

EARLY DEVELOPMENTAL BEHAVIORAL TRAJECTORY IN AUTISM SPECTRUM DISORDERS

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MAY, 2014.

CERTIFICATE

This is to certify that this dissertation entitled “**Early Developmental Behavioral Trajectory In Autism Spectrum Disorders**” is a bonafide work submitted in part fulfilment for the Degree of Master of Science (Speech-Language Pathology) of the student (Registration No.: 12SLP021). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any of the University for the Award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled “**Early Developmental Behavioral Trajectory In Autism Spectrum Disorders**” is the result of my own study under the guidance of Dr.Shyamala.K.C, Professor in Language Pathology, Department of Speech Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in other University for the award of any Diploma or Degree.

Mysore

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ಅರ್ಪಣೆ

'ಪ್ರೀತಿ' ಕೊಟ್ಟ ಪ್ರೀತಿಗೆ

'ಬದುಕು' ಕಲಿಸಿದ ಬದುಕಿಗೆ

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Table of Contents

Chapter No.	Contents	Page numbers
	List of Graphs	I
	List of Tables	II
1	Introduction	1
2	Review of literature	11
3	Method	30
4	Results and Discussion	35
5	Summary and Conclusion	71
	References	14
	Appendix	

List of Figures

<i>Figure no.</i>	<i>Title</i>	<i>Page no.</i>
4.1	Frequency of occurrence across each item for pre-natal sub skill	38
4.2	Frequency of occurrence across each item for peri-natal sub skill	39
4.3	Frequency of occurrence across each item for post-natal sub skill	40
4.4	Frequency of occurrence across each item for Gross motor domain	42
4.5	Frequency of occurrence across each item for Fine motor domain	45
4.6	Frequency of occurrence across each item for Emotional domain	48
4.7	Frequency of occurrence across each item for Cognitive domain	51
4.8	Frequency of occurrence across each item for Social domain	54
4.9	Frequency of occurrence across each item for Language (Comprehension) domain	57
4.10	Frequency of occurrence across each item for Language (Expression) domain	57
4.11	Frequency of occurrence across each item for Play domain	65

List of Tables

<i>Graph no.</i>	<i>Title</i>	<i>Page no.</i>
4.1	Frequency of occurrence across each item for pre-natal sub skill	38
4.2	Frequency of occurrence across each item for peri-natal sub skill	40
4.3	Frequency of occurrence across each item for post-natal sub skill	41
4.4	Frequency of occurrence across each item for Gross motor domain	42
4.5	Frequency of crucial gross motor items	44
4.6	Frequency of occurrence across each item for fine motor domain	45
4.7	Frequency of crucial fine motor items	46
4.8	Frequency of occurrence across each item for Emotional domain	48
4.9	Frequency of crucial Emotional items	50
4.10	Frequency of occurrence across each item for Cognitive domain	51
4.11	Frequency of crucial Cognitive items	53
4.12	Frequency of occurrence across each item for Social domain	54
4.13	Frequency of crucial Social items	56
4.14	Frequency of occurrence across each item for Language domain	58
4.15	Frequency of crucial Language items	63
4.16	Frequency of occurrence across each item for Play domain	65
4.17	Frequency of crucial Play items	68

CHAPTER 1- INTRODUCTION

“Everyone is a genius. But if you judge a fish on its ability to climb a tree, it will live its whole life believing it is stupid”-Einstein. And an unknown quote says “Doctors look at me and say I’m autistic. But the fact is... I See things differently. You would be amazed if you had my eyes”.

Autistic disorder, also known as childhood autism, infantile autism, and early infantile autism is a condition where there is a marked and sustained impairment in social interaction, deviance in communication, and restricted or stereotyped patterns of behavior and interest. Abnormalities in functioning in each of these areas must be present by age 3 (Volkmar, Klin & Schultz, 2005).

Pervasive Developmental Disorders (PDDs) are a set of phenomenological related neuropsychological disorders, characterized by patterns of both delay and deviance in multiple areas of development, their onset being typically in the first month of life. (Volkman & Lord, 1998).

PDD is a collection of disorders consist of few common features (Mauk, 1993).

- Impairment in social interaction
- Impairment in verbal and nonverbal communication
- Impairment in imaginative activities
- Limited number of interest and repetitive activities.

Autism spectrum disorders (ASDs) constitute a group of severe disorders of development, disrupting social relationships, communication, play, academic skills, and

usually leading to life-long disability. ASD affects up to 60 children in 10,000 (Baird et al. 2000; Bertrand et al. 2001)

The term pervasive developmental disorders (PDDs) was first implemented to provide a formal diagnosis for individuals who shared critical deficits similar to those associated with autism but who did not meet the full criteria of a diagnosis of autism.

In pervasive developmental disorders there will be either delay or deviance in these aspects like Communication, social and other skills. Since the child with PDD's social interaction will be lacking, the child will show interest in the inanimate objects. This is a typical characteristic of children with PDD.

This includes motor mannerisms (stereotypies), resistance to change, and idiosyncratic interests and preoccupations (Volkmar, Klin & Schultz, 2005).

Epidemiology

Prevalence of Autism Spectrum Disorders

Chakrabarti & Fombonne, 2001

- Country: United Kingdom
- Size of target population: 15,500
- Criteria used: ICD-10 1992
- Prevalence rate (per 10,000): 16.2

Baird et al., 2002

- Country: United Kingdom
- Size of target population: 16,235
- Criteria used: ICD-10 1992

- Prevalence rate (per 10,000): 30.8

Sex ratio

- Studies based on clinical and epidemiological samples have suggested a higher incidence of autism in boys rather than in girls, with ratios reported averaging around 3.5 or 4.0 to 1.
- However these ratios vary as function of intellectual functioning. Some studies reported ratios of up to 6.0 or higher to 1 in individuals with autism without mental retardation, whereas ratios within moderate to severely mentally retarded range have been reported to be as low as 1.5 to 1.
- One possibility for the discrepancy seen in the sex ratio is that males have a lower threshold for brain dysfunction than females, or conversely, more severe brain damage is required to cause autism in a girl. According to this hypothesis when the person with autism is a girl, she is more likely to be severely cognitively impaired.
- Social classes: autism is clearly seen in all social classes and in all countries.

The main problem areas of Autism include Social impairment, Language impairment and behavior concerns. Where social impairment consists of Marked impairment in the use of Multiple nonverbal behaviors to regular social interaction, failure to develop peer relationships appropriate to the developmental level. A lack of spontaneity to share enjoyment, interests or Achievements with other people and Lack of Social or emotional reciprocity.

Language impairment may include delay in, or total lack of the development of spoken language, Marked impairment in the ability to initiate or sustain a conversation despite adequate speech, Stereotyped and repetitive use of Language or Idiosyncratic Language, “Flipping” pronouns, or pronomal Reversal, Echolalia, Repeating or Reciting lines, Having a very literal and concrete use of language and a robotic voice or monotonic voice.

Behavioral issues include encompassing preoccupations with one or more stereotypical and restricted patterns of interests, apparently inflexible adherence to specific, nonfunctional routines or rituals, Stereotypical and repetitive motor mannerisms and Persistent preoccupation with parts of objects.

ASD includes:

1. ***Autism/ Autistic disorder***: It is the most severe extreme along the continuum of the Autism Spectrum Disorders. Autism is a neurobiological disorder of development that causes discrepancies in the way information is processed. This difference in information processing leads to inability to understand and use language to interact and communicate with people, events, objects and environment and learn to think in the same way the typically developing children. Studies revealed that the effects of Autism on learning and functioning can range from mild to severe.
 - A. *Qualitative impairment in social interaction, as manifested by following characteristics:*

- a) Marked impairment in the use of multiple nonverbal behaviors such as eye to eye gaze, facial expression, body postures and gestures to regulate social interaction.
- b) Failure to develop peer relationships appropriate to developmental level.

B. Qualitative impairments in communication as manifested by following characteristics:

- a) Lack of varied, spontaneous make-believe play or believe play or social imitative play appropriate to developmental level.
- b) In individuals with adequate speech, marked impairment in the ability to initiate or sustain conversation with others.

C. Restrictive repetitive and stereotyped patterns of behavior, interests and activities, as manifested by the following characteristics:

- a) Encompassing preoccupation with one or more stereotyped and restricted patterns in interest that is abnormal either in intensity or focus.
- b) Stereotyped or repetitive motor mannerisms (Ex: hand or finger flapping or twisting or complex whole body movements).

2. ***Rett's disorder:*** "Rett syndrome is an X-linked dominant neurological disorder that affects only girls and is one of the most common causes of mental retardation in females".

The hallmark of Rett syndrome is the loss of

- *Purposeful hand use and its replacement with stereotyped hand-wringing.*
- *Screaming, fits and inconsolable crying are common.*

Girls affected with Rett's Syndrome show normal development during first 6-18 months of life followed first by a period of stagnation and then rapid regression in motor and language skills.

Characteristics:

- a) Normal prenatal and perinatal development.
- b) Normal psychomotor development through the first five months after birth.
- c) Normal head circumference at birth.
- d) Deceleration of head growth between ages 5 and 48 months.
- e) Loss of previously acquired purposeful hand skills between ages 5 and 30 months with the subsequent development of stereotyped hand movements.
- f) Loss of social engagement early in the course.
- g) Appearance of poorly coordinated gait or trunk movements.
- h) Severely impaired expressive and receptive language development with severe psychomotor retardation.

3. ***Childhood Disintegrative Disorder (CDD):*** *“Childhood Disintegrative Disorder is a rare condition characterized by a marked regression in multiple areas of development after several years of normal development.”* (Saddock&Saddock, *Comprehensive Text Book of Psychiatry*)

Characteristics:

- a) Normal development for at least first 2 years after birth as manifested by the presence of age appropriate verbal and nonverbal communication, social relationships, play and adaptive behavior.
- b) Clinically significant loss of previously acquired skills.
- c) Abnormalities of functioning in at least two of the following areas.

4. ***Asperger's Syndrome:*** Asperger's syndrome is a relatively new diagnosis in the field of autism and is named after the Austrian pediatrician *Hans Asperger* (1906–80).

Asperger's syndrome is characterized by impairment in social interaction and restricted interests and behaviors as seen in autism. In its early developmental course, it is marked by lack of any clinically significant delay in spoken or receptive language, cognitive development, self-help skills, and curiosity about the environment.

Characteristics:

- a) The disturbance causes clinically significant impairment in social, occupational or other important areas of functioning.
- b) There is no clinically significant delay in language (Ex: single words used by age two years, communicative phrases used by age 3 years).
- c) There is no clinically significant delay in cognitive development or in the development of age appropriate self- help skills, adaptive behavior (other than social interaction) and curiosity about the environment in childhood.

5. ***Pervasive Developmental Disorder- not otherwise specified (PDD-NOS)***: It is a heterogeneous group comprising of those children whose symptoms do not fall neatly into any one of the diagnostic criteria of the ASDs. It has been diagnosed as a sub-threshold category which offers no specific guidelines for diagnosis (Yale Child Study Centre, 2004a). Sometimes it is called as ‘Atypical Autism’.

In Chawarska et al (2006) study, results revealed that there are noticeable differences between PDD-NOS and Autism with respect to Age of Recognition (AOR) and type of first concern. There was poor social-communicative and nonverbal cognitive functioning when the Age of recognition was delayed.

It is challenging to identify Autism at an earlier age, where most of the time children are referred for later evaluation. The parents report Autism around at the age of 17-18 months. (Chawarska et al., 2007). There are also evidences where children are not diagnosed even at the age of 4 or later. It is primarily based on child’s socio-economic status (Gray et al., 2006).

Early detection and subsequent early intervention can lead to substantially better prognosis, including improved language, social relationships, and adaptive functioning, as well as fewer maladaptive behaviors, which increases the chance of successful inclusion in public education (Eaves and Ho, 2004; Harris & Handleman, 2000).

Researchers have indicated that early identification plays a major role in social and behavioral developmental milestones. Landa et al. (2007) found social,

communication, and play behavior in the early-diagnosis group differed from low risk group and typically developing group by 14 months of age.

By 24 months, the later-diagnosis group differed from the non-autism spectrum disorder groups in social and communication behavior, but not from the early diagnosis group.

Limitations for early diagnosis

Earlier identification and diagnosis seems limited by:

- a) Our knowledge about the developmental milestone pattern in children with ASD who will be diagnosed with Autism at a later stage.
- b) Our reliance on conventional classification systems (e.g., DSM-IV; American Psychiatric Association [APA], 1994) based on the "triad" of behaviors (i.e., social, language, and behavioral symptoms) manifested in older children with Autism.

