorder and high-functiong autism is often difficult to make. Children with autism are sometimes described as high-functioning or low functioning depending on the presence or absence of mental retardation as reflected in an IQ higher or lower than 70. Between 50% and 70% of children with autism have an IQ lower than 70. The growth in agreement on diagnostic criteria progressed along with research on core deficits and with the creation and standardization of instruments to measure and score the presence or absence of these deficits (Sigman et al., 2006).

Other developmental, behavioural, psychiatric, and medical conditions commonly co-occur with autism. Mental retardation has historically been an associated diagnosis in children with autism. Behavioral difficulties may be related to core features (e.g., perseveration, hyperactivity, self-injury), or sensory abnormalities. Psychiatric symptoms (e. g., anxiety, and depression) may be influenced by severity of core deficits, cognitive impairments, and/or

comorbid medical disorders. In children with autism, specific genetic, neurologic, or metabolic disorders are identified as etiologic factors. Many other medical symptoms or disorders are commonly reported in children with autism: seizures, immune system dysregulation, gastrointestinal symptoms, feeding difficulties like refusal, selectivity, selectivity to textures, and sleep disruption (Newschaffer et al., 2007).

DEVELOPMENTAL FEATURES OF AUTISM

The developmental psychopathological perspective on autism explains the empirical findings concerning atypical behaviour and development within the context of normal principals of development. From this perspective, the concepts of normal development highlight the specific types of normal deviations, abnormalities, rates, and patterns of development of individuals and groups with perspective disorders.

SOCIAL FUNCTIONING IN AUTISM

According to Volkmar et al. (2005) social difficulties are the most powerful predictor of diagnosis for older individuals with autism; this likely is true for infant as well. Preschool children with autism often fail to demonstrate social skills typically present in the first months of life. Rutter (1978) emphasized that the unusual social development observed in autism was one of the essential features for definition; it was distinctive and was not just a function of associated mental retardation.

As cited by Berger (2006) Kanner emphasized, social characteristics of the normally developing neonate and infants are aberrant in autism - the individual has difficulty forming emotional ties with parents. Lord and Rutter

(1994) characterize the difficulties as being in ‘reciprocal social interaction and ability to form relationships’, including failure to use mutual gaze, facial expression, joint attention, and negative reactions to physical contact. By the age of 2 years, the typically developing toddler has skills in social awareness and interaction, imitation, symbolic play, and communication through gestures and language. Many of these aspects have been found to be disturbed in children with autism.

Gaze

According to Skuse (2003) eye contact ‘avoidance’ is sometimes as a feature of autism. Normally developing infants spend a significant proportion of their waking time in eye contact with their caregivers; persons with autism, however, fail to establish this pattern of mutual gaze.

Dawson et al. (2000) reported that eye contact is limited as is overall social engagement and responsivity. Studies with preschool-age and older children reveal that the human face holds little interest for children with autism; similarly they appear to lack a preference for speech sounds. Gaze behaviour also varies as a function of developmental level; more developmentally advanced children exhibit an increased frequency of eye contact (Sigman., 1992).

Joint Attention

Joint attention skills involve attention with others through pointing, showing, and coordinated look between object and people. It is one of the earliest emerging social behaviour and deficits in joint attention are apparent

prior to language acquisition. Kasari et al. (2006) cited theoretically that joint attention represent beginning understanding of the mental representations of others and understanding others leads to better social-cognitive and language abilities. According to Charman et al. (2003) significant associations are found between early joint attention skills and later language abilities.

Overtime, initiation and response to bids for joint attention do increase in children with autism, but are severely compromised in natural contexts. The pattern of these skills in autism may be atypical (Volkmar et al., 2004).

Imitation

For typically developing children, imitation and play are important for symbolic and social-cognitive development. Difficulty with imitation of others people movements appear to be particularly affected in autism. Problems with imitation discriminate children with autism from those with other developmental disorders (Rogers et al., 2003).

The capacity to imitate also appears to be a prerequisite for subsequent symbolic activities; here too, children with autism display serious deficits (Prior et al, 1979). Studies have revealed that younger children with autism consistently have problems in imitating simple body movements and those that involve objects (Stone, Ouslely, & Littleford, 1995., Charman et al, 1997)

Older children with autism consistently have difficulties in imitation (Hobson & Lee, 1999., Loveland et al., 1994, Smith & Bryson, 1994), and these difficulties are present by at least second year of life (Charman et al.,

1997; Dawson et al., 1998., Roeyers et al., 1998). Levels of information positively correlate with language levels (Sigman & Ungerer., 1984).

Play

Play activities in the typical child progress from simple object exploration to functional object to pretend play. Although the evidence on this issue is limited, in the first months of life strong differences are not observed between infants with autism and typical or delayed peers. But by nine to twelve months, abnormalities are evident and become progressively more deviant due to higher levels of perseveration (Osterling et al., 2002). Although early functional play routines may be observed, by around age 2 years, differences from typically developing peers are striking: play is less purposeful, less symbolic, and less developmentally complex.

Volkmar et al. (1997) found lack of symbolic play in autism may emerge from social difficulties or may be part of a more general problem in achieving symbolic thoughts and language. Parents reporting on the play of children with autism say it lacks social engagement and is characterized by repetitive and stereotyped object manipulation and non-functional use of objects.

Attachment

The relative absence or oddness of attachment behaviours in children with autism indicates their failure to forge basic social-affective connections with the important figures in their lives (Lord, 1993). By the end of the first years of life, typical infants have developed strong pattern of attachments;

suck behaviours maintain the proximity of the child to the caregiver while also facilitating exploration (Rutter, 1995). Children with autism do form attachment to parents (Capps et al., 1994.) and differentially respond to familiar and unfamiliar individuals. However, the quality of attachment behaviours may be unusual. Among younger children with autism, attachments to unusual objects are relatively common, but the significance of this is unclear (Volkmar et al., 2005).

Rutgers et al. (2004) also report that children with autism display attachment behaviour to their attachment figure when distressed, and that they discriminate between parents and stranger by directing more social behaviour to the caregiver than to the stranger.

LANGUAGE AND COMMUNICATION IN AUTISM

According to Bailely et al. (1996) serious abnormalities in language and communication are a fundamental feature of autism. As well as language delay, there are marked qualitative abnormalities. Language level is a good predictor of social educational outcome, and is strongly associated with severity of behavioural symptoms, social cognitive performance and familial loading. The pivotal role of language features, together with the finding that some halves of individuals with autism do not acquire useful language at all, means that language impairment must be accounted for in many psychological theories. Current psychological approaches to autism have attempted to explain the language features as one consequence of specific cognitive deficits.

Even before they begin to produce spoken language, pattern of sound production in children with autism are abnormal (Witherby et al., 2000), as is vocal quality (Sheikopf et al., 2000), a likely precursor of the noteworthy deficits in information and vocal quality seen later (Shriberg et al., 2001). The development of non-verbal communicative abilities is intimately involved for typical children in the development of conventional communicative abilities and marks the beginning of intentional communication (Bates et al., 1979). However, very young children with autism communicate less frequently than matched developmentally delayed children. They are less likely to use contact and conventional gestures but are more likely to use highly unconventional gestures such as manipulating their conversational partner's hand to obtain objects (Stone et al., 1997). Children with autism have difficulties with both the expression and production of affective responses, and the range, frequency, and integration of affective display are unusual (Yirmia et al., 1989). Children with autism are less likely to look at an apparently distressed adult (Sigman et al., 1992) and they have difficulties imitating facial display of emotion (Loveland et al., 1994).

According to Rutherford (2005) some people with autism exhibits echolalia or immediate repetition of both words and intonations in lieu of communicative speech. Language acquisition in autism is delayed compared to typical development and comprehension of words is delayed relative to production of words. In contrast, articulation skills seem to be spared.

Osterling et al. (2001) reports verbal children with autism do not readily use language to share information have posited that this phenomenon is attributable to a lack of curiosity. Children with autism have difficulties

with initiating and maintaining topics in conversation, conversational turn taking, and maintaining an appropriate level of detail as well as having difficulties with speaker-listener relations and pronominal reversal. Thus many language impairments in people with autism pertain to the social use of language. This fact has led some investigators to relate at least some of the language problems found in autism to impairments in social relatedness or lack of comprehension of speaker-listener conversational rules.

COGNITIVE FUNCTIONING IN AUTISM

The earliest formulation of the syndrome, emphasizing the social and emotional aspects of the disorder (Bettelheim, 1967; Kanner, 1943) was succeeded by two major conceptualizations. One group of investigators viewed the autistic person's deviations in perceptual processing as the primary disorder (Ornitz & Ritvo, 1976); other theorists focused on the individuals problems in language development and usage (Churchill, 1972).

One consistent observation made first by Kanner (1943) concerns the emergence of noteworthy discrepancies across developmental areas. This developmental decalage has its origin in early childhood (Sigman & Ungerer, 1981), and it not only persists overtime but it often becomes more striking (Klin et al., 1995). Differences in sensori-motor development do not seem to be syndrome-specific (Cox et al., 1999., Dawson et al. 2002). Although studies of older children have demonstrated difficulties in executive functioning (Pennington & Ozonoff 1996), studies with younger children generally have no syndrome specific differences; in some instances preschool children with autism perform better than matched controls on tasks.

The significance of cognitive dysfunctions in autism become clear from research studies of perceptual and language deficits (Rutter, 1983). These studies showed that profound and syndrome specific impairments were found only in higher-level perceptual processing. Thus, careful investigation of language and perceptions laid the foundation for studies of cognition in autistic populations (Sigman et al, 1997).

Bailey et al. (1996) reports that the notion of low level sensory perceptual deficits, such as stimulus over-selectivity or sensory dominance, was replaced by the concept of a general high level cognitive dysfunctions in deriving meaning from structured or semantic information. Burack et al. (1997) observed that a multiplicity of mechanisms and processes are attributed to attention which is considered essential to both typical and atypical development. Attention is viewed as a potential candidate in research for a core deficit association with autism.

Attention

According to Burack et al. (1997) intentional abnormalities in older children with autism are well documented. These included fixating on apparently irrelevant stimuli, to the exclusion of other information in the environment, perseverating on self-initiated tasks and foci of interest, and difficulties in focusing on educational tasks. Difficulties in autism have to do with selective attention, with problems in attending to multiple aspects of stimuli and with auditory stimuli in particular. Sustained attention is considered relevant to autism. Casey et al., (1993) found minor differences in sustained attention in high functioning male adult savants with autism. Intact visual sustained attention was also found among lower functioning persons

with autism. There is preliminary evidence that abilities in auditory sustained attention may be deficient. Reflexive visual orienting of both the physical eye and mind's eye is of interest because of common reports that person with autism perseverate in looking at and acting on idiosyncratic stimuli, are immune from distractions when so engaged, and appear to have problems in voluntarily shifting attention from one stimulus to another.

Infants later diagnosed with autism showed that they attend less to people than to objects as compared to both typically developing and delayed controls (Baranek, 1999; Mastero et al., 2002; Osterling et al., 2002), this also true after the second year of life (Dawson et al., 1998). Selective social attention is particularly impaired, for example; during free play 20-months-olds with autism were more likely to look at objects than at people than were either typical or delayed peers (Swettenham et al., 1998). Recent work employing new approaches to the study of social attention has shown that older individuals with autism exhibit markedly deviant pattern of attention to people and, particularly, to faces as compared to developmentally matched controls (Klin et al., 2002). Similar findings are emerging with very young children with autism.

Various attempts have been made to account for early differences in social-visual attention. The problem might have to do with avoiding complex visual stimuli, for example, faces (Swettenham et al., 1998), or with avoiding unpredictable and variable social stimuli (Dawson & levy, 1989). A third hypothesis posits the fundamental problem as a lack of social motivation and salience. Chawarska et al. (2003) in a study of automatic intentional cueing in 2-year-olds focused that the visual attention of the children with autism could

be cued by directional changes in eye movement, although cue-specific differences also suggested different underlying strategies

Memory

According to Mottron et al. (2001) memory deficits such as poor recall of recent events have been reported in individuals with autism. Abnormal memory functioning is consistent with 'executive' models of autism that predict deficiencies in the ability to use efficient encoding and retrieval strategies.

An alternative explanation would relate these impairments to either an episode or amnesic-like deficit, or to a semantic deficit. However the prediction of an amnesic deficit was only partially supported by empirical research on memory in individuals with autism. Impairments in immediate recall of words list (Boucher & Warrington, 1987) were reported in low-functioning persons with autism. Bennetto et al. (1996) reported that high-functioning individuals with autism display typical immediate and delayed recognition of visually presented material; delayed matching to sample tasks, long-term recognition, cued recall, or new learning ability.

Discrimination learning

Hermelin and O' Connor, (1970); Maltz (1981) and Prior, (1979) suggests that autism is not associated with pervasive deficits in the capacity to discriminate stimuli. Autistic individuals easily learn simple discriminations of line position, length of line, and dimensionality. Deficiencies in discrimination learning occur only when the stimuli to be differentiated are symbolic (Minshew, Goldstern, Munez & Payton, 1992), and these difficulties

can be surmounted when the material is made concrete (Fein, Tinder, & Waterhouse, 1979). Charlop and Carlson (1983) found that autistic children are also able to learn both reversal and non-verbal shifts and do so at the appropriate ages.

Frith (1972) reported the scientific evidences proving the limitations in autistic individual's abilities to sequence information in both auditory and visual modalities. Hermelin and O'Connor, (1970) found that greater difficulties are demonstrated in temporal sequencing than in spatial sequencing. Deficits in cross- modal learning have been reported in some studies but not in others.

Intelligence

Autistic children have deficits both in cognitive processes and in stored knowledge, with the major impairments occurring in the verbal domain. About 75% of autistic children have IQs below 70, the cut off for the administrative definition of mental retardation. However, intelligence is not uniformly impaired across all the domains usually tested. Individuals with autism, regardless of overall intelligence, have an almost unvarying characteristic cognitive strength in common: the Block Design subtest on the Performance Subscale of the Wechsler Intelligence Scales (Seigel et al., 1996). Almost all autistic individuals do very poorly on another Wechsler sub test, Picture Arrangement. This illustrates the great difficulty that autistic individuals have with narrative logic (Folstein, 1999). Rutter (1983) has interpreted the pattern of scores shown by autistic children on standardized intelligence testes and in other testing situations as indicating special difficulties in sequencing and abstraction. Autistic children show few specific

deficits in spatial performance, perceptual organization, and attentional short-term memory skills (Sigman et al., 1997)

Bailey et al. (1996) report outside of standardized or experimental measures, there are frequent reports of so-called splinter skills or islets of ability. These talents may be in reading, spelling, mathematics, music or drawing. These relatively preserved abilities, in the context of overall intellectual disability, do not seem to be especially rare. A small proportion of individuals develop an isolated talent to a level that is in excess of that found in normal people-the “idiot savant” phenomenon. Although the savant phenomenon is not limited to autism, the great majorities are autistic, and their spectacular abilities in memory, music, calculation or drawing sometimes wane as their autistic symptoms improve.

RESTRICTED AND REPETITIVE BEHAVIOURS IN AUTISM

According to Osterling et al. (2001) approximately half of children with autism are reported to display stereotypic motor movements, the most common of which are rocking; toe walking; arm, hand, and finger flapping; and spinning. These stereotypes are more prevalent in children with autism who are young or low-functioning, with higher-functioning children with autism exhibiting more complex repetitive behaviours. These ritualistic activities may include the repeated arrangement or ordering of objects, engagement in a complicated yet seemingly arbitrary sequence of motor movements, or an insistence on sameness in terms of physical environment, sequence of events in the course of a day or a given procedure, or eating habits. Individuals with autism may tend to exhibit restricted behaviour in terms of particularly intense, circumscribed interests or preoccupations with

unusual subject matter. These individuals may perseverate on these topics and are likely to exhibit encyclopedic knowledge of pertinent factual information.

THEORIES ABOUT DEFICITS IN AUTISM

The neuropsychological level of explanation is intermediate between brain and behavior. It attempts to link these two levels of analysis by mapping relationships between brain structures and the psychological and behavioral functions they serve. The theories of autism, each of which postulate a core neuropsychological impairment that is argued to account for defining behavioural features of autism. There are three classes of theories postulated to explain the developmental deficits in autism.

Social-Cognitive Theories

The first class of theories suggests that the principle disorders in autism stems from an innate lack of responsiveness to social stimuli, and that these disorders give rise to subsequent social and cognitive impairments. These social -cognitive theories stem from Kanner's original formulation of the autistic syndrome and are based on and supported by extensive research in the developmental tradition.

Research on the development of typical children shows that neonates prefer facial representations to object representations (Reddy et al., 1997) and are capable of imitating the facial gestures of social partners (Meltzoff & Moore, 1983). By 3-4 months of age, infant differentiate familiar from unfamiliar people and are sensitive to variations in the emotional and social responsiveness of their caregivers (Tronick et al., 1978). Triadic interactions, in which the infant and a social partner share their experience of an object or

another person, emerge in the second half of the first year of life (Bates et al.,1979; Bruner, 1983; Carpenter et al., 1998). By the second half of the second year of life, typical infants engage in episodes of pretend play in which they represent elaborate social interactions from point of view of different social partners.

Many studies have been conducted to assess the social capacities and behavioural tendencies on developmental level. Children with autism are less likely to imitate others (Rogers, 1999), to follow the gaze and pointing of others (Loveland & Landry, 1986; Mundy et al., 1986; Sigman et al., 1999), to imitate shared looking with others, and to engage in pretended play than are typical or mentally retarded children without autism.

Failure to attend to crucial social stimuli from early on could lead to the deficits observed in older children and adults with autism on a variety of face and voice-processing tasks. Perhaps not surprisingly then, neuroimaging studies provide evidence for abnormalities in the neural systems underling face and voice processing in individuals with ASD. In typical individuals, the lateral aspect of the fusiform gyrus responds preferentially to face over other objects (Kanwisher et al., 1997). In contrast, several functional magnetic resonance imaging studies have now observed reduced activity in the FG both in children and adult with autism spectrum disorders.

A related area of research in both typical and autistic development has focused on the concept of “theory mind,” Based on studies of Premack and Woodruff (1978) and Wimmer and Perner (1983), this concept refers to the ability of children to take the perspective of others so that they understand that other people have intentions, knowledge, and beliefs that may differ from

their own. Extensive research has corroborated the original observations of Baron-Cohen et al. (1985) that children with autism have great difficulty with theory of mind. Some studies have found that autistic children with high levels of intelligence are able to take the perspective of others sufficiently well. In fact, some high-functioning children with autism are even able to solve second-order theory of mind problems, in which they have, reasoning capacities (Bowler, 1992). However, even those individuals who perform successfully on second-order false belief tasks often have difficulty providing appropriate justifications for their responses and are impaired on advanced tasks that are more naturalistic story materials involving the comprehension of white lies, double beliefs, and irony, for example (Happe, 1994).

In the past decade, neuroimaging researchers have used a wide variety of mentalising tasks and converged up on a network of brain regions associated understanding the mental states of others. This network includes the medial prefrontal cortex, the STS, and the temporal poles. Three studies have now examined the neural basis of impairments in theory of mind in autism and all have found abnormalities in the activation of the medial prefrontal cortex (Happe et al., 1996; Castelli et al., 2002; Nieminen-von wendt et al., 2003). One of the difficulties with studies of children with autism stems from the fact that diagnosis of autism is often not made until children reach 3-5 years of age. This means that many other processes may have gone awry in the early development of the children. Therefore, the lack of social responsiveness may stem from earlier deficits in attention or cognitive processes that have resulted in the children being isolated socially and emotionally from other people.

One conundrum in understanding these social deficits is that there is little information about why the children with autism do not engage socially. One theory is that typical children are born with a tendency for social interactions are aversive to children with autism could also be born unresponsive to social interaction, which then becomes aversive to them. Another way to consider the social-cognitive theories of autism is from the point of view of specificity, uniqueness, and universality of the deficits. Social deficits are universal in autism and are required for the diagnosis. However, social difficulties are not unique to autism, although the severity and kind of social deficits experienced by individuals with autism are unusual in most other syndromes. Finally, it has been difficult to prove that the social interaction deficits are specific rather than general, in that individuals with autism manifest a variety of other problems such as limitations in shifting attention and possibly, some disturbances in their capacity to create cognitive categories.

Executive Function Theory

The fact that the social cognitive theories of autism do not explain all of the symptoms manifested by children with autism has led to the postulation of other theories. Although older, high-functioning individuals with autism have social difficulties of various kinds, they have other problems that seem to interfere with their functioning, particularly in the academic and professional arenas. Typically developing individuals use various executive functions to go beyond automatic activities, such as creating strategies for behaviour, making plans, shifting topics, maintaining a representation in working memory, and solving tasks requiring the ability to

be flexibly innovative (Shallice, 1988). The dorsolateral prefrontal cortex is known to play an important role in working memory and executive functioning. Two recent neuroimaging studies have found that high-functioning individuals with autism show reduced activity in working memory tasks (Koshino et al., 2005; Luna et al., 2002).

Children with autism have more problems with executive functions than do matched groups of comparison children, and children with autism demonstrate these difficulties in their real-life activities (Russell, 1997). Even the most able individuals may not be able to achieve at a level appropriate for their cognitive skills because they cannot plan or carry out an integrated course of action. Therefore, there is much evidence for theory that a core deficit in autism is in executive functions.

One problem in making executive functions central to the understanding of autism is that children with a number of other syndromes, such as attention deficit disorder and schizophrenia, are reported to have similar problems with executive functions. This suggests that executive function deficits are not unique to autism. However, a comparison of performance of different forms of executive function, such as flexibility, planning, and inhibition, shows that children with autism are particularly weak in some of these executive functions, such as flexibility and planning, and relatively strong in inhibition (Ozonoff & Jenson, 1999). In contrast, children with attention deficit hyperactivity disorder have the most problems with inhibition and can more flexibly create strategies and plans. Thus, there is uniqueness in the pattern of

executive function shown by children with autism relative to children with other disorders.

However, some studies by the researchers who were among the strongest proponents of executive function disorders have failed to find a difference between the executive function skills of young children with autism and matched groups of typically developing groups and groups with other disorders (Dawson et al., 2002; Griffith et al., 1999). Obviously, it may be that the children with autism can handle simple, lower-level strategies and behaviour and that impairment is only demonstrated with more sophisticated tasks. If this is the explanation, then this suggests the executive function deficits are central to autism but are not primary, so they only appear as children become older and smarter.

Central Coherence and Information-Processing Theories

Although the social-cognitive and executive function theories of autism go far in explaining the patterns of weakness in the behaviours and abilities of individuals with autism, neither of these theories explains the patterns of strengths in at least some of the children. About 20% of children with autism have special islets of abilities with numbers, music, arts, calendars, and even poetry (Hermelin, 2001). Moreover, as a group, children with autism are quite able to find figures that are embedded in larger forms, complete jigsaw puzzles, and reproduce patterns with blocks as in the block design tasks included in most intelligence tests (Shah & Frith, 1993). In order to explain these strengths and related deficits in using context and top-down approaches to problems, Frith (2003) has proposed that individuals with autism have a limited drive for “central coherence,” and consequently they

focus on details and overlook broader contexts. Thus, the individuals with autistic skills are able to reproduce visual scenes with great precision despite their cognitive limitations. Besides explaining these strengths, the central coherence theory may be applicable to repetitive and stereotyped behaviours as well as the narrow interests and over selectivity demonstrated by many high-functioning individuals with autism.

Related to the central coherence theories are theories that attribute cognitive problems to a disorder of information processing. Recent evidence has narrowed this hypothesis to complex information processing based on the finding that high-functioning individuals with autism have difficulties with memory for complex information as well as for high- order interpretation aspect of language and concept formation (Minshew et al.1999). In contrast, the performance of the high-functioning adolescents and adults with autism on attention, sensory perception, elementary motor abilities, simple associative memory, formal language, and the rule-learning aspects of abstraction did not differ from the performance of adolescents and adults without autism. Thus, the cognitive profile in autism involved selective deficits in complex abilities in the domains demonstrating deficits. It has been proposed that the basis of this pattern is the under development of neural connectivity between neural systems (Just et al., 2004).

Brain Mechanism in Autism

Regarding the significance of brain in autism different areas have emerged as related to the problem.

(a) Size

Kanner's seminal paper noted that children with autism had enlarged heads. Although subsequent studies of external head circumference confirmed this observation, it did not receive much attention until the past decade when support for this finding began to accumulate via MRI, postmortem studies, and additional head circumference studies. The size increase appears to be a shifting of the entire autism brain and head size distribution rather than merely an excess of megalencephaly among a minority of cases that elevates what would otherwise be a normal autism population mean size (Volkmar et al., 2004).

According to Courchesne et al. (2003) both MRI volumetric analysis and simple measures of head circumference indicate that autism involves transient postnatal macrencephaly. Aylward et al. (2002) found that neonates later diagnosed with autism or PDD-NOS have normal head circumference; but by 2-4 years of age, 90% of these have larger-than-average brain volumes. Recent findings suggest that the brain may be enlarged by as much as 10% in volume in toddlers with autism. However, the magnitude of the effect appears to diminish with age. In adolescence and adulthood the effect is less consistently found across studies and the size of the effect is diminished to a few percent increases at most. Several studies have shown the head is not significantly enlarged at birth leading to the proposal that there are specific events in the first months of life that are responsible for the brain enlargement.

(b) Corpus Callosum

Although different studies have noted various segments of the corpus callosum to be abnormal, they consistently find a reduced callosal size. Indeed, the posterior corpus callosum in autism is actually smaller than normal and the degree of this callosal hypoplasia correlates with the degree of frontal hyperplasia. This compartmental specificity of white matter hyperplasia is consistent with the idea of differential effects on local and long -range connections (Baron-Cohen & Belmonte, 2005). Reductions in white matter may also be consistent with PET study that showed reduced inter-regional correlations in persons with autism, suggesting reduced functional integration and connectivity. One consequence of reduced inter connectivity in the autistic brain might be increased modularity and reduced integration of functions. Such a reduction in neural integration would be consistent with one influential theory that attributes autistic symptoms to a lack of 'central coherence' a cognitive processing style that makes integration of parts into wholes problematic (Volkmar et al., 2004).

Given the corpus callosum importance in the lateralization of cerebral functions, its reduced size in autism patients, particularly in the context of an enlarged brain suggests the possibility of aberrant lateralization of brain functioning in the disorder. Many studies have provided clinical evidence of abnormal motor and language lateralization in autism patients, including increased left-and mixed-handedness and an unusual pattern of cerebral dominance for language.

(c) Cerebellum

Evidence implicating the cerebellum in the pathophysiology of autism was originally put forward by Ornitz and colleagues in the 1960s and 1970s; their studies showed that autistic children exhibited clinical and neurophysiologic deficits indicative of cerebellar dysfunction (cited by Ciaranello & Ciaranello, 1995). The cerebellum, in particular, is one of the most consistently abnormal structures in the autistic brain. Post mortem neuropathology studies have revealed that very consistent reductions in the number of Purkinje neurons in the cerebellum. The precise nature of these abnormalities, including a lack of gliosis, suggests a prenatal origin. Although classical neuropsychological models see the cerebellum as strictly a motor system, some evidence finds a role for it in cognition, sensation and attention especially as it participates as part of larger cerebellar-cortical systems. In autism, dysfunctions of cerebellar-cortical serotonergic pathways have been noted and fMRI evidence implicates the cerebellum in attention difficulties seen in autism (Volkmar et al., 2004).

Courchesne (2003) found that cerebellar white matter volumes, combined with vermis size, can discriminate 95% of toddlers with autism from normal controls and can predict whether a child with autism will be high or low functioning. Interestingly, people with autism show abnormally low activation of cerebellar cortex in a visual vigilance task, but abnormally high activation during a purely motor task of self-paced button-pressing and the degree of abnormally high cerebellar motor activation correlates with the anatomical deficits in cerebellar volume (Baron-Cohen & Belmonte, 2005).

(d) Limbic system

There is also significant interest in the role of limbic system circuitry, particularly the amygdale and hippocampus, in causal models of autism. Postmortem studies have repeatedly noted abnormalities in these areas, including reduced density, cell size, and dendritic arborization in structures such as the amygdala, hippocampus, septum, anterior cingulated and mammillary bodies. The amygdale, in particular, plays a critical role in emotional arousal, assigning significance to environmental stimuli and mediating emotional learning, and thus it is often highlighted as a core structure in models of autism pathobiology. Interest in the amygdale also stems from its role in perceptual processing of social stimuli. Several studies have now found hypoactvation of the amygdala in autism during tasks involving the perception of facial expressions and during theory of mind type tasks (Volkmar et al., 2004). Anderson and Sobel (2003) suggest that the amygdala's role in the social cognitive and perceptual process might largely be one of mediating physiological arousal. According to Dawson et al. (1998) and Klin et al. (2003) hypoactivation of the amygdala in autism may reflect nonspecific tasks effects, i.e., less interest in or emotional arousal by task stimuli. This view provides good support for social motivation hypothesis of autism pathobiology.

Baron-Cohen et al. (2000) point out that four lines of evidence converge on the hypothesis of an amygdala deficit in autism. Histopathologically, cell packing density in the amygdala increased in autism. Behaviorally, people with autism show a similar pattern of deficits to those seen in patients with amygdala lesions. In terms of gross anatomy, magnetic resonance imaging

morphometry suggests that's abnormal volume of the amygdala, although there is disagreement as to whether amygdala volume in autism may be reduced or enlarged. Physiologically adults with autism spectrum conditions manifest abnormally low activation of the amygdala during tasks of inferring emotion from pictures of the eyes or of the whole face and during passive processing of facial expressions of unfamiliar faces but not familiar faces.

(f) Cerebral Cortex

Regionally, frontal lobes show the greatest degree of enlargement, and occipital lobes show the least (Carper et al., .2002; Piven, 2004); within the frontal lobe, the dorsolateral convexity and medial frontal gyrus-areas that figure prominently in the social brain show significant overgrowth, whereas precentral gyrus and orbital cortex are not robustly affected (Carper & Courchesne, 2005). Thus the cortical areas most affected are precisely those broadly projecting, phylogenetically and ontogenetically late developing regions that are essential to complex cognitive functions such as social behaviour and language (Baron- Cohen & Belmonte, 2005).

In the areas of the brain, reduced activity has been found in left medial frontal cortex during an empathizing task in orbitofrontal cortex during recognition of mental state words and in superior temporal sulcus during passive listening to speech sounds as compared with non speech sound (Gervais et al. 2004).

A more complete picture of brain function and dysfunction in autism can be constructed if one examines not only the deficits associated with impaired empathizing but also the more subtle cognitive differences and even

superiorities associated with strong systemizing. Ring et al. (1999) conducted functional imaging during performance of the Embedded Figures Test-on which behavioural performance of people with autism is superior to normal reveals unusually high activation in ventral occipital areas and abnormally low activation in prefrontal and parietal areas. This theme of abnormally high activation in unimodal or low level processing regions alongside low activation in frontal and other integrative regions recurs in finding of heightened activity during face processing in peristraite cortex (Critchely et al., 2000), inferior temporal gyrus and superior parietal lobule (Hubel et al., 2003), precuneus (Wang et al., 2004), and other areas outside the fusiform face area (Pierce et al., 2001); by comparison, fusiform activity is abnormally low.

Belmonte and Yurgeun-Todd (2003) found that a visual attention task evokes heightened activity in ventral occipital cortex and abnormally low activations in parietal and prefrontal cortices. Just et al. (2004) report that in a sentence processing task, activation is greater than normal in Wernicke's area and less than normal in Broca's area, which suggests that processing is enhanced at the level of single words and impoverished at the level of sentential context. In addition, activity in superior temporal gyrus during inference of mental state from pictures of eyes is heightened and connectivity between extrastriate and prefrontal and temporal cortices during attribution of mental states from movements of animated shapes is weakened (Castelli et al., 2002), while prefrontal and medial temporal activations are abnormally low (Baron-Cohen & Belmonte, 2005).

CAUSES OF AUTISM

Despite a large body of literature in a variety of disciplines, the etiology of autism is still unknown. State-of the-science technique have been used to investigate possible abnormalities in genetics, brain structure, neurochemistry, immunologic systems, and neurophysiology, but no one defect has been identified.

Evidence of Genetic Determinants

Ultimately the cognitive and neural abnormalities in autism spectrum conditions are likely to be due to genetic factors. The sibling recurrence risk for autism is approximately 4.5% or a tenfold increase over general population rates (Jorde et al., 1991). An epidemiological study of same sex autistic twins found that 60% of monozygotic pairs were concordant for autism versus 0% of dizygotic pairs (Baily et al., 1995). When a broader phenotype was considered, 92% of monozygotic pairs were concordant versus 10% of dizygotic pairs. The high concordance in monozygotic twins indicates a high degree of genetic influence, and the risk to a monozygotic co-twin can be estimated at more than 200 times the general population rate (Baron-Cohen & Belmonte, 2005).

Although single-gene disorder and chromosomal abnormalities are likely to be responsible for only a fraction of all autism cases, the co-occurrence of autistic behaviour and certain neurogenetic disorders such as Fragile X syndrome, Tuberous sclerosis complex, Rett syndrome, Chromosome 15q duplication syndrome, and many others is more evidence for a genetic etiology (Sigman et al., 2006).

Immunological Mechanism

The possible involvement of the system in the pathogenesis of autism is another area of intense research. Various mechanisms have been postulated, including exposure to infectious agents and / or specific immune dysfunction. Studies demonstrating increased risk of autism in certain geographical regions (Gillberg et al., 1991) or for particular seasons of implicate exposure to various infectious agents during early pre-or postnatal development. The best studied of these is the increased risk of autism with congenital rubella syndrome (Chess 1971). Others have invoked this mechanism for the putative causal role of the measles, mumps, and rubella vaccine (Wakefield et al., 1998), although this has largely been refuted by epidemiological studies (Madsen et al., 2002; Taylor et al., 1999).

