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A Study to Findout the Correlation between Praxis Patterns and Social Participation among Children with Autism Spectrum Disorder

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ABSTRACT

AIM:
The aim of the study is to find out the correlation between praxis patterns and social participation among children with Autism Spectrum Disorder (ASD).

METHOD:
The study included 100 children with ASD in the age group between 5 – 8.11 years. The study was conducted in Department of Occupational Therapy, SVNIRTAR. Praxis subtests of SIPT and Social Participation subscale of Sensory Processing Measure were used to find out praxis skills and social participation in ASD children. The results were then subjected to statistical analysis.

RESULT:
Spearman rank correlation coefficient was used to analyze correlation between praxis skills and social participation among children with ASD. Overall result shows that there is significant strong correlation with social participation and postural praxis, praxis on verbal command, constructional praxis and oral praxis. Sequential praxis had a significant correlation with social participation in moderate range.

CONCLUSION:
The study concluded that there is a strong correlation between social participation and praxis skills patterns in children with ASD.

KEYWORDS: *Praxis, Social participation, Postural praxis, Praxis on verbal command, Constructional praxis, Oral praxis, Sequential praxis*

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1. INTRODUCTION

Autism Spectrum Disorder (ASD) is defined as persistent deficits in (a) social communication and social interaction across multiple context, (b) restricted, repetitive patterns of behavior, interest or activity, (c) symptoms must be present in early developmental period, (d) symptoms together limit and impair social, occupational or other important areas of functioning (DSM – V, APA – 2013)

The diagnosis of ASD is more of clinical diagnosis than investigative diagnosis. One needs to meet specific diagnostic criteria for ASD, but the general requirements are that one must have symptoms that belong to the three main areas of impairments;

1. Speech and communication impairment
2. Social interaction difficulties
3. Repetitive stereotype behaviors

At times, especially when diagnosed early, it may be difficult to predict what the final outcomes will be. Even though ASD is a lifelong disorder, some children will do better than others and a small proportion may "outgrow" some of the difficulties. Of children meeting criteria for ASD, the true male-to-female ratio is not 4:1; as if often assumed; rather it is closed to 3:1. There appears to be a diagnostic gender bias, meaning that girls who meet criteria for ASD are at disproportionate risk of not receiving a clinical diagnosis (Rachel Loomes, William polmear, Lockey Mandey – 2007).

Estimated prevalence rates of sensory processing problems among children withautism spectrum disorder range from approximately 40% to >90% (Baker et al., 2008).

Atypical sensory reactivity (usually called sensory modulation or sensory responsiveness) has been linked to regulatory function such as arousal, attention, affect and activity level, and may result in extreme behavioural differences that interfere with social participation (Baranek et al., 2002).

Profound deficit in social reciprocity skills is the core, underlying feature of the autism spectrum disorders (ASD), which include autistic disorder, Aspergers disorder and Pervasive developmental disorder – not otherwise specified (PDD-NOS).

Socialization deficits are a major source of impairement regardless of cognitive or language ability for individuals with ASD. (Carter, Davis, Klin & Volkmar 2005).

Further more social skills deficts do not remit with development. Indeed impairement and distress may increase as children approach adolescence because the social milieu

becomes more complex and the child become more aware of their social disability (Schopler & Lesibov, 1983; Tantam, 2003)

Individuals with ASD suffer direct and indirect consequences related to social interaction deficits. Youth with ASD often report a desire for more peer social interaction and may also express poor social support and more loneliness than their typically developing peers (Bauminger & Kasari, 2000). Ironically, when integrated with typically developing peers in mainstream classrooms, children and adolescents with ASD may be at increased risk for peer rejection and social isolation (Chamberlain, 2001).

There is also evidence that social skills deficits in youth with ASD contribute to academic and occupational under achievement (Howlin & Goode, 1998). Finally, social skill deficits ay presage mood and anxiety problems later in development (Myles, 2003; Tantum, 2003).

In sensory integration theory, praxis refers to the ability to plan new movements.

There are two levels of motor planning dysfunction; Bilateral integration sequencing (BIS) and somatodyspraxia (Ayres, 1989; Mulligan, 2000).

Praxis simply defined, is the ability to do. It has been described as a "uniquely human skill requiring conscious thought and enabling the brain to conceptualize, organize and direct purposeful interaction with the environment (Ayres, Mailloux & Wendler, 1987).

To have sensory integrative based dyspraxia individuals must have deficits in processing one or more types of sensation. Different types of praxis are associated with dysfunction in different sensory systems. Specifically, where as deficits in bilateral integration and sequencing are associated with vestibular and proprioceptive processing; somatodyspraxia is associated with processing tactile, vestibular and proprioceptive sensations (Anita.C.Bundy, 2002)

Impaired performance of skilled gestures, referred to as dyspraxia, is consistently reported in children with Autism; however its neurology basis is not well understood. Impairments in imitation of skilled motor gestures have been particularly emphasized, leading some to suggest that impaired imitation may be core feature of autism, contributing to abnormal development of functions critical to social and communicative development such as empathy, joint attention and theory of mind. Comprehensive investigation of skilled motor gestures using a traditional praxis examination, however reveals that children with autism show deficits in performance not only during imitation, but also in response to command and with tool use. These findings suggest that autism may be associated with generalized praxis deficits, rather than a deficit specific to imitation. In a developmental context, impaired performance of skilled gestures, including those involving imitation may therefore, be secondary to abnormalities in frontal / parietal sub cortical circuits important for acquisition of sensory representations of movement and/or the motor sequence programs necessary to execute them (M A Dzuik, J C Gidley Larson, A Apostu, E M Mahone, 2007).

Socialization deficits are a major source of impairment regardless of cognitive or language ability for individuals with ASD (Carter et al., 2005).

Somatodyspraxia interferes with initiation, planning, sequencing and building repertoires of action plans, all of which are essential in accomplishing multistep daily routine and building a foundation for imitation and social skills. Moreover, praxis ability may be associated with social and communication functions of people with ASD (Mostosky & Ewen, 2011).

Hence, in this study an attempt has been made to find out the relationship between praxis and social participation in children with ASD.

2. AIMS AND OBJECTIVES

AIM:

The aim of the study is to find out the relationship between praxis patterns and social participation skills among ASD population.

OBJECTIVES:

- To evaluate praxis and social participation skills in children with ASD.
- To evaluate the relationship between praxis components and social participation scores.

3. HYPOTHESIS

NULL HYPOTHESIS:

There is no relationship between praxis patterns with social participation among ASD population.

ALTERNATE HYPOTHESIS:

Praxis patterns would be highly correlated with social participation among ASD population.

4. RELATED LITERATURE

Autism spectrum disorder (ASD) is a neuro developmental disorder characterized by complex difficulties in behavior and development. The word "autism" comes from the combination of Greek words `auto' meaning `self` and `ism' meaning "the act", state or theory of the word "autism" initially was linked to detachment from reality in individuals with schizophrenia (Bleuler, 1911). It took its modern sense in 1938, when it was referred to as "autistic psychopaths" (Asperger, 1938). Kanner in 1943 elaborated the term as "an isolated self" in which a person shows restrictive social interaction (Kanner, 1943). Hans Aspergers workwas later summarized by Lorna Wing (L.Wing, 1981) as Aspergers syndrome, and later translated into English by UtaFrith (Frith, 1991). Wing pointed out that, there were many similarities in the clinical portrayals of the children described by Kanner and Asperger. Based on the findings of a study conducted with Judith Gould, Wing proposed the triad of impairements for ASD which includes impairements in social interaction, communication and repetitive behavior (Lorna Wing, Gould &Gillberg 2011). The concept of the autism spectrum was thus born, describing every aspect of impairments which could vary in severity, and could be present in individuals with different levels of intellectual functioning. This triad was widely adopted and is used into diagnostic criteria till date (M Rutter&Schopler, 1987; M Rutter&Schopler, 1992).

CLASSIFICATION OF ASD ACCORDING TO DIAGNOSTIC AND STATISTICAL MANUAL

ASD is known as one of the most challenging disabilities for children. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM) IV (1994) and IV TR (2004), autism and related disorders were collected under an umbrella of PDD - Pervasive Developmental Disorders (DSM-IV, 2000). PDD consists of five disorders with 3

manifestations in childhood ranging from severe form Autism, through a milder form called Asperger's Disorder and to some aspects of a "broader autism spectrum" called Pervasive-Developmental Disorder – Not Otherwise Specified (PDD-NOS)/atypical autism. According to DSM-IV and International Classification of Diseases – 10 (ICD- 10), two rare conditions, Rett's disorder and Childhood Disintegrative Disorder (CDD), are also included in PDD. But now, according to DSM 5 (APA, 2013) four previously separate disorders are grouped into a single condition called ASD with different levels of symptom severity. Thus, according to DSM 5, ASD now includes autistic disorder (autism), Asperger's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified. Onset, development and phenotypic presentations of ASD show a huge variability with two main types: wherein (i) early manifestation by deviating from the normal development or progression or (ii) sudden regression later, sometimes triggered by an environmental event (e.g. immune or toxic exposures) after a period of normal development during the first few years. The most typical early symptoms reported for ASD are lack of mimicry and expressiveness (suggesting early abnormalities of motor functioning) (Teitelbaum et al., 1998) and abnormal responses to sensory stimuli (Ornitz et al., 1978; Ornitz, 1988; Gillberg, 1989). The most frequent *clinical manifestations* seen in a child diagnosed with ASD are difficulties in social communication. Additionally, children with ASD may experience restricted, repetitive and stereotyped patterns of behaviour and activities that might not be considered normal (APA, 2013). Moreover, ASD has been characterised as a spectrum of difficulties in these areas that vary in combination and severity, between and within individuals (Charman, 2002).

Autism or Classic autism is a severe form of PDD with impairments in all the three areas: reciprocal social interaction, communication, and restricted, stereotyped, repetitive behaviour. In addition to these specific features, nonspecific problems are also observed, such as sleeping and eating disturbances, phobias, temper tantrums, and self-directed aggression (APA, 2013; DSM-IV, 2000).

Children diagnosed with *Asperger's Disorder (AD)* have difficulty in social interaction, reciprocity and communication. In comparison to autistic disorder, there is no clinically significant general delay in language for diagnosed children with AD. Also, these children do not have clinically significant delays in cognitive development, self-help skills, and in adaptive behaviour except in social interaction, and environmental curiosity (APA, 2013). By age two and three, children use single words and communicative phrases respectively.

