PROJECT REPORT

COGNITIVE LINGUISTIC INTERVENTION PROGRAM FOR CHILDREN AT RISK FOR LEARNING DISABILITY

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CHAPTER 1

INTRODUCTION

Learning disabilities (LD) is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition & use of listening, speaking, reading, writing, reasoning, or mathematical abilities (NJCLD, 1990). These problems are developmental and starts manifesting from preschool years, continues through school years and even to adulthood. The manifestations at each age are different in even the same child as the learning needs and demands are different in different ages.

In India diagnosticians use a set of criteria. Learning problems caused by brain damage, sensory impairment, Intellectual disability or serious emotional problems are not diagnosed as LD. An individual who is older than eight years can be labeled as learning disabled, if he/she exhibits serious academic problems without any sensory impairment, intellectual disability or brain damage and are in need of extra help interms of academic achievements (Bindu, 1996; Gowramma, 1998).

In Indian scenario, academic problems were faced by many children which are associated with learning disability, but those problems were ignored in the classrooms (Karanth, 1998) and the research on the area started to expand in 1980s and 1990s (Ramaa, 2000). The research on learning disability started to gain its pace when the number of students with academic and non-academic issues started to get reported. About 10-14% of the children in India are reported to have LD (Krishnan, 2007; Krishnakumar, 1999; Mehta, 2003). In India, at least five students with LD are present in every average sized classroom (Thomas, Bhanutej, & John, 2003). According to Ramaa and Gowramma (2002) the incidence of dyscalculia in south India was reported to be 6% of all children at school age.

Learning Disability is usually noticed and diagnosed when children show signs of scholastic issues in school and therefore the average age at which LD assessments are carried out were reported to be at 9 years (Shaywitz, 1998). Whereas it is during the preschool years, learning disabilities are manifested in children as deficits in speech andlanguage development, reasoning skills and early literacy skills. The delay in assessment and intervention leads to undesirable and unrelenting consequences for the future scholastic achievement. That is, there are possibilities that the early identification and intervention of children at risk for learning disabilities alleviate those undesirable consequences which are the consequences of delayed intervention by providing preventive services as early as possible (National Institute on Health, 2000).

Children learn skills that are necessary for literacy during the early speech and language development itself. During this emergent literacy stage, this is from birth and continues till the child enters to school. The expressive and receptive language experiences gained during the preschool period help the children to acquire the literacy skills in early school years. Research correlations are found between several linguistic skills like phonological awareness, naming skills and efficiency of phonological access to lexical storage and even phonological sensitivity. Decoding of written language also needs cues which come from the knowledge of morpho-syntactic rules. That is both receptive and expressive language skills are associated with literacy skills.

Over the past two decades, cognitive linguistics has been emerging as a dynamic framework. It views language as embedded in overall cognitive capacities of a person. Most of the research discuss about the relation between linguistic and literacy skills but strong correlations between several cognitive skills and linguistic

skills exist which are crucial for developing reading and writing skills in children. Various children with Learning Disabilities (LD) have been found to show poor reading and writing skills due to issues in cognitive and linguistic skills. The cognitive skills found to be crucial include memory, executive skills, speed of processing, etc. Such skills are reported to be associated with early decoding and word recognition skills. Research has demonstrated that so as to achieve the adequate language specific cognitive processes and reading skills, it is necessary to work on universal cognitive processes (Shaul, Katzir, Primor & Lipka, 2016). It has been found that well-defined interventions to develop specific concepts or strategies ad skills seem to be effectively interact with the deficits in phonological processing, listening comprehension, visual perception, orthographic processing and memory, and spatial and temporal processing. Different deficits in phonology, semantics and syntax are found to be related to various reading and writing disabilities. It has been reported that the knowledge about the role of specific cognitive and linguistic abilities in detail will help improving the prediction of risk of having LD and can also become the foundation of individualized intervention plan (Stuebing et al., 2014).

Response to Intervention (RTI) is a way of identifying and preventing academic difficulties in children at risk. It is an evidence based practice, which starts from the general education set up and later on increases the intensity and differentiation in set ups based on the child's response to the intervention program (Fuchs, Compton, Fuchs, Bryant, & Davis, 2008). Most of the studies focuses on reading accuracy and other academic skills and did not usually focus on the additional cognitive and linguistic factors which affect academic skills (Snowling & Hulme, 2014). Research has suggested that reading is a complicated form and therefore, the intervention programs should create a firm cognitive base such as memory and

executive functions and also concentrate on the linguistic factors which are important for learning (Katzir, Lesaux, & Kim, 2009). It may be the combination of cognitive and linguistic factors more beneficial to the children in remediating the academic difficulties (Shaul, 2016). However little is known about the various interventions that are required to benefit children with learning disability to the maximum with different oral and writtenlanguage deficits.

CHAPTER 2

REVIEW OF LITERATURE

The diagnosis of Learning Disorders depends on the person's performance on the standardized tests of reading, writing and/or mathematics. When the child's achievement on tests is substantially below that expected for age, schooling, and level of intelligence then the diagnosis of LD is made. The learning problems significantly interfere with academic achievement or activities of daily living that require reading, mathematical, or writing skills (DSM-IV-TR, 2000). DSM-5 considers SLD to be a type of Neuro-developmental Disorder that impedes the ability to learn or use specific academic skills (e.g., reading, writing, or arithmetic), which are the foundations for other academic learning. Franklin (1987) reported that children with LD will have normal intellectual skills, but not able to learn through the normal curricular activities and methods. But Learning disabilities (LD) reported to comprise cognitive issues in several executive functions such as working memory, encoding, visual- motor coordination, planning, and information processing (Barkley, 1997; Denkla, 1996; Douglas, 1972; Pennington & Ozonoff; 1996; Prifitera & Dersh, 1993; Welsh & Pennington, 1988). The conceptual definition of learning disabilities (Hammill, 1993) suggests that the aetiology of learning disability comprises lack of essential cognitive skills that are developmentally related to central nervous system dysfunction. The opinion was supportedby different authors (Flowers, 1993; Chase, 1996; Galaburda, 1991). Rueda (2005) also reported that LD can be a result of different issues that occur from biological, cognitive and social components and the interactions between these components.

The prevalence of learning disability is reported to be as many as 17 percent of the population (Lyon, 2005) and around 4-10 percent in Indian children (Ramaa,

1985). Kapur (1995) reported that in India the prevalence is 10 – 20 percent. Prevalence of LD in Urban English medium schools of India is reported to be 10 percent (Mehta, 2003). LD is diagnosed when they start demonstrate scholastic problems in school, the assessments are usually received at an age of 9 years (Shaywitz, 1998). In schools, the children who experience difficulty in developing academic skills starts losing chances to read discourse passages because of their slow reading, this occurs as they are poor in basic phonetic decoding skills. This again aggravates the poor reading skills and acts as a disadvantage throughout the academic years. Also this leads to a lack of language experience, as children learn language also through the printed text in the school years (Torgesen, 2000). It has been reported that the early language and literacy skills are very important in predicting the later literacy skills and academic achievement (National Early Literacy Panel, 2008). The foundational skills of literacy development start to develop even before formal schooling, and the children with stronger core skills are found to be more successful in academics than the age matched peers (Scarborough, 1998). Hence, researchers tried to understand the basic cognitive-linguistic skills that are predictive of literacy skills (Bowey, 2005).

Oakhill and Cain, (2012) tried to identify the precursors of reading ability in children and found that understanding a written passage depends on verbal IQ and vocabulary. Also the reading skills at early age predict the reading development in later school years. They alsoreported that the skills of Phonemic awareness, inference, monitoring, listening comprehension and the knowledge about structure of passage helps in reading comprehension and word reading accuracy in grade 6 children. Hulme, Nash, Gooch, Lervåg, and Snowling (2015) reported that the literacy skills are closely related to oral language skills. Children who reported to have language

difficulties in preschool years were observed to have later academic difficulties. Reading comprehension skills at a higher level was predicted by the oral language skills in preschool years. Before starting formal education children must develop many linguistic and cognitive skills which are important for academic learning (Entwisle & Alexander, 1993). Children's self-perception and motivation are also influencing factors while learning to read and write. Research also focused on cognitive processes, as they are more likely to be etiologic factors of literacy issues (Kirby, Desrochers, Roth, & Lai,2008).

The cognitive and linguistic factors which are important for acquisition of reading were investigated with few longitudinal studies. Muter, Hulme, Snowling, and Stevenson (2004), followed children for a period of two years after joining the grade 1, and they reported that word identification skills, vocabulary and language skills could predict the reading comprehension by the end of grade 2. Oakhill, Cain, and Bryant (2003), alsoconducted a similar study and reported that verbal Intelligence quotient, vocabulary, inference skills and monitoring skills could predict the reading comprehension of children in 3rd, 4th and 6th grades. Written language comprehension in children of grades 3, 4 and 5 were found to be related with the word decoding skills, linguistic skills and memory (Goff, Pratt, & Ong., 2005).

Several studies reported building up the skills for reading comprehension is closely related to word decoding, listening comprehension and vocabulary (Verhoeven & Van Leeuwe, 2008; De Jong & van der Leij, 2002). Davidse, de Jong, Bus, Huijbregts and Swaab (2011) discuss cognitive and environmental predictors of early literacy in Dutch. The study aimed to test the impact of home literacy environment (HLE) on literacy skills and the impactof cognitive control mechanisms

(short-term memory, inhibition, sustained attention) on the relation between HLE and literacy outcomes. A sample of 228 junior kindergarten children with a native Dutch background participated in the study. A questionnaire was completed by the parents with notes about book sharing frequency and an author recognition checklist as indicator of parental leisure reading habits. In addition, a book-cover recognition test, a vocabulary test, a letter knowledge test, a cognitive capacity test, and cognitive control measure were administered to the children. The results showed that the relationship between home literacy environment and literacy skills was mediated by children's storybook knowledge. Furthermore, it was found that vocabulary and letter knowledge were predicted by book exposure and that the effects of book exposure were similar whatever the level of cognitive control.

Cognitive – Linguistic Skills in Learning disability

Cognitive skills are a broad variety of processes like attention, perception, memory, organization, language, problem solving and reasoning, classification, concept and categorization (Best, 1999). Language is a part of cognitive skills and is considered as a device for thinking (Vygotsky, 1986). Cognitive and language development are closely interrelated and cannot be viewed as separate entities. The relationship between cognitive and linguistic skills starts from the infancy. Piaget's model (1969) explained the cognitive and linguistic skills by integrating the processes at various stages of development in children. Bloom, Lahey and Muma (1978) cognitive skills are major underlying process of language. The cognitive abilities such as attention, memory, organization, reasoning, problem solving and metacognitive skills are important for comprehension and expression of language (ASHA 1987). Such a pairing of cognitive and linguistic skills is known as cognitive linguistic abilities.

Models of reading explain the mechanisms of reading process in fluent readers. These models typically explain the bottom-up and top-down processes of reading. Bottom-up models explains from the lower level processing and then into the more refined processes for reading comprehension. Whereas in top-down processes, the choices at basic levels are decided by the processing at higher level. Rayner and Pollatsek (1989) stated that reading process cannot be explained by purely bottom-up or purely top-down models. Therefore, a mixed model of both bottom-up and top-down processes are important to entail that both graphic and contextual cues for comprehending a written expression (Perfetti, Landi, & Oakhill, 2005; Verhoeven & Perfetti, 2008). Word recognition skills develops and becomes more automatized with the increased speed and accuracy of the decoding skills in children, which is accomplished by the sight word reading skills (Reitsma, 1983; Ziegler & Goswami, 2005). Later on children start to use reading as a method to gain knowledge, they focus more on reading comprehension than on recognizing the letters and words (Perfetti, 1998; Samuels & Flor, 1997). This is accomplished by the use of mental resources and processes. These resources are reported to be a major factor in reading development as well as reading impairment. Acquisition of literacy skills is closely dependent on the linguistic skills. The development of reading and writing skills are a combination of processes that starts along with the development of oral language (Lyon, 2004).

Verhoeven, Reitsma and Seigel (2010) reported that there are robust correlations between cognitive linguistic skills that are important for development of literacy skills in childhood. It has been reported that the concrete operational stage is delayed in children with LD (Ramaa, 1991). A study was conducted by Nishy Mary (1998) on the cognitive skills in children with LD. They assessed twenty children

with learning disability within the age range of 5.5 to 9.6 years. The results showed that there are differences among LD children in different cognitive tasks. They also reported that children with LD have poor cognitive skills which are important for academic achievement. Ramaa (1991) also conducted a similar study in children with dyscalculia. They selected children with mathematical difficulties from 2nd, 3rd and 4th grades and attempted to study the seriation and conservation and classification skills in children using The Mysore Cognitive Development Status Test (Padmini and Nayar, unpublished). They reported poor seriation, conservation and classification skills in children with LD. From such studies it is understood that some cognitive skills are affected in childrenwith LD and also there are individual differences among children with LD in the cognitive skills. Hence it is important to identify strengths and weaknesses of each child's cognitive skills and have a purposeful endeavor to improve the skills of children with LD (Ramaa, 1991).

Srimani (1998) conducted a study on children with language disabilities in 3rd and 4th grade. The author assessed auditory comprehension, vocabulary, phonology, syntax and semantics skills in Kannada language. They reported that children with language disability exhibits poor performance in all the skills they assessed. On qualitative analysis they reportedthat the skills are poorer than the normally achieving peers and may not show any improvement with maturation, schooling or incidental learning. It has been also reported that children with LD in the age of 7 to 13 years has poor language performance in Linguistic Profile Test in Hindi (Karanth & Rangamani, 1986). Hence in order to develop the language skills and academic skills a systematic remedial training is necessary.

Radach, Kennedy, and Rayner (2004) stated that by several years of research it has been shown that the cognitive factors typically affects fluency of reading and

the ability to comprehend the concept as well. According to the authors attention and perception are pre- requisites of efficient reading. Adams and Snowling (2001) reported that inattention is one of the etiologic factors of reading problems. Both auditory and visual perceptions have influence in the development of reading skills (Tallal, 2000, Ramus, 2001) and the limitations in these skills leads to reading problems.

Memory is one of the most frequently studied aspects in relation to the reading skills and its development. Working memory and reading development are found to be closely associated in studies. According to Baddeley (1986) working memory is a temporary storage of information necessary to perform tasks such as learning, reasoning, and comprehension. It is a multi-component capacity limited system. Several studies have been conducted which had the task of repeating series of words. (e.g., Nation, Adams, Bowyer-Crane, & Snowling, 1999), series of nonwords (e.g., Gathercole, Willis, Baddeley, & Emslie, 1994), or sentence completion tasks (Siegel & Ryan, 1989). With respect to the relation between the central executive memory functioning of children and reading development, it has been shown that problems switching between different aspects of information-processing.

The development of reading and writing skills in children involves phonological decoding principles (Ehri, 1999). Comprehending a written expression, brain should process the set of known words and then find out the alphabetic principle based on those familiar words involving the same sounds and letters. This recoding acts as a learning apparatus on the basis of which children learn to sound letter mapping, it also acts as a component of lexical access for reading (Perfetti, 1992). Research has shown that phonological awareness has an important role in the early reading skills (Anthony & Francis, 2005). Problems in word decoding skills are

related to lack of phonological skills (Swanson, Trainin, Necoechea, & Hammill, 2003). Research has provided strong evidences that children with reading problems have issues in phonological awareness, and this has a role in initial phonological encoding (Snowling, 2000). It has been reported that poor readers lack skills in discrimination of phonemes, segmentation tasks, rapid naming, and rhyme production (Vellutino, Fletcher, Snowling, & Scanlon, 2004, Wolf & O'Brien, 2001, Lundberg & Høien, 2001). It has been also reported that the phonological processing skills are closely related to the STM (Gillam & Van Kleeck, 1996) and also that the poor readers have STM deficits (Farmer & Klein, 1995; Siegel, 1994). Hence LD is basically a problem in cognitive and linguistic skills. The linguistic part has mostly to do with the reading comprehension. The language processing mechanisms can be indirectly assessed using the short term memory tasks, as the linguistic skills and cognitive skills are highly interdependent (MacDonald & Christiansen, 2002).

Research suggested that Memory and vocabulary learning is closely related, especially in second language acquisition (Baddeley, Gathercole, & Papagno, 1998). Gathercole, Willis, Emslie, and Baddeley (1992) reported that Children who have better phonological STM have better vocabulary also. Swanson, Sáez, Gerber and Leafstedt (2004) examined the roles of STM and WM in the literacy skills of bilingual children. He conducted a study on Spanish-English speaking children (5-6 years), and could find that the second language reading skills can be predicted by both L1 and L2 working memory tasks. Swansonet al (2006) followed up the same children at the age of 6-8 years. The results suggested that the children who were at risk for LD based on the reading scores had less improvement in both STM and WM over the two years of study.

Similar results were obtained, whereresearchers suggested the memory scores

can be used to identify children with poor reading skills in bilingual populations (Da Fontoura & Siegel, 1995). Such studies imply that the memory skill assessments could be an effective identification tool for early literacy issues. Several studies identified that the STM and WM has relation to the accuracy of reading (Lesaux et al., 2007; Geva, 2006), spelling (Harrison, et al., 2016; Jongejan et al., 2007; Yeong & Liow, 2011) and understanding written expressions (Lesaux et al., 2007; Farnia & Geva, 2013). Hoover and Gough (1990) in their simple view of reading proposed that reading comprehension is a product of word decoding and listening comprehension. That is, the linguistic processes needed in reading comprehension and oral language comprehension constrains the same processes. For understanding a reading passage, the sentences should first be split into its parts and then draw inferences to make explicit relationships within and between sentences, so that the information are integrated, then also the underlying structureof the text should be identified and that is the micro structure as well as the macrostructure. It has been reported that poor readers show more problems in the processes during oral language comprehension than better readers (Yuill & Oakhill, 1991). Myklebust (1981) also reported that, children with LD are reported to be not as proficient as the normal peers in terms of their auditory comprehension, memory, oral language, spatial orientation and overall classroom behavior.

Goldstein (1976) studied the relationship between cognitive- linguistic skills andreading development. The author assessed memory and metalinguistic skills in 11 children of 4-year-old and in 12 normal children. They reported that reading skills were not correlated with sequential memory skills whereas the metalinguistic skills were correlated well with the reading skills. It has been also reported that poor and good readers can be distinguished well from the sequential memory skills (Mason,

Katz, & Wicklund, 1975) and it predicts thefuture reading achievement in children (Hartlage & Lucas, 1972).

Categorization and organizational skills are one of the major cognitive linguisticaspects which are important in learning. Categories are the mediators in all aspects of learning and interactions (Smith, 1989). Categories help perception and other cognitive skills.As the environment are dynamic and there are infinite variety in the world and also helps for the storage and retrieval of information through the help of organizational skills. Categories are very important in early childhood as they experience different people, events and objects, as they helps for the response generalization skills through the understanding of common object properties (Bornstein, 1984; Rakison & Oakes, 2003). It has been reported that development of categorization skills are fundamental in the development of cognitive function such as linguistic and memory skills (Mareschal, Powell, & Volein, 2003).

Kelly, Best, and Kirk (1989) reported that activation of pre frontal lobe is closely related with reading problems in children with learning disabilities. Aspects of executive functions in children with dyslexia have been shown marked deficits when compared to the normal peers. Executive functions include planning, problem solving, organization, flexibility and inhibition (Lezak, 1995). It has been reported that children with LD exhibits poor performance in problem solving, planning and organization skills by several authors (McLeskey, 1980; Levin, 1990; N.arhi, R.as.anen, Mets.apelto, & Ahonen, 1997; Chiarenza, 1990; Klicpera, 1983). It has been reported that children with LD demonstrate difficulty in generating and using effective strategies for solving complex tasks and also shows difficulty in tasks involving conceptual problems and mazes as well (Klicpera, 1983; Levin, 1990).

Reiter, Tucha and Lange (2004) conducted a study on executive functions in

children with LD. 42 children with LD and 42 normal peers were included in the study. The authors reported that on comparison of executive functions, children with LD displayed impairments in working memory, inhibition, flexibility, and fluency functions. They also reported that problem solving was partially impaired in children with LD. The authors also suggested as executive functions affect the other cognitive functions and the academic achievement, such deficits should also be used to develop intervention programs for children with LD.

Borkowski, Johnston, and Reid (1987) put forwarded the concept of meta-cognitionas a number of components which are interactive and mutually dependent. All the components have independent development and cause, and they helps in problem solving strategies. The metacognitive models can be applied to the memory operations as well as reading comprehension and other academic skills. They also reported that children with LD fail to develop the capacity for selecting proper strategies for some tasks.

Mental age was reported to be one of the crucial factor in the reading development (Morphett & Washburne, 1931) But Piaget's work has drawn attention to the importance of logical reasoning skills in academic and reading acquisition than the mental age. Several authors applied the theory by Piaget into the development of reading (Elkind, 1976; Furth, 1978; Murray, 1978; Rawson, 1979; Wadsworth, 1978; Waller, 1977). It has been hypothesized that basic logical reasoning skills are crucial for the development of concepts and skills. It was reported that the logical reasoning skills are highly correlated with the reading readiness scores in First graders and kindergarteners (Ayers, Rohr & Ayers, 1974).