It has also been suggested that individuals with autism have a disordered immunity with both decreased and increased function of different segments of the immune system having been reported (Horing & Lipken, 2001). Recent evidence shows subtle signs of inflammation in the brains and cerebrospinal fluid of individuals with autism (Vargas et al., 2005). The immunological mechanism could be part of a complex cascade of events that are involved with the etiology of autism related to and modulated by genetic predisposition and / or environmental triggers during critical periods in development.

Possible Environmental Influences

Despite the strong genetic influences, some scientists believe there are environmental factors that are likely to autism. Because autism is a

developmental disability in which symptoms must be present before age 3, any causality related exposure must occur at a very early stage in development. Most research has focused on prenatal factors or those occurring in the first year or two of life. Early gestational exposures are especially important because of corresponding anatomical evidence of anomalies occurring very early in fetal brain development. Autism risk is documented to be increased with chemical exposures to thalidomide, valproate, and misoprostal (Arndt et al., 2005). Various perinatal or obstetrical factors have also been implicated such as low birth weight, premature birth, low APGAR scores, abnormal presentation, but data have been conflicting (Larsson et al., 2005).

Major focus is now being turned to a number of chemicals, such as pesticides, heavy metals, or polychlorinated biphenyls (PCBs) and polybrominated diphenylethers (PBDEs), which are known to have neurotoxicity. These are compounds to which humans are commonly exposed in food, air water, or other products and that are being explored as a possible cause of autism and other developmental disabilities through prenatal / or postnatal exposures. The most controversial of these is mercury, which can be found in routine environmental exposures (water, air), dental amalgams, food, and a specific form of which has been administered to babies in increasing amounts over time through a compound used as a preservative in childhood vaccines (thimorosal). Regarding vaccine toxicity, many scientists pointed to evidence that ethyl mercury is fundamentally a different compound than methyl mercury (Clements, 2004) and that several epidemiological

studies showed no association with increased autism risk. (Andrews et al., 2004).

INTERVENTIONS

The driving force for research on autism and pervasive developmental disorders is the provision of increasingly effective treatment and interventions. At the same time the planning of an intervention strategy must be carefully related to the assessment of a child's or adult's current level of functioning, an understanding of the individual's strengths and difficulties, a theoretical and pragmatic model for planning and delivering long term, stage-by -stage programming; and a vision of the individual's potential future.

Theoretical Background of Autism Interventions

One of the reasons why there has been less progress on intervention approaches have not grown out of knowledge and theory about the core deficits in autism. Treatment approaches to autism have been based on the "grand" psychological theories that prevailed when the treatments were originated. The earliest treatment approaches were psychodynamic, in keeping with the mid-twentieth century understanding of autism and of typical development and functioning. The paradigmatic example of this approach was the Orthogenic School founded by Bruno Bettleheim and dedicated to undoing the psychic harm caused by "refrigerator" mothering.

Psychodynamic approaches were succeeded by interventions based on the theories of learning that increasingly dominated in psychology. These treatments, which were much more appropriate for intervention with children with autism, were used to address the deficits in communication and social

behaviour that characterized children with this diagnosis and reduce the manifestation of behaviour problems that interfered with the children's development. Lovass (1987) pioneered an approach to intervention that was built on the principles of reinforcement that were shown to govern the behaviour of animals and human being by such behavioural theorists of the time. Moreover, Lovass recognized that interventions with children with autism required intense involvement, so interventions were designed for 40-hour-a-week carried out over several years.

The early behaviorists also created methods to assess the gains of individual children over time. These methods were adaptations of assessment techniques used in learning studies with animals and typical children. The creation of these methods allowed for a comparison of the effectiveness of different teaching methods.

Behavioural interventions known as discrete trials continue to dominate the treatment approaches used in many parts of the world. This intensive, individual involvement of therapist with children clearly shapes some of the behaviour of the children in treatment in ways that expands their skills and minimizes their behaviour problems. At the same time, students and followers of Lovass have recognized that some of the gains of the children in treatment do not generalize to situations outside the treatment milieu. This is especially true for skills developed in the communication and social domains. Thus, current behavioural treatments often are carried out in more naturalistic settings to encourage the generalization of skills. In addition, the content of behavioural interventions has changed to focus on

pivotal skills, such as social motivation and self-initiations that form the basis for social engagement (Koegel & Koegel, 1995).

During the same years that behavioural approaches were being designed, an alternative strategy to intervention was constructed based on a community approach to intervention. The strategy used by Eric Schopler in the TEACCH programme was to insure that families were furnished with high-quality diagnostic and treatment services and providing consultation at the level of the school and clinic.

Recently, the trend has been to use more developmental approach to interventions, targeting the areas that have been shown to be at deficit in children with autism. Given that young children with autism show less social orienting and imitation, less capacity to follow the gaze and pointing gestures of others, less referencing of others in ambiguous situations and sharing of interesting experiences, and less pretended play, interventions have been developed that focus on increasing all of these social skills and behaviours. An increasing number of interventions also attempt to foster peer interaction both in mainstreamed and special school programmes. Most of these developmental interventions substitute relationship-based approaches for the more didactic form of teaching that characterizes the behaviourally based interventions.

The Goals of Intervention

The aims of intervention vary a great deal depending on the theoretical understanding of autism held by the intervention personnel. At the same time, because of the evidence that individuals with autism with better language score have better outcome later in life; many interventions have been focused

on improving communication skills. In addition, interventions also targets the social behaviours that are so frequently either missing or aberrant in individuals with autism.

According to Bergman and Gerdtz (1997) behavioural interventions have the predominant treatment approach for promoting the social, adaptive, and behavioural functions of children and adults with autism. Behavioural approaches have been adopted increasingly for enhancing personal independence and responsible choice through skill development and habilitative training, increasingly repertoires of prosocial behaviour and leisure activities, and teaching methods of self-control and relaxation. In addition, behavioural interventions have been employed for reinforcing adaptive responses and suppressing maladaptive ones.

Autism is lifelong neurodevelopmental disorder affecting sociability and communication for which no etiological based treatment has been developed. Nevertheless, as there is no cure at present, the word ‘treatment’ should be used only in a very limited sense, reflecting interventions aimed at helping people with autism to adjust more effectively to their environment (Francis, 2005).

Interventions for autistic children cover different psycho educational, behavioural techniques, alternative/augmentative communication, social skill teaching, parental involvement, sensory integration and auditory integration therapy.

Psycho educational

The Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) are a comprehensive model of intervention from childhood through to adulthood. TEACCH focuses on understanding the culture of autism; i.e., the differences in the ways in which the people with autism spectrum think, learn, and experience the world, arguing that these cognitive differences underpin autistic symptoms and explain the behavioural problems exhibited. The goal of the approach is to obtain maximum autonomy for the person at all levels of functioning, depending upon their abilities. TEACCH intervention activities includes diagnosis, parent training, education, social leisure skill development, communication, vocational training and supported employment placements.

Behavioural Techniques

Behavioural components are incorporated in many other educational approaches in autism, such as TEACCH. Thus, with the term ‘behavioral treatments refer to those interventions where the Skinnerian-based techniques from the predominant feature of this approach. Although behavioral methodology has been introduced, applied behaviour analysis and discrete trial learning still remains the core feature of behavioural intervention in autism.

Skills in receptive /expressive language, attending to social stimuli imitation, pre-academics and self-help that are deficient are broken into discrete components. They are then taught on a one-to one basis, in school and / or at home, using reveals for the successful completion of each step.

Behavioral techniques of reinforcement, backward chaining, shaping, and prompt fading are used.

In Applied Behavioural Analysis (ABA) approach the focus is on the use of rewards of reinforcement to encourage desired behaviors and the elimination or reduction of unwanted behavior by removing their positive consequences by means of 'time out', 'extinction' or punishment (Francis, 2005).

In conclusion, the literature shows that intensive behavioral therapy clearly benefits children with autism and yields a high degree of parental satisfaction: however, the original effectiveness claim was overstated and its cost-effectiveness, in terms of time, effort, and money, has been adequately assessed (Howlin, 1997).

Alternative/Augmentative Communication

As interest turned away from enhancing speech to enhancing communication alternative and augmentative communication approaches emerged. These methods are used in conjunction with other interventions, acting as a compliment to the communication domain. As the vast majority of persons with autism are visual thinkers and learners, visual support can help them to make sense of the process of communication, regardless of their level of speech. Picture Exchange Communication (PECS) was developed by Andrew Bondy and Lori Frost, as an augmentative alternative training package, based on Skinnerian rationale, for teaching functional communication to children and adults with autism and other communication deficits. PECS has been shown to facilitate the development of spoken words its principal advantage is the teaching of communication intent and initiation,

a constant setback of the majority of the other alternative/augmentative communication approaches (Bondy & Frost, 2001).

Facilitated communication claims to offer an alternative means of communication to people with speech problems through a facilitator who support their hands, wrist, or arm to help them to use a communicator board or to type words, phrases, or sentences, even if they do not have communicative speech (Francis, 2005).

Social Skills Teaching

Another interesting area of intervention, especially for higher functioning people with autism, is that of teaching social skills. Carol Gray's Social Stories is a noteworthy complimentary intervention aimed at improving the social understanding of people with autism. The stories are produced in responses to a troubling situation, to explain the how and why of its social context, and for praising the positive achievements of the child. After gathering relevant information about the topic and discussing it with the person, so that it can be tailored to their perspective, a short script is customized to their needs, interests, and abilities, and the specific guidelines of the technique.

According to Gray (1998) Social Stories include factual information regarding the social situation, positive reactions of others in that social situation, and directive statements of appropriate or desired social responses. It is then taught to the person with a relevant title comparing the core information of the social story and using descriptive, perspective directive and control sentence in a specific rate. The incorporation of visual cues in social stories adds to their effectiveness.

Parental Intervention

Despite the lack of methodologically adequate studies supporting parent- mediated interventions, both the existing literature and clinical experience suggest that the use of parents as co-therapists provides an economical method of increasing the number of hours a child receives treatment in a constant and consistent way. Diggle et al (2003) found that it offers children the possibility of generalizing what they have learned at school or from the specialists and above all, empowers the parents and makes them feel in control of their child. This results in a better parenting style and the avoidance of distress and disappointment.

The Efficacy of Intervention

Although there has been some progress in the design of interventions, the examination of the efficacy of intervention is neglected. There is some suggestion that the age at which treatment begins may be an important factor. Available treatment studies have generally focused on preschool or school-age children, and few studies have directly addressed the issues of intervention in infancy. This problem will become more critical as early diagnosis improves (Volkmar et al., 2004).

Various factors appear to be central in successful intervention programs. Children with less classical autism may respond better than those with more strictly defined autism, and children with better cognitive abilities or higher levels of engagement may respond more positively. For all treatments, generalization of skills learned across setting is critical. Unfortunately, even though earlier detection and intensive intervention have failed to do well even

with excellent intervention; the study of such children may help to clarify how treatments can be more individually tailored to the child. Although there has been a growing interest in teaching approaches for social skills, much of this literature has focused on somewhat older children. In addition, much of information on effective treatments has emerged though single-subject designs. There is a critical need for research that addresses issues of treatment mechanisms and moderators as well as individual differences in response to treatments.

A review of the empirical literature on the various aspects of autism further clarifies the issues.

Chapter II

REVIEW OF LITERATURE

For designing the present study the available empirical literature on Autism was also explored using both printed and electronic media. An examination of the nature and theme of studies reveal that (1) a large volume of studies has focused on one or two cognitive, communicative, social skills in autism. (2) Intervention studies though voluminous, were conducted mostly focusing on the affected child. (3) Since 1990's the focus has been extended to neuropsychological aspects also. (4) Very few studies have explored the feasibility of parental intervention for enhancing the development of autistic children. There is a dearth of Indian studies on parental intervention in this area.

The collected studies are presented in this chapter in four sections as follows:

(a) Language and Communication studies,
(b) Social behaviour studies,
(c) Neuropsychological studies, and
(d) Intervention studies.

LANGUAGE AND COMMUNICATION STUDIES

This section briefly explores the characteristics of the development of language in children with autism. Several studies have found that, as early as one year of age, very young children with autism are less responsive to their names or to someone speaking compared to other children (Lord, 1995;

Osterling & Dawson, 1994), and they are less responsive to the sound of their mother's voices (Klin, 1991).

In one study, Lord, Pickles, DiLavore, and Shulman (1996) found that two year-old children judged very likely to have autism had mean expressive and receptive language ages of less than 9 months, in contrast to other skills falling between 16 and 21 months. Not only was their expressive skills continued to develop at a slower rate through age five compared to nonautistic children with developmental delays at similar nonverbal levels.

Chan, Cheung, Leung and Cheung (2004) examined the verbal expression-comprehension abilities of 46 Chinese children with autism at age's five to six. Results showed that 63% of the children with autism demonstrated language impairment. Specifically, 42% were impaired in both verbal expression and comprehension abilities, and 21% demonstrated impaired expression skills.

Some other studies mainly focused on language regression in autism. Kurita (1985) found that about 25% of children with autism are described by their parent as having some words at 12 to 18 months and then losing them. A large-scale systematic longitudinal study of toddlers by Lord, Shulman, and DiLavore (2004) found that language regression after a pattern of normal language onset was unique to autism and not found among children with other developmental delays. Lord and her colleagues found that children who experienced loss of words also lost some social skills, supporting the findings from Goldberg and her colleagues (Goldberg et al., 2003), and that similar losses of social skills occurred in a smaller group of children with autism who had not yet used words at time of loss (Luyster et al., 2005)

Bernabei and Camaioni (2001) presented the developmental profile of a child with autism during the first 3 years of life presented. Clinical material obtained from different sources like, home videos from birth to 3 years, and cognitive and communicative evaluations at 24, 34, and 38 months. The videos showed that how the child appeared to make progress up to 12 months, but from 12 to 18 months some abilities that had been previously acquired were lost, and a decrease in social interaction, communication and language was observed. From 18 to 38 months communicative and linguistic abilities remained unchanged, but social interactive behaviours continued to decrease. In another study, Richler et al. (2005) demonstrated that only a minimal relationship between language regression in autism and later prognosis or outcome, with children who had regressions having, on average, slightly lower verbal IQ scores at school age than children with no history of loss.

Lord et al. (2004) found that both within and across categories of children with ASDs, there is significant variability in the rate at which language progresses among those children who does acquire some functional language. In one study, Kjelgaard and Tager-Flusberg (2004) investigated language functioning in a group of 89 children diagnosed with autism. The children, who were between four and fourteen years old, were administered a battery of standardized language tests tapping phonological, lexical, and higher-order language abilities. The main findings were that among the children with autism there was significant heterogeneity in their language skills, although across all the children, articulation skills were spared. Different subgroups of children with autism were identified on the basis of

their performance on the language measures. Some children with autism have normal language skills; for other children, their language skills are significantly below age expectations.

Charman et al. (2003) observed that in the preschool period and beyond, certain nonverbal skills, especially the frequency of initiating joint attention, and imitation, are strong predictors of language acquisition for children with autism. Recently, Thurm, Lord, Lee, and Newschaffer (2006) studied in fifty nine children with autism, twenty four children with PDD-NOS and thirty five children with non-spectrum developmental disabilities followed from age two to five. The age two and three scores of non-verbal ability, receptive communication, expressive communication and socialization were as predictors of receptive and expressive language at age five. The result revealed, early joint attention as well as vocal and motor imitation skills were more impaired in children who did not develop language by age five than in children who did develop language by five.

In another study, Toth, Munson, Meltzoff, and Dawson (2006) investigated the unique contributions of joint attention, imitation, and toy play to language ability and rate of development of communication skills in young children with autism spectrum disorder. Sixty preschool-aged children with ASD were assessed using measures of joint attention, imitation, toy play, language, and communication ability. Results showed that two skills, initiating protodeclarative joint attention and immediate imitation, were most strongly associated with language ability at age 3-4 years, whereas toy play and deferred imitation were the best predictors of rate of communication development from age 4 to 6.5 years.

Howlin, Goode, Hutton, and Rutter (2004) demonstrated that there is also a significant correlation between IQ and language outcomes, although higher levels of nonverbal language skills.

Joseph, McGrath and Tager-Flusberg (2006) examined executive dysfunction and its relation to language ability in 37 verbal school-age children with autism and 31 nonautistic comparison participants who were matched on age and on verbal and nonverbal IQ but not on language ability, which was lower in the autism group. Finding showed that children with autism exhibited deficits compared to the comparison group across all three domains of executive function that were assessed including working memory, working memory and inhibitory control, and planning. Children with autism were less developed than the comparison group in their language skills, but correlational analyses revealed no specific association between language ability and executive performance in the autism group. In contrast, executive performance was positively correlated with language ability in the comparison group. This pattern of findings suggest that executive dysfunction in autism is not directly related to language impairment per se but rather involves an executive failure to use of language for self-regulation.

Bartak, Rutter, and Cox (1975) found articulation development to be somewhat slower in children with autism than normal. Contrary to above mentioned study, Kjelgaard and Tager-Flusberg (2001) found that among children with autism who speak, articulation is often normal or even precocious. Shriberg et al. (2001) reported that one-third of speakers with high-functioning autism (HFA) and with AS retained residual speech distortion errors on sounds such as /r/, /l/, and /s/ into adulthood, whereas the rate of these errors in the general population is 1%.

Word use in autism can be observed in several studies. Minshew and Goldstein (1993) shown that verbal children with autism use semantic groupings in very similar ways to normal people who categorize and to retrieve words. Jarrold, Boucher, and Russell (1997) found that high-functioning children and adolescents with autism can score well on standardized vocabulary tests, indicating an unusually rich knowledge of words. At the same time, Tager- Flusberg (1991) found that children with autism often fail to use their knowledge of words in a normal way to facilitate performance on retrieval or organizational tasks.

Abnormal use of words and phrases has been described in autism for many years. Mayes, Volkmar, Hooks, and Cicchetti (1993) found that the presence of peculiar language pattern was one of the best discriminators of pervasive developmental disorder from language disability. Recent study by Perkins, Dobbinson, Boucher, Bol, and Bloom (2006) investigated anomalous vocabulary use in a 70,000-word corpus of conversational autistic language and examine evidence that concept formation, and hence vocabulary, is abnormal in autism. Little evidence is found of anomalous use of artifact terms, though errors with temporal and also spatial expressions are relatively common.

Kamio, Robins, Kelley, Swainson, and Fein (2006) examined whether the automatic lexical/semantic aspect of language is impaired or intact in eleven children with high-functioning autism or AS without a history of early language delay and age-, IQ-, and gender-matched typically developing individuals. Semantic priming effects were found for near-semantically related word pairs in the controls, whereas this was not the case in the AS

participants.

Eigsti, Bennetto and Dadlani (2006) investigated of syntactic and higher-level discourse abilities in verbal children with autism, age 5 years. Findings indicated clear language difficulties that go beyond what would be expected based on developmental level; specifically, syntactic delays, impairments in discourse management and increased production of non-meaningful words (jargon). The result indicated that a highly specific pattern of language impairments, and importantly, syntactic delays, in a group of children with autism carefully matched on lexical level and non-verbal mental age with children with developmental delays and typical development.

Relatively few studies have systematically investigated grammatical aspects of language acquisition in autism. Roberts, Rice, and Tager-Flusberg (2004) investigated sixty children with autism who were given tasks to elicit both the past and the third person present tense. The sample was divided into those who had scores on within the normal range on standardized language tests and those who were significantly below the mean. Results indicated that only those with impaired language score performed poorly on the tense tasks.

The most systematic direct investigation of prosodic features in AS was conducted by Shriberg et al. (2001). They analyzed speech samples collected during a diagnostic interview, which was conducted with the adolescent adult participant with autism or AS. The main findings were that about one-third of the participants with AS had distorted speech and articulation problems, and two-thirds expressed prosodic abnormalities at grammatical, pragmatic, or affective levels.

Koning and Magill-Evans (2001) investigated whether adolescents

with AS were able to use nonverbal cues, including facial expression, body gestures, prosody, to interpret the feelings of people acting in videotaped scenes. They found that the adolescents with AS were significantly worse than controls in interpreting emotions and relied least on prosodic information.

Sheinkopf and colleagues conducted a detailed examination of the vocal behaviour of young preverbal children with autism and a group of comparison children with developmental delays. Although the children with autism did not have difficulty with the expression of well-formed syllables, they did display significant impairments in vocal quality (Sheinkopf, Mundy, Oller, & Steffens, 2000).

Some research on the language of individuals with autism focused on their comprehension skills. Charman and his colleagues collected data on early language development from a large group of preschool-age children with autism using a parent report measure: the Mac Arthur Communicative Development Inventory (Charman, Drew, Baird, & Baird, 2003). They found that comprehension of words was delayed relative to production, though, like typically developing children, in absolute terms the children with autism understood more words than they produced.

Studies of very young children (Paul, Chawarska, Klin, & Volkmar, 2004) suggests that comprehension skills are depressed relative to production in the second year of life, while the gap tends to narrow, with receptive skills moving closer to expressive levels, in the third to fourth year. Kjelgaard and Tager-Flusberg (2001) studied that receptive and expressive language skills among somewhat older children with autism using standardized tests have

found that receptive skills as measured by standard scores tent to be comparable to expressive on vocabulary tests as well as tests of higher order language processing.

Language use or the pragmatic aspects of language in autism has been studied from a variety of perspectives. Stone and Caro-Martinez (1990), in an observational study of spontaneous communication of children with autism of varying abilities placed in special classrooms, found differences in the functions about which the children communicated. These differences were related to chronological age, nonverbal IQ, and whether the child's primary mode of communication was through speech or motor acts. Results showed that children who did not talk engaged in more social routines than verbal children and children with speech were more likely to use language to offer new information. They communicated to a greater number of different people and were more likely to address communications to peers as well as adults than children without speech.

Dennis, Lazenby, and Lockyer (2001) explored that the ability of 8 high-functioning children with autism and typically developing children to use and understand of the pragmatic inferences necessary for successful communication, even when they have the ability to perform noninferential language tasks. The results showed that high-functioning children with autism could define words and identify multiple meanings for ambiguous words. In understanding words for mental states, they made inferences from mental state verbs to given or presupposed knowledge. However, they failed to infer what mental state verbs implied in context; to make inferences about social scripts; to understand metaphor; and to produce speech acts, all of

which are inferences that are the basis of successful social communication because they elaborate meaning or convey intentions.

Lewis, Woodyatt, and Murdoch (2007) reported on the linguistic and pragmatic language skills of seventeen adults with a diagnosis of autism spectrum disorder. They were assessed by using the Western Aphasia Battery (WAB), the Right Hemisphere Language Battery (RHLB) and the Test of Nonverbal Intelligence-Second Edition (TONI-2). Performance by the ASD participants was compared to 13 peers with no disability. The findings showed that there were significant differences between the ASD group and the control group on a number of the WAB and the RHLB subtests, but no significant difference between the two groups on nonverbal cognitive ability.

Lewis, Murdoch, and Woodyatt (2007) investigated communicative competence and metalingusistic ability of children and adults with autism spectrum disorder by using Test of Language Competence-Expanded Edition (TLC-E). The results revealed that relative to controls, those with ASD were less competent on a range of TLC-E tasks. No differences were found for either child or adult ASD groups on any of the TLC-E measures when re-classified as Asperger syndrome and high functioning autism using DSM-IV language criterion. Hierarchical cluster analyses of individuals with ASD identified subgroups within the spectrum.

Freitag, Kleser, and Gontardf (2006) compared fifteen male adolescents with ASD, 16 male and 13 female controls regarding imitation abilities of upper and lower facial movements, and language skills as assessed by the pragmatic rating scale and the Aachen Aphasia test (AAT). The findings showed reduced imitation abilities of facial movements and non-meaningful

combined hand-and-finger gestures in Autism Spectrum Disorder subjects. Regarding language, ASD subjects showed difficulties in AAT spontaneous speech measures and reduced pragmatic language abilities. Correlations of imitation and language measures differed between ASD, male and female controls. The weak and differential correlations of imitation and language measures in the three comparison groups might imply a differential organization of language and imitation networks in the three comparison groups. Pragmatic abilities, which are a central feature in ASD, were not related to imitation abilities.

Studies of children with autism find that they rarely use language for comments, showing off, acknowledging the listener, initiating social interaction, or requesting information. Even among older higher functioning children, language is rarely used to explain or describe events in a conversational context (Ziatas, Durkin, & Pratt, 2003).

Chuba, Paul, Miles, Klin, and Volkmar (2003) reported on conversational behaviours in 30 adolescents with either HFA and AS who were engaged in semi structured conversational interviews with clinicians. Findings revealed that for both diagnoses, conversational errors were inconsistent, rather than constant. Nonetheless, it was possible to distinguish teenagers with ASD from those with typically development (TD) in terms of the quantity of conversational errors. No TD subjects made more than five errors within a 30-minute sample, whereas all subjects with HFA and AS made more than eight errors. The most robust difference observed was in the areas of gaze and intonation, while remaining differences centered on ability to share topics and infer others' informational state.

Volden (2006) investigated nine school-aged, high-functioning children with ASD and matched to nine control group children based on language level responded to a stacked series of requests for clarification (RQCLs). During conversation, an unfamiliar examiner engineered ten episodes of communicative breakdown. Each consisted of a stacked series of three RQCLs ('What?', 'I don't understand', 'Tell me another way'). Verbal and non-verbal responses to each RQCL were coded. The finding revealed that children with ASD were similar to language age-matched control children in responding to RQCLs and employing a variety of repair strategies. In addition, their pattern of responding over the series of RQCLs was very similar to the controls in varying the repair strategy by adding increasingly more information as the breakdown persisted, i.e., as the sequence of RQCLs progressed. Children with ASD, however, were significantly more likely than language age-matched controls to respond to an RQCL with an inappropriate response.

Few studies have been reported the ability of individual with autism to produce narrative discourse. Norbury and Bishop (2003) found few differences between narrative skills of children with ASD and those with specific language impairment, suggesting that difficulties with stories may be common to children with communication impairments.

Seung (2007) examined the linguistic characteristics of high functioning individuals with autism and Asperger syndrome. Each group consisted of 10 participants who were matched on sex, chronological age, and intelligence scores. Participants generated a narrative after watching a brief video segment of the Social Attribution Task video. Each participant was then asked 10

questions related to the stimulus video. The narrative samples and responses to the questions were analysed linguistically. Individuals with high functioning autism and Asperger syndrome performed similarly on most measures of language function; however, results suggest there may be pragmatically-based differences between the groups in the use of verb tense marker.

Loveland and Tunali-Kotoski (1997) observed that many children with autism have an early interest in letters and numbers, and some learn to read words without any direct instruction. In a study, O'Connor and Klein (2004) demonstrated the effects of three kinds of facilitation on reading comprehension in twenty adolescent students with autism spectrum disorders. In a within-subjects design, each students read passages under four conditions: answering pre reading questions, completing cloze sentences embedded in the text, resolving anaphora by identifying relevant antecedents, and control (reading only). A repeated measures analysis of variance indicated that conditions differed significantly in their effects on reading comprehension. Post hoc contrasts showed that the effects of anaphoric cuing were statistically significant and medium in size; the effects of pre reading questions and cloze completion were small and not statistically significant.

Nation, Clarke, Wright, and Williams (2006) investigated reading skills in 41 children with autism spectrum disorder. Four components of reading skill were assessed: word recognition, nonword decoding, text reading accuracy and text comprehension. The results showed that levels of word and nonword reading and text reading accuracy fell within average range although reading comprehension was impaired. However, there was

considerable variability across the sample with performance on most tests ranging from floor to ceiling levels. Some children read accurately but showed very poor comprehension, consistent with a hyperlexia reading profile; some children were poor at reading words and nonwords whereas others were unable to decode nonwords, despite a reasonable level of word reading skill. These findings demonstrate the heterogeneous nature of reading skills in children with ASD.

Functional magnetic resonance imaging (fMRI) is beginning to be used, as well, to investigate language processing in autism. Just, Cherkassy, Keller, and Minshew (2004) investigated brain activation during sentence comprehension. Reliable differences were found between subjects with HFA and TD in activation in the areas of the cortex. Subject with HFA showed higher activation in Wernicke's region and lower activation in Broca's area. Fuctional connectivity between cortical regions also appeared lower in subjects with HFA.

Kana, Keller, Cherkassky, Minshew, and Just (2006) examined functional MRI of brain activation in 12 participants with autism and 13 age- and IQ-matched control participants while they processed sentences with either high- or low-imagery content. The analysis of functional connectivity among cortical regions showed that the language and spatial centres in the participants with autism were not as well synchronized as in controls. In addition to the functional connectivity differences, there was also a group difference in activation. In the processing of low-imagery sentences like, addition, subtraction and multiplication are all math skills, the use of imagery is not essential to comprehension. Nevertheless, the autism group activated

parietal and occipital brain regions associated with imagery for comprehending both the low and high-imagery sentences, suggesting that they were using mental imagery in both conditions. In contrast, the control group showed imagery-related activation primarily in the high-imagery condition. The findings provide further evidence of underintegration of language and imagery in autism but also shows that people with autism are more reliant on visualization to support language comprehension.

Gaffrey et al. (2007) studied activation associated with semantic category decision in ten high-functioning men with autism spectrum disorder and ten healthy control subjects matched for gender, handedness, age, and nonverbal IQ by functional MRI. Participants indicated via button press response whether visually presented words belonged to a target category (tools, colors, feelings). The control condition required target letter detection in unpronounceable letter strings. Significant activation for semantic decision in the left inferior frontal gyrus was found in the control group. Corresponding activation in the autism group was more limited, with smaller clusters in left inferior frontal areas 45 and 47. Autistic participants, however, showed significantly greater activation compared to controls in extrastriate visual cortex bilaterally, which correlated with greater number of errors on the semantic task.

SOCIAL BEHAVIOUR STUDIES

Children with autism exhibit deficits in multiple aspects of social processing. They are gaze behaviour, social speech, joint attention, imitation, play, attachment, peer relations, and affective development. In autism,

studies of gaze behaviour are much discussed recently. In a study of 2-year olds with autism, Chawarska and colleagues (2003) demonstrated that in naturalistic setting toddlers with autism do not follow the gaze of others; they are sensitive to directional cues inherent in eye movement. In another study, Senju, Tojo, Dairoku, and Hasegawa (2004), observed that children with autism did not evidence the expected preferential gaze shifting in response to a social cue. In addition, more general pattern of difficulty shifting controlled attention was also observed.

Spezio, Adolphs, Hurley and Piven (2007) investigated the relationship between gaze onto the eye and mouth regions of faces, and the visual information that was present within those regions. The result showed that compared to ten IQ- and age-matched healthy controls, eight participants with autism showed less fixation specificity to the eyes and mouth, a greater tendency to saccade away from the eyes when information was present in those regions, and abnormal directionality of saccades.

One study in the area of speech showed that even very young children appear to lack a preference for speech sounds over other kind of sounds (Oterling & Dawson, 1994). In another experimental study in toddlers Paul, Chawarska, Klin, and Volkmar, (2004) suggests that a general decrease in interest in listening to speech and a lack of preference for typical language patterns.

The social communication profiles from behavior samples videotaped between 18 and 24 months of age in three groups of children: 50 with autism spectrum disorders, 23 with developmental delays, and 50 with typical development. The ASD group scored significantly lower than the DD group

on five social communication measures and the TD group on all 14 measures, indicating distinct profiles late in the second year (Wetherby, Watt, Morgan. & Shumway 2006).

Various studies have suggested problems in joint attention behaviours. For example, Osterling and Dawson (1994) reviewed videotapes of first birthday parties of 22 children with autism. Data were collected on social, affective, communicative, and joint attention behaviours as well as for symptoms suggestive of autism. The children with autism exhibited fewer social and joint attention behaviours and more autistic symptoms. Osterling et al. (2002) studied the same phenomena among 20 children later diagnosed with autism spectrum disorder, 14 later diagnosed with mental retardation, and 20 typically developing children. This study demonstrating that the children with autism exhibited fewer social and joint attention behaviours and more atypical autism specific behaviours than both the typically developing and developmentally delayed groups.

Children with autism display serious deficits across different types of imitation tasks. Various studies have documented deficits across different types of imitation tasks. For example in an early study, Roeyers, Oost, and Bothuyne (1998) investigated two candidate precursors, imitation and joint attention, in young children with autism and a control group of nonautistic children with a developmental delay. Children with autism were found to be impaired or delayed in imitation and joint attention abilities. Although the evidence for autism -specific deficit appears to be stronger in the domain of joint-attention behaviors than it is in the domain of imitation, it seems premature to reject imitation as a possible precursor to the development of

mind reading skills.

The adolescents with autism would have specific limitations in imitating the “style” of another person's actions. In a series of original tasks that tested the delayed imitation of novel nonsymbolic actions, 16 participants with autism and 16 nonautistic participants group-matched for age and verbal ability were proficient in copying goal-directed actions, but in 3 out of 4 tasks, strikingly fewer participants with autism imitated with style with which the demonstrator executed the actions. An additional finding was that on two conditions that involved copying self-orientated actions, only five of the participants with autism but 15 of the 16 nonautistic participants spontaneously adopted the orientation-to-self on at least one occasion (Hobson & Lee 1999). In another study by Rogers, Hepburn, Stackhouse, and Wehner (2003) demonstrated that toddlers with autism evidenced delays relative to developmentally delayed and typically developing children in specific types of imitation skills including oral-facial imitation of actions on objects.

Beadle-Brown (2004) tested if there were distinctions between different types of actions, such as symbolic versus non-symbolic, one-handed versus two-handed or symmetrical versus asymmetrical actions, on a test of elicited imitation. In this study, a large battery of tasks was used to elicit imitation from three groups of autistic children and adults, two groups of typically developing children, and a group of children with mild-to-moderate intellectual disabilities. The results showed that majority of children and adults with autism had little impairment relative to the controls, although certain actions like symbolic and asymmetrical did seem more difficult, especially for the youngest children.

