DEVELOPMENT OF AN INTERVENTION MODULE FOR PRESCHOOL CHILDREN WITH COMMUNICATION DISORDERS (PHASE I)

PROJECT REPORT

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All India Institute of Speech and Hearing

Manasagangothri, Mysore-570006

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Dedicated to

all the sweet little ones and their parents who made this study possible

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Introduction

Human beings interact in various ways incorporating gestures as well as facial expressions, which in turn influence the behaviors of others too. These social transactions can be analyzed into three major dimensions- communication, speech and language which are inseparably interrelated. These social transactions define our existence, support our survival, describe our experience and influence our understanding of the world. Communication which is vital for both biological and social existence involves exchange of information between two or more individuals. It occurs in an array of natural circumstances either verbally through speech or nonverbally through gestures, body movements, writing, sign language and thus encompasses both speech and language. Human communication through *language* by providing meaningful arrangements of words is a socially shared code or conventional system that represents ideas through the use of arbitrary symbols and rules that govern combination of these symbols. Language is a form of communication that enables humans to convey information with specificity and detail and thereby forming a link between the outside world and the mind. Language is also a medium through which they understand their social world and acquire their culture. In human beings, the primary means of communication is through *speech*. It is a verbal mode of communication, which involves the precise coordination of oral neuromuscular movements in order to produce sounds and linguistic units. Speech, the means through which language is manifested may be regarded as the basic element of oral language. Thus speech and language form an important component of communication.

Human beings have the most elaborate, sophisticated, versatile and creative means of communication. The ability to communicate verbally through the use of speech and language is a unique gift to human beings. This is made possible by an innovative and complex central nervous system and a body structure that makes this high form of communication possible. The human nervous system is specially equipped to handle sequentially complex aspects of language. Not only the nervous system but the listening apparatus (external ear and hearing system) and vocal structures of respiration like larynx, nasal and oral system, the phonatory, articulatory equipment etc., are all “designed” to facilitate speech and language processing.

As soon as the child is born, he/she announces his/her presence in the world through a cry (birth cry) which forms the first signs of communication. This sets the platform for further speech and language development. As the infant gains greater control over the respiratory and vocal mechanisms, speech and language starts developing and this process continues from

birth through several years of life. This development is a slow and gradual process. The baby begins making vowel sounds starting with 'aah' 'ee' and 'ooh' followed by strings of consonant vowel pairs like 'boo' and 'da'. The child is playing around with the sounds of speech in sorting out the sounds that are important for making words in his/her language from the sounds that are not. He/she begins to understand language spoken by his/her parents such as a few words and simple commands. Somewhere around age one the child actually begins to utter single words with meaning. Around the age of two, the child will begin putting two words together to make sentences like 'doggie run'. The child's vocabulary also increases simultaneously. As the child grows, the child may produce longer and complex sentences, uses questions, narrates stories, sings rhymes etc. By the time the child enters preschool, vast majority of the rules and sounds of the language are acquired. After this it is just a matter of combining different sentence types in new ways and adding new words to his/her vocabulary (Peechi, 1994). All children go through the same stages of language development although each child develops at his/her own pace. The 'environment' plays an important role in learning to speak. Children learn to speak only when they hear people talk to them in many different circumstances (De Houwer, 1999).

However, communication development is only a part of human development. The first few years of the typical human infant's life offer an amazingly rich and complex body of experiences that result in an equally amazing complex body of infant development and learning. As children grow, they develop in a variety of other domains such as self-help, motor, cognition, social, emotional, communication, sensory, play, academic etc. The human development proceeds simultaneously in several of these domains and in a reasonably predictable sequence. A simultaneous mutual interaction occurs among these domains since abnormally advanced or delayed development in one domain may accelerate, compensate or attenuate the interdependent development in other domains. Each of these domains is represented by its own developmental cycle.

The acquisition, development and maintenance of all the domains in human beings are dependent on adequate functioning and appropriate integration of distinct neural networks. Majority develop these domains without any effort. But, for some individuals, these domains break down or are arrested/hindered because of several factors such as brain damage caused during prenatal, natal (birth) or postnatal period leading to conditions like mental retardation, cerebral palsy, dysphasia/aphasia in childhood. It could also be affected due to sensory deficits such as congenital hearing impairment and oral structural defects such as cleft palate. Severe

emotional disorders in childhood like autism could also bring about delayed and deviant language development. These conditions could result in a communication disorder which is an impairment affecting one's understanding and speaking abilities. These conditions may range in severity from mild to profound and may be developmental (present since birth) or acquired (develop later in life). Such conditions could be evidenced by a few speech and language characteristics/manifestations such as lack of onset of speech or delay in the onset of speech and language, limited language development, incorrect/inappropriate speech characteristics including voice, articulation and prosodic abnormalities, lack of spontaneous and responsive speech seen as an inability or failure to respond to communication by others etc. Such children may also have problems in the development of other domains. They may also exhibit lack of attention, eye contact or memory, poor socialization abilities, deficit in the physical abilities, difficulty in performing the activities of daily living independently, poor emotional skills, difficulty in relating to other children and playing with them, difficulties with reading and/ or writing and poor scholastic achievement along with the speech and language problems.

Thus such children with communication problems face great difficulty in acquiring speech and language and other related skills without extra support from both parents as well as professionals. In order to develop their potentials, these children with special needs require support services beyond those that are considered sufficient for the development of their same age peers. The rehabilitation of such children has been in existence for more than half a century and during this period, efforts have been made to rehabilitate them right from infancy through preschool and school years. It has been realized gradually over the years that children with communication problems benefit maximally if rehabilitation is instituted right from preschool age with a well-formed and specific curriculum and strategies.

This paved way for the preschool training centers which adopted specialized methods of teaching these children. Once preschool training came into existence, there was a need for framing an age appropriate curriculum. Montessori, Waldorf, High Scope, The Creative Curriculum Reggio Emilia approach, Bank Street and Piaget are various noteworthy pedagogies who contributed to the foundation of preschool curriculum and framed different types of preschool curriculums. In 1987, the National Association for the Education of Young Children (NAEYC) published guidelines for developmentally appropriate practice for young children ages birth through age eight (Bredekamp, 1987). In the United States most preschools advocate support to the 'Developmentally Appropriate Practices'. *Developmentally appropriate practice* (DAP) is a framework of principles and guidelines for best practice in the

care and education of young children, birth through age eight. It is grounded both in the research on how young children develop and learn and in what is known about education effectiveness. The principles and guidelines outline practice that promotes young children's *optimal* learning and development. DAP is a program that contributes to children's development by influencing development of children's knowledge in physical, social, emotional, and intellectual areas (Bredekamp & Copple, 1997). Recognizing individual differences, teaching only enough technical skills to accomplish the larger goal of children wanting to learn, incorporating parents as partners, and comparing children's progress to themselves over time are necessary aspects of DAP. The teacher's role is to prepare the environment and provide guidance and support.

There are a few curricula developed in the Indian context too such as Preschool curriculum for young hearing impaired children (Rathna, Ghate, More, & Roy, 1991), Training guide for parents, teachers and caregivers for children with developmental disabilities (Venkatesan, 2004), Communication DEALL Developmental checklists and intervention manual (Karanth, 2008) etc.

A wide majority of the existing curricula/intervention manuals available are either for use with normal children or children with a particular disorder and are mainly focused on training or development of a restricted set of domains of child development such as personal, social and emotional development; communication, including talking and listening; knowledge and understanding of the world; creative and aesthetic development; physical development; or mathematical awareness and development etc. There are very few curricula framed to facilitate the all-round development of a child. Further although there are many preschools for children with communication problems in different parts of our country and a few curriculums available as mentioned above, an informal observation indicates that there is no standard, uniform, widely accepted preschool curriculum available to the teachers working in these special schools. Due to the non-availability of a curriculum, the teachers are forced to either prepare their own syllabus or use textbooks meant for normal children. This exerts an extra pressure on these children with special needs and they fail to reach their full potential.

Thus a need to prepare a curriculum for such children was felt by the speech-language pathologists and special educators working with special children. It is with this intention that the curriculum for special children of preschool age incorporating ten different skills viz. self-help, social, motor, cognitive, sensory, speech and language, play, pre-reading, pre-writing

and pre-arithmetic skills and activities to facilitate these skills was prepared (Swapna & Geetha, 2004). These domains have been included so as to facilitate an all round development in the child.

This preschool curriculum was prepared in three phases. In the first phase a seminar was conducted for the teachers of regular preschools and the curriculum that they followed to develop the various skills in their respective schools was discussed. In the second phase, a seminar was conducted where in the teachers working in preschools for special children with various disabilities were invited and the different types of curriculum were discussed. Moreover other experts working in the area of child development and special education were also invited to contribute to the seminar. Based on the inputs provided by all the individuals with expertise in training preschool children, a tentative curriculum was formulated for training purposes. This was distributed to normal and special school teachers who participated in the seminars for field trial. In the third phase, a workshop was conducted for the participants who were involved in the field trial to obtain their feedback regarding the curriculum based on the field trial. Following this the curriculum was finalized and was put into use at the preschool training center at AIISH.

NEED FOR THE STUDY:

During the process of implementation of the curriculum in the preschool, it was felt that assessing the functioning level of a particular child on ten different domains was a little complicated because of the way in which the curriculum was organized. In addition, there was a need felt to assess the sensitivity of this curriculum on children with communication disorders. Since there are clear stages in the acquisition of various domains during the preschool years, each child can be located at different steps or levels along this interwoven matrix of observable domains in children. Thus it is necessary to identify the step/level at which a given child is located along the continuum of skills and whether the desired teaching objectives can be ever reached in that child. Hence this study was planned and undertaken as an AIISH Research Fund project.

AIM OF THE STUDY:

The main aim of the study was to develop intervention modules to foster the development of various skills in children with communication disorders and to assess the sensitivity of the same. The specific objectives were

1. To develop intervention modules based on the already existing curriculum (Swapna & Geetha, 2004) to foster the development of ten different domains viz. self-help, social, motor, cognitive, sensory, speech and language, play, pre-reading, pre-writing and pre-arithmetic for children with communication disorders between 0-3 years.
2. To assess the sensitivity of the intervention modules for the above mentioned domains {specifically levels V (12-15 months) to level XII (2.9-3yrs)} on children with hearing impairment and mental retardation.

Review of Literature

Developmental process in human beings refers to the continuous biological and psychological changes that occurs at conception and continues through the life cycle. The infant progresses from a tiny, helpless, horizontal, sedentary creature to a considerably larger, autonomous, vertical, active child (Gallahere, 1982). Growth, that is an increase in size, is an integral part of development. Growth implies change in size or in the values given certain measurements of maturity; development may encompass other aspects of differentiation of form or function, including those emotional or social changes pre-eminently shaped by interaction with the environment. Developmental change may occur as a result of genetically-controlled processes known as maturation, or as a result of environmental factors and learning, but most commonly involves an interaction between the two. Development is more than a cumulative list of changes and accomplishments (Owens, 1988). It is a predictable, orderly and sequential process. Owens (1988) delineates five general principles while describing a developing child:

1. Development is predictable.
2. Developmental milestones are attained at about the same age in most children
3. Developmental opportunity is needed.
4. Children go through developmental phases or periods.
5. Individuals differ greatly.

Developmental predictability: The developmental pattern is predictable in character. There is an orderly sequence. For e.g., motor development proceeds from the head down. This is called cephalocaudal progression. Thus, a child is able to hold his head up before he can sit unsupported. Language development also follows a predictable sequence.

Developmental milestones: In general, children attain certain skills or abilities at predictable ages. Although there are individual variations, most children without disabilities reach such milestones.

Developmental opportunity: Although much development is a result of maturation, learning is also important. The opportunity for learning must be present in order for the child to develop. Walking will not occur on schedule without an opportunity to practice the needed prerequisite skills.

Developmental phases or periods: Development does not occur as straight line. There are orderly phases in which certain areas of development are emphasized. For example, there are two phases of rapid physical growth: from prenatal development to about six months, and from age ten or twelve years to about fifteen or sixteen. During other periods, the rate of growth is greatly decelerated. Even within a given developmental area, the type of development changes as a child matures. For example, initial language development emphasizes vocabulary growth, which decelerates as syntactic growth is stressed.

Individual Differences: Even though there are predictable stages and ages for development, the range of normality is broad. No individual child conforms to all the averages or milestones. Mean ages, weights, or heights do not describe any given child but rather some fictitious "average" child, who is a combination of all children. A child who is outside the norms may be experiencing a momentary acceleration or delay or may be proceeding at his own individual pace. Even a child with severe retardation is developing, but his personal schedule may be delayed beyond the normal period. Individual development depends on many factors, including genetic inheritance, nutrition, gender, intelligence, overall emotional and physical health, socioeconomic level, ethnicity, and prenatal conditions. The effects of these factors vary with age and most of these factors are interrelated.

Domains of development:

The child develops in a number of related, but separate areas, the major being physical, cognitive, socioemotional and communicative growth.

Physical development: This refers to physical growth and motor control. Development proceeds from gross-motor to fine-motor control. Gross-motor or large-muscle movements are those of the head, torso and limbs. These movements are used in walking, running, throwing, head turning etc. Fine-motor or small-muscle control involves the eyes, hands, fingers, so on. Much of this control is gross-motor and fine-motor control is gained during the preschool years. The muscular control needed for both types of motor control depends, in part, on nervous system maturation. At birth, the spinal cord is more mature than the higher centers of the brain. As a child matures, the higher portions of the brain develop and the child attains increased control over finer and finer muscle movement.

Cognitive development: This refers to intellectual growth. Beyond growth and internal development of the brain and spinal cord, cognitive development is reflected in the ability of a

child to organize, store, and retrieve information, problem solving and generalization. Each child perceives the world differently and must interpret incoming stimuli in light of his past experiences. Thus even reception of new stimuli is not a passive process but involves interpretation and organization. As a child matures, he or she organizes incoming stimuli in different ways. Memory also increases. A part of this change is due to increased brain weight. Other changes can be attributed to learning. By age eight, the brain is nearly mature in size but not in structure. Further development concentrates on internal growth and maturation.

Socioemotional development: This is closely related to the other three areas. As a child matures, he or she becomes less egocentric and more social. Although humans are social beings, each must learn social behaviors and the social rules and customs of his or her society. Initially the infants do not show any interest in the environment. They are quite content and happy when fed and kept clean and dry. As the child grows, he or she starts noticing and recognizing the mother and all those around him/her in the home. The ability to notice others marks the onset of social development.

Emotions are feelings everyone is born with. Emotional development means the ability to control emotions and express them in ways acceptable to the society (Nisha, 2006). Joy, anger, fear and happiness are some of the emotions that can be noticed even among small children. The emotions are simple reactions that suggest pleasure and displeasure. Sucking mother's breast, rocking and holding makes the child happy. Sudden loud noise and wet diaper cause fear and makes the child cry. The emotional expressions change with age.

Communicative development: This is also related to the other developmental areas. The development and use of linguistic symbols depends on attaining certain cognitive, social, and motor skills. The two aspects of communication are speech and language. Speech requires the physical growth of certain neuromuscular structures and motor control of their functions. Infants can only produce gurgling and cooing sounds. As the babies grow they start making short and simple word sounds such as ma-ma, ta-ta, cha-cha, ba-ba, pa-pa etc. Language development means the ability to communicate through the use of meaningful words and sentences. This starts the speech and language development which improves with age and repetitive use.

Stages of development

Child development is a continuous sequence that establishes a regular pattern, which in turn, should result in steady refinement as it progresses. For the purposes of organization and understanding, development is commonly described in terms of periods. A developmental period involves the prenatal period, infancy, early childhood, middle and late childhood, and adolescence. The prenatal period is the time from conception to birth. It is a time of tremendous growth-from a single cell to an organism, complete with a brain and behavioral capabilities, produced in approximately a nine-month period.

Infancy is the developmental period that extends from birth to twenty-four months. Infancy is a time of extreme dependence on adults. Infancy is a critical period during which, the organism is biologically in a state or readiness to benefit from particular experiences. Infancy is a time of intensive sensory exploration which can be seen in the infant's attempt to explore the world that is now emerging with ever-increasing sensory clarity. This period is characterized by a rapid rate of change, the foundation of psychosocial development, the emergence of individual differences as the beginnings of socialization (Bigner, 1985). In addition, many psychological activities like language, symbolic thought, sensory-motor coordination etc. just begin during this period.

Early childhood is the developmental period that extends from the end of infancy to about five to six years; sometimes the period is called the preschool years. During this time young children learn to become more self-sufficient and to care for themselves, they develop school readiness skills (following instructions, identifying letters), and they spend many hours in play and with peers. In child development these two periods (i.e. infancy and early childhood development) are of most importance. During this period the child has maximum capability of adsorption of various concepts. Hence this period is referred to as *critical or sensitive period* when certain experiences have a significant influence on later development. During this stage of development, children learn and assimilate information rapidly, and express interest and fascination in each new discovery. These qualities make them prime candidates for education. The critical/sensitive period is determined by biological maturation and characterized by increased vulnerability or responsivity to specific experiences. If these specific experiences occur during this period, then development will continue on its typical course. The major stages of infancy and early childhood have been broken down further into various age groups and the child's development in these different domains has been described.

I Birth to six months:

The newborn is unable to control motor behavior smoothly and voluntarily. Instead, behaviors consist of twitches, jerks and random movements, most of which involve automatic, involuntary motor patterns called reflexes. Although some reflexes, such as gagging, coughing, yawning, and sneezing remain for life, most disappear or are modified by six months of age. This disappearance is related to the rapid rate of brain growth and to myelination. The rate of brain growth is greatest immediately following birth. Reflexes originate in the brainstem, the only part of the brain fully functional at birth. They are gradually replaced by more sophisticated motor skills as the brain learns to deliver increasingly more precise signals to the neurons. Myelination is the development of a protective myelin sheath around the cranial nerves. When myelination is complete, the organism has the capacity for full neural functioning.

The big events of the first six months are those that accompany the downward progression of large-muscle control and the further maturation of the brain. The infant goes from reflexive and random behaviors to rolling and creeping. Better control accompanies firmer muscles and bones and the building of new neural connectors. Initially, the infant gains control of the head, lifting and then being able to hold it steady. This positioning provides a new perceptive from which to examine the environment. At about the same time, approximately three months of age, the infant gains full focus, which enables him or her to appreciate all the new visual stimuli available. Head and neck control is followed by trunk control and sitting. In the upright position, the infant's hands are free to examine small objects. The infant is able to grasp voluntarily at two months of age but cannot control his or her reach. Increasing arm control enables the infant to hit, then reach for, and finally grasp objects. Toy or object play will begin shortly after some measure of hand control is achieved. Grasping is still somewhat primitive, however, with the fingers generally undifferentiated. Most objects are brought to the mouth, a very sensitive and highly developed area, for tactile examination and identification.

Toward the end of the first half-year, large-muscle control has progressed so that the infant can crouch on his or her hands and knees and can roll over and creep, two early forms of locomotion. When creeping, the infant keeps the stomach on the floor while pushing with his or her feet and steering with outstretched arms. Reaching and object examination become increasingly directed by vision, who now can focus on the hands at different distances.

The reflex of most interest for speech development is the rhythmic suck-swallow pattern, which is first established at six months post conception, or three months before birth. Like other reflexes, sucking involves only the midbrain and brain stem. At birth, sucking is primarily accomplished by up-and-down jaw action. Within a few weeks, the newborn develops more lateral movement. Back-and-forth jaw movement appears at about one month. In order to suck, the neonate seals off, the nasal cavity by raising the velum, or soft palate; the newborn can then create a vacuum in the mouth, or oral cavity, by lowering the mandible or lower jaw, thus increasing the volume of the space. To swallow, the neonate opens his or her mouth slightly and protrudes and then retracts the tongue. Although this action is greatly reduced by three months of age, it is not until around three years of age that independent swallowing appears. To complete a swallow, the neonate must also close, or abduct, the vocal folds to protect the lungs.

The newborn is not totally helpless, however, but instead possesses many skills. Shortly after birth the newborn is able to breathe on his or her own and ingest food, coordinating the two to ensure that the food passes down the appropriate tube. In addition, the newborn is able to process ingested fluids, usually milk, and to eliminate waste. The newborn can turn his/her head from side to side and signal distress by crying.

As early as two months, the infant develops distinct nutritive and nonnutritive sucking behaviors. Neuromuscular control moves forward from the back of the oral cavity. With greater control of the tongue, the infant exhibits tongue cupping and strong tongue projection. The infants bite is more volitional, and he or she no longer relies on tactile stimulation. The child can place his/her lips around a spoon and use them to ingest the contents.

Newborns produce predominantly reflexive sounds, such as crying and vegetative sounds, such as burping and swallowing. Reflexive sounds are primarily produced on exhalation and consist of relatively lengthy voiced sounds of a vowel-like nature (Stark, 1986). Initially, the newborn cries on both inhalation and exhalation, but there are many individual variations. The expiration phase of breathing gradually increases with crying. The relative amount of crying also varies with the time of day. Crying is most frequent before feeding and bed. Crying helps the child become accustomed to air flow across the vocal folds and to modified breathing patterns. Since speech sounds originate at the level of the larynx, this early stimulation is important. The modified breathing will progress to the lengthened exhalations of speech.

By two months of age, the infant has developed oral muscle control to stop and start movement definitively, though tactile stimulation is still needed. This stage is characterized by laughter and non distress "gooing." Gooing consists of "vocalizations with a velar to uvular closure or near closure" (Oller, 1978). Thus, the infant produces back consonants and middle and back vowel sounds with incomplete resonance. The consonant sounds consist of velar or soft-palate fricatives similar to /s/ and incomplete velar plosives similar to /k/ and /g/. By three months of age, the infant vocalizes in response to speech of others. An infant is most responsive if his or her caregivers respond. During vocal turn-taking with a caregiver, three-month-olds produce more speech-like syllable vocalizations than isolated vowel sounds (Masataka, 1995). These reactive vocalizations continue throughout the first year and into the second even though other vocal and verbal behaviors are added to the child's repertoire (Stark, Bernstein & Demorest, 1993). As the infant's repertoire of responses expands, the amount of crying and vegetative sounds decreases markedly. By sixteen weeks, sustained laugher characterized by a rapid alternation of voiced and voiceless sounds, emerges.

At five months, an infant is able to imitate a few general sounds, usually vowels, immediately following a vocal model. He or she is even better at imitating tone and pitch signals. Most of the infant's imitative and non-imitative vocalizations are single-syllable units of consonant-vowel or vowel-consonant construction. These sound units and the early strings of sounds that begin at four months are called babbling. Vocalizing for attention, the infant will vary the volume, pitch, and rate of babbling. He or she will stop to listen to other sounds, especially to mother's voice.

With maturity, longer sequences and prolonged individual sounds evolve. Production is characterized by high and low pitches and glides between the two, growling and gutteral sounds, some friction sounds-produced by passing air through a narrow construction-nasal /m/ and /n/, and a greater variety of vowels (Stark, 1986). The child produces increasingly more complex combinations of these features and conversational units in which the vowel duration may be highly variable and often very long.

The infant is capable of fully resonating the laryngeal tone to produce vowel like sounds similar to /a/. Constriction abilities become more mature in the forward portion of the mouth, and by six months labial or lip sounds predominate. The resultant sounds may be fricative, but more often they are vibratory. Gutteral sounds such as growling tend to decrease. Increase in the size of the oral cavity and further development of discrimination to touch,

pressure, and movement in the tongue tip and lips result in the increased variety of sounds heard.

The newborn also has perceptual skills of some magnitude, especially in sight and hearing. Nearsighted at birth, the newborn can see things best about eight inches away. Still, he or she is sensitive to both brightness and color and will close his or her eyes to a very intense light. Although the newborn can follow a moving object visually from side to side, its eyes don't always converge on the object. Generally, convergence is confined to non-moving objects.

Short-term visual memory is present in the newborn but is limited to recognition when the object reappears within two and one-half seconds. Within limits, the newborn learns to distinguish some people and objects. Newborns tend to rely on patterns for recognition, with special emphasis on high-contrast areas. For example, newborns concentrate on such features as the hairline and eyes when viewing the face. Concentration on high contrast areas is an effective visual strategy when full-field focus is unavailable. It is not until about three months of age, when he or she gains full-field vision and better eye control, that the infant prefers the complexity of a whole object. Prior to this age, the infant prefers to concentrate on particular attractive parts.

At birth, the new born scans the environment visually during only about five percent of his or her waking hours. This amount increases to 35 percent by the tenth week. The new born becomes 'stuck' on any visually interesting object that comes into view. Not until about four or five months does the infant gain sufficient ocular control to move smoothly from object to object, thus gaining control over attending.

In general, newborns attend to objects of interest and have definite preferences. They prefer objects that move, have sharp contours, or have contrasts of light and dark. These preferences change with visual abilities. In general, the infant is attracted by visual stimuli that can activate his or her current level of neural activity (Haith, 1976). For example, the two-month-old infant has certain short-term mental images for common objects in the environment. He or she will attend to objects that differ slightly from the mental image already established.

The increased visual abilities used for directing reach also aid the infant's social development. As early as the first month, the infant becomes excited upon seeing objects and people, although he or she does not respond differentially. By the second month, periods of responsiveness expand up to twenty minutes. They are accompanied by arching, turning, twisting, and kicking. Certain people become associated with particular behaviors. For example, the infant's mother becomes associated with feeding, and the infant will begin a sucking response upon seeing her. This recognition of familiar people, plus the infants rapid habituation to, or boredom with, other visual stimuli, signify an increase in visual memory. By three months of age, the infant is able to discriminate different people visually and to respond accordingly.