A child is diagnosed with *Pervasive Developmental Disorder - Not Otherwise Specified (PDDNOS),* if he/she has a pervasive impairment in the development of reciprocal social interaction. PDD-NOS is a diagnosis of exclusion, which means that the child should not meet the specified criteria for other developmental disorders such as Schizotypal Personality Disorder, Schizophrenia, another Pervasive Developmental Disorder, , or Avoidant Personality Disorder (APA, 2013).

The prevalence of *Childhood disintegrative disorder (CDD)* is reported to be very low, thus not making any difference in the overall prevalence rates (Fombonne, 2002). In CDD, there is normal development till the first 2 years after birth followed by severe regression and clinically significant loss of previously acquired skills (DSM-IV, 2000). Now, CDD is no longer part of ASD diagnosis according to DSM 5 (APA, 2013).

In *Rett's Disorder* (RTT), significant impairment in expressive and receptive language development with severe psychomotor retardation (DSM-IV, 2000) is observed. These multiple deficits are observed after a period of normal growth following birth. There is a loss of previously acquired hand skills resembling hand wringing. There is also loss of interest in the social environment in the first few years after the onset of the disorder. RTT is reported to be caused due to mutations in the gene MECP2 (Amir et al., 1999) on X-chromosome. It is no more part of ASD as per DSM 5 (APA, 2013).

AETIOLOGY OF ASD

Genetics play an important role in ASD, and concordance rates among monozygotic twins and families (Bailey et al., 1995) indicate a strong genetic component. However, multiple genes have been implicated (Buxbaum, 2009) and the extent to which environmental factors are also involved is unclear. This suggest a possible role of both genetic and environmental factors in the etiology of ASD (Bailey et al., 1995; Vincent Guinchat et al., 2012a; Parner, Schendel, &Thorsen, 2008). However, geneticists have not identified a common genetic mutation that is involved in most cases of ASD. The so far identified common de novo point mutations are reported to be associated with only a small population (Cannell& Grant, 2013). It is also clear that environmental factors, such as infectious diseases and *in utero*teratogen exposure, can cause ASD or there might be an interaction between genetic and environmental factors (Gillberg& Coleman, 2000).

The extreme complexity in the behavioral, developmental and associated medical conditions across ASD indicates existence of multiple unknown causal factors. There is evidence that 54% of the increase in prevalence is a result of known factors, including changes in diagnosis, increased awareness and parental age and the remaining 46% currently unaccounted for (Weintraub, 2011). However, establishing a concrete pathogenesis of ASD has proven to be extremely difficult. The neuropathology of ASD remains unclear and the reported brain abnormalities among children with ASD indicate a probable link with disturbances in the *in utero*period (Gardener, Spiegelman, &Buka, 2011; Minshew& Williams, 2007; Pardo&Eberhart, 2007).

It has been acknowledged that there are a number of comorbidities frequently identified in individuals with autism. These can be of genetic, neurodevelopmental, mental, or behavioural origin or resulting from environmental exposure. Among the most common comorbidities are the learning/intellectual disabilities (LD/ID), epilepsy, tics, Attention-Deficit-Hyperactivity Disorder (ADHD), developmental coordination disorder (DCD), Obsessive Compulsive Disorder (OCD), Bipolar Disorder (BD), anxiety disorders, depressive disorders, Anorexia nervosa, sleep disorders, disruptive behaviour, self-injurious behaviour (SIB), impulse control problems, conduct disorders, feeding problems, constipation, catatonia and mutism, foetal alcohol syndrome etc.. (Coleman &Gillberg, 2012). In addition, there may be co-occurring physical health problems accompanying ASD. Recent

research has demonstrated that there are several medical conditions that are significantly more prevalent in individuals with autism compared to typically developing populations, for example eczema, allergies, asthma, ear and respiratory infections, gastrointestinal problems, severe headaches, migraines and epilepsy (Kohane*et al*., 2012).

PREVALENCE OF ASD

Globally, since the 1990's, a number of systematic population surveys and routine monitoring systems in various countries have indicated a rise in prevalence from 0.7% to 1% (Chakrabarti, 2001; Elsabbagh et al., 2012; Fombonne, 2002).

Generally, it is estimated that ASDs affect up to 60-65 individuals per 10, 000 in a population (Elsabbagh et al., 2012). According to Centers for Disease Control and Prevention (CDC) - recent study from 14 communities, 147 per 10, 000 children in the United States have been identified as having an Autism Spectrum Disorder (ASD) (Baio, 2014), indicating a rise in the past two decades. But this may not be the true picture as the prevalence estimates from Asian countries like China (9.8 per 10, 000) Japan (10 per 1000) and South Korea (94 per 10, 000) vary widely across time and country (Kim et al., 2011; Sun & Allison, 2010).

Based on the studies in Asian countries (Kim et al., 2011; Sun & Allison, 2010), nearly 1.7 – 2 million individuals are estimated to be affected (Karande, 2006a; Vibha Krishnamurthy, 2008) with ASD in India.

RISK FACTORS OF ASD

There has been a huge focus on pre- and perinatal events as risk factors for ASD in various studies across the globe. Studies based on concordance rates among monozygotic twins and families suggest a possible role of both genetic and environmental factors in the etiology of ASD (Guinchat et al., 2012; Parner et al., 2008; Bailey et al., 1995). For example, pregnancy-induced central nervous system insults may result in relevant epigenetic changes. Secondly, the neuropathology of ASD remains unclear and the reported brain abnormalities among children with ASD indicate a probable link with disturbances in the *in utero*period (Gardner et al., 2011; Minshew& William., 2007; Pardo&Eberhart., 2007). Thirdly, the proportion of children with a major gene defect is limited to a small proportion of ASD cases. Thus, a multifactorial approach towards ASD risk may serve as a more appropriate perspective in the study of the aetiology of ASD. Finally, identification of environmental factors for autism during pregnancy carries clinical implications in terms of primary prevention. Hence, it is imperative to focus of prenatal, perinatal events as risk factors for ASD.

Various risk factors were studied to elucidate their risk towards ASD aetiology, wherein disruptions and disorders of pregnancy, significantly higher incidence of bleeding during pregnancy (Brimacombe et al. 2007; Juul-Dam et al. 2001), breech presentation and low Apgar scores (Larsson et al. 2005), threatened abortion (Hultman et al. 2002), cesarean delivery (Glasson et al. 2004; Hultman et al. 2002) and gestational age at birth<35 weeks (Larsson et al. 2005) or <37 weeks (Brimacombe et al. 2007; Williams et al. 2008b) were predominant. Prenatal exposures to thalidomide, rubella, and daily smoking in early pregnancy were also reported to be associated with an increased risk of ASD (Hultman et al. 2002; Rodier et al. 1996; Stromland et al. 1994). Higher risk for autism has been noted with the presence of one or more unfavorable obstetric events (Bolton et al. 1997; Bryson et al. 1988; Deykin and MacMahon 1980; Finegan and Quarrington 1979). Both advanced paternal age (Durkin et al. 2008; Reichenberg et al. 2006; Shelton et al. 2010) and advanced maternal age (Bilder et al. 2009; Durkin et al. 2008; Shelton et al. 2010; Williams et al. 2008b) also have been reported to be associated with increased risk of ASD. However, the literature is not always consistent with regards to which specific prenatal and perinatal risk factors are associated with ASD.

Out of the various risk factors studied globally, relevant ones pertinent to Indian population are;

1. **Parental factors:** Consanguineous marriages, advanced maternal and paternal age at the time of child birth, maternal hormonal interventions before conception, conditions like thyroid malfunction and polycystic ovarian syndrome were analysed.
2. **Prenatal characteristics:** Conditions during pregnancy like gestational diabetes, high blood pressure, gestational infections like Urinary tract, Gastrointestinal and Respiratory tract infections, fetal distress inducing conditions like amniotic fluid loss, bleeding during gestation and other suboptimal intrauterine conditions were studied.
3. **Perinatal characteristics:** Labor characteristics like Induced or prolonged labor, Pre-mature membrane rupture; Breech presentation, Nuchal cord, and delivery types including forceps or vacuum suction mediated delivery were analyzed in the study.
4. **Neonatal characteristics:** These included the birth weight and gestational term, birth asphyxia, delayed birth cry, neonatal jaundice, eczema and seizures immediately after birth.

Apart from typical symptoms, children with ASD also show presence of comorbid conditions like Attention deficit/ hyperactivity, eating disorders, anxiety, depression, aggression, self-injury, abnormal sleep patterns etc. (Matson &Nebel-Schwalm, 2007) which often lead to behavioral problems (Leyfer et al., 2006).

ASD IN INDIAN SCENARIO

- Autism is becoming a growing challenge in developing countries like India as well, and the earlier notion of it being uncommon is no longer justified.
- It poses a much greater and serious challenge in countries like India, because of the severity of the impact on the affected individuals and their families, along with the economic burden that it imposes coupled with lack on scientific know how about the disorder (Daley, 2004).
- Due to lack of awareness about the condition, often, misdiagnosis or inclusion of ASD under the general category of mental retardation and/or speech and language disorders is commonly noticed (Singhi&Malhi, 2001).
- India is country with various regional, religious, social and economic populations. Evaluation of ASD in India is important due to various reasons like a) higher rate of inbreeding in population, b) economic burden imparting stressful life which in turn is contributing to imbalances in hormonal levels in women, c) unavailability of epidemiological data about ASD and d) lack of awareness about the disorder.

- Consanguineous marriages are prevalent among Indian families. Various studies consistently implicate a risk of medical complications associated with consanguineous marriages like increased risk of adverse perinatal outcomes including
- *Stillbirths* (Hussain, Bittles, & Sullivan, 2001; Khoury&Massad, 2000; Stoltenberg, 1999),
- *Low birth weight* (LBW)(Benson, 2005; Hussain et al., 2001; Jordan, 2007; Khalid, Ghina, Fadi, &Fadi, 2006; Khoury&Massad, 2000; Mumtaz et al., 2007; Sezik, Ozkaya, Sezik, Yapar, &Kaya, 2006; Stoltenberg, 1999).
- *Preterm delivery* (Al-Eissa&Ba'Aqeel, 1994; Mumtaz et al., 2010),
- *Apnoea of prematurity* (Tamim, Khogali, &Beydoun, 2003),
- *Infant and child mortality* (Bittles& Black, 2010),
- *Congenital birth defects and malformations* (LutfiJaber et al., 2005).