Sullivan (1995) reported that endorsing dynamic thinking and logical reasoning will facilitate the academic skills in children with LD in elementary school.

He conducted a study on 63 children studying in 4th and 5th grades and were provided training for active thinking and reasoning skills and reported that all students improved in the explanation skills. Academic learning is inherently dependent on sufficient prior knowledge and reasoningskills. Students doing well in academics are reported to be able to access and correlate the beforehand knowledge and assume the associations between the novel information and the previous knowledge and the learning happens (Pressley et al., 1992). They also suggested that a structured intervention procedure which enhances the reasoning skills would help children with LD in academic achievement. Scruggs, Mastropieri, Sullivan, and Hesser (1993) reported that training of guided and sustained use of different reasoning strategies would help children with LD. The authors indicated that children who can provide own explanations were able to do more effective reasoning whereas students who were trained with only direct information and they suggested to train children with more active reasoning strategies in order to improve in literacy skills. Several studies reported that the unresponsiveness of some children with LD to early intervention programs (Otaiba & Fuchs, 2006) focusing on phonological awareness and letter identification (Lundberg, 1994; Poskiparta, Niemi, & Vauras, 1999). One suggested reason for such unresponsiveness is the working memory deficits (Vellutino & Fletcher, 2007).Kane, Hamrick and Conway (2005) reported that working memory is closely related with the reasoning skills in children. Also studies have shown that there is a close relationship between the reading comprehension and memory (Cain, Oakhill, & Bryant, 2004). Further it was also reported that the memory training helps improve the problem solving skills and arithmetic skills in children with LD (D'Amico, 2006; Holmes, Gathercole, & Dunning, 2009). It has been suggested that children with LD should be trained in problem solving skillsand meta cognitive skills,

imaging, rehearsal strategies, categorization organizing etc (Jacobs1984).

Intervention approaches in Learning disability

LD has potentially pervasive effects on the development of children, hence early intervention is important. National Research Centre on Learning Disabilities [NRCLD] (2002), suggested the that LDs comprise a diverse and heterogeneous group with wideranging outcomes and it creates adverse consequences that are stable across lifespan and affects developmental acquisition including academic achievement. Early identification helps to determine the children who lag in developmental milestones and that may affect the learning or literacy skills which would place them at risk for LD, this can prevent serious long lasting consequences (Fletcher, Foorman & Boudousquie, 2002). The major issue regarding the early identification is the symptoms expressed in young ages. Hence a screening procedure is suggested, along with reviewing the risk and protective factors and also to move on with a detailed assessment if needed. During the assessment, it is suggestedto administer language evaluation including cognitive skill assessments and basic numerical testing (Pennington, Lefly., 2001). The strengths and weaknesses of each child will bedifferent, which should be thoroughly observed and utilized during the services and supports provided. Various studies reported the better academic achievement in children with LD who received early identification and support services (Torgesen, Alexander, Wagner, 2001).Services and support for at a later age are found to be ineffective for many factors, the major one's being the short duration and poor quality of services as well as the motivation factors (Lyon, Fletcher, Shaywitz, Shaywitz, Torgesen, Wood, Schulte & Olson, 2001). Delayed intervention can result in adverse and persistent consequences for academic skill acquisition. In contrast, early identification of children at risk for learning disabilities may offer the

potential to mitigate the negative effects of delayed intervention by directing children to preventive services at an earlier age (National Institute on Health, 2000).

Justice and Kaderavek (2004) reported that the ecological validity of therapy approaches would improve by joining the collaborative and direct interventions, as it will also increase the duration of intervention. Shepard and Carlson (2003) also suggested that the early intervention services provided should include and planned along with parents as an important team member. The cultural and linguistic differences should be taken care ofduring the intervention as well as assessment. A multidisciplinary approach should be used for the delivery of supports and services. The team members should have information about cognitive, communicative, academic, pre academic, sensory-motor and social and emotional functioning development and the possible atypical patterns and a skills of effective collaboration as well. Many effective intervention programs are tailor made for children, and they also follow a multidisciplinary approach with the team of SLP, Psychologist, Special educator etc (Selikowitz, 1998).

The early identification and response to intervention has been a major concern in the area of LD research. Torgesen (2010) reported that there was a potential reduction in the number of children eligible for services in the later years among the children who are identified as at risk for LD at an early age and provided further services. He also reported thatall the intervention programs are not equally effective for all children. The ways for executing early identification and intervention are going through a rapid development. Response to Intervention (RTI) is a major framework among them. RTI is a framework in which a child is identified as at risk for LD and is provided with the intervention services. Based on the degree to which the child responds to the intervention, he/she will be eliminatedfrom the risk category

and from the intervention. Students who benefit from the support services are said to respond to intervention, and are expected to improve in academic skills with the classroom instructions. Students with minimal improvements even after quality services are termed as not adequately responding to intervention. Such children should be provided more services including special education support. RTI framework involves early identification, intervention and continuous evaluations of progress. The support should be provided at different levels, termed as 'Tiers'. The students who don't respond at the highest level can be diagnosed as Learning Disabled. RTI is defined as a multi-tiered approach for assessment and intervention of children with LD. The levels of RTI include general classroom teaching, small group support, and tailor made, high quality and individual intervention. The accommodation of students at different levels move up and down based on the ongoing assessment results. The model highlights the elimination of labeling childrenand also the intervention.

The major features of RTI are as follows:

- A high quality (evidence based) core curriculum delivered by professional staff - The delivery of the core curriculum to mainstream students must be sound otherwise there is no way to know if student difficulties result from learning disabilities or from badteaching.
- A hierarchy of interventions (tiered instruction) - Usually there are three tiers.

a) Tier 1 (Universal classroom instruction with group interventions) –This level is general classroom instruction. This level also emphasizes some level of individual attention provided to students in a classroom by teachers. In general Tier 1 demotes an undifferentiated whole group

instruction

b) Tier 2 (Small group support) – The children who lack in adequate academic achievement from the general classroom instruction alone or children identified from screening as in need for additional support are accommodated in tier 2. Interventions are usually carried out by a support teacher in small groups, in the classroom itself. The extra support will be given few hours in a week. In this level the aim is to reduce the difference between the students in Tier 1. The students with progress will move back to Tier 1, and with less progress will be considered for more special support services.

c) Tier 3 (Intensive individual support) – Children receive one to one, intensive intervention at this tier based on the strengths and weaknesses identified during the assessment. The objective is to reduce the problems and move the child back to tier 2. Instructions can be provided 2-4 hours a week. Children who are in this tier will receive services of professionals such as special educators as well. The children who are still not making any progress are sent for more detailed assessments and are considered as having learning disabilities.

Review of literature suggests that there are no single intervention approaches that provide long term therapeutic achievement which is clinically significant as the group is heterogeneous. But there were also studies which were conducted on homogenous groups of children with LD, matched on age, intelligence quotient, etc even then the participants usedto differ significantly in the pre requisite skills such as phonological awareness which are important for development of literacy skills.

Justice and Kaderavek (2004) proposed that therapy approaches which were found to be beneficial for children with LD were mostly direct intervention approaches which were combined or multidisciplinary indirect therapy approaches. And these were mostly carried out in naturalistic settings. Most intervention approaches empathize on improving cognitive and linguistic skills. These include the cognitive, metacognitive, linguistic and the metalinguistic strategies (Shepard & Carlson., 2003)

Five instructional trends have emerged from theories and academic research related to attribution and motivation, cognition/metacognition, and cognition/ metacognitionmodification.

a) Self – concept and intrinsic motivation – Kurtz and Borokowski (1987); and Schunk and rice (1987) have talked about the importance of this for effective intervention. Research has showed that children with LD have lower self-concepts than their normal peers with greater decrements for academic self-concept than general self- worth (Chapman, 1988). These student attributions differentially influence academic behavior and performance in various instructional conditions.

b) Developing and activating schemata – Schema theory attempts to explain how knowledge or information is structured in memory and how these structures affect incoming information. Schemata are data structures for representing generic concepts stored in memory (Anderson, 1984; Rumelhart, 1980). Conceptually, schemata are often hierarchical in nature and provide the organizational framework or scaffolding on which new information can be integrated and existing information can be retrieved. One of the characteristics

of many LD students is difficulty in learning, organizing, elaborating, and retrieving meaningful information (Ceci, 1985, Torgesen, 1977). Therefore, techniques which foster the activation and development of schemata should be particularly fruitful for these students (Billingsley & Wildman, 1988; Bos & Ander, 1990a).

c) Using cognitive modelling and verbal self-instructional procedures- These procedures are mainly used in teaching task – specific and general academic strategies. This was initially conducted with LD students to modify impulsivity and inattention towards academic tasks (Meichenbaum, 1977). Graham, Harris, and Sawyer (1987) suggest that at least six types of self – instructions can be used to assist students in activating and regulating appropriate strategies to modify behavior: Problem definition' Attention focusing, Planning and response guidance, Self – reinforcement, Self – evaluation and Coping and error correcting options.

d) Using self – regulatory procedures - Efficient and effective learners are thought to regulate cognitive resources to strategically predict, plan, carry out, monitor, evaluate,and adjust their learning effectiveness toward the attainment of desired outcomes. Comparatively, LD students have been reported to approach tasks in a more passive manner (Torgesen, 1982) and exhibit a disorganized and impulsive response style (Keogh, 1977).

e) Promoting strategy acquisition, proficiency, maintenance, and generalization- This deals with using instructional methods that are appropriate for different stages of strategy and skill learning (Bos & Vaughn, 1988; d d smith, 1989). The stages include acquisition (initial learning), proficiency (consistent, accurate, and fluent usage), maintenance (consistent and

independent usage over time), and generalization/ adaptation (consistent and independent usage in similar and novel situations). An underlying assumption is that for instruction to be effective, it must incorporate that learner's prior experience with the strategy.

Research has revealed that treatment approaches focusing on universal cognitiveprocesses is important in order to acquire the proper reading acquisition and the cognitive linguistic processes (Shaul, Katzir, Primor & Lipka, 2016). Hence in children with LD, application of Vygotsky's sociocultural theory of cognitive development (1978) becomes applicable which states that the cognitive development happens through the social interactions problem solving and practical activity. Often it has been found that deficits in information processing abilities (e.g., phonological processing, listening comprehension, visual perception, orthographic processing and memory, spatial and temporal processing) also interact with high quality systematic intervention approaches to develop skills, concepts or strategies in making a difference. Deficits in phonology, syntax and semantics are also found to be affected in language based learning disabilities. For instance, the problems in phonological skills and semantic problems could predict the word recognition skills. However little is known about the different treatment/interventions that are required to provide maximum benefits with different oral and written language deficits in children with Learning Disability. It has been suggested that language problems (e.g., phonological awareness) generalize into other domains (Matthew effects; Stanovich, 1986) and/or that the processing correlates of reading problems may be indirectly related to processing difficulties in other domains (e.g., Swanson & Alexander, 1997).

The scientific repertoire related to the use of specific treatment or intervention

approach or the combinations of it with LDs are very limited. There are several factors whichcontribute to the treatment efficacy reported, which affects the results of research. The major factor which affects is the heterogeneous nature of children with LD. A review of literature revealed that there have been few systematic, quantitative (or qualitative) instructional approaches for children with LD (Lessen, Dudzinski, Karsh, & Van Acker, 1989).

Swanson, Carson, and Sachse-Lee (1996) reviewed the group design studies between 1967 and 1993, which were conducted on participants between 6-18 years. They reported thatall forms of therapy are not equally effective. They classified the approaches into four categories- therapeutic (eclectic), remedial, direct instruction, or cognitive strategies. The study also reported that reading is the most frequently investigated domain and intervention studies that produce the highest effect sizes were related to derivations of cognitive and/or direct instruction. Swanson et al (1998) summarized the experimental intervention studies on children with LD, and reported that the educational intervention in such cases produces a respectable positive effect on the academic skills. They reported that the maximum changes were observed in vocabulary and reading comprehension. Cognitive processing skills such as metacognition and problem solving showed a moderate level change with intervention and also changes were found in word recognition, memory, writing, intelligence (performance on standardized tests) etc. They also reported a combined direct instruction and strategy instruction (cognitive) model is an effective procedure for remediating learning disabilities relative to other instructional models.

Dahlin (2011) conducted a study to find out the effect of memory training in children with special needs. They used a cognitive based intervention and reported that working memory training could improve the reading comprehension skills and

was also found that it is related to word reading skills as well. The results indicated that working memory is a crucial factor in development of literacy skills in children with special needs and such cognitive based interventions helps to improve the academic skills. Training attempts were also made to improve the use of proper cognitive strategies but were found to be ineffective in case of complex and novel tasks (Wong, 1979). Gelzheiser (1984) designed an instructional program which included training rules for categorization and recall. They found mixed results, that is even after extensive training the use of strategies and the generalization skills showed only a borderline improvement.

Berler, Gross, and Drabman (1982) conducted a study on 6-8-year-old children with LD. The students were divided into treatment and control groups. Intervention included coaching, modeling, rehearsal, role play, and feedback. Multiple baselines measured target behaviors of eye contact and appropriate verbal responding. Sociometric ratings and free play observations of target behaviors in natural settings were also assessed. They reported after 5 weeks of intervention, there were significant improvements on structures and role play ratings. The generalization skills were also reported to be poor.

Stark (1984) conducted a study on children with LD; the participants were twenty-one children between the age range of 9 to 12 years. The children were divided into three groups, two groups received different intervention programs, termed social skills training, social skills training along with cognitive training and one group acted as the control group. Intervention was given for a period of four weeks. Pre, post and a 6 month follow up were carried out. And the results suggested similar changes in treatment groups, and the groups also showed the same rate of changes in skills.

Akila (1997) conducted a study on children with reading disability. They employed a neuropsychological remedial approach. The training was given for attention, phonemic processing, working memory and semantic processing. The intervention was provided for 30 sessions. The study was a two group pretest posttest design with one being the controlgroup. The activities conducted in the sessions were rhyming tasks, digit span, naming fluency etc. The results reported that there was a significant improvement in the reading accuracy after the training but not in the reading rate.

There were a large body of research conducted in the strategic intervention and Cognitive and Meta cognitive based instructional approaches to improve the reading skills in children with LD (Graham & Harris, 1997; Pressley, 2000; Swanson, 1999b). Even thoughthe research reported that the students with LD can improve on cognitive and metacognitive strategy usage (Mastropieri & Scruggs, 1997; Swanson, 1999b), it is reported that the skills develop through abstraction, perception of interrelationship among the obtained information, strategic thinking, and the ability to focus on relevant information and excluding the irrelevant information. This facilitates the simultaneous processing skills which is necessary for reading acquisition. Cognitive linguistic intervention strategies improve the logical, analytical and inferential thinking skills. This facilitates deeper processing skills and improves usage of the language skills while reading (Mahapatra, Das, Stack-Cutler & Parrila,2010).

Based on modularization of brain function (Luria, 1966) and the neuroimaging studies, PASS (Planning, Attention, Simultaneous - Successive processing) theory wasproposed (Das, Kirby, & Jarman, 1975). PASS theory of intelligence proposed that for cognitive functioning, there are three systems and

four processes which are Planning, Attention, Simultaneous and Successive processing. These processes and systems help to encode, transform and store materials in brain. These processes help to comprehend things asa whole and also to organize items such as remembering the sequence of words or digits etc. This theory provided a strong framework for cognitive assessment and intervention PREP (PASS Reading Enhancement Programme, Das, 2000) was a frame work made based on the theory. The programme is a special curriculum for children with academic problems, which tries to improve the cognitive strategies underlying academic skills. A similar cognitive based educational intervention programme was proposed by Das (2009) named COGENT. This wasa school readiness evidence based intervention approach.

PREP approach completely avoids direct reading training and promotes improvement of the simultaneous and successive processing skills (Naglieri & Das, 2002). The planning skills were encouraged by the active discussion of the strategies and solutions which were used for tasks, during and after the task completion as well. The activities included in the programme are Joining Shapes, Connecting Letters, Window Sequencing, Transportation Matrices, Related Memory Set, Tracking, Shape Design, Shapes and Objects, Matrices Numbers and Letters and Sentence Verification. After the general sessions all tasks should be followed by a curriculum related bridging component which needs the utilization of same cognitive processes for reading and spelling. The programme also focuses on inferencing and focusing the attention to the available information. Research suggested that PREP is more effective for children in elementary grades with difficulties in successive processing skills. It has been also reported that word reading skills and reading comprehension skills were improved with PREP by improving the memory, awareness, vocabulary, planning and

problem solving, inferential thinking and monitoring skills (Janzen, 2000).

Mahapatra, Das, Stack-Cutler, and Parrila (2010), conducted a study using PREP program as a cognitive based remedial training program. The study was done in children with poor reading skills in Odisha. The participants included 14 normal readers as control group and14 poor readers in grade 4 as experimental group. Baseline data on word reading skills, reading comprehension and PASS cognitive processes were compared with the same in the post intervention phase. The authors reported a significant improvement in comprehension skills and word reading skills in post intervention in the experimental group. The results indicated that the comprehension and the underlying cognitive processes and reading skills can be improved by a cognitive based intervention program. The improvement in the reading skills are attributed to the improvements in the underlying cognitive processes.

COGENT (Das, 2006) is another cognitive based intervention approach based on PASS theory of intelligence. This program has five modules, which target various parts of cognitive, linguistic and literacy skills. This programme encourages the reading acquisition in the basis of speech and language skills. The activities of the module taps areas like inhibition, attention, naming, discrimination, memory skills, phonology, syntax, semantics, associations, inferencing etc. Baral and Das (2004) reported that children (7-9 years) improve with COGENT training. They reported that children perform better in word reading after the intervention. They also reported that the cognitive processes trained also improved significantly.

Rodríguez, Timoneda, Pérez-Álvarez and Das (2015) conducted a study on 4 to 5-year-old children. The children were provided six months of intervention using COGENT modules. Simultaneous and successive processing strategies were assessed

before and after the intervention programme and the results showed a significant improvement in both the processes. COGENT is reported to be successful in ameliorating the cognitive achievement and thereby help prevent problems in literacy achievement in preschool children.

Need for the study

Learning disabilities are prevalent, and as many as 17 percent of the population may have learning disabilities (Lyon, 2005) and around 4- 10 percent in the Indian children (Ramaa, 1995). The importance of early intervention for children at risk for learning disabilities is further illustrated by their potentially pervasive effects on development. While those with learning disabilities constitute a heterogeneous and diverse population with varied outcomes, adverse consequences of learning disabilities can persist across the lifespan and extend beyond academic skill acquisition to more complex developmental tasks (National Research Center on Learning Disabilities [NRCLD], 2002).

The review of literature showed a variety of attempts made to improve the academic issues in children at risk for LD (Byrne & Fielding-Barnsley, 1983; Engelmann & Brner, 1995; Lovett et al., 2000; Lundberg et al., 1988; Oloffson & Lundberg, 1983). Attempts weremade to improve the academic skills through training phonological awareness, but the gain were found to be limited (Torgesen, 1995; Wagner et al., 1993). This may be due to the cognitive limitations underlying the reading processes (Vellutino & Fletcher, 2007). Most of the studies focused on reading accuracy and other academic skills and did not usually focus on the additional cognitive and linguistic factors which affect academic skills (Snowling & Hulme, 2014). Therefore, an instructional approach which can be utilized in young

children that can integrate the specific elements for information processing is needed. Shaul (2016) suggested that it may be the combination of cognitive and linguistic factors more beneficial to the children in remediating the academic difficulties. It is also argued that unless cognitive processes underlying reading are the focus of remediation, remediation will not be successful in promoting transfer to broader aspects of reading (Das et al., 1994). To develop such an approach, a team approach is essential in such approaches by a Speech-Language Pathologist and a Clinical Psychologist who would develop activities to improve cognitive linguistic approaches. The most important reason to integrate these fields is to discover what works for helping children who are experiencing difficulties learning. There have been limited attempts to systematically provide a scientific-research based cognitive-linguistic intervention for children at risk for LD at an early age through a RTI method. Timely identification and intervention are reported to prevent academic problems. In Indian context, the utilization of human resources and providing on time help to children at risk for LD avoids long lasting consequences is an important factor (Fletcher, Foorman & Boudousquie, 2002).

Hence, it will be interesting to study the response to intervention of cognitive-linguistic based intervention in the heterogeneous groups and extract the subgroups, if possible. It has also been found that reporting of response to intervention based approaches has been poorly described and defined which does not provide any concrete evidence to be studied. Hence there is a need to study systematically the response based intervention approaches. There is also a need to study the younger population at risk for LearningDisability over a longer duration so that the change can be recorded and documented as measurable evidences. A critical public health task confronting the field of learning disabilities is to understand and define the

treatment/intervention variables and factors that have to be considered when addressing the oral and written language needs of children with LD. There exists an immediate and compelling need to develop intervention protocols that increase the probability that individuals with LD will acquire proficient reading and written language skills as well as the skills that are related to these developmental learning processes. The current project develops an intervention module and administer on children at risk with LD. The focus of research is on young children identified as at risk for LD, which will furtherfacilitate improving their reading and writing skills and academic language skills

Aim and Objectives

Aim of the present study was to develop Cognitive Linguistic Intervention Program forChildren at risk for Learning Disability

Objectives:

1. To study the response to intervention of cognitive-linguistic based intervention model in children at risk for Learning Disability.
2. To study the type and severity of Learning Disability on cognitive-linguistic based intervention model.
3. To study the relationship between cognitive-linguistic skills and reading ability inchildren with Learning Disability based on response to intervention model.