This change is reflected in stages of smile development. At the end of this month, the infants' smile becomes less automatic, but it is still unselective. The infant will respond to both people and objects with a whole-body movement that includes limb and trunk activation and vocalizations. During the third month, as the child becomes more responsive to people, he or she smiles less at objects. In turn, his or her smile becomes more social and physically broader, with a crinkling around the eyes. This responsiveness is reflected in the infant's selective attention at four months of age to specific individuals and to joyful expressions longer than to angry ones. Although the infant learns to suck and look simultaneously by four months of age, often he or she will ignore feeding in order to concentrate on 'people watching'. Such visual attending also reflects increased visual memory, which, by five months of age, has expanded to three hours, unless there are competing visual stimuli. By six months, the infant is very social. The infant smiles and vocalizes, examines faces visually and through touch, and responds differentially. He or she cries or draws back from unfamiliar faces.

In addition to visual skills, the newborn possesses auditory abilities. The middle and inner ears reach their adult size at twenty weeks of fetal development and therefore, are ready to function at birth. The immaturity of the cortex and the lack of internal coordination of the brain's hemispheres make it difficult for the newborn to integrate sounds. In addition, the middle ear is not as sensitive to sound as it will be within two weeks after birth, when the fluid is absorbed. Despite these limitations, the newborn can distinguish loudness or intensity and duration of sound. The newborn blinks, jerks, draws in a breath, and increases his or her heart and respiration rates in response. Within the first four days, the infant can discriminate between different sounds. The newborn has auditory as well as visual preferences. Above all, the infant seems to prefer the sound of the human voice which has a quieting effect. The two-

month-old will search for its mother by visually tracking her voice but will avert his gaze from the direction of strange voices. Although the two-month-old infant can discriminate between /p/, which is made at the lips, and /g/, which is produced in the throat, he or she cannot discriminate between /p/ and /b/, both made at the lips (Owens, 2001).

Although vision and audition are very important for later communication development, they are not the newborn's only sensory abilities. He or she can sense body temperature changes and respond accordingly. Within fifty-five hours of birth, newborns can differentiate smells. Finally, newborns can discriminate different tastes and prefer sweet tastes to sour ones. Thus at birth, although the child is not the active and outgoing, the infant will begin to explore the physical and social worlds around him or her gradually.

II. Seven to twelve months:

As the infant demonstrates increasing versatility in oral movements, speech progresses to repetitive syllable production and takes on more of the qualities of the surrounding language. By approximately six months of age, the infant is able to pout and draw its lips closed while chewing and swallowing semi liquids. At the same time, chewing changes from vertical to a more rotary pattern, reflecting changes in tongue-movement control. At eight months, the extension-retraction pattern of the tongue changes gradually to include more lateral, or sideways, movements. As a result, food is moved to the side for better chewing. In addition, the tongue can remain elevated, independent of jaw movement. By eleven months, the infant has the neuromuscular control to elevate the tongue tip and to bite soft solid foods with some control. He or she can draw lips and cheeks in during chewing and close the lips when swallowing liquids.

The downward bodily progression of motor skills continues during the second six months. During the seventh month, the infant sits, creeps, and begins experimenting with standing. Within a month, standing has improved greatly but descent to the floor still needs practice. By ten months, the infant is able to push to a stand from a crawl and sit on the floor again. In the meantime, crawling speed and style improve. Two months later, the infant may walk unsupported for a few steps but still crawls when in a hurry. While walking, the infant extends the arms for balance. He or she stops by falling or grabbing nearby furniture or people.

While sitting, the infant is free to examine and manipulate objects with the hands and to experiment with uses. The index finger probes incessantly. At eight months, the infant begins to experiment with perspective by shaking the head from side to side and looking upside down, thus noting the constancy of object shapes. The knowledge of object functions and characteristics gained from such experiments is important for early concept and definition development.

The infant also acquires the ability to search physically for a missing object. This skill depends on physical and cognitive development. In order to search, the infant must be able to remember the object while searching and be able to reach for it. During the second six months of life, searching progresses from a short glance for a missing object to a brief physical search. By the first birthday, the infant can reach while looking away. A physical searching lead to the early physical trial-and-error problem solving that begins to develop at ten months.

Toward the end of second six months of life, the infant is also capable of solving problems of imitation, first direct and then indirect, or deferred. Imitation is an important learning strategy and requires a representational thought. The infant develops the ability to remember a behavior in order to reproduce it. In addition, imitation is important for social interaction. At about nine months, the infant becomes an active game player and performer. He or she loves to play peek-a-boo and patty-cake, anticipating the end. Later the infant anticipates other routines and experiments with attempts to influence the outcome. He or she anticipates leaving and waves bye-bye, anticipates the mother's or father's arrival, and shows excitement. The infant also gains some measure of independence with self-help, such as feeding and dressing, but becomes very attached to mother, usually the primary caregiver.

The infant's increasing social and representational behavior is reflected most clearly in communication. At about six or seven months, babbling begins to change. Even though he or she still produces single-syllable sounds, the infant enters a brief stage reduplicated babbling and begins to experiment with long strings of consonant-vowel syllable repetitions or self imitations, such as "ma-ma-ma-ma-ma". Reduplicated babbling often occurs when holding an object or while exploiting the environment and is similar to the rhythmic pattern of hand movement in this activity (Stark et al., 1993).

In the second half of the first year, the infant responds more consistently to speech. By approximately seven months, the infant will begin to look at objects that are named. Within another three months, he or she can recognize a familiar word within a phrase or a short

sentence. At around eight months, many changes occur in the infant's speech and interactional patterns. These include echolalia, gestures, variegated babbling, and jargon. First, the infant begins to react more to the environment by transferring the imitation stimulus to a second person. This period, ranging from eight to twelve months, has been called the **echolalic** stage. During this time the infant begins to imitate the communication of others, using echolalic speech. Echolalia is speech that is an immediate imitation of some other speaker. Initially, the infant imitates gestures and intonation, but by eight months exhibits the identifiable pitch and contour patterns of his or her parent language (deBoysson-Bardies, Sagart & Durand, 1984).

Soon the infant begins to imitate sounds, but at first only those he or she has produced spontaneously. Within a few months the infant will begin to use imitation to expand and modify his or her repertoire of speech sounds. Babbled speech sounds that are not in his or her native language decrease in number. The infant will also imitate stressed syllables in certain often used words. For example, he or she may repeat "na-na" when mother says 'banana', though he or she may not be associating the sound with the actual referent or object.

Second, the infant begins using gestures, with or without vocalizations, to communicate, although imitation is still very important. He or she begins to point, to show objects, to give objects, and to signal "no" or noncompliance, and seems to enjoy just plain showing off for attention.

Third, the speech during this period is characterized by variegated babbling, in which adjacent and successive syllables are not identical. Sound sequences may also include VCV and CVC structures, although vowel and consonant sounds do not differ within these syllables (Stark, 1986). In addition, reduplicated babbling changes in function becoming less self-stimulatory. It is used more in imitation games with adults.

Between babbling and the appearance of words, there is a reduction in the number of long babbled strings and increase in the number of more word like utterances (Menyuk, Menn & Sibler, 1986). In the second half of the first year, children begin to notice contrast in pitch contours, in vowels, and in initial consonants in consonant-vowel syllables. Children selectively listen more frequently to word-length utterances than to connected speech. They begin to recognize recurring patterns of sounds within specific situations.

Fourth, the infant experiments to begin with jargon, long strings of unintelligible sounds with adult like prosodic and intonational patterns. Infants seven to ten months of age

are sensitive to prosodic cues that help them segment speech into perceptual units corresponding to clauses (Hirsh-Pasek, Kemler Nelson, Jusczyk, Cassidy, Druss & Kennedy, 1987). Mothers' speech to infants includes pauses at sentence boundaries, while mothers' speech to other adults does not. Thus, the child is given cues to a grammatical unit of language (Nelson, Hirsh-Pasek, Jusczyk & Cassidy, 1989). The child's babbling comes to resemble the prosodic pattern of language to which he or she is exposed. Babbling patterns become shorter and phonetically more stable. These prosodic features will continue into speech. Words and utterances are acquired as a "whole tonal pattern" (Lenneberg, 1967). The resultant jargon may sound like questions, commands, and statements.

By nine to thirteen months, children 'understand' some words based on a combination of sounds. As a result of continued exposure to recurring sound patterns in context, the child learns to reproduce the aspects of these patterns in these situations. These sound patterns are most likely learned as a whole rather than as specific individual sounds.

Acquisition of single phoneme alone cannot explain word production. Some aspects of vocal development are progressively coordinated and recombined into meaningful speech, while others are dropped. Sound production depends on sound grouping and sound variation within individual words. Thus, a child adopts a problem-solving or trial-and-error approach to word production, gradually developing expressive strategies. Over time these strategies become more general, less word specific and more automatic.

At around the first birthday, the child produces the first meaningful word. Although he or she has previously responded to produced words, the infant now produces them in the presence of the referent. The child associates the word with its meaning in some limited manner. Generally, first words name favorite toys or foods, family members, or pets. Single words are used for more than naming; the infant uses them to make requests, comments, and inquiries.

The socio-emotional domain is also improving. The bond between the caregiver and the child are stronger during this period. The child shows affection by hugging. They can differentiate between love and scolding. They can differentiate between familiar persons and strangers. They fear the absence of the mother. In terms of cognitive development, the child tries to accomplish simple goals, is curious about the environment and looks for an objet fall out of sight.

III. Twelve to twenty-four months:

With a beginning realization of self and a new method of locomotion, the infant begins the second year of life. During that year he or she will change from a dependent infant to a more independent toddler. Newly acquired walking skills and increased linguistic abilities give him or her mobility to explore.

Much of the second year is spent perfecting and varying walking skills. There is a deceleration in bodily growth rate in both height and in weight. Brain growth also decelerates, and head growth increases only slightly. By age two, the brain is about 80 percent of its adult mature size. By fifteen months, the toddler is experimenting with different forms of walking and running. Favorite games are hiding and being chased. The toddler learns to walk while carrying objects and to stoop and recover. By eighteen months, the toddler is able to walk backward and to stop smoothly. The two-year-old is able to walk on tiptoes, stand on one foot with assistance, jump with both feet, and bend at the waist to retrieve an object on the floor.

Most of the toddler's play and exploration is solitary and nonsocial. As the pincer grasp becomes more co-ordinated, he or she demonstrates an interest in small objects, such as insects. By fifteen months he or she explores by fingering everything. A favorite game is carrying objects and handing them to others. He or she can release objects at will and has a primary whole-arm throw. With this grasp, sticks becomes tools for retrieving and exploring.

During the entire second year, the toddler tests the qualities of objects by touching, pushing, pulling and lifting. Mouthing decreases. Sensory exploration is still very important, however, and the toddler enjoys exploring new sights, sounds and textures, later demonstrating definite likes and dislikes. As he or she nears eighteen months, the toddler begins combining skills. He or she can carry one or several small objects in one hand and throw objects with the other and begins to concentrate on fitting things together, rather than separating them, and on filling containers, rather than emptying them. Increased fine-motor skills and a longer attention span enable him or her to look books. By eighteen months, the infant recognizes pictures of common objects. Six months later, he or she pretends to read books and has fine-motor skills to turn pages one at a time. He or she is also capable of holding a crayon and scribbling circles and vertical lines and horizontal lines.

The toddler's exploration changes concepts of objects and people in the environment and, in turn, his or her concept of self. Increased memory aids this realization process. By fifteen months, the toddler demonstrates mental abilities at physical problem solving. He or she begins to plan new trial-and-error behaviors, without going through the actual physical events, by combining ideas from previous encounters. In addition, when moving objects disappear, he or she is able to anticipate their movement. By eighteen months, objects are used increasingly for their intended function; he or she 'combs' hair with a comb for example. In addition, toys are used increasingly in play. By eighteen months, the toddler plays appropriately with toy phones, dishes and tools. He or she likes to dress-up play. Dolls and stuffed animals become more important. The toddler often repeats daily routine with toys and demonstrates short sequence of story plays at age two.

The toddler also enjoys routines and anticipates actions. From routines such as feeding, changing and eating, the toddler develops a primitive sense of order and time. By two years of age, the toddler gains a good grasp of environment. He or she is able to predict routine behaviors and location of familiar objects.

Much of the social interaction of the second year involves the toddler's attempts to be in the spotlight. Having learned in the first year to influence others, the toddler will do anything for attention. He or she becomes an active imitator of adults and siblings. The fifteen-month-old gains attention by "dancing" to music. He or she becomes more adept at imitating hand movements, such as clapping and waving. At around eighteen months, the toddler begins to imitate the family's house work, perhaps attempting to vacuum or sweep.

Increasing self-awareness and the ability to influence others are reflected in the toddlers growing noncompliance with the wishes of the family. At sixteen months, the toddler begins to assert some independence by ignoring or dawdling in response to parental commands or requests. By twenty-one months, this behavior has evolved into a very defiant "no". The child frequently says "no" even when he or she really wants help or advice being offered.

Since the two-year-old has many self help skills, he or she expresses the desire not to be helped. For example, the two-year-old can usually place food on a spoon and feed himself or herself, undress except for shoelaces, wash, turn on simple appliances, open easy doors, and straighten a bed. When the child needs help, he or she knows how to request it.

The toddlers growing sense of self is also reflected in the notion of possession. He becomes increasingly aware that the objects have owners. At around eighteen months, the toddler becomes very possessive of toys, using words such as *mine*. By twenty-two-months, the toddler may become more verbal in defense of possessions, although others may disagree as to just which objects are the child's. The toddlers verbal defense of possessions reflects an awareness that adults attend to him or her when words are used. Not all interactions are negative, however, and toddlers play near other children. This play is usually parallel or side by side with each child engaged in his or her own activity.

Language development also goes beyond the use of such single words as '*no'*, '*mine'*, and few others. The second year is one of vocabulary growth and word combinations. Vocabulary growth is slow during the few months when the toddler is concentrating on gross-motor refinement. Much of the toddler's speech consists of single words or jargon. These words are used to name objects or people. Some words, such as '*no'*, '*more'*, and '*gimme'*, can be combined easily with others to form longer sentences. Other words represent common objects, foods, pets and household members. Each toddler has his or her own lexicon, or personal dictionary, with words that reflect, in part, the child's environment. In general, the toddler's definitions are not the same as those of the adults in the same environment. For example, the word '*horse'* may apply to all four-legged animals. The toddler must therefore rely on extralinguistic cues to interpret adult language accurately. The outcome is to be expected, since the child's experience with the environment and with words is much more limited.

During the second half of the second year, the toddler begins to combine words and to increase the rate of vocabulary growth. The early word combinations appear to follow predictable patterns, and the toddler is likely to produce phrases such as "give water", "Daddy eat", "No night-night", and so on. Within a few months, short memory has increased so that the child can attempt a few longer constructions, "Daddy eat biscuit". At this time, the toddler seems to be absorbed in speech and language play. He or she likes rhymes, songs, and stories, and activities, such as playing and eating, often are accomplished by speech. Vocabulary increases rapidly. At age two the toddler has an expressive vocabulary of about 150 to 300 words. Accompanying the increases in the utterance length and the vocabulary is a decrease in the use of jargon and babbling, although the child continues to use both (Owens, 2001).

In summary, the two-year-old is relatively independent, although still very dependent upon adults for protection and well being. He or she has a good concept of the immediate environment and expectations of daily routines. The child has the social skills to attend and hold the attention of others and to express some emotions. Increased ability enables him or her to explore the environment and to modify it. In addition, he or she has the linguistic skills to influence the behavior of others.

IV. Two to three years:

By age three, the child has perfect walking on flat surfaces. He or she can run well, climb stairs without assistance, and balance on one foot. The newfound skill of tricycling expands horizons beyond the immediate household. Fine-motor abilities continue to develop slowly. The three-year-old can dress except for shoe-tying and can use a knife for spreading not cutting. He or she continues to be interested in fine-motor manipulation and explores by dismantling or dismembering house-hold objects or favorite toys. Scribbling has developed into more representational drawing. Often a single "drawing" will represent many very different things. The representation is not constrained by the object or person portrayed.

The play of a three-year-old is also less constrained by actual objects. He or she uses toys in imaginative ways and exhibits much make-believe play. Thus, one object may symbolize another. Such an event is called *symbolic play*. Unlike two-year-olds, a child of three is most likely to play in groups and to share toys and take turns. Play is often accomplished by sounds and words as he explains his actions, makes environmental noises, or takes various roles.

Speech and language are used in many other ways and there is a tremendous growth in vocabulary. The three-year-old uses an expressive vocabulary of 900 to 1000 words and employs about 12,000 individual words per day. Most three-year-olds have mastered the vowel sounds and consonants /p/, /m/, /h/, /n/, /w/, /b/, /k/, /g/, and /d/. There is much individual variation in speech-sound development, however, and at least 50% of the three-year-olds are proficient in their use of /t/, / ŋ /, /f/, /j/, /r/, /l/, and /s/ (Olmstead, 1971; Sander, 1972).

The language of the three-year-old consists of simple sentences that frequently omit small, unstressed words. Most sentences follow a subject-word-object format, although the child has begun to employ variations of adult negative, interrogative, and imperative forms.

Negative words used are '*no', 'not', 'can't', 'don't,* and '*won't,* often employed interchangeably. The most frequent interrogatives are 'what' and 'where'; 'why' and 'how' are used infrequently, and the three-year-old cannot respond successfully to these types of questions. The three-year-old uses some noun modifiers and articles, the plurals of often used nouns, and possessive -'s'. He or she also uses some pronouns and the prepositions '*in'*, '*on'*, and '*under'*. In addition, the child has learned to use the '*-ing'* and '*-ed'* endings. Unfortunately most three-year-olds over-generalize the '*-ed'* ending to regular past-tense verbs, such as '*goed'* and '*eated'*. The three-year-old still has some difficulty with auxiliary verbs and the verb '*to be'*.

In short, the child's language is increasingly beginning to reflect the environment. This is not a passive imitative process, however. The child demonstrates processing of language rules by using such constructions as *goed* and *eated*, although he or she does not hear those constructions used by adults. The child is formulating language rules. The three-year-old exhibits good motor and language skills for his or her short period of experience. Much of the environment is reflected in play and in conversation.

V. Three to four years:

The motor skills of a four-year-old reflect the increased control of independent movements of the right and left sides. The child of four can hop on one foot for a short period and can ascend and descend steps with alternating foot movements. Hand preference is also more pronounced and the child is able to copy simple block letters with the dominant hand.

Increased memory helps the child to recount the past and remember short stories. This memory and the recall are aided by the child's increased language skills. The child also demonstrates categorization skills that seem to indicate more advanced procedures for storage of learned information. The four-year-old can name the primary colors and name some coins. Although the child can count to five by rote, he or she has a notion of quantity only through three.

Socially, most four-year-olds play well in groups and cooperate well with others. Although there is still a lot of object play, role play becomes increasingly frequent. The ability to carry a role through story play is reflected in the four-year-old's language. The child can tell stories of his or her own or others' authorship. Increased language skills enable the child to form more complex sentences. Vocabulary has increased to 1,500 to 1,600 words, with

approximately 15,000 used each day. Most four-year-olds can correctly articulate all the consonant sounds mentioned under three years of age and other sounds such as /t/, /ŋ/, /f/, /j/. At least fifty percent of all four year olds can produce /r/, /l/, /s/, /t / and /z/ (Olmstead, 1971; Sander, 1972). Most sentences average four or five words, and the four-year-old demonstrates good usage of declarative, negative, interrogative, and imperative forms. Although demonstrated infrequently, the four-year-old child also can join sentences together to form longer units, using conjunctions such as '*and'*, '*but'*, and '*if'* and relative pronoun such as '*who'*. Events relayed in the order in which they occurred. Language becomes a real tool for exploration, and the four-year-old is full of questions.

A subject is now used in all sentence forms except in imperative ('throw the ball') in which it is not required. Usually one modifier or an article is used with the noun. Many regular and irregular past-tense or verbs are used correctly, as is the third-person singular, present-tense –s, as in "Mommy eats at work". Thus, four-year-olds can be expected to say "ate", not "eated", and "Mommy eats", not "Mommy eat". The specific verb acquired and the speed of acquisition depends on many factors, including environmental input. Auxiliary or helping verbs are also used in the interrogative and negative sentence forms that require their use (Owens, 2001). In general, the four-year-olds have the linguistic skills and the short-term memory to be good, if somewhat limited conversationalists. Four-year-olds are very curious and very anxious to exhibit their knowledge and abilities.

V. Four to five years:

By the fifth birthday, the child possesses a good awareness of the body and how to accomplish complex tasks and games. The five-year-old knows left and right but can't transfer them to others. Each hand can be employed independently for tasks such as dressing and cutting meat with a knife. Small-muscle control enables the child to copy short words. The child uses its body in play and enjoys group games. With increased memory skills, the child of five is able to play organized games with simple rules. He or she can concentrate on playing and still carry through certain rules of play. The five-year-old also has a good temporal sense and understands words such as yesterday, today, and tomorrow. Temporal notions aid the child's understanding of explanations of cause and effect and comprehension of temporal terms such as before and after.

A five-year-old uses very adult like language, although many of the more subtle syntactic structures are missing. In addition, the child has not acquired some of the pragmatic skills needed to be a truly effective communicator. Expressive vocabulary has grown to about 2,200 words. Word definitions still lack the fullness of adult meanings, however, and this aspect continues to be refined throughout life. Most five-year-olds can correctly articulate the /r/, /l/ /s/, /t /, /z/, /dz/, and /v/ consonant sounds. Five-year-olds still have difficulty with a few consonant sounds and with consonant blends, as in 'street' or 'clean'.

The child of five uses regular and irregular past tenses of common verbs correctly but still has difficulty with the past tense of the verb to be (was and were).The future-tense will also be used correctly where required in context. Some of the other auxiliary verbs, such as 'would', 'should', 'must' and 'might' are used less frequently and often correctly. The five-year-old child also has limited use of the comparative (more… than or-er); the possessive-'s' and possessive pronouns (his, her, your); the conjunctions (and, but, if, because, when, and so); relative pronouns for embedded clauses ("I know *who* lives next door"); gerunds ("We go *fishing*"); and infinitives ("I want *to eat* now").

Although there are still many aspects of speech, language and communication to be mastered, the five-year-old has made spectacular progress in only a few years. The child of five is able to use language to converse and to entertain. He or she can tell stories, has a budding sense of humor, and can tease and discuss emotions.

V. Five to six years:

Physically, the six-year child gains greater coordination of gross-and five motor movements. As the six-year-old attains better coordination and balance, he or she learns to ride a bicycle and to throw and catch a ball well. In ball handling, throwing skills precede catching skills by several months. Throughout the period, physical coordination enables the child to perform more motor acts at one time and therefore to enjoy sports and coordinated games. In addition, better fine-motor abilities and eye-hand coordination enable the child to engage in hobbies and crafts. With more mature motor skills, he or she gains more self-help skills and increased independence.

In terms of cognition the child has longer attention span and is less distracted by additional information when problem solving. The child remembers and repeats three digits. In terms of socialization skills, the child enjoys active games and is competitive. He or she can

identify with sex peers in groups. He or she can transform egocentric reality to more complex and relative reality view. In terms of communicative skills, he or she has expressive vocabulary of 2600 words, receptive of 20,000 to 24,000 words and can define them by function. The child will have many well formed sentences of a complex nature and can use all parts of speech to some degree. The child also has acquired all the sounds in the language including the consonant clusters.

In sum, as the preschool child exhibits new independence as the development proceeds. He or she is very mobile and very curious about the world. During the preschool years, the child acquires many self-help skills, including dressing and feeding. Increased memory enables him or her to solve the problems with less dependence on physical input, to understand temporal concepts, and to recall the past. Language skills develop rapidly during the preschool years. Language development does not stop however, and many complex forms and subtle linguistic uses are learned in the adolescent period. Recall and increased language skills combine to produce a delightful storyteller and recounter. The six-year-old, with a better-defined personality, is a more openly social being than he or she was as an infant.

Strategies used by infants to gain knowledge about the environment:

An infant has a tremendous motivation and drive to master his or her environment. The infant has much to experience and discover. The environment that the newborn child faces is quite complex. First, it is a world of almost endless stimulation of all his or her senses. There are thousands of things to see, hear, touch, smell, and taste. There are also thousands of instances where there are internal feelings to experience-hunger, physical discomfort, movement, pain etc. There are interactive sensations to experience-snuggling, feeding, being carried from place to place, and being left alone. Faced with all of these stimuli and sensations and with a brain that fairly cries out for stimulation, an infant clearly must work diligently to experience this world and impose some order and sense to it. There are a few behavioral tendencies or "strategies" that have been identified which babies use during their earliest interactions with their worlds (Synder & McLean, 1977; Synder-McLean & McLean, 1978). Three basic types of these early learning strategies:

1. Attend to and act on the environment;
2. Actively observe, listen and learn from other people; and
3. Explore and experiment.