Apart from these the risk that an autosomal recessive disorder for a progeny of a consanguineous union is also well characterized (Bittles, 2008). ASD is reported to involve high susceptibility genes and if such genes have autosomal recessive manner of transmission then could be a contributing factor. *But there has been no study done to assess the role of consanguinity and ASD.*

Research reports on epidemiology of ASD from India are not available (Sharan, 2006). According to March of Dimes, fetal distress inducing conditions and complications during labor are documented to be prevalent with significant impact on survival and development of children in India (March of dimes, 2012; NFHS -3., 2007; Singh et al, 2007; Kumar et al, 1996). Mental stress among Indian women due to the race of economic survival in the society, in turn, has reflected in imbalances in hormonal levels, menstrual cycle, infertility treatments, stressful pregnancies (UNICEF, 2006), and probable risk of ASD.

Managing ASD becomes much more difficult when there is association of comorbid conditions like Attention deficit/ hyperactivity, eating disorders, anxiety, depression, aggression, self-injury, and abnormal sleep patterns etc., which are not accounted by ASD diagnosis itself. ASD is a pervasive condition which requires a wide array of services like health & educational (Daley, Singhal, & Krishnamurthy, 2013). Knowledge about these conditions in India is important due to (i) existence of cultural beliefs which sometimes delays ASD diagnosis (ii) the absence of enough intervention services and service providers in India (iii) availability of nominal funding services, concessions or benefits from the Government of India (Aluri&Karanth, 2002; Gupta &Singhal, 2005). *There are no reports available in India regarding the comorbid conditions associated with ASD.*

Presence of comorbid condition is the major contributor for parental agony due to behavioural issues. These conditions are sometimes intertwined with each other. Reports suggest that perception of safer usage of ayurvedic medicines are encouraging parents to opt for these alternate medicine for the treatment of comorbid conditions (Hanson et al., 2007). Herbal medicines are administered as part of ayurvedic treatment and no published literature is available regarding the herbal medication given to children with ASD.

PRAXIS SKILLS IN ASD

Difficulty interacting appropriately with individuals and the environment is one of the hallmarks of the diagnosis of autism. The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorder (4thed, text rev.; APA, 2000), lists qualitative impairment in reciprocal social interaction, impairment in communication and a markedly restricted repertoire of activities and interests as major criteria of the disorder. Descriptive criteria under these headings include several difficulties that can be related to deficits in praxis and that can also severely affect the ability of children with autism to engage in productive play activities. Socially, these children may exhibit impaired or inappropriate nonverbal interaction, , lack of spontaneous interaction and diminished social-emotional reciprocity. The preoccupation with the objects and specific interests, engagement in stereotypical activities and general lack of flexibility present distinct barriers to the reciprocal interaction.

COMPONENTS OF PRAXIS

The process of praxis is hypothesized to include several defined steps (Ayres, 1972). The first of these is ideation or the ability to grasp the idea or concept that will allow purposeful interaction will the environment. From the idea, a plan is formulated that is meant to lead to an adaptive response. During the formulation of plan, a process called feed-forward sends a copy of the plan forward to compare it to sensory information and to detect motor errors.

Through this process, the plan can be corrected before the action is completed. Finally, the plan is executed or carried out. Throughout the ideation, planning and execution steps of the praxis process, internal and external feedback loops compare actual performance with the plan. Feedback information is then used to formulate future plans of action. The integration of information from all sensory system is a critical component of all steps of this process (Szklut&Trecker, 1996)

IDEATION

Ayres (1985) described ideation as an important component of praxis; "to do things one first needs the idea of doing them". Ideation or conceptualizing motor plan, involves visualizing and imagining the intentional actions or sequence of actions. Ideation may also involve creativity, but where as one can be creative without ever doing everything, ideation is goal directed and involves active interaction with the environment (May-Benson, 2001). Although cognitive figures prominently in ideation, this process is also dependent on sensory integration. An ability to integrate information from the senses, leading to an understanding of the body and what it can do, is essential in order to formulate ideas for motor plans (Ayres, 1985).

Ideation frequently is a significant problem for children with ASD. A difficulty interpreting cues from the environment limits the possibilities to initiate motor plans. Many children with autism are attracted to objects by their particular qualities and not by their affordances for action. Difficulty forming a visual percept of an object and abstracting its potential uses (Ayres, 1979) can lead to play that is stereotypical and repetitive rather than representational.

Repetitive play limits exploration with the environment, thereby further decreasing the possibilities for ideas. In addition preoccupation with objects severely limits meaningful interaction. Children with autism frequently

have significant problems modulating sensory information. Modulation refers to the nervous system's ability to regulate sensory input to maintain homeostasis. A difficulty in this area may "manifest itself as either lack of responsiveness or an exaggerated reaction to sensory stimuli" (Ornitz, 1974). Modulation directly affects arousal level. To attend, concentrate and performe tasks in a manner suitable to the situational demands, ones nervous system must be in an optimal state of arousal (Wiliams&Shellenberer, 1995). Children with autism then may have difficulty assessing ideas because they may experience major fluctuations in arousal level that are brought on by over or under sensitivity to sensory input.

Difficulties with sensory discrimination, or the ability to use sensory information for skilled activity can affect ideation. Creating an effective course of action depends on the ability to integrate sensory information (Paillard, 1982). Children with autism who have ideational difficulties may have problems with transition. A child who does not easily generate ideas may not be able to visualize the next activity in his/her mind. He / she become anxious and insist on remaining with the current familiar activity. The ability to understand temporal concepts may be diminished, which can further compound the situation.

PLANNING AND SEQUENCING TASKS

Effective processing of sensory information, in addition to being critical for ideation, is critical for planning. Difficulties in both sensory modulation and sensory discrimination can severely affect the formulation of effective motor plans. Ayres (1979) explained that during normal development humans build an immense library of neural memories that contribute to the formation of body percept. Our body percepts consist of "maps" of every body part. As a child moves and does things he/she stores countless bits of sensory information. The more variations of movement the child performs, more accurate his/her body maps will be. The brain can refer to its body percept to plan movements in much the same way as a person uses map to navigate a journey. The more accurate the maps, the more able is to navigate unfamiliar body movements (Ayres, 1979)

The social difficulties seen in children with diagnoses on the autism spectrum also affect the ability to formulate motor plans. Problems with joint attention or sharing time with others have a considerably negative effect on motor planning (Charman et al., 1997). The rigidity, lack of flexibility and intense desire for sameness (Damasio& Maurer, 1978) that are often seen in children with autism also affect the ability to easily interact with a group of peers. Young children change their play ideas frequently. When a child has difficulty quickly planning responses, "keeping up" may be impossible to do. These children may become angry and frustrated and may eventually avoid group activities, opting instead for solitary play of their own choosing.

IMITATION

Imitation is a building block for conceptualizing ideas and for formulating effective motor plans. A child may be able to perceive an action but may be unable to plan effective movements to actually accomplish the action. Imitation is often bridge between perception and action. Children who have difficulties in planning and whose imitation is also impaired may not be able to make this connection. Imitation is appears to be a base for both early friendship and early pretend play. Play at an early age may use imitation as the language of friendships (Whaley & Rubenstein, 1994).

Children with autism may have difficulty either with the ability to visually remember motor actions or with the ability to transfer information from a visual stimulus to the motor system (De-Myer et al., 1972). Imitation is extremely difficult for many children with autism. In multiple studies, these children have been shown to be impaired in imitation of actions, oral imitation and imitation with objects as well as imitating expressions and gestures (Charman et al., 1997). Some of the social difficulties seen in children with autism may, in part, be caused by deficits in imitation and motor planning. Particular problems have been observed when children with autism attempt to imitate tasks that have several parts, such as dressing and feeding a doll (Libby, Powell, Messer & Jordan, 1997). Although an abundance of research suggest that children with autism have difficulty with imitation, it is unclear whether poor praxis is basis for these difficulties.

FEEDBACK

Throughout the praxis process, the nervous system uses internal and external feedback to correct and refine motor plans both during the action and after it has occurred. Again, efficient processing of sensory information is critical to the effective use of various forms of feedback. Internal feedback is important in correcting a motor plan before the action occurs. Ayres (1979) believed that active, self directed movement produces strong signals in the brain, increasing the amount of internal feedback.

When children with autism avoid movement because of an overloaded nervous system, or when they spend much of their time engaging in repetitive activities, they may be losing opportunities to develop internal feedback mechanism. Without these mechanisms, effective motor planning is compromised. In addition, the difficulties in sensory perception that have been documented in children with autism (Garden, 1995& Huebner, 1992) may result in misinterpretation of external or production feedback that compromise future motor planning.

EXECUTION

Ayres (1985) believed that execution was not the primary area of difficulty for children with dyspraxia. However through observations of execution, deficits in ideation, planning and feedback become evident. Although qualities that interfere with execution, such as reduced muscle tone and postural instability as well as poor hand strength and dexterity are often seen in children with developmental dyspraxia, most of these children have "close to normal neuromotor skill" (Ayres, 1985).

In children with autism, once a motor act is conceived and planned, the execution of the motion may be normal or close to normal. Some children with autism do, however demonstrate differences in movement that can compromise execution (Damasiv& Maurer, 1978). These movement differences appear to be strongly related to the symptoms of autism and cannot be attributed to pathological muscular conditions. Individuals with autism and cannot be attributed to pathological muscular conditions. Individuals with autism often have difficulty initiating and sustaining movements. The abilities to smoothly combine different actions and to quickly change a motion to accommodate to a new situation may be problematic. The ramifications of these difficulties

are seen in simple movements such as facial expression, hand gestures and motions that are necessary for appropriate communication within environmental context. Abnormal postures, delayed motor responses, stereotypical and repetitive movements, facial grimacing, unusual gait patterns, under and over reactivity and other movement differences appear to interfere not only with execution but also with the broader definition of praxis (Leary& Hill, 1996).