CHAPTER 3

METHOD

The aim of the present study was to develop Cognitive Linguistic Intervention Program for Children at risk for Learning Disability. The study was intended to develop a systematic module which target Cognitive Linguistic Skills which can be used by Speech-Language Pathologists for a better and early service delivery to children at risk for Learning Disability.

The study was conducted in the following phases.

Phase 1: Development of the resource material.

Phase 2: Validation of resource material

Phase 3: Administration of the material in Children at risk for Learning disability (3-5years)

Phase 4: Analysis of the results

3.2 Participants

The participants included ten children identified as at-risk for Learning Disability (LD) by a Speech-Language Pathologist and a Clinical Psychologist in a multidisciplinary Learning Disability Clinic.

Participant Selection Criteria

The participants were selected based on the following criteria:

a) Children attending regular English medium pre-school (within 3-5 years of age) with Kannada as the mother tongue.
b) Participants who had no sensory, motor issues according to ICF CY checklist (WHOWork group, 2003)
c) Children identified as at risk for Learning disability by a qualified -Language Pathologist (SLP) and a Clinical Psychologist in a multidisciplinary Learning

Disability Clinic.

In schools 63 children were assessed using Early Literacy Screening Tool (ELST; Shanbal, Goswami, Chaithra, & Prathima, 2011) and 13 children were identified as at risk for LD byan SLP. 10 children were randomly selected and recruited for the present study. The Knox cube imitation test (Knox, 1914; Richardson, 2005) was used to assess the nonverbal intelligence of participants, and children with average intelligence were selected for thestudy. An informed consent was taken from all the participant's parents and the study followed AIISH Ethics for Bio-behavioral Sciences for Human Subjects. The participants were naive participants who have not undergone any form of intervention. Table 3.1 summarizes the participant details

Table 3.1

Participant details

Subject	**Age**	**Education**	**Language**	**ELST scores**		**MA**
				SC	**ST**	
1	5.1 yrs	UKG	K –E	10	14.5	6
2	4.8 yrs	UKG	K –E	10	12	5
3	4.11 yrs	UKG	K –E	11	13	5
4	4.9 yrs	UKG	K –E	11	14	5
5	4.6yrs	LKG	K -E	9	12	6
6	4.5 yrs	LKG	K –E	12	14	6
7	4.3 yrs	LKG	K –E	10	12.5	4
8	3.7 yrs	LKG	K –E	7	7	4
9	3.11 yrs	LKG	K –E	8	6	5
10	3.9 yrs	LKG	K –E	7	5	4

K=Kannada, E= English, ELST= Early Literacy Screening Tool, SC= Screening checklist, ST= Screening tool, MA=Mental age

3.3 Material, Scoring & Data Analyses

The material included activities for Cognitive-Linguistic skills. The principles of Cognitive-Linguistic Improvement Program by Ross-Swain (1992) were adapted along with various other resources (Harwell, 1993; Jena, 2013). Cognitive Linguistic Improvement Program (CLIP), proposed by Deborah Ross- Swain (1992) was designed for the treatment of communication deficits post traumatic brain injury. The material provides the specialist with a framework of treatment tasks which are arranged in a hierarchy under specific cognitive functions. Different treatment tasks and activities for cognitive linguistic skills in children with LD were selected from other resources as well. The pictures used for the stimulus manual were line drawings adapted from a standardized set of 260 pictures (Snodgrass & Vanderwart., 1986).

After the review of literature, the domains selected for the present study included working on Memory, conceptual relationships and association, organization and categorization, problem solving and reasoning. The domains and sub domains are as follows

i. Memory

- Immediate memory
    - Digit repetition (e.g., repeat the numbers 4 3 2)
    - Letter repetition (e.g., repeat the letters N K V)
    - Remembering lists of words (e.g., repeat the words Run, jump, walk)
    - Sentence repetition (e.g., repeat the sentence Close the door)
    - Following body part commands (e.g., open your mouth)
- Recent memory
    - Answering yes/no questions (e.g., is auto a vehicle?)

- Multiple choice questions (e.g., Where do you sleep, in bedroom or in kitchen?)
- Sentence completion (e.g., Stars are present in ----------)
- Wh questions (e.g., Where does a fish live?)

ii. Conceptual relations and associations

- Part – whole and whole-part relation (fig: 3.1)
- Object person relation and person object relation (e.g., Teacher - Book)
- Synonym recognition (e.g., Below and under)
- Naming synonyms (e.g., Tell another word for "Above")
- Recognizing opposites (e.g., Up and down)
- Naming Antonyms (e.g., Name the opposite of "Small")

Figure. 3.1
E.g., for images used for Part – whole and whole-part relation (leaf-tree) (Snodgrass & Vanderwart., 1986).

iii. Organization and categorization

- Category identification (Fig: 3.2)
- Naming the category (e.g., car, aeroplane, train - Vehicles)
- Category member recall (e.g., Name 5 Fruits)

- Category member recall from description (e.g., It is an animal. It has four legs;it makes ‘bow’ sound. - Dog)
- Category member comparison (Identify the odd one - e.g., Eye, ear, scissors,foot).
- Association (e.g., Key - lock)

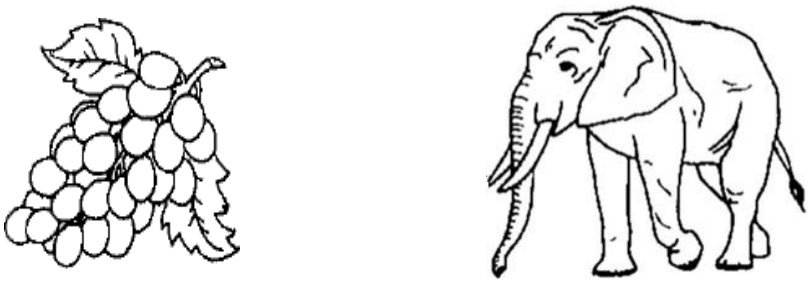

Figure. 3.2

E.g. for images used for Category identification (fruits, animals respectively) (Snodgrass & Vanderwart., 1986)

iv. Problem solving and reasoning

- Find the way (Mazes)
- Predicting outcome (e.g., You got sick)
- Predicting cause (e.g., Her hand is injured)
- Answering why questions (e.g., Why do people go for job?)
- Predicting effects of actions (e.g., She fell down)
- Sequential task analysis (e.g., Playing a game)
- Role playing (e.g., Consultation with a doctor)
- Cognitive style and reasoning (e.g., story related factual and inferential questions)

Scoring*:* The scoring instructions for each sub sections were provided in the

manual (Appendix). The overall scores on each section is represented in Table 3.2.

All the activities and stimuli were arranged in a hierarchy from a simple to complex manner. After developing the manual, the stimuli and pictures were validated by a Speech Language Pathologist (SLP), a special educator and a psychologist who are experienced inthe field of learning disability. The professionals were expected to rate the stimuli using the scale given based on two criteria. The rating was done for two aspects which included -appropriateness and difficulty of stimuli for children in the age range of 3-5 years.

*Table 3.*2
Scores on cognitive linguistic intervention manual

No	Domains	Scores
1	Memory	90
2	Conceptual relationships and associations	30
3	Organization and categorization	80
4	Problem solving and reasoning	35
5	Total	235

The following scales were used for rating. For the stimulus, the professionals were asked to rate the appropriateness of the stimuli as ‘0’ being absolutely inappropriate, ‘1’being somewhat appropriate and ‘2’being absolutely appropriate. Similarly, they were asked to rate the level of difficulty of stimulus as ‘1’ being very difficult, ‘2’ being difficult and ‘3’ being easy. The professionals were also asked to rate the level of appropriateness and level of difficulty using same scale for pictures, they were asked to rate the parameters like size and appearance of the pictures, iconicity, stimulability and clinical relevance as very poor, poor, fair, good and excellent. Based on the

appropriateness and difficulty rating the material was revised.

2.4 Experimental Design and Procedure

Participants were selected from the Learning disability clinic at All India Institute of Speech and Hearing. Children identified using the Early Literacy Screening Tool (ELST; Shanbal, Goswami, Chaithra, & Prathima, 2011) were selected for the study. The children were also assessed by a qualified -Language Pathologist and a Clinical Psychologist in a multidisciplinary Learning Disability Clinic and identified as at risk for learning disability. The study followed a single case ABAB withdrawal design with replication of cognitive linguistic intervention across 10 participants. ABAB design starts with a baseline assessment followed by alternating treatment phases with a withdrawal of therapy phase in between. The treatment effect is usually determined by comparing the performances atbaseline and after the treatment phases.

The children were enrolled for Cognitive-Linguistic Intervention Program. Initially, the baseline was established using ELST. After the baseline assessment, children were assigned for 45 minutes' session each day for 20 sessions. The researcher (SLP) initiated the sessions with strategies in consultation with the Clinical Psychologist. A lesson plan was prepared based on the baseline including goals for specific skills such as the memory,conceptual relationships and associations, categorization and organization, and problem solving and reasoning. The activities were designed in such a way that it followed a developmental model to acquisition of academic language skills. The activities were selected from the material prepared initially. The intervention program was carried out in a clinical set up. A baseline was taken and the post testing was done after 20 sessions of therapy in the clinical set up. Maintenance and generalization were also carried out after every goal takenup as part of the program.

Quantitative & Qualitative Analyses

The data were analyzed using SPSS software version 21.0. The analysis was done based on the parameters of the ELST for pre and post therapy information. The number of responses in the domains of Cognitive-Linguistic Intervention Module were also recordedand analyzed for pre and post therapy changes. Qualitative analyses of the data were also carried out.

CHAPTER 4

RESULTS

The primary aim of the present study was to investigate response to intervention of cognitive-linguistic based intervention model in children at risk for Learning Disability ($3.0 \leq A \leq 5.0$ years). A single subject experimental, ABAB withdrawal design was used to investigate the effectiveness of cognitive linguistic intervention and its relationship with the academic skills. Cognitive linguistic intervention program included training in Memory (M), Conceptual relations and associations (CRA), Organization and categorization (OC) andProblem solving and reasoning skills (PSR). ELST was used to identify the children at riskfor Learning Disability and to assess the changes in academic skills with intervention.

Descriptive statistics was used to compute mean, median and standard deviation values (SD) for the scores of Cognitive Linguistic Intervention Program for Learning Disability (CLIP-LD) as well as ELST scores of children at risk for Learning disability. Shapiro-Wilk's test was administered to check for normality, and the results revealed that thedata follows normal distribution on the measures of Memory, Conceptual relations and associations and Screening Tool score of ELST. Whereas the data did not follow normal distribution on the measures of Organization and categorization, Problem solving and reasoning and screening checklist scores of ELST. Hence, parametric and Non-parametric tests were carried out respectively for the above stated measures to infer the performance of children at risk for learning disability, and also to infer about the correlation betweencognitive linguistic skills and literacy skills.

The results are discussed under the following subsections

4.1 Performance of children at risk for LD on the domains of CLIP-LD

4.2 Performance of children at risk for LD on the domains of ELST

4.3 Relationship between Cognitive Linguistic Measures and ELST

4.4 Qualitative analysis of performance on CLS and Early literacy skills

4.1 Performance of children at risk for LD on the domains of CLIP-LD

Descriptive statistics was used to compute mean, median and SD for scores of M, OC,CRA and PSR components of CLIP-LD and Total scores on Screening checklist (SC) and total scores of Screening tool (ST) of ELST. The assessments of cognitive linguistic skills and ELST were done at four points of time, baseline assessment (A1) a post therapy evaluation after 20 sessions of cognitive linguistic intervention (B1), a 3rd assessment done after withdrawal of cognitive linguistic intervention for 10 days (A2) and the 4th assessment after reintroduction of cognitive linguistic intervention for 20 sessions (B2). Table 4.1 shows mean, median, SD scores, X^2 or F values of the parameters on CLIP-LD that is for M, OC, CRA, and PSR of children at risk for LD in the age range of 3 to 5 years at different points of time.

The results of the study are explained in the following subsections.

Table 4.1
Mean, SD and median of CLS, M, OC, CRA and PSR of children at risk for LD

Domains	Phases	Mean (SD)	Median	X^2	F
CLS	A1	99.70 (18.65)	100.25	30.00 (p=.000)	-
	B1	188.70 (18.91)	186.50		
	A2	153.60 (23.02)	151.50		
	B2	203.85 (17.60)	206.00		
M	A1	28.00 (8.65)	26.00	-	348.55 (p=.000)
	B1	71.10 (8.53)	71.00		
	A2	54.00 (12.74)	51.00		
	B2	75.10 (7.09)	75.00		
CRA	A1	8.90 (3.28)	8.00	-	96.54 (p=.000)
	B1	22.70 (3.65)	22.00		
	A2	17.70 (3.33)	16.50		

OC	B2	26.70 (2.58)	27.00	28.08(p=.000)	-
	A1	53.35 (6.79)	54.25		
	B1	75.75 (4.04)	77.00		
	A2	66.80 (5.09)	67.00		
	B2	77.35 (4.47)	78.75		
PSR	A1	9.45 (4.16)	8.50	28.92(p=.000)	-
	B1	19.15 (5.01)	17.75		
	A2	15.10 (5.42)	12.75		
	B2	24.70 (6.07)	24.50		

Note: M: memory, OC: Organization and categorization, CRA: Conceptual relationships andassociations, PSR: Problem solving and reasoning, CLS: Overall Cognitive linguistic skills

A non-parametric Friedman's test was conducted among repeated measures of scores on Cognitive Linguistic skills, in A1, B1, A2 and B2 phases and rendered a chi square value of 30.00 which was significant ($p<0.05$). Post-hoc analysis with Wilcoxon signed-rank test was conducted and with Cognitive Linguistic Intervention, there was a significant difference between the following pair wise comparisons A1 versus B1($Z=2.81$, $p<.05$), A1 versus A2 ($Z=2.80$, $p<0.05$), A1 versus B2 ($Z=2.80$, $p<0.05$), B1versus A2 ($Z=2.80$, $p<0.05$), B1 versus B2 ($Z=2.80$, $p<0.05$) and A2 versus B2 ($Z=2.80$, $p<0.05$).

The table 4.1 showed that cognitive linguistic skills improved from A1 (Mean =99.70, SD= 18.65) to B1 (Mean =188.70, SD=18.91) and then reduced after the withdrawal of intervention, that is to phase A2 (Mean=153.60, SD=23.02) and improved further with the re-introduction of therapy that is B2 (Mean=203.85, SD=17.60). That is the changes in the cognitive linguistic skills were found to be significantly different from the baseline scores even after the withdrawal of intervention and also with the reintroduction of therapy scores again improved significantly. On visual inspection of the data from figure 4.1.1, the results indicated a steady improvement in the overall cognitive linguistic skills scores with the cognitive linguistic intervention and a reduction in the

performance of the same scores while the therapy was withdrawn.

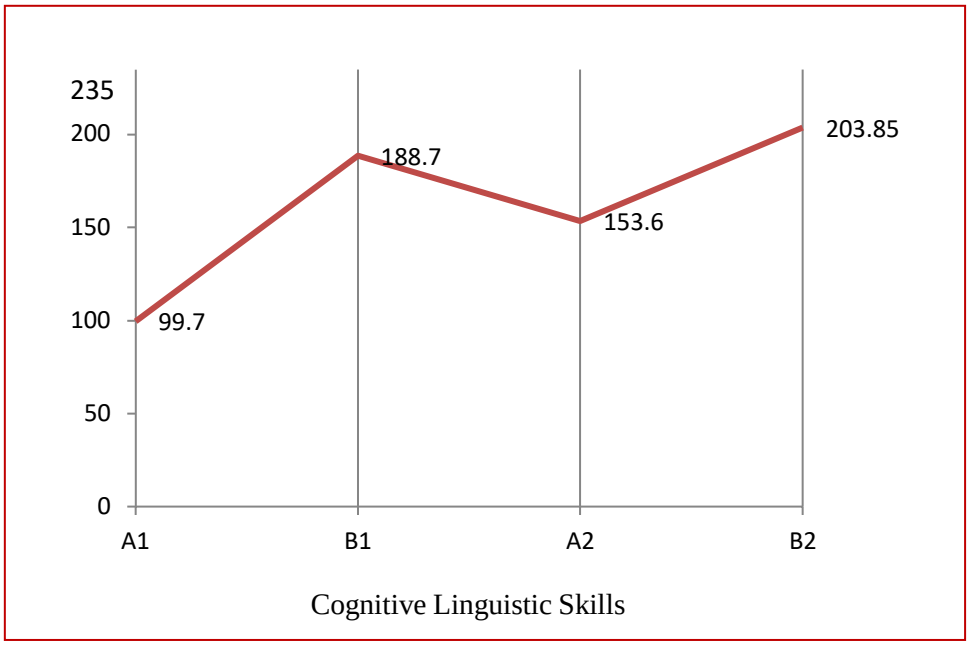

Figure 4.1

Performance on cognitive linguistic skills at different phases of intervention program

4.1.1 Performance of children at risk for LD on Memory

A one-way repeated measures ANOVA was conducted to compare the effect of Cognitive Linguistic Intervention on memory in the four phases of intervention program -A1, B1, A2 and B2. The analysis showed that there was a significant difference between the scores on Memory in the four phases of intervention ($F = 348.5$, $p < 0.05$). Post hoc tests using the Bonferroni alpha correction of 0.0125 revealed that after Cognitive Linguistic Intervention, there was a significant difference between all the pair wise comparisons, A1 versus B1 (p=0.000), A1 versus A2 (p=0.000), A1 versus B2 (p=0.000), B1 versus A2 (p=0.000), B1 versus B2 (p=0.002) and A2 versus B2 (p=0.000). The table 4.1.1 showed that the performance on memory improved from A1 (Mean = 28.00, SD= 8.65) to B1 (Mean =71.10, SD= 8.53). The results also showed a

reduction in the performance of memory after the withdrawal of intervention that is B1 to A2 (Mean=54.00, SD= 12.74) and then an improvement to B2 (Mean= 75.1, SD: 7.09). Visual inspection of the data on figure 4.1.1 indicated a steady improvement in the memory scores with the cognitive linguistic intervention and a reduction in the performance of memory scores while the therapy was withdrawn. The effect remained significant even after the withdrawal of therapy for 10 sessions.

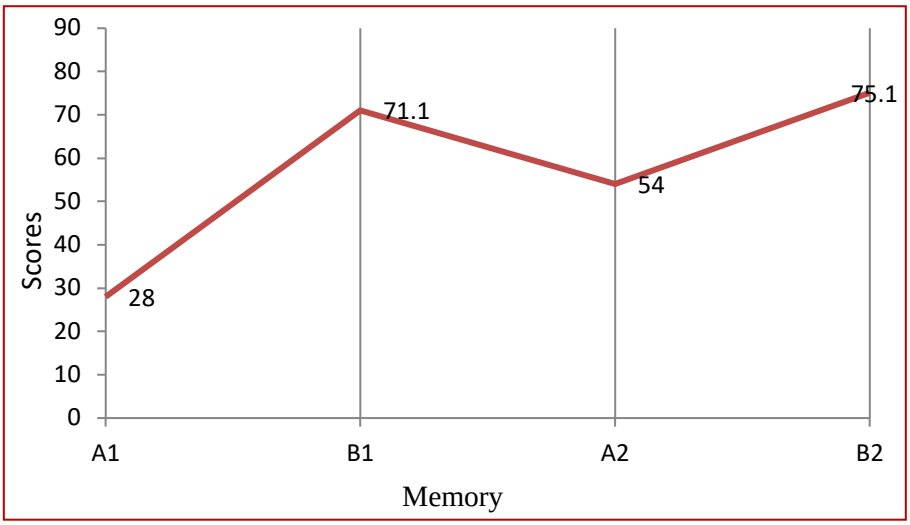

Figure 4.1.1
Performance on Memory at different phases of intervention program

4.1.2 Performance of children at risk for LD on Conceptual Relationships and association

A one-way repeated measures ANOVA was conducted to compare the effect of Cognitive Linguistic Intervention on conceptual relationships and association skills in A1, B1, A2 and B2 phases of the intervention program. The analysis showed that there was a significant difference between the scores of CRA in the four phases of intervention ($F = 96.54$, $p < 0.05$). Post hoc tests using the Bonferroni alpha correction revealed that with Cognitive Linguistic Intervention, there was a significant difference between the

following pair wise comparisons A1 versus B1 (p=0.000), A1 versus A2 (p=0.000), A1 versus B2 (p=0.000), B1 versus A2 (p=0.003), and A2 versus B2 (p=0.000) except for B1 versus B2 (p=0.092). The table 4.1.1 showed that the performance on CRA improved significantly frompre therapy A1 (Mean = 8.29, SD= 3.28) to post therapy B1 (Mean =22.70, SD= 3.65). The results then showed a reduction after withdrawal of the intervention that is from B1 to A2 (Mean=17.70, SD= 3.33) and then with the re-introduction of therapy that is A2 (Mean= 26.70, SD: 2.58) the scores improved significantly. Visual inspection of the data represented on figure 4.1.2 indicated a steady improvement in the Conceptual Relationships and Organization scores with the cognitive linguistic intervention and a reduction in the performance of the same scores while the therapy was withdrawn. The effect of intervention was observed to be significant after the withdrawal phase also. In general, the performance on CRA skills shows a significant difference between the presence and absence of cognitive linguistic intervention with a better performance in the presence of intervention.