Strategy I: Attend to and act on the people and objects in the environment:

Babies are in a state of alertness, actively attending to the environment around them. They watch, listen, touch, or manipulate the people or objects that surround them. Some times they practice making sounds with their vocal tracts and see how they might alter these sounds to make other sounds. Babies constantly replay things that they have learned. As they observe and act on their environment, they create new pathways among the neurons of their brain. With this new learning, they also combine and modify the older pathways so that their minds are gradually, but quickly, being expanded and their existing knowledge holdings are refined. So, in addition to learning new things, they repeat previously learned activities. Favorite toys are established as babies learn what actions on certain toys bring them the most interesting results. They are, in other words, happy to be competent in their play with familiar toys. They love 'peek-a-boo' because they have learned how to play this particular game. For the same reason, infants love to look at the same books over and over again. They are also happiest in their own beds with their favorite blanket, teddy bear, and music box. Thus in a remarkably short time, infants have established many millions of connections in their brains and have begun to develop their own unique minds. Their individual minds reflect the sum of all of their previous experiences and the learning that has resulted from these experiences.

Strategy 2: Observe, listen, and learn from other people:

At a few months of age, infants have made the connection that other people around them are a primary source for knowledge about how and what to do to master their environment. They have, for example, been highly rewarded for doing what mother or daddy does. Thus, when they take turns they have learned to observe the adult's demonstration of the action called for in a particular situation and have done their best to reproduce the adult's actions in that situation. If their reproduction is not quite right, they have discovered that mother or father will take their hands and directly help them perform the correct motor act. In learning from others in their environment, then, children take instruction from them.

Imitation

In their first few months children can only imitate actions that they can see themselves produce. Thus, they can imitate and adult reach or grasp, watch both themselves and mother in a mirror and match actions. Around seven months or so, however, most children can imitate actions without being able to see themselves. They have gained enough proprioceptive experience to know, at least roughly, what position their limbs are in and what changes need to

be made to approximate the actions of their imitative model. To be sure, some of these imitations are only approximations of an adult's actions because infants of this age do not yet have fine motor movements in all of their extremities. For example, they might experience difficulty in letting go of an object. Thus, most parents know that the first acts of "giving" mother an object might be more of a throw than a give. Parents are sensitive to such limitations in children's abilities, however, and they accept imitations that are even close to their model.

In the second six months of children's lives, they begin to reflect all kinds of abilities to carry out the appropriate actions with many items in their environment. They take mother's hat and put it on their head. They put daddy's glasses on their heads. They take spoons and 'stir' in pots and pans. They put mother's necklace around their neck. Thus, in addition to being able to imitate actions that they cannot see themselves carry out, they are also reflecting all of the knowledge that their active attending has allowed them to discover. They bang drums, hit things with hammers, and feed their dolls with miniature bottles. They are, essentially, doing what other people do. They belong to, and in, the world of both people and things.

Seeking and taking instructions

There is a natural extension of the general imitation tendencies of very young children. This tendency is to look to adults (or other children around them) for instructions in behaviors they have not yet mastered. Thus, a frequent activity for a young child is to take a toy and hand it to another person. The intention that adults assign to such an act is, "Show me what to do with this-show me how it works." At other times, babies might attempt to open a jar or make a music box play without success. After such a failure, an infant will often look at an adult and then look back at the toy; or perhaps he or she will attempt the task again and then look at the adult in these cases the infant seems to be saying, "See, I am really tried, but I need help". In most cases, the adult is ready to help the baby open the jar or wind up the music box-either directly or by taking the baby's hands and putting them through the needed action. The child's request is 'sincere' in that she has tried and failed. Similarly adults follow the rules for human interactions by responding to the child's communicative act in a sincere and constructive manner.

In such helpful teaching episodes, adults often help a child learn by "scaffolding" for them on a task (Bruner, 1975). In scaffolding, or 'reverse-chaining', an adult sets up situations

so that a child only has to do only a small action to complete a task. The next time these tasks occur, the adult will complete a bit less of the required task and allow the child to do more. In this way, adults teach children how to do things but they arrange the task so that children can experience some immediate success, see what the end result of the 'chain' is, and not become frustrated by having to do more of the task than they can handle at any given time.

Strategy 3: Explore and experiment:

In addition to interactions to seek and accept help from adults and other children around them, babies spend long periods of time acting on objects in isolation. They will for example, play with their blocks, plastic cups, or toy mailboxes for hours-experimenting and learning how to stack and put things inside one another. Each action and each success is recorded in the brain and is maintained there as an established pathway that is combined with past learning. Of course, a lot of early learning will be needed to revise as later experiences add new material to the child's knowledge base.

Besides physically acting on objects, infants also watch and listen intently. As they near the three quarter mark of their first year, infants have stored up thousands of bits of information through observation. This observational learning coupled with "learning by doing" means that an alert, active infant has piled up millions of pathways in the neurons of his or her brain. The baby has a grand storehouse of knowledge about both the objects and the people in his or her environment.

Strategies used by adult

Adult strategies also help children discover important things about the world. First, they engage the infant in interactions that involve both activities with the physical world and the social world of people. They make sure that they share a 'common focus' with the child. They flood the child with language and other auditory stimulations such as rattles, squeaky toys, music boxes, and music. They also provide infants with objects to feel, see, and manipulate. They practice turn taking and provide interactive games such as 'peek-a-boo' and 'find the rattle' being hidden behind the adult's back. They simplify their language input to the child by using simple sentences and phrases and talking slowly and emphasizing key words and phrases. They leave gaps in their interactions to provide infants with opportunities to respond. They teach infants to do things with objects and toys (e.g., shake rattles, hug teddy

bears, and roll balls). Adults provide infants with a wealth of sensory experiences and socially interactive episodes that stimulate, and thus, 'program' the neurons of their brain and to create the pathways that constitute discovery or learning. Adult strategies for providing children a rich world of sensory stimuli and social experience are sincere and clear efforts to facilitate infant learning (Snyder & McLean, 1977).

Delayed and/or deviant development:

The development of the child and the acquisition and maintenance of various skills in human beings are dependent on the adequate functioning and appropriate integration of distinct neural networks, proper functioning of the various systems in the body, proper environmental stimulation and other such factors. The inborn tendency to respond to the environment is a function of the infant's brain and neurological system, which allows the newborn to perceive and process environmental stimuli and to respond and learn from them. It is the infant's brain and neurological system that allows the child to emotionally attach to other people and to see, hear, touch, feel, explore, experiment, and learn from these environmental experiences. And it is the continuing growth of this system, the building of millions of new neural networks that allow the child to integrate what he or she has learned and thus continue to learn and develop new skills.

Majority of the children develop these skills without effort over lifetime. But some children exhibit a significant disruption or difficulty in subsequent development of these skills. Two major factors have been identified that affect the child development and readiness for school:

1. Lack of proper experiences
2. Impairment in the child.

Many children do not receive proper experiences during their developmental period due to several reasons such as lack of parental involvement, poor socioeconomic status, poor parental education, poverty etc. and hence they fail to perform at a level similar to their peers. But, for some individuals, development is arrested/hindered because of an impairment which jeopardizes his or her motor, cognitive, communicative, or linguistic development. This could occur due to several factors such as brain damage caused during parental, natal (birth) or postnatal period leading to conditions like mental retardation, cerebral palsy, dysphasia/ aphasia in childhood. It could also be affected due to sensory deficits as congenital hearing

impairment and oral structural defects such as cleft palate. Severe emotional disorders in childhood like autism could also bring about delayed and deviant language development. Some children could also exhibit learning disabilities during schooling.

The prenatal (before birth) factors insults to the unborn baby. Prenatally, one major influence is the child's genetic code. Certain speech and language disorders may be hereditary, that is, they may be carried in a gene that can be passed from parent to child. Beyond genetic causes, a number of other prenatal factors related to the mother's health and well-being can influence the unborn child's developing brain and neurological system. One of these factors is poor nutrition. If the pregnant mother's diet does not contain adequate nutrients, vitamins, and minerals, she can not provide these essential building blocks to her unborn baby. Alternatively, if the mother is ingesting other substance (including alcohol, prescription drugs, or illegal, 'street' drugs), these will be absorbed into the unborn infant's fragile, developing neurological system. In addition, serious illness, infection such as rubella, syphilis or trauma to the pregnant mother can also cause damage to an unborn infant's neurological system.

There are additional risks to the newborn's neurological system during birth (perinatal risks) and in the early months following birth (postnatal risks). Perinatally, the greatest risk any thing that interrupts the supply of oxygen to the infant's brain before he or she is able to breathe air on his or her own. This risk is greatest in cases of very difficult or very premature births. The other risk factors include prolonged labour, forceps delivery, breech delivery etc. Following birth, the newborn's brain and central nervous system will continue to develop for several years. During this period of infancy and early childhood, the child's neurological system is particularly vulnerable to insults. Physical trauma to the infant's head or neck at this stage can result in permanent brain damage. This is why it is so dangerous to shake children, especially very young children.

Illnesses in a child's early years can also result in brain damage. Lead poisoning, seizures associated with high fevers, or infections affecting the brain or central nervous system (meningitis, encephalitis) are examples of early childhood illnesses that can result in permanent brain damage. A very common childhood illness, fluid and infection in the middle ear (otitis media), has even been shown to contribute to delayed language development, because the temporary hearing loss that accompanies it can cause disruptions in language comprehension and production at critical periods in a child's development. Consequently, if

middle ear infections are chronic in the child's early months, serious disruptions of communicative development can occur.

These factors that interfere with the development of functioning of the brain can have highly specific effects on a child's ability to acquire different aspects of language learning. Some brain damage can affect the fine motor abilities of the phonation or articulatory mechanisms needed to produce sounds and running speech. Injuries to other parts of a child's brain may prevent that child from being able to comprehend speech. Still other insults may damage the ability to formulate speech and language messages.

Therefore many pre-, peri-, or postnatal factors can have a direct, negative impact on the child's overall learning abilities and, thus, on his or her language development. For this reason, children who have any one of a wide array of neurological disabilities, including serious motor problem, vision or hearing impairments, or mild to moderate levels of mental retardation, will almost always show the effects of these impairments in both the learning that prepares infants for language learning and in the linguistic development process itself. Truly serious conditions such as severe autism or severe mental retardation usually result in rather global developmental problems that have devastating effects on the development of both speech and language. Children with such pervasive neurological disruptions to their development and learning will almost always need some expert help to compensate for the ways their disabilities limit their acquisition of the broad range of knowledge that they need to acquire communication and language.

Other environmental factors also might interfere with caregiver's providing effective language learning environments for their children. The mature communication partner should be able to focus attention on the young child and should be motivated to establish and maintain an interaction with that child. However, some caregivers are chronically too busy, too distracted, or too sick to focus their attention and energies on a young child. Any condition that produces serious and constant stress in the caregiver's life can jeopardize his or her ability to provide a supportive language learning environment. These stress factors can include major illness, drug or alcohol addiction, poverty, or mental health problems. Some young parents lack the maturity to focus on the infant's needs and wants, because they are still absorbed in their own needs. These can include very young parents or parents with mental retardation or mental illness.

Interaction of Child and Environmental Factors

These factors can interact with each other. For example, a premature infant will have a neurological system that is not yet fully developed. This factor, in itself, would pose some risk to the child's language development. However, that risk can be overcome by caregivers who are able to learn and use specific strategies for interacting with their baby. Alternatively, if the infant's caregivers are under significant stress due to poverty or any of the other stressors mentioned above, these two risk factors will interact with and compound one another. As this cycle continues, the infant's delayed development and other problems related to his other prematurity may add further to the parent's stress and further weaken the parent's ability to provide an effective language learning environment. Samaroff (1975) described this as a 'transactional process'. Thus, when both the child and the caregiver brink risk factor to their partnership, the impact on the child's development is more than just the sum of these risk factors; it is multiplied and exacerbated by this transactions process of mutual influence. Figure 2.1 illustrates this transactional process.

The schematic model illustrates the circular nature of human interactions and communication. An infant's initial act provides an antecedent condition that evokes some response from the caregiver. The caregiver's response then provides both a consequence to the infant's act and an antecedent condition for another act from the infant. This give-and-take, 'transactional' pattern characterizes all human interaction and is important because it shows that less than adequate responding on one partner's part necessarily has effects on the nature and quality of the other partner's behavior. Thus, a child who does not bring a full set of acquisition skills to this partnership will not reinforce an adult's facilitation behaviors, and vice versa. Quite simply, if either the adult or child doesn't play his or her part in these early interactions, the quality of the other partner's efforts will suffer negative effects. Thus, the poor responsiveness of a child with developmental delays will often extinguish the efforts needed from the adults around him or her. Both adults and children 'fine-tune' their behaviors to each other's level. By doing so, in cases of typical development, each partner "drives" the other partner to new and usually higher levels. Such an escalating spiral on both sides of the dyad is critical to the entire process of development. When this escalation fails to occur on either side of partnership, real trouble looms.

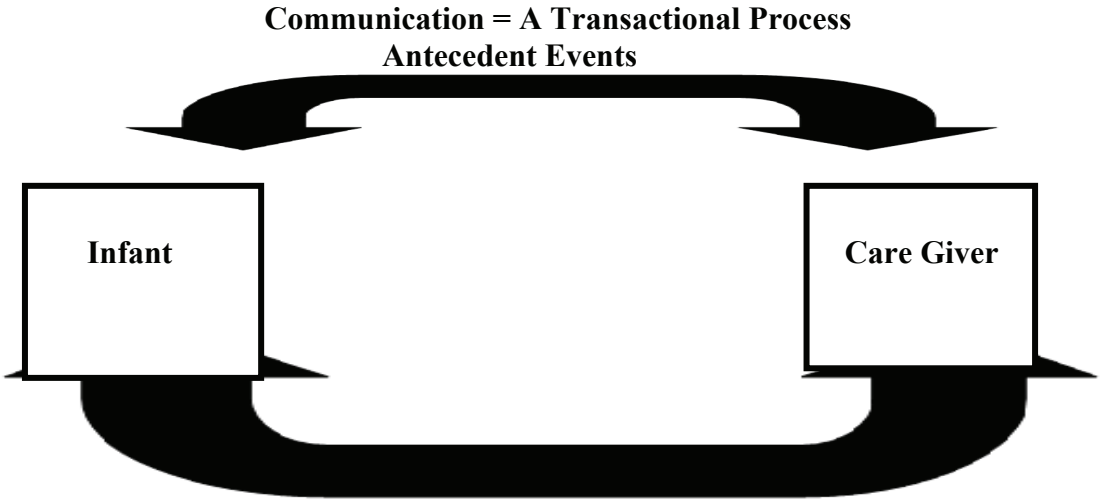


Figure 2.1: The Transactional Process (Source: McLean & Snyder-McLean, 1999)

The vast majority of children develop speech and language quite normally. Human infants are innately predisposed to learn language and mature speakers are equally predisposed to help them in that learning. Thus, despite great individual differences in parenting styles and resources and tremendous variation in child learning styles and opportunities, only one child in 10 will show any significant delays or problems in this critical aspect of development.

Such children with these disorders face a delay/deviance in their communication abilities apart from a delay in few other developmental areas. Thus a communication disorder is an impairment affecting one's understanding and speaking abilities. These disorders may range in severity from mild to profound and may be developmental (present since birth) or acquired (develop later in life).

Such conditions could be evidenced by a few or several of the following speech and language characteristics/ manifestations.

1. Lack of onset of speech with limited vocalization or delay in the onset of speech and language with deviant behavior
2. Incorrect / inappropriate speech characteristics including voice, articulation and prosodic abnormalities seen as in the use of inappropriate pitch, loudness and quality, misarticulations, inappropriate rate and rhythm of speech all leading to unintelligible speech.
3. Limited language development, atypical and limited vocabulary and grammatical development, poor length and complexity variety of utterances, inadequate mastery of grammatical inflections, inadequate acquisition of grammatical categories of nouns, verbs, adjectives, adverbs, prepositions, etc.

4. Stereotyped and repetitive use of language such as echolalia and use of neologisms (new and nonexistent words in the language of exposure) whose meaning is obscure to others.
5. Lack of spontaneous and responsive speech seen as an inability or failure to respond to communication by others, failure to initiate and sustain conversation indicating problems with interpersonal, two way communications in any given situation.
6. Difficulties with speech comprehension seen in the failure to comply to requests, questions, an inability to derive meaning from others speech or failure to understand others speech etc.
7. Abnormalities in use of nonverbal aspects involved in communication as in the poverty of facial expressions and gestures as pointing, showing, impaired emotion recognition and expression, failure to understand basic gestures and facial expression etc.
8. Difficulties with reading and/ or writing and poor scholastic achievement.

The characteristic features of a few disorders have been described below which results in a communication disorder.

HEARING IMPAIRMENT (HI):

Hearing impairment and deafness are serious disabilities which impose a host of related problems such as delayed development of speech, language, cognitive and auditory skills, which may result in slow learning and difficulty progressing in school. Hearing impairment is a broad term used to describe the complete or partial loss of the ability to hear in one or both ears. Deafness refers to the complete loss of ability to hear from one or both ears. The level of impairment can be mild, moderate, severe or profound; affecting the outer &/or middle or the inner ear. Since children cannot hear language and speech sounds, they cannot learn and imitate them. HI in children may be congenital or acquired. Congenital could be again hereditary or due to the result of pre and perinatal causes. Acquired hearing loss may result from various illnesses starting from a plain ear infection to meningitis, typhoid, etc…

Based on the onset, one can classify hearing impaired as prelingual deaf or postlingual deaf. Prelingual deaf are those who develop HI before the onset of language development and postlingual deaf are those who acquire HI after they have acquired a partial/complete mastery of the language of exposure. However, the age limits of these types are not unanimously agreed upon.

The impact of hearing impairment on a child's speech, language, education and social integration depends on the level and type of hearing impairment, and the age of onset, especially if it begins before the age when speech normally develops. The consequences of HI can be viewed as primary and secondary effects. Primary effect of HI is on language development. The primary loss of hearing affects the acquisition, maintenance and generalization of language concepts. Because of improper and inadequate auditory inputs the HI children face more speech problems. They also face difficulty in listening to sound. The secondary effect is on social and emotional adjustment. Their inabilities to develop adequate skills in both receptive and expressive language make communication with others difficult thus creating psychological & social isolation from the peer group. The hearing impairment may also impede academic performance. The cognitive abilities starting from sensation, perception, conceptualization and intelligence are all affected by hearing impairment.

Speech and Language problems of the hearing impaired: Children who lack a primary and significant sensory input besides its consequent effect on cognitive skills perform poorly on speech and language skills. Their speech and language differs from typically developing children in terms of all aspects. The frequently seen speech problems are:

- High pitched voice with slow rate of speech and sometimes labored.
- Monotonous voice
- Abnormal stress, rhythm of speech, and juncture and pausing, distorted and prolonged vowels.
- Nasalized speech, i.e., excessive nasality.
- Misarticulations in consonant production due to inappropriate and imprecise articulation.
- Poor intelligibility of speech on verbal expression

The frequently seen language problems are:

- Highly limited vocabulary due to lack of exposure & experience to understand different situations and meaning according to context.
- Deviant/delayed language abilities.
- Difficulty in the comprehension of abstract concepts.
- Lack of ability to verbalize abstract ideas, feelings, etc…
- Lack of comprehension of concepts and words both simple as well as complex interms of language forms and uses.

- Minimal length of utterances.
- Problems in sentence construction in terms of word order and word length.

MENTAL RETARDATION (MR):

Mental retardation is a developmental disorder characterized by significantly below-average intelligence (an intelligence quotient [IQ] below 70) and an inability to function in and adapt to daily life without assistance. They exhibit deficits in adaptive behaviors such as inadequate functioning, economic activity, communication, number and time of use, social activity. The level of impairment can be mild, moderate, severe or profound. Children with mental retardation often experience delayed development of speech, language and many other skills, which may result in slow learning and difficulty progressing in school. The problems seen in these children depend on the degree of severity. Apart from speech and language problems, there is a marked delay in developmental milestones, have poor sensory motor skills, poor gross and fine motor skills and poor self help skills. They exhibit a variety of behavior problems such as hyperactivity, poor attention span and concentration. They have poor cognitive deficits too in terms of poor reasoning abilities, poor perceptual skills, poor sorting, matching and association, sequential and logical thinking and memory abilities. Most of these children have good socialization abilities and they use gestures and have the intent to communicate.

Speech and language problems: Their speech and language skills can be either delayed or deviant.

The most commonly seen language problems are:

- Limited vocabulary
- Usage of simple and short sentences
- Grammatical errors and or mistakes
- Lack of generalization of verbal out put

The most commonly seen speech problems are:

- Inconsistent articulatory errors
- Omission of sounds in the final position
- Low and or high pitch voice
- Harsh and or hoarse voice

- Fluency problems (stuttering)
- Abnormal stress on words
- Absent/ abnormal intonation
- Abnormal rhythm
- Monotonous speech

Over the last few decades the number of children with these communication disorders has risen alarmingly. These disorders have to be considered seriously because if not identified early and rehabilitated at the right time, it results in a variety of social, educational and vocational problems. Thus early identification, intervention and speech/language communication therapy aimed at alleviating speech and language handicaps listed above and improving communication behavior should be the major steps in rehabilitation. A finely coordinated team work including professionals such as neurologists pediatricians, child psychiatrists, clinical psychologists, audiologists, special educators, social workers and of course, parents along with SLPs (Speech-Language Pathologists) is an absolute necessity for diagnostic as well as therapeutic intervention. Early schooling with a well formed curriculum and parental training results in successful integration of the child into the society. If the right steps are taken at the right time, then the child can be a contributing and productive member of the society.

The efforts towards successful integration paved way for the preschool training centers which adopted specialized methods of teaching for children with special needs. Once preschool teaching or training came into existence, there was a need for framing an age appropriate curriculum. This led to the framing of different types of preschool curriculum for such children especially in the west. There are a few curricula/training guide/intervention manual developed in the Indian context too such as Preschool curriculum for young hearing impaired children (Rathna, Ghate, More, Roy, 1991), training guide for parents, teachers and caregivers for children with developmental disabilities (Venkatesan, 2004), Communication DEALL Developmental checklists and intervention manual (Karanth, 2008) etc. Although there are many preschools for children with communication problems in different parts of our country and a few curricula available as mentioned above, an informal observation indicates that there is no standard, uniform, widely accepted preschool curriculum available to the teachers working in these special schools. Due to the non-availability of a curriculum, the teachers are forced to either prepare their own syllabus or use textbooks meant for normal

children. This exerts an extra pressure on these children with special needs and they fail to reach their full potential. In addition the existing curriculums available are either for use with normal children or children with a particular disorder and mainly focused on training or development of one or more of the following aspects of child development such as personal, social and emotional development; communication, including talking and listening; knowledge and understanding of the world; creative and aesthetic development; physical development; mathematical awareness and development etc. There are very few curricula that are framed to facilitate all-round development of a child.

Adopting a curriculum developed in the west on the Indian children may not be appropriate since there are individual differences in learning and both environmental exposure (which involves cultural, traditional exposures and socio economic status etc.) and biological exposure play a major role in child development. Thus there is a dire need for a curriculum or an intervention module to be developed for the Indian children to facilitate the all-round development in various skills.

Thus a need to prepare a curriculum for such children was felt by the speech-language pathologists and special educators working with special children. It is with this intention that the curriculum for special children of preschool age incorporating ten different skills viz. self help, social, motor, cognitive, sensory, speech and language, play, pre-reading, pre-writing and pre-arithmetic skills and activities to facilitate these skills was prepared (Swapna & Geetha, 2004). These domains have been included so as to facilitate an all-round development in the child. Following this the curriculum was finalized and was put into use at the preschool training center at AIISH.

During the process of implementation of the curriculum, it was felt that assessing the functioning level of a particular child on ten different skills was a little difficult because of the way in which the curriculum was organized. Generally assessment of the developmental profiles of very young children are carried out though checklists, given that the young infants are not very amenable to behavioral testing. This is also true of 'difficult to test' children. Checklists have therefore become the most widely used tools to identify the presence of a developmental delay and also to provide a basic understanding of the developmental skills of a given child in one or more areas. Thus it was planned to develop checklists to assess the functioning level in ten different skills along with activities to facilitate them for children between 0-3 years as apart of the intervention module.

In addition, there was a need felt to assess the sensitivity of this module on children with communication disorders and hence this was taken up as an AIISH Research Fund project. Since there are clear stages in the acquisition of various skills during the preschool years, each child can be located at different steps or levels along this interwoven matrix of observable skills in children. Thus it is necessary to identify the step/level at which a given child is located along the continuum of skills and whether the desired teaching objectives can be ever reached in that child. Hence the main aim of the study was to develop intervention modules incorporating checklists and activities based on the already existing curriculum used in the preschool training center, AIISH to foster the development of various domains for children between 0-3 years. Yet another aim of the study was to carry out the sensitivity assessment of the same {specifically levels V (12-15 months) to level XII (2.9-3yrs)} on children with hearing impairment and mental retardation.

Method

The primary aim of this study was to develop intervention modules based on the existing curriculum (Swapna & Geetha, 2004) used in the preschool training center, AIISH to foster the development of various domains for children between 0-3 years. Yet another aim of the study was to carry out the sensitivity assessment of the same on children with hearing impairment and mental retardation. The proposed intervention module is a comprehensive kit for each domain that comprises of:

1. Checklists for assessment of ten different domains viz. Self-help, Social-emotional, Motor, Cognitive, Sensory, Speech-language, Play, Pre-reading, Pre-writing and Pre-arithmetic that are designed to elicit systematic and comprehensive information on current-domain behavior levels in children with communication disorders between 0 to 36 months (shown in appendix I). These serve as a module guide and have been field tested primarily on a sample of typically developing Kannada speaking preschool children. The checklists consist of 466 items distributed across the ten domains. It was ensured that each of the items were written in observable and measurable terms for ease of understanding and interpretation. The user manual provided with the checklists describes the method to elicit the information for each item. The items within each age-level are placed in an increasing order of difficulty/complexity, such that more items are passed at lower levels than at higher levels. The reliability, validity, internal consistency and sensitivity of items included in this checklist have been worked out and reported under step 1 & step 6 which follows.