Rationalization for the present study

- There is no literature which had developmental milestones for ASDs.
- There is a need for identifying the crucial factors in the developmental milestones which helps in assessment and management of children with ASDs.

Aim of the study

To develop a checklist for early identification with Developmental and Pragmatic behavioral milestones for autism spectrum disorders.

Objectives of the study

- To obtain a tool for early identification and assessment of autism spectrum disorder with the consideration of behavioral milestones
- To help clinically in identifying crucial markers, setting therapeutic goals and in management.

Implications of the study

1. Questionnaire will be used for the interview purpose.
2. It can be administered by Speech Language Pathologists and other professionals.

CHAPTER 2- REVIEW OF LITERATURE

Progressions in the field of early identification, diagnosis and treatment of very young children with ASDs have challenged researchers and Speech language pathologists to examine the alternative assessments of progress of child and outcome of early intervention programs. Research evidences and studies suggests that early intervention leads to better outcomes. When children enter an intervention program at younger age, they will have greater gain.

Zwaigenbaum et al. (2005) included 150 infant siblings which consisted of 65 infants who had been followed to age 24 months. Preliminary results indicated that siblings who were later diagnosed with autism were able to be distinguished from the children who were diagnosed by 12 months of age.

Following aspects were noticed

- Numerous definite behavioral markers comprising atypicalities in eye contact, visual tracking, disconnection of visual attention, orientation to name, imitation, social smiling, reactivity, social interest and affect, and sensory-oriented behaviors.
- For the shift of visual attention prolonged latency was noticed.
- At the age of 6 months a typical characteristic pattern was observed which included, a tendency to fixate on particular objects in the environment, extreme distress reactions and decreased expression of positive affect by 12 months.
- Delayed expressive and receptive language.

Gregory et al. (2010) conducted a prospective longitudinal study where he compared 25 infants diagnosed as autism spectrum disorders (ASD) at the later stage. And 25 genders matched low risk typically developing children. Children were evaluated at the age of 6, 12, 18, 24 and 36 months.

At the age of 6 months, the frequency of gaze to faces, shared smiles, and vocalizations to others were highly equivalent between the groups. But there was a great decline in the group which was later diagnosed as ASDs. At the age of 12 months group differences were highly significant. Repeated evaluated recognized loss of skills in most infants with ASD, most parents did not report a regression in their child's development.

Earlier treatment studies nonstandard diagnoses showed different results in outcome from each other (Lovaas, 1987; Rogers & Lewis, 1989). Very early follow up studies of children with features of autism suggested that children with the most unusual motor behaviors had better outcomes than the children who were referred predominantly because of the absence of appropriate social behaviors; at older ages, the latter group frequently appeared to have significant mental disabilities but not necessarily autism (Knobloch & Pasamanick, 1975).

Several early psychiatric follow up studies, in which experienced investigators made diagnoses of children younger than 3 years and then followed these children, showed examiners to be quiet accurate in predicting stable diagnoses of autism (Gillberg et al., 1990; Lord, 1995). In these cases, however, the most effective diagnostic strategy

was using overall clinical judgment; standard frameworks of diagnoses and methods were not particularly appropriate for these very young children.

In a large scale epidemiological study, initial results suggested that a screening instrument, the Checklist for Autism in Toddlers (CHAT; Baron- Cohen et al., 1996), was quite effective in identifying children with autism at 18 months old (Baron- Cohen, Allen & Gillberg, 1992). Further results for the same sample, however indicated that the instrument may have missed a substantial proportion of children diagnosed with ASD at 5 years (Charman, Baron- Cohen, Baird, Cox, Swettenham & Wheelwright, 1999).

Other research has shown clinical measures to be quite accurate in placing 2 year olds within the autism spectrum but not in differentiating within the spectrum or in identifying children with mild ASD (Stone et al., 1999).

Similarly, another study (Lord, Pickles, DiLavore & Shulman, 1996) found that an experienced clinician's diagnosis of autism at the age of 2 was associated with the same diagnosis in 72% of the children at the age of 3, with all but one of the children who had received an autism diagnosis at the age of 3 (94%) continued to fall within the autism spectrum range (PDD NOS) at the age of 3. Diagnoses of PDD-NOS at the age of 2 were less consistent over time, with only 42 % of the children retaining the specific PDD-NOS diagnosis at the age of 3. Outcomes for children with PDD-NOS were equally split so that for half of the remaining children, symptoms had worsened to autism by the age of 5 and for half, symptoms lessened and were then considered to be outside the spectrum (Lord et al., 1996).

Overview of the main theories:

Hobson (1990, 1993, 2005) stated that children with autism primarily lack an interpersonal relatedness, resulting in an impersonal relationship with other people, a deficient concept of self and others, an inability in perspective taking, and a limited capacity for symbolization and abstraction. On the other hand cognitive theories stated that the socio – affective problems are corollaries of a general cognitive deficit. Within this viewpoint, three elaborate theories have been developed. The executive functioning hypothesis of autism (Russell, 1997) stated that the symptoms of the disorder are the result of deficient ‘executive functions’, processes that serve to generate, maintain, and evaluate problem solving behavior (e.g. planning, working memory, and flexibility).

The central coherence theory stated that persons with autism have problems on the domain of central coherence (Frith & Happe, 1994). This is the human capacity to integrate stimuli into a meaningful whole, and take the context into account. The cognitive theory that has been around for the longest time and that until now, has attracted the largest research interest, is however the ‘Theory of Mind’ hypothesis of autism (Baron-Cohen, Leslie & Frith, 1985). This hypothesis stated that persons with autism are unable to develop a coherent theory of mind, which is the capacity to infer mental states (such as beliefs and intentions) and use these mental states to predict and explain other persons’ behavior (Premack & Woodruff, 1978).

In typical development this understanding of other persons’ minds shows an explosive growth between the third and fourth year of life (Wellman, Cross & Watson, 2001). Many empirical studies have supported this idea of a theory of mind deficit in

ASD (Baron-Cohen, 2000). This phenomenon was also given the telling term ‘Mild - blindness’ (Baron-Cohen, 1995a).

Early theory on itself is not able to cover the full range of symptoms shown by persons with autism, and there is no proof yet that the assumed deficits are universal and specific to the syndrome, and remain stable throughout development. The studies integrated in the chapter at hand originated from an important limitation of the theory of mind hypothesis; the observation that children with autism already show deficits in their social and communicative behavior from birth onwards, while a ‘theory of mind’ as it was conceptualized is at the earliest present by the age of three.

Empirical studies of Autism in young Children

In contrast to the variation in results of the follow up studies, the cross-sectional, empirical research with preschool children with autism has been much more consistent across tasks and laboratories. Difficulties in joint attention, including response to theirs’ attempts to direct attention and the child’s initiation of attempts to obtain joint attention, have been found consistently to be associated with autism (McEvoy, Rogers, & Pennington, 1993; Mundy et al., 1994).

A number of investigators have also found that reduced propensity to looking at faces, lack of response to name, and limited pretending (Hertzog, Snow & Sherman, 1989; Osterling & Dawson 1994) differentiated young children with autism from children with similar nonverbal profiles and sometimes, from children with similar degrees of language impairment.

Difficulties in diagnosing very young children

Clinical issues in diagnosing very young children remain. Discrepancies between areas of development that allow identification of specific social deficits as opposed to more generalized developmental delay are more difficult to document in very young children (Lord, 1997).

For children whose nonverbal developmental skills fall at an early infant level, descriptions of dramatic differences between nonverbal skills and social skills become quite difficult (Lord, Shulman, Pickles, & DiLavore, 1997). For example, if a 2 year old cannot stack blocks, place objects in containers, or carry out simple object permanence tasks, an examiner may feel uncomfortable saying that the child has specific social deficits. Though the child's social behavior and communication may show even greater impairments than his or her nonverbal skills. In these cases, it is important to recognize that there are several delays that include social and communicative deficits and possibly autism; diagnostic specification can follow.

Parents as sources of information

Parents of two year olds have much greater knowledge about their children's behavior and history of development than do any other people. Research on acquiring information from parents of children with other disorders has indicated that parents are excellent sources of information but that they may not interpret what they see as would an expert in autism (Schopler & Reichler, 1972).

One of the difficulties is that with autism, parents have to recognize as deficits behaviors that are transparent in everyday social interaction (Lord, 1995). That is, when a

very young child does not look at a parent, the parent often simply moves over to be within the range of the child's vision without necessarily noticing that he or she has done so. When parents are asked about the child's eye contact, they may report any difficulties or more commonly, may report that they have not noticed anything but others have commented about it.

Canadian early diagnosis study

In a Canadian study of early diagnosis (Lord, 1995), researchers saw 30 children younger than 3 years referred for possible diagnoses of autism and administered a standard parent interview, the autism Diagnostic Interview –Revised (ADI-R; Lord, Rutter & LeCouteur, 1994). The children also reviewed a best estimate clinical diagnosis from the same clinician who had administered the ADI and who had conducted psychological testing and informal observations.

At the age of 3 the children were tested by other examiners. The ADI-R and psychological tests as well as standard observations were re-administered. A second diagnosis made in 29 of 30 cases, agreed with the judgment of the new examiner. Two items from the interview were the clearest discriminators of children at age 2 who continued to receive a diagnosis of autism at age 3. These items had to do with children's attention to neutral statements made by other people and the degree to which the children spontaneously directed other people's attention at any manner (Ex: pointing, vocalization, gestures in some other way).

In the Canadian study (Lord, 1995), clinical diagnosis at age two was more accurate than were the standard instruments. Yet, there was concern that these diagnoses were not based on a clear framework. These results were similar to findings by Gillberg and Colleagues (1990), who were also able to predict at age 2 children who would continue to have autism at age 3 or older, but who similarly found that the most stable diagnosis at age 2 were not necessarily equivalent to those yielded by formal ICD-10 criteria.

Two year olds who were misdiagnosed with autism by the instruments (i.e., ADI-R; Childhood Autism Rating Scale (CARS; Schopler, Reichler & Renner, 1986) in this study tended to have more significant delays than the rest of the children in the sample. Children who did not receive standard diagnosis of autism at age 2 but did at age 3 tended to be higher functioning children. These children had some language at age 2 and had more socially directed behavior than most children with autism. By age 3, their language had become more clearly stereotyped and their social behavior, although continuing to improve was more obviously not as adequate as other children of their age.

North Carolina Early Diagnosis Study

The PL-ADOS was next used in a second, larger study in North Carolina, in which 110 two year olds referred for possible autism to the Treatment and Education of Autistic and related Communications Handicapped Children (TEACCH) program and 21 children with developmental delays serving as comparisons were followed until age 5. When the children were two years old, examiner made best-estimate diagnoses of probable autism or not autism. When the children were five years old, as independent

clinical diagnosis, as well as an overall diagnosis, was made using the ADI-R and clinical impression.

A preliminary analysis of the PL-ADOS used with children at age two to predict autism at age 5 (Lord, 1997) has yielded findings similar to earlier studies findings.

Domains

There are several domains which have to be focused in the process of child's development. From the beginning of life, children develop in many ways, physically, cognitively and socially. As a child develops across these areas, the child becomes more and more able to begin communication with others. Language development and the ability to communicate with others is an intricate process of development. In order for children to develop language abilities, skills associated with physical, cognitive and social development must develop in a co-ordinate way, so that they can be integrated or combined to create meaningful connections with the child's environment.

Medical Domain

A report of National Institute of Mental health state that many children who develop ASD have not reported of any family history of Autism, suggesting that infrequent, accidental and many gene mutations are likely to affect a person's risk.

Gardner et al. (2009) aimed to obtain the first quantitative review and meta-analysis of the association between maternal pregnancy difficulties and pregnancy related issues and risk of autism. And results revealed the strongest evidences for autism risk included previous maternal hypertension, proteinuria, pre-eclampsia and swelling, advanced parental age at birth, bleeding, maternal prenatal medication use and gestational

diabetes and the author concludes saying there are not sufficient evidence to incriminate any one prenatal factor in autism etiology.

Maramara et al. (2014) estimated the prevalence of pre and perinatal risk factors in a cohort of children with ASDs compared with New Jersey population. Results showed ASDs cohort rates of 7 prenatal risk factors were significantly higher than new Jersey state rates. Authors also say that multiple risk factors during pregnancy appeared to be associated with a high risk of ASDs in offspring.

Langridge (2013) concluded that pregnancy asthma, hypertension, elective C-sections, some types of ante-partum hemorrhage, any type of preterm birth, breech presentation, urinary tract infection, poor fetal growth and need for resuscitation at birth were showing an increased risk for Autism. It was also associate with poor fetal growth, labor or delivery complications. And peri natal causes like pregnancy hypertension and small head circumference were associated with a reduced risk.