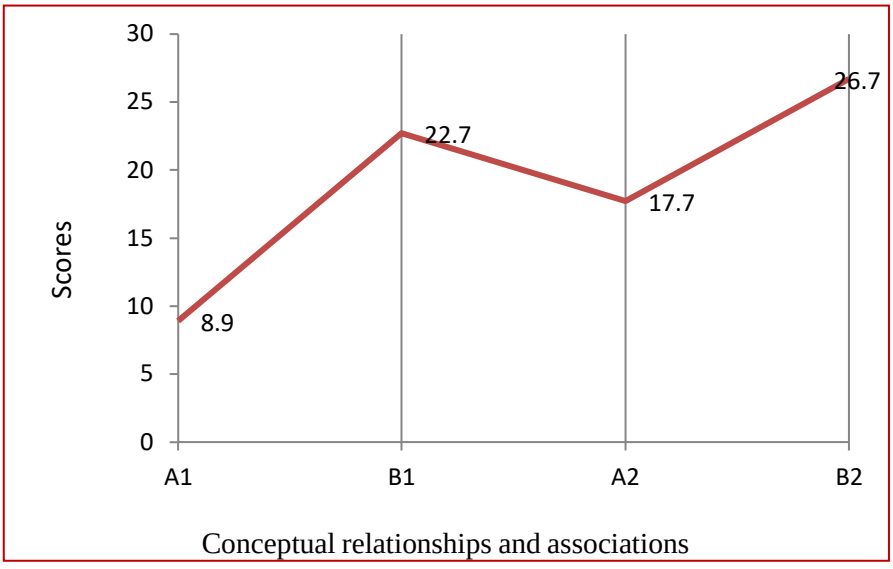

Figure 4.1.2
Performance on conceptual relationships and association at differentphases of intervention program

4.1.3 Performance of children at risk for LD on Organization and Categorization

A non-parametric Friedman's test was conducted among repeated measures of scores on Organization and Categorization domain in A1, B1, A2 and B2 phases of the intervention program and it rendered a chi square value of 28.08 which was significant ($p<0.05$). Post-hoc analysis with Wilcoxon signed-rank test was and it showed a significant difference between the following pair wise comparisons A1 versus B1 ($Z=2.80$, $p<.05$), A1 versus A2 ($Z=2.80$, $p<0.05$), A1 versus B2 ($Z=2.80$, $p<0.05$), B1 versus A2 ($Z=2.80$, $p<0.05$), and A2 versus B2 ($Z=2.80$, $p<0.05$) except for B1 versus B2 ($Z=1.79$, $p>.05$).

The table 4.1 showed that the performance on Organization and Categorization skills improved from pre therapy A1 (Mean = 53.35, SD= 6.78) to post 20 sessions of therapy B1 (Mean =75.75, SD= 4.04). The results also showed a significant reduction in the performance on OC after the withdrawal of intervention for 10 sessions that is from B1 to A2 (Mean=66.80, SD= 5.08) and then an improvement after the re-introduction of therapy that is B2 (Mean= 77.35, SD= 4.46). On visual inspection, the data represented in figure 4.1.3 indicated a steady improvement in the OC scores with the cognitive linguistic intervention and a reduction in the performance of the same scores while the therapy was withdrawn. The results revealed that there is a significant effect of cognitive linguistic intervention on Organization and categorization skills of children at risk for LD. The results also revealed that the effect of therapy remains significant even after post 10 sessions of therapy withdrawal.

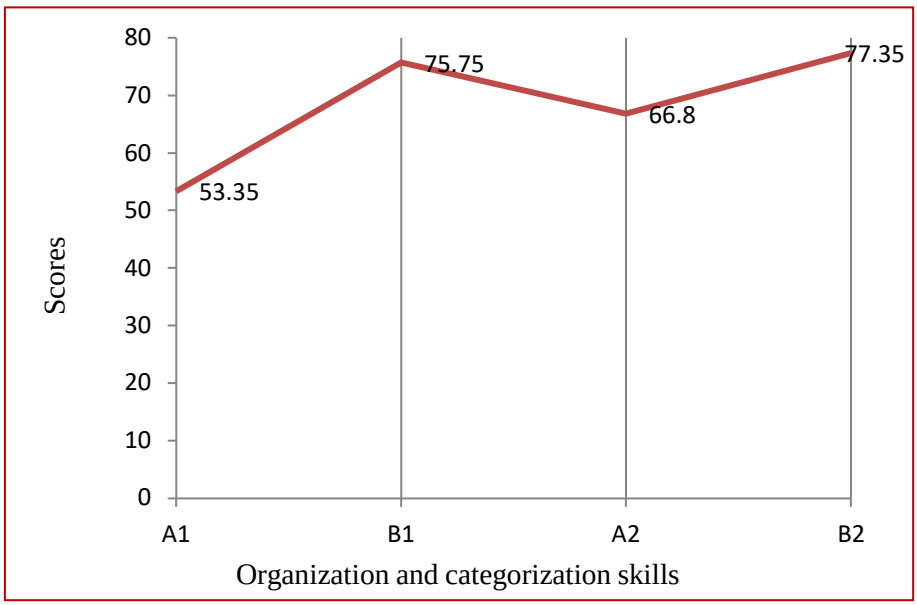

Figure 4.1.3

Performance on Organization and Categorization skills at differentphases of intervention program

4.1.1 Performance of children at risk for LD on Problem solving and Reasoning

A non-parametric Friedman's test was conducted among repeated measures of scores on Problem solving reasoning domain in different phases of intervention and it rendered a chisquare value of 28.9 which was significant ($p<0.05$). Post-hoc analysis with Wilcoxon signed- rank test was conducted and it reported that with Cognitive Linguistic Intervention, there was a significant difference between the following phases of intervention, A1 versus B1 ($Z=2.80$, $p<.05$), A1 versus A2 ($Z=2.80$, $p<0.05$), A1 versus B2($Z=2.80$, $p<0.05$), B1 versus A2($Z=2.60$, $p<0.05$), B1 versus B2($Z=2.80$, $p<0.05$) and A2 versus B2($Z=2.80$, $p<0.05$).

The table 4.1 showed that the performance on Problem solving and Reasoning skills improved from pre therapy A1 (Mean = 9.45, SD= 4.15) to post 20 sessions of therapy B1 (Mean =19.15, SD= 5.00). The results also showed a reduction in the performance of PSR skills after the withdrawal of intervention for 10 sessions that is from

B1 to A2 (Mean=15.10, SD= 5.41) and then an improvement after the re-introduction of therapy that is B2 (Mean= 24.70, SD= 6.07). On visual inspection, the data represented on figure 4.1.4 indicated asteady improvement in the PSR scores with the cognitive linguistic intervention and a reduction in the performance of the same was noticed while the therapy was withdrawn. In summary, the results revealed a significant effect of cognitive linguistic intervention on the problem solving and reasoning skills and the effect remained significant even after thewithdrawal of the therapy (A1 to A2 phase).

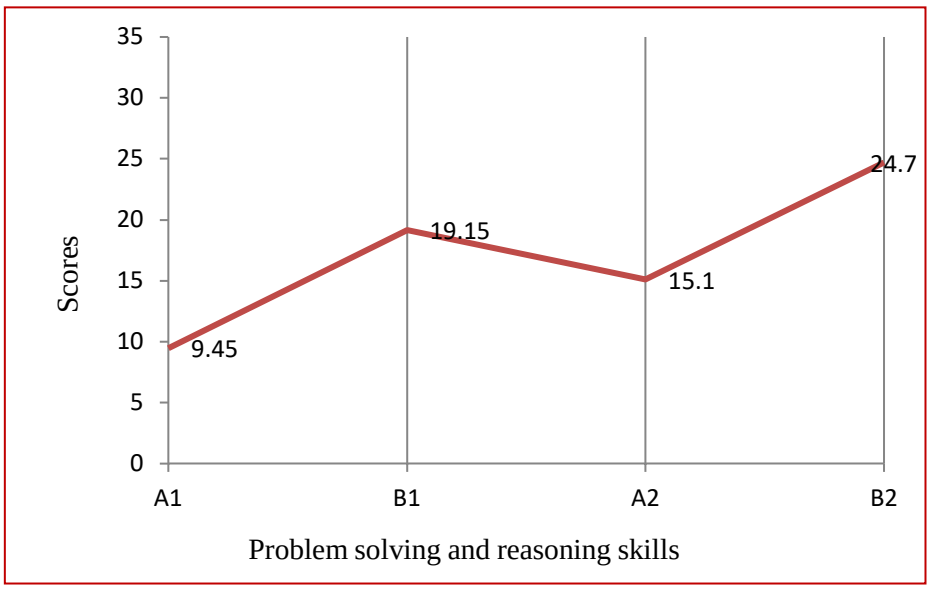

Figure 4.1.4

Performance on Problem solving and reasoning skills at different phasesof intervention program

4.2 Performance of children at risk for LD on domains of ELST

Table 4.2 shows mean, median, SD and X^2 or F values of scores on Screening Checklist (SC) and Screening Tool (ST) of ELST for children at risk for LD in the age range of 3 to 5 years at different points of time.

Table 4.2

Mean, median, SD and χ^2 or F *of SC and ST of children at risk for LD in percentage*

Domains	Phases	Mean (SD)	Median	χ^2	*F*
SC	A1	67.99 (4.89)	66.66	26.67 (p=0.000)	-
	B1	84.54 (7.47)	86.66		
	A2	91.03 (7.86)	93.33		
	B2	93.69 (8.21)	93.33		
ST	A1	60.17 (7.03)	60.71	-	65.66 (p=0.000)
	B1	75.90 (9.09)	76.19		
	A2	81.53 (9.35)	84.52		
	B2	89.26 (8.02)	90.47		

Note: SC: Screening Checklist of ELST, ST: Screening Tool of ELST

4.2.1 Performance of children at risk for LD on Screening Checklist of ELST

A non-parametric Friedman's test was conducted among repeated measures of scores on Screening checklist of ELST at four phases of intervention (A1, B1, A2 and B2) and rendered a chi square value of 26.67 which was significant ($p<0.05$). Post-hoc analysis with Wilcoxon signed-rank test was conducted. It showed that with Cognitive Linguistic Intervention, there was a significant difference between A1 and B1 ($Z=2.82$, $p<.05$), A1 and A2 ($Z=2.81$, $p<0.05$), A1 and B2 ($Z=2.81$, $p<0.05$), B1 and A2 ($Z=2.20$, $p<0.05$), B1 versus B2 ($Z=2.37$, $p<0.05$) and A2 and B2 ($Z=2.00$, $p<0.05$) phases.

The table 4.2 showed that the scores on screening checklist improved consistently from A1 to B2 significantly. The children performed better at the B2 phase (Mean = 93.69, SD= 8.21) than all other phases, followed by A2 (Mean = 91.03, SD= 7.86) which was better than the performance on B2 (Mean = 84.54, SD= 7.47) followed by the pre therapy baseline scores, A1 (Mean = 67.99, SD= 4.89). On visual inspection the data represented on figure

4.2.1 indicated a steady improvement in the SC scores in ELST with the cognitive linguistic intervention. The results suggested that there was a significant improvement observed in SC scores even after the withdrawal of intervention program.

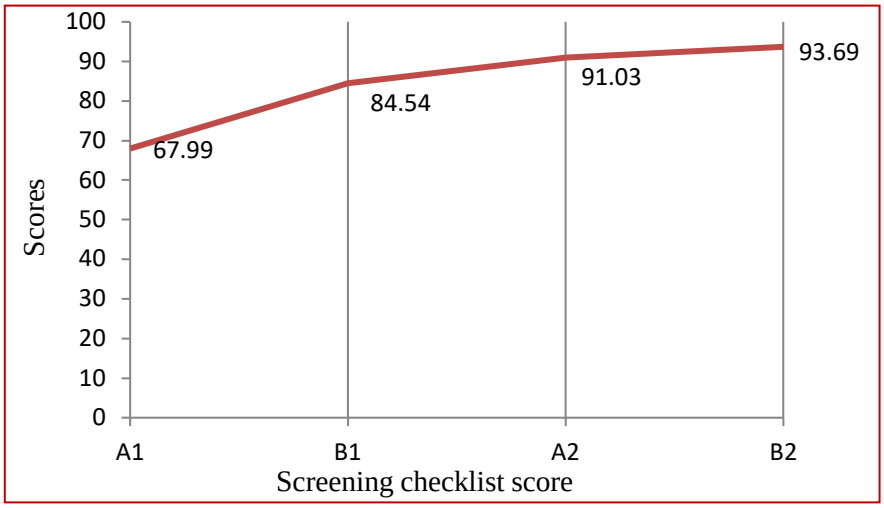

Figure 4.2.1
Scores on screening checklist of ELST at different phases of intervention program

4.2.2 Performance of children at risk for LD on Screening Tool of ELST

The scores of Screening Tool of ELST followed a normal distribution hence repeated measures ANOVA was conducted to compare the scores of Screening tool (ST) at different phases of Cognitive Linguistic Intervention, in A1, B1, A2 and B2 phases. The analysis showed that there was a significant difference between the scores on ST in the four phases of intervention ($F = 65.66$, $p < 0.05$). Post hoc tests using the Bonferroni correction revealed that after Cognitive Linguistic Intervention, there was a significant difference between all the pair wise comparisons between the phases, A1 versus B1 (p=0.001), A1 versus A2 (P=0.000), A1 versus B2 (p=0.000), B1 versus A2 (p=0.015), B1 versus B2 (p=0.000) and A2 versus B2 (p=0.002).

The table 4.2. showed that the scores on screening checklist improved consistently

from A1 to B2. B2 having the maximum score (Mean = 89.26, SD= 8.02) followed by A2 (Mean = 81.53, SD= 9.34), B1 (Mean = 75.90, SD= 9.09) and A1 (Mean = 60.16, SD= 7.03) respectively. On visual inspection the data represented on figure 4.2.2 indicated a steady improvement in the ST scores in ELST with the cognitive linguistic intervention. The results suggested a significant improvement in the ST scores of ELST regardless of withdrawal of intervention.

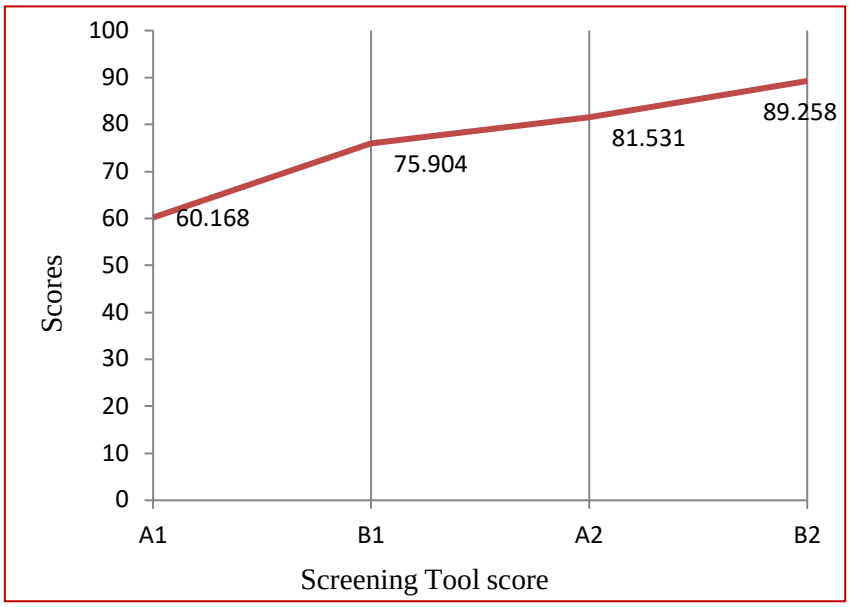

Figure 4.2.2

Scores on Screening Tool of ELST at different phases of intervention program

4. 3 Relationship between Cognitive Linguistic Measures and ELST

Spearman correlation analysis was carried out to find the relationship between the cognitive linguistic skills and the ELST scores in children at risk for LD and the results are discussed in the below subsections.

4.3.1. Relationship between Overall cognitive linguistic performances and ELST

Correlation analysis was carried out between overall CLS and ST and CS of ELST.Table 4.3.1 shows the rho scores and the p values of each condition.

Table 4.3.1

Correlation coefficients of overall CLIP-LD scores and the ELST scores at differentphases of intervention

		CLS			
		A1	B1	A2	B2
SC	A1	0.729*(p=.01)	0.561(p=.09)	0.530 (p=.11)	0.536(p=.11)
	B1	0.634*(p=.04)	0.665*(p=.03)	0.474(p=.16)	0.406(p=.24)
	A2	0.214(p=.55)	0.522(p=.12)	0.189(p=.60)	0.145(p=.69)
	B2	0.259 (p=.47)	0.511 (p=.13)	0.310(p=.60)	0.401(p=.24)
ST	A1	0.683*(p=.03)	0.598(p=.06)	0.720*(p=.01)	0.677*(p=.03)
	B1	0.659*(p=.03)	0.677*(p=.03)	0.640*(p=.04)	0.585(p=.07)
	A2	0.616(p=.06)	0.683*(p=.03)	0.494(p=.14)	0.470 (p=.17)
	B2	0.303(p=.39)	0.568 (p=.08)	0.309 (p=.38)	0.241(p=.50)

CLS: Cognitive Linguistic skills, SC: Screening Checklist, ST: Screening Tool

*p<0.05 level

The results presented in Table 4.3.1 revealed that there was a significant correlation present between the cognitive linguistic score in pre therapy phase, A1 and SC scores in A1 phase (ρ=0.729, p<0.05) CLS in A1 was also found to be significantly correlated with SC scores in B1 (ρ=0.634, p<0.05). Whereas the correlation was not significant between CLS in A1 and SC in A2 (ρ=0.214, p>0.05) as well as with SC in B2 (ρ=0.259, p>0.05). There was a significant correlation between CLS in B1 and SC in B1 (ρ=0.665, p<0.05) whereas the correlation was not statistically significant between CLS in B1 and SC in A1 (ρ=0.561, p>0.05), SC in B1 (ρ=0.522, p>0.05) and SC in B2 (ρ=0.511, p>0.05) phases. CLS in A2 was not significantly correlating with SC in any phases that is with A1 (ρ=0.530, p>0.05), B1 (ρ=0.474, p>0.05), A2 (ρ=0.189, p>0.05)

and B2 (ρ=0.310, p>0.05). Similarly, CLS in A2 was not significantly correlated with SC in A1 (ρ=0.536, p>0.05), B1 (ρ=0.406, p>0.05), A2 (ρ=0.145, p>0.05) and B2 (ρ=0.407, p>0.05).

The results also revealed that CLS in A1 is significantly related to ST in A1 (ρ=0.683,p<0.05), and B1 (ρ=0.659, p<0.05). Also CLS in B1 was significantly related to ST in B1 (ρ=0.677, p<0.05) and A2 (ρ=0.683, p<0.05). Similarly, CLS in A2 was significantly related to ST in A1 (ρ=0.720, p<0.05) and B1 (ρ=0.640, p<0.05). Also CLS in B2 was found to be significantly related to ST in A1 (ρ=0.677, p<0.05).

The correlation analysis revealed that cognitive linguistic skills are correlating significantly with the scores on ELST in different phases (7 out of 16 conditions), and also a positive correlation was observed in all the phases even though it was not significant.

4.3.2. Relationship between Memory, OC, CRA and PSR with ELST

Correlation analysis was also done with the domains cognitive linguistic intervention program with the ELST in each phases of the intervention program.

Table 4.3.2a

Correlation coefficients of M, CRA, OC and PSR in A1 phase with ELST

	A1			
	M	CRA	OC	PSR
SC	0.475(p=.165)	0.790*(p=.007)	0.524(p=.120)	0.028(p=.939)
ST	0.719*(p=.019)	0.433(p=.212)	0.433(p=.211)	0.278(p=.436)

*p<0.05 level

The results represented in table 4.3.2a revealed that in the pre therapy phase A1, memory scores correlated significantly with the ST of ELST (ρ=0.719, p<0.05) but not

with SC (ρ=475, p>0.05). Whereas OC was not significantly correlating with either SC (ρ=0.524, p>0.05) or ST (ρ=0.433, p>0.05). The Scores on CRA has a significant correlation with SC (ρ=0.790, p<0.05) whereas the correlation was not statistically significant with ST (ρ=0.433, p>0.05). The scores on PSR was also not significantly correlated with ELST, that is with both SC (ρ= -0.028, p>0.05) and ST (ρ= -0.278, p>0.05). In General Memory and conceptual relationships and associations were correlating with ELST in A1 phase, also all other cognitive linguistic measures showed a positive correlation with ELST however it was not significant.