The influence of developmental level on interaction and imitation in infants and young children with autism on the basis of family videos and filmed consultation was investigated by Receveur et al. (2005). The sample comprised 18 children with autism divided into two groups according to their developmental quotient. The findings showed that, at a very early age, infants later diagnosed as having autistic disorder show different intensities of interaction and imitation deficits according to developmental level.

Ham, Corley, Rajendran, Carletta, and Swanson (2007) tested on imitation of two types of meaningless gesture: hand postures and finger positions in nineteen people with High-Functioning Autism. The individuals with HFA achieved lower scores in the imitation of both hand and finger positions relative to a matched typical group. The between-group difference was primarily accounted for by performance on a test of visual motor integration, together with a hand imitation deficit which was specifically due to errors in body part orientation.

Studies have consistently revealed that children with autism have problems in the play skills. For example, Jarrold (2003) reviewed the empirical evidence of difficulties in pretend play in autism, and focuses in particular on individuals' ability to engage in pretence in free play conditions, to produce pretence in more structured situations, and to make sense of pretend actions carried out by another person. These data suggest that individuals with autism have a marked difficulty in producing pretend play, but one that is reduced by providing substantial structure to the play situation or by testing comprehension of pretence.

Rutherford and Rogers (2003) studied development of pretended play skills in 28 young children with autism, 24 children with other developmental disorders, and 26 typical children. Result did show that children with autism were significantly delayed on pretend play. Later, Rutherford and his colleagues (2006) tested the hypothesis that developmental change in pretend play performance can be predicted by earlier measures of executive function, intersubjectivity, imitation, or general development. Participants at the time of follow-up testing were 28 children with autistic disorder, 18 children with other developmental disorders, and 27 typically developing children. Children with autism were profoundly delayed given both competence measures as well as performance measures.

Holmes and Willoughby (2005) investigated the play behaviours of children with autism. Cognitive and social levels of play engaged in by 4- to 8-years-old children with autism spectrum disorders were examined in naturalistic classroom settings. In addition, play at home was compared with play at school via mother and educator questionnaires. Seventeen school-aged children, their educators, and their mothers participated in the study. Each participant was observed for one free play session on 5 separate days. The most frequently observed play behaviours included parallel-functional play, adult interactions, and solitary-functional play.

Spontaneous symbolic play, declarative joint attention, social referencing and imitation of symbolic play in 3- to 6-year-old children with an autism spectrum disorder during interaction with their mothers was examined by Warreyn, Roeyers, and Groote (2005). Compared to a control group matched on age and IQ, the children with ASD initiated less joint

attention with their mothers when confronted with a pleasant event and they showed a tendency to play less symbolically and more non-functionally. Children with ASD showed no social referencing or imitation deficits.

In a meta-analytic study employing the Strange Situation, Rutgers, Berckmans-Kranenburg van Ijzendooran, and van Berckelaer-Onnes (2004) demonstrated that autism is compatible with a secure attachment organization. Moreover, Rutgers and his colleagues revealed that, although children with autism were more likely to have insecure attachment organization than their typically developing peers, higher functioning individuals with autism were no more likely to be insecurely attached than their typically developing peers.

Nadel et al. (2000) studied eight low-functioning and non-verbal children with autism. They were presented with a modified version of the 'still face' paradigm performed by a stranger. The children's reactions illustrate the development of expectancies concerning human social behaviour. While they ignored the stranger and did not show any concern about her odd behaviour during the first still episode, they all focused on the adult during the second still episode. In this episode, they exhibited a mixed social pattern of positive overtures and negative emotional expressions which resembles the still face effect found in normally developing infants. These findings suggest that low-functioning children with autism are able to integrate their previous experience with a partner and detect social contingency.

Dissanayake and Crosseley (1997) examined separations and reunions in naturalistic settings. They found that children with autism (and children with Down syndrome) showed fundamentally similar attachment behaviours

but greater variability in behaviours across three observation sessions.

Among individuals with autism limited interest in social interaction and reduced initiation of social contact with peers remain apparent overtime. In one study by Koning and Magill-Evans (2001) found that in older children, there is typically a failure to engage in social interchange with peers, and cooperative play is usually absent; they make far fewer approaches to peers than other children.

Orsmond, Krauss, and Seltzer (2004) investigated peer relationships and participation in social and recreational activities among 235 adolescents and adults with autism who live at home. Both individual and environmental factors were investigated as predictors of having peer relationships and participation in social and recreational activities. Greater participation in social and recreational activities was predicted by characteristics of the individual with autism (greater functional independence, less impairment in social interaction skills, higher levels of internalizing behaviors) and characteristics of the environment (greater maternal participation in social and recreational activities, greater number of services received, and inclusion in integrated settings while in school).

Observational study by Jackson et al. (2003), highlight deficits in social initiations to peers relatives to both typically developing and cognitively impaired peers. In another study, Bauminger and Kasari, (2000) found that direct interviews of higher functioning children and adolescents revealed greater difficulty defining central elements of what determines friendship relationships as well as greater feelings of loneliness.

Ruble (2001) studied the complexity of social interactions of 16

children with autism or Down syndrome. Statistical analyses revealed similar social contexts and opportunities to receive bids from others for both groups. Study also showed that differences in the frequencies and complexities of children's behaviors depended on behavioral intent. Socially intended behaviors were less frequent, less self-initiated, and less complex in children with autism.

In one study, Bauminger, Shulman, and Agam (2003) examined social interaction with peers and the understanding and feelings of loneliness in 18 high-functioning children with autism and 17 typically developing children matched for IQ, chronological age, gender, and maternal education. They observed on children's spontaneous social initiations and responses to their peers in natural settings. Children with autism revealed a good understanding of both social interaction and loneliness, and they demonstrated a high level of social initiation. Children with autism also reported higher degrees of loneliness than their typical age-mates, as well as a lower association between social interaction and loneliness, suggesting their poorer understanding of the relations between loneliness and social interaction.

Macintosh and Dissanayake (2006) compared the social skills and problem behaviours of children with high-functioning autism and Asperger's Disorder by using parent and teacher reports on the Social Skills Rating System. The participants were 20 children with high-functioning autism, 19 children with Asperger's Disorder, and 17 typically developing children, matched on chronological and overall mental age. The findings revealed that the children with autism and Asperger's Disorder were not differentiated on any social skill or problem behaviour based either on teacher or parent report.

NEUROPSYCHOLOGICAL STUDIES

Studies related to neuropsychological factors in autism include current psychological models like, theory of mind, central coherence, and executive functions, with related research findings interpreted and integrated into these specific constructs. Studies on social-cognitive mechanisms and language development also within the domain of neuropsychological function, but each are mentioned in earlier. In this section, focus is placed on studies related to specific cognitive mechanisms such as sensory perception, attention, memory, and executive functions.

Several studies are well documented on sensory disturbances and viewed as a primary area of deficit in autism. Ornitz and Ritvo (1968) observed that the range of hypo- and hypersensitivity affecting each of the senses in over 150 cases of autism. In the studies of early behavioural characteristics in autism by Adrien (1992); Osterling and Dawson, (1994) consistently found that abnormal responses to sensory stimulation to differentiate between children with autism and developmentally matched controls. They also found that a cluster of behaviours include: empty gaze; visual fascination with patterns and movements; failure to react sound/ appearing deaf; hyposensitivity to pain, cold, or heat; hypersensitivity to taste; and inappropriate use of objects, such as licking/mouthing, peering, or interest in texture.

Studies of Watling, Deitz, and White, (2001); and Dunn, Myles, and Orr (2002) by using parent questionnaire also report more severe or more frequent sensory symptoms in three through six years of age young and school age children with autism as well as children with Aspergers syndrome

with the need for external validation using clinical assessment methods. A significant association was not found when the relationship between sensory symptoms severity and severity of autism symptomotology was examined (Kientz & Dunn, 1997), but degree of abnormal sensory responsivity and impairments in adaptive behaviour were related (Rogers et al., 2003).

In one study, Laurent and Rubin (2004) found that the presence of sensory disturbances in autism has been connected with the levels of arousal, attention, emotional regulation, action or adaptive goal-directed behaviour. Researchers like Courchesne, Townsend et al. (1994) found that attention is a central deficit in autism and that the neocerebellum is an important structure in the coordination of attention and arousal systems, presenting evidence for its development in autism.

Goldstein, Johnson, and Minshew (2001) found that sustained attention for simple repetitive visual information is generally intact in individuals with autism compared to developmentally matched controls, as measured by continues performance tasks. In another study by Schatz, Weimer, and Trauner (2002) conducted a preliminary study of attention in Aspergers syndrome was suggestive of an attention deficit, specifically manifest in an inconsistent or variable response pattern to stimuli in a sustained visual attention task.

Deficits in attention in autism are typically reported for more complex tasks requiring filtering, selective attention, and shifts in attentional focus. One study by Burack (1994) on a target discrimination task, low-functioning individuals with autism were found to benefit from the presentation of a target location cue, but were more susceptible to nontarget distracters than

their developmentally matched counterparts. Plaisted, Swettenham and Rees (1999) investigated the selective attention task; children were instructed to attend to either the local or global level. The results showed that children with autism and normally developing children were quicker to respond to the global target than local target in the selective attention task.

Brian, Tipper, Weaver, and Bryson (2003) studied the inhibitory control mechanisms of selective attention in autism spectrum disorders. A negative priming task was used to examine selective spatial inhibition in participants with autism relative to matched non-clinical controls. The results indicated that inhibition of direct inhibition to task-relevant stimulus features. They also found that the irrelevant perceptual features of colour produced a facilitation effects in autism.

Mann and Walker (2003) examined if visual attention in autism is spatially over focused and if there is an associated deficits in broadening the spatial spread of attention. Result indicated that individual with autism are relatively less accurate and slower to respond in visual attention task.

The frequency and distribution of spontaneous attention shifts between social and non- social stimuli in autistic, typically developing, and non-autistic developmentally delayed infants investigated by Swettenham et al. (1998). The infant with autism showed a different pattern, shifting attention between an object and another object more than any other of shift. Further more, infants with autism showed fewer shifts of attention between an object and a person, and between person and person, than did the two control groups.

Sanders, Johnson, Garavan, Gill, and Gallagher (2007) reviewed the literature on four specific functions in ASD – sustained attention, orienting attention, response inhibition and set shifting. Based on the data there is evidence to suggest that deficits in orienting attention, response inhibition and set shifting exist in ASD, but sustained attention ability appears to be normal.

Ozonoff et al. (2004) found that speed and expectancy deficit in autism at a higher order level suggest that it is part of a more general difficulty with executive control originating from frontal lobe dysfunction, as evidenced by specific deficits on measures of attention that require cognitive flexibility or shifting between categories, sets, or rules.

Some other studies of Klin (2000) and Klin, Jones, Schultz, and Volkmar (2003) found that individuals with autism and AS shows deficiencies with regard to processing the most essential or salient information from stimulus-rich environments and attending to meaningful or shared aspects of a learning situation, namely, those not explicitly stated, both of which are of great relevance to the daily lives of individuals with autism.

It is consistently found that individuals with autism show intact digit span and intact immediate recall for semantically unrelated lists of words relative to ability-matched and, in some cases, normal controls (Bennetto, Pennington, & Rogers, 1996). There is also evidence to suggest well-developed associative learning mechanisms (Minshew & Goldstien, 2001).

Mottron, Morasse and Belleville (2001) administered memory tasks to

14 high-functioning individuals with autism and 14 typically developing individuals matched on chronological age and verbal intelligence. The tasks consisted of free and cued recall of 15 semantically unrelated words in 3 encoding conditions: phonological encoding, semantic encoding, and a no encoding orientation. The results indicated that in both groups, semantic orientation led to better free recall than did orientation toward syllabic encoding or absence of orientation. In contrast, semantic cues at retrieval led to better cued recall than phonological cues in typically developing individuals, whereas both types of cue had the same effect in prompting cued recall for individuals with autism.

Heaton, Ludlow and Roberson (2007) tested in two experiments on tasks of colour discrimination and memory in children with autism and two groups of controls matched for either chronological or non-verbal mental age. The results showed significantly poorer colour discrimination in children with autism in comparison to typically developing chronological age matched controls and children with autism, retained unlabelled perceptual colour information to a significantly higher level than either group of controls. The findings suggest that enhanced performance on perceptual tasks relate to a reduced tendency to encode verbal information in memory.

In a study (Russell, Jarrold, & Henry, 1996), when presented with working memory capacity tasks, both children with autism and children with moderate learning difficulties performed significantly more poorly than the normal controls on all three tasks. There was no difference, however, in the performance between the two comparison groups. Ozonoff and Strayer (2001) also reported no autism-specific impairments in working memory in

the context of a significant association between IQ, age, and performance on working memory tasks.

Joseph, Steele, Meyer, and Tager-Flusberg (2005) tested that twenty four high-functioning school-age children with autism and a comparison matched group were impaired in using verbal encoding and rehearsal strategies in the service of working memory. Working memory was assessed using verbal and non-verbal variants of a non-spatial, self-ordered pointing test. Participants were also administered a verbal span task to assess non-executive verbal rehearsal skills. Although the two groups were equivalent in verbal rehearsal skills, the autism group performed significantly less well in the verbal, but not the non-verbal, self-ordered pointing test. These findings suggested that children with autism are deficient in the use of verbal mediation strategies to maintain and monitor goal-related information in working memory.

Williams, Goldstein, and Minshew (2005) studied the auditory and visual memory of 29 high-functioning adults with autism and 34 group-matched normal controls. The individuals with autism performed as well as the controls on immediate and delayed memory for word pairs and stories and on a verbal working memory task. The autism group was impaired on immediate and delayed recall of faces and of family scenes and had impaired spatial working memory. The integrity of verbal working memory and impaired spatial working memory is consistent with the findings of other studies and may reflect the greater computational demands of the spatial task.

Williams, Goldstein, and Minshew (2006) administered a clinical memory test to 38 high-functioning children with autism and 38 individually

matched normal controls, 8-16 years of age. The resulting profile of memory abilities in the children with autism was characterized by relatively poor memory for complex visual and verbal information and spatial working memory with relatively intact associative learning ability, verbal working memory, and recognition memory.

Steele, Minshew, Luna, and Sweeney (2006) investigated working memory deficits in high-functioning children with autism by using the CANTAB computerized test of spatial working memory. Results showed that individuals with autism made more errors than a matched group of typically developing controls on this task, and were less likely to consistently use a specific organized search strategy to complete the task. Overall, these results demonstrate reduced spatial working memory abilities in autism.

Bowler and Colleagues examined episodic memory function in adults with AS in a series of studies and reported impairments in source memory as well as greater reliance on remembering relative to control (Bowler, Gardiner, & Grice, 2000; Gardiner, Bowler, & Grice, 2003).

Crane and Goddard (2007) examined the episodic and semantic autobiographical memories in a group of adults with autism spectrum disorders (ASD) and a control group matched for age, gender and IQ. Results demonstrated a personal episodic memory deficit in the ASD group in the absence of a personal semantic memory deficit, suggesting deficit dissociation between these two components of memory in ASD. Further analysis of memories across different lifetime periods revealed the adolescent and early adult lifetime periods to facilitate memory recall in the control group, but not in the ASD group.

When perceptual processing tasks have been used to examine implicit memory in autism and AS, no evidence of impairment has been found (Bowler et al., 1997; Renner et al., 2000). Whereas age and level of intellectual ability are more strongly associated with performance on explicit memory tasks, task complexity is likely to be a strong factor in both. Atypical patterns of results on list learning tasks (e.g., with manipulation to examine the effect of variables such as levels of processing, associative value, and redundancy) also suggest that it is the relation between semantic memory and episodic memory that explains impairment on explicit memory tasks (Beversdorf et al., 2000; Toichi & Kamio, 2002, 2003).

Kamio and Toichi (2000) compared the pictures and words with respect to access to semantic systems in autism using a semantic priming paradigm. The results showed that the autism group performed better on picture-word task than on word-word task. The finding suggests that the possible advantage of pictures over words in access to semantics in autism.

Kamio and Toichi (2006) investigated in 13 individuals with high-functioning autism, 15 individuals with Asperger's disorder, and age-, and IQ-matched controls were presented a list of sentences auditorily. Participants then evaluated semantically related but new sentences and reported whether they were old or new. Results indicated that the total rates of false recognition for semantically related sentences were similar among the three groups. Nevertheless, memory illusion on some aspects was reduced in HFA participants. These results suggest that HFA have difficulties in semantic association.

Diehl, Bennetto and Young (2006) examined story recall and narrative

coherence in 17 children with high-functioning ASDs and 17 typically developing children matched on age, gender, language abilities, and cognitive abilities. The study revealed no group differences in story length or syntactic complexity. Children with ASDs also did not differ from controls in their use of the gist of a story to aid recall or in their sensitivity to the importance of story events. Children with ASDs did, however, produce narratives that were significantly less coherent than the narratives of controls. Children with ASDs appeared less likely to use the gist of the story to organize their narratives coherently.

From studies of traditional executive function tasks, such as the Wisconsin Card Sorting Test, it is observed that for individuals with autism, the capacity to deal with complex information or new situations is limited by deficits in cognitive flexibility and /or understanding of novel/abstract concepts (Minshew, Meyer, & Goldstein et al., 2002). Conceptual flexibility versus perceptual or attentional flexibility appears to be the predominant deficit in higher functioning individuals. Additionally, rule learning and shifting within a rule or category are within the range of normal function (Berger, Aerts, Van Spaendonck, Cools, & Tenunisse, 2003).

When children with HFA and ADHD were compared on a range of tasks involving executive functions, the HFA group showed broad-based deficits in inhibiting a prepotent responses and verbal fluency (Geurts, Verte, Oosterlaan, Roeyers, & Sergent, 2004). Parent rating of the behaviour in these groups of children also yield a range of elevations on executive function scales although, again, the autism group is distinguishable by deficits in flexibility whereas the ADHD (combined) group exhibits more severe

inhibitory deficits when compared (Gioia, Isquith, Kenworthy, &Barton, 2002).

Individuals with AS also Show deficits in executive functioning and may perform equally poorly as individuals with HFA. The major difference between them was the overall higher IQ in Asperger syndrome, which was largely due to superior verbal abilities. (Manjiviona &Prior, 1999; Miller & Ozonoff, 2000). Indeed, a preliminary study of individuals with AS revealed a significant deficits in spatial working memory but no impairment in strategy formation on a spatial tasks (Morries et al., 1999).

The intellectual profiles of individuals with autism have been reviewed extensively, and it is typically found that visual and visual spatial processing are well preserved and frequently a strength relative to verbal abilities (Barnhill, Hagiwara, Myles, & Simpson, 2000).

Kuschner, Bennetto, and Yost (2006) studied patterns of nonverbal cognitive functioning in preschoolers with ASDs compared to groups with non-autism developmental delays and typical development. Profiles were examined using the Leiter International Performance Scale-Revised. Results indicated that the ASD group displayed clear relative strengths in visuospatial disembedding and detail-focused processing, with relative weaknesses in abstraction and concept formation. This contrasted with patterns of roughly equivalent abilities in both comparison groups.

Rinehart, Bradshaw, Moss, Brereton, and Tonge (2001) examined executive functioning, in particular, attentional set-shifting deficits in high-functioning autism and Asperger's disorder. A large or global digit composed

of smaller or local digits was presented during each trial. The participants indicated the presence of ones or twos by pressing the appropriate button. These targets could appear globally or locally. Relative to IQ, sex and age matched controls; reaction time to global targets in individuals with autism was retarded when the previous target appeared locally. This deficiency in shifting from local to global processing, however, was not observed in individuals with Asperger's disorder.

Iarocci, Burack, Shore, Mottron, and Enns (2005) examined the global-local processing in high-functioning children with autism and in groups of typically developing children. In experiment 1, the effects of structural bias were tested by comparing visual search that favored access to either local or global targets. The children with autism were not unusually sensitive to either level of visual structure. In experiment 2 a structural global bias was pitted against an implicit task bias favoring the local level. Children with autism were least sensitive to the structural global bias but showed greater sensitivity to the implicit task bias. This suggests that autism is associated with differences in the executive control processes used to guide attention to either the global or local level, and strategies may be more "data driven".

Tsatsanis et al. (2003) found that in a group of children who presented with significant language limitations and obtained a Vineland Expressive Communication age equivalent score at or below 3 years nonverbal IQ scores with strengths on subtests drawing primarily on visualization skills and particularly spatial reasoning.

Using the WISC-III, Mayes and Calhoun (2003) found strengths in

lexical knowledge relative to verbal reasoning in both high- IQ and low-IQ groups of older children, but a selective strength in visual spatial ability in their low-IQ group. Within the younger age group, assessed using the Stanford-Binet, IV, relative strengths in visual processing were found for both IQ groups, as well as strength in rote memory. The disparity between verbal and nonverbal abilities observed in the younger group was not obtained in the group of older children, representing an increase in verbal IQ versus change in nonverbal ability. Ghaziuddin and Mountain-Kimchi (2004) also found no difference in WISC-III VIQ and performance IQ scores overall in their samples of subjects with HFA at the mean age 12.42 years.

INTERVENTION STUDIES

As mentioned earlier in this chapter applying intervention strategies as a mode of help to improve the behaviour of autistic children is the focus of many studies. Most of the studies are limited to small number of cases as they have been conducted as part of helping autistic children seeking help from clinicians. However the results are found to be quite increasing. For the present study a brief review of the available ones during the past years is attempted. An examination of these studies reveals that they fall mainly under five categories: intervention to improve behavioural skills; social skills; communication skills and parental intervention.

Behavioural intervention

Current behavioural interventions can trace their roots to studies conducted in the early 1960's. Ferster and DeMyer (1961, 1962), were among the first to demonstrate that children with autism could indeed learn and would do so if the systematic application of operant discrimination learning

techniques was employed. Lovaas and his colleagues (e.g., Lovaas, 1977; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Lovaas, Freitag, Gold, & Kassorta, 1965; Lovaas, Koegal, Simmons, & Long, 1973) were the first to develop a comprehensive, systematic package of behaviour interventions that addressed a wide range of behaviours in children with autism (c.f. Schreibman & Ingersoll, 2004).

One often cited study found that 47% of preschool-age children with autism who had received intensive (40 hours per week), discrete trial intervention for 2 years achieved normal intellectual and educational functioning compared with 2% who received less intensive interaction (Lovaas,1987).

In one important study by Ozonoff and Cathcart (1998) found that students who received home-based structured teaching significantly improved on developmental and cognitive tasks in the areas of imitation, fine motor skills compared to students who did not receive this type of intervention at home. In addition, the experimental group exceeded the control group on other developmental measures by two to three times and gained 9.6 months after 4 months of treatment.

In another intensive behaviourally oriented intervention study by Ben-Itzchak and Zachor (2007) found that significant progress in six developmental-behavioural domains including imitation, receptive language, expressive language, nonverbal communication skills, play skills and stereotyped behaviours after 1 year of intervention. Children with higher initial cognitive levels and children with fewer measured early social interaction deficits showed better acquisition of skills in three developmental

areas, receptive language, expressive language and play skills.

Similar benefits from applied behaviour analysis were found by Green, Brennan and Fein (2002) a toddler to be high risk for autism at the age of about 1 year. Treatment was delivered in the child's home and other settings. Intensive treatment continued for 3 years; by the 4th year, the child was spending most of her time in a regular preschool classroom. Direct observational data and results of norm-referenced tests documented large increases in language, social, cognitive, and daily living skills over the course of treatment.

There has been an interest in whether targeting early social-communicative behaviours that are theoretically linked to later emerging behaviours in typical development leads to increased development of these later emerging behaviours in autism. For example, Whalen (2001) used behavioural methodology to teach young children with autism to make joint attention initiations and found increases in language despite the fact that language was not directly targeted. Similarly, Ingersoll (2003) found increases in language, play, and joint attention after targeting reciprocal imitation.

Like the work of Ingersoll and Schreibman (2006) illustrated a multiple-baseline design across five young children with autism to assess the benefit of a naturalistic behavioral technique for teaching object imitation. Participants increased their imitation skills and generalized these skills to novel environments. In addition, participants exhibited increases in other social-communicative behaviors, including language; pretend play, and joint

attention. In another study by Ingersoll, Lewis, and Korman (2006) also found increases in spontaneous use of descriptive gestures by using reciprocal imitation training for five young children with autism.

In contrast, cognitive behavioural approaches have seldom been used or studied explicitly in intervention for autism. One study by Bauminger (2002) evaluated the effectiveness of a 7-month cognitive behavioural intervention for the facilitation of the social-emotional understanding and social interaction of 15 high-functioning children with autism. Results demonstrated progress in social interaction, problem solving and of emotion understanding. Children also obtained higher teacher-rated social skills scores in assertion and cooperation after treatment.

Koegal et al. (2001) reviewed many studies on pivotal response training showing the efficacy of the approach and long-term improvement in disruptive behaviour, language, social and academic skills as well as attitude toward learning and enthusiasm. PRT uses behavioural procedures such as self-recording, and self-reinforcement, to teach self-management and self-initiation.

Some of the studies explored whether the ‘intensity’ of service delivery and the age at which behavioural intervention was introduced influenced developmental rating scale assessments of progress. Children who were involved in service before and after 3 years of age all demonstrated significant changes on six developmental domains when assessed before and following intervention but there were no significant differences between these groups. Overall improvement in the areas of communication, cognitive

and social- emotional functioning was predicted by the duration of time that a child spent in home-based intervention (Luiselli, Cannon, Ellis, & Sisson, 2000).

In another attempt at an early behavioural intervention program may be influenced how conclusions about the progress of preschool children by the use of different cognitive assessment tools. As part of a longitudinal treatment outcome study, 24 children with autism aged between 27 and 58 months were each tested on the Bayley, Merrill-Palmer and Vineland scales. Their performance on each of these tests was compared. Results showed that, while scores on the different tests were highly correlated, actual test scores varied considerably, with the Bayley tending to produce the lowest IQ scores and the Merrill-Palmer the highest. These findings have important implications, as it is evident that judgements about the effects of therapy may be significantly influenced by the selection of the tests for pre-and post-treatment assessments (Magiati & Howlin, 2001).

Social intervention

Hwang and Hughes (2000) reviewed 16 empirical studies that investigated the effects of social interactive interventions designed to increase early social communicative skills of young children with autism by increasing their role as initiator of social interactions. Increases were found for social and affective behaviors, nonverbal and verbal communication, eye contact, joint attention, and imitative play. Limited generalization or maintenance of target behaviors was reported.

Smith (2001) noted several potential advantages to social stories,

including the likelihood that learned social skills would generalize to new settings. Several studies have reported that social stories can result in increases in social behaviour and reductions in problem behaviour. Lorimer, Simpson, Myles, and Ganz (2000) demonstrated that social stories reduced tantrums in a high-functioning 5-year old boy using an ABAB design, but Smith's optimism about generalization was not confirmed. The frequency of tantrums increased when the social stories are not used.

Kuoch and Mirenda (2004) studied by presenting social stories using ABA design with three children 3 to 6 years old; social stories resulted in a reduction in problem behaviour that continued when social stories were not presented. In contrast, Barry and Burlew (2004) used social stories to teach new skills, rather than to reduce problem behaviour. They taught two lower functioning children with autism to make choices and to engage in appropriate play. The study did not have a phase in which the social stories were removed, so no findings on generalization could be demonstrated. Furthermore, Crozier and Tincani (2004) used a reversal design to compare the effectiveness of the modified social story with and without verbal prompts on the disruptive behaviour of a student with autism. The disruptive behaviour decreased during the intervention but to a greater degree when the story was paired with prompting.

The most widely used strategy for teaching play and other social skill to children with autism in inclusion setting is to enlist the aid of a typically developing peer. DiSalvo and Oswald (2002) reviewed the research on these peer-mediated strategies and noted that they have been generally effective in increasing social initiations or social responses but not both. In a recent

example, a study of a 4-year-old boy in an inclusion preschool found increases in initiations by peers and increases in initiation by the target child (McGrath, Bosch, Sullivan, & Fuqua, 2003). Peer-mediated instruction of social skills has also been a key element of the Learning Experiences, an Alternative Program for Preschoolers and Their parents (LEAP) preschool curriculum, which has shown impressive long-term benefits (Strain & Hoyson, 2000).

Another attempt at a simplified program is presented by Garfinkle and Schwartz (2002). Three children with ASD were taught to imitate peers during small group activities in an inclusionary preschool classroom. Results suggest that participants increased peer imitation behaviour in the training setting and generalized them to free play setting, as well. Increases in other social behaviours, such as proximity to peers and number of peer interactions, were also reported. In a recent study by McGrath, Bosch, Sullivant and Fuqua (2006) investigated the effectiveness of peer and individual social skills training for a preschooler diagnosed with autism. Results indicated that the frequency of appropriate initiations and responses did increase and that these changes were socially valid because as measured by expert ratings of change; and in comparison to typical peer-to-peer social behaviour.

More recently, Chung et al. (2007) evaluated the effectiveness of a peer-mediated social skills training (SST) program combined with video feedback, positive reinforcement and token system in increasing social communication skills in young children with high-functioning autism. Four boys with high-functioning autism, ages 6–7 years, participated in the study. Improvement was observed in three out of four children, although individual

differences among children were seen for changes in two global scales as well as subscales. These results suggest that the social skills training were effective in improving social communication skills for some children with high-functioning autism.

Attending to the correct social stimulus is a deficit in virtually every child with autism, so successful intervention must rely on more than exposure to a model. Jahr, Eldevik, and Eikeseth (2000) attempted to teach children with autism to engage in cooperative play using models but found that modeling alone was not effective. When the researcher also required the children with autism to give an oral description of the modeled activity, all six children learned to initiate and sustain episodes of cooperative play, vary their play, and transfer their skills to new play partners. In another study on preschool social communication intervention reveals that children with autism do show increase in social play when appropriate supports are provided (Rogers, 2000).

Communication intervention

As cited from Paul and Sutherland (2004) discrete trial instruction (DTI), the most basic method has been used extensively to teach receptive language in children with autism. Lovaas used this technique to the treatment of speech in autism, and outcomes appear to be limited to the elicitation of verbal production in the high functioning individuals. Nonetheless, a relatively large study has demonstrated the efficacy of this method in eliciting vocal imitation (Ross & Greer, 2003) and speech in nonverbal children (Yoder & Layton, 1988). To eliciting first word in children with autism is the rapid motor imitation (RMI) response approach presented by Tsiouri and

Greer (2003). This method make use of structured operant instruction in producing rapid motor imitation sequences of action the child can already do to get children in an imitation mode and result shows meaningful.

Milieu approaches like mand-modal, prompt-free and incidental teaching have been shown to be associated with increased ability to initiate communication in children who did not show this ability previously (Matson, Sevin, Box, Francis, & Sevin, 1993). Non-verbal children have developed speech using these methods and increases in the frequency, spontaneity, and elaboration of language have also been documented (Delprato, 2001; Goldstein, 2002; L.K. Koegel, 2000).

One area of common difficulty in the treatment of children with autism is teaching communication strategies to nonverbal children. The Picture Exchange Communication System (PECS) is the most widely used iconic system for nonverbal children (Bondy & Frost, 1998). Although the research on its effectiveness is limited, PECS has found wide acceptance in the school-based intervention programs. Charlop-Christy, Carpenter, Leblanc, and Kellet (2002) conducted a study to examine the use of PECS with three preschool children with autism and its effect on speech development. Results from this study indicated that all children met the learning criteria for PECS and showed increases in use of speech. The effect of PECS on the spontaneous communication skills of a 6-year old girl with autism was studied by Kravits, Kamps, Kemmerer, and Potucek (2002). Results indicated increased spontaneous expressive communication using a variety of modalities across all the environments in which PECS was trained.

Manual signs have also been used frequently as a communication modality for children with autism who do not speak. Goldstein (2002) reviewed a range of studies employing manual signs combined with speech and concluded that total communication (TC) approaches can be effective for teaching early vocabulary both receptively and expressively. Similar study by Martin, Drasgow, Halle, and Brucker (2005) used functional communication training to teach a 10-year-old student with autism and severe language delays, to reject items by touching an icon instead of pushing away by applying prompting, differential reinforcement, and error correction procedures. Results indicate that training was successful at replacing pushing away with touching an icon to reject items.

There is limited evidence that non-speaking individuals with autism can benefit from exposure to high-tech devices, as well. The youths with autism were among the participants in a study by Romski and Sevcik (1996), who showed increased both spoken language and a computerized voice output communication aids (VOCAs) device over course of a 2-year study, in which naturalistic teaching methods were employed to teach the use of device. This approach also resulted in an increased use of communicative behaviours to request objects, respond to questions, and make comments among four children with autism in another study (Schepis, Reid, Behrmann, & Sutton, 1998). A case study of one child with autism by Light, Roberts, DiMarco, and Greiner (1998) also reported positive language outcomes when a VOCA was included as a component of a comprehensive communicative system. Other components included gestures, natural speech, and a communication book.

Krantz and McClannanhan (1998) used script-fading procedures with preschoolers with minimal reading skills. The children were taught to use the written cues “Look” and “Watch me” to initiate conversation with adults who did not prompt but responded only to conversation directed to them. The scripts were faded by cutting away portions of the cue cards. Unscripted interactions were found to continue and generalize to new topics.

Keen, Rodger, Doussin, and Braithwaite (2007) investigated the effects of the Stronger Families Project, a social-pragmatic intervention, on the communication and symbolic abilities of 16 children aged 2–4 years with autism. Changes in some communication and symbolic behaviours occurred following the Stronger Families Project intervention according to parent report.