Motor domain

When motor development is discussed, it includes gross and fine motor skills. Gross motor skills refer to movements involving large muscles, such as trunk muscles used for walking. Smaller muscles, such as those in the fingers or tongue, are used for fine motor tasks such as writing or talking respectively.

Social and Emotional domain: Child's connection with his world plays an important role in his communication. This connectedness in initially expressed through nonverbal modes, such as eye contact and facial expression.

Leonard et al. (2013) conducted a follow up study of infant siblings to ascertain motor development in children at risk of Autism. Study included 20 children who had increased risk of developing ASD. These children were studied at 9 and 40 months of age, on the basis of having an older sibling diagnosed with the condition. A higher section of children than expected demonstrated motor difficulties at the follow-up visit and those emphasized by parental report as having poor motor skills as infants and toddlers were also more likely to have lower face processing scores and elevated autism-related social symptoms at 5–7 years, despite having similar IQ levels. These data stands as a support to the argument that early motor difficulties may be a risk factor for later motor impairment as well as differences in social communication and cognition, traits that are related to autism spectrum disorder.

The purpose of Chester et al (2012) study was to quantify gait symmetry in children with ASD when compared with age matched typically developing children. There were no significant differences found for any temporal –spatial measures or symmetry indices. Results suggested that children with autism demonstrate typical symmetry during gait.

Emotional Domain

This mainly includes the ability of a child to comprehend and to express emotions. At a point of time where other children are learning self- control, a child with autism may exhibit a behavior without thinking. The child may also exhibit temper tantrums or becomes aggressive [Keefer, Globalpost.com].

By the use of intonation and variations in factors such as loudness, speech rate and pitch range in the utterance will tell us the expression of emotions or of the speaker (Couper-Kuhlen, 1986). For example, an utterance said with prosody suggesting positive affect will generally have a wider and higher pitch range than one said with prosody suggesting negative affect.

Prosody in autism has concentrated on prosodic expression for affective or pragmatic purposes and on the opinion that the speech of a child with autism is often characterized by poor inflection and excessive or maligned stress (Hargrove, 1997).

Cognitive domain

Cognitive development refers to the progressive and continuous growth of perception, memory, imagination, conception, judgment and reason; it is the intellectual counterpart of one's biological adaptation to the environment (Nicolosi, Harryman, & Kresheck, 1989). Cognition also involves the mental activities of comprehending information and the processes of acquiring, organizing, remembering and using knowledge (Owens, 2008).

Long et al. (2011) compared the cognitive skills of young children who were diagnosed as ASDs to same aged peers who were suspected to have developmental delays or behavioral problems using Bayley Scales of Infant Development- Third edition. A retrospective study was carried out on 147 children of age arranged 16 to 38 months. Results exhibited less discrepancy in the cognitive skills of children with and without ASDs while language skills with ASD were more significantly delayed than language skills in children without ASD.

Lord (1995) indicated that standard diagnostic criteria tended to over diagnose children with significant cognitive delays as having autism at age 2, but under diagnose a small proportion of children with autism who did not yet show clear, repetitive behaviors, this may have been in part because parents did not yet recognize the children's behaviors as usually repetitious.

For example, a two year old repeatedly throwing small objects or flipping through magazines is not extraordinary. The repetitive quality of these behaviors may be apparent only after the child continues them for a substantial period of time and fails to engage in other behaviors.

Social Domain

Generally, with the PL-ADOS, behaviors in specific contexts were not as effective in discriminating among children with different diagnoses as were judgments of behaviors across several contexts. Although there were very stable differences were also strongly influenced by development (Di-Lavore & Lord, 1995).

Judgments of a child's social reciprocity made during these and other tasks were more consistently associated with diagnosis across development than with scoring of specific behaviors. For example, differences in requesting, which characterized the youngest and developmentally lowest functioning children in this sample, were not necessarily apparent at later ages; however, judgments about a quality of a child's social overtures when he or she was motivated to approach an adult were consistent across chronological age and developmental level.

Even though the absolute scores on these tests varied somewhat depending on the content of the items, it was quiet possible to predict trajectories from 2 years to 5 years for the children. Children with a diagnosis of autism at age 5 tended to show less variation in their scores and to have lower scores in receptive and expressive language in all the points than did children in any of the other diagnostic groups.

Chin-Chin et al. (2010) explored different developmental trajectories of social-communicative skills in children with autism and typically developing infants. They conducted two longitudinal studies. In first study, Developmental sequence of social-communicative skills in 26 typically developing infants at the age of 9 months were assessed and they were followed up at the age of 12 and 15 months. The results revealed a consistent developmental sequence of social-communicative skills in infants with typical development. In second study, they explore the sequence of emergence of social-communicative skills of 23 children with autism and 23 children with developmental delay between the ages of 2 and 4 years. And results showed that the developmental sequence of social-communicative skills in young children with autism and children with developmental delays was different.

Speech and Linguistic domain

This includes at least five separable domains: Phonology, morphology, semantics, syntax and Pragmatics. These separable domains grouped into the form, content and use.

The trajectories yielded by developmental tests at age 2 were remarkably straight (Taylor, Pickering, Lord & Pickles, 1998). Growth curve analysis were able to project linear trends for individual children based on their receptive and expressive language scores on a variety of measures including the Mullen Scales of Early Learning (MSEL;

Mullen, 1989) and the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) as well as the Bayley Scales of Infant Development (Bayley, 1969).

Baird et al. (2002) measured an early language development using the MacArthur Communicative Development Inventory (CDI–Infant Form). Data was collected on 134 children who were attending preschool with autism spectrum disorder. The developmental pattern of understanding of phrases, word comprehension and expression and production of gestures were compared with typically developing children. There was a significant delay of language when compared with normal course. And also atypical pattern of development was noticed. When compared to word production, comprehension of words was delayed. When compared with late gestures, production of early gestures was delayed. Many aspects were similar to typically developing children including word comprehension being in advance of word production in absolute terms, gesture production acting as a ‘bridge’ between word comprehension and word production and the broad pattern of acquisition across word categories and word forms.

Play domain

Play occupies a conspicuous role in young children’s cognitive development, as well as their physical and social development. It provides a prospect for the better understanding of development across several domains, including cognitive and social functioning. Playing fulfills an important role in the life of a child: it is the activity that young children spend most of their time on. By exploring and manipulating objects, their knowledge of the world increases. In the process of playing, children also learn to think flexibility and creatively, which benefits their problem solving abilities. Children with ASD show marked impairments in symbolic play (Jarold, 2013; Libby, Powell, Messes,

& Jordan, 1998). Their functional play is less varied, elaborate, and integrated than what is found in typical children (Williams, Reddy & Costal, 2001). An early lack of symbolic play (combined with a deficit in joint attention) is highly predictive for a later diagnosis of ASD (Baron-Cohen et al., 1992).

Existing Diagnostic Tools

Since the individual with Autism will not be able to directly involve in the interview, the assessment and diagnosis usually depends upon the behavioral observation or parents or caregiver's interview and support. This section consists of a brief description of all the tools that were reviewed for this study.

The Childhood Autism Rating Scale (CARS)

Schopler, Reichler, De Vellis and Daly (1980) developed the Childhood Autism Rating Scale (CARS). This consists of 15 item rating scale which helps to identify children with Autism and also to distinguish them from developmentally disabled children who are not autistic. This can be used with any child who is above two years. This was developed over a period of 15 years on 1500 cases. It includes mainly 5 domains. They are

- Relating to people
- Body use
- Adaptation to change
- Listening response
- Verbal communication

Information will be collected by interviewing the parents or caregivers and also from other medical records. After this procedure, examiner rates the child on each item using a seven point rating scale. This indicated the degree to which the child's behavior in the given area deviates from that of a normal child of the same age. Based on this scale, the child can be diagnosed into two categories: mild to moderate and severe.

The Modified Checklist for Autism in Toddlers (M-CHAT)

M-CHAT was developed by Robins et al. in 2001. This consists of 23 Yes/No items parent report checklist, examining children's developmental milestones. Six items pertaining to social relatedness and communication were found to have the best discriminability between children diagnosed with and without Autism/PDD.

The Autistic Behavior Composite Checklist and Profile

The Autistic Behavior Composite Checklist and Profile, developed by Riley (1984) is used as a tool to check for different aspects of autistic features. Even though it does not talk about how to rate individual on the spectrum; it talks gives a categorical diagnosis of whether the individual is autistic or not.

Diagnostic tools in India

Development of Assessment Tool for Differential Diagnosis of Autism Spectrum Disorder (DDC-ASD)

Shyamala et al. (2007) developed an assessment tool for differential diagnosis of Autism Spectrum Disorders (ASD). Based on the results it was concluded that by

focusing more on crucial features and overlapping features which occurred in more than 50% of children for the Autistic and Asperger's' syndrome and based on the literature the features listed out for the Rett's and Childhood disintegrative Disorder, this checklist was considered as an effective tool for differential diagnosis in Indian context.

Checklist includes following domains:

- ❖ Development
- ❖ Regression
- ❖ Motor
- ❖ Behavior
- ❖ Physical/medical
- ❖ Sensory
- ❖ Intellectual
- ❖ Social
- ❖ Speech and language

The Diagnostic Scale for Autism Spectrum Disorders.

Aditi (2002) aimed at the construction of a diagnostic scale which could assess the nature and characteristics of ASDs, and also to profile the symptoms. It includes the following domains.

Domains:

- ❖ Social

- ❖ Cognitive
- ❖ Behavioral
- ❖ Communication

As observed from the review of Literature, there are no currently existing tool or profile which talks about children with ASD's developmental milestones with respect to different domain in specific. Hence there is a need for developing a checklist for knowing a developmental trend in ASD's for better assessment, Diagnosis and management.

CHAPTER 3- METHOD

The aim of present study was to develop a checklist for early identification with developmental and Pragmatic behavioral milestones for autism spectrum disorders (ASDs).

In order to achieve this aim, the present study followed two phases. Preparation of checklist for administration was carried out in the first phase. In the second phase, the validated checklist was administered for children with autism spectrum disorders.

As mentioned in the previous Chapter, questions were taken:

- ❖ Assessment checklist for speech & language domain (Swapna, Jayaram, Prema & Geetha (2010) Developed at AIISH, Mysore)
- ❖ The Modified Checklist for Autism in Toddlers (M-CHAT) (Robins et al., 2001).
- ❖ The Childhood Autism Rating Scale (CARS) (Schopler, Reichler, De Vellis & Daly, 1980]

Based on the review of the literature, following domains were taken as domains for the questionnaire.

- ❖ Medical
- ❖ Motor
- ❖ Emotional
- ❖ Cognitive
- ❖ Social
- ❖ Speech-language domain

❖ Play

Procedure

Phase 1: The questionnaire development:

- Questionnaire was prepared by selecting the questions from Review of literature. Questions were mainly inspired from Assessment checklist for speech & language domain which mainly contains normal developmental pattern of a child.
- For the validity check, it was given to 3 Master's Degree Holders in Speech Language Pathology, who had experience in dealing with ASD children.
- SLPs were asked to rate the questions in 3 point rating scale. 2 indicating most relevant, 1 indicating partially relevant and 0 indicating least relevance.
- There was 60% agreement across experts and based on the rating, questions were selected for next Phase.

Features of Checklist

1. The questionnaire has closed ended questions (Yes/No) for Medical History. This domain contains 15 questions including Pre, Peri and Post natal risk factors.

Following risk factors were noted if they were present.

Risk factors

Pre natal	Peri natal	Post natal
Adult rheumatoid arthritis,	Birth weight	Head injury
hypothyroidism, and systemic lupus	Prematurity	Seizures
Erythematous	Seizures	Social, environmental and
Maternal urinary tract and Vaginal	Upper respiratory	emotional factors

infections	infections
Asphyxia Related cognitive or social abnormalities	Birth complications
Smoking, and alcohol consumption by the parents	Lbw and gestational age
Neurological and psychiatric disorders of parents	Hypoxic conditions
Prenatal or intrapartum use of medications	
Parental preconception chemical exposures	
Advanced paternal age	
Advanced maternal age	
Maternal immigration	

2. For other domains there is a column to mention Age range at which the particular behavior was achieved.

DOMAINS	No. Of questions
➤ Medical	15
➤ Motor (Gross+ Fine)	47 (23+24)
➤ Emotional	23
➤ Cognitive	24
➤ Social	24

➤ Speech-language domain (Comp+Exp)	56 (28+28)
➤ Play	23
TOTAL:	212

Phase II: Administration of the questionnaire

Participants:

- ❖ Age range would be up to 6years depending upon the availability of the children with ASDs.
- ❖ The languages used were Kannada, English, Hindi, Malayalam etc. depending upon the native language of the speaker.