Table 4.3.2b

Correlation coefficients of M, CRA, OC and PSR in B1 phase with ELST

	B1			
	M	CRA	OC	PSR
SC	0.636*(p=.048)	0.619(p=.056)	0.346(p=.328)	0.566(p=.088)
ST	0.703*(p=.023)	0.617(p=.058)	0.162(p=.655)	0.506(p=.136)

*p<0.05 level

The results represented in table 4.3.2b revealed that after the first intervention phase, that is B2, there was a significant correlation present between M and SC (ρ=0. .636, p<0.05) and between M and ST (ρ=0.703, p<0.05). Whereas OC was not significantly correlated with SC (ρ=0.346, p>0.05) and ST (ρ=0.162, p>0.05). Similarly, CRA was not significantly correlated with any of the measures of ELST, that is SC (ρ=0.619, p>0.05) and ST (ρ=0.617, p>0.05). Also there was no significant correlation between PSR and SC (ρ= 0.566, p>0.05) aswell as ST (ρ= 0.506, p>0.05). That is even though all four cognitive linguistic skills, that is memory, conceptual relations and associations, organization and categorization and problem solving and reasoning skills were positively correlated with ELST, only Memory was found to have a significant

correlation.

Table 4.3.2c

Correlation coefficients of M, CRA, OC and PSR in A2 phase with ELST

	A2			
	M	CRA	OC	PSR
SC	0.114(p=.755)	0.098(p=.787)	0.663*(p=.037)	0.307(p=.388)
ST	0.434(p=.210)	0.206(p=.568)	0.554(p=.097)	0.074(p=.840)

*p<0.05 level

From the table 4.3.2c, there was no significant correlation observed between M and SC (ρ=0.114, p>0.05), and M and ST (ρ=0.434, p>0.05). Whereas OC was observed to be significantly correlating with SC (ρ=0.663, p<0.05) but not with ST (ρ=0.554, p>0.05). CRA was not significantly correlated with either SC (ρ=0.098, p>0.05) or ST (ρ=0.206, p>0.05).

Similarly, PSR was also not correlated significantly with SC (ρ= 0.307, p>0.05) and ST3 (ρ= 0.074, p>0.05). Only Organization and Categorization skill had a significant correlation with ELST in A2 phase, however all the cognitive linguistic skills were positively correlated with ELST.

Table 4.3.2d

Correlation coefficients of M, CRA, OC and PSR in B2 phase with ELST

	B2			
	M	CRA	OC	PSR
SC	0.436 (p=.208)	0.370 (p=.293)	0.359 (p=.309)	0.110 (p=.762)
ST	0.388 (p=.268)	0.091 (p=.802)	0.252 (p=.482)	0.000 (p=1.00)

Results presented in Table 4.3.2d revealed that in B2 phase there was no significant correlation found between M and SC (ρ=0.436, p>0.05), M and ST (ρ=0.388, p>0.05).Similarly, there was no significant correlation found between OC with the measures onELST, that is with SC (ρ=0.359, p>0.05) as well as ST (ρ=0.252, p>0.05). CRA was also not correlated significantly with both SC (ρ=0.370, p>0.05) as well as ST (ρ=0.091, p>0.05). Problem solving and reasoning skills was also not correlating significantly with ELST measures, that is SC4 (ρ= 0.110, p>0.05) and ST4 (ρ= 0.00, p>0.05). In summary, all the cognitive linguistic components had a positive correlation with scores on ELST in B2 phase, even though it was not statistically significant.

4.4 Qualitative analysis of performance on CLS and Early literacy skills

Qualitative analysis of performance of each child recruited for cognitive linguistic intervention was carried out. It has been observed that all children showed an improvementin all activities and domains trained. It has been also observed that younger children (Subject 8 and Subject 10) showed a comparatively lesser improvement when compared to older children even though the mental age was 4 years as per the assessment results. Subject 10 and 8 were also ruled out as the outliers in statistical analysis also. In the initial assessment (A1) the performance on children showed difficulty in all the cognitive linguistic tasksexcept few aspects in CRA (Part – whole and whole-part relation & Object - person and person - object relation), OC (Category identification) and M (digit repetition and letter repetition). Children performed better in CRA and OC followed by M and the most difficultywas observed in PSR. This pattern was followed till the A2 phase. In the B2 phase a similar performance/gain was observed in all the four domains. Subject 10 was an exception for this pattern also, in the A1 phase, the child performed comparatively better in OC whereas the performance on M, CRA and PSR was poor. Even though the performance improved significantly from A1 to B2 for

all the domains, the margins were less compared to the other participants.

In general, on ELST children performed poorer in working memory, Early literacy development and mathematical skills. But the children improved on all the subsections, except subject 10 who didn't improve on mathematical skills even after 40 sessions. On all other subtests, as well subject 10 had the least scores, the margin of increment in scores was also less, compared to other participants. It has been also observed that the numeracy skills, working memory and ELD were affected in subject 10.

Hence, overall the results of the present study revealed that there is a significant effect of cognitive linguistic intervention on cognitive linguistic skills, Memory, Conceptual relationships and association, Organization and categorization as well as problem solving and reasoning skills. ELST scores were also found to be significantly improving with time. The major assumption for ABAB designs was satisfied in case of cognitive linguistic skills and itssub domains as the changes in the performance co-varied with the intervention. Whereas withELST even though there was significant change with the presence of intervention and/with time, the changes were not found to be reversible with the withdrawal of intervention hence a causative effect of cognitive linguistic skills on early literacy scores could not be confirmed. Further, the correlation analysis revealed that cognitive linguistic skills and the sub domains trained that is memory, conceptual relationships and associations and problem solving and reasoning skills were significantly related at least in one phase of the therapy with ELST. Also all the domains were positively correlated with ELST scores in all the phases.

CHAPTER 5

DISCUSSION

The aim of the present study was to develop Cognitive Linguistic Intervention Program for Children at risk for Learning Disability. A Cognitive Linguistic Intervention Module was developed. A single subject experimental, ABAB withdrawal design was used to investigate the effectiveness of cognitive linguistic intervention and its relationship with the academic skills. The subjects of the study were 10 children attending regular English medium pre-school (within 3-5 years of age) with Kannada as the mother tongue.

The findings of the present study are discussed under the following sections.

5.1 Performance of children at risk for LD on the domains of CLIP

5.2 Performance of children at risk for LD on the domains of ELST

5.3 Relationship between Cognitive Linguistic Measures and ELST

5.1 Performance of children at risk for LD on the domains of CLIP-LD

The overall cognitive linguistic skills improved after the introduction of cognitive linguistic intervention program. There was an improvement in scores noted after the introduction of the treatment followed by a reduction in the same after the withdrawal phase (A2) which improved further with the re-introduction of treatment (B2). Showing a steady improvement in the overall cognitive linguistic skills scores with cognitive linguistic intervention and reduction after withdrawal.

The results of the present study indicated a steady improvement in the overall cognitive linguistic skills (CLS) scores with the cognitive linguistic intervention and a reduction in the performance of the same scores while the therapy was withdrawn. The changes in the CLS were found to be significantly different from the baseline scores even after the withdrawal of intervention, and with the reintroduction of therapy CLS scores improved significantly. A similar result was obtained for all the domains of cognitive

linguistic improvement program developed by the authors, which includes Memory (M), Conceptual Relationships and Associations (CRA), Organization and Categorization (OC) and Problem Solving and Reasoning (PSR).

The memory scores of children at risk of LD significantly improved across all four phases of intervention. Similar to the overall cognitive skills, memory scores also reduced during the withdrawal phase and substantially improved after the re-introduction phase. Working memory has been identified as an important component in learning process (Gupta, & Sharma, 2017). Immediate and recent memory was intervened in the study. In order to comprehend a written material, the sentences should first be broken down into their constituent parts, and then inferences should be drawn to make explicit relationships within and between sentences. Later this information has to be integrated in order to understand the text completely. Working memory is significant for carrying out these processes; it aids in storing information temporarily and manipulate these information during performing the particular task. According to Alloway (2009), working memory is better predictor for learning than intelligence even at two years of age. Memory skills were also found to be related to written language comprehension in grade 3, 4 and 5 (Goff, Pratt, & Ong, 2005). These findings are in support of the findings of Swanson et al (1998) who identified that training memory domains helps in improving performance of children with LD during pre-post-test comparison. This is in line with the findings of Dahlin (2010) who found that that working memory training could improve the reading comprehension skills and word reading skills.

The scores of CRA in the four phases of intervention improved significantly. The performance on CRA skills shows a significant difference between the presence and absence of cognitive linguistic intervention with a better performance in the presence of intervention. The performance on CRA improved significantly from pre therapy to post therapy. The results then showed a reduction after withdrawal of the intervention that is from and then with the re-introduction of therapy the scores improved significantly.

The results of the present study revealed that in young children at risk for LD, shows immature association skills (Mindell, 1978), and relations (Giacomo, Federicis, Pistelli, & Passafiume, 2012) which has to be developed at an early age, could be enhanced by specifically designed training programs. Increasing experiences on cognitive linguistic tasks are reported to improve, the associative strengths and orientation skills as well. In young children, the cognitive linguistic skills develop rapidly (Röthlisberger, Neuenschwander, Cimeli, Michel, & Roebers, 2012), targeting such children at a younger age might also increase the positive effect of intervention.

The results revealed that there is a significant effect of cognitive linguistic intervention on Organization and categorization skills of children at risk for LD. Similar patterns of improvement was noted across the four phases, with increased performance at the initial introduction of treatment, decreasing performance at the withdrawal phase and increased performance at the re-introduction phase of intervention. The results also revealed that the effect of therapy remains significant even after post 10 sessions of therapy withdrawal.

Several authors have reported poor performance in problem solving, planning and organization in children with learning disability (McLeskey, 1980; Levin, 1990; Narhi, Rasanen, Metsapelto, & Ahonen, 1997; Chiarenza, 1990; Klicpera, 1983). Although there is a well-established link between conceptual structure and vocabulary development, the causal relationship between word learning and conceptual organisation is less evident. Mareschal, Powell, and Volein, (2003) identified categorization skills to be crucial in the development of cognitive function such as linguistic and memory skills, which eventually affects the learning outcomes.

The results revealed a significant effect of cognitive linguistic intervention on the problem solving and reasoning skills and the effect remained significant even after the withdrawal of the therapy. Conceptual knowledge and problem solving skills play an

important role in academic skills including mathematical cognition. Impaired application of concepts may also lead to mathematical difficulties (Geary et al., 1992; Putnam et al., 1990). Children with mathematics difficulties also demonstrate poor performance in solving word problems (Gonzales & Espinel, 2002) where they find it difficult to understand the complex word problems involving multiple steps or irrelevant information (Fuchs & Fuchs, 2002).

In general, the results of cognitive linguistic intervention confirm the previous findings which suggested, the cognitive skills could be facilitated by the interventions for children at risk for LD (Diamond, 2007). Literature reported that Memory (Farnia & Geva, 2013), categorization (Kelman, & Elisabeth, 2012), Organization (Bornstein & Arterberry, 2010) and reasoning skills (Meltzer, Solomon, Fenton, & Levine, 1989) are important to achieve adequate literacy skills. It has been also reported that such skills are often neglected in the intervention of LD at a younger age (Agran, Blanchard, Wehmeyer, & Hughes, 2002). Only a few studies have explored the possibility of enhancing cognitive abilities in kindergartners using specific training (Dowsett & Livesey, 2000; Röthlisberger, Neuenschwander, Cimeli, Michel, & Roebers, 2012; Thorell, Lindqvist, Bergman Nutley, Bohlin, & Klingberg, 2009).

Cognitive interventions are also reported to promote competence and resilience in children at risk for LD (Diamond, 2007). Vellutino and Fletcher (2007) reported that unresponsiveness of children with LD, to specific intervention programs targeting academic skills might be due to the working memory impairment. Further, the present study also contributes the fact that the unresponsiveness to intervention might not be only as a result of working memory deficit, but as a result of deficits in overall cognitive linguistic skills.

The results also showed a reduction in the cognitive linguistic skills when the therapy was withdrawn for a short period. This demonstrates the cause – effect relationship between the intervention and cognitive linguistic skills. Hence, it suggests the importance of

assessing various cognitive linguistic skills in children at risk for LD, for better understanding about LD as well as providing effective intervention. The importance of cognitive linguistic assessment and the importance of intervention for providing quality services for children with LD were also suggested by Helland (2006).

Hence, Treatment of the core cognitive linguistic skills in children at risk for LD could help in improving them significantly, so that children at risk for LD are able to process information at a higher cognitive level, which might improve their academic skills as well. The results of the present study suggested improvement in all the four cognitive-linguistic domains trained in the present study, which indicates that it is possible to effectively ameliorate the cognitive linguistic deficits which are underlying the academic language deficits in children at risk for LD at an early age.

5.2 Performance of children at risk for LD on domains of ELST

The descriptive statistics were computed for the screening checklist and screening tool across all four phases of intervention. There was significant improvement across all four phases of intervention. The correlation between the phases was also found to be significant. Thus indicating that there was steady improvement from the initial phase of treatment until the re-introduction phase. (A1 to B2) The re-introduction had the highest performance score in screening checklist.

All the four phases of intervention showed significant improvement. Steady increase in the performance scores was observed from the initial intervention phase to the re-introduction phase of treatment (A1 to B2). Significant improvement was observed across all four phases of intervention. The cognitive linguistic intervention across the four phases showed a steady improvement, increasing from initial phase(A1) until the re-introduction phase (B2).

The results of the present study indicated a steady improvement in the SC and ST scores in ELST with the cognitive linguistic intervention. The results suggest an

improvement in the early literacy skills in children at risk for LD with the cognitive linguistic intervention and/or time and the regular classroom activities. The ELST domains in general included, Listening skills, Oral language, Verbal memory, Early literacy development, Auditory discrimination skills and Mathematical skills.

The results of the present study showed that with cognitive linguistic intervention an improvement could be observed in early literacy skills as well in preschool children. Regarding the improvement observed in early literacy skills, the results are in line with the findings by various authors. The results confirm the previous hypothesizes which reported endorsing dynamic thinking and logical reasoning would facilitate the academic skills in children at a young age (Sullivan, 1995). It has been reported that the training on cognitive linguistic skills such as memory (Farnia & Geva, 2013) can improve the academic skills and numeracy skills (Kroesbergen, Noordende & Kolkman, 2014) as well, few studies also demonstrated the improvement in academic skills with memory intervention (Kroesbergen et al., 2014). The improvements in literacy skills - without direct intervention - focus towards the memory and other cognitive deficits in children with LD which leads to the academic deficits (Vellutino & Fletcher, 2007). They pointed out to the fact that the unresponsiveness of children with LD to the intervention programs focusing on phonological awareness and letter identification could be because of the cognitive deficits.

However, a reversal of the changes in literacy skills could not be observed in the present study along with the reversal of intervention. This suggests that in the present ABAB design study couldn’t prove a cause- effect relationship between the cognitive linguistic skills and the early literacy skill development. Hence, present study could not separately attribute the developmental changes as well as the practice effect of the material used to assess the early literacy skills in preschool children. The assessments were done within a short interval, this might have inflated the scores on ELST, which might have hindered the reversal of scores, and also there is a possibility of the effect of

ongoing classroom activities on the early literacy skills.

5.3 Relationship between Cognitive Linguistic Measures and ELST

The relationship between cognitive linguistic measures and the screening checklist and screening tool of ELST was estimated through correlation analysis. The overall cognitive linguistic scores showed significant improvement across the four phases of the treatment design. The overall CLS with screening checklist and screening tool scores of ELST showed a positive correlation although not significant. Specific domains of the cognitive linguistic program were also correlated with the subtests of ELST and tabulated individually across the four phases of the treatment design (A1 to B2). All of the domains in the program positively correlated with the ELST scores, however the same was not found to be significant.

The domain of memory and CRA had a significant correlation with the scores of ELST in the A1 phase. Out of the four specific domains present, the Memory domain was the only domain found to have a significant correlation with the scores of ELST in the first intervention phase (B1). In the withdrawal phase (A2) organisation and categorisation was found to significantly correlate with the scores of ELST. In the re-introduction phase (B2), although there was a positive correlation across all the domains like other phases of treatment design, none of them exhibited a significant correlation.

The correlation analysis revealed that cognitive linguistic skills and the sub domains trained that is memory, conceptual relationships and associations and problem solving and reasoning skills were significantly related at least in one phase of the therapy with ELST. Also all the domains were positively correlated with ELST scores in all the phases.

The results of the present study are in line with many previous research findings. Children with LD are also reported to have poor cognitive linguistic skills which are important for their later academic achievement (Nishy Mary, 1998). As reported by

Verhoeven, Reitsma and Seigel (2010), there are robust correlations between cognitive linguistic skills that are important for development of literacy skills in childhood. It was also reported that the logical reasoning skills are highly correlated with the reading readiness scores in First graders and kindergarteners (Ayers, Rohr & Ayers, 1974). Few studies using a prospective longitudinal design show developmental changes of EF in preschool- and/or young school-aged children (Altemeier, Abbott, & Berninger, 2008; Hughes et al., 2010; Roebers, Röthlisberger, Cimelli, Michel, & Neuenschwander, 2011; Van der Ven et al. 2012, Willoughby et al., 2012b). Additionally, it seems that the developmental changes are much larger in preschool children when compared to older group (Altemeier et al., 2008; Roebers et al., 2011; Willoughby et al., 2012b). Swanson and Sa´ez, (2006), conducted a study to investigate the growth in reading, vocabulary, and memory in 5-10-year-old children at risk for reading disabilities and reported a correlation between memory skills and the reading measures.

It has been also reported that the phonological processing skills are closely related to the STM (Gillam & Van Kleeck, 1996) and also that the poor readers have STM deficits (Farmer & Klein, 1995; Siegel, 1994). Swanson, Sáez, Gerber and Leafstedt (2004) examined the roles of STM and WM in the literacy skills of bilingual children. The results suggested that the children who were at risk for LD based on the reading scores had less improvement in both STM and WM. Similar results were obtained, where researchers suggested the memory scores can be used to identify children with poor reading skills in bilingual populations (Da Fontoura & Siegel, 1995). Such results indicate the relationship between the cognitive linguistic skills and the learning outcomes in children at risk for LD, which is in line with the results of present study as well. Scruggs, Mastropieri, Sullivan, and Hesser (1993) reported that training of guided and sustained use of different reasoning strategies would help children with LD. The authors indicated that children who can provide own explanations were able to do more effective reasoning whereas students who were trained with only direct information and they

suggested to train children with more active reasoning strategies in order to improve in literacy skills.

Also, it has been reported that there is no strong evidence that the effect of trained cognitive domains is being transferred to the untrained academic areas (Melby-Lervåg & Hulme, 2013). However, the training on cognitive linguistic intervention focused on young children, as examined in the present study significantly improved all the areas trained and the early literacy skills, even though a cause –effect relationship could not be established between cognitive linguistic skills and early literacy skills. It is also suggested that such training should be carried out at younger age attributing to the neural plasticity (Wass, Scerif & Johnson., 2012). The findings suggest that more explicit instruction is likely to accelerate progress in various areas of cognitive-linguistic skills in children at risk for LD and the same effect could be transferred to untrained early literacy skills. And it also suggests the importance of a combined direct instruction and strategy instruction (cognitive) model as an effective procedure for remediating learning disabilities educational intervention for a positive effect on the academic skills (Swanson et al., 1998).

5.4 Qualitative analysis of performance on CLS and Early literacy skills

All the children in the present study exhibited improvements in all the domains that they were trained for, with the younger children showing a lesser improvement than their older participants. There was a significant effect of the cognitive linguistic intervention on all the specific domains of the program and also with the overall cognitive scores of the program trained for. The scores of ELST improved with time, and were found to be not reversible even at the withdrawal phase of treatment design. Whereas, the cognitive linguistic skills and the specific domains satisfied the ABAB design. Thus, the influence of cognitive skills on the early literacy scores could not be established.

The analysis of individual scores on the cognitive linguistic domain scores

identified children who are less responsive to intervention programs as well, in such children even though improvements were noted statistically, the margins were less when compared to other children. Such children may fall under unresponsive to therapy (Otaiba & Fuchs, 2006) in traditional therapy approaches. This may be attributable to suggesting modifications in intervention approaches and providing more focused tier 3 level support according to RTI approach for such children.

Summary and Conclusions

The aim of the present study was to develop Cognitive Linguistic Intervention Program for Children at risk for Learning Disability. The subjects of the study were 10 children attending regular English medium pre-school (within 3-5 years of age) with Kannadaas the mother tongue. The effectiveness of cognitive linguistic intervention and its relation with academic skills were investigated using a single subject experimental, ABAB withdrawal design.

The overall cognitive linguistic skills improved after the introduction of cognitive linguistic intervention program. The scores of CRA in the four phases of intervention improved significantly, with increasing scores at the initial phase of intervention, reduction of scores at the withdrawal phase and increasing scores at the re-introduction phase of treatment. There was significant correlation of cognitive linguistic intervention across all phases. The overall cognitive linguistic scores showed significant improvement across the four phases of the treatment design and correlated significantly with ELST.