SOCIAL SKILLS

Every child experiences social difficulties at some time. It is not uncommon to struggle with making and keeping friends, to experience teasing, to have trouble fitting in with groups, or to misunderstand the unwritten social rules of the classroom or play ground. Socially competent children learn the cues that characterize interactive situations, and they learn to react accordingly. When they make awkward social moves, they generally are able to draw from experience and use coping strategies to get through those situations. Children with an autism spectrum disorder (ASD), however have difficulty picking up the social nuances of interactions. They often are unable to grasp informal rules of social interactions. Their ability to generalize information and predict social behaviour based on experience can be limited. To those children, social interactions can be mysterious or confusing, and their attempts to interact with others can be met with indifference, teasing or bullying.

The social domain influences a child's ability to successfully function in almost every situation. Occupational therapy, as a profession that promotes engagement in occupation to support participation in contexts (AOTA, 2002), must consider the relevance of social skills in occupational performance, the development of friendships and the resultant quality of life.

IMPORTANCE OF DEVELOPING SOCIAL SKILLS

The development of social skills in children frequently taken for granted. Hartrup (1992) suggested that the ability to get along with other children is the single best indicator of adult success more than academic ability, intelligence, or classroom behavior. Children who are seen by peers and teachers as socially and emotionally positive are more accepted by others. The social acceptance a child experiences is an indicator of current and future academic success. Children who are seen as able to interact effectively, who have good behavior and who use positive coping skills acquire a reserve of positive feelings from peers and teachers. Those who are seen as having poor interactional and coping skills compile a reserve of negative feelings and expectations (Ladd, Birch & Buhs, 1999). Attributes such as positive outlook, independence, empathy, humor, the ability to solve problems, the ability to handle negative emotions and fairness are viewed favorably by others (Cassidy & Asher, 1992).

As children move from preschool to elementary school, they begin to engage in more complex play, to develop and maintain friendships and to learn about the importance of peer groups. They move away from the social support and understanding of their families and begin to develop self concept, based in large part on how they compare with other children. This is a continuous and dynamic cycle of gauging themselves by how closely they meet the standards of the peer group. At the same time, those children are being observed and measured by their peers to determine how well they fit with the group. As children mature, more and more of their time is spent in the company of other children. For those who struggles socially, there is little respite from the social demands of others (Cassidy & Asher, 1992; Havinghurst, 1973).

SOCIAL SKILLS AND THE ASDs

Children with an ASD can have significant difficulty acquiring developmental social abilities and socialization is often an area of great concern for them and their families (Kraijer, 2000; Hogan & Brown 1999). Restall& Magill Evans (1994) state that, "children with autism may frequently receive feedback that their social participation does not meet the expectations of their environment or the standards of their peers. This may lead to a decreased desire to engage in play activities that require social participation. The result is a negative cycle in which the children do not avail themselves of opportunities to practice the skills they need. Play provides a medium through which children develop skills, experiment with roles and interact with others. Difference between the play of children with autism and children who are developing normally suggest that children with autism are disadvantaged in their use of play for these purposes.

Stone and Lemanck (1990) studied the patterns of deficits in play skills in children with autism. Their work involved children with autism and children with similar developmental levels who either were developmentally disabled or were developing typically. The study group's children were less likely to show interest in other children, to imitate the movements of other children, to play cooperatively for 2-10 minutes, to engage in simple make-believe activities, to play simple group games, to join in play with other children, or to follow rules in simple games. Those results suggest that the play patterns are specific to autism and "reveal circumscribed areas of difficulty for children with autism relative to other children at comparable developmental levels". Many children with an ASD are interested in other children. This interest can range from engaging in onlooker play, to wanting friends and not knowing how to initiate or sustain friendship, to having friends but struggling to keep them because of odd or inadequate social skills. Children with ASD sometimes actively alienate other children but do not understand why. They might interpret what is said too literally and misunderstand implied language. They might not regard or understand nonverbal cues, including facial expression. Children with autism have difficulty scanning faces and recognizing emotions, particularly self conscious emotions of embarrassment or shame (Bormann- Kischkel, Vilsmeier& Baude, 1995) Spoken and unspoken communication, proficiency with an interest in a range of activities and skill in social interactions are major developmental areas that enable and motivate children to engage with others. Because children with an ASD can interact in odd ways, have difficulty communicating effectively or seem to ignore others, some observers might assume that they have no awareness of being excluded. Although some children do lack awareness, many higher functioning children are actually aware of social rejection, difficulties and differences. They often lack the ability to change that situation, however certainly, social difficulties become more complicated by odd or socially inappropriate behaviors. Poor social skills also can have long term effects on independence and on making the transition into adult life (Freeman, 1991).

THEORETICAL BASIS OF DEFICITS

There are many theories about the basis of the social deficits seen in people with an ASD, and research has been done to explore the extent, manifestation and biologic basis of social deficits in children with autism and Asperger's syndrome.

Theory of mind

One useful model for conceptualizing the particular social deficits evidenced by children with an ASD is the theory of mind construct (Baron – Cohen, Leslie, & Frith, 1985, Heerey et al., 2003) which refers to one's ability to understand that other people have thoughts, beliefs and feelings and that are separate and different from one's own. Typically developing children acquire this understanding around the age of four.

The inability to take the perspective of another person can lead to behaviors that appear odd or insensitive, demonstrating some or all of the following characteristics (Jordan & Powell, 1995);

- Limited ability to predict what another person will do next or to understand another person's intention and motives; problems understanding that other people might deceive or try to fool someone.
- Limited ability to explain one's behavior as it relates to a social situation as well as difficulty understanding and predicting how another person might react to one's own behavior in that situation.
- Limited ability to understand and label emotions in oneself and others.
- Poor ability to understand social signals in facial expression or body language.
- Limited use of facial expressions and body language to convey feelings to others.
- Limited ability to apprehend what information someone else is likely to have already, which leads either to providing no supporting information or to providing background information in exacting excessive detail.
- Difficulty perceiving and monitoring another person's interest in what one has to say.
- Focus on a single area of particular interest, to the exclusion of all other interactions or available information.
- Difficulty with taking turns in conversation.
- Poor social use of eye contact; and
- Difficulty understanding pretend play or abstract references.

Children with an ASD can exhibit those characteristics to some greater or lesser degree, and it is crucial to understand that those children do not intentionally behave in socially inappropriate ways. They simply do not understand the basic methods of effective social interaction.

Executive functioning

Another useful model of examining social difficulties is called *executive functioning* or execution of higher level, goal directed abilities related to frontal lobe functions such as planning, sequencing, cognitive flexibility working memory and monitoring and cassation of inappropriate behavior. Deficits in executive functioning have been shown to hamper the ability of many children with an ASD to communicate, to have successful social interaction with other children or to engage in play activities (Gillotty et al., 2002).

A person with executive functioning deficits might do extremely well with familiar tasks performed in familiar surroundings but would have great difficulty with combinations of activities that might be new or abstract or that takes place in unfamiliar surroundings.

Social situations are particularly difficult for a person with executive functioning deficits. Such a person would be likely to struggle with flexibly and intuitively interpreting, predicting and forming responses to the range of facial expressions, body language, tone of voice and topics of conversation that would occur during typical interactions with others (Hughes, Russell & Robbins, 1994)

5. REVIEW OF LITERATURE

This chapter reviews available literature in order to obtain an understanding of the praxis patterns and social participation skills present in children with ASD. This section presents a brief review of some of the research done in the area of praxis patterns in children with ASD, social participation skills in ASD children and scales used to measure praxis and social participation in ASD children.

Maninderjit Kaura et al., in their study **Comparing motor performance, praxis, coordination, and interpersonal synchrony between children with and without Autism Spectrum Disorder** (2018) used a comprehensive set of measures to compare gross and fine motor, praxis/imitation, motor coordination, and interpersonal synchrony skills across three groups of children between 5 and 12 years of age: children with ASD with high IQ (HASD), children with ASD with low IQ (LASD), and typically developing (TD) children. They used the Bruininks-Oseretsky Test of Motor Proficiency and the Bilateral Motor Coordination subtest of the Sensory Integration and Praxis Tests to assess motor performance and praxis skills respectively. Children were also examined while performing simple and complex rhythmic upper and lower limb actions on their own (solo context) and with a social partner (social context). Both ASD groups had lower gross and fine motor scores, greater praxis errors in total and within various error types, lower movement rates, greater movement variability, and weaker interpersonal synchrony compared to the TD group. In addition, the LASD group had lower gross motor scores and greater mirroring errors compared to the HASD group. Overall, a variety of motor impairments are present across the entire spectrum of children with ASD, regardless of their IQ scores. Both, fine and gross motor performance significantly correlated with IQ but not with autism severity; however, praxis errors (mainly, total, overflow, and rhythmicity) strongly correlated with autism severity and not IQ. The study findings highlight the need for clinicians and therapists to include motor evaluations and interventions in the standard-of-care of children with ASD and for the broader autism community to recognize dyspraxia as an integral part of the definition of ASD.

Danielle McAuliffea et al., in their study **Dyspraxia in ASD: Impaired Coordination of Movement Elements** (2017) hypothesized that the simultaneous execution of multiple movement elements is especially impaired in affected children. They examined 25 school-aged participants with ASD and 25 age-matched controls performing seven simultaneous gestures that required the concurrent performance of movement elements and nine serial gestures, in which all elements were performed serially. There was indeed a group × gesture-type interaction ($p < 0.001$). Whereas both groups had greater difficulty performing simultaneous than serial gestures, children with ASD had a 2.6-times greater performance decrement with simultaneous

(vs. serial) gestures than controls. These results point to a potential deficit in the simultaneous processing of multiple inputs and outputs in ASD. Such deficits could relate to models of social interaction that highlight the parallel-processing nature of social communication.

Susanne Smith Roley et al., in their study **Sensory Integration and Praxis Patterns in Children With Autism** (2015) sought to characterize sensory integration (SI) and praxis patterns of children with autism spectrum disorder (ASD) and discern whether these patterns relate to social participation. They extracted Sensory Integration and Praxis Tests (SIPT) and Sensory Processing Measure (SPM) scores from clinical records of children with ASD ages 4–11 yr (N 589) and used SIPT and SPM standard scores to describe SI and praxis patterns. Correlation coefficients were generated to discern relationships among SI and praxis scores and these scores' associations with SPM Social Participation scores. The findings suggest that children with ASD characteristically display strengths in visuopraxis and difficulties with somatopraxis and vestibular functions, which appear to greatly affect participation.