Method

The questionnaire was administered by interviewing parents of 100 children with Autism Spectrum Disorder who had reported to ASD Unit in AIISH and in other Centers.

- ❖ Age of acquisition of these behaviors was noted.
- ❖ These questions were asked parents, therapist who is taking therapy for the child.
- ❖ When the information was not sufficient, then it was collected from medical records or case files.
- ❖ Age, Onset of the problem, Medical history and Pre-peri-post natal history and duration of therapy attended was considered.
- ❖ Child with Autism spectrum disorder with mild mental retardation or no retardation was considered for the study.
- ❖ If the interviewer was not familiar with the language spoken by the parents, help of an interpreter was taken.
- ❖ The interview was done to the child's developmental level and diagnostic status.

Phase III

After gathering all the information the final comprised list was made

- ❖ Using the developmental checklist, presence / absence, common/uncommon of crucial risk factors were noted.
- ❖ Most significant of behaviors at particular age were noted.
- ❖ Crucial items were highlighted and noted as markers/ developmental milestones for ASDs.

CHAPTER 4- RESULTS AND DISCUSSION

The current study aimed to develop a checklist for early identification with developmental and Pragmatic behavioral milestones for Autism Spectrum disorders (ASDs). For the preparation of the checklist, a detailed review was done and a questionnaire was prepared mainly based on Assessment checklist for speech & language domain (Swapna et al., 2010) consisting enlisted normal developmental pattern of a children. The procedure is elaborated in the Method section. The results of the various stages carried out during the study are as follows:

Results of Phase I

After the preparation of checklist, it was submitted for reliability check to 3 Speech language Pathologists. Only the items (in each subdomain) that were in 60% agreement or above across SLPs. (they had to rate on the basis of most occurring milestone or behavior (by numbering higher to lower in typically developing children) were selected. Few items that had the least ratings were deleted and the rest were retained for phase II.

1. Medical domain

2 items were deleted according to ratings received from SLPs.

The items deleted (from peri-natal history) were:

- a. Did the mother have poor fetal growth?
- b. Was there any maternal pregnancy difficulties?

SLPs' rating was not uniform for the above item probably because both items were not very common when compared with other items.

2. Motor domain

None of the items were deleted from this subdomain.

3. Emotional Domain

3 items were deleted from this subdomain.

- ❖ Temper tantrums begin to decrease.
- ❖ Shows self-confidence and is enthusiastic and willing to try and learn new things.
- ❖ Can distinguish fantasy (make-believe) from reality, e.g., aware that demons / He Man / Spiderman do not exist etc.

4. Cognitive subdomain.

2 items were deleted from cognitive subdomain

- ❖ Knows that people and things have labels, e.g., looks at fan, light etc. when asked.
- ❖ Compares two weights and describes it in terms of heavy or light.

Social Subdomain

No items were rejected.

5. Speech Language subdomain

In comprehension section 3 items were deleted.

- ❖ Responds to pitch and loudness changes in voice of others (distinguishes emotions).
- ❖ Comprehends many words (nouns such as common objects, animals, and vehicles).
- ❖ Shows gradual increase in the number of words understood in all categories including nouns, verbs, adjectives and adverbs.

In expression section, 2 items were deleted.

- ❖ Produces a yes-no question by adding a rising intonation to the end of a sentence, e.g., “You took ball?” etc.
- ❖ Describes objects, events (e.g., visit to the zoo, park etc.), 2-3 related actions (e.g., painting a picture, carrying out a household work etc.) in 4- word sentences.

6. Play Domain

No items were rejected from this subdomain.

Hence for phase II, the item distribution was as follows:

DOMAINS	No. Of questions
➤ Medical	15
➤ Motor (Gross+ Fine)	47 (23+24)
➤ Emotional	23
➤ Cognitive	24
➤ Social	24
➤ Speech-language domain (Comprehension + Expression)	56 (28+28)
➤ Play	23

Results of Phase II

As a part of Qualitative analysis, item analysis was carried out. Based on ‘Yes’ response for every question, frequency table was prepared for medical domain. And for other domains, if the behavior was achieved score ‘1’ was given and if the behavior was not achieved score ‘0’ was given. Based on this response, frequency table was prepared.

Frequency distribution for each question is been depicted in graphical representation. Responses to questions having frequency above 50% were considered as crucial items or developmental / biomarkers.

Medical Domain: This section includes questions regarding Pre, peri and Post natal Histories of the child.

Pre-natal

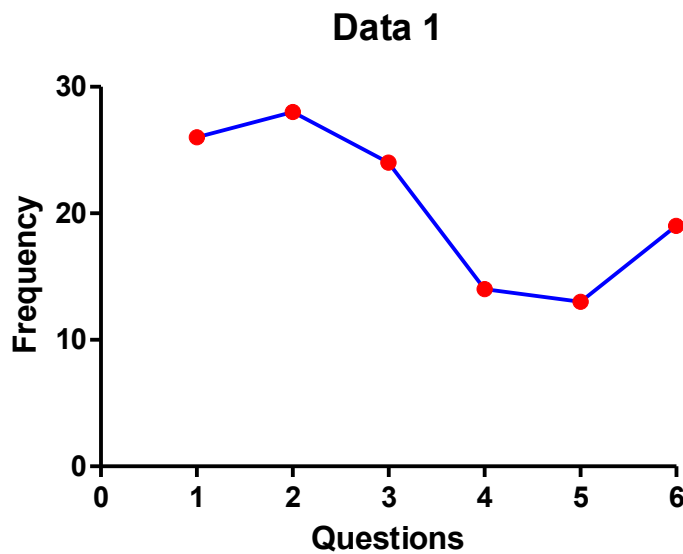


Figure 4.1. Frequency of occurrence across each item for pre-natal sub skill

Table 4.1

Frequency of occurrence across each item for pre-natal sub skill

Question	No. of Yes responses	No. of No responses
Did the child’s mother take any medicines for illness during pregnancy?	26	74
Was the baby born before the due date given by the doctor	28	72

(before 37 weeks from last menstrual period)?

Did the child's mother have any miscarriage?	24	76
Did the mother have viral infection or any other illness?	14	86
Did the mother undergo x-ray during pregnancy?	13	87
Did the mother have excessive vomiting even after 5 months of pregnancy?	19	81
Total score	124	476

Peri- natal

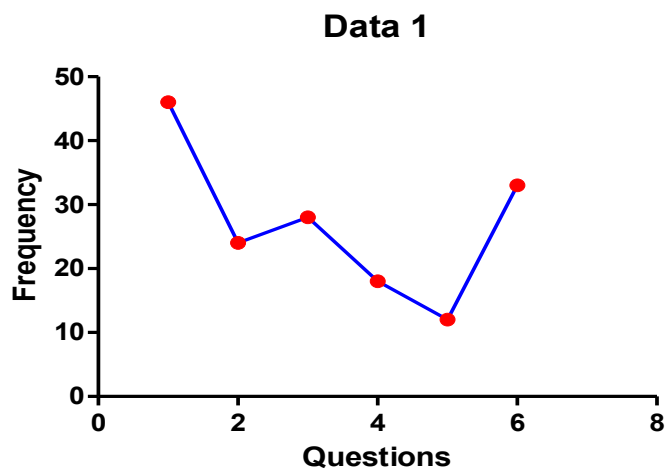


Figure 4.2: Frequency of occurrence across each item for peri-natal sub skill

Table 4. 2

Frequency of occurrence across each item for peri-natal sub skill

Question	No. of Yes responses	No. of No responses
Were there any complications during the delivery?	46	54
Did the child appear yellow or blue at birth?	24	76
Was birth cry of the child delayed?	28	72
Was the child's weight low at birth (less than 1.5 kg)?	18	82
Was there any defect on the head and face when the child was born?	12	88
Was the child kept in Hospital for treatment after birth?	33	67
Total score	161	439

Post natal

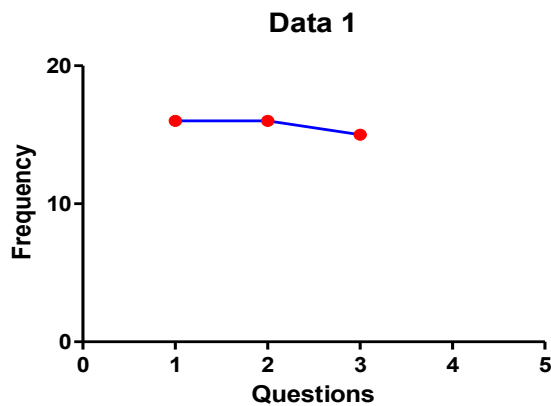


Figure 4.3. Frequency of occurrence across each item for post-natal sub skill

Table 4.3

Frequency of occurrence across each item for post-natal sub skill

Question	No. of Yes responses	No. of No responses
Did the child suffer any head injury associated with loss of consciousness, skull fracture, bleeding or discharge from ear following injury?	16	84
Did the child have any other illness like Mumps, Chicken pox, Typhoid etc. after the birth?	16	84
Did the child undergo any emotional turmoil?	15	85
Total score	47	254

As seen in the graph, there were no questions whose ever were had frequency above 50%. A study by Gardner et al. (2009) revealed that the strongest evidences for autism risk included previous maternal hypertension, proteinuria, pre-eclampsia and swelling, advanced parental age at birth, bleeding, maternal prenatal medication use and gestational diabetes. But because of the limited evidences they could not strongly conclude that medical risk factors were the indicators for autism.

There were contradicting studies by Maramara et al. (2014) and Langridge (2013) that proved that multiple risk factors during pregnancy (including pre, peri and post natal) had increased risk for Autism. In other words, multiple risk factors during pregnancy appeared to be associated with a high risk of ASDs in offspring.

Current study shows that medical history of the parent does not have a significant effect on a child who had developed Autism. Since sample size is not adequate, it is difficult to conclude from this study whether (or not) saying, Medical history are the risk factors for ASDs.

In Motor, Emotional, Cognitive, Social, Speech- language and Play domains, there were a few items which had above 50% response. This indicates that those particular questions were present in more than 50 children out of 100. So those items can be considered as behavioral milestones for that particular domain. And they have been arranged in ascending order of frequency.

Motor domain

Motor domain includes gross motor skills and fine motor skills. Below shown graph explains frequency distribution according to questions.

Gross motor

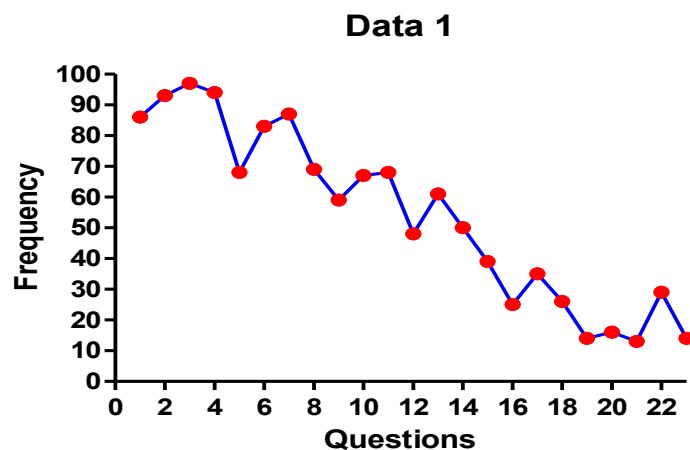


Figure 4.4: Frequency of occurrence across each item for gross motor domain

Table 4.4

Frequency of occurrence across each item for gross motor domain

	No. of Yes responses	No. of No responses
Stretches legs out when lying on stomach or back	86	14

Turns over	93	7
Sits with support	97	3
Sits without support	94	6
Rolls ball in specific direction from sitting position	68	32
Walks holding on to a hand or furniture	83	17
Walks independently	87	13
Walks in different directions, e.g., walks backward, in circle etc.	69	31
Runs	59	41
Sits crossed legged	67	33
Jumps in place with both feet	68	32
Catches a rolled ball and rolls it forward	48	52
Walks down stairs independently, placing both foot on each step	61	39
Bends over easily without falling	50	50
Throws a ball overhead with accuracy (4-6 foot distance)	39	61
Supports weight on combinations of body parts or on hands alone, e.g., clings to horizontal bars etc.	25	75
Jumps in place with both feet (2-3 feet above ground) and jumps in different ways and directions, e.g., frog jump.	35	65
Hops forward on each foot separately	26	74
Jumps with two feet together over a rope at 20 cm or approximately 1 foot high from ground	14	86
Jumps 3-4 feet across space	16	84