2. Simple and user friendly activities along with photographs to enhance the domains mentioned above in children with communication disorders. An activity kit has also been included along with the intervention module. The list of materials included in the module is depicted in Appendix III.

3. A response/score sheet to document the child's baseline and the progress once in six months period for duration of two years (shown in appendix II).

To accomplish the first aim, the study was conducted in eight steps:

Step 1: Development of checklists – The checklists were developed to serve as indicators of a given child's functioning across several domains at a given period in time. The checklist construction began with the formation of a comprehensive item pool of activities and criterion

referenced checklists related to the development of children between birth to 3 years of age. An extensive review of literature on developmental milestones in early childhood across the developmental domains was then carried out by the research team. A comprehensive list of 678 items covering all the domains was initially selected and compiled from various sources in literature for the assessment of children. These were compiled from the existing curriculum used at AIISH preschool training center (Swapna & Geetha, 2004), available assessment and intervention programmes for preschoolers in the country as well as from books, existing assessment materials and other internet resources. These items were then categorized into ten specific domains viz. Self help, Social-emotional, Motor, Cognitive, Sensory, Speech-language, Play, Pre-reading, Pre-writing and Pre-arithmetic from 0-36 months in 12 groups at 3 month age intervals. A few of these domains were further classified as shown in Table 3.1.

Table 3.1: *Further division of domains*

Domains	**Subskills**
Self help	Feeding
	Dressing
	Toileting
	Personal hygiene
Social emotional	Social
	Emotional
Motor	Gross
	Fine
Sensory	Auditory
	Visual
	Tactile, olfactory, gustatory
Speech- language	Comprehension
	Expression

The self-help domain was further classified into feeding, dressing, toileting and personal hygiene, the social emotional domain had items separately under social and emotional subskill, the motor domain was categorized into gross motor and fine motor, the sensory domain consisted of items for auditory, visual, tactile, olfactory and gustatory subskills and the speech-language domain contained items both for reception and expression. During the initial formation of the item pool, care was taken to see that the test items were placed in a hierarchical order of increasing difficulty according to the chronological ages of the children. The easiest and lower chronologically-aged test items were placed at the beginning of the checklist, and the more difficult and higher-aged items were placed towards the end of the checklist. The items in the checklist were presented to the co-investigators of the project and who are speech-language pathologists with an average of 15 years of

experience in the field and were asked to judge the adequacy of the items compiled and comment on the adequacy of the phrasing of the sentences and their understandability. Based on their input the list of items were reviewed and edited and the following changes were incorporated:

1. Deletions: Test items which were redundant in eliciting the same behavior, age-inappropriate and culturally unsuitable were deleted from the item pool. Thus a total of 220 items were deleting reducing the number of items to 458.
2. Trainability: Test items were restructured or modified for want of their trainability. It was felt important to keep the items that showed the possibility of their being targeted for training.
3. Terminology: The items were worded in a simple manner. Technical and ambiguous words were substituted with non technical and simple words.
4. User manual: A user manual consisting of the method to elicit the information from the parents and the materials required was included.

Thus the face validity and the content validity of the items were established in this manner. Further, it was ensured that the items included in the checklists were both exhaustive and mutually exclusive. A score sheet was also developed to document the response of each child.

Step 2: Pilot study: A pilot study was carried out so that the examiners could familiarize themselves with the administration procedure and in order to foresee and prevent glitches in administration of the checklists if any. In addition, the examiners were also trained on the administration procedure and the way to collect the data and record the responses. The initial pilot study was carried out on a selected sample of 10 typically developing children. This resulted in a few more modifications and restructuring of the checklist. Several test items missed by oversight, or by intention after their use, was realized at the end of the pilot study. Thus 22 items were added at the end of this exercise. In a similar manner around 14 items which were repetitive were also deleted.

Revision of items in the checklist: The final form of the checklist developed at the end of the pilot study comprised of 466 test items distributed along ten domains. This has been shown in appendix I. The number of items included in each domain is depicted in the Table 3.2 below.

Table 3.2: *Number of items in each domain*

Domains	Subskills	No. of items
Self help	Feeding	22
	Dressing	13
	Toileting	7
	Personal hygiene	11
Social emotional	Social	30
	Emotional	23
Motor	Gross	39
	Fine	31
Cognitive	-	46
Sensory	Auditory	31
	Visual	26
	Tactile, olfactory, gustatory	19
Speech- language	Comprehension	40
	Expression	40
Play	-	25
Pre-reading	-	25
Pre-writing	-	23
Pre-arithmetic	-	15
Total		**466**

The maximum score that can be obtained by a three year old child on any given item is one and on all the checklists is 466**.** This number was maintained to facilitate ease of computation and analysis of data.

Step 3: Final Field study:

Subjects: 185 typically developing children (minimum of 10 children in each age group) from different play homes, primary health centers and pediatric clinics in Mysore in the age group of 0-36 months were considered for standardizing the checklist. The sample included 92 males and 93 females as shown in the Table 3.3. All the subjects were exposed to Kannada and had Kannada as their mother tongue. Those children with no history of language, hearing, neurological, developmental, academic, intellectual or emotional and orofacial abnormalities were included in the study. They were informally screened for voice, articulation, fluency and language problems. Oral mechanism examination and hearing screening was carried out to rule out any abnormality. Ethical procedures were used to select the subjects. The parents were explained the purpose and the procedures of the study and an informed written consent was taken. Their parent's education, socio economic status and other variables were controlled**.**

Table 3.3: *Age and gender distribution of the subjects*

Age Group	No. of subjects		Total
	Male	Female	
0-3	5	5	10
4-6	11	7	18
7-9	6	9	15
10-12	8	9	17
13-15	8	9	17
16-18	10	10	20
19-21	9	10	19
22-24	5	5	10
25-27	9	4	13
28-30	6	14	20
31-33	8	8	16
34-36	7	3	10
Total	**92**	**93**	**185**

Step 5: Standardization of checklists: The items listed under each domain from the checklists were administered individually on all the typically developing children who participated in the study. The below mentioned guidelines were followed during the administration of the checklist.

1. Each item was read carefully and the child was evaluated on that item. It was assessed whether the child can perform the item or not upon clear instructions being given under the stipulated conditions therein.
2. The examiner proceeded with the premise that the child can perform the said item (and not vice versa) before establishing the correct degree/level of the performance.
3. The responses were obtained by interviewing the parents/guardians or on direct observation of the behavior whenever necessary. The direct observation was given more weightage rather than the parents interviews /reports about the child's performance. In cases where it was difficult to observe the child's response, information was obtained from them by providing a lot of examples related to real life situation.
4. The testing was stopped after five consecutive failures on items in a particular domain by a child within any age range. Therefore the rest of the items were not administered and scored zero. The test administration started at a lower-age level and then proceeded to higher-age levels until the child showed five consecutive failures within a particular domain.

The child was given periods of rest in between sessions. The following scoring procedure was used to assess the current functioning level and the responses were scored and entered in the score sheet: 0-Not applicable/absent, 0.5-totally dependent/physical/verbal prompt, and 1-consistent and independent. The responses were recorded in the prepared data sheet for the purpose of standardization.

Step 6:- Procedure for standardization: The scores of 185 normal children were categorized based on the age group viz 0-3 months, 3-6 months, 6-9 months, 9-12 months, 12-15 months, 15-18 months, 18-24 months, 24- 30 months, 30-33 months, 33-36 months. In each age group the total number of subjects who scored "one" for a particular item was counted. The traditional criteria of 50 percent of children passing any given test item to determine its developmental age allocation along the age scale was maintained (Kamat, 1967; Venkatesan, 2002a, 2002b) in development and standardization of the checklist. The lowest age group in which more than 50% of the children scored "one" for an item was noted and that particular item was retained in that age group. The same procedure was followed to standardize all the items. This was done to determine the developmental hierarchy of test items in order to arrange them in sequence of complexity.

Establishment of 'goodness' of checklist: The statistical measures adopted for establishing instrument goodness in this study were reliability and sensitivity checks for the checklists.

1. **Reliability:** Three types of reliability checks were undertaken for these checklists.

a. Inter-rater reliability: This was carried out by administering these checklists on a sub-sample of 20 typically developing Kannada speaking children and subjecting them to repeat testing by two independent raters. The first rater was a speech-language pathologist and the second rater was a special educator. They were given training on administration and scoring of these checklists. These scores were compared to check for the inter-rater agreement. There was a high reliability between the two raters i.e., Cronbach's alpha value (>0.8 to 1) which is depicted in Table 3.4.

Table 3.4: *Inter-rater reliability (alpha value) for each of the domain considered*

Domain	Alpha value
Self help	0.95
Social-emotional	0.96
Motor	0.94
Sensory	0.92
Cognitive	0.87
Speech-language	0.88
Play	0.93
Pre-reading	0.86
Pre-writing	0.89
Pre-arithmetic	0.92

b. Correlation between items: The correlation between items in these checklists was estimated using the Spearman's rank correlation coefficient. This describes how much each item is correlated with the other items in the checklists. Table 3.5 shows the overall item to total correlation for each of the domains considered. Generally $p<0.05$ indicates that there is a significant correlation between the items. These findings indicate high correlation and confirm the homogeneity of the test item pool and the hierarchy of the developmental age allocations made for items included in the checklist.

Table 3.5: *Spearman's rank correlation coefficient for each of the domain considered*

Domain	Spearman correlation	Significant difference
Self help	0.26	0.039
Social-emotional	0.25	0.025
Motor	0.42	0.004
Cognitive	0.38	0.006
Sensory	0.46	0.001
Speech-language	0.30	0.034
Play	0.37	0.009
Pre-reading	0.33	0.016
Pre-writing	0.16	0.008
Pre-arithmetic	0.32	0.021

c. Test-retest reliability: The items on all the domains were re-administered on a randomly selected sub-sample of 20 typically developing Kannada speaking children after a period of 15 days from the date of initial administration. The obtained data was compared with the initial data on the same subjects. The results indicated that the average between the initial and the second administration was highly correlated. The total coefficient for all the items on these checklists within the same sample was found to be 0.83 ($p<0.05$).

Table 3.6: *Pearson's Product moment correlation coefficient for test-retest reliability for each of the domains considered*

Domain	*r*	't'
Self help	0.74	0.20
Social-emotional	0.88	0.15
Motor	0.68	0.25
Cognitive	0.91	0.14
Sensory	0.83	0.18
Speech-language	0.90	0.19
Play	0.79	0.22
Pre-reading	0.87	0.16
Pre-writing	0.93	0.13
Pre-arithmetic	0.85	0.16

2. **Sensitivity:** To accomplish the second aim of the study, viz. sensitivity assessment, activities to enhance the development of the items present in the checklists were prepared. A sample of 42 subjects with communication disorders {33 with hearing impairment (HI) and 9 with mental retardation (MR)} were tested on a home training program which consisted of the activities prepared from different domains for a duration of three months The steps carried out as a part of the sensitivity assessment are as follows:

Step 1: Development of an intervention module and an activity kit: An intervention module was developed separately for different domains, incorporating the items and activities in greater detail along with adequate pictures and illustrations. Simultaneously an activity kit was also developed which contained the materials necessary for training the domains mentioned in the intervention module.

Step 2: Formulation of baseline/progress charts: A progress chart for each domain incorporating all the items was prepared to assess the baseline and to monitor the rate of progress of the subjects selected objectively as well as descriptively during the sensitivity assessment at periodic intervals (see appendix II).

Step 3: Selection of subjects: Forty two subjects in the age group of 0-3 years with (HI) and (MR) were considered for the study. These children were selected from those attending the preschool program and the training clinic at All India Institute of Speech & Hearing, Mysore. Their parent's education, socio economic status and other variables were controlled. The details of the subjects are depicted in the Table 3.7:

Table 3.7: D*etails of subjects who were a part of the study on sensitivity assessment*

Age group in months	**Children with HI**		**Children with MR**	
	Male	**Female**	**Male**	**Female**
0-3	-	-	-	-
4-6	-	-	-	-
7-9	-	-	-	1
10-12	1	-	-	-
13-15	-	2	-	-
16-18	2	3	-	1
19-21	3	1	-	-
22-24	-	1	-	-
23-27	4	2	1	-
28-30	2	3	-	1
31-33	2	2	2	-
34-36	1	4	1	2
Total	**15**	**18**	**4**	**5**
Grand Total	**33**		**9**	

The children with HI had bilateral sensorineural loss and the children with MR had moderate and severe degree of retardation. The details of their severity are provided in the table below. All the children with HI wore bilateral behind the ear type of hearing aids.

Table 3.8: *Details regarding the severity of the problem*

Degree of impairment	Moderate	Moderately severe	Severe	Profound	Total
Children with HI	-	2	29	2	33
Children with MR	7	-	2	-	9

Step 4: Demographic data sheet: A data sheet was prepared to elicit the demographic information of the child, parents and other family members. This has been enclosed in appendix II.

Step 5: Baseline assessment: The standardized checklists were then administered on the subjects with HI & MR. The responses were rated as per the scoring pattern mentioned under standardization procedure and recorded on the baseline/progress sheet. When the subjects failed on five consecutive zeros (failures) the administration was terminated this was considered as the baseline of the subject. The baseline score of the subject was converted into percentage which was called as "baseline percentage".

$$\text{Baseline percentage} = \frac{\text{Total number of items the passed}}{\text{Total number of items from the first item to the item in the age group corresponding to the chronological age of the subject}} \times 100$$

If the baseline percentage was below 50% then the score was considered as below average; if the baseline percentage was between 50-75 % then the score was considered to be in average level. Home training program was given to subjects for a duration of three months who had below average and average scores.

Step 6: Training program: Those items on which the subjects obtained a score of 0.5 or 0 on the baseline assessment were given for training to each subject. The parents/caregivers were given a remediation program for a selected list of three domains and three items under each domain. Guidelines and activities were given to them from the intervention module to maintain uniformity in the techniques used for training across all the subjects. The parents/caregivers were trained in carrying out the activities mentioned in the intervention module. Supporting verbal and written guidelines were provided to them on the following:

- Items/objectives to train the subject and activities

- Methods/techniques to be followed while training
- Reinforcement strategies to be used
- Simple record keeping procedures to track progress
- Specific toys and teaching aids to be used

Periodic counseling to maintain their motivation in carrying out the activities on a regular basis was carried out for the parents involved in the training program. They were given follow up dates on a regular basis at the rate of at least one follow up in 2 weeks ranging for a period of three months to discuss issues regarding the activities carried out, the day to day progress, to clarify their queries etc. The progress and the achievements of each domain was recorded during every follow up along with the information on items not achieved or those that were inconsistently achieved (ongoing) for further training. Only when the subject achieved the specified number of item/objectives under the three domains in the first set, the second set was given for training. In a similar manner all the set of domains were given to each participant for training within the specified three months depending on the progress seen. The selection of domains for children with HI and MR for the sets was based on the delay seen, i.e., the delay (gap between the chronological age and the functional level) was maximum in the first set. The final assessment was carried out at the end of the intervening training period of three months to assess the overall progress made in all the domains. The below mentioned table depicts the sequence of domains selected for training.

Table 3.9: *Sequence of domains selected for training*

Sl. No.	Set given for training	Sequence of domain for subjects with HI	Sequence of domain for subjects with MR
1.	First set	Speech-language, cognitive and sensory (auditory)	Speech-language, cognitive and self-help
2.	Second set	Pre-reading, pre-writing, and pre-arithmetic	Motor, pre-reading, and pre-writing
3.	Third set	Self-help, social-emotional, sensory (other domain except auditory), motor and play	Pre-arithmetic, play, sensory and social-emotional

The checklists were re-administered at the end of three months to assess the improvement in the child. The pre and post-training scores obtained for each age group with respect to each domain were averaged. These were converted into percentage score using the mentioned above which was further subjected to statistical analysis using SPSS (version 10). Descriptive statistics to obtain mean and standard deviation was carried out. Wilcoxon Signed Ranks Test, a non-parametric test to examine whether there was a significant difference between the pre and post training means scores in all the domains was also carried out.

Results and Discussion

The main aim of the study was to develop intervention modules based on the already existing curriculum used in the preschool training center, AIISH to foster the development of various domains for children between 0-3 years. The intervention modules were developed for ten different domains and this was further subjected to sensitivity assessment on children with hearing impairment and mental retardation.

A few selected activities from each domain which were developed as a part of the intervention modules were given to these children as a training program depending on their baseline scores for a duration of three months. The checklists which were also developed as a part of the intervention module were administered twice on these children once before the training program (pre-training) and once after the training program (post-training) to assess the overall improvement seen in these children. The pre and post-training scores obtained for each age group with respect to each domain were averaged. The data was converted into percentage which was further subjected to statistical analysis using SPSS (version 10). Descriptive statistics to obtain mean and standard deviation was carried out. Wilcoxon Signed Ranks Test, a non-parametric test to examine whether there was a significant difference between the pre and post-training means scores in all the domains was also carried out.

The results are presented and discussed domain wise under the following sub headings:

1. Subjects with Hearing Impairment (HI)
2. Subjects with Mental Retardation (MR)

I. Subjects with Hearing impairment: Out of the 33 subjects with HI considered for the study, first set of domains viz. sensory (auditory), speech-language and cognitive were given to almost all the subjects for training. Almost all the children obtained poor scores on these domains and hence these domains were selected first for training. The other domains in the second and the third set could be given to lesser number of subjects because they could not complete either the first or the second set of domains due to the slow rate of progress seen which in turn could be attributed to the severity of the impairment. A few other children had already age-appropriate development in certain domains.

I. First set:

1. Sensory domain: The **s**ensory domain consisted of 3 subskills as indicated earlier viz. a) Auditory b) Visual c) Tactile, olfactory and gustatory. Amongst these subskills the auditory subskill was given the first preference as all the subjects with hearing impairment showed average or below average pre-training scores and it lays the foundation for the development of other domains.

Auditory subskill: The checklist was administered on 33 subjects with HI. Among them 23 subjects had below average (<50 %) scores and 10 subjects had average (50-75 %) scores in auditory subskill. Therefore age appropriate home training program was given to the parents/caregivers of all 33 subjects (1,2,5,4,1,6,5,4 and 5, subjects in 10-12, 13-15, 16-18, 19-21, 22-24, 25-27, 28-30, 31-33, 34-36 age groups respectively). Post-training scores were obtained by re-administering the checklist. Table 4.1 shows the mean and standard deviation w.r.t. the auditory subskill. A comparison of the data in the table revealed that the post-training mean was greater than the pre-training mean for all the age groups. The total pre-training mean was 31.74 and the post-training mean was 42.170.

Table 4.1: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to auditory subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
10-12	1	Mean	6.25	18.75
13-15	2	Mean	0.00	7.26
		SD	0.00	3.19
16-18	5	Mean	10.95	17.62
		SD	12.44	15.30
19-21	4	Mean	13.46	23.08
		SD	6.84	5.21
22-24	1	Mean	71.43	83.93
23-27	6	Mean	40.52	51.44
		SD	26.57	27.47
28-30	5	Mean	48.66	60.67
		SD	32.71	33.53
31-33	4	Mean	26.21	35.89
		SD	30.39	30.89
34-36	5	Mean	53.94	67.88
		SD	24.47	23.92
Total	**33**	**Mean**	**31.74**	**42.19**
		SD	**28.48**	**30.28**

The pre and post-training scores for auditory subskill is depicted in Figure 4.1. The mean values were subjected to Wilcoxon Signed Ranks Test, a non-parametric test to examine whether there was a significant difference between the pre and post-training means. The results revealed that the difference between pre-training and post-training mean was significant ($Z= 5.01$, $p<0.05$).

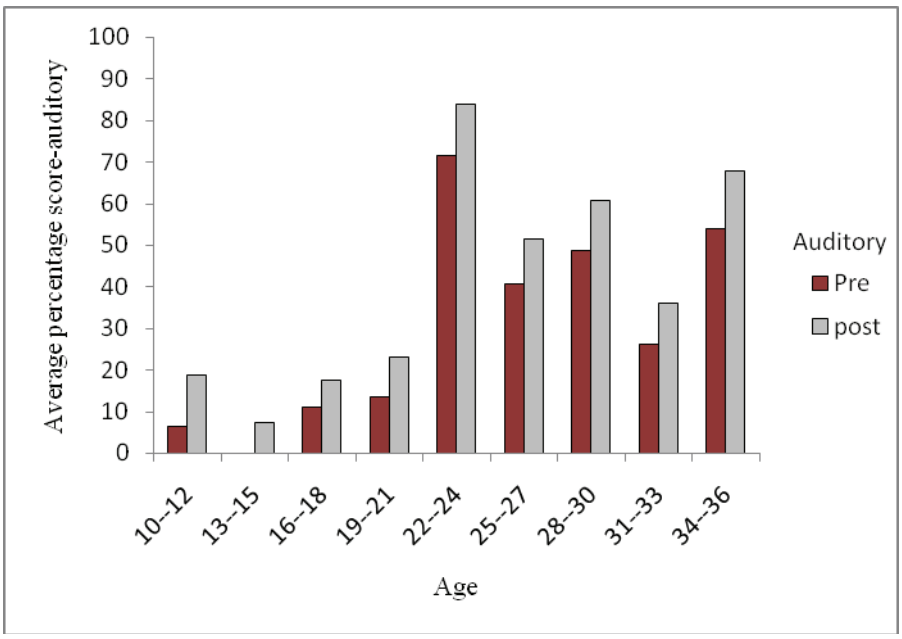


Figure 4.1: *Pre and post-training percentage scores of 33 subjects on auditory subskills.*

Auditory skills are vital in learning to speak and to comprehend speech. It is also essential for normal development in other domains such as cognitive, social, emotional, play, reading, writing etc. A hearing impairment can result in auditory deprivation which could inturn retard the development of these skills. Hence it is important to provide the children with a suitable amplification device and initiate auditory training at the earliest. The intervention module developed on training auditory skill incorporates training at different levels such as awareness, discrimination, and localization. It incorporates these subskills in a hierarchical manner in the order of development in the typically developing children. The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed. It was observed that some of the children were quick in learning the items and covered more number of

them during the training period, while some others were a little slow. This could be due to the individual differences in the children, differences with respect to the other domains, ability of the mother in understanding and executing the activities on their children, differences in the severity of the hearing impairment (2 had moderately severe, 2 had profound and 29 had severe hearing impairment), working status of the hearing aid (the hearing aid was not in working condition in some children and was given for repair), the health conditions of the child and the mother, the accessibility to AIISH (some were settled quite away from AIISH and therefore could not come for regular follow ups) etc.

2. **Speech and Language domain:** This domain consists of two subskills - comprehension and expression. For testing the sensitivity of the items/objectives in this domain, the checklist was administered on 33 HI subjects to check the baseline. Among them 24 subjects had below average (< 50 %) speech-language scores, 8 subjects had average scores (50-75 %) and one child had above average scores in comprehension. Hence age appropriate home training program was given to the parents/caregivers of 32 subjects in comprehension and all the 33 subjects in expression subskill (1,2,5,4,1,6,5,3 and 5, subjects in 10-12, 13-15, 16-18, 19-21, 22-24, 25-27, 28-30, 31-33, 34-36 age group and 1,2,5,4,1,6,5,4 and 5, subjects in 10-12, 13-15, 16-18, 19-21, 22-24, 25-27, 28-30, 31-33, 34-36 age group in comprehension and expression respectively). Post-training scores were obtained by re-administering the checklist. Tables 4.2 and 4.3 show the mean and standard deviation of the comprehension and expression subskill respectively. The results revealed that the post-training mean is greater than the pre-training mean for all the age groups for both comprehension and expression. The pre-training mean of the group for comprehension was 30.61 which increased to 38.98 after training for 3 months. The pre-training mean of the group for expression was 28.55 which significantly improved to 37.03. The pre and post-training scores for comprehension and expression is depicted in Figure 4.2 and Figure 4.3 respectively. Wilcoxon Signed Ranks Test revealed that the difference between pre-training and post-training mean for comprehension ($Z= 4.94$, $p<0.05$) and expression ($Z= 5.01$, $p<0.05$) was significant.