Stefanie C. Bodison in her study **Developmental Dyspraxia and the Play Skills of Children With Autism** (2015) sought to investigate the impact of developmental dyspraxia on the play skills of children with autism spectrum disorder (ASD). The praxis abilities of 32 children with ASD (mean age 5 7.5 yr) were assessed using two subtests of the Sensory Integration and Praxis Tests and the Planning and Ideas domain of the Sensory Processing Measure Home Form. Play and leisure skills were measured with the Vineland Adaptive Behavior Scales, Second Edition. Utilizing correlation coefficients, we investigated the relationship between developmental dyspraxia and the play skills of children with ASD. The results found that Children with ASD demonstrated definite dysfunction in imitative praxis abilities, the generation of ideas, and participation in age-appropriate play and leisure activities. Praxis problems in children with ASD greatly affect their successful participation in play and leisure activities.

Sudha. M. Srinivasan et al., in their study **The Effects of Rhythm and Robotic Interventions on the Imitation/Praxis, Interpersonal Synchrony, and Motor Performance of Children with Autism Spectrum Disorder (ASD): A Pilot Randomized Controlled Trial** (2015) assessed the effects of three interventions, rhythm, robotic, and standard-of-care, on the imitation/praxis, interpersonal synchrony, and overall motor performance of 36children with Autism Spectrum Disorder (ASD) between 5and 12years of age in their study. Children were matched on age, level of functioning, and services received, prior to random assignment to one of the three groups. Training was provided for 8 weeks with 4 sessions provided each week. They assessed generalized changes in motor skills from the pretest to the posttest using a standardized test of motor performance, the Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition (BOT-2). They also assessed training-specific changes in imitation/praxis and interpersonal synchrony during an early and a late session. Consistent with the training activities practiced, the rhythm and robot groups improved on the body coordination composite of the BOT-2, whereas the comparison group improved on the fine manual control composite of the BOT-2. All three groups demonstrated improvements in imitation / praxis. The rhythm and robot groups also showed improved interpersonal synchrony performance from the early to the late session. Overall, socially embedded movement-based contexts are valuable in promoting imitation/praxis, interpersonal synchrony, and motor performance and should be included within the standard-of-care treatment for children with ASD.

Ting Liu et al., conducted a study on **Gross Motor Performance by Children with Autism Spectrum Disorder and Typically Developing Children on TGMD-2** (2014) to examine the gross motor skill performance using the Test of Gross Motor Development-2 (TGMD2) on children with autism spectrum disorder (ASD) and their age matched peers (5-10 years). A total of 21 children with ASD (M=7.57 years) and 21 age matched typically developing children (M=7.38 years) participated in this study. TGMD-2 is a standardized test to assess 12 gross motor skills for children. All study participants completed the TGMD-2 assessments. The results shows that, for the loco motor subtest, 67% children with ASD received poor standard scores and 40% of scores were very poor. About 60% children with ASD had poor standard scores and 33% of scores were very poor on object control skills as described in the TGMD-2 manual. For overall gross motor quotient scores, 81% children with ASD were below 79 and classified as poor and about 76% children scored below 70 and received very poor rating. A MANOVA analysis revealed significant performance difference between children with ASD and typically developing children ($p<.01$).

Gael I.Orsmond et al., in their study **Social Participation Among Young Adults with an Autism Spectrum Disorder** (2013) examined rates of participation in social activities among young adults who received special education services for autism (ASD group), compared to young adults who received special education for intellectual disability, emotional/behavioral disability, or a learning disability. Young adults with an ASD were significantly more likely to never see friends, never get called by friends, never be invited to activities, and be socially isolated. Among those with an ASD, lower conversation ability, lower functional skills, and living with parent were predictors of less social participation.

Ho Yee Wan and Yvonne in their study **Praxis performance in children with high functioning autism and Asperger's Syndrome** (2012) aimed to compare the praxis performance of children with AS/HFA with typically developing children, using three tests on Praxis from the Sensory Integration and Praxis test (SIPT). A total of 48 children between age 5 and 8 years were recruited from mainstream schools and social rehabilitation services agencies. The 24 pairs of participants in the HFA/AS and normal developing groups were matched using age and gender. Tests of Postural Praxis, Sequencing Praxis and Praxis to Verbal Command from SIPT were administered to them. t-test was used to analyze the difference in performance of praxis between these two groups of children. Pearson correlation coefficient was used to explore the relationship between age and praxis performance of these two groups of children. Result showed that HFA/AS group has significantly lower scores on all 3 praxis tests than the control group. It suggests that children with HFA/AS have significant deficits in praxis. However, there was no significant correlation between age and praxis performance in HFA/AS, which could be due to small sample size and the narrow age range of children recruited in this study. The result suggested that early and comprehensive

motor assessment, including the use of formal praxis assessment, should be administered to children diagnosed with Autistic Spectrum Disorder.

Lindsey K. MacNeil and Stewart H. Mostofsky in their study **Specificity of Dyspraxia in Children with Autism** (2012) explored the specificity of impaired praxis and postural knowledge to autism by examining three samples of children, including those with autism spectrum disorder, attention-deficit hyperactivity disorder, and typically developing children. Twenty-four children with ASD, 24 children with ADHD, and 24 TD children, ages 8– 13, completed measures assessing basic motor control (the Physical and Neurological Exam for Subtle Signs; PANESS), praxis and the ability to recognize correct hand postures necessary to perform these skilled gestures (the Postural Knowledge Test; PKT). The results suggest that Children with ASD performed significantly worse than TD children on all three assessments. In contrast, children with ADHD performed significantly worse than TD controls on PANESS but not on the praxis examination or PKT. Furthermore, children with ASD performed significantly worse than children with ADHD on both the praxis examination and PKT, but not on the PANESS. The findings suggest that impaired formation of perceptual-motor action models necessary to development of skilled gestures and other goal directed behavior is specific to autism; whereas, impaired basic motor control may be a more generalized finding.

Stefanie Bodison and Terrence D Sanger in their study **Exploring the sensory basis of developmental dyspraxia in children with Autism Spectrum Disorder** (2012) documented that between 80 and 94% of children with ASD have some kind of sensory abnormality and while there is little consensus regarding the pattern of these sensory deficits, it is theorized that children with ASD fail to properly develop the ability to integrate, or bind together, multisensory inputs. As reported in the literature and through case reports, some children with ASD have difficulty learning age appropriate complex motor skills suggesting that they may also have some form of developmental dyspraxia. This study sought to explore the relationship between multisensory integration and the development of praxis in children with ASD compared to typically developing children. Through the use of a newly developed behavioural paradigm and several standardized measures of sensory and motor function, results suggest that some children with ASD have difficulty transforming sensory data into motor action, leading to delays in the attainment of complex motor skills.

Roseann C. Schaaf, Joanne Hunt and Teal Benevides in their case report **Occupational Therapy Using Sensory Integration to Improve Participation of a Child With Autism: A Case Report** (2012) describe the changes in adaptive behaviors and participation of 1 child with autism during a 10-wk program of intensive occupational therapy using a sensory integrative approach (OT–SI) following a manualized protocol. This case is part of a larger study examining the efficacy of the OT–SI approach. They found improvement in sensory processing, as measured by the Sensory Integration and Praxis Tests, as well as enhanced participation in home, school, and family activities, as indicated on parent-rated goal attainment scales.

Beth A. Pfeiffer et al., in their study **Effectiveness of Sensory Integration Interventions in Children With Autism Spectrum Disorders: A Pilot Study** (2011) establish a model for randomized controlled trial research, identify appropriate outcome measures, and address the effectiveness of sensory integration (SI) interventions in children with autism spectrum disorders (ASD). Children ages 6–12 with ASD were randomly assigned to a fine motor or SI treatment group. Pretests and posttests measured social responsiveness, sensory processing, functional motor skills, and social–emotional factors. Results identified significant positive changes in Goal Attainment Scaling scores for both groups; more significant changes occurred in the SI group, and a significant decrease in autistic mannerisms occurred in the SI group. No other results were significant.

Connie Kasari, Jill Locke, Amanda Gulsrud and Erin Rotheram-Fuller in their study **Social Networks and Friendships at School: Comparing Children With and Without ASD** (2011) self, peer and teacher reports of social relationships were examined for 60 high-functioning children with ASD. Compared to a matched sample of typical children in the same classroom, children with ASD were more often on the periphery of their social networks, reported poorer quality friendships and had fewer reciprocal friendships. On the playground, children with ASD were mostly unengaged but playground engagement was not associated with peer, self, or teacher reports of social behavior. Twenty percent of children with ASD had a reciprocated friendship and also high social network status. Thus, while the majority of high functioning children with ASD struggle with peer relationships in general education classrooms, a small percentage of them appear to have social success.

Heidi Stieglitz Ham, Angela Bartolo, Martin Corley, Gnanathusharan Rajendran, Aniko Szabo and Sara Swanson, in their study **Exploring the Relationship Between Gestural Recognition and Imitation: Evidence of Dyspraxia in Autism Spectrum Disorders** (2011), explored the relationship between gesture recognition and imitation. Nineteen individuals with Autism Spectrum Disorder (ASD) were compared to a control group of 23 typically developing children on their ability to imitate and recognize three gesture types (transitive, intransitive, and pantomimes). The ASD group performed more poorly than controls on all tasks of recognition and imitation. Higher performance on tests of working memory was associated with increased odds of successful imitation in both groups. Group differences remained even when working memory was statistically controlled for. An association was revealed in the ASD group between pantomime recognition and imitation but a similar association was not identified for intransitive gestures suggesting that recognition alone is not sufficient for imitation success.

Caroline P. Whyatt and Cathy M. Craig in their study **Motor Skills in Children Aged 7–10 Years, Diagnosed with Autism Spectrum Disorder** (2011) used the Movement Assessment Battery for Children (M-ABC2) to assess motor skills in children aged 7–10 years with autism (n = 18) in comparison to two groups of age-matched typically developing children; a receptive vocabulary matched group (n = 19) and a nonverbal IQ matched group (n = 22). The results shows significant general motor impairment in the group with autism. However, sub-analysis of the M-ABC2 revealed that there were only 2 out of 8 subcomponent skills

which showed universal significant specific deficits for the autism group; i.e. catching a ball and static balance.