Hits nails with hammer head, uses screwdrivers unassisted	13	87
Rides a bicycle with supporting side wheels	29	71
Somersaults (tumbles over on bed)	14	86
Total score	1241	1059

Crucial items of gross motor sub skill are listed below

Table 4.5

Frequency of crucial gross motor items

Questions	Frequency
Sits with support	97
Sits without support	94
Turns over	93
Walks independently	87
Stretches legs out when lying on stomach or back	86
Walks holding on to a hand or furniture	83
Walks in different directions, e.g., walks backward, in circle etc.	69
Rolls ball in specific direction from sitting position	68
Jumps in place with both feet	68
Sits crossed legged	67
Walks down stairs independently, placing both foot on each step	61
Runs	59
Bends over easily without falling	50

Fine motor

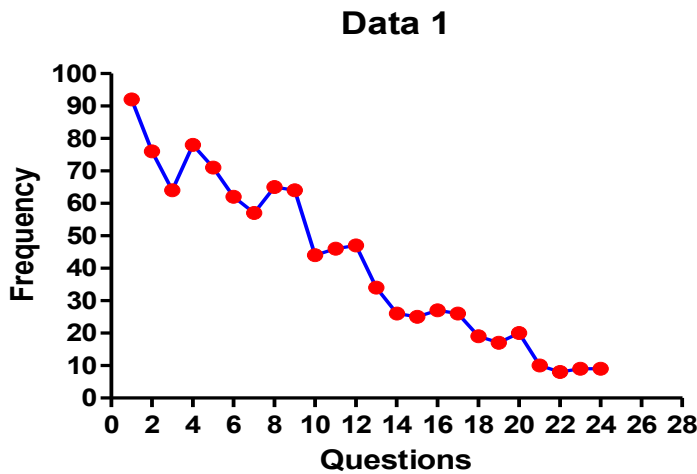


Figure 4.5. Frequency of occurrence across each item for Fine motor domain

Table 4.6

Frequency of occurrence across each item for fine motor domain

Questions	No. of Yes responses	No. of No responses
Holds objects with one/both hands, e.g., rattle (palmar grasp)	92	8
Rakes at a small object with fingers (not thumb) (raking grasp)	76	24
Fisting eliminated in both hands	64	36
Reaches out for small objects hung in front/dropped	78	22
Releases objects	71	29
Points to objects with index finger	62	38
Has thumb finger opposition to pick up small objects (pincer grasp), e.g., raisin, pulses etc.	57	43
Stacks 2-4 one inch blocks	65	35
Colors with a large crayon holding it appropriately (tripod grasp)	64	36

Rolls, pounds, and squeezes clay/dough	44	56
Screws and unscrews jar lids	11	89
Operate (open, close, turn) door knobs/latches	10	90
Strings five large beads on a shoelace	13	87
Moves fingers independently, e.g., counting numbers	16	84
Holds scissors of small size and makes an attempt to cut	17	83
Uses eraser	14	16
Fills water through a funnel into bottle	15	85
Cuts on a straight line with scissors	19	81
Shows by holding 6-7 playing cards	20	80
Colors within outlines	18	82
Folds paper and inserts into envelope	21	79
Ties tags, simple knots/shoe laces	24	76
Cuts primary shapes using a scissors	22	78
Laces a thread shoelace in a sequence of holes	23	77
Total score	916	1414

Crucial items of fine motor sub skill are listed below

Table 4.7

Frequency of crucial fine motor items

Questions	Frequency
Holds objects with one/both hands, e.g., rattle (palmar grasp)	92
Reaches out for small objects hung in front/dropped	78
Rakes at a small object with fingers (not thumb) (raking grasp)	76
Releases objects	71
Stacks 2-4 one inch blocks	65

Fisting eliminated in both hands	64
Colors with a large crayon holding it appropriately (tripod grasp)	64
Points to objects with index finger	62
Has thumb finger opposition to pick up small objects (pincer grasp), e.g., raisin, pulses etc.	57

In a longitudinal study by Leonard et al. (2013), out of 20, above 60% of children exhibited motor difficulties at the follow up visits. And this data proves that early motor difficulties may be a risk factor for later motor impairment as well as differences in social communication and cognition, traits that are related to Autism spectrum disorder.

Chester et al. (2012) did not find any significant evidences to conclude motor difficulties can demonstrate Autism.

There are no evidences which explain that there will be a delay in a child with ASD's motor development. An assessment checklist for speech and language domain by Swapna et al. (2010) lists out the developmental milestones in typically developing children. With the reference of that checklist, this study shows the motor development of the child with ASD follows the same pattern of motor development of typically developing children. And also there was no significant delay found in the development.

Emotional domain

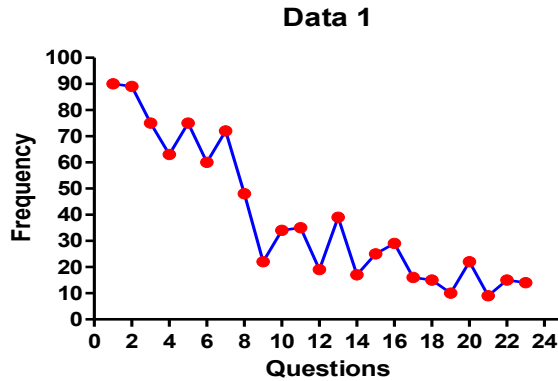


Figure 4. 6. Frequency of occurrence across each item for emotional domain

Table 4.8

Frequency of occurrence across each item for Emotional domain

Questions	No. of Yes responses	No. of No responses
Communicates feelings of pleasure/distress/disgust through gestures, noises and expressions	90	10
Laughs when stimulated (through play/communication)	89	11
Responds to other people's expression of emotions and changes in tone of voice	75	25
Vocalizes displeasure when an object is taken away	63	37
Shows denial by shaking head or moving arms, e.g., putting hands in front of face to avoid having it washed	75	25
Starts to exhibit a temper tantrums when angry	60	40
Imitates, understands and responds to gestures and facial expression	72	28
Demonstrates increasing awareness of self as separate from others, e.g. tells their name and others names	48	52

More evident temper tantrums to command/demand needs	22	78
Expresses self-conscious emotions like pride, e.g., on being appreciated repeats the task		
Displays ownership of objects	34	66
Expresses self-conscious emotions like pride, e.g., on being appreciated repeats the task	35	65
Separates easily from parents (separation anxiety decreases)	19	81
Indicates awareness of people having different feelings and desires in different situations	39	61
Exhibits fears of harmless objects, e.g., strange looking toys like dolls or models of insects, animals etc.	17	83
Shows affection for familiar playmates	25	75
Generally enjoys caring for and playing with younger children	29	71
Has difficulty accepting defeat	16	84
Refuses to accept a situation or an event that happened, e.g., on the loss a pet dog, the child may pretend that the pet is still living in the house etc.	15	85
May have unpredictable mood swings	10	90
Able to create and give constructive criticism, e.g., “You would have got the prize, if you would have written neatly” etc.	22	78
Feels quite guilty about mistakes but, does not admit it for the fear of being exposed to criticism	9	91
May have unpredictable mood swings	15	85
Has a good sense of humor, and enjoys sharing jokes and laughter with adults (Enjoys funny cartoon shows)	14	86
	Total score	893
		1407

Crucial markers are

Table 4. 9

Frequency of crucial Emotional items

Questions	Frequency
Communicates feelings of pleasure/distress/disgust through gestures, noises and expressions	90
Laughs when stimulated (through play/communication)	89
Responds to other people's expression of emotions and changes in tone of voice	75
Shows denial by shaking head or moving arms, e.g., putting hands in front of face to avoid having it washed	75
Imitates, understands and responds to gestures and facial expression	72
Vocalizes displeasure when an object is taken away	63
Starts to exhibit a temper when angry	60

Hargrove (1997) concluded that children with autism are often characterized by poor inflection and excessive or misassigned stress. He also mentioned that in a child with Autism, both comprehension and expression of prosody will be affected. When compared with the checklist of Swapna et al. (2010) there is a remarkable delay of around 2-2 ½ years in developing emotional behaviors in children with Autism. Thus, only younger age behaviors were present in emotional domain.

Cognitive domain

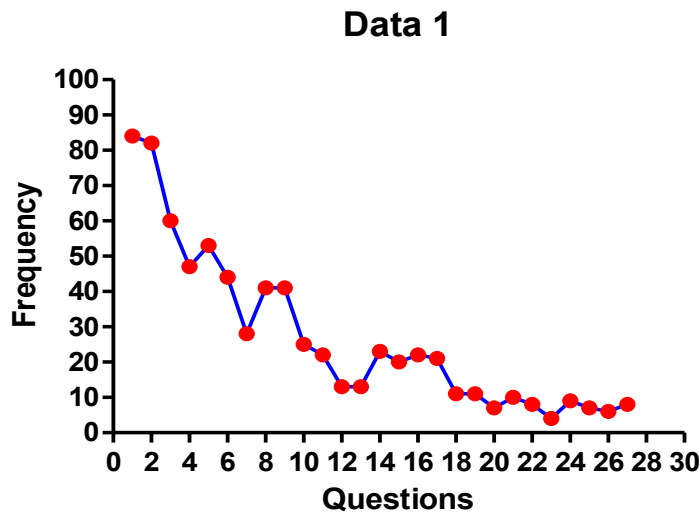


Figure 4. 7. Frequency of occurrence across each item for Cognitive domain

Table 4.10

Frequency of occurrence across each item for Cognitive domain

Items	No. of Yes responses	No. of No responses
Makes simple associations, e.g., bottle-drink	84	76
Attends/tracks to moving objects in and around the vicinity	82	18
Demonstrates memory for objects and faces seen	60	40
Retains one object when given another and pays attention to both	47	53
Finds hidden toys after watching it disappear and hence shows the awareness that objects exist when not seen	53	47
Learns to do something after demonstration, e.g., rock doll, hit balloon etc.	44	56
Preserves coins or notes as money	28	72

Has attention span of 3-4 minutes	41	59
Matches two identical objects	41	59
Dismantles and re-arranges the objects, e.g., tries to fix broken parts of toys	25	75
Has good memory of self and people around, e.g., tells names of self, parents and siblings	22	78
Preserves coins or notes as money	13	87
Discriminates 'more-less' in liquids	13	87
Recalls three objects/pictures presented visually	23	77
Understands the concept of same/different	20	80
Categorizes objects or pictures based on two or more attributes like color, shape, size etc.	22	78
Spots minute differences between pairs of pictures	21	79
Performs double alternate sequence activities, e.g., red, red, blue, red, red, blue,....(what's next)	11	89
Copies a shape from memory after seeing a model for several seconds	11	89
Knows difference between right and left	7	93
Gives information regarding any of these: complete address/phone number/occupation of parents	10	90
Reports seasons in a year	8	92
Names 'after' month, e.g., "What comes after May" etc.	4	96
Arranges pictures sequentially to create a new story	9	91
Demonstrates spatial relations in terms of constructing symmetry by figure/color completion or full drawing	7	93
Understands time concepts (today/tomorrow/yesterday etc.)	6	94
Gives information regarding any of these: complete address/phone number/occupation of parents	8	92
Total score	720	2040

Crucial items are mentioned below

Table 4.11

Frequency of crucial Emotional items

Questions	Frequency
Makes simple associations, e.g., bottle-drink	84
Attends/tracks to moving objects in and around the vicinity	82
Demonstrates memory for objects and faces seen	60
Finds hidden toys after watching it disappear and hence shows the awareness that objects exist when not seen	53

It was noticed that there were less disparities in the cognitive skills of children with and without ASDs while language skills with ASD were more significantly delayed than language skills in children without ASD (Long et al., 2011). Children have followed the same pattern in attaining cognitive skills. But the behaviors were delayed (Compared with the checklist of Swapna et al., 2010) by 1-2 years and only few initial and early behaviors were achieved.