Table 4.2: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to comprehension subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post- training percentage
10-12	1	Mean	31.82	50.00
13-15	2	Mean	9.45	18.59
		SD	3.27	11.14
16-18	5	Mean	16.47	28.24
		SD	24.48	23.95
19-21	4	Mean	16.48	24.43
		SD	8.58	11.19
22-24	1	Mean	53.70	64.81
25-27	6	Mean	38.71	45.83
		SD	20.59	22.43
28-30	5	Mean	45.95	52.72
		SD	24.98	28.05
31-33	3	Mean	23.41	28.97
		SD	14.69	15.07
34-36	5	Mean	38.88	46.22
		SD	13.40	12.44
Total	**32**	**Mean**	**30.61**	**38.98**
		SD	**21.02**	**21.53**

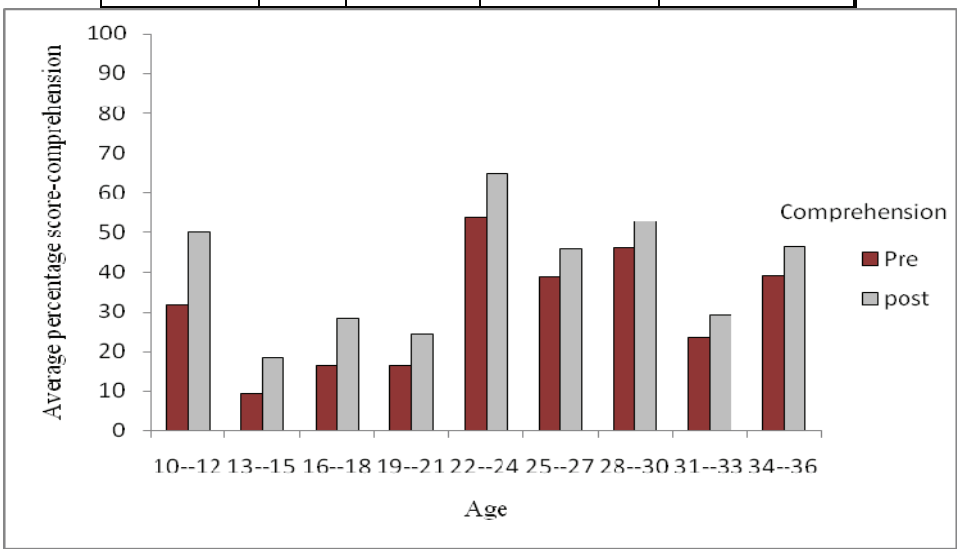


Figure: 4.2: *Pre and post-training percentage scores of 32 subjects on comprehension subskill.*

Table 4.3: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to expression subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
10-12	1	Mean	18.18	36.36
13-15	2	Mean	8.93	24.58
		SD	12.63	5.65
16-18	5	Mean	18.82	25.29
		SD	17.35	17.84
19-21	4	Mean	20.45	28.41
		SD	8.70	10.08
22-24	1	Mean	66.67	77.78
25-27	6	Mean	30.38	37.08
		SD	21.13	21.18
28-30	5	Mean	40.55	48.99
		SD	18.63	19.53
31-33	3	Mean	31.55	37.50
		SD	22.60	21.77
34-36	5	Mean	30.44	40.22
		SD	10.23	12.33
Total	**33**	**Mean**	**28.55**	**37.03**
		SD	**18.56**	**18.65**

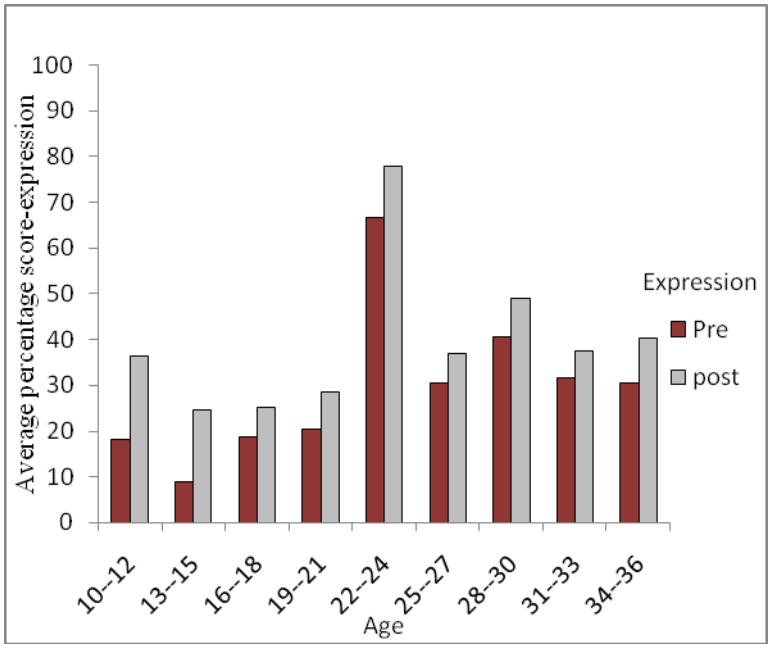


Figure 4.3: *Pre and post-training percentage scores of 33 subjects in expression subskill.*

The speech-language skill plays an important role in the communication of a particular individual with other fellow human beings. It helps the individual to function socially and enhances the development in other domains such as cognition, emotional, reading and writing. In children with hearing impairment as a result of auditory

deprivation, the development of speech and language skill is affected. The children may exhibit problems in the acquisition of phonology, semantics, morphology, syntax and pragmatics. Hence it is important to initiate training in speech and language skills at the earliest. The intervention module developed on training speech and language skill incorporates training at different levels such as phonology, semantics, morphology, syntax and pragmatics for comprehension and expression and to improve speech skills. It incorporates these subskills in a hierarchical manner in the order of development in the typically developing children. All the 33 children selected in this study had a speech and language problem except one child who had appropriate comprehension abilities. This could be because of the speech-language and listening therapy he was attending. The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve comprehension and expression. All the children selected for training in this skill showed significant improvements in comprehension and expression which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed. In general, it was observed that some of the children were quick in learning the items and covered more number of them during the training period, while some others were a little slow. This could be due to the individual differences in the children, differences with respect to the other domains, ability of the mother in understanding and executing the activities on their children, differences in the severity of the hearing impairment (2 had moderately severe, 2 had profound and 29 had severe hearing impairment), working status of the hearing aid (the hearing aid was not in working condition in some children and was given for repair), the accessibility to AIISH (some were settled quite away from AIISH and therefore could not come for regular follow ups) etc.

3. **Cognitive domain:** For testing the sensitivity of the items in this domain, the checklist was administered on 33 HI subjects to check the baseline. Among them one subject had below average score, 29 subjects had average scores (50-75%) and 3 subjects had above average scores. Hence age appropriate objectives were given as home training program to the parents/caregivers of 30 subjects (2, 5, 3, 1, 5, 5, 4, 5 subjects in 13-15, 16-18, 19-21, 22-24, 25-27, 28-30, 31-33, and 34-36 age groups respectively). Post-training scores were

obtained by re-administering the checklist. Table 4.4 depicts the mean and standard deviation for all the subjects considered w.r.t the cognitive domain. The results revealed that there was an increase in the post-training scores compared to the pre-training scores. The pre-training mean of the group was 66.50 and the post-training mean is 77.39. The pre and post-training scores for cognitive domain has been depicted in Figure 4.4. Wilcoxon Signed Ranks Test revealed that the difference between pre-training and post-training mean for cognition ($Z= 4.78$, $p<0.05$) was significant.

Cognition involves a wide range of mental processes such as attention, memory, reasoning, problem solving, classification, logical thinking etc. These cognitive processes are interrelated with one another rather than existing in isolation. Cognition underlies the development in all other domains as well. The development of cognitive processes are influenced by several internal and external factors. One such factor is the hearing impairment. An auditory deprivation could lead to a delayed development in cognition as seen in the majority of children who participated in this study. Amongst the 33 children, only three of them had appropriate cognitive skills. The two of them had lesser degrees of hearing impairment and one of them had attended started the intervention program early and therefore had attended longer duration of therapy sessions before participating in the study. Hence it is important to initiate training in cognitive skills along with the training in auditory and speech-language skills. The intervention module developed on training cognitive skill incorporates training for attention, cause-effect relationship, categorization, association, memory, problem solving, reasoning etc. at different levels. It incorporates these subskills in a hierarchical manner in the order of development in the typically developing children.

Table 4.4: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to cognitive domain (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
13-15	2	Mean	70.08	91.67
		SD	16.61	11.79
16-18	5	Mean	72.50	87.50
		SD	5.59	14.43
19-21	3	Mean	73.15	82.41
		SD	1.60	5.78
22-24	1	Mean	77.27	86.36
25-27	5	Mean	61.92	74.23
		SD	10.03	9.96
28-30	5	Mean	70.63	76.56
		SD	14.88	14.91
31-33	4	Mean	65.70	73.26
		SD	10.11	10.31
34-36	5	Mean	54.04	64.04
		SD	8.75	11.17
Total	**30**	**Mean**	**66.50**	**77.39**
		SD	**11.34**	**13.43**

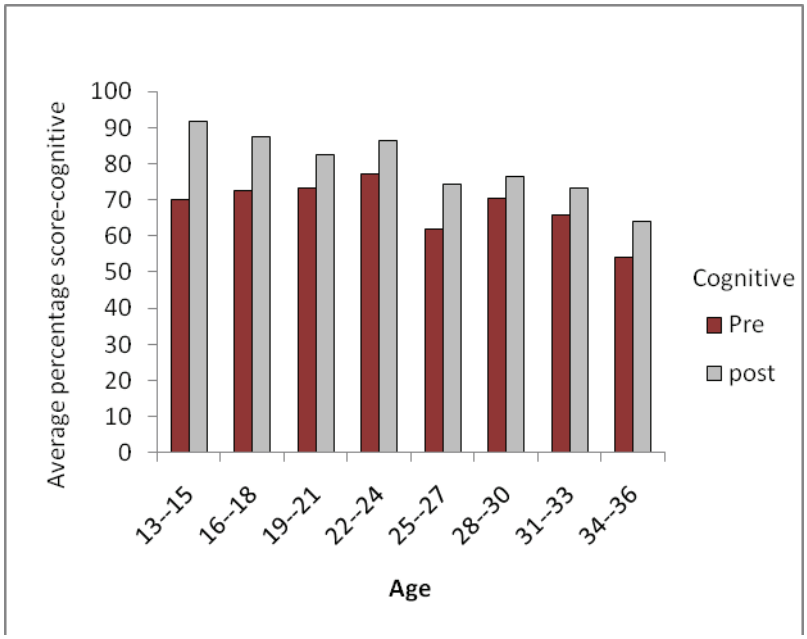


Figure 4.4: *Pre and post-training percentage scores of 30 subjects on the cognitive domain.*

The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve cognition. All the children selected for training in this skill showed significant improvements in cognition which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried

out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

II. Second set:

4. **Pre-reading domain:** The subjects who had below average (< 50 %) and average scores (50-75 %) were selected for training. The checklists were administered on 33 HI subjects to check the baseline. Eight subjects had below average scores, twenty subjects had average scores and five had above average scores in pre-reading domain. The parents/caregivers of 14 subjects in pre-reading domain (2,2,4,2 and 4 subjects in 16-18, 19-21, 22-24, 25-27, 28-30, 34-36 age groups respectively) were given a home training program. The remaining subjects could not be given a home training program since they did not complete their training in the first set. Post-training scores were obtained by re-administering the checklist. Table 4.5 depicts the mean and standard deviation of the subjects w.r.t. the pre-reading domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The mean of pre-reading domain was 48.65 (pre-training) and 58.47 (post-training). The pre and post- training scores for pre-reading domain is depicted in Figure 4.5. Wilcoxon Signed Ranks Test revealed that there was a significant difference between the pre and post training means ($Z=3.30$, $p<0.05$).

Table 4.5: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-reading domain (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
16-18	2	Mean	28.57	42.86
19-21	2	Mean	50.00	61.11
		SD	23.57	23.57
25-27	4	Mean	52.50	63.33
		SD	13.44	11.55
28-30	2	Mean	56.94	66.67
		SD	1.96	0.00
34-36	4	Mean	50.00	56.00
		SD	9.09	6.53
Total	**14**	**Mean**	**48.65**	**58.47**
		SD	**13.48**	**11.89**

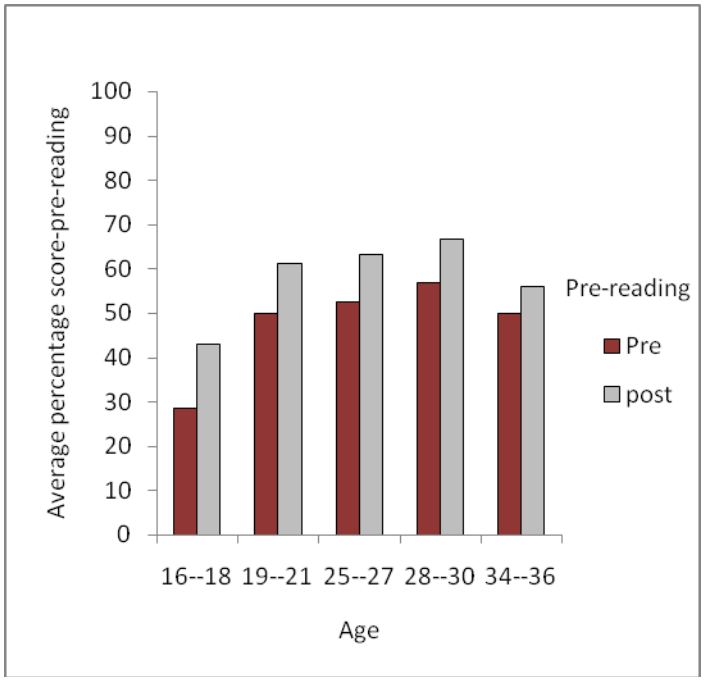


Figure 4.5: *Pre and post-training percentage scores of 14 subjects on the pre-reading domain.*

Reading is a complex cognitive process of decoding symbols for the intention of constructing or deriving meaning (reading comprehension). It is a means of language acquisition, of communication, and of sharing information and ideas. Like language, it is a complex interaction between the text and the reader which is shaped by the reader's prior knowledge, experiences, attitude, and language community which is culturally and socially situated. The reading process requires continuous practice, development, and refinement. Pre-reading skills is the beginning stage of acquiring reading skill and required in order to help them to become a good reader. Many of these skills are learnt naturally, during the

course of a normal childhood, at home and in the nursery/preschool environment. However in some situations it may be affected or a delay in development of pre-reading skill could be seen. One such condition is the presence of a hearing impairment in children. The auditory process are critical to developing phonological awareness and a host of other pre-reading skills. In the present study, amongst the 33 children selected, five children had age appropriate pre-reading abilities. However, all the other children had deficient pre-reading skill which was the reason for selecting this domain as the first for training amongst the second set of domains in the training program. Therefore it was important to initiate training in pre-reading skills along with the training in auditory, speech-language and cognitive skills. The intervention module developed on training pre-reading skill incorporates training for basic skills such as left to right eye movement, book holding skill, matching skill, developing interest in reading, distinguishing between books and toys etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children.

The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve pre-reading. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

5. **Pre-writing domain:** The checklists were administered on 33 HI subjects to check the baseline. Five subjects had below average scores, 14 had average scores, 14 had above average scores in pre-writing domain. The parents/caregivers of 10 subjects in pre-writing domain (1, 1, 1, 4, 2 and 1, subjects in 10-12, 22-24, 25-27, 28-30, 31-33, 34-36 age groups respectively) were given a home training program. The other subjects could not be given a home training program since they did not complete their training in the first set. Post-training scores were obtained by re-administering the checklist. Table 4.6 shows the mean and standard deviation wr.t to the pre-writing domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The mean pre-training scores of pre-writing domain showed an increase from 40.03 (pre-training) to 49.89 (post-training). The pre and post- training scores for pre-writing domain is depicted

in Figure 4.6. Wilcoxon Signed Ranks Test revealed that there was a significant difference between the pre and post training means ($Z= 2.80$, $p<0.05$).

Table 4.6: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-writing domain (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
10-12	1	Mean	16.67	41.67
22-24	1	Mean	40.00	50.00
25-27	1	Mean	50.00	57.14
28-30	4	Mean	52.94	61.76
		SD	14.99	16.11
31-33	2	Mean	38.75	45.00
		SD	26.52	28.28
34-36	1	Mean	4.35	13.04
Total	**10**	**Mean**	**40.03**	**49.89**
		SD	**20.99**	**20.19**

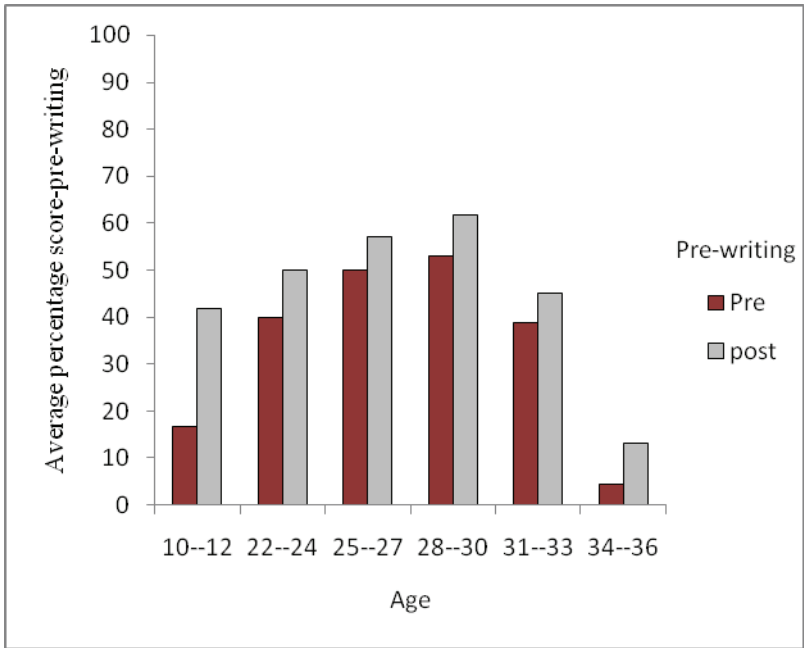


Figure 4.6: *Pre and post-training percentage scores of 10 subjects on the pre-writing domain.*

Pre-writing skill lays the foundation for the development of later writing skill. Children who gain a lot of practice in pre-writing skill, develop good and efficient writing skill. A hearing impairment could lead to a delay in the acquisition of writing skills in some children. Amongst the children selected for this study, 14 obtained above average pre-writing scores. However the remaining children had poor scores and therefore they were

given the activities in the intervention module according to their baseline levels. Reading and writing go hand in hand and therefore this was the next domain selected for training amongst the second set of domains. The intervention module developed on training pre-writing skill incorporates training for basic skills such as left to right eye movement, book holding skill, matching skill, developing interest in writing, tripod grasp, acquisition of drawing of strokes and curves etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children.

The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve pre-writing skill. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

6. **Pre-arithmetic domain:** The checklists were administered on 33 HI subjects to check the baseline. Eight subjects were in the age ranges which did not have pre-arithmetic domain objectives since the development of the skill starts at a later age, twelve subjects were below average, six subjects had average score and one had above average scores. The parents/caregivers of 22 subjects in pre-arithmetic domain (3,1,6,3,4,and 5 subjects in 19-21, 22-24, 25-27, 28-30, 31-33, 34-36 age group respectively) were given a home training program. Post-training scores were obtained by re-administering the checklist. Table 4.7 depicts the mean and standard deviation w.r.t to the pre-arithmetic domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The mean pre-training scores of pre-arithmetic domain showed an increase from 20.20 (pre-training) to 41.06 (post-training). The pre and post-training scores for pre-arithmetic domain is depicted in Figure 4.7. Wilcoxon Signed Ranks Test revealed that there was a significant difference between the pre and post training means ($Z=3.48$, $p<0.05$).

Table 4.7: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-arithmetic domain (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
19-21	3	Mean	0.00	66.67
		SD	0.00	28.87
22-24	1	Mean	50.00	100.00
25-27	6	Mean	20.83	29.17
		SD	34.86	20.92
28-30	3	Mean	3.70	20.74
		SD	6.42	1.28
31-33	4	Mean	29.55	43.18
		SD	27.15	31.82
34-36	5	Mean	28.00	38.67
		SD	29.87	26.52
Total	**22**	**Mean**	**20.20**	**41.06**
		SD	**27.19**	**28.69**

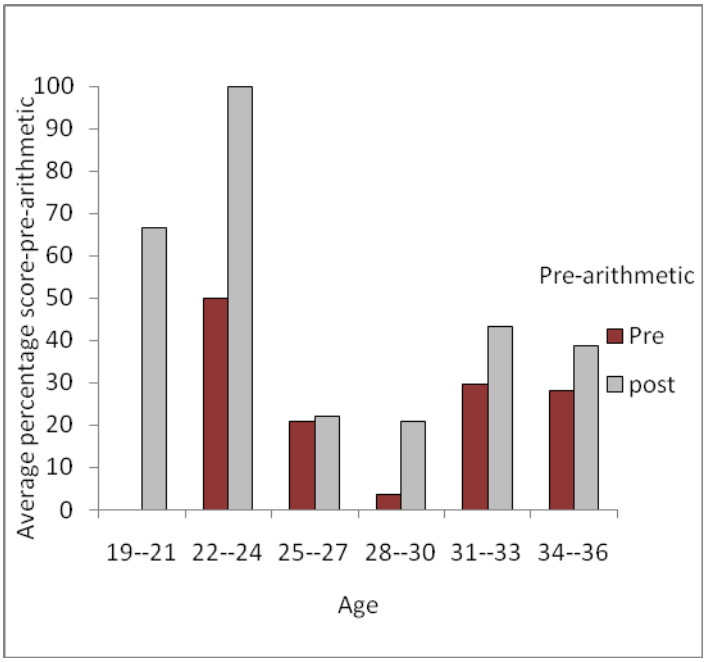


Figure 4.7: *Pre and post-training percentage scores of 22 subjects on the pre-arithmetic skill.*

Pre-arithmetic domain is one of the academic domains which is essential for the acquisition of arithmetic ability. These vital early childhood skills include learning to count numbers, learning the proper sequencing of numbers, learning to determine which shapes are bigger or smaller, and learning to count objects on a screen or book. Pre-arithmetic

skills are also tied into reading and writing skills to learn the correct pronunciations and writing of numbers. Eventually, all the pre-academic skills including pre-reading, pre-writing and pre-arithmetic skills will lead to a strong foundation of early science skills. Pre-arithmetic skill also helps children develop critical thinking and problem-solving skills. However, this skill can get affected in children with hearing impairment and intervention is essential in order to develop this skill in the children. In the present study, amongst the 25 children, 18 had poor pre-arithmetic skills and only one had adequate abilities. Hence this domain was also considered important in training and was given priority after the pre-writing skill. The intervention module developed on training pre-arithmetic skill incorporates training for basic skills such as grouping, recognizing shapes and patterns, estimating the quantity and weight, skill, etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children.

The parents were provided with suitable activities for their children according to their baseline levels to improve pre-arithmetic skill. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

III. Third set:

7. **Self help domain**: This domain consists of four subskills - feeding, dressing, toileting and personal hygiene. The subskills which had below average (<50%) and average scores (50-75%) were selected for training. In feeding one subject had obtained average scores and all the other subjects had above average scores. In dressing subskill six subjects had average scores, six were in the age range which does not have dressing subskill items and rest all subjects had above average scores. In toileting subskill three subjects had below average scores, 7 had average scores, 8 were in the age range which does not have toileting subskill objectives and 15 had above average scores. Among them the parent/caregiver of one subject in feeding subskill of 27-30 age group, 5 subjects in dressing subskill (one subject in each 13-15, 16-18, 19-21, 22-24, 25-27 age group respectively), 4 subjects in toileting subskill (one subject in 19-21, 25-27, 28-30, 31-33 age group respectively) and 9 subjects in personal hygiene subskill (2,1,5,1, subjects in 19-21, 22-24, 25-27, 28-30, age groups

respectively) were given home training program. The other subjects were yet to complete the previous set of training program. The post-training scores were obtained by re-administering the checklist. Tables 4.8, 4.9, 4.10 & 4.11 show the mean and standard deviation w.r.t. the self-help domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The pre-training mean of feeding subskill was 92.50 and the post-training mean was 100.00. Likewise the pre-training mean scores of dressing subskill, toileting subskill, and personal hygiene subskill showed an increase 20.98, 32.83, 1.600 and 20.17 (pre-training) to 82.38, 59.17 and 56.82 (post-training) respectively. The pre and post- training scores for dressing, toileting and personal hygiene subskills are depicted in Figures 4.8, 4.9 and 4.10 respectively. It is also observed that most of the children with hearing impairment did not have much difficulty in learning self-help domain. Wilcoxon Signed Ranks Test revealed that was a significant difference between the pre and post-training means for dressing ($Z=2.03$, $p<0.05$) and personal hygiene ($Z= 2.68$, $p<0.05$).

Wilcoxon Signed Ranks Test was not performed for feeding subskill due to the small sample size. The Wilcoxon Signed Ranks test performed on toileting subskill showed insignificant values. This could be attributed to the lack of sufficient training given by the mothers because of their ill health. Though the “z” value is insignificant there is an improvement in the individual pre to post values indicating that the activities and method of training are adequate.