Erin Rotheram-Fuller et al., in their study **Social Involvement of Children with Autism Spectrum Disorders in Elementary School Classrooms** (2010), seventy-nine children with ASD and 79 randomly-selected, gender-matched peers (88.6% male) in 75 early (K-1), middle (2nd–3rd), and late (4th–5th) elementary classrooms across 30 schools completed social network surveys examining each child's reciprocal friendships, peer rejection, acceptance, and social involvement. Results found that across grade levels, peers less frequently reciprocated friendships with children with ASD than students in the matched sample. While children with ASD were not more likely to be rejected by peers, they were less accepted and had fewer reciprocal friendships than matched peers at each grade level. Although 48.1% of children with ASD were involved in the social networks of their classrooms, children with ASD were more likely to be isolated or peripheral to social relationships within the classroom across all grade levels, and this difference is even more dramatic in later elementary grades. In inclusive classrooms, children with ASD are only involved in peers' social relationships about half of the time, and appear to be even less connected with increasing grade level.

Lauren R. Dowell, M.S et al., conducted a study on **Associations of Postural Knowledge and Basic Motor Skill with Dyspraxia in Autism: Implication for Abnormalities in Distributed Connectivity and Motor Learning** (2010). The goals of this study were: (a) to determine whether dyspraxia in autism is associated with impaired representational ("postural") knowledge, and (b) to examine the contributions of postural knowledge and basic motor skill to dyspraxia in autism. Thirty-seven children with autism spectrum disorder (ASD) and 50 typically developing (TD) children, ages 8–13, completed: (a) an examination of basic motor skills, (b) a postural knowledge test assessing praxis discrimination, and (c) a praxis examination. Children with ASD showed worse basic motor skill and postural knowledge than controls. The ASD group continued to show significantly poorer praxis than controls after accounting for age, IQ, basic motor skill, and postural knowledge. Dyspraxia in autism appears to be associated with impaired formation of spatial representations, as well as transcoding and execution.

Emmanuelle Jasmin et al., conducted a study on **Sensori-motor and Daily Living Skills of Preschool Children with Autism Spectrum Disorders** (2009) to determine the impact of sensori-motor skills on the performance of daily living skills (DLS) in preschool children with ASD. Thirty-five children, 3–4 years of age, were recruited and assessed with a battery of diagnostic and clinical tests. Children showed atypical sensory responses, very poor motor and DLS. Sensory avoiding, an excessive reaction to sensory stimuli, and fine motor skills were highly correlated with DLS, even when cognitive performance was taken into account. Sensori-motor deficits have an impact on the autonomy of children with ASD and interventions should aim at improving and supporting the development of sensori-motor skills.

Elizabeth A. Laugeson et al., in their study **Parent-Assisted Social Skills Training to Improve Friendships in Teens with Autism Spectrum Disorders** (2009) examines the efficacy of a manualized parent-assisted social skills intervention in comparison with a matched Delayed Treatment Control group to improve friendship quality and social skills among teens 13–17 years of age with autism spectrum disorders. Targeted skills included conversational skills, peer entry and exiting skills, developing friendship networks, good sportsmanship, good host behavior during get-togethers, changing bad reputations, and handling teasing, bullying, and arguments. Results revealed, in comparison with the control group, that the treatment group significantly improved their knowledge of social skills, increased frequency of hosted get-togethers, and improved overall social skills as reported by parents.

Ido Green phd, Tony Charman, Andrew Pickles, Susie Chandler and Tom Loucas undertook the study **Impairment in movement skills of children with autistic spectrum disorders** (2008) study to explore the degree of impairment in movement skills in children with autistic spectrum disorders (ASD) and a wide IQ range. Movement skills were measured using the Movement Assessment Battery for Children (M-ABC) in a large, well defined, population-derived group of children (n=101: 89 males, 12 females; mean age 11y 4mo, SD 10mo; range 10y–14y 3mo) with childhood autism and broader ASD and a wide range of IQ scores. Additionally, we tested whether a parent-completed questionnaire, the Developmental Coordination Disorder Questionnaire (DCDQ), was useful in identifying children who met criteria for movement impairments after assessment (n=97 with complete M-ABCs and DCDQs). The results suggest that of the children with ASD, 79% had definite movement impairments on the M-ABC; a further 10% had borderline problems. Children with childhood autism were more impaired than children with broader ASD, and children with an IQ less than 70 were more impaired than those with IQ more than 70. This is consistent with the view that movement impairments may arise from a more severe neurological impairment that also contributes to intellectual disability and more severe autism.

Roseann C. Schaaf, Kathleen McKeon and Nightlinger in their study **Occupational therapy using a sensory integrative approach: a case study of effectiveness** (2007) presents a case report of a child with poor sensory processing and describes the disorder's impact on the child's occupational behavior and the changes in occupational performance during 10 months of occupational therapy using a sensory integrative approach (OT-SI). Retrospective chart review of assessment data and analysis of parent interview data are reviewed. Progress toward goals and objectives is measured using goal attainment scaling. Themes from parent interview regarding past and present occupational challenges are presented.The result suggests notable improvements in occupational performance are noted on goal attainment scales, and these are consistent with improvements in behavior. Parent interview data indicate noteworthy progress in the child's ability to participate in home, school, and family activities.

Scott Bellini et al., in their study **A Meta-Analysis of School-Based Social Skills Interventions for Children With Autism Spectrum Disorders** (2007) examined the effectiveness of school-based social skills interventions for children and adolescents with ASD. Intervention, maintenance, and generalization effects were measured by computing the percentage of non-overlapping data points. The results suggest that social skills interventions have been

minimally effective for children with ASD. Specific participant, setting, and procedural features that lead to the most effective intervention outcomes are highlighted, and implications for school personnel are discussed.

Susan Williams White, Kathleen Keonig and Lawrence Scahill in their review **Social Skills Development in Children with Autism Spectrum Disorders: A Review of the Intervention Research** (2007) summarizes the state of research in group-based social skills training programs for school-age children and adolescents with ASD. All published studies of group social skills interventions between 1985 and 2006 were reviewed, as well as dissertations examining group based social skills intervention programs. To assess the state of the science, a template developed by an NIMH work group was applied to 14 identified studies. Based on this review, the empirical support for this approach is incomplete, but promising intervention strategies were identified.

MA Dziuk et al., in their study **Dyspraxia in autism: association with motor, social, and communicative deficits** (2007) forty-seven high-functioning children with an autism spectrum disorder (ASD), autism, or Asperger syndrome (43 males, four females; mean age 10y 7m, mean Full-scale IQ (FSIQ) 99.4 [SD 1.9], and 47 typically developing controls (41 males, six females; mean age 10y 6m), mean FSIQ 113.8, age range 8–4y completed: (1) the Physical and Neurological Assessment of Subtle Signs, an examination of basic motor skills standardized for children, and (2) a praxis examination that included gestures to command, to imitation, and with tool-use. Hierarchical regression was used to examine the association between basic motor skill performance and praxis performance. Results indicate that dyspraxia in autism cannot be entirely accounted for by impairments in basic motor skills, suggesting the presence of additional contributory factors. Furthermore, praxis in children with autism is strongly correlated with the social, communicative, and behavioral impairments that define the disorder, suggesting that dyspraxia may be a core feature of autism or a marker of the neurological abnormalities underlying the disorder.

Scott Bellini et al., in their study **A Meta-Analysis of School-Based Social Skills Interventions for Children With Autism Spectrum Disorders** (2007)conducted a meta-analysis of 55 single-subject design studies examined the effectiveness of school-based social skills interventions for children and adolescents with ASD. Intervention, maintenance, and generalization effects were measured by computing the percentage of non-overlapping data points. The results suggest that social skills interventions have been minimally effective for children with ASD. Specific participant, setting, and procedural features that lead to the most effective intervention outcomes are highlighted, and implications for school personnel are discussed. Finally, the results are compared to the outcomes of similar meta-analyses involving social skills interventions with other populations of children. The results of this study are consistent with those of previous meta-analyses indicating that social skills interventions are only minimally effective for children with ASD and other social skills deficits.

Deborah Dewey et al., in their study **Motor and gestural performance in children with autism spectrum disorders, developmental coordination disorder, and / or attention deficit hyperactivity disorder** (2006) investigated motor and gestural skills of children with autism spectrum disorders (ASD), developmental coordination disorder (DCD), and / or attention deficit hyperactivity disorder (ADHD). A total of 49 children with ASD, 46 children with DCD, 38 children with DCD+ADHD, 27 children with ADHD, and 78 typically developing control children participated. Motor skills were assessed with the Bruininks–Oseretsky Test of Motor Proficiency Short Form, and gestural skills were assessed using a test that required children to produce meaningful gestures to command and imitation. Children with ASD, DCD, and DCD+ADHD were significantly impaired on motor coordination skills; however, only children with ASD showed a generalized impairment in gestural performance. Examination of types of gestural errors revealed that children with ASD made significantly more incorrect action and orientation errors to command, and significantly more orientation and distortion errors to imitation than children with DCD, DCD+ADHD, ADHD, and typically developing control children. The study concluded that gestural impairments displayed by the children with ASD were not solely attributable to deficits in motor coordination skills.

Stewart H. Mostofsky, Prachi dubey and Vandna K. Jerath in their study **Developmental dyspraxia is not limited to imitation in children with autism spectrum disorders** (2006); praxis in 21 high-functioning children with autism spectrum disorders (ASD) was compared with 24 typically developing controls using a traditional approach in which performance was evaluated through detailed examination of error types. Children with ASD produced significantly fewer correct responses not only during Gesture to Imitation, but also during Gesture to Command and with Tool Use. The pattern of errors in ASD was similar to that of controls with spatial errors being most common in both groups; however, body-part-for-tool errors were more common in children with ASD, suggesting dyspraxia is not entirely attributable to motor deficits. The findings suggest that autism is associated with a generalized praxis deficit, rather than a deficit specific to imitation. In a developmental disorder such as autism, the findings may reflect abnormalities in frontal parietal–subcortical circuits important for acquisition (i.e., learning) of sensory representations of movement and or the motor sequence programs necessary to execute them.

Kelle M. Laushey and L. Juane Heflin in their study **Enhancing Social Skills of Kindergarten Children with Autism Through the Training of Multiple Peers as Tutors** (2000) sought to determine if a peer-initiated procedure that is taught to all peers in a kindergarten class will yield more or less effective results than a proximity approach to peer involvement. This study used an ABAB design to determine if a peer buddy approach in which all students were trained to interact in dyads would increase non-adult-directed interactions. Data collected on the students with autism indicate that the peer buddy approach significantly increased their appropriate social interactions. Follow-up data on one of the students indicates generalization of appropriate social interactions to a new classroom.