In general, it can be observed from the study that, the deficits primarily seem to be due to two main reasons that are identified while intervention in the present study, processing speed and deficits in psycholinguistic skills, and specifically, in phonological awareness. These results are in line with the theories of double deficits of dyslexia (Graham, MacArthur, & Fitzgerald, 2013; Lachmann, & Weis, 2018), as the subjects seem to show a deficit in the processing speed, which could affect the cognitive processes and prevents the brain connections necessary for the learning of the literacy. Likewise, there are also relevant deficits in phonological awareness, since the subject is unable to isolate the phonemes of the words and to be able to correctly carry out the grapheme-phoneme correspondence processes (González-Valenzuela, 2017; Defior, Serrano, & Gutiérrez, 2015; Soriano, 2014; Ortiz, 2012; Katalin, 2004).

Limitations of the study

Owing to the inclusion and exclusion criteria for participants in the current study, data was small and limited. The present study followed a single case design, which indicates that the study may lack and affect external validity, since the findings are limited to the subjects under study. Furthermore, the study is carried out with Kannada-English biliterate children and the intervention was in English, hence generalizing to Kannada or other biliterate children should be studied. Future studies are warranted in order to use the intervention module for specific generalization to the different subtypes of children with Learning Disabilities.

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APPENDIX

MEMORY

a. Immediate memory

Activity 1: **Digit repetition**

Instruction: I will say some numbers, and you repeat them after meMaterials: Stimulus card, score sheet

Procedure: Digits should be given at the rate of one per second. Recite digits in an evenmonotone without any variation in pitch of voice. Work on the activity till the child achieves 80% accuracy in the responses.

Scoring: Score of '1' for correct repetition and '0' for incorrect repetitionStimulus:

No	Item
1	4 3 2
2	5 5 6
3	6 7 8
4	2 4 9
5	8 7 5
6	11 2 4
7	4 3 2 1
8	1 2 6 7
9	8 6 4 9
10	5 6 9 8

Activity 2: Letter repetition

Instruction: I will say some alphabets, and you say them after meMaterials: Stimulus card, score sheet

Procedure: alphabets should be presented by the clinician in an intelligible way without any variation in pitch. And the client has to repeat it back in the same order. Work on the activity till the child

achieves 80% accuracy in the responses.

Score: Score of ‘1’ for correct repetition and ‘0’ for incorrect repetitionStimulus:

No	Item
1	A Z P
2	B Q M
3	H I J
4	S W L
5	N K V
6	B P O D
7	R P K B
8	T V N R
9	C S U T
10	V X Q J

Activity 3: Remembering lists of words

Instruction: I will say some words, and you say them after me Materials: Stimulus card, score sheet

Procedure: words should be presented by the clinician in an intelligible way without any variation in pitch. And the client has to repeat it back in the same order. Work on the activity till the child achieves 80% accuracy in the responses.

Score: Score of ‘1’ for correct repetition and ‘0’ for incorrect repetitionStimulus

No	Item
1	Bed, pillow, sleep
2	Run, jump, walk
3	Brush, towel, soap
4	Table, school, bus
5	Fish, Cake, Chair
6	Stop, bird, boy, cap
7	Big, duck, green, jump

8	Play, tree, girl, day
No	**Item**
9	Drink, cup, apple , boat
10	Mom, Table, paint, colour

Activity 4: sentence repetition

Instruction: I will say a sentence, and you say them after meMaterials: Stimulus card, score sheet

Procedure: sentences should be presented by the clinician in an intelligible way withoutany variation in pitch. And the client has to repeat it back in the same order. Work on the activity till the child achieves 80% accuracy in the responses.

Score: Score of '1' for correct repetition and '0' for incorrect repetitionStimulus:

No	**Item**
1	Go there
2	Close the door
3	She is my friend
4	I like playing
5	You can do it
6	He went to the shop
7	Give me a chocolate
8	My mother is beautiful
9	Parrot is green in colour
10	I saw a doctor yesterday

Activity 5: Body part commands

Instruction: I will ask you to do some things with parts of your body. Listen and dowhat I ask you to do.

Materials: Stimulus card, score sheet

Procedure: sentences should be presented by the clinician in an intelligible way without any variation in pitch. And the client has to do the correct action. The items are arranged in an easy to difficult progression; complete each level with more than 80% accuracy and move on to next level.

Score: Score of '1' for correct response and '0' for incorrect response

Stimulus:

No	Item
1	Raise your hands/ Hands up
2	Open your mouth
3	Close your eyes
4	Cross your hands
5	Cross your hands and close your eyes
6	Turn your head and touch your hair
7	Touch your nose and put your tongue out
8	Put your tongue out and point your finger
9	Clap your hands and open your mouth
10	Tap your finger, blink and cross your hands

b. <u>Recent memory</u>

Activity 1: **Yes/ No questions**

Instruction: I will ask you some questions, and you answer yes or noMaterials: Stimulus card, score sheet

Procedure: Clinician should ask the questions provided in an intelligible way and the client have to reply either yes/ no. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.Stimulus:

1. Is your name -------- (client's name)? (Yes)
2. Do you use pen to write? (Yes)
3. Do you use your eyes for seeing? (Yes)
4. Can you run? (Yes)

5. Has a dog got six legs? (No)
6. Do you sleep in bedroom? (Yes)
7. Are roses green in colour? (No)
8. Is auto a vehicle? (Yes)
9. Do trees walk? (No)
10. Is apple red?(No)

Activity 2: Answering questions (multiple choices)

Instruction: I will ask you a question, and you select the best answer for that and tell meMaterials: Stimulus card, score sheet

Procedure: Clinician should say the question along with the option in a slow rate and intelligibly without change in intonation and the client has to respond with any of the options provided. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.Stimulus:

1. How do you run, with hands or with legs? (Legs)
2. Where do you sleep, in bedroom or in kitchen? (Bedroom)
3. When does the sun come, in the night or the day? (Day)
4. What are your ears for, watching or hearing? (Hearing)
5. Which number comes after 7, eight or four? (Eight)
6. How many legs does a cat have, four or two? (Four)
7. Is parrot a bird or an animal? (Bird)
8. What colour is banana yellow or blue? (Yellow)
9. When do we have breakfast, in the morning or in the night? (Morning)
10. What animal has a really long neck a giraffe or a cow? (Giraffe)

Activity 3: **Sentence completion**

Instruction: I will start the sentence and you finish it with one word.Materials: Stimulus card, score sheet

Procedure: Clinician should say the sentence and the child have to fill the last word of the incomplete sentence. Work on the activity till the child

achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.Stimulus:

1. Stars are present in----------(Sky /night)
2. The colour of leaves are---------(green)
3. A bird has wings to --------- (fly)
4. We write with a pen on a---------- (paper/ book)
5. We go to school to ---------(study)
6. Ice cream is ------ (sweet / tasty / cold/ colours)
7. The number of tyres that an auto has is---------(three)
8. I run with my -------- (legs)
9. The person who teaches is called a----------(teacher)
10. A ship moves on------ (water / sea)

Activity 4: **Answering questions**

Instruction: I will ask you a question, and you answer it with one wordMaterials: Stimulus card, score sheet

Procedure: Clinician should say the question in a slow rate and intelligibly without change in intonation and the client has to respond with a single word answer. Work on the activity till the child achieves 80% accuracy in the responses.

Scoring: Conceptually correct answers can be scored 1 and a score of '0' for incorrectanswers.

Stimulus:

1. Which body part helps you see? (Eyes)
2. When do we sleep? (at night)
3. Where does a fish live? (Water/ Pond/ Sea.)
4. What is the colour of an apple? (Red)
5. What do we wear on our feet? (shoes or socks)
6. What is the opposite of the word 'up'? (Down)
7. What do you use a pen for? (To write)
8. What comes after the number 2? (Three)
9. What shines in the night sky? (Moon/Stars)
10. What does cow gives us to drink? (Milk)

CONCEPTUAL RELATIONSHIPS AND ASSOCIATIONS

Activity 1: **Part – whole and whole-part relation (Match the following)**

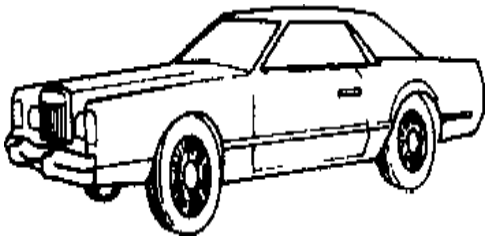
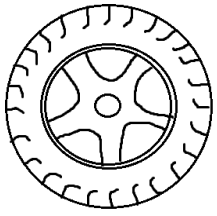
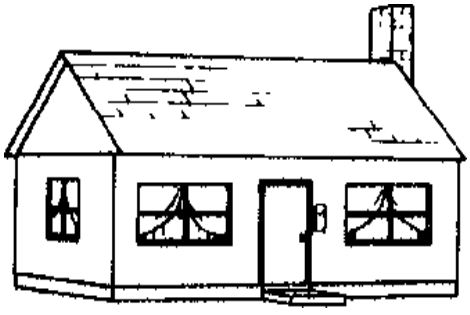
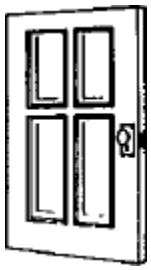
Instruction: I will show you few pictures and you match them, which are related to eachother.

Materials: Stimulus cards

Procedure: show the child the picture card and ask him/her to name it, if the child is not able to name it, name the item and ask the child to tell what it is a part of. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.Stimulus:

No.	Items
1	Button (Expected Answer: Shirt/ Dress)
2	Leaves (Expected Answer: Tree)
3	Finger (Expected Answer: Hand)
4	Wheel (Expected Answer: Car/Vehicle)
5	Door (Expected Answer: House)

Activity 2: **Object person relation and person object relation**
(Pick up from the options)

Instruction: I will name a person, and you tell me what type of object that person may use. If you are not able to name the object I will show you three objects and you select one object from that.

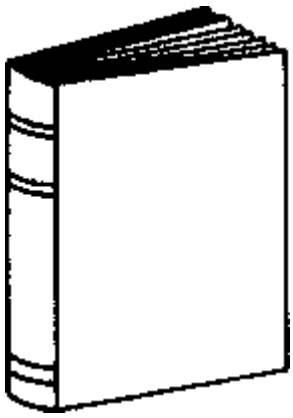
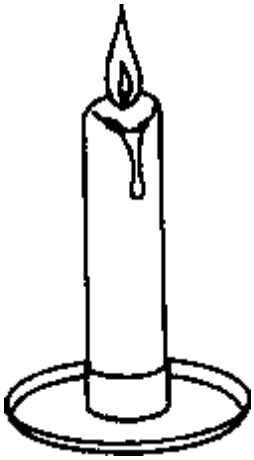
Materials: Stimulus cards

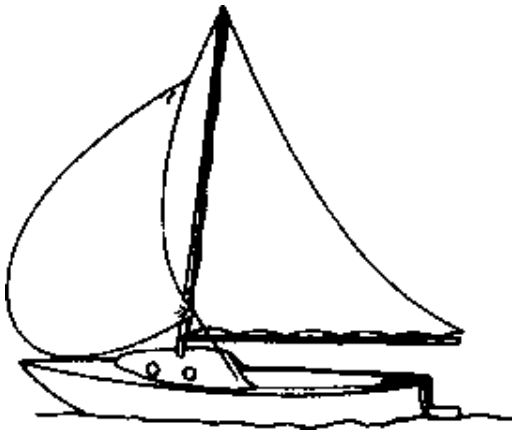
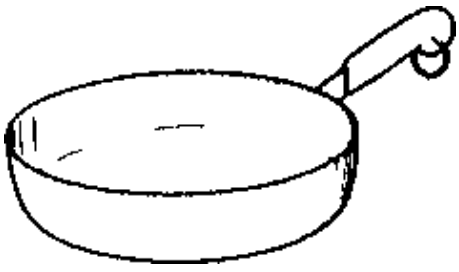
Procedure: Name the role / profession of the person and ask the child to tell an object which is associated with present the stimulus to the child. Work on the activity till the child achieves 80% accuracy in the responses

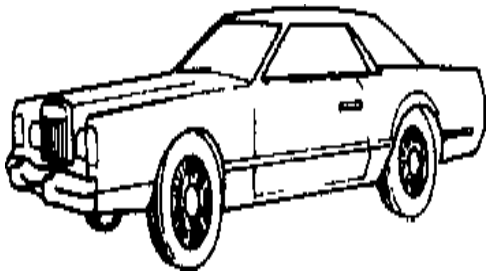
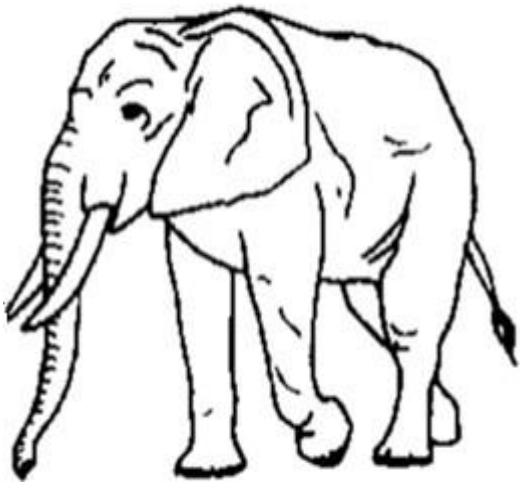
Scoring: A score of '1' for correct answers and '0' for incorrect answers.

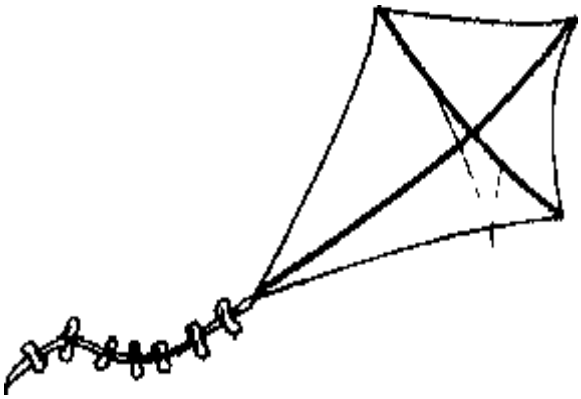
Stimulus:

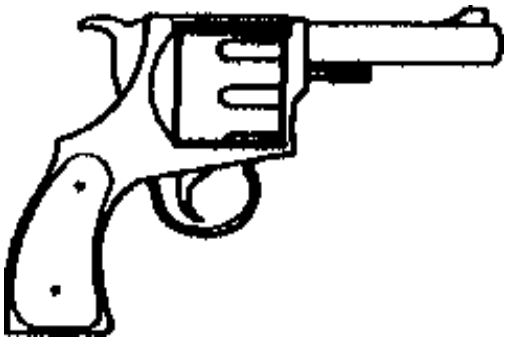
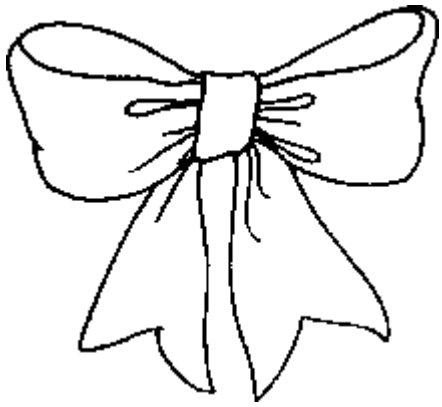
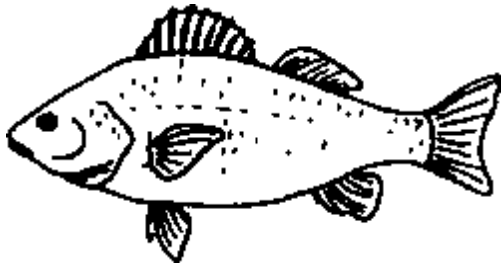
No.	Items
1	Teacher (Expected answer: Book)
2	Cook/ chef (Expected answer: pan)
3	Driver (Expected answer: Car/ Vehicle)
4	Doctor (Expected answer: Stethoscope)
5	Soldier(Expected answer: Gun)

1. Teacher	  

2. cook/ Chef	  

3. Driver	  

4. Doctor	  

5. Soldier	  

Activity 3: **Synonym recognition – Yes/ No**

Instruction: I will say two words, and you tell me if they mean the same.

Materials: Stimulus manual

Procedure: The clinician should say the two words given in the manual and the child should be asked to say whether both the words mean the same or not. Work on the activity till the child achieves 80% accuracy in the responses.

Scoring: A score of '1' for correct answers and '0' for incorrect answers.

Stimulus:

1. Below and under (correct)
2. Big and small (Incorrect)
3. Up and above (correct)
4. Long and small (Incorrect)
5. Child and kid (Correct)

Activity 4: **Naming synonyms**

Instruction: I will say a word and you tell me another word that means the same thing

Materials: Stimulus manual

Procedure: Present the word clearly and ask the child to respond with the word having the same meaning. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers. Conceptually correct answers can be scored correct.

Stimulus:

1. Under (Below/Down)
2. Above (Up)
3. Begin (Start)
4. Cash (Money)
5. End (Finish)

Activity 5: **Recognizing opposites – Yes/ No**

Instruction: I will say two words, and you tell me if they are opposite of one another.

Materials: Stimulus manual

Procedure: The clinician should say the two words given in the manual and the child should be asked to say whether both the words are opposite to one another or not by saying yes/no. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.

Stimulus:

1. Up and down (correct)
2. Right and left (correct)
3. In and out (correct)
4. Boy and girl (correct)
5. Black and red (Incorrect)

Activity 6: **Naming Antonyms**

Instruction: I will say a word and you tell me its opposite

Materials: Stimulus manual

Procedure: Present the word clearly and ask the child to respond with the word having the opposite meaning. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answers and '0' for incorrect answers.

Stimulus:

1. Day (night)
2. Slow (Fast)
3. Small (Big)
4. Come (Go)
5. Open (Close)

ORGANIZATION AND CATEGORIZATION

Activity 1: **Category identification**

Instruction: I will give you some pictures, you can colour on the things you can eat/animal/ fruits/ vehicles/ and school items.

Materials: Stimulus manual, Crayons

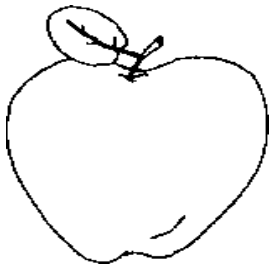
Procedure: Present the pictures provided in the manual and ask the child to colour on items which are asked. See the picture plates and select the instruction appropriately. Work on the activity till the child achieves 80% accuracy in the responses

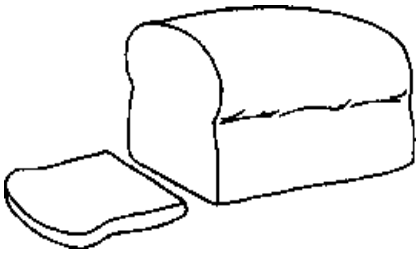
Scoring: A score of '1' for correct answers and '0' for incorrect answers and -1 for colouring incorrect item). (Maximum score: 30 from five picture plates)

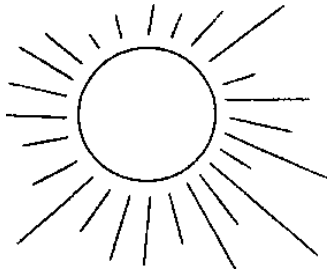
Stimulus:

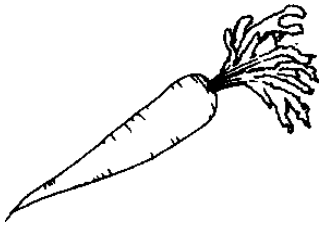
No		Items
Plate1	Max score: 6	Apple, Bread, Grapes, Cake, Banana, Carrot
Plate 2	Max score: 7	Dog, Rabbit, Tortoise, Elephant, Lion, Cat, Cow
Plate 3	Max score: 6	Grapes, Apple, Watermelon, Pineapple, Banana, Strawberry
Plate 4	Max score: 7	Bus, Car, Train, Helicopter, Aeroplane, Bicycle, Boat
Plate 5	Max score: 4	Pencil, Scale, Pen, Book

Picture plate 1: colour the things you can eat

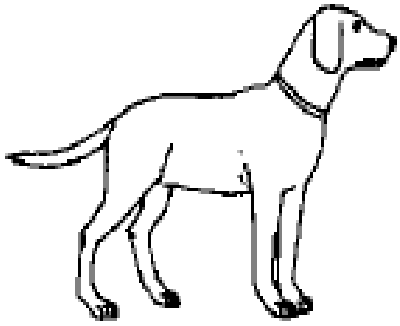


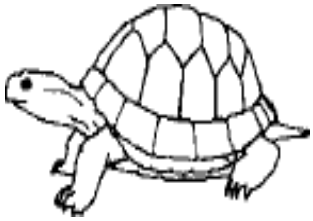
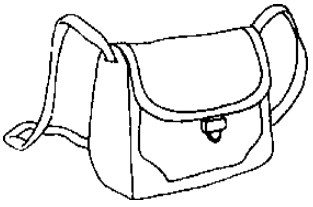
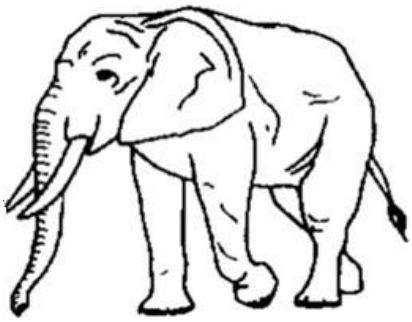
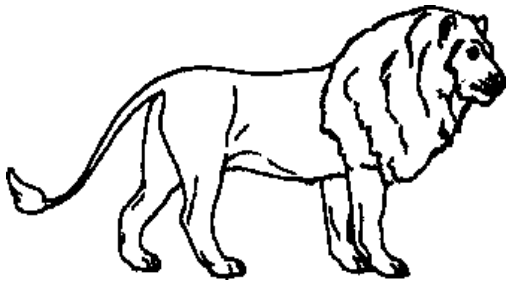