Social domain

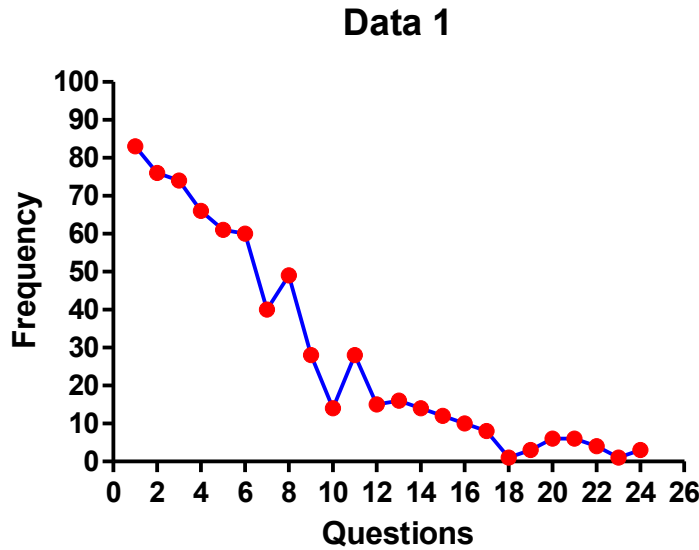


Figure 4. 8. Frequency of occurrence across each item for social domain

Table 4.12

Frequency of occurrence across each item for Social domain

Questions	No. of Yes responses	No. of No responses
Maintains eye contact to the caregiver	83	17
Responds to the caregiver by smiling	76	24
Enjoys being hugged	74	26
Smiles towards familiar people/own image	66	34
Enjoys and expects repetition of simple games, e.g., peek-a –boo	61	39
Waves goodbye on request	60	40
Imitates behavior of others, especially adults and older children and	40	60

mostly housework		
Greets others by using words like hello, hi on request	49	51
Has awareness of family relationships	28	72
Comforts a distressed friend or parent	14	86
Shows awareness of parental approval or disapproval for his/her actions	28	72
Shows increased independence from caregiver, e.g., insists on doing his/her work independently	15	85
Plays side by side with other children without exchanging ideas or materials	16	84
Waits for his/her turn	14	86
Participates actively in group games	12	88
Answers telephone calls for adult or talks to familiar persons over phone	10	90
Says please and thank you appropriately	8	92
Loves to tell jokes that may not make any sense at all to adults.	1	99
Bargains for what they want, e.g., “If you give me the crayon, I’ll give you the toy”, etc.	3	97
Engages easily with adults and shows a sense of community by helping in group situations, e.g., passes food items on request, wipes up spills after meal time, dusts/wipes furniture on instruction, sets table during mealtime etc.	6	94
Cooperates with other children and enjoys their company and can behave in a warm and empathetic manner	6	94
Writes small letters/notes/chits to a friend	4	96
Accepts someone else's choice, e.g., “It’s better to go to the park” etc.	1	99
Evaluates self and friends and expresses the same to others	3	97
Total score	678	1818

Crucial items are given below

Table 4.13

Frequency of crucial social items

Questions	No. of Yes responses
Maintains eye contact to the caregiver	83
Responds to the caregiver by smiling	76
Enjoys being hugged	74
Smiles towards familiar people/own image	66
Enjoys and expect repetition of simple games, e.g., peek-a –boo	61
Waves goodbye on request	60

In a longitudinal study, Chin-Chin et al. (2010) assessed developmental trajectory of social- communicative skills in children with Autism and typically developing infants. The results revealed a consistent developmental sequence of social-communicative skills in infants with typical development. In a second study, they explored the sequence of emergence of social- communicative skills of 23 children with Autism and 23 children with developmental delay between the ages of 2 and 4 years. The results showed that the developmental sequence of social-communicative skills in young children with Autism and children with developmental delays was different.

Current study shows that children with Autism have followed the same trend. Mauk (1993) states that impairment in social interaction is a common feature of autistic children. And when compared with normal children, social communication was severely impaired.

Language

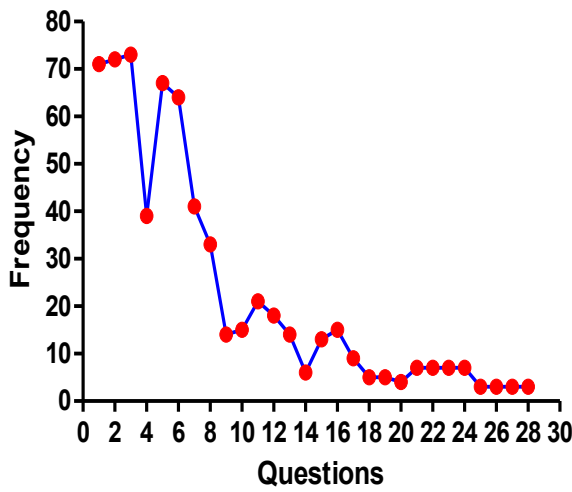
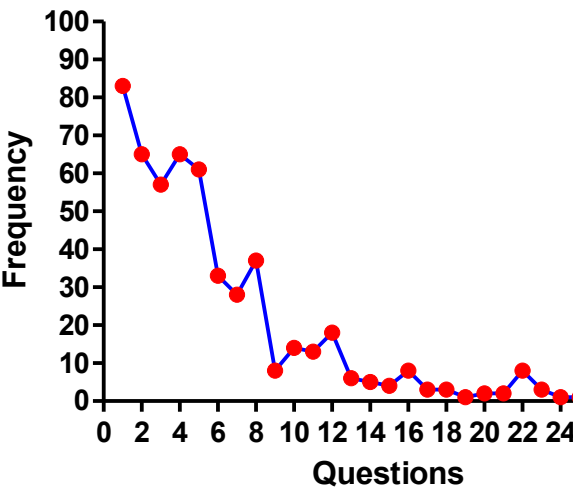
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<p><i>Figure 4.9.</i> Frequency of occurrence across each item for Language (Comprehension) domain</p>	<p><i>Figure 4.10.</i> Frequency of occurrence across each item for Language (Expression) domain</p>																																																																																																																

Table 4.14*Frequency of occurrence across each item for Language domain*

Comprehension	No. of Yes responses	No. of No responses	Expression	No. of Yes responses	No. of No responses
Regards speakers' face and shows interest in the process of talking	71	29	Cries to indicate discomfort/pain / hunger	83	17
Looks about in search of the speaker	72	28	Vocalizes and uses some intonation patterns	65	35
Stops crying when someone talks to him/her	73	27	Vocalizes in response to others' speech	57	43
Frequently appears to listen to whole conversations between others	39	61	Plays by making sounds and noises (cooing)	65	35
Responds to name call	67	33	Utters series of syllables (babbling) and longer vocalizations with varied intonation patterns	61	39
Understands denial (responds to the word 'no')	64	36	Often uses jargon (short sentence like utterances of four or more	33	67

			syllables without true words)		
Comprehends simple 'what' and 'whose' questions, e.g., "What is this?", "Whose shirt is this?" etc.	41	59	Says 'finished' to signify completion of action	28	72
Understands around fifty words (other nouns such as fruits, Household materials, birds, food items etc.)	33	67	Utters sounds like /m/, /w/, /b/, /p/, /t/, and /d/ consistently; speech is 25% intelligible	37	63
Comprehends complex verbal sentences, e.g., "When we get to the stores, I'll buy you an ice cream" etc.	14	86	Uses question markers (what & where) and thereby requests for information	8	92
Remembers and associates new words by categories, e.g., cake-food, lion-animal, etc.	15	85	Says his/her name	14	86
Detects simple rhymes (responds by action, if a familiar rhyme is heard)	21	79	Uses possessives, e.g., daddy's, mummy's etc.	13	87
Identifies objects by use, e.g., "What do you cut with?" etc.	18	82	Greet others by saying 'hello' or 'hi' on request	18	82
Recognizes common adjectives and adverbs, e.g., fat, thin, short, tall, dry,	14	86	Uses past, present and future tense appropriately to	6	94

wet, slow, fast, etc.			describe events.		
Comprehends 'how' questions, e.g., "How is the chocolate?" etc.	6	94	Uses pronouns and possessives (he, she, him, his, her, they, we and your)	5	95
Comprehends 'how many' questions, e.g., "How many flowers are there?" etc.	13	87	Expresses in 3-4 word sentences and maintains topic beyond several turns during conversation	4	96
Understands more number of words (nouns such as clothes, vegetables, flowers, stationary items etc.)	15	85	Utters sounds such as /t/ /d/, /f/, /s/, /j/, /l/, /ng/; speech is 60-75% intelligible.	8	92
Comprehends possessives such as its, our(s), their(s) e.g., This is <u>our</u> umbrella, It is <u>their</u> puppy etc.	9	91	Uses pronouns and possessives (I, my, you, me, mine, this, that)	3	97
Attempts to tell stories (recalls or sequences 3 or 4 events of a familiar story)	5	95	Uses causatives, e.g., The girl is made to brush her teeth, The child is made to take bath, the child is made to take bath, he is made to eat his food etc.	3	97
Comprehends long	5	95	Describes short	1	99

stories when told or read and retells it and can answer content related questions based on the story			stories in simple and compound sentences		
Understands time concepts such as today/ tomorrow/yesterday, for a long time, for years, a whole week, in the meantime, sooner-later, two things at once etc.), e.g., What is the day tomorrow? Yesterday Do you go to school? etc.	4	96	Speaks of imaginary conditions such as such as “I hope, I feel.....”e.g., I hope it rains, I feel that she will come to play with me, etc.	2	98
Comprehends three and four step commands, e.g., come here, take this book, give it to your sister; go to the kitchen, fill a glass of water, switch off the light and bring it to me etc.	7	93	Speaks in sentences/clauses of 8 or more words in length using since, in order that, as soon as, until, even though, although, before, after etc. e.g., Come and see me <u>as soon as</u> the work is finished, Don't come <u>until</u> you finish eating, the baby ate the cookie before I could put it on the table, let's	2	98

			go to the store <u>after</u> we eat etc.		
Comprehends questions related to daily routine activities, e.g., What Does you do in the morning? etc.	7	93	Names all colors and shapes (circle-round; square-box) etc.	8	92
Knows common antonyms (opposites), e.g., big x small, hard x soft, heavy x light etc.	7	93	Expresses demonstrative nouns such as these and those e.g., <u>These</u> are my books; <u>Those</u> are my brother's books etc.	3	97
Knows common antonyms (opposites), e.g., big x small, hard x soft, heavy x light etc.	7	93	Uses PNG (person, number and gender) markers, e.g., The cat is/cats are sleeping, He is/ they are sleeping, mother is sleeping ,This is my glass, these are my glasses etc.	1	99
Understands conditional clauses (if, unless), e.g., <u>If</u> there is picture of fan in this page, clap your hands, <u>Unless</u> I call your name you	3	97	Speaks of imaginary conditions such as such as "I hope, I feel....."e.g., I hope it rains, I	1	99

should not touch the picture			feel that she will come to play with me, etc.		
Understands spatial and temporal concepts, e.g., before/after, whole/half etc., e.g., She had <u>half</u> an apple, The rabbit went <u>before</u> the tortoise etc.	3	97	Expresses conditional clauses such as if, unless, e.g., He can't get in to the train <u>unless</u> it stops, <u>If</u> the train moves, the goat will die etc.	1	99
Understands passive sentences, e.g., The rat was killed by the cat et	3	97	Utters a few blends such as ks,a, skr, st, str, s, t etc. Speech is 100% intelligible.	4	96
Understands the concepts of left and right	3	97	Expresses hints that do not mention the intention in the request, e.g., those smell good” etc.	1	99
Total score	639	2161	Total score	535	2265

Crucial items are listed below

Table 4.15

Frequency of crucial Language items

Comprehension- Questions	Frequency	Expression- Questions	Frequency
---------------------------------	------------------	------------------------------	------------------

Stops crying when someone talks to him/her	73	Cries to indicate discomfort/pain/ hunger	83
Looks about in search of the speaker	72	Vocalizes and uses some intonation patterns	65
Regards speakers' face and shows interest in the process of talking	71	Plays by making sounds and noises (cooing)	65
Responds to name call	67	Utters series of syllables (babbling) and longer vocalizations with varied intonation patterns	61
Understands denial (responds to the word 'no')	64	Vocalizes in response to others' speech	57

Baird et al. (2002) compared early language development on preschool children with Autism spectrum disorders, and found there was a significant delay in children with Autism. An atypical developmental pattern was noticed. When compared with word production, comprehension of words was delayed. When compared with later gestures,

production of early gestures was delayed. The present findings support this study. There is a slight atypical pattern seen in both comprehension and expression of language. When compared with the normative of Swapna et al. (2010), there is a delay of 1-1 ½ years delay in early language skills and 3-4 years delay in higher language skills.