Joint attention is thought to be an important foundation for language development and has been shown to be a significant predictor of language outcome on children with autism (Mundy, 2003). Few studies have examined the efficacy of targeted intervention of joint attention and symbolic play in children with autism by Whalen and Schriebman, (2003); and Kasari, Freeman, and Paparella, (2006). Result indicated that joint attention behaviours are effectively trained and targeted behaviours generalized to others settings. The children also showed more diverse type of symbolic play in interaction with their mothers and higher play levels on both the play assessment and in interaction with their mothers.

Kalyva and Avramidis (2005) examined the efficacy of intervention in improving the communication skills of five pre-school aged children with autism- three in intervention group and two in control group. The 'circle of

friends' was applied for 30 min on a weekly basis at a nursery setting for a period of 3 months with the active involvement of one teacher and five peers of each child with autism. The statistical analysis of the data revealed children in the intervention group had significantly higher successful response and initiation rates at post-intervention and follow-up than those in the control group.

Several studies have described efforts to teach theory of mind to children with autism. As a review by Charlop-Christy and Daneshvar (2003) indicated, attempts to teach theory of mind have been largely unsuccessful and have shown no evidence that the skills has generalized to new circumstances or to other cognitive and social behaviour. For instance, Chin and Bernard-Opitz (2000) taught conversation skills to three boys with autism ages of 5 to 7 but found that their conversation skills did not generalize to improved theory of mind performance on a standard task.

Parental intervention

During the recent years attention has been directed to intervention through parent and other caregivers in addition to the children with autism. Symon, (2005); and Seung, Ashwell, Elder, and Valcante (2006) have attempted parental training in the family set up. The results showed that parental training is efficient in improving parental skills for waiting for the child to verbally communicate, and in using verbal imitation for better interaction. The studies also showed that children with autism could improve in social skills behaviours and communication. The parental training also made the parents to be good trainers for other caregivers in the family.

Researchers such as Girolametto, Sussman, and Weitzman, (2006); Mahoney, and Perales (2006); Ingersoll, and Gergans (2007) tested the effectiveness of parental training in clinical setting using 11 to 56 sessions. They reported improvement in parent child interaction with better responsiveness and skills in reciprocal imitation training. The results also indicate improvement in language, social skills, better imitation skills and emotional functions. In another study Sim, Whiteside, Ditter and Mellon examined the effectiveness of a 12-session manualised social skills intervention involving parent participation in clinical setting. Findings suggest that parent rating of children's social skills and self-control improved and aggressive behaviour decreased.

Aldred, Green, and Adams (2004) tested a new theoretically based social communication intervention targeting parental communication with their twenty eight children with autism in a randomised design against routine care alone. The intervention was given in addition to existing care and involved regular monthly therapist contact for 6 months with a further 6 months of 2-monthly consolidation sessions. It aimed to educate parents and train them in adapted communication tailored to their child's individual competencies. The active treatment group showed significant improvement compared with controls in reciprocal social interaction and expressive language, communicative initiation and parent-child interaction.

There are some other studies which do not give the exact situation under which training to parents and autistic children are given. Gillett and LeBlanc, (2007); Crockett, Fleming, Doepke, and Stevens, (2007) examined

effectiveness of parental training in NLP and DTT respectively. The results demonstrated better language training by NLP and initial control of the training program over parent responding and parents could extent the use of DTT across other skills in children.

In contrast, Drew et al. (2002) reported finding of pilot RCT for a parent training intervention with a focus on the development of joint attention skills and joint action routines. Twenty-four children with autism randomized to the parent training group or to local service only. A follow-up was conducted 12 months later. There was some evidence that the parent training group made more progress in language development than the local service group.

The study by Swallows and Graupner (2005) compared 24 children with autism who were randomly assigned to a clinic-directed group for intensive behavioural training, and to a parent-directed group received intensive hours by equally well trained supervisors. Outcome after four years of treatment, including cognitive, language, adaptive, social, and academic measures, was similar for both groups. After combining groups, they found that 48% of all children showed rapid learning, and were succeeding in regular education classrooms.

Smith, Buch and Gamby (2000) examined parent-directed, intensive early intervention for children with Pervasive Developmental Disorder. Parents and therapists received six one-day work shops over a five months period, with additional consultations for the next 2-3 years. Five of 6 children rapidly acquired skills when treatment began, but only 2 clearly improved on

standardized tests at the 2-3 year follow-up.

Mc Conachie, Randle, Hammal and Le Couter (2005) evaluated a training course for parents to facilitate social communication with their young children with suspected autism spectrum disorders. Controlled trial for 51 children aged 24 to 48 months, whose parents received either immediate intervention or delayed access to the course. Outcome was measured 7 months after recruitment in parents' use of facilitative strategies, adaptation to the child, and in children's vocabulary size, behaviour problems, and social communication skills. The results showed that a significant advantage was found for the intervention group in parents' observed use of facilitative strategies and in children's vocabulary size.

In addition to parent training, one study investigated combined effectiveness of parent and children. Goodlin-Jones and Anders, (2004) reported the findings of a 20 week social adjustment enhancement curriculum for children and parents attended a semi-structured concurrent psycho educational training during children's sessions. The results shows that statistically significant improvements in facial expression recognition, and problem solving.

In a recent review by Mc Conachie and Diggle (2007) found very few studies that had adequate research design from which to draw conclusion about the effectiveness of parent-implemented early intervention. Both randomized and controlled studies tend to suggest that parent training leads to improved child communicative behaviour, increased maternal knowledge of autism and parent-child interaction.

Another trend has been the inclusion of family members and teachers

in the planning and implementation of behavioural interventions, thereby promoting the maintenance and generalization of treatment effects across individuals and naturalistic environments (Horner, Carr, Strain, Todd, & Reed, 2002). In one study, contextualized behavioural support in early intervention for children with autism and their family enhanced the value of functional assessment techniques and promoted the stability and durability of functional communication training in addressing the challenging behaviour of several children with autism (Moes, & Frea, 2002). Although problem behaviours may be successfully handled by parent-managed behaviour procedures, developmental progress may not as robust as can be achieved by professionally directed program intervention (Biby, Eikeseth, Martin, Mudford, & Reeves, 2002).

THE PRESENT STUDY

Autism is an early onset and lifelong condition characterized by impairments in socialization, communication and repetitive and restricted pattern of interest that have a severe impact on a person's ability to meet the demands of everyday life (American Psychiatric Association, 2000). Although early studies of outcome predicted a rather bleak future for those affected with the condition, a number of factors have led to a marked increase in the number of individuals who achieve higher levels of independence in adulthood (National Research Council, 2001). It is still the case that there is greater variability in outcome, which may be 12 % or so reaching a "very good outcome" and maybe 60% or so being described as having a "poor" or very "poor outcome" (Howlin, Goode, Hutton & Rutter, 2004).

Reviewers of this still limited literature have catalogued a number of measures and indicators used to study current functioning and outcome in individuals with autism. Quite often, standardized instruments testing cognitive and behavioural functioning and attainment are used to measure outcome, and yet, outcome studies of individuals in the higher end of the cognitive spectrum of autism as that by Howlin (2003) seem to indicate that higher intellectual potential and academic achievement cannot be seen as assurance of better outcome in adulthood.

From the practical standpoint, one critical indicator of children with autism is his/her current cognitive and behavioural functioning relating to real life. These include communication, daily living skills, socialization and behavioural problems of children with autism. Among these various skills, communication and social adaptive skills are of particular interest.

Knowledge of the developmental course and individual factors impacting on the acquisition of communication and social adaptive skills can be of great importance in planning more effective interventions. For example, information on spurts or lags in the acquisition of adaptive skills can inform interventionists of the need to intensify skill instruction at specific age transitions. Information on the relationship between IQ level and skill acquisition can help interventionists to further individualize and intensify level of skill instruction on the basis of the person's developmental level. Similarly, one of the factors addressed in most educational and treatment programs are reduction of autistic symptomatology (National Research Council, 2001). In order to ascertain that this is a justified priority in such

programs, there is a need to systematically document a positive relationship between symptoms reduction and various skills improvement.

Once considered to be a very rare disorder, occurring in only around 3 or 4 children per 10,000, recent epidemiological research indicates that the rate for autistic disorder is around 19 per 10,000. This finding goes against claims of a current 'epidemic' of autism but rather suggests that recent increase in rates of diagnosis reflect greater awareness of autism spectrum disorders among professionals, together with widespread improvement in diagnostic practice (Howlin, 2006). At India's current population, this means there is an estimated 1.7 million autism persons in the country, assuming that there are no significant variations in this rate world wide, which is a question that has yet been addressed by epidemiologist outside the west.

The cognitive and behavioural analyses focus on the following purposes. (1) To identify in each individual the unique profile of strengths and needs that characterize the form autism takes in this particular person, in order to plan an individualised education and habilitation program. (2) To move beyond global descriptions to more refined, precise documentation of an individuals functioning in various domains such as, global intellectual level and specific verbal and performance abilities, social competence, and social use of language; self-care and other abilities of living etc. (3) To document baseline functioning, against which post intervention status can be compared in each area of individual need. (4) To examine the efficacy of parent training intervention on children with autism.

Many treatments have been suggested as effective for children with autism, some even claiming to bring about cures or recovery from the condition. Such claims are rarely supported by experimental evidence and treatments such as facilitated communication, holding therapy, auditory integration therapy or secretion injections, although claimed to have almost 'miraculous' results, have been found to be no more effective than Placebo. On the whole, structured educational programmes combining developmental and behavioural approaches and focusing on visually based teaching strategies seem to have the most positive outcomes. The involvement of families in treatment, and the use of strategies that build on the children's strengths rather than focusing on areas of weakness, also appear to be important.

Family members are the most stable, influential, and valuable people in the child's development. By the beginning of the twenty-first century, the pragmatic and philosophical stance that parents can and should collaborate in the design and implementation of intervention services for their children with autism had achieved international acceptance (Schopler & Mesibow, 2000).

Research indicates that parent participation lead to a host of positive outcomes for children with autism, including greater generalization and maintenance of treatment gains, greater continuity, and more effective strategies for resolving problems. Frea and Hepburn (1999) taught two families, each having a 4-year-old child with autism, the functional assessment process. Koegal, Bimbela, and Schreibman (1996) compared two different parent training approaches and their effect on families' global style of interactions during the unstructured home activities of 17 families' lives.

Lorimer, Simpson, Myles, and Ganz (2002) used a social story as an antecedent intervention to prevent problem behaviours in the home settings.

All comprehensive programmes for young children with autism explicitly involve parents in implementing the strategies, to a greater or lesser extent (National Research Council, 2001). Other programmes are based in special education measures, with additional training to parents in specific skills (Ozonoff and Cathcart, 1998) and a range of supports offered to families (Prizent, Wetherby, Rubin, & Laurent, 2003). Finally, there are intervention approaches involving parents in behaviour management and promotion of communication skills which are non-intensive, utilizing teaching within everyday situations (Shields, 2001).

Parental intervention is also advantageous from other perspectives. The clinicians intervention is likely to be much more effective if parents have the opportunity to directly observe what takes place in the evaluations and then to discuss specific behaviours with the clinicians afterwards.

It is in the context of this understanding, as well as in the process of discussing a child's strengths and weakness and the required interventions emerging from this profile, that parents are optimally prepared to become advocates and coordinators of the child's intervention program.

Increasingly, autism has been recognised as a biologically based neurodevelopmental disorder with diverse aetiologies rather than as an emotional disturbance. Parallel to this, parents, once viewed as the cause of their child's problems, have been recognised as able to play a key role in the effective treatment of their child.

Increased parental skills allows for continued opportunities for children's learning in a range of situations. Training parents as 'co-therapists' allows consistent handling, and ensures that intervention is appropriate in enhancing children's earliest social relationships. The potential benefits of parents training are increased skills, renewed confidence and reduced stress for parents as well as for children. Group training for parents in new skills has been demonstrated to facilitate mutual support (Baxendale, Frankham & Hesketh, 2001; and Symon, 2001).

Despite its needs and importance however, many parents have little or no involvement in children with autism education services, especially in Indian scenario. The present study is the first attempt in this direction in Kerala population to explore the basic aspects of cognitive and behaviour functioning of children with autism and the efficacy of parental training intervention.

Objectives

1. To assess the cognitive functions in relation to the different levels of autism.
2. To explore the behavioural pattern in relation to different levels of autism.
3. To explore the role of age and gender on the cognitive functions and behavioural pattern among children with autism.

4. To evaluate the usefulness and efficacy of parental training intervention on skill improvement and reduction of problem behaviour among selected children with autism.

Hypotheses

1. Cognitive skills differ with different levels of autism.
2. Cognitive skills differ with age and gender among children with autism.
3. Behavioural pattern differ with different levels of autism.
4. Behavioural pattern differ with age and gender among children with autism.
5. Cognitive skills and Autism Quotient are related in children with autism.
6. Behavioural skills and Autism Quotient are related in children with autism.
7. Autism Quotient can be predicted by means of cognitive and behavioural patterns of children with autism
8. Parental training intervention improves Cognitive skills of children with autism.
9. Parental training intervention improves behavioural skills and reduces problem behaviour of children with autism.
10. Parental training intervention significantly reduces the severity level of children with autism.

Chapter III

METHOD

This chapter mainly describes the details of methods utilized for this research. Methodology in its narrowest sense is the collection of methods or rules by which a particular piece of research is undertaken. However, it is generally used in a broader sense to mean the whole system of principles, theories, and values that underpin a particular approach to research (Somekh & Lewin, 2005).

The method of the present study includes

1. Research design
2. Participants
3. Measures
4. Administration and scoring
5. Procedure
6. Data Analysis

RESEARCH DESIGN

A research design is a general plan for implementing a research strategy. A research design specifies whether the study will involve groups or individual subjects, whether the study will make comparisons within a group or between group, and how many variables will be included in the study (Gravetter & Forzano, 2003). Kothari (1993) opines that generally the design which minimizes bias and maximizes the reliability of the data collected and analyzed is considered a good design. Research design methodology in psychology follows the principles of research methodology in sciences.

In the present study two types of research designs, descriptive exploratory design and pre-/post test between-group design with follow-up are used (Asher, 1994).

PARTICIPANTS

The sampling of the present study has been drawn using purposive sampling method (Sapsford & Jupp, 1996). The present study consists of 60 children with Autism including both boys and girls, in the age range of 3-12 years with a mean age of 6.5 years. On the basis of GARS score, the group was divided into two-average Autism (90-110) and above average Autism (111-and above).

The autistic groups in the present sample are those who have been diagnosed and certified as cases of Autism from the Institute for Communicative and Cognitive Neurosciences (ICCONS), Shornur, Palakkad. Those who have been clinically diagnosed and are attending three Special schools in Calicut district of Kerala are also included in this study. Table 3.1 gives the distribution regarding sample characteristics.

Table 3.1: Distribution of Participants characteristics

Particulars	Boys		Girls		Total
	Age (in years)		Age (in years)		
	3 -5	6-12	3-5	6-12	
Average Autism (90-110)	12	13	1	5	31
Above average in Autism (111and above)	8	12	2	7	29
Total	20	25	3	12	60

Children belonging to the selected age group are likely to have many behavioural or physical/physiological problems other than autism or comorbid with autism (Gillberg & Coleman, 2000). Therefore, for enhancing the validity of the study, an inclusion-exclusion criterion is used for the screening of participants into the present sample.

Inclusion criteria

1. The children between chronological age of 3 to 12 years.
2. The identified, assessed, and diagnosed with autism by professionals in the institute.
3. Those who met the criteria of the DSM-IV (APA, 1994) for autism.
4. Those with a score above 30 on Childhood Autism Rating Scale (CARS).
5. Those with or without associate problems such as mild mental retardation, behavioural problems that are not listed under any psychiatric categories, and also children with seizure disorder are included. This could not be avoided because almost all the cases with autism had these problems with different levels of intensity.

Exclusion criteria

1. Children with other forms of developmental disabilities like sensory impairments, cerebral palsy, diagnosed psychiatric disturbances, and history of serious head injury
2. Children with inborn metabolic disorders associated with tuberous sclerosis, neurofibromatosis and phenylketonuria.

For employing parental training, a group of 20 children with autism who are attending in special schools were selected. Then these children were divided into experimental and control groups consisting of 10 each. Table 3.2 shows the distribution of selected parents of children with autism in experimental and control group.

Table 3.2: Distribution of sample characteristics of parents of children with autism in Experimental and Control group

Particulars	No. of participants	
	Experimental group	Control Group
Father	1	2
Mother	8	7
Caregivers	1	1

Caregivers were ladies other than the mother of the child, who took care of the child when the parents did not have sufficient time to spend either with their children or for the training.

MEASURES

The following measures are used for the present study.

1. Socio-demographic Data Sheet.

2. Childhood Autism Rating Scale (CARS).
3. Gilliam Autism Rating Scale (GARS).
4. Vineland Adaptive Behaviour Scale-Survey Edition.
5. Behavioural Assessment Scale for Indian Children with Mental Retardation (BASIC-MR).

A brief description of each measure is followed.

1. Socio-demographic Data Sheet

The socio-demographic data sheet (Appendix-I) was developed by the investigator for the purpose of collecting the demographic and the primary information related to the children with autism.

2. Childhood Autism Rating Scale

Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1986) is the strongest, best-documented and most widely used clinical rating scale for behaviour associated with autism. It consists of 15 items on which children and adults are rated, generally after observation, on a 4-point scale. In the present study, it is used to make diagnosis in conjunction with DSM-IV criteria for autism and to rate severity of autism.

Reliability

The interrater reliability coefficients for individual items are somewhat variable, ranging from .10 to .93, most are above .50. Reliability coefficients for the CARS total score have been strong, ranging from .68 to .80 and above (Sevin et al., 1991).

Validity

It has also been proved good criterion related validity by attaining a .80 correlation coefficient with PEP's pathology section.

3. Gilliam Autism Rating Scale (GARS)

The Gilliam Autism Rating Scale (Gilliam, 1995) was developed as a relatively easy, inexpensive aid in the surveillance and diagnosis of autism. It is intended for individuals between 3 and 22 years of age. The scale consists of 56 items across four subscales: Social Interaction, Communication, Stereotyped Behaviours, and Developmental Disturbances. The first three subscales listed are based on a child's current behaviour and the final scale is based on a child's developmental history.

Reliability

The reliability of the GARS is well within acceptable ranges. Internal consistency of the GARS subtests ranged from .88 to .93, with a coefficient of .96 for the autism quotient. Interrater reliability coefficients ranged from .83 to .99 for the autism quotient and from .55 to .99 for the subtest scores. Test-retest coefficients ranged from .81 to .86 for subtests, and the autism quotient was .88.

Validity

The validity of the GARS was demonstrated throughout several studies. These studies confirm that (a) the items of the subtests are representative of the characteristics of autism; (b) the scores are strongly related to each other and to performance on other tests that screen for autism and the GARS can discriminate persons with autism from other subjects with severe behavioural disorders; (c) the score are not related to age; (d) persons with various diagnosis will score differently on the GARS.

4. Vineland Adaptive Behaviour Scale-Survey Edition

Vineland Adaptive Behaviour Scale (Sparrow, Balla, & Cicchetti, 1984) is a standardized caregiver interview instrument designed to evaluate children aged 0-18 years covering current adaptive behaviour in four areas like Communication, Daily Living Skills, Socialization, and Motor Skills. Communication refers to those skills required for receptive, expressive, and written language; Daily Living Skills include the practical skills needed to take care of oneself and contribute to a household and community; Socialization pertains to those skills needed to get along with others, regulate emotions and behaviour, as well as play; Motor Skills, comprising both fine and gross motor items, are typically assessed in individuals below the age of 6 years or when significant difficulty in motor development is suspected. The Vineland also contains a Maladaptive Behaviour Domain, which assess the presence of problematic behaviours that interfere with an individual's functioning. The VABS has been reported to be a valid instrument in establishing the cognitive level for an individual functioning at an IQ-level below 70-75. It has been widely used to map the overall functioning of an individual, regardless of IQ in order to be used as a prognosis and intervention measures for habilitation.

Reliability

In general, domain internal consistency reliability is quite satisfactory for the interpretation of individual performance. The split-half reliability coefficient for the Adaptive behaviour Composite, ranging from .89 to .98 (median = .94) are excellent. The test-retest reliability coefficient for the domains and Adaptive Behaviour Composite are very good, with the majority

of the coefficients in the .80s and .90s. Based on representative samples, reliability for each of the four domains have ranged from .93 to .99.

Validity

VABS score exhibited higher correlations with other adaptive behaviour scores than with intelligence measures. The correlations between the Vineland and other adaptive scales were only moderately high, thus meeting another criterion of construct validity. Concurrent validity between Vineland and the AAMD Adaptive Behaviour Scale School Edition is good (Perry & Factor, 1989).

6. Behavioural Assessment Scales for Indian Children with Mental Retardation

The BASIC-MR (Peshwaria & Venketasan, 1992) has been designed to elicit systematic information on the current level of behaviours in children between 3 to 16 years. The scales are relevant for behavioural assessment and can also be used as a curriculum guide for programme planning and training based on the individual needs of each mentally handicapped child. BASIC-MR has been developed in two parts: A and B. Part A of the scales helps to assess the current level of skill behaviours in the child. The Part B of the scale helps to assess the current level of problem behaviours in the child.

The BASIC-MR, Part A, consists of 280 items grouped under the following seven domains: Motor, Activities of Daily Living (ADL), Language, Reading-Writing, Number-Time, Domestic-Social, Pre-vocational- Money. There are forty items under each domain.

The BASIC-MR, Part B, consists of seventy five items grouped under the following ten domains. Violent and destructive behaviours, Temper tantrums, Misbehaves with others, Self injurious behaviours, Repetitive behaviours, Odd behaviours, Hyperactive behaviours, Rebellious behaviours, Antisocial behaviours, and Fears.

The present study utilized Number-Time domain from the BASIC-MR, Part A and the whole scale in the BASIC-MR Part B.

Reliability

The interrater reliability for the test was very good. It was found to be .83 for the overall scores as well as within each domain on a sample of 46 schools going children with mental handicap and having them independently assessed concurrently by two raters.

Validity

The concurrent validity of the BASIC-MR, Part A, was established against social quotient of the mentally retarded children as derived on the Vineland Social Maturity Scale, Indian adaptation by Malin. Construct validity of BASIC-MR, Part A and B were also found to be statistically significant. And the face validity for BASIC-MR Part A & B as obtained from ratings was found to be high.

ADMINISTRATION AND SCORING

The administration procedures for the different measures are as follows:

1. Sociodemographic Data Sheet

With regard to the sociodemographic data sheet, the investigator has collected information from parents/caregivers by interviewing and by direct behavioural observation of the child. Before using various measures, the investigator explained the purpose of the present study and obtained an informal consent from their parents after initial probing.

2. Childhood Autism Rating Scale

The investigator established a good rapport with parents of the children with autism. The investigator completed the test as per the instruction given in the scale.

CARS item was scored based on direct behavioural observations in various settings, interview data, and/or chart review. Behaviour was analyzed in the light of chronological age, peculiarity, frequency, intensity, and duration.

Each CARS item was scored on a 7-point continuum from 1 to 4 (including mid-points), with scores of 1 indicating that the behaviour is appropriate for the chronological age of child and the score 4 indicating the behaviour is severely abnormal for the chronological age of the child. A total score is then calculated by summing all item scores, and total score of 30 or above are in the autism range. Scores of 30 to 36.5 suggest mild to moderate autism, while scores of 37 to 60 suggest severe autism.

3. Gilliam Autism Rating Scale

First the item wise information was collected from parents of the children with autism after explaining each item in the GARS to them. The

items on this subtest evaluate the participants' ability to relate appropriately to people, events, and objects.

After completing the administration procedure, the investigator started to rate the frequency of each behaviour on a 4-point scale, from 'never observed' to 'frequently observed'. The scores for all items in each scale are then summed and the total score converted into standard scores based on the reference sample (M = 10, SD = 3).

Typically, all scales of the GARS are completed. However, if a child is nonverbal and/or the parent does not have the knowledge of the early history of the child, then the Communication and Developmental History scales are omitted. A standard score or Autism Quotient can be based on 4, 3, or 2 scales of the GARS. An Autism Quotient is derived by summing relevant scale scores, yielding a standard score with a mean of 100 and a standard deviation of 15. The Autism Quotient is divided into seven ordinal categories for detecting autism in the child. A score of 90 or above specifies that the child is 'Probably autistic'.

4. Vineland Adaptive Behaviour Scale

The investigator assessed the personal and social behaviour of the children with autism in a semi-structured interview with the primary caregiver. The investigator has always attempted to complete the administration within a single session of 20 to 60 minutes. The interview took place in a quiet room with comfortable seating arrangement.

The items in the communication, daily living skills, and socialization was scored in one of several ways, depending upon whether the activity is

usually or habitually performed (score 2); is performed sometimes or with partial success (score 1); is never performed (score 0); is not performed because of the limited external circumstances (score N for 'No opportunity'); or either involves a behaviour or a skill of which the respondent has no knowledge of the individual's performance (score DK for 'Don't know'). Then the investigator computes the total score of each of the sub domain. From the combined sub domain scores of Communication, Daily Living Skills and the Socialization, the Adaptive Behaviour Composite is computed.

5. Behavioural Assessment Scales for Indian Children with Mental Retardation

The BASIC-MR, Part A, was administered individually on each child. The scale assesses whether the child can or cannot perform the target behaviour and employed direct observational techniques to determine actual performance of the child, i.e., how well the child can or cannot perform the said item. In rare cases, where information could be gathered through direct observation, the information from parents/caregivers was subsequently supplemented. The test administration within any domain is stopped after five consecutive failures by a child in that domain. The rest of the items are then not administered, and they will be scored '0'. In such case, maximum possible score for the child in each domain continues to be 200.

Children were rated on the basis of six possible levels of performance under which each item is scored, viz., "Independent", "Clueing", "Verbal Prompting", "Physical Prompting", "Totally Depended", "Not Applicable", respectively. On each of the items on the scale, a child may get any score

ranging from 0 to 5 depending upon one's level of performance for that particular item. The maximum possible score for a child within each domain of 40 items is 200 and the maximum possible score for a child in all the seven domains of the scale is 1400. The individual score of each item within a domain added gives the 'Raw Score' for that domain. Then these Raw Scores are converted into percentage for these domains. The BASIC-MR, Part A Score is then calculated from the total 'Raw Score' for all the seven domains. A higher score indicates the better skill behaviours of the child. Then the 'Raw Score' is converted into cumulative percentage.

PARENT TRAINING INTERVENTION

Parent training intervention is simply one component of early intervention for the children with autism. Parents are given advice about the behavioural management and promoting compliance. This includes the principles of reinforcement, interrupting unwanted behaviours and positively teaching alternative behaviours to the child. In the present study, parent training is focused on: 1) reducing disruptive behaviors, 2) improving learning readiness skills, 3) increase child communication skills, 4) increase child social skills, and 5) reduce parental stress through counseling and enhanced active involvement of parents in the intervention programme.

PROCEDURE

The present intervention programme is conducted in the following phases.

In the first phase, permission was sought from the institutions for intervention among the selected samples for this study. The participants are then divided into experimental and control groups each consisting of ten children with autism in a group. It then made sure that both these groups are matched on the basis of age, sex, and severity of the autistic disorder. The investigator then subsequently met each of the parents or caregiver of the autistic children in the experimental group and explained all the procedures, including the intervention programme.

In the second phase, the investigator administered each of the measures on all the children in the experimental and control group.

In the third phase of the study, parents/caregivers of ten children from the experimental group were selected based on informed consent for the intervention training. A matched group of 10 children are then also selected for the control group. The age range of the participants selected for this phase of the study is between 3 to 10 years. Table 3.3 shows the distribution of the selected participants for the intervention programme.

Table 3.3: Distribution of sample characteristics for intervention

Children with Autism	**Experimental group**		**Control group**		**Total**
	Age (in yrs)		**Age (in yrs)**		
	3-6	**7-10**	**3-6**	**7-10**	
Boys	5	1	5	1	12
Girls	1	3	1	3	8
Total	6	4	6	4	20

Parental intervention focused mainly on the individual sessions for each of the parent of the children with autism in the experimental group. The parent training intervention was conducted in the special school settings. The intervention training package included 15 individual sessions for each parent over a period of two months, consisting of 2 sessions in each week. Each session lasted for a maximum of 1 hour in a day. In this parent training, skills for improving the child's behaviour were taught to them by the instructional methods. The instructional methods included: direct instruction, modeling and giving direct feedback during the training period.

A brief description of each focused area and mode of parent training intervention is as follows:

1. Reducing disruptive behaviours

Firstly, the parents are taught to identify the problem behavior of the child. This is especially important because children with autism frequently exhibit different types of disruptive behaviours that result in the interruption of their learning environments and training procedure. These behaviours range from hyperactivity, temper tantrums, self-injurious behaviours, aggression and to repetitive behaviours. That is, although the children's behaviour may be uneventful for large period of time, they might engage in highly noticeable disruptive events with little provocation at seemingly unpredictable times. For reducing disruptive behaviours of the child, parents are taught how to decrease unwanted behaviours or behavioural excesses of the child through behavioural techniques like rewarding positive behaviours and imparting mild forms of punishments which includes saying 'NO' loudly, mild form of tapping, strapping the child in a chair, time out etc.

2. Improving Learning Readiness Skills

Learning readiness skills training to parents focused on improving the attention, concentration, imitation, and eye-hand coordination of the child by using different methods like the threading needle, stringing beads, stacking blocks, transferring liquid into containers with small mouths, rolling clay into a elongated strand, scribbling etc. It also includes how to maintain an eye-to-eye contact of the child with others and also teaching them to sit in a chair independently. Along with learning readiness skills, the parents of children with autism were also trained in how to implement pre-academic skills. The programme was integrated into everyday routines, such as mealtimes, tidying up, and independence skills such as dressing, washing and bedtime. This part was scientifically formulated based on the system followed by Schopler's (1979) Psychoeducational profile (PEP). It is also productive and certainly more rewarding for all concerned to focus on developing child's existing skills as well as attempting to overcome fundamental deficits.

3. Increase child communication skills

Communication skills training incorporates speech training, receptive labeling, expressive labeling, and incidental teaching. It also teaches the methods to increase the vocalization of the child through teaching the child to imitate sounds and words, through instilling the meaning of words, picture naming, teaching the child to use language expressively to label objects, make verbal requests, and express desires more spontaneously and more functionally in every day life situations. The programme focused

on the development of early precursors to social and communicative competence.

4. Increase child social skills

Social skill training included various methods that are used to improve the social behaviour of the child. The parents are educated in the areas related to how to improve their child's imitation skills, social smile, group play, greeting skills, sharing skills and turn taking etc. They are also trained to express affection to their children. Additionally, parents are also advised to change the way they interact with their child, like maximizing the amount of continuous interaction with the child, giving enough chance to play with siblings and other children, utilizing the children's parks, giving some simple responsibilities to their children and finally giving a chance to children to accompany their parents while they go for an outing. It also included an emphasis on non-verbal requests, object-function play, imitating actions, and turn-taking games.

5. Parental counseling

The training for the parents included giving appropriate counseling to reduce their stress and also encourage them to become an active partner in observing, and detecting the problems in their child; in developing the intervention plan and in its proper implementation for their child. The investigator was available for telephone support and advice to the parents throughout the intervention period.

At the fourth phase of the intervention, a post intervention assessment was done characterized by the following categories: (a) observation of child's behaviour, (b) parent report about child's functioning, and (c) child's developmental functioning.

In the last phase, three months after the intervention, a follow up study was done in which all the measures were again administered on the children of both groups to assess the changes in their behaviour.

DATA ANALYSIS

The present investigation planned to study cognitive and behavioural analysis of autism in relation to parental training intervention strategies that formulates certain hypotheses presented in the second chapter. After scoring and tabulating the responses of each measure, the tenability of the hypotheses was tested statistically as follows.

Analysis of variance (3-way) was used to examine the group differences in the mean scores of the Cognitive skills and Behavioural skills for severity, age, and gender of the children with autism. Further, independent sample t-test was used to specify the nature of difference between age (preschool and school) and severity level (average and above average scorers) of children with autism. Same independent sample t-test was used for comparing the experimental and control groups for preintervention. Separate paired sample t-test was used to compare pre and post, post and follow-up assessment phases of experimental and control groups.

Pearson correlations are then used to examine the relations between the key predictive and outcome variables like Cognitive, Behavioural, and

Autism Quotient. Stepwise multiple regression analyses were also carried out to predict the Autism Quotient by Cognitive and Behavioural variables.

Chapter IV

RESULTS AND DISCUSSION

Considering the first three objectives of the study an exploratory analysis of the cognitive and behavioural characteristics of the children with autism was done in four steps. The first three steps were aimed at studying the selected Cognitive and Behavioural variables among the Children with autism. The fourth step was aimed to study the interrelation between the Cognitive, Behavioural variable and major symptomatology of autism on the one hand and to assess the predictive validity of the Cognitive and Behavioural variables in assessing the severity of autism on the other.

With regard to the first objective to explore the cognitive functions in relation to different levels of autism, in the first step descriptive statistics were worked out for cognitive variables and behavioural variables. As the second step separate three-way ANOVA was conducted for each of the two sets of variables with the three independent variables Viz; Gender, Age and Severity of autism. As the third step mean differences between pairs of variable scores were tested for significance by t-test. Table 4.1 gives the details of the descriptive statistics for cognitive variables.

Table 4.1: N, Means and SDs of the Cognitive variables for children with autism

Variable	N	Score		Mean	SD
		Minimum	Maximum		
Receptive language	60	5	29	16.21	5.18
Expressive language	60	2	46	13.48	11.88
Written language	60	0	13	0.73	2.09
Number concept	60	0	23	4.43	5.45
Communication domain	60	8	82	30.43	17.70

As revealed in Table 4.1 children with autism included in the present study obtained highest mean score, of 16.21 in the receptive language area as

compared with other specific variables. It suggests that children with autism are able to comprehend language, but the problem exists in the sphere of expressive skills. The expressive language score is found to be in the range of 2 and 46 and with a mean of 13.48, which indicates that children with autism are always manifesting difficulty to express their needs with others. With regard to a mean score of 0.73 for written language clearly indicates that most of the children with autism have poor ability in this area. The same trend is also observed in the area of number concept. For the communication domain consisting of receptive, expressive and written language score the mean score 30.43 with a SD of 17.70 reveal that variability in communication ability of children with autism is quite large.