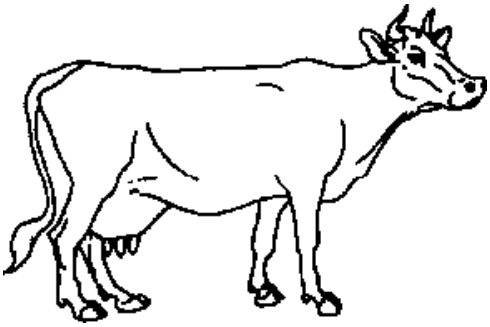


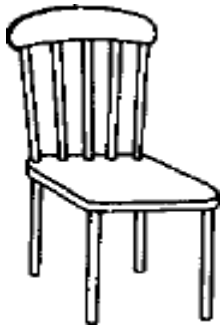


Picture plate 2: colour only the animals



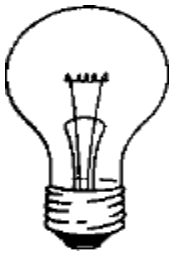
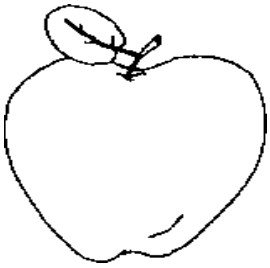








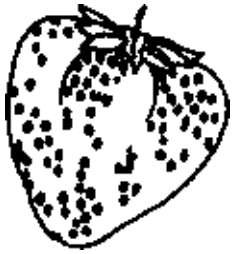
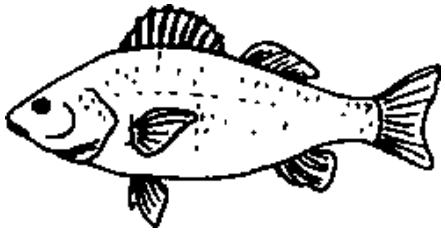
Picture plate 3: colour only the fruits



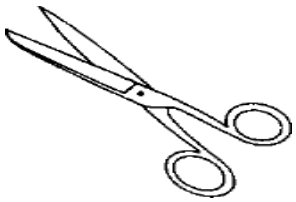



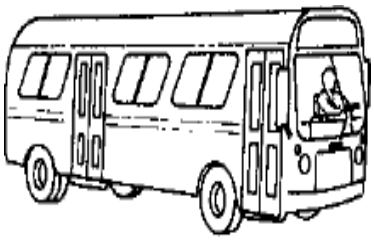


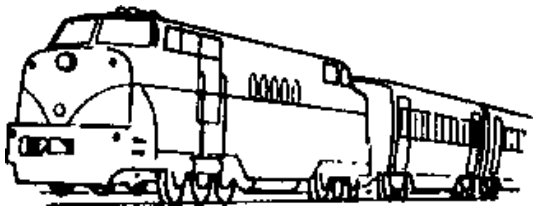


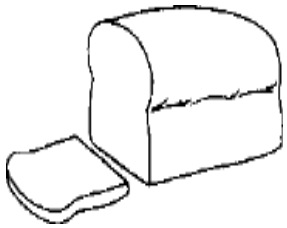



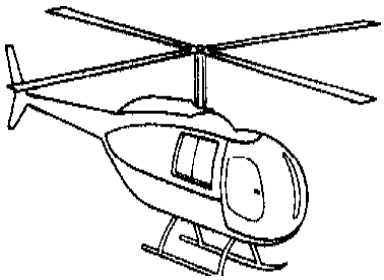
Picture plate 4: colour only vehicles

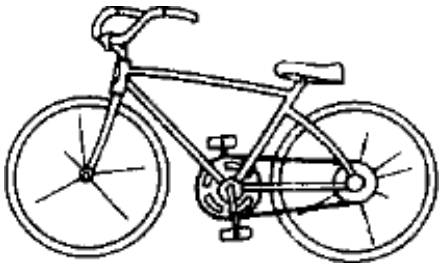




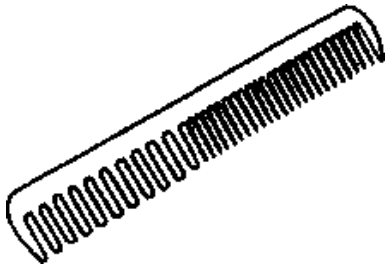


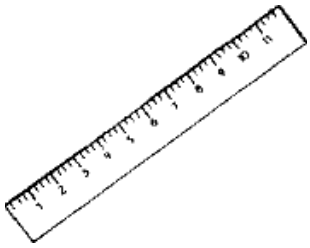


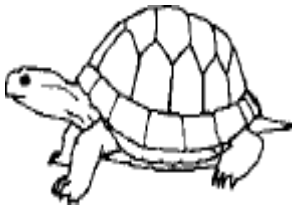


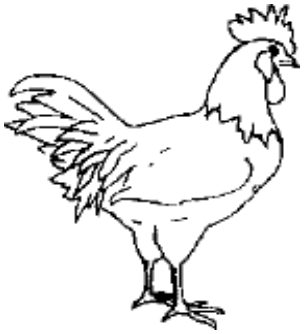


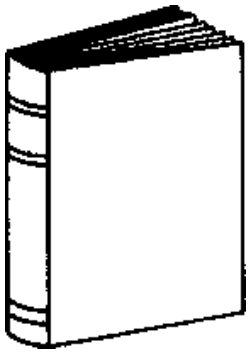
Picture plate 5: Colour only school items







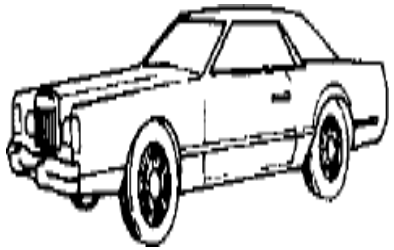
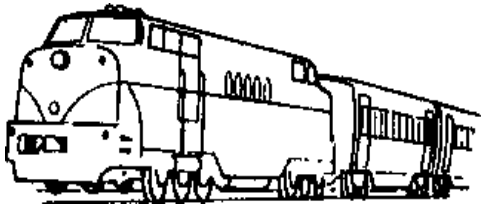




Activity 2: **Category identification – Name the category**

Instruction: I will show you three pictures you tell me their names and what category they belong to.
Materials: Stimulus manual
Procedure: Present the pictures provided in the manual and ask the child to name the category which they belong to. Work on the activity till the child achieves 80% accuracy in the responses
Scoring: A score of '1' for correct answers and '0' for incorrect answers.
Stimulus:

No	Items	Category
1	Shirt, Pants, Socks	Dress/ Clothes
2	Car, aeroplane, Train	Vehicles
3	Apple, Grapes, Banana	Fruits
4	Lion, Tiger, Dog	Animals
5	Eye, Ear, Hand	Body parts

Sl no.	Items		
1.			
2			

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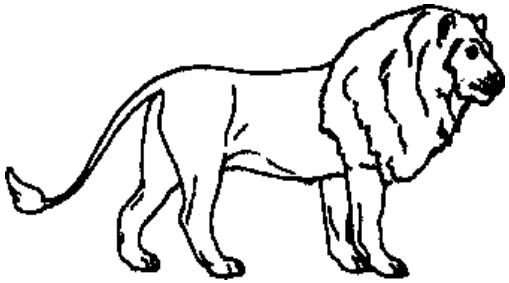
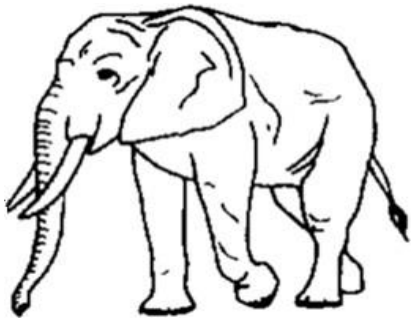
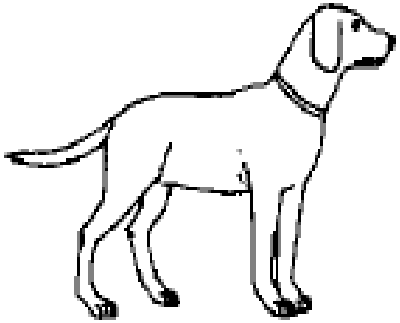
4.			
5			

Activity 3: **Category member recall**

Instruction: I will name a category, and you name five items in that category.

Materials: Stimulus manual

Procedure: name the category and ask the child to respond with the names of items in that category. Work on the activity till the child achieves 80% accuracy in the responses.

Score: A score of '1' for each correctly named item and a score of '0' for incorrect answers and/ or no answer (Total score: 25)

Stimulus:

1. Vehicles
2. Fruits
3. Vegetables
4. Dresses
5. Animals

Activity 3: **Category member recall from description**

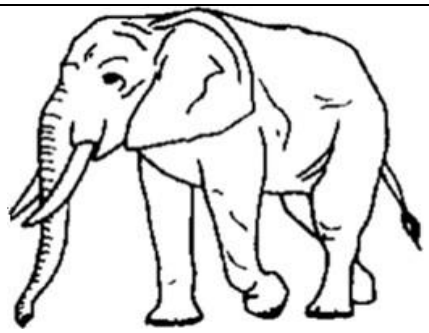
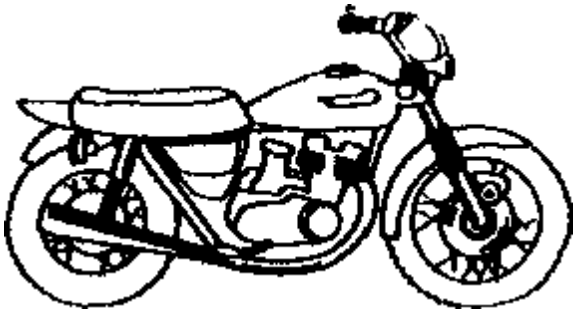
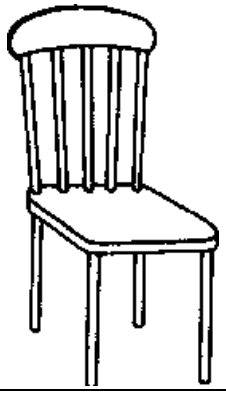
Instruction: I will give you three clues and you try to find out what I am describing about.

Materials: Stimulus manual

Procedure: Give the clues to the child slowly and intelligibly and wait for the child to respond the item name. Show the picture of the item and ask the child to name it if he/she cannot recall it from the description and explain the features again. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for correct answer without the help of picture cue, Score of '0.5' for answering with the help of picture cue and a score of '0' for incorrect/No answer

Stimulus:

Sl. no		
1	It is a large animal, black in colour and it has a very long nose called trunk (Expected answer : elephant)	
2	It is an animal. It has four legs, it makes ‘bow’ sound. (Expected answer : Dog)	
3	It is a vehicle, it has 2 tyres, people wear helmet while travelling in it. (Expected answer :Bike)	
4	It is furniture. It has 4 legs. We sit on it. (Expected answer :Chair)	
5	It is a vehicle, flies in the air, a pilot will be inside and it has wings. (Expected answer :Aeroplane)	

Activity 4: **Category member comparison**

Instruction: I will show you four pictures, and you find the odd one and tell me why.

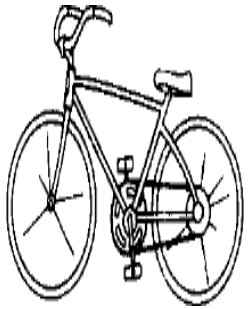
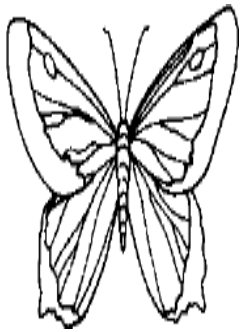
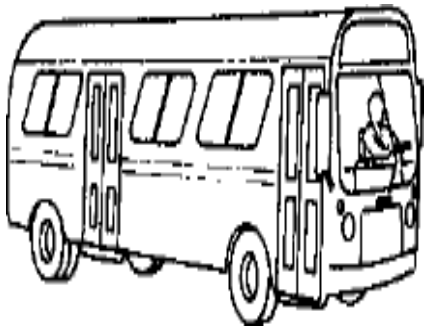
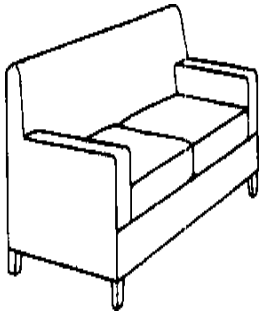
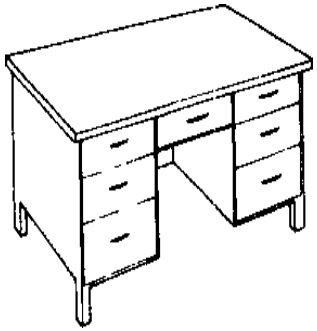
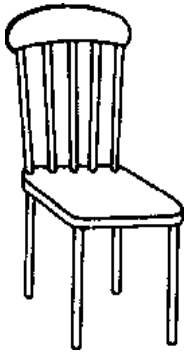
Materials: Stimulus manual

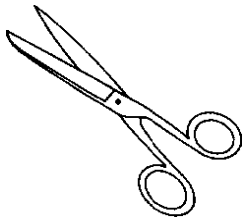
Procedure: Present the pictures to the child and ask the child to find out the odd one. Ask him to explain why. If the child is not able to explain, show him/ her correct answer and explain why. Work on the activity till the child achieves 80% accuracy in the responses

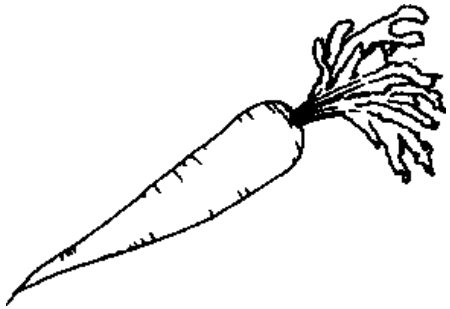
Score: A score of '1' for complete and correct answer, a score of '0.5' for answering without explaining the reason and a score of '0' for incorrect/ No answer.

Stimulus

No	Items	Odd item
1	Bicycle, butterfly, car, bus	Butterfly
2	Sofa, cake, table, chair	Cake
3	Hen, eagle, swan, cat	Cat
4	Eye, ear, scissors, foot	Scissors
5	Carrot, banana, pineapple, grapes	Carrot

1				
2				

3				
4				

5				

Activity 5: **Association**

Instruction: I will give you a sheet with pictures, you draw a line between the objects which go together, and tell me why they are related

Materials: Stimulus manual, colour pens

Procedure: Present the stimulus sheets and ask the child to draw line between the related objects and explain why they are related. If the child is not able to explain guide him/ her to draw the line correctly and explain why. Work on the activity till the child achieves 80% accuracy in the responses

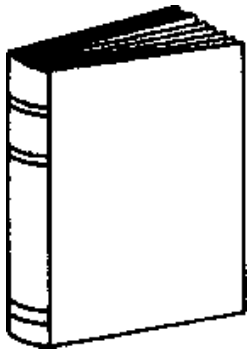
Scoring: A score of '1' for correctly associating each items and a score of '0' for incorrect answers and/ or no answer. (A total score of 10 from 3 picture plates)

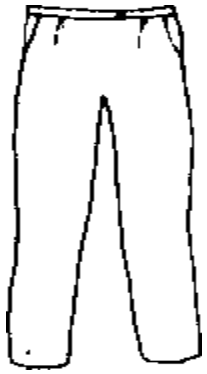
Stimulus:

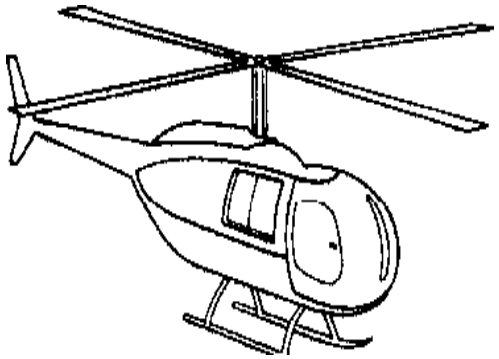
No	
Plate1	Key - lock
	Leg - shoe
	Cup- bowl
Plate 2	Pen- book
	Shirt - pants
	Aeroplane- helicopter
Plate 3	Tree- leaf
	Watch- clock
	Candle – bulb
	Cycle- train

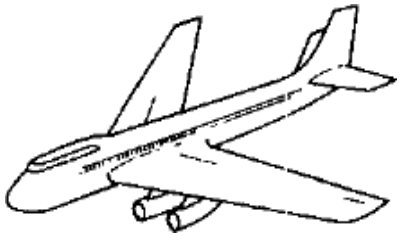
Picture plate 1

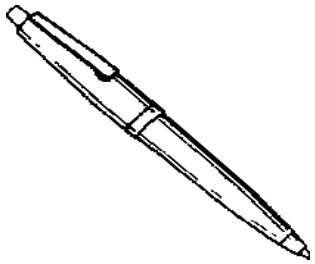
Picture plate 2:



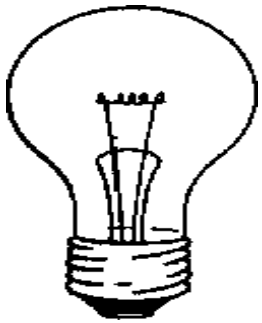


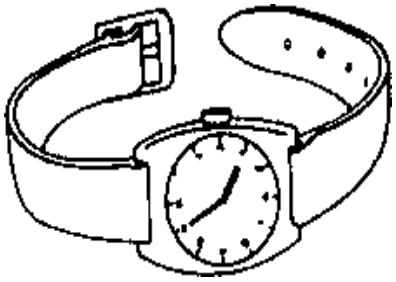


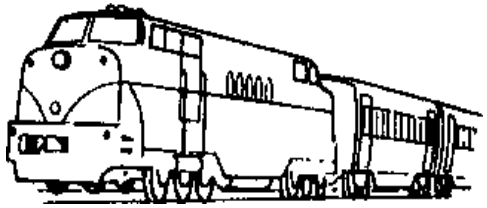


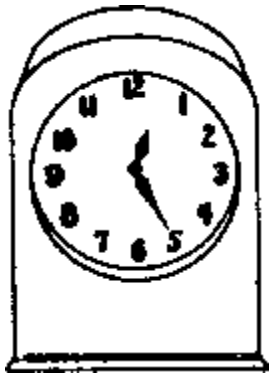


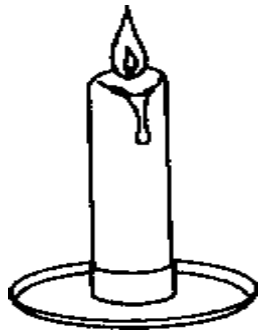
Picture plate 3











PROBLEM SOLVING AND REASONING

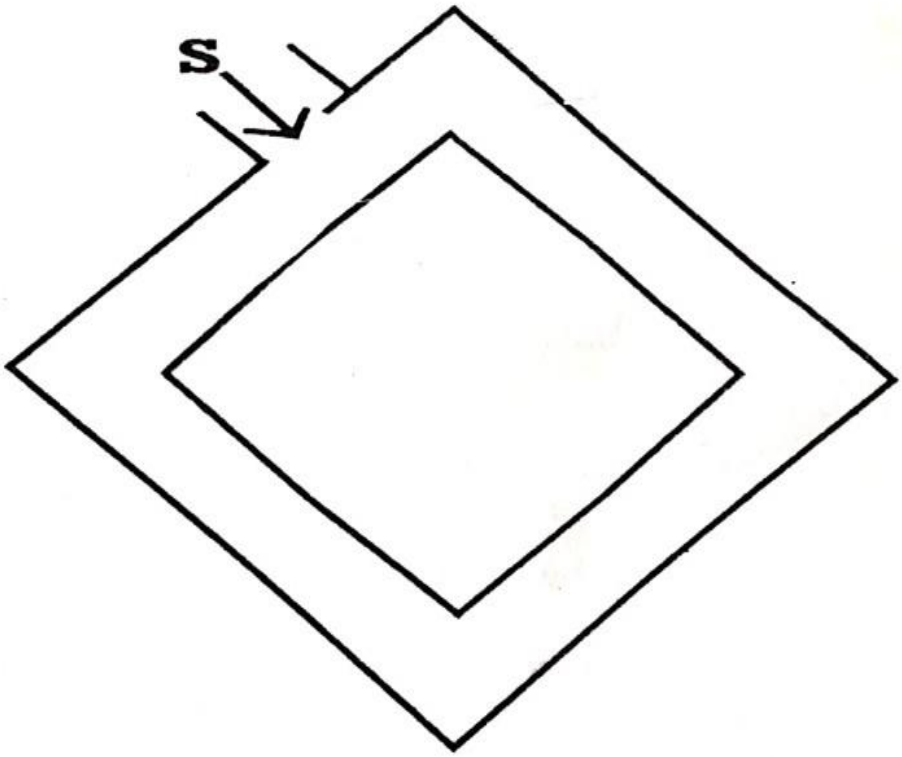
Activity 1: **Find the way (mazes)**

Instruction: I will give you a maze, you find the correct way

Materials: Stimulus manual

Procedure: present the maze to the child and ask them to draw through the uninterrupted path to reach the other end. The clinician can give cues if necessary. Work on the activity the child can solve the maze independently at least 80% of the time.