Play domain

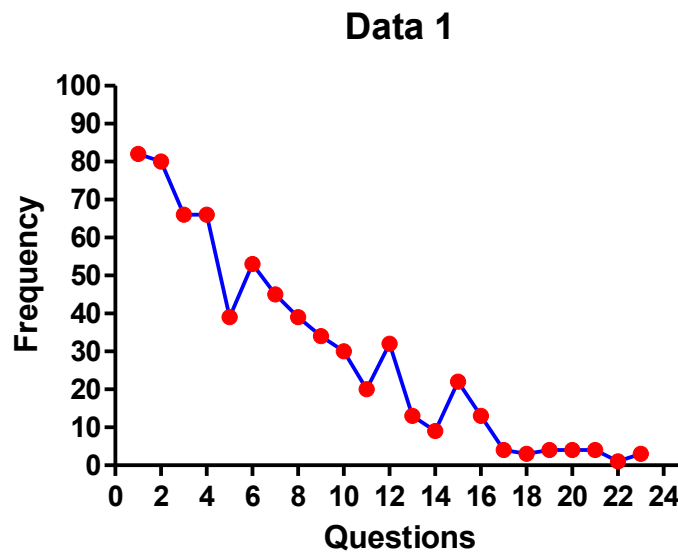


Figure 4. 11. Frequency of occurrence across each item for play domain

Table 4.16

Frequency of occurrence across each item for play domain

Questions	No. of Yes responses	No. of No responses
Exhibits exploratory play with own hands or legs	82	18
Exhibits exploratory play with toys, e.g., grabbing rattles, hitting objects or mouthing them	80	20

Enjoys playing games with adults, e.g., peek-a-boo	66	34
Finds hidden toys after watching it disappear	66	34
Exhibits non participant play/onlooker play i.e. passive observation of others at play without participating	39	61
Exhibits solitary play (playing alone and independently in adult's proximity without relating to others who may be playing nearby)	53	47
Plays with shadows or hide and seek games	45	55
Exhibits functional play by manipulating objects in a meaningful manner, e.g., pushing a toy vehicle, dialing telephone etc.	39	61
Exhibits symbolic play on self (e.g., pretending to sleep/drink) and later beyond self (e.g., brushing doll's hair, feeding doll/mother etc.) on single object/people at a time	34	66
Finds toys invisibly hidden under 2-3 covers	30	70
Exhibits symbolic play- performs pretend activities on multiple objects/people, e.g., feeding self, doll and mother; putting spoon into a cup, etc.	20	80
Exhibits play with blocks, sand and water	32	68
Exhibits enactive play, i.e. representing events less frequently	13	87

experienced or observed (events being short) e.g., store shopping etc.		
Exhibits associative play, i.e. playing with other children sharing activities, ideas, and materials (enjoys being in proximity)	9	91
Blows bubbles from soapy water	22	78
Builds three-dimensional structures with blocks, e.g., bridge, gate, etc.	13	87
Plays competitive games, e.g., running/hopping race, leap frog race etc.	4	96
Sets a scene and uses language to take roles of character in the play, child or two or more dolls/puppets have multi-roles or may take turns in roles, e.g., mother & wife, fireman, husband & father etc.	3	97
Follows rudimentary rules in group games led by an older child	4	96
Plays hide and seek by following the actual rules of the game	4	96
Plays outdoors independently without supervision	4	96
Exhibits more detailed and imaginative pretend play with objects/dolls and other children, assigns more than one role per doll, plans several sequences of events integrating parts of known schemas/scripts and new/novel schemas/scripts along	1	99

with usage of appropriate language, e.g., builds ship, sails in the sea, catches fishes, explores, etc.		
Plays simple board games and follow the rules	3	97
Total score	666	1634

Crucial items are noted below

Table 4.17

Frequency of crucial Play items

Questions	Frequency
Exhibits exploratory play with own hands or legs	82
Exhibits exploratory play with toys, e.g., grabbing rattles, hitting objects or mouthing them	80
Enjoys playing games with adults, e.g., peek-a-boo	66
Finds hidden toys after watching it disappear	66
Exhibits solitary play (playing alone and independently in adult's proximity without relating to others who may be playing nearby)	53
Total score	347

In the current study, similar pattern as above is followed in the development of Play in children with Autism. In early few items there is a delay of 6 months to 1 year. There is a marked delay of 3-4 years in items which are achieved after 1 year in typically developing children. Jarold (2013), Libby, Powell, Messes and Jordan (1998) reported that there was a significant delay in the development of symbolic play in ASD.

Variations

Out of 100 children with ASD, two children were diagnosed as Asperger's disorder and one child was diagnosed as Rett's syndrome. In the child with Asperger's disorder, development was near normal in all the domains other than higher level language expression. And in the child with Rett's syndrome, development in all the domains was severely impaired. But sample size is not adequate to conclude about the developmental trend of these two subgroups.

Zwaigenbaum et al. (2005) found that siblings who were later diagnosed with autism were able to be distinguished from the children who were diagnosed by 12 months of age. At the age of 6 months a typical characteristic pattern was observed that included a tendency to fixate on particular objects in the environment, extreme distress reactions and decreased expression of positive affect by 12 months. Research evidences and studies suggest that early intervention leads to better outcomes. When children enter an intervention program at younger age, they would have greater gain. Results of the current study support the research evidences which are mentioned above. It is observed that early identification and management brought remarkable improvement in the child, though therapy obtained was not showed separately as a variable.

Phase III

Items from all the domains were arranged according to highest to lowest frequency and listed. This checklist shows the trend or a pattern of development of behavioral milestone in children with Autism spectrum disorders.

This scale bears scope for profiling of the symptoms, to account for a more thorough diagnosis. However, the results of the study cannot be generalized because of inadequacy in the sample size.

CHAPTER 5- SUMMARY & CONCLUSIONS

Autistic disorder, also known as childhood autism, infantile autism, and early infantile autism is a condition where there is marked and sustained impairment in social interaction, deviance in communication, and restricted or stereotyped patterns of behavior and interest. Abnormalities in functioning in each of these areas must be present by age 3 (Volkmar, Klin & Schultz, 2005).

PDDs are a set of phenomenological related neuropsychological disorders, characterized by patterns of both delay and deviance in multiple areas of development, their onset being typically in the first month of life (Volkman & Lord, 1998).

Behavioral issues include encompassing preoccupations with one or more stereotypical and restricted patterns of interests, apparently inflexible adherence to specific, nonfunctional routines or rituals, stereotypical and repetitive motor mannerisms and persistent preoccupation with parts of objects.

The study essentially aimed at the construction of a checklist for early identification with developmental and pragmatic behavioral milestones for autism spectrum disorders (ASDs). Subsequently there is no literature which had developmental milestones for ASDs and also there is a need for identifying the crucial behaviors in the developmental milestones which helps in assessment and management of child with ASDs.

Items from other checklists were taken and categorized into 7 domains. Medical, Motor, Emotional, Cognitive, Social, Speech and Language and Play.

As a part of qualitative analysis, item analysis was carried out. Based on ‘Yes’ response for every question, frequency table was prepared for medical domain. And for other domains, if the behavior was achieved, score ‘1’ was given and if the behavior was not achieved score ‘0’ was given. Based on this response, frequency table was prepared.

Frequency distribution for each question is been depicted in graphical representation. Responses to questions having frequency above 50% were considered as crucial items or developmental / biomarkers.

Items were eliminated and selected after each stage, and finally incorporated into the diagnostic form, which was named “Early developmental behavioral trajectory in autism spectrum disorders”. Instructions for administration of the checklist is mentioned in the Appendix-I.

During the study, many technical difficulties were encountered. The primary one being the diversity of symptoms in cases labeled "Autistic". Also, all the subjects studied had undergone therapy for different duration, and they all had differences in age of the children and age of identification of the problem. There is still the need to discover something concrete about these behavioral milestones of the ‘spectrum’.

Limitations of the study

- The constructed checklist has to be standardized across a large population.
- The scale is only a qualitative tool for the measurement of ASDs.
- Asperger’s disorder, Childhood disintegrative disorder and Rett’s disorder in the spectrum were not studied as separate entities as they were too small in number.

Implications for further research

- Further modification of the current tool following standardization across large population.
- A large sample can be taken to obtain a scale for diagnosis of Asperger's disorder, Childhood disintegrative disorder and Rett's disorder since the pattern of development vary in them compared to other Autistic children.
- This tool can be used as a diagnostic tool
- Can also be used for baseline and post therapy assessment.

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APPENDIX

Early Developmental Behavioral Trajectory in Autism Spectrum Disorders

Instructions to the evaluator

- This form should be filled by the professional on the bases of both parent/ caregiver report, and observation of the child.
- This checklist assesses risk for ASD.
- Users should be aware that, even a significant number of the children who screen positive on this checklist, will not be diagnosed as only ASDs. At best these children may be identified to be at risk for any developmental disorders or delays.
- Note: Where and when required, the use of pronoun should be used as She.
- The pronoun “He” has been used throughout in the form to refer to the case for the sake of convenience only.

Scoring

The items which are given in bold letters are the crucial items. A professional should diagnose the child based on this checklist by considering child’s age as a main factor.

Low risk: If the child fails in 50% and above in other items (if answer is ‘NO’), it indicates mild-moderate risk of developing Autism Spectrum Disorders.

High risk: If the child fails in 50% and above in crucial items (if answer is ‘NO’), it indicates severe impairment in child’s developmental milestones.

Name:	
Number:	
Age/ Gender	
Language	
Diagnosis	
Age of identification	
Duration of therapy attended	
Contact Details (Phone & email ID)	

Domains:

1. Medical
2. Motor
3. Emotional
4. Cognitive
5. Social
6. Speech-language domain
7. Play

Please answer these questions about your child. Only if the behavior is stabilized, then answer 'yes'. If you have seen the particular behavior a few times, then answer 'No'.

1. Medical History:

Pre-natal:

	Question	Yes	No
1.	Was the baby born before the due date given by the doctor (before 37 weeks from last menstrual period)?		
2	Did the child's mother take any medicines for illness during pregnancy		
3	Did the child's mother have had any miscarriage?		
4	Did the mother have excessive vomiting even after 5 months of pregnancy?		
5	Did the mother have had viral infection or any other illness?		
6	Did the mother undergo x-ray during pregnancy?		

Peri natal

	Question	Yes	No
1	Did the child cry immediately after birth?		
2	Was the delivery of the child normal?		
3	Was the child kept in Hospital for treatment after birth?		

4	Did the child appear yellow or blue at birth?		
5	Was the child's weight low at birth (less than 1.5 kg)?		
6	Was there any defect on the head and face when the child was born?		

Post natal

	Question	Yes	No
1	Did the child suffer any head injury associated with loss of consciousness, skull fracture, bleeding or discharge from ear following injury?		
2	Did the child have any other illness like Mumps, Chicken pox, Typhoid etc. after the birth?		
3	Did the child undergo any emotional turmoil?		

MOTOR DOMAIN

GROSS MOTOR SUBSKILL

	Items	Yes	No
1	Sits with support		
2	Sits without support		
3	Turns over		
4	Walks independently		
5	Stretches legs out when lying on stomach or back		
6	Walks holding on to a hand or furniture		
7	Walks in different directions, e.g., walks backward, in circle etc.		
8	Jumps in place with both feet		
9	Rolls ball in specific direction from sitting position		
10	Sits crossed legged		
11	Walks down stairs independently, placing both foot on each step		
12	Runs		
13	Bends over easily without falling		
14	Catches a rolled ball and rolls it forward		
15	Throws a ball overhead with accuracy (4-6 foot distance)		

16	Jumps in place with both feet (2-3 ft. above ground) and jumps in different ways a and directions, e.g., frog jump		
17	Rides a bicycle with supporting side wheels		
18	Hops forward on each foot separately		
19	Supports weight on combinations of body parts or on hands alone, e.g., clings to horizontal bars etc.		
20	Jumps 3-4 ft. across space		
21	Jumps with two feet together over a rope at 20 cm or approximately 1 foot high for from ground		
22	Somersaults (tumbles over on bed)		
23	Hits nails with hammer head, uses screwdrivers unassisted		

FINE MOTOR SUBSKILL

	Items	Yes	No
1	Holds objects with one/both hands, e.g., rattle (palmar grasp)		
2	Reaches out for small objects hung in front/dropped		
3	Rakes at a small object with fingers (not thumb) (raking grasp)		
4	Releases objects		
5	Stacks 2-4 one inch blocks		
6	Fisting eliminated in both hands		
7	Colors with a large crayon holding it appropriately (tripod grasp)		
8	Points to objects with index finger		
9	Has thumb finger opposition to pick up small objects (pincer grasp), e.g., raisin, pulses etc.		
10	Operate (open, close, turn) door knobs/latches		
11	Screws and unscrews jar lids		
12	Rolls, pounds, and squeezes clay/dough		
13	Strings five large beads on a shoelace		
14	Uses eraser		
15	Fills water through a funnel into bottle		
16	Moves fingers independently, e.g., counting numbers		