Table 4.8: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to feeding subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
28-30	1	Mean	92.50	100.00

Table 4.9: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to dressing subskill (N indicates the number of children)*

Age Group	N		Pre-training percentage	Post-training percentage
13-15	1	Mean	33.33	66.67
16-18	1	Mean	50.00	66.67
19-21	1	Mean	80.00	100.00
22-24	1	Mean	83.33	100.00
25-27	1	Mean	57.14	78.57
Total	**5**	**Mean**	**60.76**	**82.38**
		SD	**20.98**	**16.80**

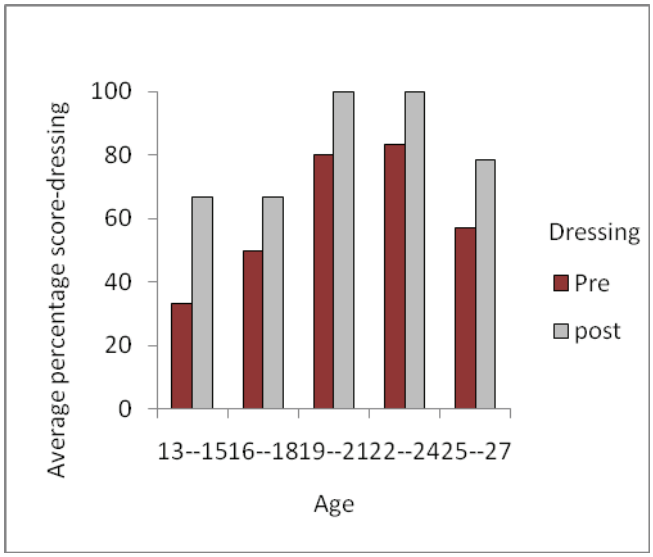


Figure 4.8: *Pre and post-training percentage scores of 5 subjects on the dressing subskill.*

Table 4.10: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to toileting subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
19-21	1	Mean	0.00	50.00
25-27	1	Mean	33.33	50.00
28-30	1	Mean	48.00	70.00
31-33	1	Mean	50.00	66.67
Total	**4**	**Mean**	**32.83**	**59.17**
		SD	**23.12**	**10.67**

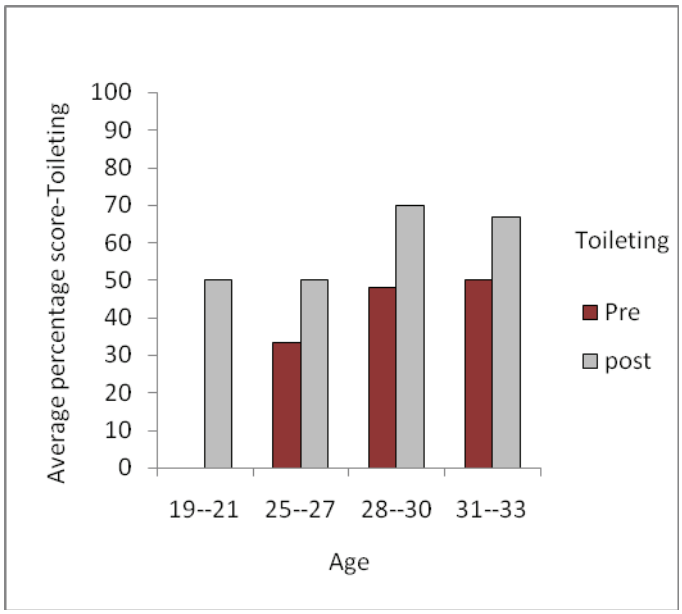


Figure 4.9: *Pre and post-training percentage scores of 4 subjects on the toileting subskill.*

Table 4.11: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to personal hygiene subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
19-21	**2**	Mean	25.00	62.50
		SD	35.36	17.68
22-24	1	Mean	50.00	60.00
25-27	5	Mean	40.67	51.00
		SD	17.02	15.97
28-30	1	Mean	57.14	71.43
Total	**9**	**Mean**	**40.05**	**56.83**
		SD	**20.17**	**14.96**

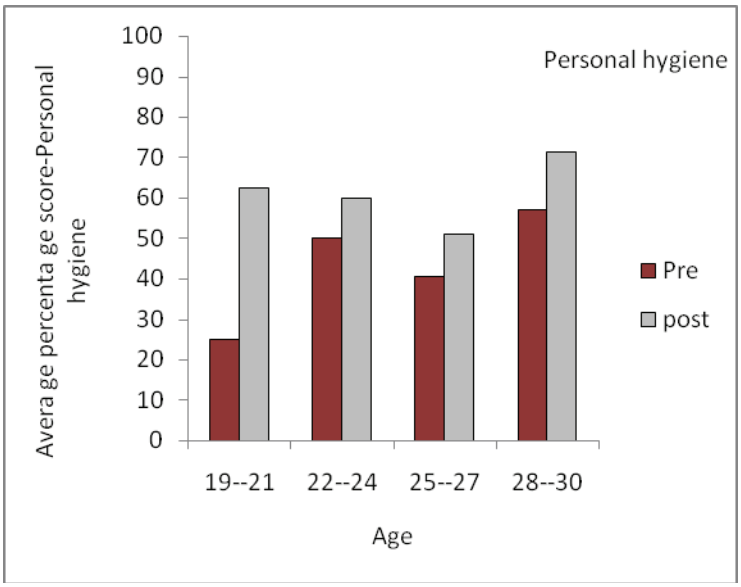


Figure 4.10: *Pre and post-training percentage scores of 9 subjects on the personal hygiene subskill.*

Self-help skills are those skills that help a child gain control over his/her body over time. These include feeding, brushing, toileting, dressing etc. These skills are needed to take care of one's own needs. Young children with different disabilities often demonstrate delays in multiple areas of development. Because of these delays, they may need additional help with skills that other children acquire easily and naturally. It is important that self-help skills should be a focus during the preschool years so as to enable the child in becoming independent and well accepted in the society. In the present study, some children did have deficient self-help skills. However only a few could be given the training program under each subskill as mentioned above. The intervention module developed on training self-help skill incorporates training for basic skills listed above. It

incorporates these items in a hierarchical manner in the order of development in the typically developing children.

The parents were provided with suitable activities for their children according to their baseline levels to improve self-help skill. All the children selected for training in this skill showed an improvement in all the subskills which indicated that they responded positively to the activities mentioned in the intervention module. With respect to the dressing and personal hygiene training, there was a significant improvement as per the Wilcoxon's test probably because of the greater number of subjects considered for training. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

8. **Social-Emotional domain:** This domain consists of two subskills - social and emotional. These checklists were administered on 33 HI subjects to check the baseline. In the social subskill, five subjects had below average score and all other subjects had above average scores. In the emotional subskill, one subject had average scores and all other subjects had above average scores. The parents/caregivers of all the five subjects (1, 3, 1 subjects in 22-24, 25-27, 28-30 age groups respectively) in the social subskill and one subject in the emotional subskill were given the training program. The post-training scores for social and emotional subskills were obtained by re-administering the checklist. Tables 4.12 and 4.13 depict the mean and standard deviation w.r.t the socio-emotional domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores (i.e. from 74.79 to 81.61 for social subskill and 90.05 to 98.50 in the emotional subskill). The improvement seen in pre-training scores for the social subskill is depicted in Figure 4.11. These subskills were considered for the subjects who completed the first training set successfully. Wilcoxon Signed Ranks Test revealed a significant difference between the pre and post- training means for the social subskill ($Z= 2.03$, $p<0.05$). The same could not be done for the emotional subskill due to small sample size.

Table 4.12: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to social subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
22-24	1	Mean	80.00	88.00
25-27	3	Mean	71.79	76.92
		SD	8.01	7.69
28-30	1	Mean	78.57	89.29
Total	**5**	**Mean**	**74.79**	**81.61**
		SD	**7.01**	**8.43**

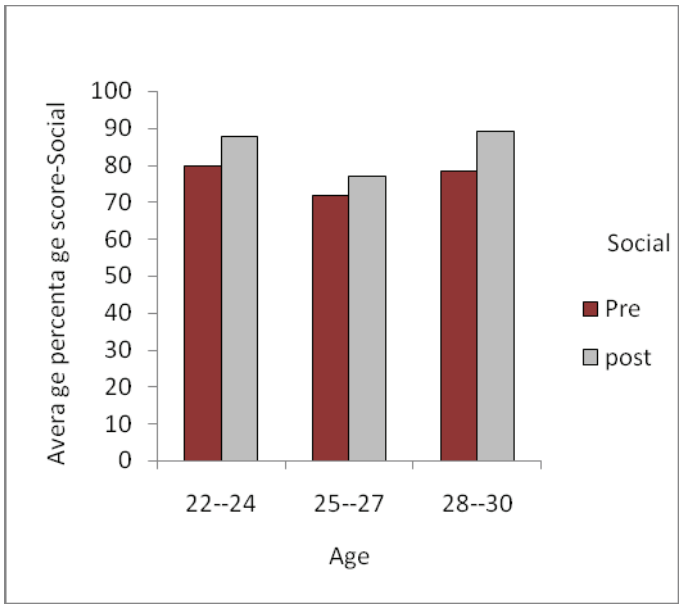


Figure 4.11: *Pre and post-training percentage scores of 5 subjects on the social subskill.*

Table 4.13: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to emotional subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
28-30	1	Mean	90.50	98.50

Socio-emotional development refers to the child's ability to interact with others, including helping themselves and self-control. Examples of this type of development would include: a six-week-old baby smiling, a ten-month-old baby waving bye-bye, or a five-year-old boy knowing how to take turns in games at school. Training in socio-emotional skills can benefit any child, especially children afflicted with various communication disorders. Effective socio-emotional skills are the key to success in adult life where these skills are an important part of achieving success in a career. A major goal of social skills training is teaching persons about the verbal as well as nonverbal behaviors involved in social interactions. Social skills training helps children to learn to interpret the social signals, so that they can determine how to act appropriately in the company of other people in a variety of different situations. Another goal of social skills training is improving a patient's ability to function in everyday social situations. A person who lacks certain social skills may have great difficulty building a network of supportive friends and acquaintances as he or she grows older, and may become socially isolated. Moreover, one of the consequences of loneliness is an increased risk of developing emotional problems or mental disorders.

Hence it is essential that every child, especially those with communication disorders be trained in these skills. The intervention module developed on training socio-emotional skill incorporates training for basic skills listed above. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only five subjects and one subject could be given the training program on social and emotional skills respectively since the others could not complete the previous set of the training program. The parents were provided with suitable activities for their children according to their baseline levels to improve socio-emotional skill. All the children selected for training in this skill showed an improvement in which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

9. **Visual subskill (Sensory domain):** For testing the sensitivity of the items in this subskill, the checklist was administered on 33 HI children to check the baseline. Five subjects had average scores. Among them the parents/caregivers of 4 subjects (1, 1 and 2 subjects in 25-27, 31-33, 34-36 age groups respectively) were given training program, one subject was not given home training program as the subject was yet to complete the previous set. Post training scores were obtained by re-administering the checklist. Table 4.14 depicts the mean and standard deviation w.r.t. the visual subskill. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The pre-training mean of the group was 65.21 which significantly improved to 69.66. The pre and post-training scores for the visual subskill is depicted in Figure 4.12. Wilcoxon Signed Ranks performed on visual subskill revealed that the difference between pre and post-training mean was not significant ($Z=1.83$, $p>0.05$).

Table 4.14: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to visual subskill (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
25-27	1	Mean	68.18	72.73
31-33	1	Mean	76.00	80.00
34-36	2	Mean	58.33	62.96
		SD	3.93	5.24
Total	**4**	**Mean**	**65.21**	**69.66**
		SD	**8.86**	**8.82**

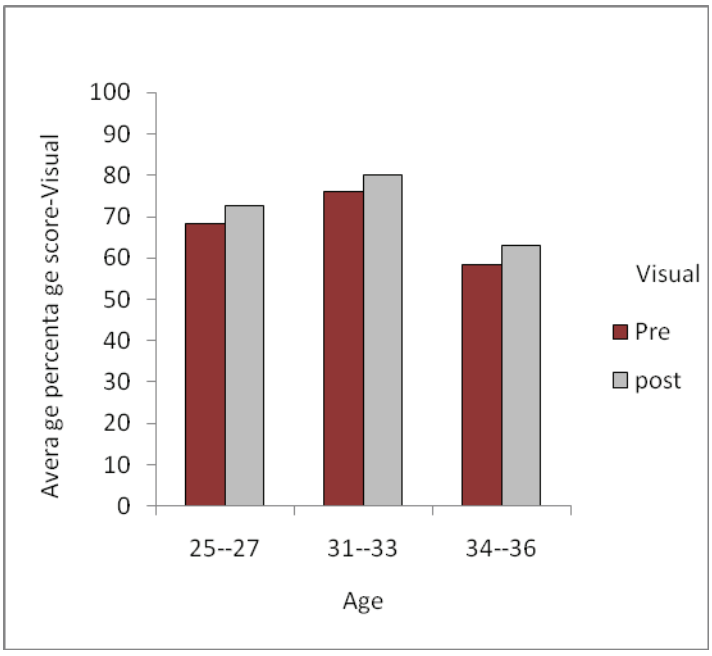


Figure 4.12: *Pre and post-training percentage scores of 4 subjects on the visual subskill.*

Visual skill, which is a part of the sensory skill is the ability to identify, interpret and understand what is seen. This skill can be trained and developed. Visual skill is the key to the development in all the other domains as well. Visual skills include awareness, discrimination, tracking, scanning, eye gaze, figure ground differences etc. This skill plays a very important role in the development of reading and writing. The aims of a visual training program are to encourage and help each individual make best use of their vision and to provide a variety and number of opportunities for the individual to learn about and understand their environment. Accordingly an intervention module was developed on training visual skill which incorporates training for basic skills listed above. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only four subjects could be given the training program on visual skills. The parents were provided with suitable activities for their children according to

their baseline levels to improve visual skill. Although the Wilcoxon test did not reveal a significant difference between the pre-training and the post-training score, all the children selected for training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The lack of significant difference could have been because of the reduced sample size. Moreover the training carried out by the mother of one subject was intermittent due to ill health of the child. Though the "z" value is insignificant, there is an improvement in the individual pre to post values indicating that the activities and method of training were adequate and sensitive. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

10. **Motor domain**: The motor domain consists of two subskills - gross motor subskill and fine motor subskill. These domains were considered for the subjects who completed the first and second training set successfully. Of the 33 subjects with hearing impairment, in gross motor subskill one subject had average score and the rest of them had above average score. In fine motor subskill three subjects had average scores and rest of the subjects had above average scores. Thus, in gross motor subskill only one subject (one subject in 25-27 age group) was given the training program and in fine motor subskill two subjects one in each 19-21 and 25-27 age groups) were given training program. The other subject was still continuing the previous set of domains as home training. The post-training scores were obtained by re-administering the checklist. The mean and standard deviation w.r.t this domain has been depicted in Tables 4.15 and 4.16 for gross and fine motor subskill respectively. There was an increase in the post-training scores when compared to the pre-training scores for both gross and fine motor subskill. The improvements seen in pre and post-training scores for fine motor subskill is depicted in Figure 13. Due to the small sample size, the Wilcoxon Signed Ranks Test was not performed on the gross and fine motor subskill**.** Though the "z" value could not be computed, it can be seen from the mean scores that there was an improvement in the individuals' pre to post-training values indicating that the activities and method of training were adequate and sensitive.

Table 4.15: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to gross motor subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
25-27	1	Mean	93.55	100.00

Table 4.16: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to fine motor subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post- training percentage
19-21	1	Mean	90.48	95.00
25-27	1	Mean	87.04	95.92
Total	**2**	**Mean**	**88.76**	**95.46**
		SD	**2.43**	**0.65**

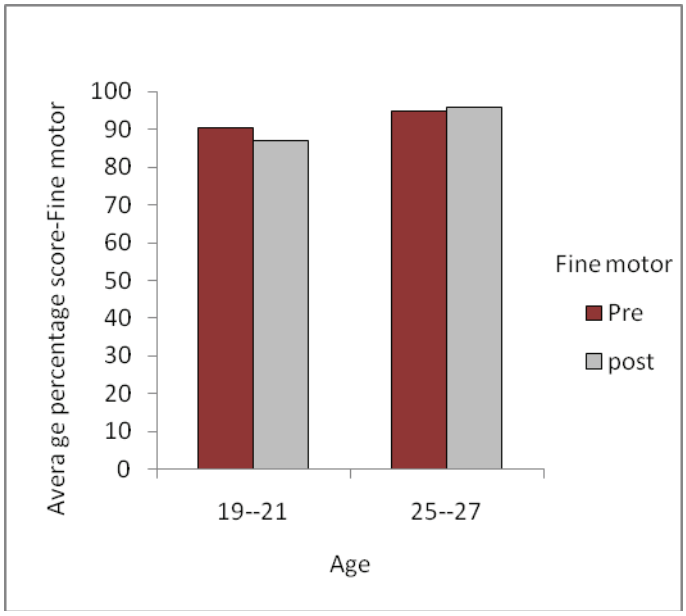


Figure 4.13: *Pre and post-training percentage scores of 2 subjects on the fine motor subskill.*

A motor skill is a learned sequence of movements that combine to produce a smooth, efficient action in order to master a particular task. In general motor skills are classified into two types: Gross motor and fine motor skill. Gross motor skills are larger movements that a child makes with his arms, legs, or feet, or his entire body, for e.g., crawling, running and jumping are gross motor skills. Fine motor skills are smaller actions. When the child picks things up between his finger and thumb or wriggles his toes in the sand he's using his fine motor skills. Motor skills are very essential for carrying out the activities of daily living so that the child can function independently in the society. Therefore it is imperative that training be carried out to improve motor skills. Accordingly an intervention module was developed on training motor skill which incorporated training

for basic gross and fine motor skills. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only one two subjects could be given the training program on gross and fine motor skill respectively. The parents were provided with suitable activities for their children according to their baseline levels to improve motor skill. All the children selected for training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

11. **Tactile, olfactory and gustatory subskill:** For testing the sensitivity of the items in these subskills, the checklist was administered on 33 HI subjects to check the baseline. Among them 14 subjects had below average scores and 19 subjects had average scores. Only parents/caregivers of subjects two were given the training program (one in each 19-21 and 25-27 age groups respectively) because the other subjects were yet to complete the previous set of training program. Post-training scores were obtained by re-administering the checklist. The means and standard deviation w.r.t. these subskills have been depicted in Table 4.17. The results revealed that there was an increase in the post training scores when compared to the pre-training scores. The pre-training mean of the group was 62.91 which enhanced to 68.54. Due to the small sample size, the Wilcoxon Signed Ranks Test was not performed in this domain. Though the “z” value could not be computed, it can be seen from the mean values that there was an improvement in the individual pre to post values indicating that the activities and method of training were adequate and sensitive.

Table 4.17: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to tactile, olfactory and gustatory subskills (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
19-21	1	Mean	61.54	69.23
25-27	1	Mean	64.29	67.86
Total	**2**	**Mean**	**62.91**	**68.54**
		SD	**1.94**	**0.97**

Tactile, olfactory and gustatory subskills are a part of the sensory skill which conveys information about touch, smell and taste sense. Training in these skills is essential especially in children with communication disorders. Some children may not be able to discriminate these senses which could be a result of a sensory dysfunction. Accordingly an intervention module was developed on training these skills which incorporated training for basic tactile, olfactory and gustatory subskills. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only two subjects could be given the training program on these skills. The parents were provided with suitable activities for their children according to their baseline levels. All the children selected for training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

12. **Play domain**: For testing the sensitivity of the items/objectives in this domain, the checklist was administered on 33 HI subjects to check the baseline. Among them one subject in 16-18 age group was below average level (<50%) and five subjects had average scores. Age appropriate home training program was given only to the parent/caregiver of one child with below average scores as the other five subjects in average range were yet to complete the previous set of training program. As play domain was given for training in the last set not all subjects could complete the previous sets and reach the last set in the stipulated time period of three months except one subject. Post-training scores were obtained by re-administering the checklist. Table 4.18 depicts the mean and standard deviation w.r..t this domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The pre-training mean was 20.00

which enhanced to 40.00. Due to the reduced sample size, Wilcoxon Signed Ranks Test could not be carried out in play domain. Though the "z" value could not be computed there was an improvement in the pre to post values indicating that the activities and method of training to be adequate.

Table 4.18: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to play domain (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
16-18	1	Mean	20.00	40.00

Play is considered to be one of the primary needs of the child - as vital as love, food, care and hope. As early as infancy, children immerse themselves in play activities with the purpose of exploring their environment and making sense of the world around them. Play is a human activity that blends cognitive, social, emotional, linguistic, and motor components and combines both action and thought. Play is integral to the academic environment enhancing children's learning readiness, learning behaviors, and problem-solving skills. Play develops along ordinal levels that range from early sensorimotor–exploratory and adaptive interactions with objects to fairly elaborated scripted sequences of events. As children develop, their play becomes more complex and flexible as well as more generalized and symbolic. In children with communication disorders their play skills may be affected due to lack of development in the other domains. Hence it is important to teach these skills. Accordingly an intervention module was developed on training play skill. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. The training program could be given only to one subject. The parent was provided with suitable activities for the child according to his baseline level. The child selected for training in this skill showed an improvement which indicated that he responded positively to the activities mentioned in the intervention module. The parent was also satisfied with the detailed assessments carried out and the activities provided.

Table 4.19 summarizes the results obtained in children with hearing impairment. This table depicts the domains given for training to the children with hearing impairment and the results of the statistical analysis. The pre and post-training scores in percentages in children with HI is depicted in the Figure 4.14.

Table 4.19: *Pre and post- training mean scores in percentages, standard deviation (SD) and the results of the Wilcoxon test in children with HI*

Sl. No.	Domains and subskills	No. of subjects (baseline)	Pre training scores (%)		No of subjects given training	Post training scores (%)		/Z/ Value
			Mean	SD		Mean	SD	
1a	Sensory-Auditory	33	31.73	28.47	33	42.20	30.28	5.01*
2a	Language-Comprehension	33	30.61	21.01	32	38.98	21.52	4.94*
2b	Language-Expression	33	28.55	18.56	33	37.02	18.65	5.05*
3	Cognitive	33	66.50	11.44	30	77.38	13.42	4.78*
4	Pre-reading	33	48.64	13.48	14	58.47	11.89	3.30*
5	Pre writing	33	40.03	20.99	10	49.89	20.18	2.80*
6	Pre arithmetic	33	20.19	27.18	22	41.06	28.69	3.48*
7a	Self-help-Dressing	33	60.76	20.98	5	82.30	16.82	2.03*
7b	Self-help-Toileting	33	32.83	23.10	4	59.17	59.17	1.84
7c	Self-help-Personal hygiene	33	40.05	20.17	9	56.82	14.96	2.68*
8	Social	33	74.79	7.01	5	81.61	8.42	2.03*
9	Sensory-Visual	33	65.21	8.85	4	69.66	8.82	1.83

[*p< 0.05]

SA- Sensory-Auditory
SV- Sensory-Visual
LC- Language – Comprehension
LE- Language – Expression
C- Cognitive
PR- Pre- reading
PW- Pre- writing
PA- Pre-arithmetic
SHD- Self- Help Dressing
SHT- Self- Help Toileting
SHPH– Self - Help Personal hygiene
S- Social

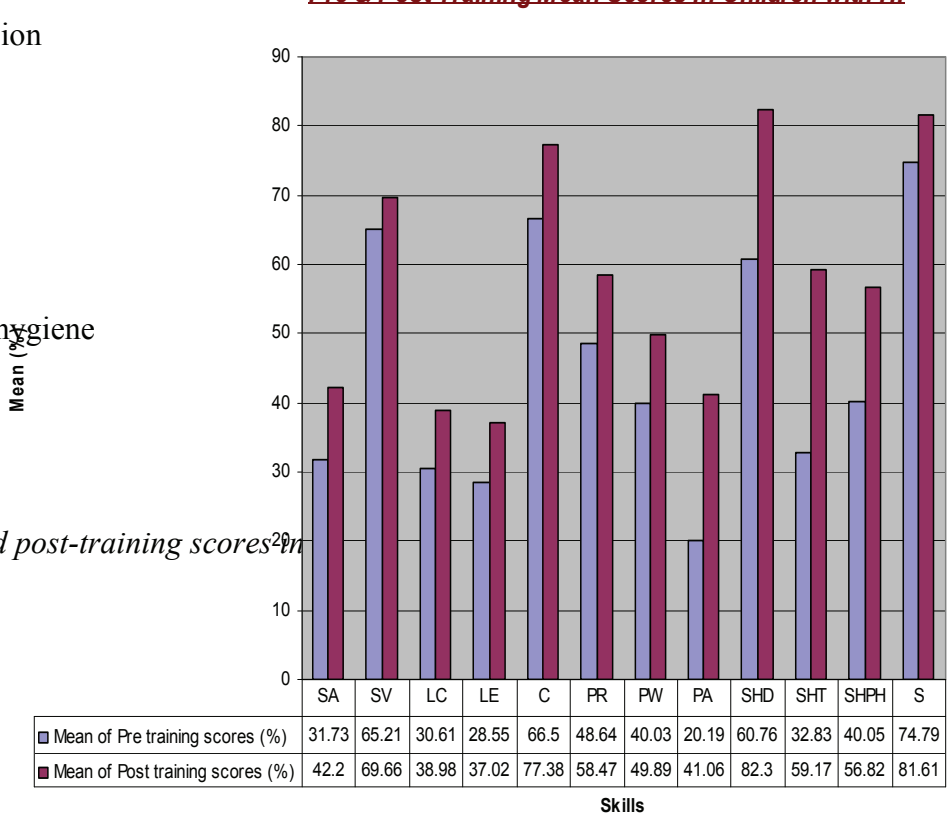


Figure 4.14: *Pre and post-training scores in*

To sum, the results indicated that there was an overall improvement in all the children with HI for the domains mentioned in the above table. This is evident when a comparison is made between their pre-training and their post-training percentages. The post-training mean percentages are greater than the pre-training mean percentages. This indicated that the children in all age groups responded positively to the activities given to them for training under the specified domains. The results of the Wilcoxon test revealed that there was a significant improvement in the children with respect to all the domains except the toileting subskill under the self-help domain and the visual subskill under the sensory domain. This could have occurred because of the smaller sample size considered for the study under these subskills. The training program for the other domains not mentioned in the table (emotional, motor, play, feeding and sensory including tactile, olfactory and gustatory) were given for training to a smaller number of children because they could not complete the previous set of training program and moreover only a small number of children showed deficits in these areas. Hence Wilcoxon test could not be administered, although their post-training mean were greater than their pre-training means, which indicated that the children did respond positively to the activities.