Sally Ozonoff and Judith N. Miller in their study **Teaching theory of mind: A new approach to social skills training for individuals with autism** (1995) examined the effectiveness of a social skills training program for normal-IQ adolescents with autism. Five boys participated in the 4 1/2-month treatment condition; four boys matched on age, IQ, and severity of autism constituted the no-treatment control

group. In addition to teaching specific interactional and conversational skills, the training program provided expliciand systematic instruction in the underlying social-cognitive principles necessary to infer the mental states of others (i.e., theory of mind). Pre- and post-intervention assessment demonstrated meaningful change in the treatment group's performance on several false belief tasks, but no improvement in the control sample.

Robert L. Koegel and William D. Frea conducted a study on **Treatment of social behavior in autism through the modification of pivotal social skill** (1993). They examined acquisition of individual social communicative behaviors and generalization across other social behaviors in 2 children with autism. The results of a multiple baseline design showed that the children's treated social behaviors improved rapidly and that there were generalized changes in untreated social behaviors. These improvements were accompanied by increases in subjective ratings of the overall appropriateness of the children's social interactions. The results suggest the possibility of identifying pivotal response classes of social communicative behavior that facilitate the understanding of social behavior in autism as well as improve peer interactions, social integration, and social development.

Jyinn Kern Koiwom et al., in their study **Improving social skills and disruptive behavior in children with autism through self-management** (1992) suggests that children with autism typically are unresponsive to verbal initiations from others in community settings, and that such unresponsiveness can lead to problematic social interactions and severely disruptive behavior. Four children with autism participated in their study. The present study assessed whether self-management could be used as a technique to produce extended improvements in responsiveness to verbal initiations from others in community, home, and school settings without the presence of a treatment provider. The results showed that children with autism who displayed severe deficits in social skills could learn to self-manage responsivity to others in multiple community settings, and that such improvements were associated with concomitant reductions in disruptive behavior without the need for special intervention.

6. METHODOLOGY

➢ Research design

A qualitative study design was adopted for this study.

➢ Sampling

The sample selected for this study was done using convenient method.

➢ Place of the study

The study was conducted in Department of Occupational Therapy, SVNIRTAR; and data was collected from Jewel Autism Centre, Kerala and BRC (SSA) Centre for Autism by Govt. of Kerala, Cherthala, kerala.

- **Selection criteria**

➢ Inclusion criteria :

- Children with ASD who met Diagnostic and Statistical Manual of Mental Disorder – V
- Children between the ages of 5 – 8.11 years
- Children who shows sensory preference on Sensory Profile

➢ Exclusion criteria :

- Children who are not diagnosed with ASD.
- Children who are primarily Mentally retarded.
- Children with any neurological disorder.

- **Tools**

➢ Sensory profile

The Sensory Profile (Dunn, 1999); is a 125 question caregiver completed profile that reports the frequency of the person's response to various sensory experiences. Using a 5 point likert scale, the parents responded to each behavioural statement as follows:

1. Always
2. Frequently
3. Occasionally
4. Seldom
5. Never

➢ Sensory Integration and Praxis Test (SIPT)

The SIPT are a series of 17 tests, standardized on 1997 children ages 4 years to 8 years 11 months, designed to assess visual and tactile perception, visual – motor skills, two and three dimensional construction, vestibular – proprioceptive functions, bilateral motor skills and praxis (Ayres, 1989). Each test has high interrater reliability ($r > 0.90$) and discriminates between typical and atypical samples ($p < 0.01$) (Ayres, 1989). Content validity and construct validity have been established. Each test of the SIPT is administered using visual demonstration in addition to standardized verbal instructions with the exception of praxis on verbal command, which is solely language dependent. A lower SIPT score indicates greater difficulty.

➢ Sensory Processing Measure (SPM)

The SPM is a questionnaire completed by parents or teachers that provides standard scores based on a normative sample of 1051 typically developing children ages 5 – 12 years (Parham & Ecker, 2007). SPM scores provide information about the child's sensory reactive, praxis and social participation. The total sensory scale score is a composite measure of the visual, hearing (auditory processing), touch, body awareness (proprioception)and balance and motion (vestibular processing) scale scores, which primarily measure sensory reactivity within specific sensory systems. The total sensory score also includes items measuring reactivity to taste and smell. The ideas and planning score is a measure of praxis. The social participation score is a measure of child participation. A higher SPM score indicates greater difficulty. Content and construct validity has been established with strong test – retest reliability ($r > 0.93$). Scores from the social participation subscale of SPM Home form were analyzed in the study.

- **Procedure**

In the first step of this study, researcher approached the institution with a permission letter to the concerned authority. After being explained the detailed aims and objectives of the study, the permission has been granted. The subject who were fulfilling inclusion criteria was selected and informal consent was received from parents. The researcher explained about sensory profile and social participation subscale of SPM to the parent. Both the questionnaires were given to the parents and requested to select the appropriate answer. Researcher assessed the praxis skills of the participants by using manual scoring pattern of the postural praxis, praxis on verbal command, constructional praxis, sequential praxis and oral praxis subscale of SIPT. Data was then subjected to statistical

analysis to find out the correlation between the praxis skills and social participation.

7. DATA ANALYSIS & RESULTS

The present study included 100 children with Autism Spectrum Disorder between the age group of 5 years – 8.11 years. The data was collected from the parents and participants by using Sensory profile, Social Participation subscale of Sensory Processing Measure and Postural praxis, Praxis on verbal commands, Constructional praxis, Sequential praxis and oral praxis subscale of Sensory Integration and Praxis Test (SIPT). The score of each scale were subjected to statistical analysis. All the statistical analysis was done using SPSS version 23. Spearman rank correlation coefficient was used to analyze the correlation between praxis skills and social participation among children with ASD.

TABLE – I Demographic characteristics of subjects

Sl no :	Variable	
1	Age	
	Mean age	5.65
	Standard deviation	1.03
2	Gender	
	Male	77
	Female	23

As shown in above table, this study consists of 100 children including 77 boys and 23 girls. The children ranged from 5 to 8.11 years with the mean age of 5.65 years.

TABLE – II SIPT and SPM mean scores and standard deviation.

Sl no:	Scale	N	Mean	SD
1	Social participation	100	66.68	9.59
2	Postural Praxis	100	10.36	6.74
3	Praxis on Verbal Command	100	8.36	5.47
4	Constructional Praxis	100	7.67	4.34
5	Sequential Praxis	100	12.86	10.83
6	Oral Praxis	100	10.32	7.30

Table II depicts the mean T scores of Social participation sub scale of SPM Home form and scores of Praxis subscales of SIPT of 100 children with ASD.

TABLE – III Correlation of Praxis scores and Social participation scores

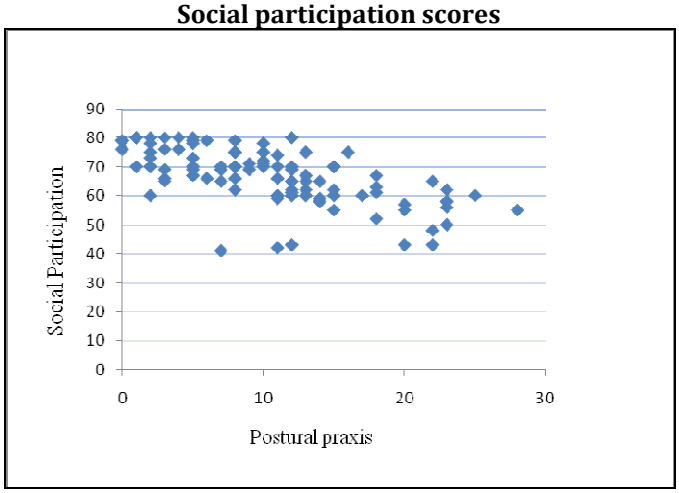
	Social Participation	
	r value	p value
Postural praxis	-.688	0.000
Praxis on verbal command	-.674	0.000
Constructional praxis	-.666	0.000
Sequential praxis	-.530	0.000
Oral praxis	-.630	0.000

Table 3 presents the correlation among the five praxis functions measured by the SIPT and Social participation measured using SPM Home form.

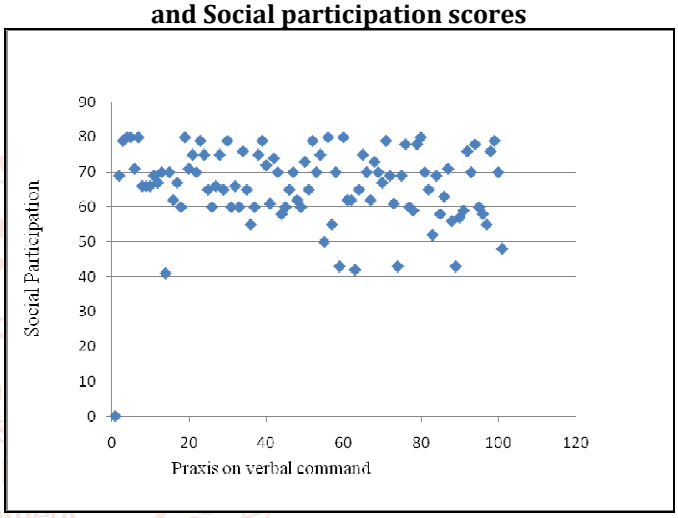
SIPT functions that correlated most strongly with Social participation are Postural praxis (r = -.688; p = .000), Praxis on verbal command (r = -.674; p = .000), Constructional praxis (r = -.666; p = .000) and Oral praxis (r = -.630; p = .000).

Sequential praxis also had a significant correlation with social participation in the moderate range (r = -.530; p = .000).