Scoring: Scoring: A score of ‘1’ for each correctly finishing the maze, a score of 0.5 for completing the task with the help of clinician, and a score of ‘0’ for incorrect answers and/ or no answer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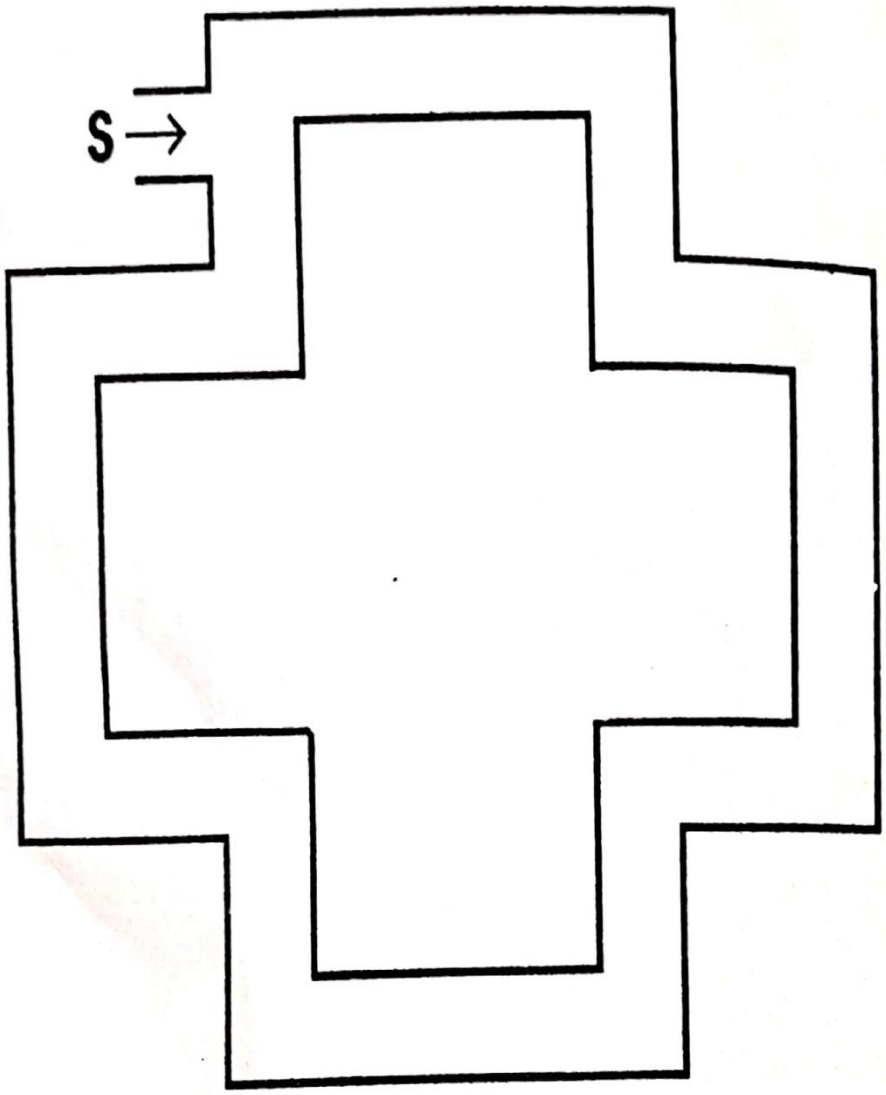
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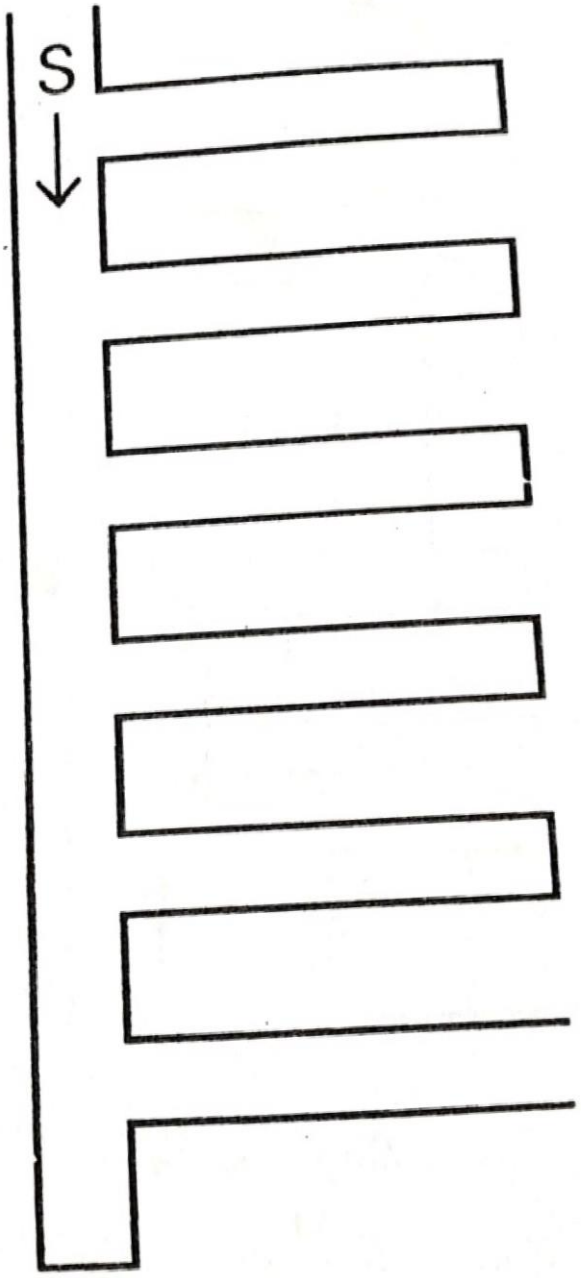
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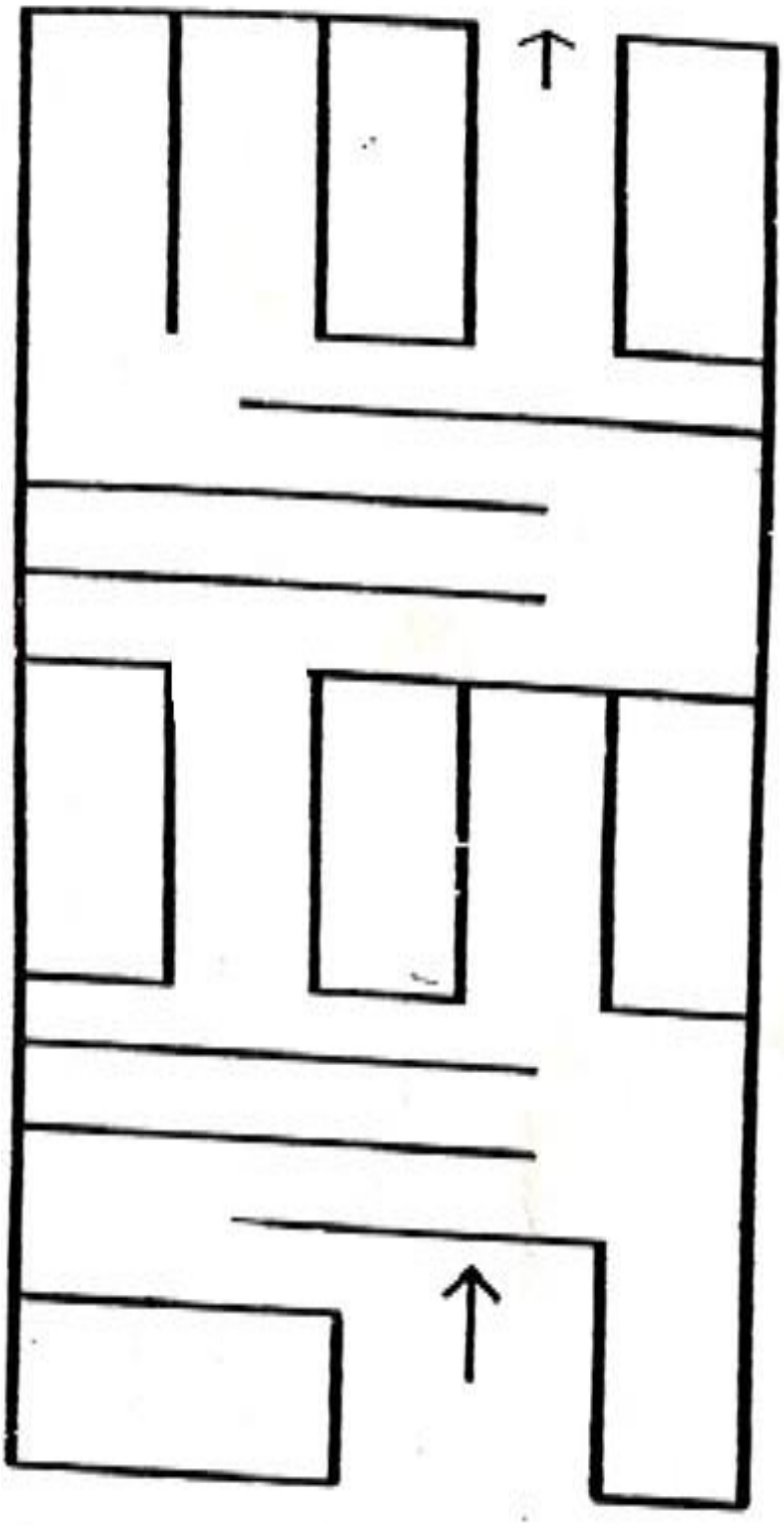

Activity 2: **Predicting outcome**

Instruction: I will describe a situation, and you tell me what you would do if.....
Materials: Stimulus manual
Procedure: Present the situations clearly to the child and ask him to explain the outcome. Wait 20-30s for the child to respond and if the child is not able to respond with the proper outcome, give the cue word provided in the manual. If the child is not able to respond correctly even after the cue, clinician should explain the outcome. Work on the activity till the child achieves 80% accuracy in the responses
Scoring: A score of '1' for each correctly predicting the outcome without cue word, a score of 0.5 for predicting the outcome with the help of cue word, and a score of '0' for incorrect answers and/ or no answer
Stimulus:

1. You got sick (cue: Hospital)
2. You are playing outside and it started raining. You don't have anumbrella with you (cue: wet)
3. you leaked curry on your dress (cue: change dress , wash, scold)
4. you lost your favourite toy (cue: search, ask mom)

Activity 3: **Predicting cause**

Instruction: I will tell you an outcome; you tell me what the probable causes are for that

Materials: Stimulus manual
Procedure: Present the situations clearly to the child and ask him to explain the cause. Wait 20-30s for the child to respond and if the child is not able to respond with the proper cause, give the cue word provided in the manual. If the child is not able to respond correctly even after the cue, clinician should explain the cause. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of '1' for each correctly explaining the cause and a score of '0' for incorrect answers and/ or no answer. Conceptually correct answers can be accepted.

Stimulus:

1. You went to hospital (Expected answer: sick / meet someone who is hospitalized)
2. You are hungry (Expected answer: skipped food / it's time to eat)
3. Her hand is injured / her hand is in bandage (Expected answer: Fell down)
4. My friend was absent in class today (Expected answer: Sick/ function)
5. He is taking medicines. (Expected answer: Sick)

Activity 4: Answering "why" questions

Instruction: I will ask you a question, and you answer it as completely as possible.
Materials: Stimulus manual
Procedure: Ask the questions clearly to the child and wait for his/her responses (note: clinician should stimulate or cue for elaborative responses when necessary). Work on the activity till the child achieves 90% accuracy in the responses
Scoring: A score of '1' for each correctly explaining the cause, a score of 0.5 for answering with the help of cues and a score of '0' for incorrect answers and/ or no answer. Conceptually correct answers can be accepted.

Stimulus:

1. Why do you go to school? (Expected answer: to study)
2. Why do you have to take an umbrella or rain coat while going out in rainy season?(Expected answer: not to get wet)
3. Why would you carry books to school? (Expected answer: to study/ to read/ to write)
4. Why do you need a phone? (Expected answer: to call someone)
5. Why do people go for job? (Expected answer: to earn money)

Activity 5: **Predicting effects of actions**

Instruction: I will tell you a situation you try to tell me all the possible effects that can occur with each situation
Materials: Stimulus manual
Procedure: Present the situations clearly to the child and ask him to explain all the possible outcomes. Wait 20-30s for the child to respond and if the child is not able to respond with different outcomes. Clinician can provide cues accordingly. If the child is not able to respond correctly even after the cue, clinician should explain the outcomes. Work on the activity till the child achieves 80% accuracy in the responses

Scoring: A score of ‘1’ for each correctly predicting the effects, 0.5 for answering with cues and a score of ‘0’ for incorrect answers and/ or no answer. Conceptually correct answers can be accepted.

Stimulus

1. You didn’t have breakfast. (Expected answer: feel hungry)
2. She fell down. (expected answer: injury/ cry)
3. You have guests at home (Expected answer: food)

Activity 6: Sequential task analysis

Instruction: I will give you a task, and you tell me all the steps needed to complete the task from beginning to end

Materials: Stimulus manual

Procedure: Present the task clearly to the child and ask him to explain the steps from beginning to end. Wait 20-30s for the child to respond and if the child is not able to respond with the proper outcome, give the cues. If the child is not able to respond correctly even after the cue, clinician should explain the steps in detail. Work on the activity till the child achieves 90% accuracy in the responses

Scoring: A score of ‘1’ for each correctly explaining the sequence, a score of ‘0.5’ for partially correct responses and a score of ‘0’ for incorrect answers and/ or no answer.

Stimulus

1. Going to school
2. Eating lunch
3. Playing a game (any game can be accepted, Eg: Hide and seek).

Activity 7: **Role playing**

Instruction: I will present you with a situation and we will role play the situation.

Materials: Stimulus manual

Procedure: Present the situations clearly to the child and participate in the role play. The clinician should be creative enough to challenge the child. Work on the activity till the child achieves 90% accuracy in the responses

Scoring: A score of ‘1’ for each actively participating in the activity, a score of ‘0.5’ for partially correct responses and a score of ‘0’ for incorrect answers and/ or no answer.

Stimulus

1. Rabbit and the tortoise story
2. Consultation with a doctor
3. A new student comes to your class and sits next to you, make friendship with him

Activity 9: **Cognitive style and reasoning**

Instruction: I will tell you a story you listen to it carefully. I will ask you some questions and you try to answer them correctly. And you have to summarize the story after I finish

Materials: Stimulus manual

Procedure: The clinician has to read the passage and ask questions given in the manual, wait for the child to give reason and answers for the questions asked. And ask the child to summarize the story in his/her own words. Work on the activity till the client reaches 80% score.

Scoring: A score of '1' for each correct answer, 0.5 for answering with cues and a score of '0' for each incorrect answer/ no response.

Stimulus:

Story 1:

A dog was barking in front of Appu's house. Appu gave stomach full of milk to the dog. Dog waved its tail because of happiness. Now the dog is taking care of Appu's house.

1. Give an appropriate name to the story. (Loyal dog, Appu and Dog)
2. Why was the dog barking? (Hungry)
3. Appu didn't give milk to the dog, what would the dog do? (Die)
4. Why the dog is taking care of Appu's house? (because Appu gave food)

Story 2:

There was a shepherd boy lived in a village. One day while herding the flock he thought he will have some fun, and started screaming " fox .. fox". Hearing this all the farmers nearby ran and came with sticks. The shepherd boy started laughing at the farmers. Then the farmers went back without the boy who lied to them. After one week the boy again screamed that a fox is there. This time also the farmers ran and came. They went back angrily by seeing fox is not there. After a few days the same boy screamed "fox.. fox". This time nobody came to help him. The fox ate all his sheep without any fear. The boy realized the mistake he did.

1. Give a suitable title to the story. (A shepherd boy)
2. Why did farmers get sticks along with them? (To beat the fox)
3. Why did the boy laughed at the farmers? (they believed his lies)
4. Why no one did come to help him when he screamed for help? (they thought the boy was lying again)

Response recording sheet- CLIP-LD

Client Name: **Case Number:**
Clinician:
Age/ G: **PD:** **Date:**

1. Memory

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Digit repetition	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct repetition and '0' for incorrect repetition

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Letter repetition	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct repetition and '0' for incorrect repetition

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Remembering lists of words	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct repetition and '0' for incorrect repetition

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Sentence repetition	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct repetition and '0' for incorrect repetition

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Body part commands	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Yes/ no questions	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct answer and '0' for incorrect answer

Items	No						Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Answering questions (multiple choices)	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
sentence completion	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Answering questions	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Score of '1' for correct answer and '0' for incorrect answer

2. CONCEPTUAL RELATIONSHIPS AND ASSOCIATIONS

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Part – whole and whole-part relation (Match the following)	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Object person relation and person object relation (Pick up from the options)	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Synonym recognition – Yes/ No	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Naming synonyms	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Recognizing opposites – Yes/ No	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Naming Antonyms	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

3. ORGANIZATION AND CATEGORIZATION

Items	No		Response/Score					Remarks
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Category identification	Plate1	Max score: 6						
	Plate 2	Max score: 7						
	Plate 3	Max score: 6						
	Plate 4	Max score: 7						
	Plate 5	Max score: 4						

Score of '1' for correct answers and '0' for incorrect answer, and -1 for colouring incorrect item.

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Category identification – Name the category	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer and '0' for incorrect answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Category member recall	1						
	2						
	3						
	4						
	5						

Score of '1' for each correctly named item and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Category member recall from description	1						
	2						
	3						
	4						
	5						

score of '1' for correct answer without the help of picture cue, Score of '0.5' for answering with the help of picture cue and a score of '0' for incorrect/No answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Category member comparison	1						
	2						
	3						
	4						
	5						

Score of '1' for correct answer, a score of '0.5' for answering without and a score of '0' for incorrect/ No answer.

Items	No		Response/Score					Remarks
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Association	Plate1	Key - lock						
		Leg - shoe						
		Cup- bowl						
	Plate 2	Pen- book						
		Shirt - pants						
		Aeroplane- helicopter						
	Plate 3	Tree- leaf						
		Watch- clock						
		Candle – bulb						
		Cycle- train						

Score of '1' for correctly associating each items and a score of '0' for incorrect answers and/ or no answer

PROBLEM SOLVING AND REASONING

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Find the way (mazes)	1						
	2						
	3						
	4						

Score of '1' for each correctly finishing the maze, a score of 0.5 for completing the task with the help of clinician, and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Predicting outcome	1						
	2						
	3						
	4						

Score of '1' for each correctly predicting the outcome without cue word, a score of 0.5 for predicting the outcome with the help of cue word, and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Predicting cause	1						
	2						
	3						
	4						
	5						

A score of '1' for each correctly explaining the cause and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Answering "why" questions	1						
	2						
	3						
	4						
	5						

A score of '1' for each correctly explaining the cause and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Predicting effects of actions	1						
	2						
	3						

A score of '1' for each correctly predicting the effects0.5 for answering with cues and a score of '0' for incorrect answers and/ or no answer

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Sequential task analysis	1						
	2						
	3						

Score of '1' for each correctly explaining the sequence, '0.5' for partially correct responses and '0' for incorrect answers and/ or no answer.

Items	No	Response/Score					Remarks
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Role playing	1						
	2						
	3						

Score of '1' for each actively participating in the activity, '0.5' for partially correct responses and '0' for incorrect answers and/ or no answer.

Items	No		Response/Score					Remarks
			Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
Cognitive style and reasoning	Story 1	Q 1						
		Q 2						
		Q 3						
		Q 4						
	Story 2	Q 1						
		Q 2						
		Q 3						
		Q 4						

A score of '1' for each correct answer, 0.5 for answering with cues and a score of '0' for each incorrect answer/ no response.

Score sheet –CLIP-LD

Domains		Maximum score	Patient score
Memory	Digit repetition	10	
	Letter repetition	10	
	Remembering lists of words	10	
	Sentence repetition	10	
	Following body part commands	10	
	Answering yes/no questions	10	
	Multiple choice questions	10	
	Sentence completion	10	
	Wh questions	10	
Conceptual relations and associations	Part – whole and whole-part relation	5	
	Object person relation and person object relation	5	
	Synonym recognition	5	
	Naming synonyms	5	
	Recognizing opposites	5	
	Naming Antonyms	5	
Organization and categorization	Category identification	30	
	Naming the category	5	
	Category member recall	25	

	Category member recall from description	5	
	Category member comparison	5	
	Association	10	
Problem solving and reasoning	Find the way	4	
	Predicting outcome	4	
	Predicting cause	5	
	Answering why questions	5	
	Predicting effects of actions	3	
	Sequential task analysis	3	
	Role playing	3	
	Cognitive style and reasoning	8	
Overall		235	