Further, the information collected during the periodic follow up of clients during the training period suggested the possibility of influence of some factors such as individual differences in the children, differences with respect to the other domains, ability of the mother in understanding and executing the activities on their children, differences in the severity of the hearing impairment (2 had moderately severe, 2 had profound and 29 had severe hearing impairment), working status of the hearing aid (the hearing aid was not in working condition in some children and was given for repair), the health conditions of the child and the mother, the accessibility to AIISH (some were settled quite away from AIISH and therefore could not come for regular follow ups) etc.

II. Subjects with mental retardation:

A baseline was taken for 9 subjects with mental retardation (MR) using the checklists. It was found that in the maximum number of children with mental retardation, performances in almost all the domains were affected. The domains which were affected maximally in all the subjects were:- speech-language, cognitive, self-help, motor and pre-academic domains including pre-reading, pre-writing and pre-arithmetic subskills. Hence speech-language, cognitive and self-help domains were selected for the first set of the training program. Subjects who could complete the first set successfully, were given the second set of training program which consisted of motor, pre-reading and pre-writing domain. The subjects who achieved all the objectives in the second set were give third set of training program which included pre-arithmetic, play sensory and social-emotional domain.

I. First set:

1. **Speech and Language domain:** This domain consists of two subskills - comprehension and expression. For testing the sensitivity of the objectives in this domain, initially the checklist was administered on 9 subjects with MR to assess the baseline. Among them all the 9 subjects (one in each 7-9, 16-18, 25-27, 28-30, 2 subjects in 31-33 and 3 subjects in 34-36 age groups respectively) had below average expression scores and 9 subjects (one in each 16-18, 25-27, 28-30, 31-33 and 5 subjects in 34-36 age groups respectively) had below average comprehension scores. Therefore age appropriate activities were given to the parents/caregivers of all the subjects. Post-training scores were obtained by re-administering the checklist. Table 4.20 and 4.21 depicts the mean and standard deviation w.r.t the comprehension and expression skill. On comparison of the data, the results revealed that the post-training scores of comprehension and expression of these subjects

were greater than the pre-training scores. The mean of the group for comprehension was 12.78 (pre-training) which increased to 22.16 (post-training). The mean of the group for expression was 24.71 (pre-training) which increased to 30.99 (post-training). The improvement seen in pre-training scores for comprehension and expression has been depicted in Figure 4.15 and 4.16 respectively. A non-parametric test, Wilcoxon Signed Ranks Test was performed to find out if there was a significant difference between the pre and post-training means. The results revealed that the difference between pre-training and post-training mean was significant for both comprehension ($Z=2.37$, $p < 0.005$) and expression ($Z= 2.67$, $p < 0.005$) subskills.

Table 4.20: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to speech-language domain (comprehension subskill) (N indicates the number of children)*

Age group	**N**		**Pre-training percentage**	**Post-training percentage**
7-9	1	Mean	0.00	25.00
16-18	1	Mean	11.36	25.00
25-27	1	Mean	6.25	9.37
28-30	1	Mean	5.26	13.15
31-33	2	Mean	24.40	35.71
		SD	0.84	6.73
34-36	3	Mean	14.4	18.51
		SD	4.84	4.62
Total	**9**	**Mean**	**12.78**	**22.16**
		SD	**8.59**	**9.72**

Table 4.21: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to speech-language domain (expression subskill) (N indicates the number of children)*

Age Group	N		Pre-training percentage	Post-training percentage
7-9	1	Mean	0.00	20.00
16-18	1	Mean	31.81	45.45
25-27	1	Mean	31.25	34.37
28-30	1	Mean	15.78	19.73
31-33	2	Mean	28.57	44.04
34-36	3	Mean	21.85	24.44
		SD	4.20	3.84
Total	**9**	**Mean**	**24.71**	**30.99**
		SD	**6.42**	**10.61**

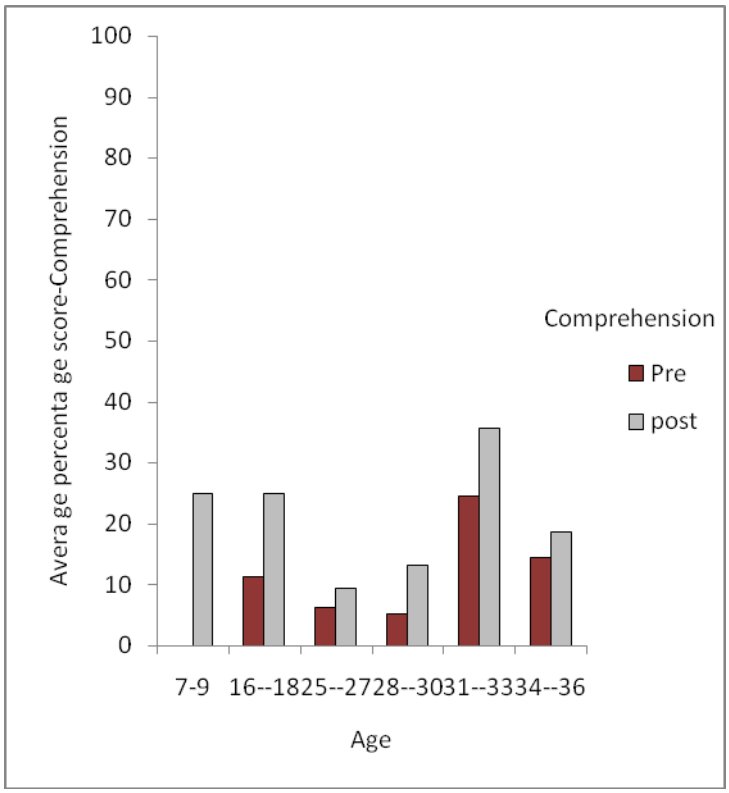


Figure 4.15: *Pre and post-training percentage scores in 9 subjects on comprehension subskill.*

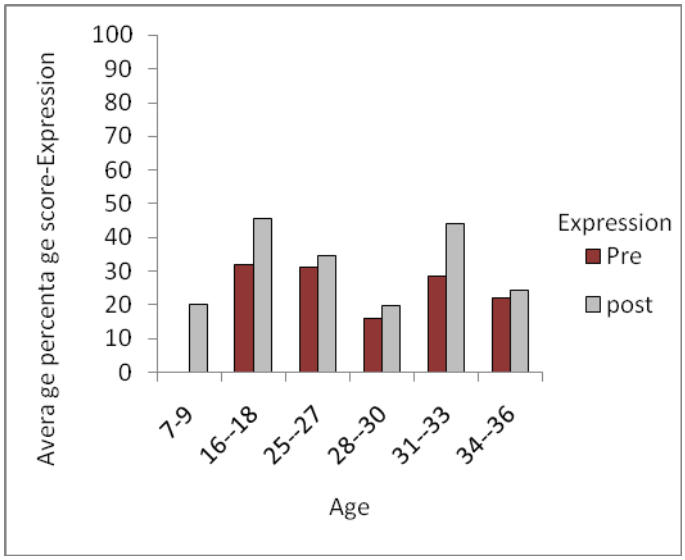


Figure 4.16: *Pre and post-training percentage scores on 9 subjects on expression subskill.*

Children with mental retardation have delayed acquisition of the speech-language skill as a result of their inadequate mental abilities. They have difficulty in acquiring the different levels of language including semantics, syntax, morphology and pragmatics. In addition they also exhibit different speech disorders such as articulation difficulties, voice problems and fluency problems. The presence of these disorders in an individual may affect his/her overall communication abilities. Hence it is important to initiate training in speech and language skills in these children at the earliest. The intervention module developed on training speech and language skill incorporates training at different levels such as phonology, semantics, morphology, syntax and pragmatics for comprehension and expression. It incorporates these subskills in a hierarchical manner in the order of development in the typically developing children. All the 9 children selected in this study had a speech and language problem. The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve comprehension and expression. All the children selected for training in this skill showed significant improvements in comprehension and expression which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed. In general, it was observed that some children were quick in learning the items and covered more number of them during the training period, while some others were a little slow. This could be due to the individual differences in the children, differences with respect to the other domains, ability of the mother in

understanding and executing the activities on their children, differences in the severity of the mental retardation (7 had moderate retardation and 2 had severe retardation), the accessibility to AIISH (some were settled quite away from AIISH and therefore could not come for regular follow ups) etc.

2. **Cognitive domain:** For testing the sensitivity of the objectives in this domain, initially the checklist was administered on 9 children with MR to check the baseline. All the 9 subjects (one in each 7-9, 16-18, 25-27, 28-30, 2 subjects in 31-33 and 3 subjects in 34-36 age groups respectively) had below average scores. Hence age appropriate home training program was given to the parents/caregivers of 9 subjects. Post-training scores were obtained by re-administering the checklist. Table 4.22 depicts the mean and standard deviation w.r.t the cognitive domain. When the pre-training and the post training means were compared across age groups, the results revealed that the post-training scores were greater compared to the pre-training scores. The mean of the group was 24.64 (pre-training) which increased to 31.13 (post-training) after training for 3 months. The improvement seen in pre-training scores for cognitive domain is depicted in Figure 4.17. Wilcoxon Signed Ranks Test revealed a significant improvement in cognitive domain ($Z=2.52$, $p<0.005$).

Table 4.22: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to cognitive domain (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
7-9	1	Mean	21.42	28.57
16-18	1	Mean	38.88	58.33
25-27	1	Mean	34.61	42.30
28-30	1	Mean	3.12	7.81
31-33	2	Mean	26.74	29.06
34-36	3	Mean	24.11	27.65
		SD	15.50	16.88
Total	**9**	**Mean**	**24.64**	**31.13**
		SD	**13.42**	**17.01**

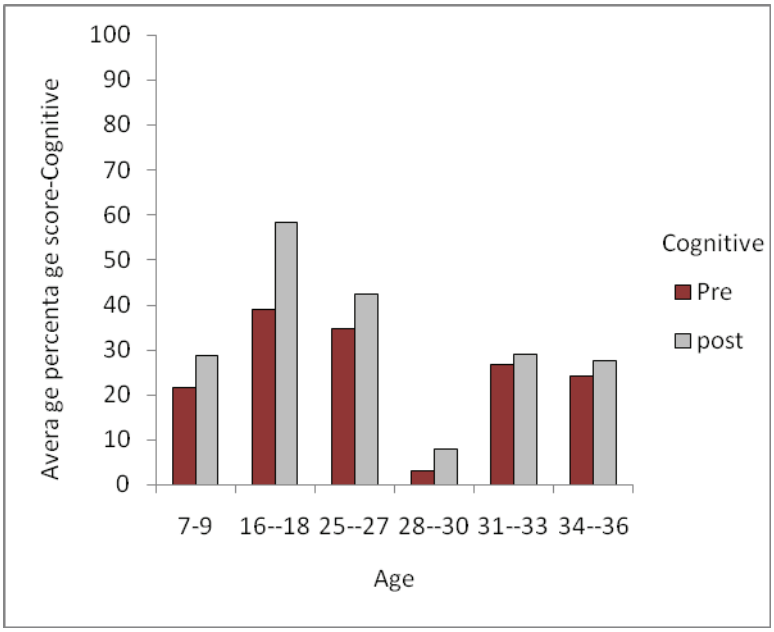


Figure 4.17: *Pre and post-training percentage scores on 9 subjects on cognitive domain.*

Mental retardation affects the development of cognitive skills which involves a wide range of mental processes such as attention, memory, reasoning, problem solving, classification, logical thinking etc. Cognition is a necessity to carry out a variety of activities in day to day living. Hence it is important to initiate training in cognitive skills along with the training in speech-language skills. In the present study all the 9 children selected had a deficit in cognitive skills. The intervention module developed on training cognitive skill incorporates training for attention, cause-effect relationship, categorization, association, memory, problem solving, reasoning etc. at different levels. It incorporates these subskills in a hierarchical manner in the order of development in the typically developing children. The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve cognition. All the children selected for training in this skill showed significant improvements in cognition which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

3. **Self-help domain**: Self-help consists of 4 subskills - feeding, dressing, toileting and personal hygiene. The subskills which had below average and average scores were selected for training. The checklists were administered on 9 subjects with MR to check the baseline. In feeding subskill 2 subjects were below average, 2 had average scores and 5 had above average scores.

In dressing subskill 3 subjects were below average, 1 had average scores, 4 had above average scores and one subject was in the age range which did not have objectives for dressing subskill. In toileting subskill 4 subjects had below average scores, four subjects had average scores and one was in the age range which did not have objectives for toileting subskill. In personal hygiene subskill 7 subjects had below average score, one had average score and one was in the age range which did not have objectives for personal hygiene subskill. Among them 4 subjects in feeding subskill (1,1, and 2 each in 25-27, 28-30 and 34-36 age groups respectively), 4 subjects in dressing subskill (one in each 16-18, 28-30, 31-33 and 34-36 age groups respectively), 8 subjects in toileting subskill (1,1,1,2 and 3 each in 16-18, 25-27, 28-30, 31-33 and 34-36 age groups respectively) and 8 subjects in personal hygiene subskill (1,1,1,2 and 3 subjects in 16-18, 25-27, 28-30, 31-33 and 34-36 age groups respectively) were given home training program for a duration of 3 months. Post training scores were obtained by re-administering the checklist. Tables 4.23, 4.24, 4.25, and 4.26 shows the mean and standard deviation w.r.t. the feeding, dressing, toileting and personal hygiene subskills respectively. The results revealed that the post-training scores were greater when compared to the pre-training scores. The mean of feeding subskill showed an increase from 52.7 (pre training) to 60.89 (post-training). Likewise the mean of dressing, toileting, personal hygiene subskills showed an increase from 36.7, 23.66 and 15.15 (pre-training) to 50.19, 43.60 and 24.12 (post-training) respectively, after training for three months. The improvement seen in pre-training scores for feeding, dressing toileting, and personal hygiene subskills have been depicted in Figures 4.18, 4.19, 4.20 and 4.21 respectively. Wilcoxon Signed Ranks Test revealed that the difference between pre-training and post-training mean was significant for toileting subskill ($Z=2.53$, $p<0.05$) and personal hygiene subskill ($Z=2.31$, $p<0.05$). The Wilcoxon Signed Ranks test performed on dressing and feeding subskills showed insignificant values. This could have been due to the lack of sufficient training given by the mothers because of their ill health. Though the “z” value is insignificant there is an improvement in the individual pre to post values indicating that the activities and method of training are adequate.

Table 4.23: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to self-help domain (feeding subskill) (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
25-27	1	Mean	47.22	58.33
28-30	1	Mean	27.50	37.50
34-36	2	Mean	68.18	73.86
		SD	19.28	20.89
Total	**4**	**Mean**	**52.77**	**60.89**
		SD	**22.48**	**21.02**

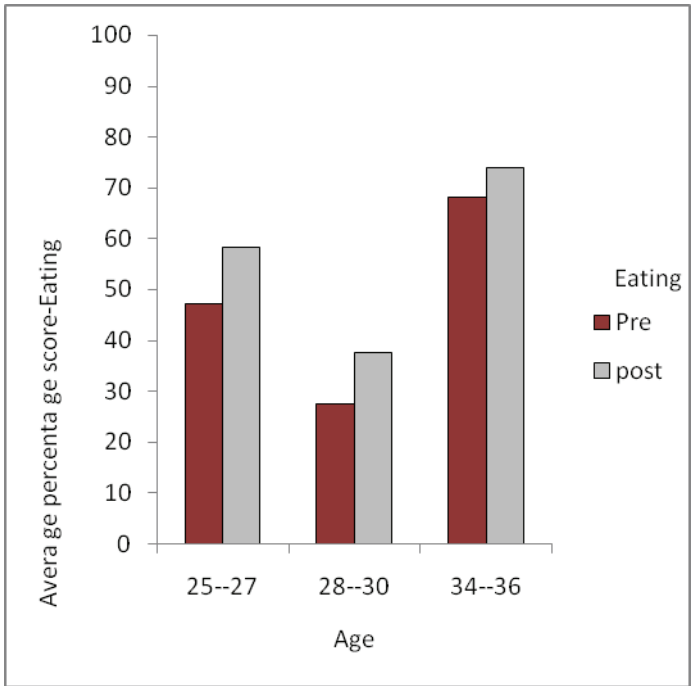


Figure 4.18: *Pre and post-training percentage scores on 4 subjects on feeding subskill.*

Table 4.24: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to self help domain (dressing subskill) (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
16-18	1	Mean	40.00	60.00
28-30	1	Mean	25.00	50.00
31-33	1	Mean	55.00	60.00
34-36	1	Mean	26.92	30.76
Total	**4**	**Mean**	**36.73**	**50.19**
		SD	**13.88**	**13.78**

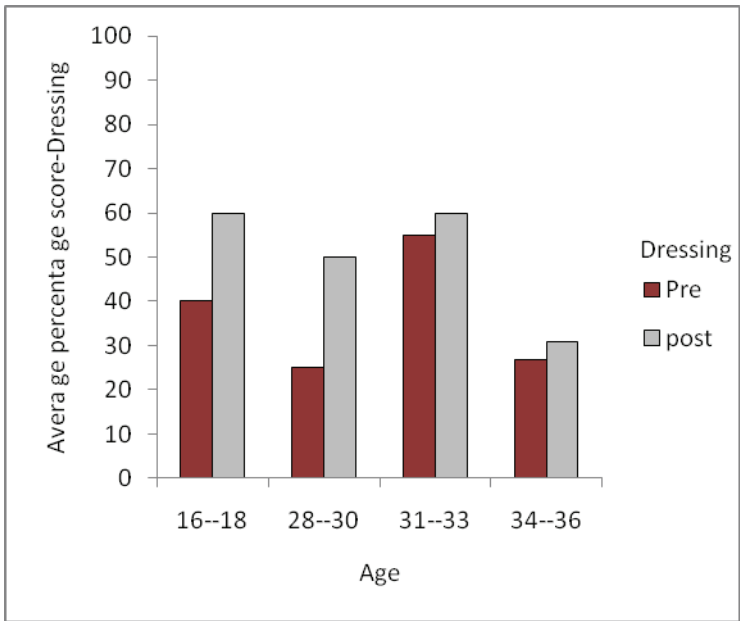


Figure 4.19: *Pre and post-training percentage scores on 4 subjects on dressing subskill.*

Table 4.25: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to self help domain (toileting subskill) (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post- training percentage**
16-18	1	Mean	0.00	50.00
25-27	1	Mean	0.00	25.00
28-30	1	Mean	0.00	25.00
31-33	2	Mean	37.50	45.83
		SD	29.46	29.46
34-36	3	Mean	38.09	52.38
		SD	21.82	21.82
Total	**8**	**Mean**	**23.66**	**43.60**
		SD	**25.37**	**19.98**

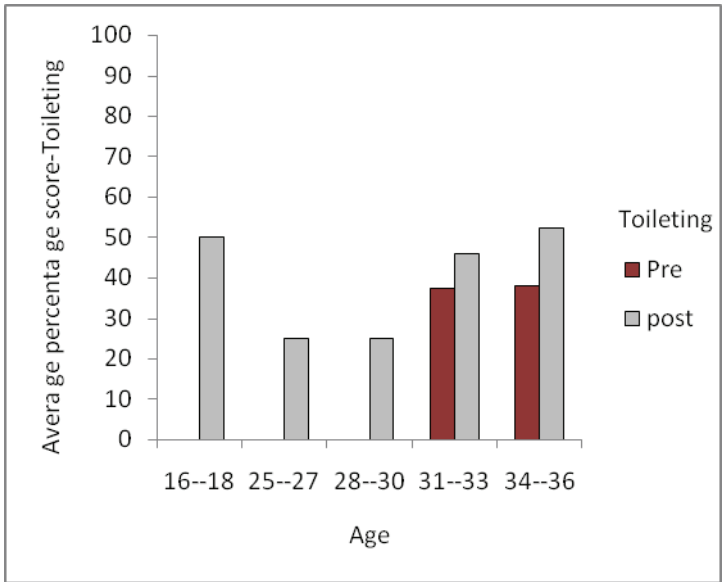


Figure 4.20: *Pre and post-training percentage scores on 8 subjects on toiletting subskill.*

Table 4.26: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to self help domain (personal hygiene subskill) (N indicates the number of children)*

Age Group	N		Pre-training percentage	Post-training percentage
16-18	1	Mean	0.00	25.00
25-27	1	Mean	0.00	8.33
28-30	1	Mean	0.00	7.14
31-33	2	Mean	33.33	44.44
		SD	31.42	31.42
34-36	3	Mean	18.18	21.21
		SD	4.54	5.24
Total	**8**	**Mean**	**15.15**	**24.12**
		SD	**18.54**	**18.64**

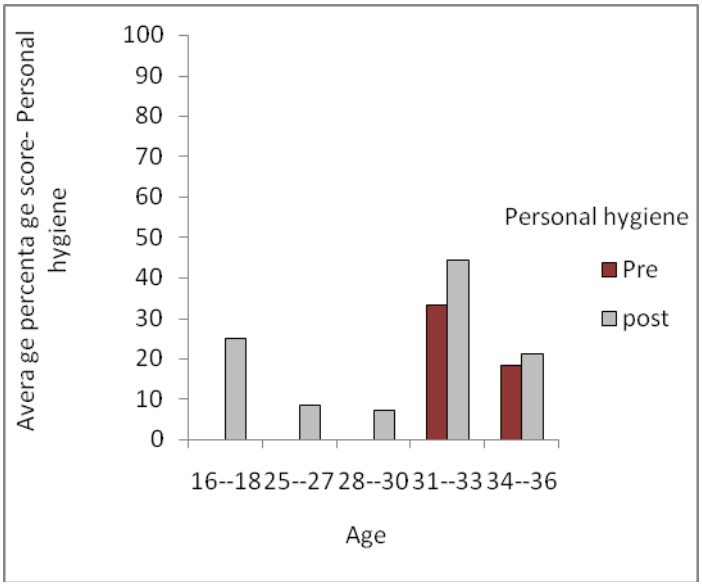


Figure 4.21: *Pre and post-training percentage scores on 8 subjects on personal hygiene subskill.*

Children with mental retardation have below average intelligence that limits their ability to function normally. This includes their ability to perform their daily routine activities including brushing, eating, toileting, bathing, dressing etc. which are included under the umbrella term self-help skills. Self-help skills are those skills that help a child gain control over his/her body over time. Consequently self- help skills must be taught, in order for them to become less reliant on others and more integrated into society. The intervention module developed on training self-help skill incorporates training for basic skills listed above. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. In the present study, some of the children

selected did have deficient self-help skills. The parents were provided with suitable activities for their children according to their baseline levels to improve self-help skill. All the children selected for training in this skill showed an improvement in all the subskills which indicated that they responded positively to the activities mentioned in the intervention module. With respect to the toiletting and personal hygiene training, there was a significant improvement as per the Wilcoxon's test probably because of the greater number of subjects considered for training. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

II. Second set:

4. **Motor domain**: The motor domain consists of 2 subskills - gross and fine. The checklists were administered on 9 subjects with MR to check the baseline. Among them, in gross motor subskill six subjects had below average scores, 2 subjects had average scores and 1 subject had above average scores. Six subjects having below average score and one subject having average score (one in each 7-9, 16-18, 25-27, 28-30, 31-33 and 2 in 34-36 age groups respectively) were given the training program. In fine motor subskill four subjects had below average score, four had average score and one subject had above average score. Four subjects had below average scores, four subjects had average scores and one subject had above average score. 4 subjects having below average scores (one in each 7-9, 25-27, 28-30 and 34-36 age groups respectively) were given training program for a duration of three months. The other subjects had not yet completed the previous set of the training program. The post-training scores were obtained by re-administering the checklist. Tables 4.27 and 4.28 shows the mean and standard deviation w.r.t. the gross motor and fine motor skill respectively. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores for both the subskills. The mean score of the group for gross motor subskill increased from 11.00 (pre-training) to 39.05 (post-training). The mean score of the group for fine motor subskill increased from 4.13 (pre-training) to 7.25 (post-training). The improvement seen in pre-training scores for gross and fine motor subskill is depicted in Figures 4.22 and 4.23 respectively. Wilcoxon Signed Ranks Test revealed that the data was significant only for the gross motor subskill ($Z= 2.36$, $p<0.005$).