In order to study the cognitive pattern in detail, the means and SDs of Cognitive variable scores values of the present sample were compared with the means and SDs of the normal standardization group falling under the same mean age as reported by Sparrow, Balla & Cicchetti,(1984) except for the number concept. The number concept was compared with the mean and SD of the mentally retarded children as reported by Peshawaria & Venkatesan, (1992). Table 4.2 gives the details.

Table 4.2: Means and SDs of the normal, MR and children with autism for Cognitive variables

Particulars	**Receptive language**		**Expressive language**		**Written language**		**Number concept**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Normal	25.2	1	56.3	4.4	14.8	6.7	-	-
Autism	16.21	5.18	13.48	11.88	0.73	2.09	4.43	5.45
Average in autism	18.58	5.29	19.16	13.70	1.22	2.64	6.35	6.04
Above average in autism	13.68	3.73	7.41	4.73	0.20	1.11	6.35	6.04
Mentally retarded	-	-	-	-	-	-	77.54	42.16

The comparison shown in Table 4.2 clearly indicates that in all the three language variables the children with autism scored far below, to the extent of 11+ SDs, the normal children and the two autistic groups differ by more than 2 SDs with each other. It is also notable that score for written language is consistently lower in all the groups except normals. It is also indicated that the trend in development is same for all the skills. With respect to the fourth variable, number concept, all the autistic groups fall much below the mentally retarded children and the lowest is for the above average group which is in the expected direction. This also suggests that children with autism could develop the number concept very poorly with more individual variability.

In order to verify the first four hypotheses, in the second step the scores in the two sets of variables were subjected to three-way ANOVA to explore the scatter and interaction of the cognitive and behavioural skills with three independent variables. The first hypothesis states that cognitive skills

differ with different levels of autism and the second hypothesis states that cognitive skills differ with age and gender among children with autism. Cognitive variables included are Receptive, Expressive, Written, Number concept and Communication domain score. The independent variables in the present study are gender, age, and severity level of autism. Table 4.3 gives the details of the ANOVA using the scores in cognitive variables.

Table 4.3: Main effects of three-way ANOVA of Cognitive variables for Gender, Age and Severity of children with autism.

Variable	**Residual**		**Main effects**								
			Gender			**Age**			**Severity**		
	Sum of squares	**Mean squares**	**Sum of squares**	**Mean squares**	**F**	**Sum of squares**	**Mean squares**	**F**	**Sum of squares**	**Mean squares**	**F**
Receptive language	889.84	17.11	0.41	0.41	.02	1.36	1.36	0.08	10.97	10.97	0.64
Expressive language	5706.02	109.73	22.57	22.57	.20	132.98	132.98	1.21	684.28	684.28	6.23**
Written language	209.55	4.03	0.53	0.53	.13	6.94	6.94	1.72	2.75	2.75	0.68
Number concept	1211.17	23.29	8.09	8.09	.34	55.41	55.41	2.37	33.56	33.56	1.44
Communication domain	11782.02	226.57	23.42	23.42	.10	235.22	235.22	1.03	969.21	969.21	4.27*

*P<.05; **P<.01

While analyzing the obtained results of the ANOVA presented in table 4.3 related to the main effects, there are only two significant F-values in the area of severity for Expressive language and Communication domain. These variables are not showing any difference with respect to gender or age. As Communication domain represents the first three variables in Vineland scale

the only independent cognitive function that is differentiating the severity levels is the Expressive language.

An examination of Expressive language with a highly significant F-value indicates that children with average and above average autism differ significantly on this sub scale. The same trend is also seen in Communication domain of the children with autism. This result also suggests that deficits in expressive behaviour and over all communication skills deteriorate further with increase in severity level. Or in other words it can also be inferred that the severity in autism is primarily a reflection of the degree of deficits in expressive language and communication skills rather than of a pervasive cognitive disability.

The table values also reveal that in the case of other independent variables, gender and age, none of the F values is significant. It suggests that the selected cognitive functions do not vary with these socio demographic variables. Table 4.4 gives the details of interaction effects explored in the computations of the ANOVA.

Considering the interaction effects with respect to specific cognitive variables and overall communication domain, the results in the table clearly show that severity has consistently yielded a significant F with the other two independent variables in receptive language. Another indication is that severity of autism is also significantly interacting with gender for number concept and for overall communication domain. To clarify the interaction between severity and gender t-test was computed between the scores of boys and girls for the two sub groups of children with autism separately. Table 4.5 gives the details.

Table 4.5: Means, SDs, and t-values of boys and girls in average and above average scorers in autism

Variable	Average scorers					Above average scorers				
	Boys		Girls		t	Boys		Girls		t
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Receptive language	19.77	4.38	15.66	6.40	2.06*	13.13	2.59	15.83	6.43	1.62
Expressive language	20.59	13.96	15.66	13.16	0.90	6.73	2.68	10.00	9.14	1.54
Written language	1.54	3.03	0.44	1.01	1.05	00	00	1.00	2.44	2.06*
Number concept	7.72	6.54	3.00	2.59	2.08*	1.56	2.50	5.50	6.47	2.39*
Communication domain	41.90	19.41	31.77	19.67	1.31	19.86	4.99	26.83	16.55	1.80

*P<.05

Only two variables, Receptive language and Number concept differ in the average group. A very striking feature observed is that in number, boys were better among the average scorers while girls were better among the above average scorers. The exact picture and inference can only be made after assessing the intergroup differences. The F values in Table 4.3 and 4.4

partially support the first hypothesis of the study while the second hypothesis is not supported by the present results as none of the cognitive skills significantly differ between the two genders and the two age groups.

In order to understand the nature of differences indicated in the results of ANOVA, for severity of autism, t-test was computed with respect to each of the five all the cognitive variables between scores of average and above average scorers in autism. Table 4.6 gives the details.

Table 4.6: N, Means, SDs and t-values for Cognitive variables between average and above average scorers in autism

Variable	Average in autism			Above average in autism			t
	N	Means	SD	N	Means	SD	
Receptive language	31	18.58	5.29	29	13.68	3.73	4.11**
Expressive language	31	19.16	13.70	29	7.41	4.73	4.37**
Written language	31	1.22	2.64	29	0.20	1.11	1.92*
Number concept	31	6.35	6.04	29	2.37	3.87	3.01**
Communication domain	31	38.96	19.71	29	21.31	8.76	4.42**

* P< .05, ** P< 0.01

An examination of the ‘t’ values in Table 4.6 indicates that, although only two Cognitive variables viz; Expressive language and Communication domain showed a significant variation with severity of autism in ANOVA, all the five ‘t’ values are significant with four beyond .01 level and one beyond .05 level that differentiate children with autism at different severity levels. While considering the first variable, Receptive language with a highly significant t-value, the mean value is higher for average autism group, which

indicates that they are better in receptive language ability compared to the above average autism group. Hence it suggests that ascending in severity level leads to further deterioration of the receptive language skills. Another line of research showed that the group who had serious receptive language deficit in early childhood, remained more severely language delayed as a whole (Rutter, Mawhood, & Howlin, 1992).

The second highly significant‘t’ value is for Expressive language. The result reveals that, the average autism group is better in expressive language also than the above average group. The same trend is observed in Number concept, Written language and Communication domain with significant t-values. These results suggest that all the cognitive functions differ with severity of autism. The three non significant F values in ANOVA might be due to interaction effects. Thus null hypothesis is rejected and the alternate hypothesis is accepted. That is cognitive skills differ with different levels of autism.

Reports by Happe, 1994; Lord & Rutter, 1994 also reveal that language deficits are associated with specific pattern of cognitive function in many children with autism, their poorest performance to be on tests requiring verbal concepts, abstractions, or symbolization and in the use of language to establish the meaning of a situation. The present findings could be viewed in vogue with the comment by Rutter (2000) that many findings suggest that cognitive and linguistic impairment in autism are closely related, the nature of association, and the centrality of the role played by language deficits, remain unclear.

With respect to the second objective of the study to explore the behavioral pattern of children with autism first the descriptive statistics was worked out which is given in table 4.7

Table 4.7: N, Means and SDs of the children with autism for Behavioural variables

Variable	N	Minimum	Maximum	Mean	SD
Personal skills	60	10	52	32.35	10.71
Domestic skills	60	0	8	1.96	2.04
Community skills	60	0	5	1.78	1.13
Interpersonal skills	60	6	29	18.46	4.72
Play & Leisure	60	2	17	10.05	3.34
Coping skills	60	0	1	6.66	.25
Problem behaviour	60	9	73	27.83	11.69
Daily living skills domain	60	10	65	36.10	13.11
Socialization domain	60	10	47	28.75	7.71

Analysis of the obtained results in the table reveal that the Personal skills of the children with autism is found to have a higher mean value of 32.35 than other areas in the behavioural variables, which indicates that children with autism are better in self help skills like eating, dressing, and grooming area. Next higher mean value of 27.83 is obtained for the area of Problem behaviour, which is clearly indicating that children with autism often exhibit disruptive behaviour pattern and it varies from person to person as revealed by the range of scores, especially in the case of children with autism. The area of Interpersonal skills has a relatively higher mean value than other behavioural variables like Play& Leisure, and Coping skills. While considering the variables Domestic, Community, and Coping skills the

obtained mean values are found to be very low. These results suggest that Domestic, Community and Coping skills are relatively very poor in children with autism.

The behavioural pattern of children with autism was also compared with the means and SDs of the normal standardization group falling under the same mean age reported by Sparrow, Balla, & Cicchetti, (1984) except for Problem behaviour. In the case of Problem behaviour comparison was made with the means and SDs of the mentally retarded children reported by Peshawaria & Venkatesan, (1992). Table 4.8 gives the details of the comparisons.

Table 4.8 gives a clear cut evidence of behavioural deficit and higher rates of Problem behaviour in comparison with mentally retarded children in the case of children with autism (combined group). While comparing with normal children the same trends are observed in the two autistic groups differing significantly in mean scores. It is also noticed that the deficit is more pronounced in Personal, Interpersonal, and Play & Leisure behaviour. Hence this result is to a large extent supported by the fact that autism specific disruptive behaviour is unique and different while comparing with other children, especially mentally retarded.

As the second step a three way ANOVA was computed to examine the pattern of interaction and the role of independent variables like Age, Gender, and Severity of autism. Table 4.9 presents the details of the main effects.

On analyzing the main effects of gender, age, and severity of autism with respect to behavioural variables, the table shows that gender has no significant effect on any of the variables. Seven F-values are significant out of 21, four for severity and three for age. While considering the main effects of age F-values are significant for Personal skills, Domestic skills, and Daily Living Skills domain. It suggests that Pre School and School age children with autism significantly differ in Personal skills, Domestic skills and Daily Living Skills domain. This trend is similar to that of healthy children and hence does not indicate any special feature of autism. Regarding the severity level, the results show that four F-values are significant, that is, the F-values obtained in the cases of Personal skills, Community skills, Daily Living Skills domain and Problem behaviour. Out of these four F-values three are significant at .05 level and one at .01 level. This result shows that Personal skills, Community skills, Daily Living Skills domain and Problem behaviour differ with severity of autism. None of the skills differ with respect to gender. These results support the hypothesis third and partially support the fourth.

Interaction effect of the three independent variables, Gender, Age, and Severity was also examined. The details are shown in table 4.10

The table values reveal that only four F-values are significant out of 28. It is interesting to note that in main effects gender was not a significant factor while in interaction effect gender has emerged as a more significant factor than age. Considering interaction effect between age and gender, and among all the three with respect to behavioural variables no F-value is found to be significant. The interaction between gender and severity is found to influence Interpersonal skills, Play & Leisure, and Socialization. Severity is also found to be interacting significantly with age for community skills.

The significant results in ANOVA were further studied. As the interaction effect between severity and age are indicating significance, the specific variable scores were further analyzed by separate t-test to understand the nature of difference between the two groups varying in age and severity of autism. Table 4.11 gives the details of the computations for severity.

Table 4.11: Means, SDs, and t-values on Behavioural variables between average and above average scores in autism

Variable	Average in autism		Above average in autism		t
	Mean	SD	Mean	SD	
Personal skills	36.03	10.36	28.41	9.78	2.92**
Domestic skills	2.64	2.16	1.24	1.64	2.81**
Community skills	2,32	1.07	1.20	0.90	4.33**
Interpersonal skills	20.48	4.08	16.31	4.45	3.78**
Play & Leisure	11.48	2.63	8.51	3.37	3.81**
Coping skills	0.09	0.30	0.03	0.18	0.95
Problem behaviour	22.25	7.31	33.79	12.64	4.36**
Daily living skills domain	41	12	30.86	11.36	3.22**
Socialization domain	32.38	6.09	24.86	7.43	4.29**

** P < .01; * P < .05

The table 4.11 shows that among the behavioural variables six of the sub variables and the two domain variables are highly significant and only one is not significant. For all the variables children average on autism scored higher than those scoring above average on autism except for Problem behaviour. With regard to Problem behaviour the average scorers on autism scored very low when compared with the above average group. These results clearly indicate that adaptive behaviour skill deteriorates with increase in severity of autism. The SD values also indicate that Personal skills and Daily

Living Skills domain show greater variability among the subjects followed by Problem behaviour and Socialization domain. The nonsignificant difference between the two groups on coping skills may be because of the reason that most of the behavioral skills which are tools for coping are deficient or dysfunctional in both the groups. The mean differences reveal in 4.11 supports third hypothesis of the study. Or the null hypothesis that behaviour pattern does not differ with different levels of autism is rejected.

The F-value with respect to age was also further explored by using t-test. Table 4.12 gives the details of the computations for age.

Table 4.12: Means, SDs, and t-values for Behavioural variables between age groups

Variable	Preschool age		School age		t
	Mean	SD	Mean	SD	
Personal skills	25. 91	9.10	36.63	9.58	4.33**
Domestic skills	0.95	1.08	2.63	2.25	3.39**
Community skills	1.45	0.77	2	1.28	1.84
Interpersonal skills	17.58	3.38	19.05	5.18	1.18
Play & Leisure	9.50	2.44	10.41	3.81	1.04
Coping Skills	0.00	0.00	0.11	0.31	1.70
Problem behaviour	26.08	9.81	29	12.80	0.94
Daily living skills domain	28.33	10.39	41.27	12.23	4.25**
Socialization domain	27.50	5.68	29.58	8.79	1.02

** P < .01

Considering the behavioural variables with respect to the age of children with autism the Table 4.12 shows that Personal skills and Domestic skills are found to be highly significant at 0.01 level between preschool and school age children. It demonstrates that School age children with autism

have more ability in Personal and Domestic skills, whereas, Preschool children perform very poorly in these behavioural areas. The same trend is seen with respect to cognitive skills also. On the other behavioural variables viz., Community, Interpersonal, Play & Leisure, Coping skills and Problem behaviour the mean differences between the two age groups are not statistically significant. But in the case of domain scores Daily Living Skills is also found to be significantly higher for School age group and in Socialization no significant difference found between the groups. However, these differences or the trend shown is in tune with the developmental pace. That is as the child grows the adaptive skills ought to improve.

After studying the significance of the cognitive variables and behavioural variables with respect to severity of autism, age, and gender the relationship of Cognitive skills and Behavioural skills with Autism was also explored to meet the first two objectives of the study. Hypothesis 5th and 6th were tested for this purpose by computing product moment correlations between Autism Quotient and sub variables of cognitive skills and behavioural skills. It is important to note that higher Vineland scores signify greater ability, whereas higher GARS scores signify greater disability (i.e., the greater the score, the more disabled is the individual). Table 4.13 gives the details of correlations between Autism Quotient and Cognitive skills.

Table 4.13: Correlation coefficients between Autism Quotient and Cognitive variables

Variable	r
Receptive language	-.583**
Expressive language	-.579**
Written language	-.346**
Communication domain	-.601**
Number concept	-.468**

** p < .01

From the Table 4.13 it is clearly indicated that all cognitive variables are significantly and negatively related with Autism Quotient at 0.01 level. This indicates that as the severity of autism increases the cognitive skills become poorer or vice versa. These results also show that Cognitive skills and Autism Quotient are negatively interdependent which supports the alternate hypothesis and hence the null hypothesis is rejected.

Table 4.14 gives the details of correlations between Autism Quotient and Behavioural variables.

Table 4.14: Correlation coefficients between Autism Quotient and Behavioural variables

Variable	r
Personal skills	-.448**
Domestic skills	-.439**
Community skills	-.595**
Daily Living Skills domain	-.486**
Interpersonal skills	-.550**
Play & Leisure	-.564**
Coping skills	-.206
Socialization domain	-.597**
Problem behaviour	.559**

**p < .01

Coefficients in Table 4.14 show that the five Behavioural skills independently and the two domains are negatively related to Autism Quotient. These results demonstrate that autism specific behaviour often inhibit the positive behavioural ability. That is lower symptomatology relates to better socialization skills in real-life situations. Another noteworthy result is that Problem Behaviour shows a significant positive correlation with Autism Quotient. It indicates that Problem behaviour and autism

symtomatology are more or less similar in nature. The correlations between Coping skills and Autism Quotient scores were quite low in both groups of children, suggesting weak associations between levels of autistic symptomatology and levels of Coping skills in real life. This result can be related to the results shown in Table 4.11 and 4.12 suggesting that Coping skill is not a major indicator of autism.

In addition to the correlations stepwise multiple regression analysis was also carried out for the whole sample to find out the relevance of cognitive and behavioural variables with regard to their predictability of autism.

For this analysis all the five cognitive variables, viz., Receptive language, Expressive language, Written language, Number concept, overall Communication domain and the eight Behavioural skills, viz., Personal skills Domestic skills, Community skills, Interpersonal behaviour, Play & Leisure, Coping skills, overall Daily Living Skills domain, overall Socialization domain and Problem behaviour were considered as independent variables and Autism quotient considered as dependent variable. Details of the step of multiple regression analysis that has derived from cognitive and behavioural variables is given in the Table 4.15

Table 4.15: Multiple regression analysis (step wise) Autism Quotient as dependent variable

Step No	Independent Variable	Multiple Regression	R^2	F-value	Partial Regression Coefficient 'b'	Constant	Beta coefficient B
1.	Communication domain	0.601	0.361	32.716***	-.383	122.069	-.601
2.	Problem behaviour	0.680	0.462	24.489***	(Communication) -.278 (Problem behaviour) .347	109.207	(Communication) .435 (Problem behaviour) .359

3.	Community	0.714	0.510	19.414***	Communication -.162 (Problem behaviour) .313 (Community skills) -2.941	111.887	(Communication) -.254 (Problem behaviour) .324 (Community skills) -.296

*** P< .001

From Table 4.15 it can be seen that only three independent variables have emerged as capable of significantly predicting autism among the studied sample. The first variable entered into the multiple regression analysis for predicting Autism Quotient was overall Communication domain. The multiple correlation (R) obtained is 0.601. The relationship is negative as indicated by the negative value of 'b', the partial regression coefficient. This shows that the score on Communication domain is the most capable variable that can predict autism among the 14 variables entered. Table also gives the highly significant F-value between these two variables as 32.716 and that the coefficient of multiple regression R^2 as 0.361. This reveals that 36 percent of the variance in Autism Quotient is accounted by overall Communication domain.

The partial regression coefficient or B coefficient is -.383. This value indicates that Autism Quotient will change by -.383 units for every unit of change in overall Communication domain.

The result also demonstrates that the overall Communication domain is strongly related with autism symptomatology and any variation in the quality of communicative production will influence severity of autism. So it

can be inferred that communication is a single major factor to predict the autism severity or Autism Quotient. The second most significant variable entered into the stepwise regression analysis is Problem behaviour. The multiple regression (R) between Autism Quotient on the one side and the two independent variables, viz., overall Communication and Problem behaviour on the other side is 0.680. The value of R^2 in the step is 0.462. Therefore the two variables put together could explain about 46 percent of variance in the dependent variable. The relative contribution of the predictor variable overall Communication domain and Problem behaviour is 36.1 to 46.2 percent and the increment being 10.1, which is the variance accounted by Problem behaviour.

The partial regression coefficient of Problem behaviour is 0.347. This means that the scores of Autism quotient will change by 0.347 units for every unit of change in Problem behaviour. The third important factor entered into the analysis is Community skills. The multiple correlations with the three variables, R, for overall Communication domain, Problem behaviour and Community skills are 0.714 and 'F' of 19.414. The R^2 value of 0.510 shows that 51 percent of variance in Autism Quotient is explained by these three variables. Out of this variance, 36.1 percent, 10.1 percent, and 4.8 percent of the variance are explained by variables overall Communication domain, Problem behaviour, and Community skills respectively.

The obtained partial regression coefficient with these predictor variables indicate that the change in the Autism Quotient is by -.162, 0.313 and -2.941 units for every unit of change in variables, overall Communication

domain, Problem behaviour and Community skill while controlling the influence of other variables.

Thus the present results indicate that the overall Communication domain, Problem behaviour and Community skills are the three major variables that can predict Autism. The relationship is negative for Communication domain and Community skills, where as it is positive for Problem behaviour.

The last objective of the present study is to explore the usefulness and efficacy of parental training on skills improvement and reduction of severity of Problem behaviour among selected children with autism.

Parental intervention was provided to the experimental group in addition to the training given to the autistic child where as the control group had undergone routine special education training only.

On the basis of the above objective the three hypotheses formulated, ie., parental training improves cognitive skills in children with autism, parental training improves behavioural skills, and parental training reduces symptom severity of the children with autism were tested in four steps.

In the first step pre-intervention mean scores of the control and experimental groups for cognitive, behavioural variables and autism severity were compared using separate t-test. Table 4.16 gives the details of comparison for Cognitive variables.

Table 4.16: Pre intervention Means, SDs of the Experimental and Control group and 't' values for Cognitive variables

Variable	Experimental group		Control group		t
	Mean	**SD**	**Mean**	**SD**	
Receptive language	17.80	2.44	17.90	4.79	0.05
Expressive language	16.50	8.47	16.80	12.28	0.95
Written language	1.10	1.91	0.40	0.96	0.31
Number concept	6.00	3.26	3.60	2.45	1.85
Communication domain	35.40	12.11	35.10	17.36	0.96

The t value is not significant for any cognitive variable. It indicates that the experimental and control group do not differ in cognitive skills before parental training intervention.

Table 4.17 gives the details of the comparisons with respect to Behavioural variables.

Table 4.17: Pre intervention Means, SDs of Experimental and Control group and t-values for the Behavioural variables

	Experimental group		Control group		t
	Mean	**SD**	**Mean**	**SD**	
Personal skills	33.90	8.53	35.30	8.59	0.71
Domestic skills	2.20	1.13	2.70	2.21	0.53
Community skills	1.90	0.31	2.20	0.78	0.27
Daily living skills domain	38.00	9.59	40.30	10.83	0.62
Interpersonal skills	19.90	3.21	20.80	4.39	0.60
Play & Leisure	10.60	2.59	11.00	3.26	0.76
Coping skills	0.10	0.31	0.10	0.31	1.00
Socialization domain	30.60	5.50	31.90	7.06	0.65

Problem behaviour	31.00	4.21	28.10	4.53	0.15

None of the t-value is found to be significant which clearly indicate that both groups are similar in their behavioural functioning before intervention.

Table 4.18 gives the details of comparison for Autism severity.

Table 4.18: Pre intervention Means, SDs of Experimental and Control group and 't' value for Autism Quotient

Variable	**Experimental group**		**Control group**		**t**
	Mean	**SD**	**Mean**	**SD**	
Autism Quotient	108.50	4.17	106.30	2.79	0.18

The non significant t-value in Table 4.18 indicates that both groups are not differing significantly in the severity of autism before intervention. Thus the Experimental and Control group are matched for their Cognitive and Behavioural skills and autism severity.

In the second step pre and post parental intervention scores on Cognitive, Behavioural variables and Autism Quotient of the experimental group were compared using the paired samples t- test to assess the effect of intervention on these variables. Table 4.19 gives the details of the computations for Cognitive variables.

Table 4.19: Pre and post intervention Means, SDs and't' values of Cognitive variables for the Experimental group

Variable	**Pre intervention**		**Post intervention**		**t**
	Mean	**SD**	**Mean**	**SD**	
Receptive language	17.80	2.44	19.60	2.31	9.00***

Expressive language	16.50	8.47	19.10	9.26	8.51***
Written language	1.10	1.91	1.40	2.27	1.96
Communication domain	35.40	12.11	40.20	13.18	12.34***
Number concept	6.00	3.26	7.10	3.75	3.16**

**P<.01; ***P<.001

Table 4.19 reveals that four of the five t values are significant for cognitive variables. The only nonsignificant t value is for written language, which indicates that written language has not improved by the intervention where as Receptive language, Expressive language, Number concept, and overall Communication domain could significantly change due to the intervention. While analyzing the change in Receptive language, Expressive language, Number and overall Communication domain, it can be seen that the changes in all these variables are in positive direction i.e., scores have increased significantly by the intervention. It is interesting to note that all the four variables that show an increase are inseparable components in day to day interactions where as development of written language is a product of formal training. Such formal training was not included in the parental training and hence no significant improvement in this skill. So it demonstrates that the parental training intervention is beneficial for children with autism.

Table 4.20 gives the details of pre and post comparison of Behavioural variables for experimental group.

Table 4.20: Pre and post intervention Means, SD and t-values of Behavioural variables for the Experimental group

Variable	Pre intervention		Post intervention		t
	Mean	**SD**	**Mean**	**SD**	
Personal skills	33.90	8.53	37.80	8.86	14.08***
Domestic skills	2.20	1.13	2.80	0.63	2.71*
Community skills	1.90	0.31	2.10	0.31	1.50
Daily Living Skills domain	38.00	9.59	42.80	9.43	14.69***
Interpersonal skills	19.90	3.21	22.70	3.19	11.22***
Play & Leisure	10.60	2.59	12.50	2.63	8.14***
Coping skills	0.10	0.31	0.10	0.31	0.00
Socialization domain	30.60	5.50	35.40	5.54	13.37***
Problem Behaviour	31.00	4.21	27.90	4.67	9.85***

*P<.05, ***P<.001

From the Table 4.20 it can be seen that Personal skills, overall Daily Living Skills domain, Interpersonal, Play & Leisure, overall Socialization domain and Problem behaviour, significantly changed after pre intervention. The post intervention means for all the variables except the last show an increase and for the last a decrease is evident. That is all the positive behavioural variables like Personal, Domestic, overall Daily Living Skills domain, Interpersonal, Play & Leisure and overall Socialization domain improved as a result of the intervention provided to the parents of children with autism. In addition to the enhancement of positive skills the unhealthy component of Problem behaviour considerably reduced with parental intervention. So it can be interpreted that problem behaviour in children with autism could be effectively controlled by the parental intervention.

It can also be noted that on the two variables, Community skills and Coping skills, no significant improvement is obtained. However in Community skills the score shows some increase though not enough to be significant while in Coping skills absolutely no change has occurred.

To verify the hypothesis that Autism Severity or Autism Quotient can be significantly decreased through parental intervention, pre and post intervention Autism Quotient of the experimental group were subjected to t-test. The results are given in table 4.21

Table 4.21: Pre and post intervention Means, SDs of Autism Quotient and t-value for the Experimental Group

Intervention	**Autism Quotient**		**t**
	Mean	**SD**	
Pre intervention	112.20	4.21	9.94***
Post intervention	107.50	4.19	

***P< . 001

Table 4.21 indicates that mean score of Autism Quotient has decreased significantly after intervention by the parental training provided. As autism symptomatology is considered as the most crucial and distinctive feature of autism disorders, the present finding is very significant in helping children with autism. The alternate hypothesis can be accepted and null hypothesis is rejected.

Besides the pre-post intervention comparisons made for experimental group, the present study also explored whether any change has occurred in the control group. This was essential to assess the improvement contributed by parental training over routine special education training given to the selected children. The paired samples t- test was done separately for testing mean difference between scores of the pre and post parental intervention period for Cognitive variable, Behavioural variables and Autism Quotient. Table 4.22 shows the details for Cognitive variables.

Table 4.22: Pre and post intervention Means, SDs and t values of Cognitive variables for the Control group

Variable	**Pre intervention**		**Post intervention**		**t**
	Mean	**SD**	**Mean**	**SD**	
Receptive language	17.90	4.79	18.10	4.38	1.00
Expressive language	16.80	12.28	17.00	12.29	1.50
Written language	0.40	0.96	0.40	0.96	0.00
Communication domain	35.10	12.36	35.50	17.01	1.80
Number concept	3.60	2.45	3.60	2.45	0.00

The t values in Table 4.22 show that with respect to Cognitive variables there is no significant difference between the means of the two phases. This clearly demonstrates that routine special education intervention is insufficient for developing positive change in the realm of Cognitive skills on children with autism. Therefore it is a striking finding that parental intervention is better as compared with routine special education provided in school settings.

Table 4.23 gives the details of the t-test with respect to the Behavioural variables.

Table 4.23: Pre and post intervention Means, SDs and t values for the Control group on Behavioural variables

Variable	Pre intervention		Post intervention		t
	Mean	SD	Mean	SD	
Personal skills	35.30	8.59	35.90	8.55	2.71*
Domestic skills	2.70	2.21	2.70	2.21	0.00
Community skills	2.20	0.78	2.20	0.78	0.00
Daily Living skills domain	40.30	10.83	40.90	10.72	2.71*
Interpersonal skills	20.80	4.39	21.20	4.36	1.50
Play & Leisure	11.00	3.26	11.20	3.22	1.50
Coping skills	0.10	0.31	0.10	0.31	0.00
Socialization domain	31.90	7.06	32.50	6.88	1.96
Problem behaviour	28.10	4.53	27.30	4.54	4.00**

**P< .01, *P<.05

Values in Table 4.23 show that three t values are significant, indicating a change in Personal, overall Daily Living Skills, and Problem behaviour. Although Personal and overall Daily Living Skills domain has got higher mean score in post assessment as compared with pre assessment mean score the difference is minimal, which indicates that only slight improvement has occurred in their skills by routine special education training. The Problem behaviour has reduced to some extent in the control group as a result of special education. However, a close examination of the changes seen in the experimental group (Table 4.20) after parental intervention and the change in the control group (Table 4.23) reveal that the mean difference is much higher in the experimental group. This observation further strengthens the utility of parental intervention.

Table 4.24 gives the details of t-test for the control group on Autism Quotient.

Table 4.24: Pre and post intervention Means, SDs and 't' values for the Control group on Autism Quotient

Phase	Mean	SD	t
Pre intervention	106.30	2.79	4.58**
Post intervention	105.60	2.67	

** P < .01

Table 4.24 reveals that t value is highly significant. The mean score of pre intervention is found to be 106.30 and that is for post intervention is 105.60, which indicates that reduction of severity has been manifested by the control group in the post assessment period and that is due to the special education care received by the child. But a comparison with the change in the experimental group this is much lower, which suggests that parental intervention facilitates the improvement initiated by special education of the affected children.

The present investigation also included a follow-up study to analyze the efficacy of parental training intervention. The Cognitive, Behavioural and Autism Quotient were assessed for the Experimental (parent training group) and Control groups and they were compared as post intervention and follow-up assessments in the same groups. Table 4.25 gives the details of the comparisons.

Table 4.25: Post intervention and follow-up Means, SDs and t values for the Experimental group on Cognitive variables

Variable	Post intervention		Follow-up		t
	Mean	SD	Mean	SD	

Receptive language	19.60	2.31	20.70	2.21	6.128***
Expressive language	19.10	9.26	21.40	9.64	4.86***
Written language	1.40	2.27	1.60	2.17	1.50
Communication domain	40.20	13.18	43.70	13.47	6.22***
Number concept	7.10	3.75	8.30	3.86	3.674*

*** P< 0.001; P<0.05*

The Table 4.25 indicates that t values are found to be significant for Receptive, Expressive, Number and overall Communication domain in the post and follow-up assessment comparisons of the experimental group. Receptive and expressive language mean scores have found to be higher in the case of follow-up assessments while comparing with the mean scores in the post assessments. It indicates that improvement continues because the parents consistently maintains and facilitate the process. The same trend is also observed in the overall Communication domain, the mean score for post assessment is 40.20 and it is 43.70 for follow-up assessment. Hence the positive change and increment in the communication skills of the children in the experimental group has been attributed to the effectiveness of the parental training intervention.

The similar result also is seen in Number concept with a significant t value of 3.674. While comparing the mean score of Number concepts, the post assessment has got 7.10 and for follow-up assessment has scored 8.30, which is pinpointing of positive effects of parental training. On the contrary in the written language there is no significant difference found between the post assessment and follow-up scores of experimental group. It validates that written skill is a more complex task for parental training intervention,

especially in the case of autism and also suggesting that special care and attention needs to given to improve these skills.