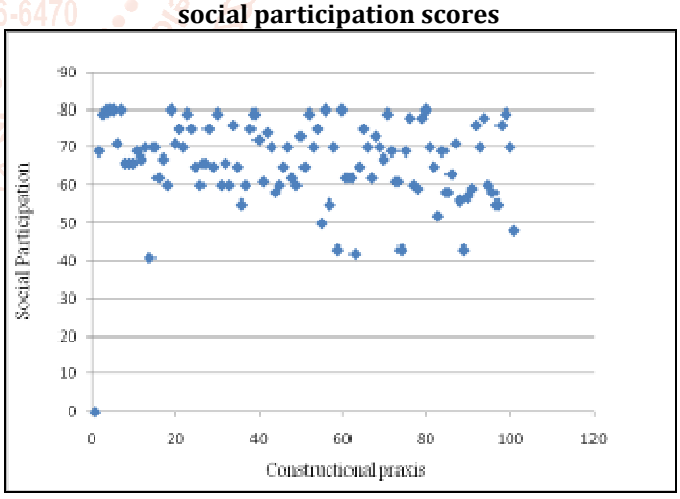
GRAPH – I Correlation of Postural praxis scores and Social participation scores



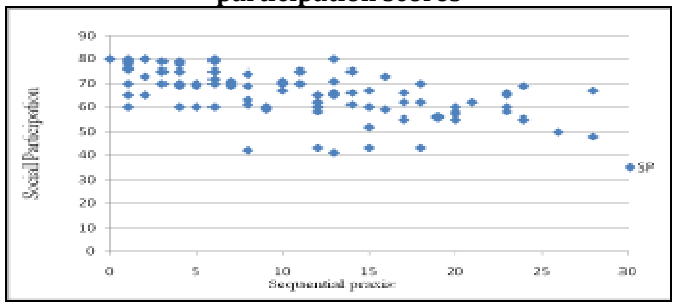
GRAPH – II Correlation of Praxis on verbal command and Social participation scores



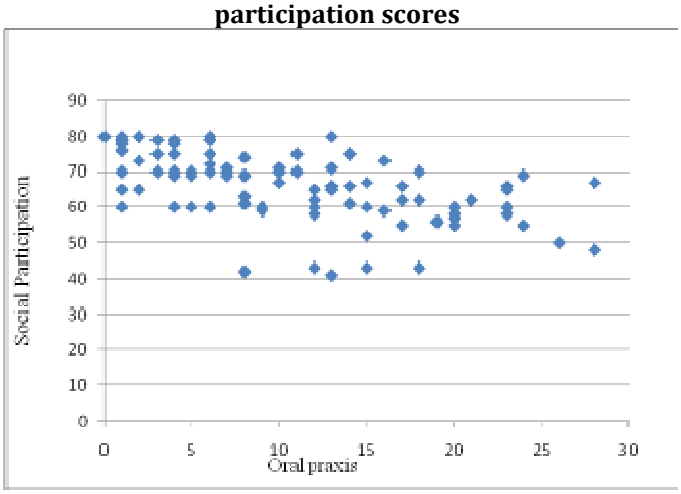
GRAPH – III Correlation of Constructional praxis and social participation scores



GRAPH – IV Correlation of Sequential praxis and Social participation scores



GRAPH – V Correlation of Oral praxis and Social participation scores



8. DISCUSSION

The present study was conducted to find out the relationship between praxis skills and social participation in children with Autism Spectrum Disorders (ASD). The study was conducted in Department of Occupational Therapy, SVNIRTAR and data was collected from Special School and Autism Centre in kerala. The present study included 100 ASD children between the age of 5 – 8.11 years. Data was collected using Sensory profile, Social participation subscale of Sensory Processing measure and praxis subscales of SIPT.

The primary objective of this study was to find out the correlation between praxis patterns and social participation in children with ASD.

In this study praxis subscales of SIPT (Postural Praxis, Praxis on Verbal Command, Constructional Praxis, Sequential Praxis and Oral Praxis) used to measure the praxis skills in ASD children.

The Social participation subscale of SPM (Home) used to measure social participation skills in children with ASD. Parents were asked to recall children's social behavior over recent weeks. The Social participation subscale consists of 12 items. Rating on each item summed to generate a single total score; higher scores indicate more dysfunction in social participation.

Sensory profile used to measure the sensory preferences in daily life of children with ASD. It consists of 125 behavioral statements arranged into 8 categories. Using a 5 point likert scale parents rate their child's sensory responses to each of the behavioral statements.

Table I shows the demographic details of participants. There were 100 children with ASD between the age group of 5 – 8.11 years with the mean age of 5.6 years. In that population 77% were males and 23% were females.

Table III shows the correlation between praxis patterns and social participation in ASD children. In that Postural praxis, Praxis on verbal command, Constructional praxis and Oral praxis show strong correlation and Sequential praxis shows moderate correlation with social participation.

The result is consonant to the study done by Susanne Smith Roley et al., (2015) except the correlation between praxis on verbal command and social participation. They sought to characterize Sensory Integration and praxis pattern of children with ASD and discern whether these pattern relate to social participation. This study concluded that children with characteristically display strength in visuo – praxis and difficulties with somatopraxis and vestibular functions, which appear to greatly affect participation. Social participation at home is primarily associated with imitation praxis. The surprising finding of this study was that Praxis on verbal command showed lower correlations with social participation than imitation praxis.

A low score on Praxis on verbal command indicates that the child has difficulty in interpreting the test's verbal directions to plan postural positions. The problem may be in linguistic processing or in postural praxis or in both. When low Praxis on verbal command accompanied by low Postural praxis, the problem may be in Postural praxis component (Ayres, 1989). Because of this importance of language during social interactions Praxis on verbal command showed stronger correlation with social participation. Children who understand a verbal direction but who cannot plan some or all of the actions given can appear to be inattentive, disorganized or even defiant (Bodison, 2006)

Postural praxis taps a central practic ability common to all of the praxis tests, but especially to Oral praxis, Sequential praxis and Constructional praxis. A score on Postural praxis is often a major indicator of somatodyspraxia. The frequent co-occurrence of visuo – construction defects (as evidenced by low Constructional praxis scores) with a low Postural praxis score illustrates the importance of an adequate body perception and praxis to visually directed, skilled upper extremity use and manipulation of objects.

A child with a low Postural praxis score combined by some somatosensory deficit will probably have trouble with skilled body environmental interactions (Ayres, 1989).

Difficulty with the ability to imitate positions and actions can create significant problems for a student, although it is often missed if not specifically assessed. Within busy classrooms children not only relay on the teachers verbal instructions but also learn to look for gestural cues from the teacher as well as from peers.

Because children are great motivators for one other, those who can imitate easily have the advantage of learning new and novel ways of accomplishing tasks and joining game (Bodison, 2006)

Performance on Constructional praxis can be interpreted as an indication of the child's skills in relating objects to each other in an orderly arrangement and through systematic assembly. A child who performs poorly on the test is apt to have trouble organizing his/her behavior in general and specifically in relating to objects in a manipulative or organizational manner. The cognitive and conceptual demands characteristics of all visuo and somatopractic ability is well assessed by Constructional praxis. Spatial reasoning may be an important aspect of this task.

Constructional praxis is closely associated with Postural praxis, supporting the idea that an adequate body perception is needed for body environment interaction (Ayres, 1989).

Three dimensional construction underlies many craft and play activities as well as the organization of academic projects and group assignments (Bodyson, 2006).

Of all the praxis tests, Oral praxis is most closely related to perception and interpretation of sensations from the body, especially tactile sensation severe deficits would likely

affects speaking, eating and other functions related to oral cavity.

Oral praxis problems are frequently associated with a Postural praxis problem. Poor functional integration of the two sides of the body and poor sequencing also may contribute to low Oral praxis scores (Ayres, 1989).

Like postural praxis, this test helps to identify the ability to copy actions, in this case of the face, mouth and tongue. Because of the child cannot see his/her own actions, performance on the test relies highly on the tactile and proprioceptive perception.

Poor performance is likely to help explain difficulty with articulation in speaking, eating, the ability to make and interpret facial expressions and awareness of food or saliva on the face (drooling). Many of these functions carry special significance for social interactions.

In a busy classroom, children often will need to interpret the subtle facial expressions of their teachers or peers in order to glean cues about what is happening. When one's own oral praxis is poor interpreting others facial actions also may be difficult (Bodison, 2006)

Sequential praxis is often interpreted as measuring a quality that is central to praxis. A low Sequential praxis score in conjunction with a low scores on another praxis test may be interpreted as evidence of somatodyspraxia (Ayres, 1989).

Being able to imitate a series of action is required in many play ground games as well as circle time, sing along activities.

Copying or initiating the correct sequence of actions also is needed for many tasks such as washing and drying hands, tying shoes and completing school projects. (Bodison, 2006)

Play can generally the conceptualized as an enjoyable, self selected activity in which people participate. From an occupational perspective, play is viewed as an occupation in which children engage. Problems with imitation and the conceptualization of novel ways to interact with objects and materials can greatly affect the development of play skills in children with ASD. The praxis difficulties not only influence the child's ability to share in imaginative play or make friends but can substantially alter the child's ability to develop and understand relationships, the description of which comprises the core features of the disorder. (Bodison, 2015).

Development of social communication and interaction involves learning complex motor sequence that parallel those on the praxis examination. The impaired performance of skilled gestures (including social gestures) may contribute to impaired social interaction and communication in ASD. (M A Dzuik, 2007). Hence the identification of praxis deficits in children with ASD can inform the use of safe and effective intervention strategies that have the potential to expand children's social participation.

9. CONCLUSION

The present study was undertaken to determined the correlation between praxis skills and social participation in children with ASD. The researcher arrived at the particular hypothesis by reviewing literature that identified the increased prevalence of praxis deficits and inadequate social skills in ASD children and on examining the studies that implicated the correlation between praxis patterns and social participation.

Empirical findings of this study conform that the social participation is correlated most strongly with postural praxis, praxis in verbal command, constructional praxis and oral praxis. Sequential praxis also shows significant correlation with social participation in moderate range. The present study also supports the existing view that children with ASD manifests impaired praxis skills and social participation skills. In conclusion, despite of some methodological limitation this study provides valuable insight into the correlation between praxis skills and social participation in children with ASD and offers a potential avenue for future research.

10. LIMITATIONS AND RECOMMENDATIONS

Limitations

- In this study only praxis tests have taken for statistical analysis, so manual scoring had done instead of doing computerized analysis.
- As the scales used other than SIPT are an interview method of evaluation, it is not completely reliable.
- Small sample size.
- Age group of sample was very limited.

Recommendations

- Study can be done in larger sample size.
- The study can be conducted in adult population.
- Future research should focus on the relationship between sensory preference, praxis skills and social participation.