17	Holds scissors of small size and makes an attempt to cut		
18	Colors within outlines		
19	Cuts on a straight line with scissors		
20	Shows by holding 6-7 playing cards		
21	Folds paper and inserts into envelope		
22	Cuts primary shapes using a scissors		
23	Ties tags, simple knots/shoe laces		
24	Laces a thread shoelace in a sequence of holes		

3. EMOTIONAL DOMAIN

	Items	Yes	No
1	Communicates feelings of pleasure/distress/disgust through gestures, noises and expressions		
2	Laughs when stimulated (through play/communication)		
3	Responds to other people's expression of emotions and changes in tone of voice		
4	Shows denial by shaking head or moving arms, e.g., putting hands in front of face to avoid having it washed		
5	Imitates, understands and responds to gestures and facial expression		
6	Vocalizes displeasure when an object is taken away		
7	Starts to exhibit a temper when angry		
8	Demonstrates increasing awareness of self as separate from others, e.g. tells their name and others names		
9	Indicates awareness of people having different feelings and desires in different situations		
10	More evident temper tantrums to command/demand needs Expresses self-conscious emotions like pride, e.g., on being appreciated repeats the task		
11	Displays ownership of objects		
12	Generally enjoys caring for and playing with younger children		
13	Shows affection for familiar playmates		
14	Expresses self-conscious emotions like pride, e.g., on being appreciated		

	repeats the task		
15	Able to create and give constructive criticism, e.g., “You would have got the prize, if you would have written neatly” etc.		
16	Separates easily from parents (separation anxiety decreases)		
17	Exhibits fears of harmless objects, e.g., strange looking toys like dolls or models of insects, animals etc.		
18	Has difficulty accepting defeat		
19	Refuses to accept a situation or an event that happened, e.g., on the loss a pet dog, the child may pretend that the pet is still living in the house etc.		
20	May have unpredictable mood swings		
21	Has a good sense of humor, and enjoys sharing jokes and laughter with adults (Enjoys funny cartoon shows)		
22	May have unpredictable mood swings		
23	Feels quite guilty about mistakes but, does not admit it for the fear of being exposed to criticism		

4. COGNITIVE DOMAIN

	Items	Yes	No
1	Makes simple associations, e.g., bottle-drink		
2	Attends/tracks to moving objects in and around the vicinity		
3	Demonstrates memory for objects and faces seen		
4	Finds hidden toys after watching it disappear and hence shows the awareness that objects exist when not seen		
5	Retains one object when given another and pays attention to both		
6	Learns to do something after demonstration, e.g., rock doll, hit balloon etc.		
7	Has attention span of 3-4 minutes		
8	Matches two identical objects		
9	Preserves coins or notes as money		
10	Dismantles and re-arranges the objects, e.g., tries to fix broken parts of toys		
11	Recalls three objects/pictures presented visually		
12	Has good memory of self and people around, e.g., tells names of self, parents		

	and siblings		
13	Categorizes objects or pictures based on two or more attributes like color, shape, size etc.		
14	Spots minute differences between pairs of pictures		
15	Understands the concept of same/different		
16	Preserves coins or notes as money		
17	Discriminates 'more-less' in liquids		
18	Performs double alternate sequence activities, e.g., red, red, blue, red, red, blue,....(what's next)		
19	Copies a shape from memory after seeing a model for several seconds		
20	Gives information regarding any of these: complete address/phone number/occupation of parents		
21	Arranges pictures sequentially to create a new story		
22	Reports seasons in a year		
23	Gives information regarding any of these: complete address/phone number/occupation of parents		
	Knows difference between right and left		
	Demonstrates spatial relations in terms of constructing symmetry by figure/color completion or full drawing		
	Understands time concepts (today/tomorrow/yesterday etc.)		
	Names 'after' month, e.g., "What comes after May" etc.		

5. SOCIAL DOMAIN

	Items	Yes	No
1	Maintains eye contact to the caregiver		
2	Responds to the caregiver by smiling		
3	Enjoys being hugged		
4	Smiles towards familiar people/own image		
5	Enjoys and expect repetition of simple games, e.g., peek-a –boo		
6	Waves goodbye on request		
7	Imitates behavior of others, especially adults and older children and mostly		

	housework		
8	Greets others by using words like hello, hi on request		
9	Has awareness of family relationships		
10	Comforts a distressed friend or parent		
11	Plays side by side with other children without exchanging ideas or materials		
12	Shows increased independence from caregiver, e.g., insists on doing his/her work independently		
13	Comforts a distressed friend or parent		
14	Waits for his/her turn		
15	Participates actively in group games		
16	Answers telephone calls for adult or talks to familiar persons over phone		
17	Says please and thank you appropriately		
18	Engages easily with adults and shows a sense of community by helping in group situations, e.g., passes food items on request, wipes up spills after meal time, dusts/wipes furniture on instruction, sets table during mealtime etc.		
19	Cooperates with other children and enjoys their company and can behave in a warm and empathetic manner		
20	Writes small letters/notes/chits to a friend		
21	Bargains for what they want, e.g., “If you give me the crayon, I’ll give you the toy”, etc.		
22	Evaluates self and friends and expresses the same to others		
23	Loves to tell jokes that may not make any sense at all to adults		
	Accepts someone else's choice, e.g., “It’s better to go to the park” etc.		

6. SPEECH-LANGUAGE DOMAIN

	Comprehension	Yes	No		Expression	Yes	No
1	Stops crying when someone talks to him/her			1	Cries to indicate discomfort/pain/ hunger		
2	Looks about in search of the speaker			2	Vocalizes and uses some intonation patterns		

3	Regards speakers' face and shows interest in the process of talking			3	Plays by making sounds and noises (cooing)		
4	Responds to name call			4	Utters series of syllables (babbling) and longer vocalizations with varied intonation patterns		
5	Understands denial (responds to the word 'no')			5	Vocalizes in response to others' speech		
6	Comprehends simple 'what' and 'whose' questions, e.g., "What is this?", "Whose shirt is this?" etc.			6	Utters sounds like /m/, /w/, /b/, /p/, /t/, and /d/ consistently; speech is 25% intelligible		
7	Frequently appears to listen to whole conversations between others			7	Often uses jargon (short sentence like utterances of four or more syllables without true words)		
8	Understands around fifty words (other nouns such as fruits, Household materials, birds, food items etc.)			8	Says 'finished' to signify completion of action		
9	Detects simple rhymes (responds by action, if a familiar rhyme is heard)			9	Greet others by saying 'hello' or 'hi' on request		
10	Identifies objects by use, e.g., "What do you cut with?" etc.			10	Says his/her name		
11	Remembers and associates new words by categories, e.g., cake-food, lion-animal, etc.			11	Uses possessives, e.g., daddy's, mummy's etc.		
12	Understands more number of words (nouns such as clothes,			12	Uses question markers (what & where) and thereby requests for		

	vegetables, flowers, stationary items etc.)				information		
13	Comprehends complex verbal sentences, e.g., “When we get to the stores, I’ll buy you an ice cream” etc.			13	Utters sounds such as /t/, /d/, /f/, /s/, /j/, /l/, /ng/; speech is 60-75% intelligible.		
14	Recognizes common adjectives and adverbs, e.g., fat, thin, short, tall, dry, wet, slow, fast, etc.			14	Names all colors and shapes (circle- round; square-box) etc		
15	Comprehends ‘how many’ questions, e.g., “How many flowers are there?” etc.			15	Uses past, present and future tense appropriately to describe events.		
16	Comprehends possessives such as its, our(s), their(s) e.g., This is <u>our</u> umbrella, It is <u>their</u> puppy etc.			16	Uses pronouns and possessives (he, she, him, his, her, they, we and your)		
17	Comprehends three and four step commands, e.g., come here, take this book, give it to your sister; go to the kitchen, fill a glass of water, switch off the light and bring it to me etc.			17	Expresses in 3-4 word sentences and maintains topic beyond several turns during conversation		
18	Comprehends questions related to daily routine activities, e.g., What Does you do in the morning? etc.			18	Utters a few blends such as ks a, skr, st, str, s, t etc. Speech is 100% intelligible.		
19	Knows common antonyms (opposites), e.g., big x small, hard x soft, heavy x light etc.			19	Uses pronouns and possessives (I, my, you, me, mine, this, that)		
20	Knows common antonyms (opposites),e.g., big x			20	Uses causatives, e.g., The girl is made to brush her teeth, The child is made to take bath, the		

	small, hard x soft, heavy x light etc.				child is made to take bath, he is made to eat his food etc.		
21	Comprehends ‘how ‘questions, Eg: “How is the chocolate?”			21	Expresses demonstrative nouns such as these and those e.g., <u>These</u> are my books; <u>Those</u> are my brother’s books etc.		
22	Attempts to tell stories (recalls or sequences 3 or 4 events of a familiar story)			22	Speaks of imaginary conditions such as such as “I hope, I feel.....”e.g., I hope it rains, I feel that she will come to play with me, etc.		
23	Comprehends long stories when told or read and retells it and an answer content related questions based on the story			23	Speaks in sentences/clauses of 8 or more words in length using since, in order that, as soon as, until, even though, although, before, after etc. e.g., Come and see me <u>as soon as</u> the work is finished, Don’t come <u>until</u> you finish eating, the baby ate the cookie before I could put it on the table, let’s go to the store <u>after</u> we eat etc.		
24	Understands time concepts such as today/ tomorrow/yesterday, for a long time, for years, a whole week, in the meantime, sooner-later, two things at once etc.), e.g., What is the day tomorrow? Yesterday Do you go to school? etc.			24	Describes short stories in simple and compound sentences		
25	Understands conditional clauses (if, unless),e.g., <u>If</u> there is picture of fan in this page, clap your hands, <u>Unless</u> I call your name you should not touch the picture			25	Uses PNG (person, number and gender) markers, e.g., The cat is/cats are sleeping, He is/ they are sleeping, mother is sleeping ,This is my glass, these are my glasses etc.		

26	Understands spatial and temporal concepts, e.g., before/after, whole/half etc., e.g., She had <u>half</u> an apple, The rabbit went <u>before</u> the tortoise etc.			26	Speaks of imaginary conditions such as such as “I hope, I feel.....”e.g., I hope it rains, I feel that she will come to play with me, etc.		
27	Understands passive sentences, e.g., The rat was killed by the cat			27	Expresses conditional clauses such as if, unless, e.g., He can’t get in to the train <u>unless</u> it stops, <u>If</u> the train moves, the goat will die etc.		
28	Understands the concepts of left and right			28	Expresses hints that do not mention the intention in the request, e.g., those smell good” etc.		

7. PLAY DOMAIN

	Items	Yes	No
1	Exhibits exploratory play with own hands or legs		
2	Exhibits exploratory play with toys, e.g., grabbing rattles, hitting objects or mouthing them		
3	Enjoys playing games with adults, e.g., peek-a-boo		
4	Finds hidden toys after watching it disappear		
5	Exhibits solitary play (playing alone and independently in adult’s proximity without relating to others who may be playing nearby)		
6	Plays with shadows or hide and seek games		
7	Exhibits non participant play/onlooker play i.e. passive observation of others at play without participating		
8	Exhibits functional play by manipulating objects in a meaningful manner, e.g., pushing a toy vehicle, dialing telephone etc.		
9	Exhibits symbolic play on self (e.g., pretending to sleep/drink) and later beyond self (e.g., brushing doll’s hair, feeding doll/ mother etc.) on single object/people at a time		
10	Exhibits play with blocks, sand and water		
11	Finds toys invisibly hidden under 2-3 covers		

12	Blows bubbles from soapy water		
13	Exhibits symbolic play- performs pretend activities on multiple objects/people, e.g., feeding self, doll and mother; putting spoon into a cup, etc.		
14	Exhibits enactive play, i.e. representing events less frequently experienced or observed (events being short) e.g., store shopping etc.		
15	Builds three-dimensional structures with blocks, e.g., bridge, gate, etc.		
16	Exhibits associative play, i.e. playing with other children sharing activities, ideas, and materials (enjoys being in proximity)		
17	Plays competitive games, e.g., running/hopping race, leap frog race etc.		
18	Follows rudimentary rules in group games led by an older child		
19	Plays hide and seek by following the actual rules of the game		
20	Plays outdoors independently without supervision		
21	Sets a scene and uses language to take roles of character in the play, child or two or more dolls/puppets have multi-roles or may take turns in roles, e.g., mother & wife, fireman, husband & father etc.		
22	Plays simple board games and follow the rules		
23	Exhibits more detailed and imaginative pretend play with objects/dolls and other children, assigns more than one role per doll, plans several sequences of events integrating parts of known schemas/scripts and new/novel schemas/scripts along with usage of appropriate language, e.g., builds ship, sails in the sea, catches fishes, explores, etc.		