A graphical representations of the change in Cognitive skills by parent training intervention for the Experimental is given in Fig. 4.1

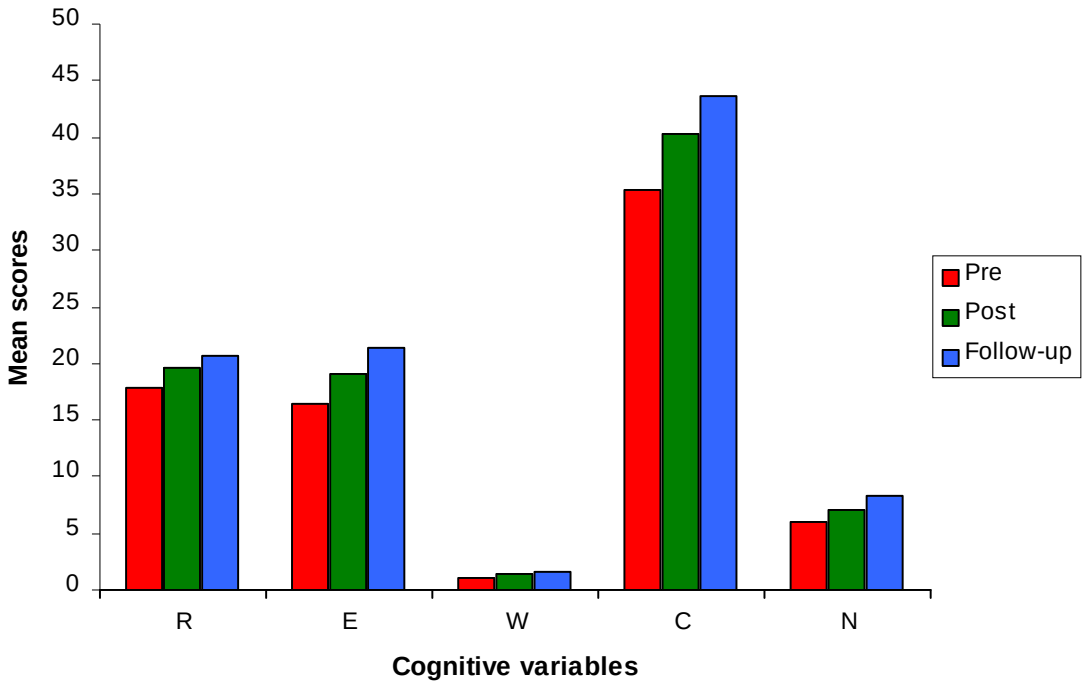

Fig. 4.1: ***Comparison of pre, post and follow-up scores on Cognitive variables for the parental intervention group***

The change in the behavioural skills whether behaviour variables scores could be changed after post intervention was also estimated. For that purpose the behavioural variables scores for the experimental group are studied in the post and follow-up assessments. The results are shown in the Table 4.26.

Table 4.26: Post intervention and follow-up Means, SDs and t values for the Experimental group on Behavioural variables

Variable	Post		Follow-up		t
	Mean	**SD**	**Mean**	**SD**	
Personal skills	37.80	8.86	39.70	9.06	3.612**
Domestic skills	2.80	0.63	3.20	1.03	1.80
Community skills	2.10	0.31	2.10	0.31	00
Daily Living Skills domain	42.80	9.43	45.00	9.86	4.29**
Interpersonal skills	22.70	3.19	24.80	3.29	4.58***
Play & Leisure	12.50	2.63	14.00	2.62	5.58**
Coping skills	0.10	0.31	0.10	0.31	00
Socialization domain	35.40	5.54	38.90	5.89	6.45***
Problem behaviour	27.90	4.67	26.20	4.73	4.29**

**P<0.01, ***P<0.001

From the Table 4.26 it can be seen that the t values for Personal, Play & Leisure and overall Daily Living Skills domain and Problem behavior are significant. The same trend is also observed in overall socialization domain, Personal, Interpersonal, and Play & Leisure respectively. In the Problem behaviour the mean score for post assessment is 27.90 where as 26.20 for follow-up assessments, which clearly reveals that the continued efforts of parents in the home based training could yield a positive outcome and slightly reduced the Problem behaviour of children with autism. These results indicate that positive change as a result of parental training intervention continues even without professional supervision.

A graphical representation of the change in Behavioural Skills by parent training intervention for the experimental group is given in Fig. 4.2

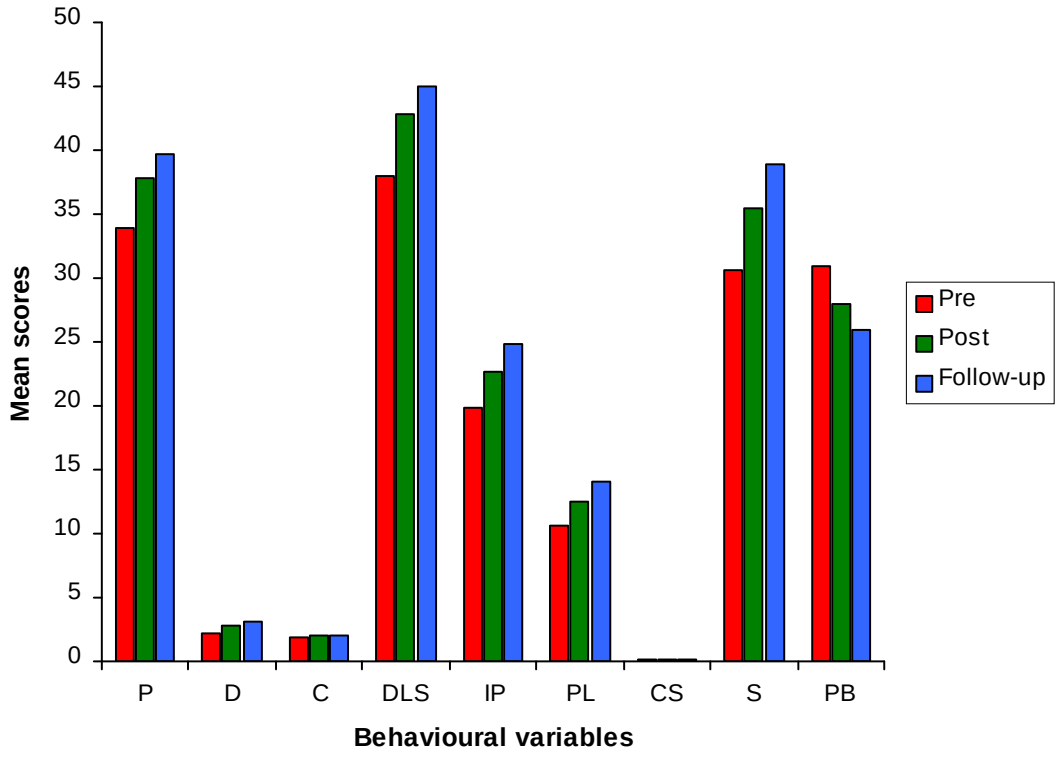

Fig. 4.2: ***Comparison of pre, post and follow-up scores on Behavioural variables for the parental intervention group***

The Autism Quotient scores of post intervention and follow-up were also compared using t-test. Table 4.27 gives the details of the computations.

Table 4.27: Post intervention and follow-up Means, SDs and t values of Autism Quotient for the Experimental group

Variable	Post intervention		Follow-up		t
	Mean	SD	Mean	SD	
Autism Quotient	107.50	4.19	104.20	4.39	5.70***

Table 4.27 indicates that the t-value and the mean score of autism severity in post assessment suggest that autism severity could be effectively decreased through the continuation of the intervention programme after the

post intervention in home setting. A graphical representation of the comparison is shown in Fig. 4.3.

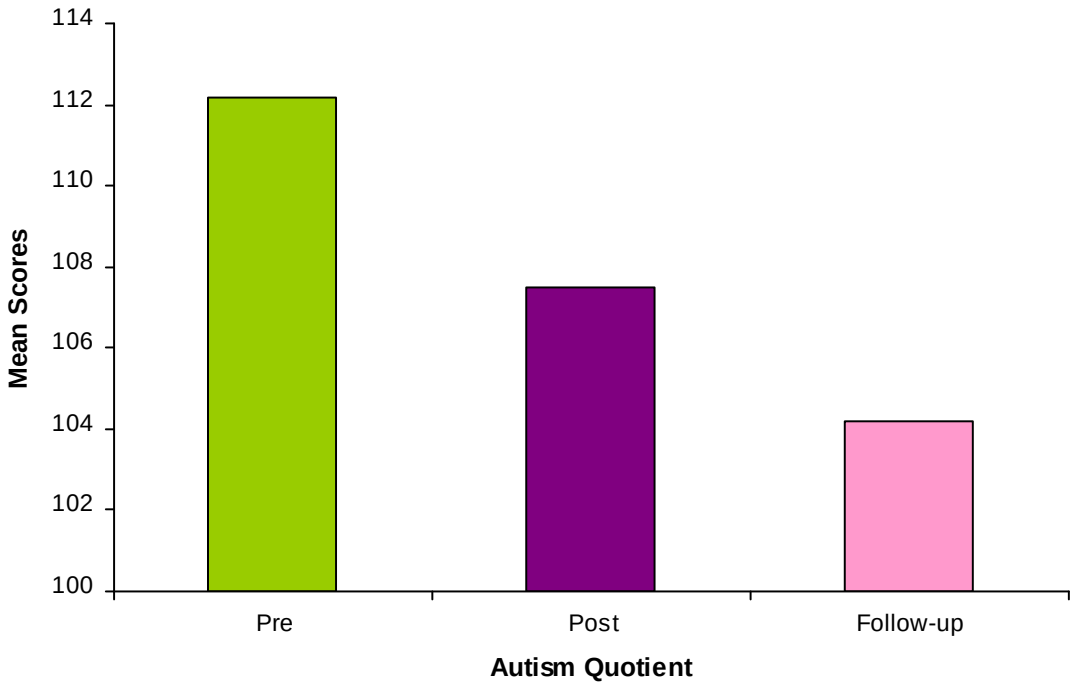

Fig. 4.3: ***Comparison of pre, post and follow-up scores on Autism Quotient for the parental intervention group***

In addition to the post and follow-up intervention comparisons made for experimental group, the present study also explored whether any change has occurred in the control group during the same period of time. The paired sample test was used for testing mean difference between scores of the post and follow-up period for Cognitive variables, Behavioural variables and Autism Quotient. Table 4.28 shows the details for cognitive variables.

Table 4.28: Post intervention and follow-up Means, SDs and t values for the Control group on Cognitive variables

Variable	Post intervention		Follow-up		t
	Mean	SD	Mean	SD	

Receptive language	18.10	4.38	18.30	4.49	1.50
Expressive language	17.00	12.29	17.10	12.25	1.00
Written language	0.40	0.96	0.40	0.96	0.00
Communication domain	35.50	17.01	35.90	17.36	1.80
Number concept	3.60	2.45	3.60	2.45	0.00

The t-values in Table 4.28 indicate that the control group has not changed much in the sphere of cognitive skills. Hence this result strongly supports the potency of parental training intervention revealed by the changes in the experimental group.

Table 4.29 gives the details of the t-test with respect to the Behavioural variables for Control group.

Table 4.29: Post intervention and follow-up Means, SDs and t-values for the Control group on Behavioural variables

Variable	Post		Follow-up		t
	Mean	SD	Mean	SD	
Personal skills	35.90	8.55	36.40	8.39	2.23*
Domestic skills	2.70	2.21	2.80	2.34	1.00
Community skills	2.20	0.78	2.20	0.78	0.00
Daily Living Skills domain	40.90	10.72	41.30	10.33	1.50
Interpersonal skills	21.20	4.36	21.40	4.42	1.50
Play & Leisure	11.20	3.22	11.40	3.34	1.50
Coping skills	0.10	0.31	0.10	0.31	0.00
Socialization domain	32.50	6.88	32.90	6.90	1.80
Problem behaviour	27.30	4.54	26.90	4.60	1.80

*P<.05

Table 4.29 reveals that in the area of Personal skills has got significant t-value where as for all other Behavioural variables the change is not significant. While analyzing the mean scores of Personal skills of post and follow-up for the control group it can be seen that only a very slight change

has occurred. It is further apparent that special education is not enough for improving the Behavioural skills of children with autism.

Table 4.30 gives the details of t-test for the control group on Autism Quotient.

Table 4.30: Post intervention and follow-up Means, SDs and t values of Autism Quotient for the Control group

Variable	Post intervention		Follow-up		t
	Mean	SD	Mean	SD	
Autism Quotient	105.60	2.67	105.40	2.75	1.50

Table 4.30 shows that only a meagre decrement of severity has been manifested by the control group in the follow-up period. While comparing with the change in the experimental group this is lower. It also substantiates the importance of parental training intervention to increase and maintain the improvement initiated by special education of the children with autism.

In some of the results obtained in Tables from 4.16 to 4.30 graphical comparison of the pre and follow-up scores of experimental and control groups were also done for the three sets of variables as shown in Figures 4.4, 4.5 and 4.6 respectively.

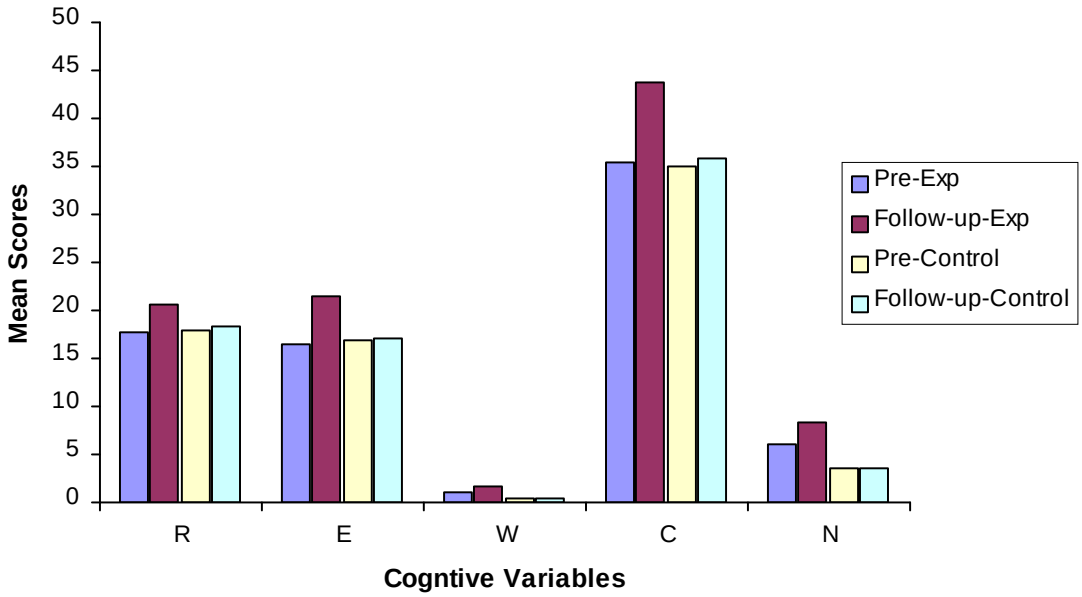

Fig. 4.4: ***Comparison of pre and follow-up scores on Cognitive variables for experimental and control group***

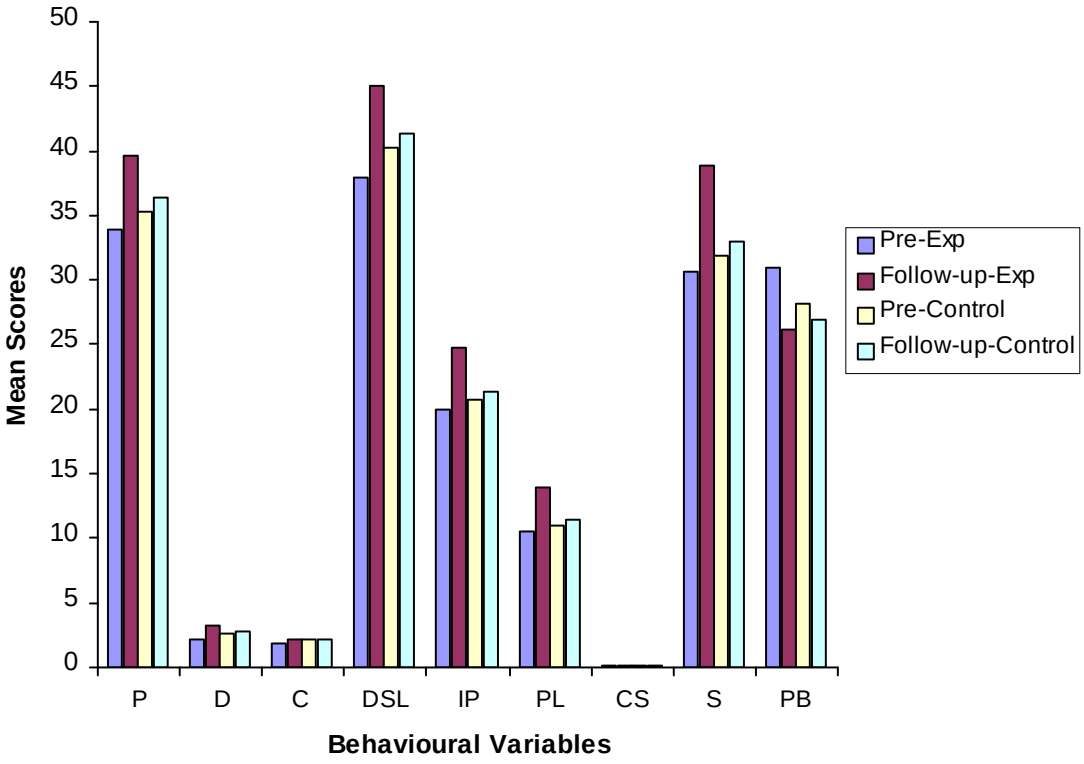

Fig. 4.5: ***Comparison of pre and follow-up scores on Behavioural variables for experimental and control group***

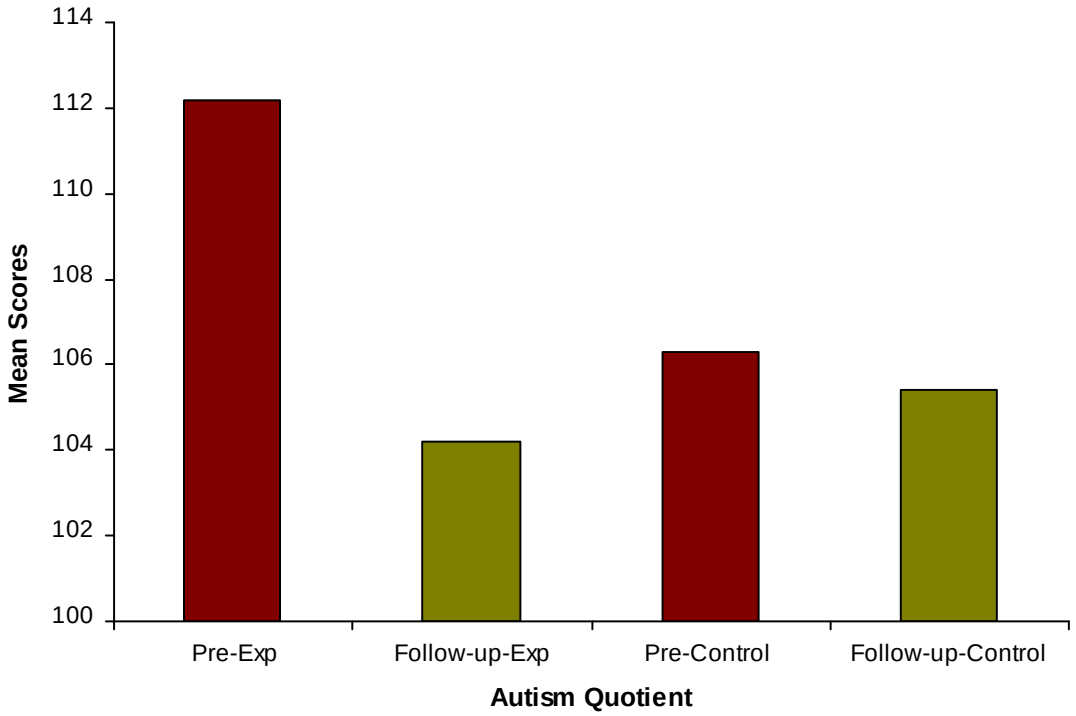

Fig. 4.6: ***Comparison of pre and follow-up scores on Autism Quotient for experimental and control group***

Table 4.4: Interaction effects of the three-way ANOVA of Cognitive variables for Gender, Age and Severity of children with autism

Variable	Residual		Interaction effects											
			Gender and Age			Gender and Severity			Age and Severity			Gender, Age and Severity		
	Sum of squares	Mean squares	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F
Receptive Language	889.84	17.11	11.55	11.55	0.67	225.51	22.51	13.17**	146.19	146.19	8.54**	93.03	93.03	5.43*
Expressive Language	5706.02	109.73	5.11	5.11	.04.	135.05	135.05	1.23	65.47	65.47	.59	0.97	0.97	.00
Written Language	209.55	4.03	1.21	1.21	.00	5.77	5.77	1.43	0.92	0.92	.23	2.91	2.91	.72
Number Concept	1211.17	23.29	.84	.84	.03	129.20	129.20	5.54*	.40	.40	.01	.40	.40	.01
Communi-cation domain	11782.02	226.57	1.37	1.37	.00	843.44	843.44	3.72*	447.16	447.16	1.97	48.35	48.35	.21

*P<.05, **P<.01

Table 4.8: Means, SDs of the normal, MR and children with autism for Behavioural variables

Particulars	Personal		Domestic		Community		Interpersonal		Play & leisure		Coping skills		Problem behaviour	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Normal	68.5	4.8	18	5	29.9	6.1	41.4	3.7	26	3.7	22.2	6.7	-	-
Autism	32.35	10.71	2.64	2.16	1.78	1.13	18.46	4.72	10.05	3.34	6.66	.25	27.83	11.69
Average in Autism	36.03	10.36	2.64	2.16	2.32	1.07	20.48	4.08	11.48	2.63	9.67	0.30	22.25	7.31
Above Average in Autism	28.41	9.78	1.24	1.64	1.20	0.90	16.31	4.45	8.51	3.37	3.44	0.18	33.79	12.64
Mentally retarded	-	-	-	-	-	-	-	-	-	-	-	-	15.83	15.78

Table 4.9: Main effects of the three way ANOVA of Behavioural variables for Age, Gender, and Severity of autism

Variable	Residual		Main effects								
			Gender			Age			Severity		
	Sum of squares	Mean squares	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F
Personal skills	3962.79	76.20	34.78	34.78	.45	936.78	936.78	12.29**	307.45	307.45	4.03*
Domestic skills	166.50	3.20	1.05	1.05	.33	16.66	16.66	5.20*	7.28	7.28	2.27
Community skills	45.10	.867	1.41	1.41	.01	1.88	1.88	2.17	3.44	3.44	3.96*
Interpersonal skills	923	17.75	16.66	16.66	.93	6.08	6.08	.34	31.27	31.27	1.76
Play & Leisure	467.46	8.99	5.49	5.49	.61.	.19	.19	.02	15.94	15.94	1.77
Coping skills	3.30	6.34	1.94	1.94	.30	.13	.13	2.17	8.62	8.62	.13
Problem behaviour	5466.46	105.12	37.87	37.87	.36	154.36	154.36	1.46	868.47	868.47	8.26**
Daily living skills domain	5716.66	109.93	24.89	24.89	.22	1300.44	1300.44	11.82**	487.90	487.90	4.43*
Socialization domain	2311.56	44.45	34.45	34.45	.77	6.67	6.67	.15	107.64	107.64	2.42

** P < .01; * P < .05

Table 4.10: Interaction effects of the three-way ANOVA of Behavioural variables for Age, Gender, and Severity of autism

Variable	Residual		Interaction effects											
			Gender and Age			Gender and Severity			Age and Severity			Gender, Age and Severity		
	Sum of squares	Mean squares	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F	Sum of squares	Mean squares	F
Personal skills	3962.79	76.20	3.48	3.48	.00	48.87	48.87	.64	68.74	68.74	.90	47.55	47.55	.62
Domestic skills	166.50	3.20	.41	.41	.13	2.22	2.22	.69	5.85	5.85	1.83	2.47	2.47	.77
Community skills	45.10	.86	1.41	1.41	.01	2.94	2.94	3.39	4.55	4.55	5.24*	.62	.62	.72
Interpersonal skills	923	17.75	1.05	1.05	.05	70.98	70.98	3.99*	47.51	47.51	2.67	26.38	26.38	1.48
Play & Leisure	467.46	8.99	7.38	7.38	.82	34.78	34.78	3.86*	25.62	25.62	2.85	10.57	10.57	1.17.
Coping skills	3.30	6.34	1.94	1.94	.30	1.94	1.94	.30	8.62	8.62	.13	1.94	1.94	.30
Problem behaviour	5466.46	105.12	89.33	89.33	.85	1.51	1.51	.01	209.32	209.32	1.99	134.28	134.28	1.27
Daily living skills domain	5716.66	109.93	.33	.33	00	104	104	.94	165.01	165.01	1.50	85.79	85.79	.78
Socialization domain	2311.56	44.45	8.45	8.45	.19	229.80	229.80	* 5.17	128.83	128.83	2.89	80.03	80.03	1.80

* P< .01

Chapter V

SUMMARY AND CONCLUSIONS

This chapter is systematically structured into four parts. The first part gives an outline of the objectives and the hypotheses framed for the study. Secondly, it gives the method adopted for this investigation. The third part presents the major findings and the last section provides suggestions for the future research.

The present study is an attempt to explore the cognitive and behavioural analysis of autism and test the efficacy of parent training intervention for improving the conditions of children with autism. A few objective and hypothesis are formulated for this purpose. They are given below:

Objectives

1. To assess the cognitive functions in relation to the different levels of autism.
2. To explore the behavioural pattern in relation to different levels of autism.
3. To explore the role of age and gender on the cognitive functions and behavioural pattern among children with autism.
4. To evaluate the usefulness and efficacy of parental training intervention on skill improvement and reduction of problem behaviour among selected children with autism.

Hypotheses

1. Cognitive skills differ with different levels of autism.

2. Cognitive skills differ with age and gender among children with autism.
3. Behavioural pattern differ with different levels of autism.
4. Behavioural pattern differ with age and gender among children with autism.
5. Cognitive skills and Autism Quotient are related in children with autism.
6. Behavioural skills and Autism Quotient are related in children with autism.
7. Autism Quotient can be predicted by means of cognitive and behavioural patterns of children with autism
8. Parental training intervention improves Cognitive skills of children with autism.
9. Parental training intervention improves behavioural skills and reduces problem behaviour of children with autism.
10. Parental training intervention significantly reduces the severity level of children with autism.

Participants

The sampling of the present study has been drawn using purposive sampling method. The present study consists of 60 children with Autism including both boys and girls, in the age range of 3-12 years with a mean age of 6.5 years. The autistic groups in the present sample are those who have been diagnosed and certified as cases of Autism from the Institute for Communicative and Cognitive Neurosciences (ICCONS), Shornur, Palakkad.

Those who have been clinically diagnosed and are attending three Special schools in Calicut district of Kerala are also included in this study.

Measures

The measures used in this study include five standardised observation/ interview schedules and socio-demographic data sheet.

1. Socio-demographic Data Sheet.
2. Childhood Autism Rating Scale (CARS).
3. Gilliam Autism Rating Scale (GARS).
4. Vineland Adaptive behaviour Scale-Survey Edition (VABS).
5. Behavioural Assessment Scale for Indian Children with Mental Retardation (BASIC-MR).

Procedure

The above mentioned measures are individually administered and parent training intervention was given to a selected group. After this the data is analysed by appropriate statistical methods.

Major Findings

The major findings of the present study are as follows:

1. The children with autism have more skills in the receptive language and problem exists in the sphere of expressive communication.
2. The written communication is very poor in children with autism and great variability in communication skills.
3. Children with autism develop the number concept very poorly with more individual variability.

4. Expressive language and overall communication ability significantly differ in children with average and above average children with autism.
5. Preschool and school age children with autism significantly differ in receptive language.
6. A very striking feature is that while the average scoring boys were better in number and the above average scoring girls also turned out to be better in number.
7. Average scorers are better in receptive, expressive, written, number and overall communication domain skills.
8. Personal skills are comparatively better in autism especially self help skills.
9. Children with autism show more disruptive behaviours.
10. Domestic, community and coping skills are poor in children with autism.
11. Gender has no significant effect on behavioural skills of children with autism.
12. Preschool and school children with autism significantly differ in personal, domestic and overall daily living skills.
13. Personal, community, overall daily living skills and problem behaviour differ significantly between average and above average scores in autism.
14. Above average children has more problem behaviour.

15. School age children with autism have more ability on personal and domestic skills than preschool ones.
16. Cognitive variables are significantly and negatively related to autism quotient.
17. Problem behaviour is positively and significantly related to autism quotient.
18. Other behavioural variables are negatively and significantly related to autism quotient.
19. Autism quotient could be predicted by the overall communication skills, problem behaviour and community skills of children with autism.
20. Parental training intervention is effective for improving the cognitive and behavioural skills of children with autism.
21. Autism quotient is effectively reduced through parent training intervention.

Conclusions

The present study strongly corroborates the scientific notions related to the autism disorders. This is one of the major findings of this study, which clearly substantiates;

- There is a proportionally significant relationship between the ability level and autism symptomatology of the child.
- Autism severity can be predicted through the analysis of the communication skills, adaptive behaviour and problem behaviour of the children with autism.

- Parent training intervention focusing on cognitive and behavioural competence will specifically enhance the overall skills of the children with autism.
- Parent training intervention consistently reduces the severity level of the children with autism.

Limitations of the present study

Although the result of the present study is quite inspiring, it would be earnest to point out a few limitations.

- The sample size for the intervention phase of the study is quite small.
- The parental training intervention is conducted only for very short time duration. Related to this, the systematic assessment of parent-child interaction was not conducted.

Suggestions for future research

The present study highlights the major practical and methodological difficulties in undertaking a training intervention programme for the parents of the children with autism. Notwithstanding these difficulties, the modest findings of improved communication competence, behavioural skills and the reduced autism severity levels of the child, emphasize a greater need for further work on the parent training approaches. This should include methodological rigour to confirm and extend these tentative findings and more clearly demonstrate whether parent training approaches focused on cognitive skills and behavioural skills have a specific beneficial effect on the overall competence of children with autism. However, if these interventions are replicated, as this study suggests, a developmentally oriented, focused

approach to parent training intervention treatment can be a useful addition to the regular care in managing autistic disorders.

REFERENCES

Adrien, J. L., Barthelemy, C., Perrot, A., Roux, S., Lenoir, P., Hameury, L., et al. (1992). Validity and reliability of the Infant Behavioural Summarized Evaluation (IBSE): A rating scale for the assessment of young children with autism and developmental disorders. *Journal of Autism and Developmental Disorders*, 22, 375-394.

Aldred, C., Green, J., & Adams, C. (2004). A new social communication intervention for children with autism: pilot randomised controlled treatment study suggesting effectiveness. *Journal of Child Psychology and Psychiatry*, 45, 1420–1430.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, D C: American Psychiatric Association.

Anderson, A., Moore, D. W., Godfrey, R., & Fletcher-Flinn, C. M. (2004). Social skills assessment of children with autism in free-play situations. *Autism*, 8, 369-385.

Andrews, N., Miller, E., Grant, A., Stowe, J., Osborne, V., & Taylor, B. (2004). Thimerosal exposure in infants and developmental disorders: a retrospective cohort study in the United Kingdom does not support a causal association. *Pediatrics,* 114, 584–91.

Arndt, T.L., Stodgell, C.J., & Rodier, P.M. (2005). The teratology of autism. *International Journal of Developmental Neurosciences,* 23, 189–99.

Asher, W. (1994). Research Methodology. In R. J. Corsini (Eds.) *Encyclopedia of Psychology*, Vol.3, New York: John Wily and Sons.

Aylward, E.H., Minshew, N.J., Field, K., Sparks, B.F & Singh, N. (2002). Effects of age on brain volume and head circumference in autism. *Neurology*, 59, 175-187.

Bailey, A., Le Couteur A., Gottesman, I., Botton, P., Simmonoff, E. (1995). Autism as a strongly genetic disorder: evidence from a British twin study. *Psychological Medicine*, 25, 63-77.

Bailey, A., Phillip, W., & Rutter, M. (1996). Autism: Towards an integration of clinical, genetic, neuropsychological, and neurobiological perspectives. *Journal of Child Psychology and Psychiatry*, 37, 89-126.

Baranak, G.T. (1999). Autism during infancy: a retrospective video analysis of sensory, motor and social behaviours at 9-12 months of age. *Journal of Autism and Developmental Disorders*, 29, 213-24.

Barnhill, G., Hagiwara, T., Myles, B. S., & Simpson, R. L. (2000). Asperger syndrome: A study of the cognitive profiles of 37 children and adolescents. *Focus on Autism and Other Developmental Disabilities*, 15, 146-153.

Baron-Cohen, S. & Belmonte, K.M. (2005). Autism: a window onto the development of the social and the analytic brain. *Annual Review of Neuroscience*, 28, 109-126.

Baron-Cohen, S. (2004). Autism: research into causes and intervention. *Pediatric Rehabilitation*, 7, 33-78.

Baron-Cohen, S., & Hammer, J. (1997). Parents of children with Asperger syndrome: What is the cognitive phenotype? *Journal Cognitive Neuroscience*, 9, 548-54.

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

Barry, L. M., & Burlew, S.B. (2004). Using social stories to teach choice and play skills to children with autism. *Focus on Autism and Other Developmental Disabilities*, 19, 45-51.

Bartak, L., Rutter, M., & Cox, A. (1975). A comparative study of infantile autism and specific developmental receptive language disorder: I. The children. *British journal of Psychiatry*, 126, 127-145.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L., & Volterra, V. (1979). *The Emergence of Symbols: Cognition and Communication in Infancy*. New York: Academic.

Bauminger, N. (2002). The Facilitation of Social-Emotional Understanding and Social Interaction in High-Functioning Children with Autism: Intervention Outcomes. *Journal of Autism and Developmental Disorders*, 32, 283-298.

Bauminger, N., & Kasari, C. (2000). Loneliness and friendship in high-functioning children with autism. *Child Development*, 71, 447-456.

Bauminger, N., Shulman, C., & Agam, G. (2003). Peer Interaction and Loneliness in High-Functioning Children with Autism. *Journal of Autism and Developmental Disorders*, 33, 489-507.

Baxendale, J., Frankham, J., & Hesketh, A. (2001). The Hanen Parent Programme: a parent's perspective. *International Journal of Language and Communication Disorders Special Issue*, 36, 511-516.

Beadle-Brown, J. (2004). Elicited Imitation in Children and Adults with Autism: the Effect of Different Types of Actions. *Journal of Applied Research in Intellectual Disabilities*, 17, 37-48.

Ben-Itzchak, E., & Zachor, D. A. (2007). The effects of intellectual functioning and autism severity on outcome of early behavioral intervention for children with autism. *Research in Developmental Disabilities*, 28, 287-303.

Bennetto, L., Pennington, B. F., & Rogers, S. J. (1996). Intact and impaired memory functions in autism. *Child development*, 67, 1810-1835.

Berger, H. J. C., Aerts, F. H. T. M., Van Spaendonk, K. P. M., Cools, A. R., & Teunisse, J. P. (2003). Central coherence and cognitive shifting in relation to social improvement in high-functioning young adults with autism. *Journal of Clinical and Experimental Neuropsychology*. 25, 502-511.

Berger, M. (2006). A model of preverbal social dysfunctions in autism. *Journal of Child Psychology and Psychiatry*, 47, 338-371.

Bergman, J.D. & Gertz, J. (1997). Behavioural Interventions. In D.J. Cohen & F.R. Volkmar, *Handbook of Autism and Pervasive Developmental Disorders*. New York: Wiley.

Bernabi, P., & Camaioni, L. (2001). Developmental profile and regression, *Autism*, 5, 287-297.

Bernard-Opitz, V. & Ing, S. (2004). Comparison of Behavioural and Natural Play Interventions for Young Children with Autism. *Autism*, 8, 319-333.

Bernard-Opitz, V., Sriram, N., & Nakhoda-Sapuan, S. (2001). Enhancing social problem solving in children with autism and normal children through computer-assisted instruction. *Journal of Autism and Developmental Disorders*, 31, 377-384.

Bettelham, B. (1967). *The empty fortress: Infantile autism and the birth of the self*. New York: Free Press.

Beverdorrf, D. Q., Smith, B. W., Crucian, G. P., Anderson, J. M., Keillor, J. M., Barrett, A. M., et al. (2000). Increased discrimination of "false memories" in autism spectrum disorders. *Proceedings of the National Academy of Sciences of the United States of America*, 97, 8734-8737.

Bibby, P., Eikeseth, S., Martin, N. T., Mudford, O. C, & Reevs, D. (2002). Progress and outcomes for children with autism receiving parent-managed intensive interventions. *Research in Developmental Disabilities*, 23, 81-104.

Bildt, A., Serra, E., Luteijn, E., Kraijer, D., Sytema, S., Minderaa, R. (2005). Social skills in children with intellectual disabilities with and without autism. *Journal of Intellectual Disability Research*, 49, 317-328.

Bondy, A. & Frost, L. (2001). The picture exchange communication system. *Behavioural Modification*, 25, 725- 744.

Bondy, A., & Frost, L. (1998). The picture exchange communication system. *Seminars in Speech and Language*, 19, 373-389.

Bono, M. A., Daley, T., & Sigman, M. (2004). Relations Among Joint Attention, Amount of Intervention and Language Gain in Autism.

Journal of Autism and Developmental Disorders, 34, 495-505.

Boucher, J., & Warrington, E.K. (1976). Memory deficits in early infantile autism: Some similarities to the amnesic syndrome. *British Journal of Psychiatry*, 67, 73-87.

Bowler, D. M., Gardiner, J. M., & Grice, S. J. (2000). Episodic memory and remembering in adult with Aspergers syndrome. *Journal of Autism and Developmental Disorders*, 30, 295-304.

Bowler, D. M., Mathews, N. J., & Gardiner, J. M. (1997). Asperger's syndrome and memory: Similarity to autism but not amnesia. *Neuropsychologia*, 35, 65-70.

Bowler, D.M. (1992). "Theory of mind" in Asperger's syndrome. *Journal of Child Psychology and Psychiatry*, 33, 877-93.

Boyd, B. A., Conroy, M. A., Mancil, G. R., Nakao, T., & Alter, P. J. (2006). Effects of Circumscribed Interests on the Social Behaviors of Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 2, 437-448.

Brian, J. A., Tipper, S. P., Weaver, B., & Bryson, S. E. (2003). Inhibitory mechanism in autism spectrum disorders: typical selective inhibition of location versus facilitated perceptual processing. *Journal of child Psychology and Psychiatry*, 44, 552-560.

Bruner, J.S. (1983). *Child's Talk: Learning to Use Language*. New York: Norton

Burack, J. A. (1994). Selective attention deficits in persons with autism: Preliminary evidence of an inefficient attentional lens. *Journal of abnormal Psychology*, 103, 535-543.

Burack, J.A., Enns, J.T., Stauder, E.A., Mottron, L. & Randolp, B. (1997). Attention and autism: behavioural and electrophysiological evidence. In D.J. Cohen & F.R. Volkmar. *Handbook of Autism and Pervasive Developmental disorders*. New York :John Wiley and sons, Inc.

Caesy, B. J., Gordon, C. T., Mannheim, G. B., & Rumsey, J. M. (1993). Dysfunctional attention in autistic savants. *Journal of Clinical and Experimental Neuropsychology*, 15, 933-946.

Capps, L., Sigman, M., & Mundy, P. (1994). Attachment security in children with autism. *Developmental Psychopathology*, 6, 249-61.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monograph of Social Research and Child Development*, 63, 1-143.

Castelli, F., Frith, C., Happe, F., & Frith, U. (2002). Autism, Asperger syndrome and brain mechanisms for the attribution of mental states to animated shapes. *Brain*, 125, 1839-49.

Chan, A. S., Cheung, J., Leung, W. W. M., Cheung, R. & Cheung, M. (2004). Verbal expression and comprehension deficits in young children with autism. *Focus on Autism and Other Developmental Disabilities*, 20, 117-125.

Charlop, M.H., & Carlson, J. (1983). Reversal and nonreversal shifts in autistic children. *Journal of experimental Child Psychology*, 36, 56-57.

Charlop-Christy, M. H. & Carpenter, M. H. (2005). Modified incidental teaching sessions: a procedure for parents to increase spontaneous speech in their children with autism. *Journal of Positive Behavior Interventions*, 2, 98-112.

Charlop-Christy, M. H., & Daneshvar, S. (2003). Using video modeling to

teach perspective taking to children with autism. *Journal of Positive Behaviour Interventions*, 5, 12-21.

Charlop-Christy, M. H., Carpenter, M., LeBlanc, L., & Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communication behaviour, and problem behaviour. *Journal of Applied Behavioural Analysis*, 35, 213-231.

Charman, T. Baron-Cohen, S. (1997). Brief report: prompted pretended play in autism. *Journal of Autism and Developmental Disorders*. 27, 325-32.

Charman, T., Baron-Cohen, S., Swettenham, J., Baired, G., Drew, A., & Cox, A. (2003). Predicting language outcome in infants with autism and pervasive developmental disorder. *International Journal Language Communication Disorders*, 38, 265-285.

Charman, T., Drew, A., Baird, C., & Baird, G. (2003). Measuring early language development in preschool children with autism spectrum disorder using the MacArthur Communicative Development Inventory (Infant From). *Journal of Child Language*, 30, 213-236.

Charman, T., Swettenham, J., Baron-Cohen, S., Cox, A., Baird, G., & Drew, A. (2006). Infants with autism: an investigation of empathy, pretend play, joint attention and imitation. *Developmental Psychology*, 33, 78-789.

Chawarska, K, klin, A., & Volkmar, F. (2003). Automatic cueing through eye movement in 2-year-old children with autism. *Child Development*, 74(4), 1108-1122.

Chess, S. (1971). Autism in children with congenital rubella. *Journal of Autism and Child Schizophrenia*, 1, 33-47.

Chin, H. H., & Bernard-Opitz, V. (2000). Teaching conversational skills to children with autism: Effects on the development of a theory of mind. *Journal of Autism and developmental Disorders*, 30,569-583.

Chuba, H., Paul, R., Miles, S., Klin, A., & Volkmar, F. (2003). *Assessing pragmatic skills in individuals with autism spectrum disorders*. Presentation at the National Convention of the American Speech-Language-Hearing Association, Chicago.

Chung, K. M., Reavis, S., Mosconi, M., Drewry, J., Matthews, T., & Tassé**c**, J. M. (2007). Peer-mediated social skills training program for young children with high-functioning autism. ***Research in Developmental Disabilities***, 28, 423-436.

Churchill, D. W. (1972). The relation of infantile autism and early childhood schizophrenia to developmental language disorders of childhood. *Journal of Autism and Childhood Schizophrenia*, 2, 182-197.

Ciaranello, A. L., & Ciaranello, R.D. (1995). *Annual Reviews of Neuroscience*, 18, 101-28.

Clements, C.J. (2004). The evidence for the safety of thiomerosal in newborn and infant vaccines. *Vaccine*, 22, 1854–61.

Courchesene, E., Townsend, J., Akshoomoff, N. A., Saitosh, O., Yeung-Courchesne, R., Murukami, A., et al. (1994). Impairment in shifting attention in autistic and cerebellar patients. *Behavioural Neuroscience*, 108, 848-865.

Courchesne, E., Carper, R., & Akshoomoff, N. (2003). Evidence of brain overgrowth in the first year of life in autism. *Journal of the American Medical Association*, 290, 337- 344.

Cox, A., Klein, K, Charman, T., Baird, G., Baron-Cohen, S., et al. (1999). Autism spectrum disorders at 20 and 42 months of age: stability of clinical and ADI-R diagnosis. *Journal of Child Psychology and psychiatry*, 40, 719-32.

Crane, L., & Goddard, L. (2007). Episodic and Semantic Autobiographical Memory in Adults with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 37, 345-357.

Crockett, J. L., Fleming, R. L., Doepke., K. J. & Stevens, J. S. (2007). Parent training: Acquisition and generalization of discrete trials teaching skills with parents of children with autism. *Research in Autism Spectrum Disorders*, 1, 101-115.

Crozier, S. & Tincani, M. J. (2004).Using a modified social story to decrease disruptive behaviour of a child with autism. *Focus on Autism and Other Developmental Disabilities*, 20, 150-157.

Dawson, G., & Lewy, A. (1989). Reciprocal subcortical-cortical influences in autism: the role of attentional mechanisms. In G. Dawson (Eds), *Autism: Nature, Diagnosis, and Treatment*. New York: Guilford.

Dawson, G., Meltzoff, A. N., Osterling, J., & Rinaldi, J. (1998). Neuropsychological correlates of early symptoms of autism. *Child Development*, 69, 1276-85.

Dawson, G., Munson, J., Estes, A., Osterling, J., & Mc-Partland, J, et al. (2002). Neurocognitive function and joint attention ability in young

children with autism spectrum disorder versus developmental delay. *Child Development,* 73, 345–58.

Dawson, G., Webb, S.J., Caruer, L., Panagiotides, H., & Mc Partland, J. (2000). Young children with autism show atypical brain responses to fearful versus neutral facial expressions of emotion. *Developmental Science*, 7, 340-359.

Delprato, D. (2001). Comparison of discrete trial and normalized behavioural language intervention for young children with autism. *Journal of Autism and Developmental Disorders*, 31, 315-325.

Dennis, M., Lockyer, A.L., & Lockyer, L. (2001). Inferential Language in High-Function Children with Autism. *Journal of Autism and Developmental Disorders,* 31, 47-54.

Diehl, J. J., Bennetto, L., & Young, E. C. (2006). Story Recall and Narrative Coherence of High-Functioning Children with Autism Spectrum Disorders. *Journal of Abnormal Child Psychology*, 22, 167-178.

DiSalvo, C. A., & Oswald, D. P., (2002). Peer-mediated interventions to increase the social interaction of children with autism. *Focus on Autism and Other Developmental Disabilities*, 17, 198-207.

Dissanayake, C., & Crosseley, S.A. (1997). Autistic childrens' separation and reunion with their mothers. *Journal of autism and developmental disorders*, 27, 295-312.

Downs, A., & Smith, T. (2004). Emotional Understanding, Cooperation, and Social Behavior in High-Functioning Children with Autism. *Journal of Autism and Developmental Disorders*, 34, 625-635.

Drew, A., Baird, G., Baron-Cohen, S., Cox, A., Slonims, V., Wheelwright, S., Swettenham, J., Berry, B., Charman, T. (2002). A pilot randomized control trial of a parent training intervention for pre-school children with autism. *European Child and Adolescent Psychiatry*, 11, 266-272.

Dunn, W., Myles , B. S., & Orr, S. (2002). Sensory processing issues associated with Aspergers syndrome: A preliminary investigation. *American Journal of Occupational Therapy*, 56, 97-102.

Eigsti, I., Bennetto, L., & Dadlani, M. (2006). Beyond Pragmatics: Morphosyntactic Development in Autism. *Journal of Autism and Developmental Disorders*, 21, 12-23.

Eikeseth, S., Smith, T., & Smith, E. (2002). Intensive Behavioral Treatment at School for 4-to 7-Year-Old Children with Autism A 1-Year Comparison Controlled Study. *Behavior Modification*, 26, 49-68.

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for Children with Autism who Began Intensive Behavioral Treatment Between Ages 4 and 7. *Behavior Modification*, 31, 264-278.

Elgar, K., & Cambell, R. (2001). The cognitive neuroscience of face recognition: implication for developmental disorders. *Journal of Child Psychology and Psychiatry*, 42, 705-717.

Fein, D., Tinder, P., & Waterhouse, L. (1979). Stimulus generalization in autistic and normal children. *Journal of Child Psychology and Psychiatry*, 20, 325-355.

Field, T., Field, T., Sanders, C., & Nadel, J. (2001). Children with Autism Display more Social Behaviors after Repeated Imitation Sessions. *Autism*, 5, 317-323.

Folstein, S.E. (1999). Autism. *International Review of Psychiatry*, 11, 269-277.

Francis, K. (2005). Autism interventions: a critical update. *Developmental Medicine & Child Neurology*, 47, 493-499.

Frea, W.D., & Hepburn, S. L. (1999). Teaching parents of children with autism to perform functional assessments to plan interventions for disruptive behaviours. *Journal of Positive Behaviour Interventions*, 1, 112-116.

Freitag, C. F., Kleser, C., & Gontardf, A. V. (2006). Imitation and language abilities in adolescents with Autism Spectrum Disorder without language delay. *European Child & Adolescent Psychiatry*, 20, 124-130.

Frith, U. (1972). Cognitive mechanisms in autism: Experiments with colour and tone sequence production. *Journal of Autism and Childhood Schizophrenia*, 2, 160-173.

Frith, U. (2003). *Autism: Understanding the Enigma*. Oxford, UK: Blackwell Science.

Gaffrey, M. S., Kleinhans, N. M., Haist, F., Akshoomoff, N., Campbell, A., Courchesne, E., & Müller, R., (2007). A typical participation of visual cortex during word processing in autism: An fMRI study of semantic decision. ***Neuropsychologia***, 45, 1672-1684.

Gardiner, J. M., Bowler, D.M., & Grice, S.J. (2003). Further evidence for preserved priming and impaired recall in adults with Asperger

syndrome. *Journal of Autism and Developmental Disorders*, 33, 259-269.

Garfinkle, A. N., & Schwartz, I. S. (2002). Peer-mediation: Increasing social interactions in children with autism and other developmental disabilities in inclusive preschool classrooms. *Topics in Early Childhood Special Education*, 22, 26-38.

Gervais, H., Belin, P., Boddaert, N., Leboyer, M., Coez, A, et al. (2004). Abnormal cortical voice processing in autism. *Nature neuroscience*, 7, 801-812.

Geurts, H. M., Verte, S., Oosterlaan, J., Roeyers, H., & Sergeant, J.A. (2004). How specific are executive functioning deficits in attention deficit hyperactivity disorder and autism? *Journal of child Psychology and Psychiatry*, 45, 836-854.

Ghaziuddin, M., & Mountain-Kimchi, K. (2004). Defining the intellectual profile of Asperger syndrome: Comparison with high-functioning autism. *Journal of Autism and Developmental Disorders*, 34, 279-284.

Gillberg, C., & M. Coleman. (2000). *The Biology of Autistic Syndromes* (3rd ed.). London: Mac Keith Press.

Gillberg, C., Steffenburg, S., & Schaumann, H. (1991). Is autism more common now than ten years ago? *British Journal of Psychiatry,* 158, 403-419.

Gillett, J. N., & LeBlanc, L. A. (2007). Parent-implemented natural language paradigm to increase language and play in children with autism. ***Research in Autism Spectrum Disorders***, 1, 247-255.

Gilliam, J.E. (1995). *Gilliam autism Rating Scale*. Austin. TX: Pro-Ed.

Gioia, G. A., Isquith, P. K., Kenworthy, L., & Barton, R. M. (2002). Profiles of everyday executive function in acquired and developmental disorders. *Child Neuropsychology*, 8, 121-137.

Girolametto, L., Sussman, F., & Weitzman, E. (2006). Using case study methods to investigate the effects of interactive intervention for children with autism spectrum disorders. *Journal of Communication Disorders*, 5, 135-142.

Goldberg, W., Osann, K., Filipek, P., Laulhere, T., Jarvis, K., Modahl, C., et al. (2003). Language and other regression: assessment and timing. *Journal of Autism and Developmental Disorders*, 33, 607-616.

Goldstein, G., Jonson, C. R., & Minshew, N. J. (2001). Attentional processes in autism. *Journal of Autism and Developmental Disorders*, 31, 433-440.

Goldstein, H. (2002). Communication intervention for children with autism: A review of treatment efficacy. *Journal of Autism and Developmental Disorders*, 32, 373-396.

Goodlin-Jones, B. L., & Anders, T. F. (2004). A Social adjustment enhancement intervention for high functioning autism, Asperger s syndrome, and pervasive developmental disorder-NOS. *Journal of Autism and Developmental Disorders*, 34, 649-668.

Gravetter, F. J., and Forenzo, L. B. (2003). *Research Methods for the Behavioural science*. UK: Thomson-Wadsworth.

Green, G., Brennan, L. C., & Fein, D. (2002). Intensive Behavioral Treatment for a Toddler at High Risk for Autism. *Behavior Modification*, 26, 69-102.

Griffith, E.M, Pennington, B.F., Wehner, E.A., & Rogers, S.J. (1999). Executive functions in young children with autism. *Child Development*, 70, 817-32.

Hale, C. M., & Tager-Flusberg, H. (2005). The relationship between theory of mind and discourse development. *Autism*, 9, 157-178.

Ham, H. S., Corley, M., Rajendran, G., Carletta, J., & Swanson, S. (2007). Imitation of Meaningless Gestures in Individuals with Asperger Syndrome and High-functioning Autism. *Journal of Autism and Developmental Disorders*, 2, 432-442.

Hamilton, A. F. C., Brindley, R. C., & Frith, U. (2007). Imitation and action understanding in autistic spectrum disorders: How valid is the hypothesis of a deficit in the mirror neuron system?. *Neuropsychologia*, 45, 1859-1868.

Happe, F., Ehlers, S., Fletcher, P., Frith, U., & Johansson, M., et al. (1996). "Theory of mind" in the brain. Evidence from a PET scan study of Asperger syndrome. *Neuroreport*, 8, 197-201

Happe, F.G.E. (1994). An advanced test of theory of mind: understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal Autism and Developmental Disorders*, 24, 129-54.

Heaton, P., Ludlow, A., & Roberson, D. (2007). When less is more: Poor discrimination but good colour memory in autism. *Research in Autism Spectrum Disorders*, In press.

Hermelin, B. (2001). *Bright Splinters of the Mind. A Personal Story of Research with Autistic Savants*. London: Jessica Kingsley.

Hermelin, B., & O'Connor, N. (1970). *Psychological experiments with autistic children*. New York: Pergamon Press.

Hilton, C., Graver, K., & LaVesser. (2007). Relationship between social competence and sensory processing in children with high functioning autism spectrum disorders. *Research in Autism Spectrum Disorders*, 1, 164-173.

Hobson, R. P., & Lee, A. (1999). Imitation and Identification in Autism. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*. 40, 649-659.

Holmes, E., & Willoughby, T. (2005). Play behaviour of children with autism spectrum disorders. ***Journal of Intellectual & Developmental Disability***, 30, 156-164.

Horner, R. H., Carr, E. G., Strain, P. S., Todd, A. W., & Reed, H. K. (2002). Problem behaviour interventions for young children with autism: A research synthesis. *Journal of Autism and Developmental Disorders*, 32, 423-446.

Hornig, M., & Lipkin, W. (2001). Infectious and immune factors in the pathogenesis of neurodevelopmental disorders: epidemiology, hypotheses, and animal models. *Mental Retardation and Developmental Disabilities Research Review*, 7, 200-10.

Howlin, P. & Goode, S., Hutton, J., & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*, 45, 212-229.

Howlin, P. (1997). Prognosis in autism: do Specialist treatments affect long-term outcome? *European Child and Adolescent Psychiatry*, 6, 55-72.

Howlin, P. (2003). Outcome in high functioning adults with autism with and without early language delays: implication for the differentiation between autism and Aspergers. *Journal of Autism and Developmental Disorders*, 33, 3-13.

Howlin, P. (2006). Autism spectrum disorders. *Psychiatry*, 5-9.

Hughes, C., Plumet, M.H., Leboyer, M. (1999). Towards a cognitive phenotype of executive dysfunction and superior spatial span among siblings of children with autism. *Journal of Child Psychology and Psychiatry*, 40, 705-18.

Hwang, B., & Hughes, C. (2000). The Effects of Social Interactive Training on Early Social Communicative Skills of Children with Autism. *Journal of Autism and Developmental Disorders*, 30, 331-343.

Iarocci, G., Burack, J.A., Shore, D. I., Mottron, L., & Enns, J. T. (2005). Global-local visual processing in high functioning children with autism: structural vs. implicit task biases. *Journal of Autism and Developmental Disorders*, 35, 154-168.

Ingersoll, B. (2003). Teaching children with autism to imitate using a naturalistic treatment approach: Effects on imitation, language, play, and social behaviours. *Dissertation Abstracts International*, 63, 61120B.

Ingersoll, B., & Gergans, S. (2007). The effect of a parent-implemented imitation intervention on spontaneous imitation skills in young

children with autism. ***Research in Developmental Disabilities***, 28, 163-175.

Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: effects on language, pretend play, and joint attention. *Journal of Autism and Developmental Disorders*, 36, 221-228.

Ingersoll, B., Lewis, E., & Kroman, E. (2006). Teaching the imitation and spontaneous use of descriptive gestures in young children with autism using a naturalistic behavioral intervention. *Journal of Autism and Developmental Disorders*, 36, 143-149.

Jackson, C.T., Fein, D., Wolf, J., Jones, G., Huck, M., Waterhouse, L., et al (2003). Responses and sustained interactions in children with mental retardation and autism. *Journal of Autism and Developmental Disorders*, 33, 115-121.

Jahr, E., Eldevik, S., & Eikeseth, S. (2000). Teaching children with autism to initiate and sustain cooperative play. *Research in Developmental Disabilities*, 14, 4-16.

Jarrold, C. (2003). A review of research into pretend play in autism. *Autism*, 7, 379-390.

Jarrold, C., Boucher, J., & Russell, J. (1997). Language profiles in children with autism: Theoretical and methodological implications. *Autism: Journal of Research and Practice*, 1, 57-76.

Jarrold, C., Butler, D.W, Cottington, E.M., & Jimenez, F. (2000). Linking theory of mind and central coherence bias in autism and in the general population. *Developmental Psychology*, 36, 126-38.

Jorde, L., Hasstedt, S., Ritvo, E., Mason-Brothers, A., Freeman, B. (1991). Complex segregation analysis of autism. *American journal of Human Genetics*, 49, 932-38.

Joseph, M.R. (1999). Neuropsychological frameworks for understanding autism. *International reviews of Psychiatry*, 11, 309-325.

Joseph, R. M., McGrath, L. M., & Tager-Flusberg, H. (2006). Executive dysfunction and its relation to language ability in verbal school-age children with autism. *Developmental Neuropsychology*, 27, 361 - 378.

Joseph, R. M., Steele, S. D., Meyer, E., & Tager-Flusberg, H. (2005). Self-ordered pointing in children with autism: failure to use verbal mediation in the service of working memory? *Neuropsychologia*, 43, 1400-1411.

Just, M., Cherkassy, Keller, T., & Minshew, N. (2004). Cortical activation and synchronization during sentence comprehension in high-functioning autism: Evidence of underconnectivity. *Brain*, 10, 1093-2003.

Just, M.A., Cherkassky, V.L., Keller, T.A., Minshew, N.J. (2004). Cortical activation and synchronization during sentence comprehension in high-functioning autism: evidence of underconnectivity. *Brain*, 127, 1811–21.

Kalyva, E., & Avramidis, E. (2005). Improving communication between children with autism and their peers through the 'Circle of Friends': a small-scale intervention study. *Journal of Applied Research in Intellectual Disabilities*, 18, 253-261.

Kamio, Y., & Toichi, M. (2006). Memory illusion in high-functioning autism and Asperger's disorder. *Journal of Autism and Developmental Disorders*, 36, 112-132.

Kamio, Y., Kamio, D., Kelley, E., & Swainson, B. (2006). Atypical lexical/semantic processing in high-functioning autism spectrum disorders without early language delay. *Journal of Autism and Developmental Disorders*, 20, 156-165.

Kamps, D. M., Kemmerer, K., & Potucek, J. (2002). Increasing communication skills for an elementary-aged student with autism using the picture exchange communication system. *Journal of Autism and Developmental Disorders*, 32, 225-230.

Kana, R. K., Keller, T. A., Cherkassky, V. L., Minshew, N. J., & Just, M. A. (2006). Sentence comprehension in autism: thinking in pictures with decreased functional connectivity. *Brain*, 129, 2484-2493.

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

Kanwisher, N., McDermott, J., & Chun, M.M. (1997). The fusiform face area: a module in human extrastriate cortex specialized for face perception. *Journal Neurosciences,* 17, 4302-11.

Kasari, C., & Rotheram-Fuller, E. (2006). Involvement or isolation? The social networks of children with autism in regular class rooms. *Journal of Autism and Developmental Disorders*, 2, 260-272.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: a randomized controlled intervention study. *Journal of Child Psychology and Psychiatry*, 47, 611-620.

Keen, D., Rodger, S., Kim, D., & Braithwaite, M. (2007). A pilot study of the effects of a social-pragmatic intervention on the communication and symbolic play of children with autism. *Autism*, 11, 63-71.

Keogel, R. L. Bimbela, A. & Scheribman, L. (1996). Collateral effect of parent training on family interactions. *Journal of Autism and Developmental Disorders*, 26, 347-359.

Kientz, M. A., & Dunn, W. (1997). A comparison of the performance of children with and without autism on the sensory profile. *American Journal of Occupational Therapy*, 51, 530-537.

Kjegaard, M., & Tager-Flusberg, H. (2001). An investigation of language impairment in autism: Implication for genetic subgroups. *Language and Cognitive Processes*, 16, 287-308.

Kjelgaard, M. M. & Tager-Flusberg, H. (2004). An investigation of language impairment in autism: implications for genetic subgroups. *Language and Cognitive Processes*, 16, 287-308.

Klin, A. (2000). Attributing social meaning to ambiguous visual stimuli in higher functioning autism and Aspergers syndrome: The Social Attribution Task. *Journal of child Psychology and Psychiatry and allied Disciplines*, 33, 763-769.

Klin, A., & Cohen, D. (Eds.), *Handbook of Autism and Pervasive Developmental Disorders*. New Jersey: John Wiley & Sons, Inc.

Klin, A., (1991). Young autistic children's listening preferences in regard to speech: A possible characterization of the symptom of social withdrawal. *Journal of Autism and Developmental Disorders*, 21, 29-42.

Klin, A., Jones, W., Schilts, R. T., & Volkmar, F. R. (2003). The enactive mind: From actions to cognition: lessons from autism. *Philosophical transactions of the Royal Society, Biological Science*, 358, 345-360.

Klin, A., Jones, W., Shultz, R., Volkmar, F., & Cohen, D. (2002). Visual fixation patterns during viewing of naturalistic social situations as predictors of social competence in individuals with autism. *Archives of General Psychiatry*, 59, 809-16.

Klin, A., Saulnier, C. A., Sparrow, S. S., Cicchetti, D. V., Volkmar, F. R., & Lord, C. (2006). Social and communication abilities and disabilities in higher functioning individuals with Autism spectrum disorders: The Vineland and the ADOS. *Journal of Autism and Developmental Disorders*, 4, 56-73.

Klin, A., Volkmar, F. R., Sparrow, S. S., Cicchetti, D. V., Rourke, B.P., (1995). Validity and neuropsychological characterization of Asperger syndrome: convergence with nonverbal learning disabilities syndrome. *Journal of Child Psychology and psychiatry*, 36, 1127-40.

Koegel, L. K., (2000). Interventions to facilitate communication in autism. *Journal of Autism and Developmental Disorders*, 30, 383-391.

Koegel, R. L., Koegel, L.k., & McNerney, E. K. (2001). Pivotal areas in intervention for autism. *Journal of Clinical child Psychology*, 30, 19-32.

Koegel, R.L., Koegel, L.K., (1995). *Teaching Children with Autism: Strategies for Initiating Positive Interactions and Improving Learning Opportunities*. Baltimore, MD: Brookes.

Koning, C., and Magill-Evans, J. (2001). Social and language skills in adolescent boys with Asperger's syndrome. *Autism*, 5, 23-36.

Koshino, H., Carpenter, P.A., Minshew, N.J., Cherkassky, V.L., Keller, T.A., & Just, M.A. (2005). Functional connectivity in an fMRI working memory task in high-functioning autism. *Neuroimage*, 24, 810-21.

Krantz, P. J., & McClannahan, L. E. (1998). Social interaction skills for children with autism: A script- fading procedure for beginning reader. *Journal of Applied Behavioural Analysis*, 31, 191-202.

Kravits, T., Kamps, D., Kemmerer, K., & Potuuck, J. (2000). Brief report: Increasing communication skills for an elementary-aged student with autism using the Picture Exchange Communication System. *Journal of Autism and Developmental Disorders*, 32, 225-230.

Kroeger, K. A., Schultz, J. R., & Newsom, C. (2006). A Comparison of Two Group-Delivered Social Skills Programs for Young Children with Autism. *Journal of Autism and Developmental Disorders*, 3, 125-134.

Kroeger, K. A., & Nelson, W. M. (2006). A language programme to increase the verbal production of a child dually diagnosed with Down syndrome and autism. *Journal of Intellectual Disability Research*, 50, 101-108.

Kuoch, H. & Mirenda, P. (2004). Social story interventions for young children with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 18, 219-227.

Kurita, H. (1985). Infantile autism with speech loss before the age of thirty months. *Journal of the American Academy of Child Psychiatry*, 24, 191-196.

Kuschner, E. S., Bennetto, L., & Yost, K. (2006). Patterns of Nonverbal Cognitive Functioning in Young Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 36,148-157

Lanter, E., McComish, C., Watson, L. R., Crais, E. R., & Baranek, G.T. (2006). Analysis of Social Interaction Gestures in Infants with Autism. ***Child Neuropsychology***, 12, 307-319.

Larsson, H.J., Eaton, W.W., Madsen, K.M., Vestergaard, M., & Olesen, A.V., et al. (2005). Risk factors for autism: perinatal factors, parental psychiatric history, and socioeconomic status. *American Journal Epidemiology,* 161, 916-25.

Laurent, A. C., & Rubin, E. (2004). Challenges in emotional regulation in Aspergers syndrome and high-functioning autism. *Topics in Language Disorders*, 24, 286-297.

Lewis, F. M., Woodyatt, G. C., & Murdoch, B. E. (2007). Linguistic and pragmatic language skills in adults with autism spectrum disorder: A pilot study. *Research in Autism Spectrum Disorders,* In Press.

Lewis, F.M., Murdoch, B. E., & Woodyatt, G. C. (2007). Communicative competence and metalinguistic ability: performance by children and adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 36, 68-75.

Light, J., Roberts, B., DiMarco, R., & Greiner, N. (1998). Augmentative and alternative communication to support receptive and expressive communication for people with autism. *Journal of Communication disorders*, 31, 153-180.

Lord, C. (1995). Follow-up of two year-olds referred for possible autism. *Journal of Child Psychology and Psychiatry*, 36(8), 1365-1382.

Lord, C., & Rutter, M. (1994). Autism and pervasive developmental disoders. In M. Rutter, E. Taylor, & L. Hersov (Eds.), *Child and adolescent psychiatry*. Oxford: Blackwell Scientific.

Lord, C., Pickles, A., DiLavore, P. C., & Shulman, C. (1996). *Longitudinal studies of young children referred for possible autism*. Paper presented at the biannual meetings of the International Society for Research in Child and Adolescent Psychopathology, Barcelona, Spain.

Lord, C., Shulman, C., & DiLavore, P. (2004). Regression and word loss in autistic spectrum disorders. *Journal of Child Psychology and Psychiatry*, 45, 936-955.

Lorimer, P. A., Simpson, R. L., Myles, B. S., & Ganz, J. B. (2002). The use of social stories as a preventive behavioural intervention in a home setting with a child with autism. *Journal of Positive Behaviour Interventions*, 4, 53-60.

Lovaas, O. I. (1987). Behavioural treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and clinical Psychology*, 55, 3-9.

Loveland, K. A., Tunali-Kotoski, B., Pearson, D. A., & Brelsford K. A. et al. (1994). Imitation and expression of facial affect in autism. *Development psychopathology*, 6, 433-44.

Loveland, K., Tunali-Kotoski, B. (1997). The school-age child with autism. In D. Cohen & F. Volkmar (Eds.), *Handbook of autism and Pervasive developmental disorders* (pp, 283-308).

Loveland, K.A., & Landry, S.H., (1986). Joint attention and language in autism and developmental language delay. *Journal of Autism and Developmental Disorders,* 16, 335-49.

Luiselli, J. K., Cannon, B. O., Ellis, J. T., & Sisson, R. W. (2000). Home-based behavioral intervention for young children with autism/pervasive developmental disorder. *Autism*, 4, 426-438.

Luna, B., Minshew, N. J., Garver, K. E., Lazar, N.A., & Thulborn, K.R, et al. (2002). Neocortical system abnormalities in autism: an fMRI study of spatial working memory. *Neurology*, *59*, 834-40.

Luyster, R., Richler, J., Hsu, W.L., Dawson, G., Bernier, R., Dunn, M., et al. (2005). Early regression in social communication in autistic spectrum disorders. *Developmental Neuropsychology*, 20, 143-144.

MacDuff, J. L., Ledo, R., McClannahan, L. E., & Krantz (2007). Using scripts and script-fading procedures to promote bids for joint attention by young children with autism. *Research in Developmental Disabilities*, 28, 23-36.

Macintosh, K., & Dissanayake, C. (2006). A comparative study of the spontaneous social interactions of children with high-functioning

autism and children with Asperger's disorder. *Autism*, 2, 199-220.

Macintosh, K., & Dissanayake, C. (2006). Social skills and problem behaviours in school aged children with high-functioning autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*, 2, 528-535.

Madsen, K.M., Hviid, A., Vestergaard, M., Schendel, D., & Wohlfahrt, J., et al. (2002). A population based study of measles, mumps, and rubella vaccination and autism. *Journal of Medicine.* 347, 1477-82.

Maestro, S., Muratori, F., Cavallaro, M. C., Pei, F., Stern, D. et al. (2002). Attentional skills during the first 6 months of age in autism spectrum disorder. *Journal of American Academy Child and Adolescent Psychology*, 41, 1239-45.

Magiati, L., & Howlin, P. (2001). Monitoring the progress of preschool children with autism enrolled in early intervention programmes problems in cognitive assessment. *Autism*, 5, 399-406.

Mahoney, G., & Perales, F. (2006). Using relationship-focused intervention to enhance the social-emotional functioning of young children with autism spectrum disorders. *Topics in Early Childhood Special Education*, 23, 77-89.

Majiviona, J., & Prior, M. (1999). Neuropsychological profiles of children with Asperger syndrome and autism. *Autism*, 3, 327-356.

Maltz, A. (1981). Comparison of cognitive deficits among autistic and retarded children on the Arthur Adaptation of the Leiter International Performance Scales. *Journal of Autism and Developmental Disorders*, 11, 413-426.

Mann, A. T., & Walker, P. (2003). Autism and a deficit in broadening the spread of visual attention. *Journal of child Psychology and Psychiatry*, 44, 274-284.

Martin, C. A., Drasgow, E., Halle, J. W., & Brucker, J. M. (2005). Teaching a child with autism and severe language delays to reject: direct and indirect effects of functional communication training. ***Educational Psychology***, **25**, 287-304.

Matson, J., Sevin, J., Box, M., Francis, K., & Sevin, B. (1993). An evaluation of two methods for increasing self-initiated verbalization in autistic children. *Journal of Applied Behaviour Analysis*, 26, 389-398.

Mayes, L., Volkmar, F., Hooks, M., & Cicchetti, D. (1993). Differentiating Pervasive Developmental Disorders-Not Otherwise Specified from autism and language disorders, *Journal of Autism and developmental Disorders*, 23, 79-90.

Mayes, S. D., & Calhoun, S. L., (2003). Analysis of WISC-III, Stanford-Binet, IV, & academic achievement test scores in children with autism. *Journal of Autism and Developmental Disorders*, 33, 329-341.

McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: a systematic review, *Journal of Evaluation in Clinical Practices*, 12, 120-129.

McConachie, H., Randle, V., Hammal, D., & Le Couteur, A. (2005). A controlled trial of a training course for parents of children with suspected autism spectrum disorder. *The Journal of Pediatrics*, 147, 335-340.

McGrath, A. M., Bosch, S., Sullivan, C. L., & Fuqua, R. W. (2003). Training

reciprocal social interactions between preschoolers and a child with autism. *Journal of Positive Behaviour Interventions*, 5, 47-54.

McGrath, M., Bosch, S., Sullivan, C. L., & Fuqua, R. W. (2006). Training reciprocal social interactions between preschoolers and a child with autism. *Journal of Positive Behavior Interventions*, 5, 47-54.

Meltzoff, A.N., & Moore, M.K. (1988). Newborn infants imitate adult facial gestures. *Child Development,*54, 702-9.

Miller, J. N., & Ozonoff, S. (2000). The external validity of Aspergers disorder: Lack of evidence from the domain of neuropsychology. *Journal of Abnormal Psychology*, 109, 227-238.

Minshew, N. J., & Goldstein, G. (2001). The Pattern of Intact and Impaired Memory Functions in Autism. ***The Journal of Child Psychology and Psychiatry and Allied Disciplines***, 42, 1095-1101.

Minshew, N. J., & Goldstien, G. (1993). Is autism an amnesic disorder? Evidence from the California Verbal Learning Test. *Neuropsychology*, 7, 209-216.

Minshew, N. J., Meyer, J., & Goldstein, G. (2002). Abstract reasoning in autism: dissociation between concept formation and concept identification. *Neuropsychology*, 16, 327-334.

Minshew, N.J., Goldestin, G., Muenz, L.R., & Payton, J. B. (1992). Neuropsychological functioning in nonmentally retarded autistic individuals. *Journal of Clinical and Experimental Neuropsychology*, 14, 749-761.

Minshew, N.J., Goldstein, G., & Siegel, D.J. (1997). Neuropsychologic functioning in autism: profile of a complex information processing

disorder. *Journal of International Neuropsychological Society*, 3, 303-16.

Minshew, N.J., Sweeney, J.A., & Bauman, M.L. (1997). Neurological aspects of autism. In D.J. Cohen & F.R. Volkmar (Eds.), *Handbook of Autism and Pervasive Developmental Disorders* (2nd edn, pp.344-369). New York: Wiley.

Moes, D. R., & Frea, W. D. (2002). Contextualized behavioural support in early intervention for children with autism and their families. *Journal of Autism and Developmental Disorders*, 32, 519-533.

Morries R. G., Rowe, A., Fox, N., Feigenbaum, J. D., Miotto, E. C., & Howlin, P. (1999). Spatial working memory in Asperger's syndrome and in patients with focal and temporal lobe lesions. *Brain and Cognition*, 41, 9-26.

Mottron, L., Morasse, K., & Belleville, S. (2001). A Study of Memory Functioning in Individuals with Autism. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42, 253-260.

Mundy, P. (2003). The neural basis of social impairment in autism: The role of the dorsal medial-frontal cortex and anterior cingulated system. *Journal of Psychology and Psychiatry*, 47, 793-809.

Mundy, P., & Sigman, M. (1989). The theoretical implications of joint-attention deficits in autism. *Developmental Psychopathology*, 1, 173-83.

Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: the contribution of non-verbal communication measures. *Journal of Child Psychology and Psychiatry*, 27,657-69.

Nadel, J., Croué, S., Mattlinger, M., Canet, P., Lécuyer, C. H., & Martini, M. (2000). Do children with autism have expectancies about the social behaviour of unfamiliar people? A pilot study using the still face paradigm. *Autism*, 2, 133-145.

Nation, K., Clarke, P., Wright, B., & Williams, C. (2006). Patterns of reading ability in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 4, 18-25.

National Research Council. (2001). *Educating children with autism. Washington*, D C: National Academy Press.

Newschaffer, C. J., Croen, L.A., Daniels, J., Giarelly, E. & Grether, J. K. (2006). The epidemiology of autism spectrum disorders. *Annual Reviews of Public Health*, 28, 20-53.

Nieminen-von Wendt, T., Metsahonkala, L., Kulomaki, T., Aalto, S., & Autti, T., et al. (2003). Changes in cerebral blood flow in Asperger syndrome during theory of mind tasks presented by the auditory route. *European Journal of Child and Adolescent Psychiatry*, 12, 178-89.

Norbury, C., & Bishop, D. V. M. (2003). Narrative skills of children with communication impairments. *International journal of Language and Communication Disorders*, 38, 287-314.

O'Connor, I. M., & Klein, P. D. (2004). Exploration of strategies for facilitating the reading comprehension of high-functioning students with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 34,* 115-127.

Ornitz, E. M., & Ritvo, E. (1976).The syndrome of autism: a critical review. *American Journal of Psychiatry*, 133, 609-621.

Ornitz, E. M., & Ritvo, E. R. (1968). Perceptual inconsistency in early infantile autism: The syndrome of early infant autism and its variants including certain cases of childhood schizophrenia. *Archives of General Psychiatry*, 18, 76-98.

Orsmond, G. I., Krauss, M. W., & Seltzer, M. M. (2004). Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of Autism and Developmental Disorders*, 34, 245-256.

Osterling, J., & Dawson, G. (1994). Early recognition of children with autism: A Study of 1st birthday home videotapes. *Journal of Autism and Developmental Disorders*, 24, 247-257.

Osterling, J., Dawson, G., & McPartland, J. (2001). In C. E. Walker & M. C. Roberts (Eds), *Handbook of Clinical Child Psychology* (pp. 443-452). New York: John Wiley & Sons, Inc.

Osterling, J.A., Dawson, G., & Munson, J. A. (2002). Early recognition of 1-year-old infants with autism spectrum disorder versus mental retardation. *Developmental Psychology*. 14, 239-251.

Ozonoff, S., & Cathcart, K. (1998). Effectiveness of a home program intervention for young children with autism. *Journal of Autism and Developmental Disorders*, 28, 25-32.

Ozonoff, S., & Jensen, J. (1999). Brief report: specific executive function profiles in three neurodevelopmental disorders. *Journal of Autism Developmental Disorders,* 29, 171-77.

Ozonoff, S., & Strayer, D. L. (2001). Further evidence of intact working memory in autism. *Journal of Autism and Developmental Disorders*, 31, 257-263.

Ozonoff, S., Cook, I., Coon, H., Dawson, G., Joseph, R. M., Klin, A., et al. (2004). Performance on Cambridge Neuropsychological Test Automated Battery subtests sensitive to frontal lobe function in people with autistic disorder: Evidence from the Collaborative Programs of Excellence in Autism Network. *Journal of Autism and Developmental Disorders*, 34, 139-150.

Paul, R., & Sutherland, D. (2004). Enhancing early language in children with autism spectrum disorders. In F. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of Autism and Pervasive Developmental Disorders*. New Jersey: John Wiley & Sons, Inc.

Paul, R., Chawarska, K., Klin, A., & Volkmar, F. (2004). *Profiles of communication in toddlers with autism spectrum disorders*. Invited paper presented at the American Psychological Association, Honolulu, HI.

Paul, R., Chawarska, K., Klin, A., & Volkmar, F. (2004). *The development of preverbal communication in toddlers with autism spectrum disorders*. Paper presented at the annual meeting of the American Psychological Association, Honolulu, Hawaii, August, 2004.

Pennington, B., F., & Ozonoff, S., (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and psychiatry, 37*, 51-87.

Perkins, M. R., Dobbinson, S., Boucher, J., Bol, S., & Bloom, P. (2006). Lexical knowledge and lexical use in autism. *Journal of Autism and Developmental Disorders*, 21, 70-78.

Perry, A., & Factor, D.C. (1989). Psychometric validity, clinical usefulness of the Vineland Adaptive Behaviour Scales and the AAMD Adaptive Behaviour Scale for an autistic sample. *Journal of Autism and Developmental Disorder*, 19, 41-55.

Peshwaria, R. & Venkitesan, S. (1992). *Behaviour Assessment Scales for Indian Children with Mental Retardation*. Secundrabad: National Institute for the Mentally Handicapped.

Plaisted, K., Swettenham, J., & Rees, L. (1999). Children with autism show local precedence in a divided attention task and global precedence in a selective attention task. *Journal of child Psychology and Psychiatry*, 40, 733-742.

Premack, D., & Woodruff, G. (1978). Chimpanzee problem-solving: a test for comprehension. *Science*, 202, 532-35.

Prior, M. R. (1979). Cognitive abilities and disabilities in infantile autism: A review. *Journal of Abnormal Child Psychology*, 7, 357-380.

Prizant, B. M., Wetherby, A. M., Rubin., E, & Laurent, A. C. (2003). The SCERTS Model: a transactional, family-centered approach to enhancing communication and socioemotional abilities of children with autism spectrum disorders. *Infants and Young Children*, 16, 296-316.

Receveur, C., Lenoir, P., Desombre, H., Roux, S., Barthelemy, C., & Malvy, J. (2005). Interaction and imitation deficits from infancy to 4 years of age in children with autism. *Autism*, 9, 69-82.

Reddy, V., Hay, D., Murray, L., & Trevarthen, C. (1997). Communication in infancy: mutual regulation of affect and attention. In G. Bremner, A Slater & G Butterworth (Eds) *Infant Development: Recent Advances*, (pp. 247-74). Hove, UK: Psychological Press

Renner, P., Klinger, L. G., & Klinger, M. R. (2000). Implicit and explicit memory in autism: Is autism an amnesic disorder? *Journal of Autism and Developmental Disorders*, 30, 3-14.

Richler, j., Lusyter, R., Risi, S., Hsu, W. L., Dawson, G., Bernier, R., et al. (2005). Is there a regressive "phenotype" of autism spectrum disorder associated with the measles-mumps-rubella vaccine? A CPEA study. *Journal of Autism and Developmental Disorders*, 35, 236-248.

Rinehart, N. J., Bradshaw, J. L., Moss, S. A., Brereton, A. V., & Tonge, B. J. (2001). A Deficit in shifting attention present in high-functioning autism but not Asperger's Disorder. *Autism*, 5, 67-80.

Ring, H.A., Baron-Cohen, S., Wheelwright, S., Williams, S.C., & Brammer M, et al. (1999). Cerebral correlates of preserved cognitive skills in autism: a functional MRI study of embedded figures task performance. *Brain*, 122, 1305-15.

Robert, J., Rice, M., & Tager-Flusberg, H. (2004). Tense marking in children with autism. *Applied Psycholingustics*, 25, 429-448.

Roeyers, H., Oost, P. V., & Bothuyne, S. (1998). Immediate imitation and joint attention in young children with autism. *Development and Psychopathology*, 10, 441-450.

Roger, S. & Ozonoff, S. (2005). Annotation: what do we know about sensory dysfunction in autism? A critical review of the empirical evidence. *Journal of child Psychology and Psychiatry*, 46, 1255-1268.

Rogers, J. S., Hepburn, S. L., Stackhouse, T., Wehner, E. (2003). Imitation performance in toddlers with autism and those with other developmental disorders. *Journal of Child Psychology and Psychiatry* 44, 763-781.

Rogers, S. (1999). An examination of the imitation deficit in autism. In J. Nadel & G. Butterworth, *Imitation in Infancy*, (pp. 255-83). Cambridge: Cambridge University Press

Rogers, S. (2000). Interventions that facilitate socialization in children with autism, *Journal of Autism and Developmental Disorders*, 30, 399-409.

Rogers, S. J. (2003). Cognitive underpinnings of pretend play in Autism. *Journal of Autism and Developmental Disorders*, 33, 289-302.

Rogers, S., Hepbarn, S., Stackhouse, T., & Wehner, E., (2003). Imitation preference in toddlers with autism and those with other developmental disorders. *Journal of Child Psychology and Psychiatry*, 44, 763- 781.

Rogers, S., Hepburn, S., & Wehner, E. (2003). Parent reports of sensory symptoms in toddlers with autism and those with other developmental disorders. *Journal of Autism and Developmental Disorders*, 33, 631-642.

Romski, M., & Sevick, R. (1996). *Breaking the augmented means.* Ballmore: Paul Brookes.

Ross, D., & Greer, R. (2003). Generalized imitation and the mand: Inducing first instances of speech in young children with autism. *Research in Developmental Disabilities*, 24, 58-74.

Ruble, L. A. (2001). Analysis of Social Interactions as Goal-Directed Behaviors in Children with Autism. *Journal of Autism and Developmental Disorders*, 31, 471-482.

Russell, J. (1997). *Autism as an Executive Disorder*. Oxford: Oxford University Press.

Russell, J., Jarrold, C., & Hentry, L. (1996). Working memory in children with autism and with moderate learning difficulties. *Journal of child Psychology and Psychiatry and Allied Disciplines,* 37, 673-686.

Rutgers, A. H., Backermans- Kranenburg, M.J., Van Ijzendoorm, M.H., Van Berckelar- Onnes, I.A. (2004). Autism and attachment : a meta-analytic review. *Journal of Child Psychology and Psychiatry*, 45, 1123-1134.

Rutgers, A. N., Bakermans-Kranenburg, M. J., Ijzendoorn, M. H., Berckelaer-Onnes, I. A. (2004). Autism and attachment: a meta-analytic review. *Journal of Child Psychology and Psychiatry* 45 (6), 1123 -1134.

Rutherford, M. D., & Rogers, S. J. (2003). Cognitive underpinning of pretended play in autism. Journal of Autism and Developmental Disorders, 33, 289-302.

Rutherford, M. D., Young, G. S., Hepburn, S., & Rogers, S. J. (2006). A Longitudinal Study of Pretend Play in Autism. *Journal of Autism and Developmental Disorders,* 2, 284-291.

Rutter, M. (1978). Diagnosis and definition. In M. Rutter & E. Schopler (Eds.), *Autism: A reappraisal of concepts and treatment* (pp. 1-25). New York: Plenum.

Rutter, M. (1995). Clinical implications of attachment concepts: retrospect and prospect. *Journal Child Psychology and Psychiatry*, 36, 549-71.

Rutter, M., (1983). Cognitive deficits in the pathogenesis autism. *Journal of Child Psychology and psychiatry, 24,* 513-531.

Sanders, J., Johnson, K. A., Gill, M., & Gallagher, L. (2007). A review of neuropsychological and neuroimaging research in autistic spectrum disorders: Attention, inhibition and cognitive flexibility. *Research in Autism Spectrum Disorders,* In press.

Saulnier, C. A., & Klin, A. (2006). Social and Communication Abilities and Disabilities in Higher Functioning Individuals with Autism and Asperger Syndrome. *Journal of Autism and Developmental Disorders*, 3, 15- 26.

Schatz, A. M., Weimer, A. K., & Trauner, D. A. (2002). Brief report: Attention differences in Aspergers Syndrome. *Journal of Autism and Developmental Disorders,* 32, 333-336.

Schepis, M., Reid, D., Behermann, M., & Sutton, K. (1998). Increasing communicative interactions of young children with autism using a

voice output communication aid and naturalistic teaching. *Journal of Applied Behavioural Analysis*, 31, 561-578.

Schopler, E., & Mesibov, G. B. (2000). Cross-cultural priorities in developing autism services. *International Journal of Mental Health*, 29, 3-21.

Schopler, E., & Mesibov, G. B. (2000). Cross-Cultural priorities developing autism services. *International Journal of Mental Health*, 29, 3-21.

Schopler, E., & Reichler, R. J. (1979). Individualized assessment and treatment for autistic and developmentally disabled children, *Psychoeducational profile*. Baltimore: University park press.

Schopler, E., Reicheler, R., and Renner, B. R. (1986). *The Childhood Autism Rating Scale (CARS) for diagnostic screening and classification of autism*. New York: Irvington Publishers

Schreibman, L., & Ingersoll, B. (2004). Behavioural Interventions to Promote Learning in Individual with autism. In F. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of Autism and Pervasive Developmental Disorders*. New Jersey: John Wiley & Sons, Inc.

Senju, A., Tojo, Y., Dairoku, H., & Hasegawa, T. (2004). Reflexive orienting in response to eye gaze and an arrow in children with and without autism. *Journal of Child Psychology and Psychiatry*, 45(3), 445-458.

Seung, H. K. (2007). Linguistic characteristics of individuals with high functioning autism and Asperger syndrome. ***Clinical Linguistics & Phonetics***, **21**, 247-259.

Seung, H. K., Ashwell, S., Elder, J. H., & Valcante, G. (2006). Verbal communication outcomes in children with autism after in-home father training. *Journal of Intellectual Disability Research*, 50, 139-150.

Sevin, J. A., Matson, J. L., Coe, D. A., & Fee, V. E. (1991). A comparison and evaluation of three commonly used autism scales. *Journal of Autism and Developmental Disorder*, 21, 417-432.

Shah, A., & Frith, U. (1993). Why do autistic individuals show superior performance on the block design task? *Journal of Child Psychology and Psychiatry*, 34, 1351-64.

Shallice, T. (1988). *From Neuropsychology to Mental Structure*. Cambridge, UK: Cambridge University Press.

Sheinkopf, S., Mundy, P., Oller. K., & Steffens, M. (2000). Vocal atypicalities of preverbal autistic children. *Journal of Autism and Developmental Disorders*, 30, 345-354.

Shields, J. (2001). The NAS Earlybird programme: partnership with parents in early intervention. *Autism*, 5, 49-56.

Shriberg, L., Paul, R., McSweeney, J., Klin, A., Cohen, D., & Volkmar, F. (2001). Speech and prosody characteristics of adolescents and adults with high-functioning autism and Asperger syndrome. *Journal of Speech, language, and Hearing Research*, 44, 1097-1115.

Siegel, D. J., Minshew, N. J. & Goldstein, G. (1996). Wechsler IQ Profile in diagnosis of high-function autism. *Journal of Autism and Development Disorders*, 26, 389-409.

Sigman, M. & Kasari, C. (1992). Response to the negative emotions of others by autistic, mentally retarded, and normal children. *Child Development*, 63, 796-807.

Sigman, M., & Capps, L. (1997). *Children with Autism: A Developmental Perspective*. Cambridge, MA: Harvard University Press.

Sigman, M., & Ungerer, J. A. (1981) sensori motor skills and language comprehension in autistic children. *Journal of Abnormal Child Psychology*, 9, 149-65.

Sigman, M., & Ungerer, J. A. (1984). Cognitive and language skills in autistic, mentally retarded, and normal children. *Journal of Developmental Psychopathology*, 20, 293-302.

Sigman, M., Dissanayake, C., Arbelle, S. & Ruskin, E. (1997). Cognition and emotion in children and adolescent with autism. In D.J. Cohen & F.R. Volkmar. *Handbook of Autism and Pervasive Developmental Disorders*. New York: John Wiley & Sons, Inc.

Sigman, M., Ruskin, E., Arbeile, S., Corona, R., Dissanayake, C., et al. (1999). Continuity and change in the social competence of children with autism, Down syndrome, and developmental delays. *Monograph of Social Research and Child Development*, 64, 1-114.

Sigman, M., Spencer, J.S. & Wang, T.A. (2006). Autism from developmental and neuropsychological perspectives. *Annual Reviews of Clinical Psychology*, 2, 327 -55.

Sim, L., Whiteside, S. P., Ditter, C. A., & Mellon, M. (2006). Effectiveness of a social skills training program with school age children. *Journal of Child and Family Studies*, 15, 408-417.

Skuse, D. (2003). Jack Tizard lecture: fear recognition and the neural basis of social cognition. *Child and Adolescent Mental Health*, 8, 50-60.

Smith, C. (2001). Using social stories to enhance behaviour in children with autistic spectrum difficulties. *Educational Psychology in Practice*, 17, 337-345.

Smith, I. M., & Bryson, S. E. (1994). Imitation and action in autism: a critical review. *Psychological Bulletin*, 116, 259-73.

Smith, T., Bush, G. A., & Gamby, T. E. (2000). Parent-directed, intensive early intervention for children with pervasive developmental disorder. *Research in Developmental Disabilities*. 21, 297-309.

Somekh, B. and Lewin, C. (2005). *Research Methods in the Social Sciences*. New Delhi: Vistar Publications.

Sparrow, S.S., Balla, D.A., & Cicchetti, D.V. (1984).*Vineland Adaptive Behaviour Scales*. Circle Pines, MN: American Guidance Services.

Spezio, M. L., Adolphs, R., Hurley, R. S. E., & Piven, J. (2007). Analysis of face gaze in autism using "Bubbles". *Neuropsychologia*, 45, 144-151.

Stahl, L., & Pry, R. (2002). Joint Attention and Set-Shifting in Young Children with Autism. *Autism*, 6, 383-396.

Steele, S. D., Minshew, N. J., Luna, B., & Sweeney, J. A. (2006). Spatial Working Memory Deficits in Autism. *Journal of Autism and Developmental Disorders*, 36, 78-92.

Stone, W. L., Caro-Martinez, L. M. (1990). Naturalistic observations of spontaneous communication in autistic children. *Journal of Autism and Developmental Disorders*, 20, 437-453.

Stone, W. L., Ousley, O. Y., Yoder, P. J., Hogen, K. L., & Hepburn, S. L. (1997). Noverbal communication in two- and-three-year old children with autism. *Journal of Autism and Developmental Disorders*, 27, 677-67.

Stone, W. L., Ousley, O.Y., & Littleford, C. (1995). Play and imitation skills in the diagnosis of autism in young children. *Pediatrics*, 86, 267-272.

Strain, P. S., & Hoyson, M. (2000). The need for longitudinal, intensive social skills intervention: LEAP follow-up outcomes for children with autism. *Topics in Early Childhood Special Education*, 20, 116-122.

Swallows, G. O., & Graupner, T. D. (2005). Intensive behavioural treatment for children with autism: four-year outcome and predictors. *American Journal on Mental Retardation*, 110, 417- 438.

Swettenham, J., Baron-Cohen, S., Charman, T., Cox, A., Baird G. *et al*. (1998). The frequency and distribution of spontaneous attention shifts between social and nonsocial stimuli in autistic developmentally delayed infants. *Journal Child Psychology and Psychiatry*, 39, 747-53.

Swettenham, J., Baron-Cohen, S., Cox, A., Baird, G., Drew, A., Charman, T., Rees, L., & Wheelwright, H. (1998). The frequency and distribution of spontaneous attention shifts between social and non-social stimuli in autistic developmentally delayed infants. *Journal of child Psychology and Psychiatry*, 28, 747-753.

Symon, J. B. (2001) Parent education for autism: issues in providing services at a distance. *Journal of Positive Behavior Interventions*, 3, 160-174.

Symon, J. B. (2005). Expanding interventions for children with autism: parents as trainers. *Journal of Positive Behavior Interventions*, 7, 159-173.

Tager-flusberg, H. (1991). Semantic processing in free recall of autistic children: Further evidence for a cognitive deficit. *British journal of Developmental Psychology*, 9, 417-430.

Tastsanis, K. D., Dartnall, N., Cicchetti, D., Sparrow, S., Klin, A., & Volkmar, F. R. (2003). A comparison of performance on the Leiter and Leiter-R in low-functioning children with autism. *Journal of Autism and Developmental Disorders*, 33, 23-30.

Taylor, B., Miller, E., Farrington, C.P., Petropoulos, M.C., & Favot-Mayaud, I., et al. (1999). Autism and measles, mumps, and rubella vaccine: no epidemiological evidence for a causal association. *Lancet*, 353, 2026-29.

Thurm, A., Lord, C., Lee, L., & Newschaffer, C. (2006). Predictors of Language Acquisition in Preschool Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 15, 105-116.

Toichi, M., & Kamio, Y. (2002). Long-term memory and levels-of-processing in autism. *Neuropsychologia*, 40, 964-969.

Toichi, M., & Kamio, Y. (2003). Long-term memory in high-functioning autism: Controversy on episodic memory in autism reconsidered. *Journal of Autism and Developmental Disorders*, 33, 151-161.

Toth, K., Munson, J., Meltzoff, A. N., & Dawson, G. (2006). Early Predictors of Communication Development in Young Children with Autism Spectrum Disorder: Joint Attention, Imitation, and Toy Play. *Journal of Autism and Developmental Disorders*, 21, 30-41.

Tronick, E., Als, H., Adamson, L., Wise, S. & Brazelton, T.B. (1978). The infant's response to entrapment between contradictory messages in

face-to-face interaction. *Journal American Academy of Child Psychiatry*, 17, 1–13.

Tse, J., Strulovitch., & Tagalakis, V. (2007). Social skills training for adolescents with Asperger syndrome and high-functioning autism. *Journal of Autism and Developmental Disorders*, 4, 26-33.

Tsiouri, L., & Greer, R. D. (2003). Inducing vocal verbal behaviour in children with severe language delays through rapid motor imitation responding. *Journal of Behaviour Education*, 12, 185-206.

Vargas, D.L., Nascimbene, C., Krishnan, C., Zimmerman, A.W., & Pardo, C.A., (2005). Neuroglial activation and neuroinflammation in the brain of patients with autism. *Annuals of Neurology*, 57, 67-81.

Volden, J. (2006). Conversational repair in speakers with autism spectrum disorder. *International Journal of Language & Communication Disorders*, 39, 171-189.

Volkmar, F., Carter, A., Grosman, J. & Klin, A. (1997). Social development in autism. In F.R. Volkmar & D.J. Cohen. *Handbook of Autism and Pervasive Developmental Disorders*. New York : John Wiley & Sons, Inc.

Volkmar, F., Chavaraska, K., & Klin, A. (2005). Autism in infancy and early childhood. *Annual Reviews of Psychology*, 56, 315-336.

Volkmar, F.R., Lord, C., Bailey, A., Schultz, R.T., & Klin, A. (2004). Autism and pervasive developmental disorders. *Journal of child Psychology and Psychiatry*, 45, 135-170.

Wakefield, A.J., Murch, S.H., Anthony, A., Linnell, J., & Casson, D.M., et al. (1998). Ileal-lymphoidnodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *Lancet,* 351, 637-41.

Warreyn, P., Roeyers, H., & Groote, I. (2005). Early social communicative behaviours of preschoolers with autism spectrum disorder during interaction with their mothers. *Autism*, 9, 342-361.

Watling, R. L., Deitz, J., & White, O. (2001). Comparison of sensory profile score of young children with and without autism spectrum disorders. *American Journal of Occupational Therapy,* 55, 416-423.

Webb, B. J., Miller, S. P., Pierce, T.B., Strawser, S., & Jones, W. P. (2005). Effects of social skill instruction for high-functioning adolescents with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 19, 53-62.

Wetherby, A. M., & Prizant, B. M., (2000). *Autism Spectrum Disorders: A Transactional Developmental Perspective*. Baltimore, MD: Brooks.

Wetherby, A. M., Watt, N., Morgan, L., & Shumway, S. (2006). Social Communication Profiles of Children with Autism Spectrum Disorders Late in the Second Year of Life. *Journal of Autism and Developmental Disorders*, 2, 576-581.

Whalen, C. (2001). Joint attention training for children with autism and the collateral effects on language, play, imitation, and social behaviours. *Dissertation Abstracts International*, 61, 6122B.

Whalen, C., & Schreibman, L. (2003). Joint attention training for children with autism using behaviour modification procedures. *Journal of Child Psychology and Psychiatry*, 44, 456-468.

Williams, D. L., Goldstein, G., & Minshew, N. J. (2005). Impaired memory for faces and social scenes in autism: clinical implications of memory dysfunction. *Archives of Clinical Neuropsychology*, 20, 1-15.

Williams, D. L., Goldstein, G., & Minshew, N. J. (2006). The Profile of memory function in children with autism. *Neuropsychology*, 20, 21-29.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: representation and constraining function of wrong beliefs in young children understands of deception. *Cognition,* 13, 103-28.

Wing, L. (1996). *The Autistic Spectrum : a Guide for Parents and Professionals*. London: Constable.

Yang, N. K., Huang, T. A., Schaller, J. L., Wang, M. H., Tsai, S. F. (2004). Enhancing appropriate social behaviors for children with autism in general education classrooms: an analysis of six cases. *Education and Training in Developmental Disabilities,* 38, 405-416.

Yirmiya, N., Kasari, C, Sigman, M. & Mundy, P. (1989). Facial expressions of affect in autistic, mentally retarded and normal children. *Journal Child Psychology and Psychiatry*, 30, 725-35.

Yoder, P., & Stone, W. L. (2006). Randomized Comparison of Two Communication Interventions for Preschoolers With Autism Spectrum

Disorders. *Journal of Consulting and Clinical Psychology*, 74, 426-435.

Yoder, P.J., & Layton, T. (1988). Speech following sign language training in autistic children with minimal verbal language. *Journal of Autism and Developmental Disorders*, 18, 217-229.

Zachor, D. A., Ben-Itzchak, E., Rabinovich, A. L., & Lahat, E. (2006). Change in autism core symptoms with intervention. ***Research in Autism Spectrum Disorders***. In press

Ziatas, K., Durkin, K., & Pratt, C. (2003). Differences in assertive speech acts produced by children with autism, Asperger syndrome, specific language impairment, and normal development. *Development and Psychopathology*, 15, 73-94.

APPENDICES

Appendix I
Sociodemographic Data Sheet

NAME	F/NO
AGE	SEX
DOB	DATE:
EDUCATION	
BIRTH ORDER	No. of SIBLINGS
TEMPORARY/PERMANENT ADDRESS	
PHONE No.	
INCOME p.m.	INFORMANTS:
DETAILS OF FATHER	DETAILS OF MOTHER
NAME	NAME
AGE	AGE
EDUCATION	EDUCATION
PROFESSION	PROFESSION
e-mail id	e-mail id
MOBILE No.	MOBILE No.

NATURE OF FAMILY:

HISTORY OF ILLNESS IN THE FAMILY:

FAMILY BACKGROUND:

ANY HISTORY OF SEIZURES

ANY OTHER COMORBID ILLNESS

INVESTIGATIONS

DEVELOPMENTAL ASSESSMENT IQ/SQ

SCALE USED

ANY REMARKS

CARS SCORE