Table 4.27: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to gross motor subskill (N indicates the number of children)*

Age Group	**N**		**Pre-training percentage**	**Post-training percentage**
7-9	1	Mean	8.33	16.66
16-18	1	Mean	57.69	69.23
25-27	1	Mean	25.80	33.87
28-30	1	Mean	22.85	30.00
31-33	1	Mean	32.43	37.83
34-36	2	Mean	39.28	42.85
		SD	1.68	0.00
Total	**7**	**Mean**	**32.24**	**39.04**
		SD	**15.55**	**16.07**

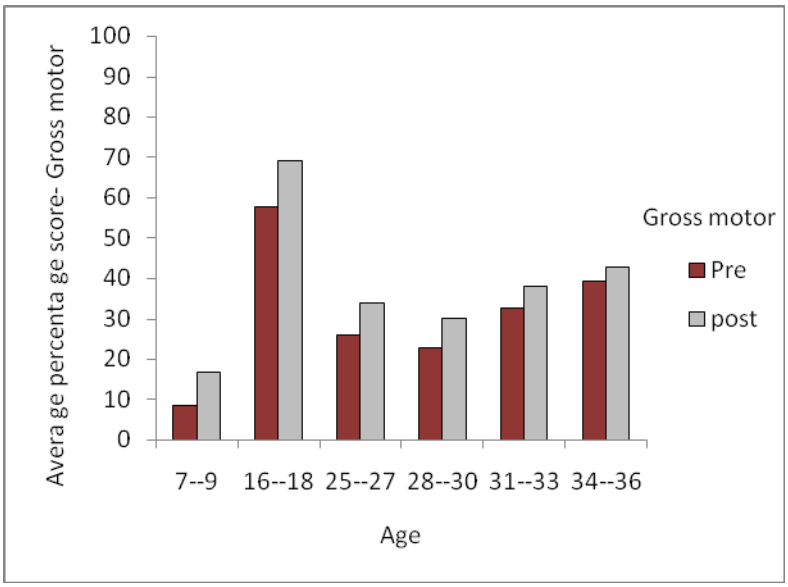


Figure 4.22: *Pre and post-training percentage scores on 7 subjects on gross motor subskill.*

Table 4.28: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to fine motor subskill (N indicates the number of children)*

Age group in months	N		Pre-training percentage	Post-training percentage
7-9	1	Mean	18.75	27.27
25-27	1	Mean	7.40	14.81
28-30	1	Mean	8.06	12.90
34-36	1	Mean	31.81	36.36
Total	**4**	**Mean**	**16.51**	**22.83**
		SD	**11.45**	**11.04**

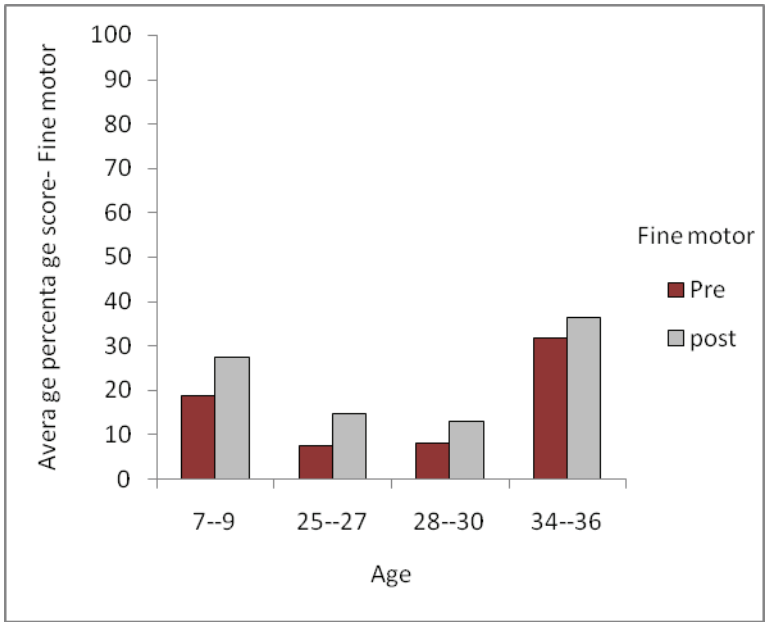


Figure 4.23: *Pre and post-training percentage scores on 4 subjects on fine motor subskill.*

Children with mental retardation may be having a deficit in motor skills too. The problems could either be in the gross motor subskill, fine motor subskill or both. Gross motor skills are larger movements that a child makes with his arms, legs, or feet, or his entire body, for e.g., crawling, running and jumping are gross motor skills. Fine motor skills are smaller actions. When the child picks things up between his finger and thumb or wriggles his toes in the sand he's using his fine motor skills. Motor skills are very essential for carrying out the activities of daily living so that the child can function independently in the society. Therefore it is imperative that training be carried out to improve motor skills. Accordingly an intervention module was developed on training motor skill which incorporated training for basic gross and fine motor skills. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Amongst the 9 subjects, 7 of them were given the training for gross motor subskill and 4 for fine motor subskill. The parents were provided with suitable activities for their children according to their baseline levels to improve motor skill. All the children selected for

training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed. However, Wilcoxon Signed Ranks Test revealed that the data was significant only for the gross motor subskill ($Z= 2.36$, $p<0.005$). This could be attributed to the fewer subjects who were given the training program for the fine motor subskill.

5. **Pre-reading domain:** The checklists were administered on 9 subjects with MR to assess the baseline. In pre-reading domain seven subjects had below average score, one had average score and one subject is in 6-9 age range which does not have pre-reading objectives. Among them 7 in pre-reading domain (1,1,1,1 and 3 subjects in 16-18, 25-27, 28-30, 31-33, 34-36 age groups respectively) were given home training program. The other subject was continuing with the previous set of training program. Post-training scores were obtained by re-administering the checklist. Table 4.29 depicts the mean and standard deviation w.r.t. the pre-reading domain. The results revealed that there was an increase in the post-training scores when compared to the pre-training scores. The mean of pre-reading showed an increase from 17.09 (pre-training) to 21.02 (post-training). The improvement seen in pre-training scores for pre-reading domain is depicted in Figure 24. Wilcoxon Signed Ranks Test revealed a significant difference between the pre and post-training means ($Z= 2.37$, $p<0.005$).

Table 4.29: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-reading domain (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
16-18	1	Mean	11.11	22.22
25-27	1	Mean	10.00	13.33
28-30	1	Mean	25.00	27.78
31-33	1	Mean	29.55	31.82
34-36	3	Mean	14.67	17.33
		SD	18.58	19.73
Total	**7**	**Mean**	**17.09**	**21.02**
		SD	**12.99**	**13.18**

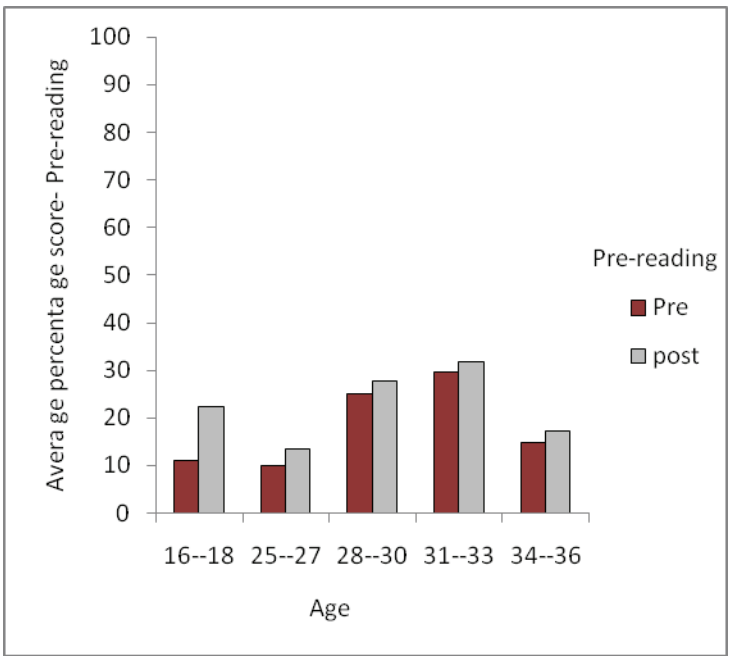


Figure 4.24: *Pre and post-training percentage scores on 7 subjects on pre-reading domain.*

Pre-reading are the basic skills that are acquired prior to reading skills. Children with mental retardation do exhibit deficits in the academic areas including the 3R's and therefore it is a must to train the basic pre-reading domain before tackling reading. Accordingly an intervention module was developed on training pre-reading skill which incorporates training for basic skills such as left to right eye movement, book holding skill, matching skill, developing interest in reading, distinguishing between books and toys etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. In the present study most of the children selected exhibited

deficient pre-reading skills. The parents of these children were provided with suitable activities for their children according to their baseline levels to improve pre-reading abilities. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

6. **Pre-writing domain:** In pre-writing domain, eight subjects had below average scores and one subject was in 6-9 age range which does not have pre-writing skill objectives. All the 8 subjects (1,1,1,2 and 3 subjects in 16-18, 25-27, 28-30, 31-33, 34-36 age groups respectively) were given home training program. Post-training scores were obtained by re-administering the checklist. Table 4.30 depicts the mean and standard deviation w.r.t the pre-writing domain. The results revealed that the post-training scores were greater than the pre-training scores. The mean of pre-writing showed a significant improvement from 15.36 (pre training) to 23.33 (post training). The improvement seen in pre-training scores for pre-writing domain is depicted in Figure 25. Wilcoxon Signed Ranks Test revealed a significant difference between the pre and post-training means ($Z=2.52$, $p<0.005$).

Table 4.30: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-writing domain (N indicates the number of children)*

Age Group in months	**N**		**Pre-training percentage**	**Post-training percentage**
16-18	1	Mean	12.50	25.00
25-27	1	Mean	0.00	7.14
28-30	1	Mean	11.76	14.70
31-33	2	Mean	36.25	52.50
		SD	12.37	31.81
34-36	3	Mean	8.69	11.59
		SD	15.06	14.47
Total	8	**Mean**	**15.35**	**23.32**
		SD	**16.34**	**23.56**

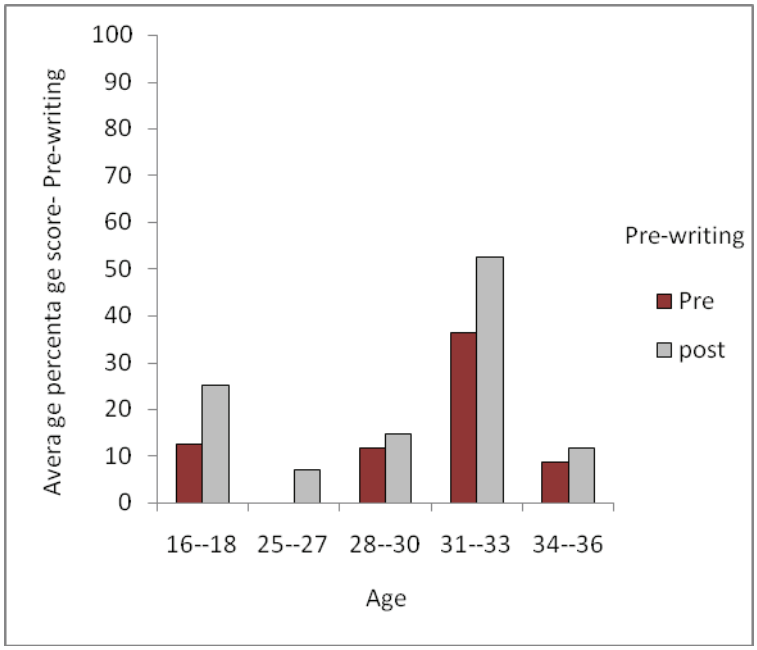


Figure 4.25: *Pre and post-training percentage scores on 8 subjects on pre-writing domain.*

Pre-writing skill lays the foundation for the development of later writing skill. Children with mental retardation could exhibit a delay in the acquisition of writing skills. Hence it is important to train the pre-writing domain before working on actual writing skill. Accordingly the intervention module developed on training pre-writing skill incorporates training for basic skills such as left to right eye movement, book holding skill, matching skill, developing interest in writing, tripod grasp, acquisition of drawing of strokes and curves etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Amongst the children selected for this study, 8 had poor pre-writing scores. Reading and writing go hand in hand and therefore this was the next domain selected for training amongst the second set of domains. The parents were provided with suitable activities for their children according to their baseline levels for a duration of three months to improve pre-writing skill. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

III. Third set:

7. **Pre-arithmetic domain:** In the pre-arithmetic domain eight subjects had below average scores and one subject was in 6-9 age range which does not have pre-arithmetic domain objectives. Among them 5 subjects (1, 2 and 2 each in 25-27, 31-33 and 34-36 age groups respectively) were given training program. The other subjects were continuing with the previous set of training program. Post-training scores were obtained by re-administering the checklist. Table 4.31 shows the mean and standard deviation w.r.t pre-arithmetic domain. On comparing the pre and post training means, it was seen that the post-training scores were greater than the pre-training scores. The mean of pre-arithmetic domain showed an increase from 2.72 (pre-training) to 13.75 (post-training). The improvement seen in pre-training scores for pre-arithmetic domain depicted in Figure 26. The results of the Wilcoxon Signed Ranks Test revealed a significant difference between the pre and post-training means ($Z=2.03$, $p<0.005$).

Table 4.31: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to pre-arithmetic domain (N indicates the number of children)*

Age Group in months	**N**		**Pre- training percentage**	**Post- training percentage**
25-27	1	Mean	0.00	16.66
31-33	2	Mean	6.81	22.72
		SD	9.64	25.71
34-36	2	Mean	0.00	3.33
		SD	0.00	0.00
Total	**5**	**Mean**	**2.72**	**13.75**
		SD	**6.09**	**16.18**

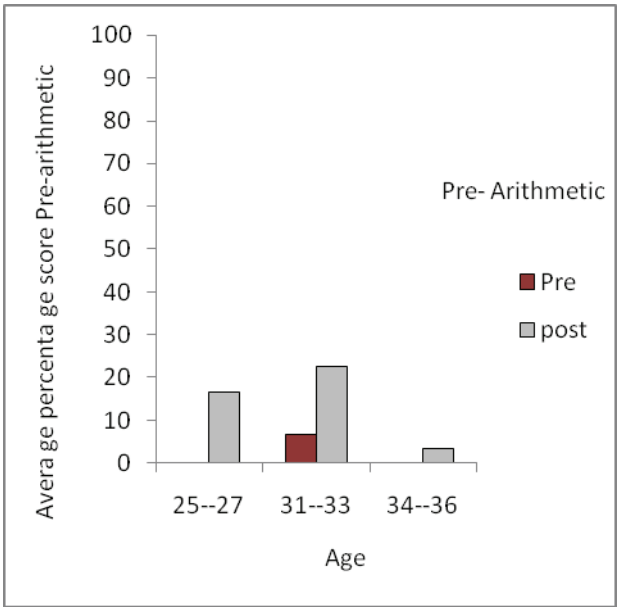


Figure 4.26: *Pre and post-training percentage scores on 5 subjects on pre-arithmetic domain.*

Pre-arithmetic domain is one of the academic domains which is essential for the acquisition of arithmetic ability. These vital early childhood skills include learning to count numbers, learning the proper sequencing of numbers, learning to determine which shapes are bigger or smaller, and learning to count objects on a screen or book. Pre-arithmetic skills are also tied into reading and writing skills to learn the correct pronunciations and writing of numbers. Pre-arithmetic skill also helps children develop critical thinking and problem-solving skills. However, this skill can get affected in children with mental retardation and intervention is essential in order to develop this skill in the children. The intervention module developed on training pre-arithmetic skill incorporates training for basic skills such as grouping, recognizing shapes and patterns, estimating the quantity and weight, skill, etc. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. The pre- arithmetic training program was given to 5 children with mental retardation. The parents were provided with suitable activities for their children according to their baseline levels to improve pre-arithmetic skill. All the children selected for training in this skill showed significant improvements which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

8. **Play domain:** For testing the sensitivity of the activities in this domain, the checklist was administered on 9 subjects with MR to assess the baseline. Among them six subjects had below average scores and two had average scores. Age appropriate training program was given to only 4 subjects (one in each 7-9 and 25-27 and 2 in 34-36 age groups respectively) having below average scores as the other subjects were yet to complete the previous set of training program. Post-training scores were obtained by re-administering the checklist. Table 4.32 depicts the mean and standard deviation w.r.t. the play domain. On comparing the pre and the post-training scores, it was seen that the post-training scores were greater when compared to the pre-training scores. The mean was 24.07 (pre-training) which increased to 37.35 (post-training). The improvement seen in pre-training scores for play is depicted in Figure 4.27. Wilcoxon Signed Ranks Test revealed no significant difference between the pre and post-training means.

Table 4.32: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to play domain (N indicates the number of children)*

Age Group	N		Pre training percentage	Post training percentage
7-9	1	Mean	16.66	50.00
25-27	1	Mean	17.64	29.41
34-36	2	Mean	31.00	35.00
		SD	1.41	1.41
Total	**4**	**Mean**	**24.07**	**37.35**
		SD	**8.04**	**8.87**

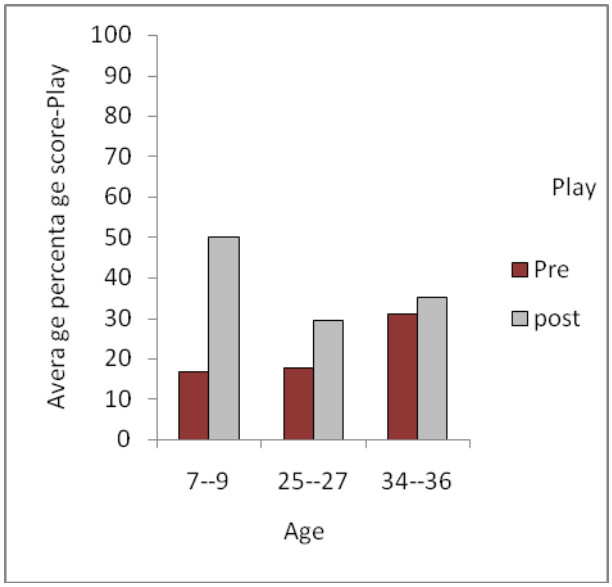


Figure 4.27: *Pre and post-training percentage scores on 4 subjects on play domain.*

Play is a human activity that blends cognitive, social, emotional, linguistic, and motor components and combines both action and thought. Play is integral to the academic environment enhancing children's learning readiness, learning behaviors, and problem-solving skills. Play develops along ordinal levels that range from early sensorimotor–exploratory and adaptive interactions with objects to fairly elaborated scripted sequences of events. As children develop, their play becomes more complex and flexible as well as more generalized and symbolic. In children with communication disorders their play skills may be affected due to lack of development in the other domains. This is true with respect to the children with mental retardation too. They could especially be deviant in functional and symbolic play. Hence it is important to teach these skills. Accordingly an intervention

module was developed on training play skill. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. The training program was given only to four subjects. The parents were provided with suitable activities for the children according to their baseline level. The children selected for training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The parent was also satisfied with the detailed assessments carried out and the activities provided. However, Wilcoxon Signed Ranks Test revealed no significant difference between the pre and post-training means. This could be because of the reduced sample size because most of the other children could not complete the previous set itself as this domain was selected in the last set of training program. Another possibility could be the insufficient time for training of this domain.

9. **Sensory domain: -** Sensory domain comprised of mainly 3 subskills a) Auditory b) Visual c) Tactile, olfactory and gustatory.

   Auditory subskill: For testing the sensitivity of the objectives in this subskill, the checklist was administered on 9 subjects with MR to check the baseline. Among them three subjects had below average scores and the other six subjects had average scores. Only one subject of 7-9 age group was given age appropriate training program as the other subjects were continuing with the previous set of the program. Post-training scores were obtained by re-administering the checklist. Table 4.33 shows the pre and post-training mean scores. On comparison of these, it can be seen that the post-training scores were greater than the pre-training scores. The mean of the group was 11.53 (pre-training) which increased to 23.070 (post-training). As auditory subskill was given for training in the last set not all subjects could complete the previous sets and reach the last set in the stipulated time period of 3 months except one subject. Hence Wilcoxon Signed Ranks Test could not be performed. But the increase in the post-training mean shows that the activities given are age appropriate and apt.

Table 4.33: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to auditory subskill (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
7-9	1	Mean	11.53	23.07

Visual subskill: For testing the sensitivity of the activities in this subskill, the checklist was administered on 9 subjects with MR to assess the baseline. Three subjects had below average scores and 6 subjects had average scores. Out of the 3 subjects (one in 7-9 age group having average score and 2 in 34-36 age group having below average score) were given training program were given training as the other subjects were continuing the previous set of training program. Post-training scores were obtained by re-administering the checklist. Table 4.34 depicts the mean and standard deviation w.r.t. to the visual subskill. On comparing these, it was seen that there was an increase in the post-training scores when compared to the pre-training scores. The mean of the group was 37.93 (pre-training) which increased to 44.81 (post-training). The improvement seen in pre-training scores for the visual subskill is depicted in Figure 4.28. As visual subskill was given for training in the last set not all subjects could complete the previous sets and reach to the last set in the stipulated time period of 3 months except three subjects. Hence a non-parametric Wilcoxon Signed Ranks Test could not be performed. But the increase in the post-training mean shows that the activities given are age appropriate and apt.

Table 4.34: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to visual subskill (N indicates the number of children)*

Age Group	N		Pre-training percentage	Post-training percentage
7-9	1	Mean	27.27	36.36
34-36	2	Mean	43.26	49.03
		SD	14.95	17.67
Total	**3**	**Mean**	**37.93**	**44.81**
		SD	**14.04**	**14.48**

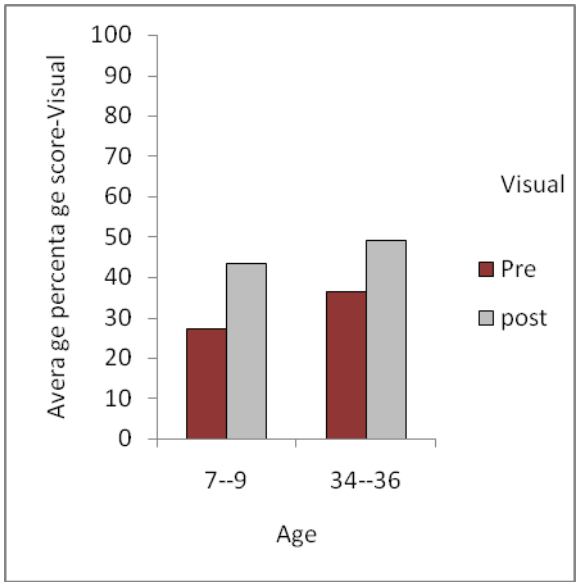


Figure 4.28: *Pre and post-training percentage scores on 3 subjects on visual subskill.*

Tactile, olfactory and gustatory subskills: For testing the sensitivity of the activities in this subskills, the checklist was administered on 9 subjects with MR to check the baseline. Among them two subjects had below average scores and five subjects had average scores and two subjects had above average scores. However, only one subject of 28-30 age group was given the training program as the other subjects were still continuing the previous set training program. Post-training scores were obtained by re-administering the checklist. Table 4.35 shows the mean and standard deviation w.r.t. the tactile, olfactory and gustatory subskills. On comparing the pre and post-training scores, it was seen that the post-training scores were grater than the pre-training scores. The mean of the group was 41.07 (pre-training), which increased to 42.85 (post-training). As tactile, olfactory and gustatory subskills were given for training in the last set not all subjects could complete the previous sets and reach to the last set in the stipulated time period of 3 months except one subject. Hence a non-parametric Wilcoxon Signed Ranks Test could not be performed. But the differences in pre-training and post-training mean show that the activities given were age appropriate and apt.

Table 4.35: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to tactile, olfactory and gustatory subskills (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
28-30	1	Mean	41.07	42.85

Sensory skill is the ability to identify, interpret and understand the information coming through the sense organs. This could be affected in children with mental

retardation, however, this skill can be trained and developed. Accordingly an intervention module was developed on training sensory skill which incorporates training for basic skills such as awareness, discrimination and identification of different sensory stimuli. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only one subject could be given the training program on visual skills. The parents were provided with suitable activities for the child according to their baseline levels to improve sensory skill. The child selected for training in this skill showed an improvement which indicated that they responded positively to the activities mentioned in the intervention module. The parents were also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

10. **Social-Emotional domain:** The social-emotional domain consists of 2 subskills - social and emotional. These checklists were administered on 9 subjects with MR to check the baseline. Among them, in emotional subskill six subjects had below average score and 3 subjects had average scores. I the social subskill three subjects had below average score and six subjects had average scores. Only one subject of 25-27 age level was given training program as the other subjects were continuing with previous set of training program. The post-training scores were obtained by re-administering the checklist. Table 4.36 depicts the mean and standard deviation for the socio-emotional domain. On comparing the pre and post-training scores, it can be seen that the post-training scores were grater compared to the pre-training scores (i.e. from 20.00 to 25.00). These subskills were considered for the subjects who completed the first training set successfully. As social-emotional domain was given for training in the last set, not all subjects could complete the previous sets and reach the last set in the stipulated time period of 3 months except one subject. Hence a non-parametric Wilcoxon Signed Ranks Test could not be performed. But the differences in pre-training versus post-training mean shows that the activities given were age appropriate and apt.

Table 4.36: *Pre and post-training mean percentages and Standard Deviation (SD) with respect to social-emotional domain (N indicates the number of children)*

Age Group in months	N		Pre-training percentage	Post-training percentage
25-27	1	Mean	20.00	25.00

Socio-emotional development refers to the child's ability to interact with others, including helping themselves and self-control which could be affected in children with mental retardation. Training in socio- emotional skills can benefit any child. Effective socio-emotional skills are the key to success in adult life where these skills are an important part of achieving success in a career. Accordingly, the intervention module developed on training socio-emotional skill incorporates training for basic skills. It incorporates these items in a hierarchical manner in the order of development in the typically developing children. Only one subject could be given the training program on social and emotional skills since the others could not complete the previous set of the training program. The parent was provided with suitable activities for their child according to the baseline levels to improve socio-emotional skill. The child selected for training in this skill showed an improvement in which indicated that they responded positively to the activities mentioned in the intervention module. The parent was also satisfied with the detailed assessments carried out and the activities provided. They were enthusiastic in training their children and documenting the day to day progress observed in them as instructed.

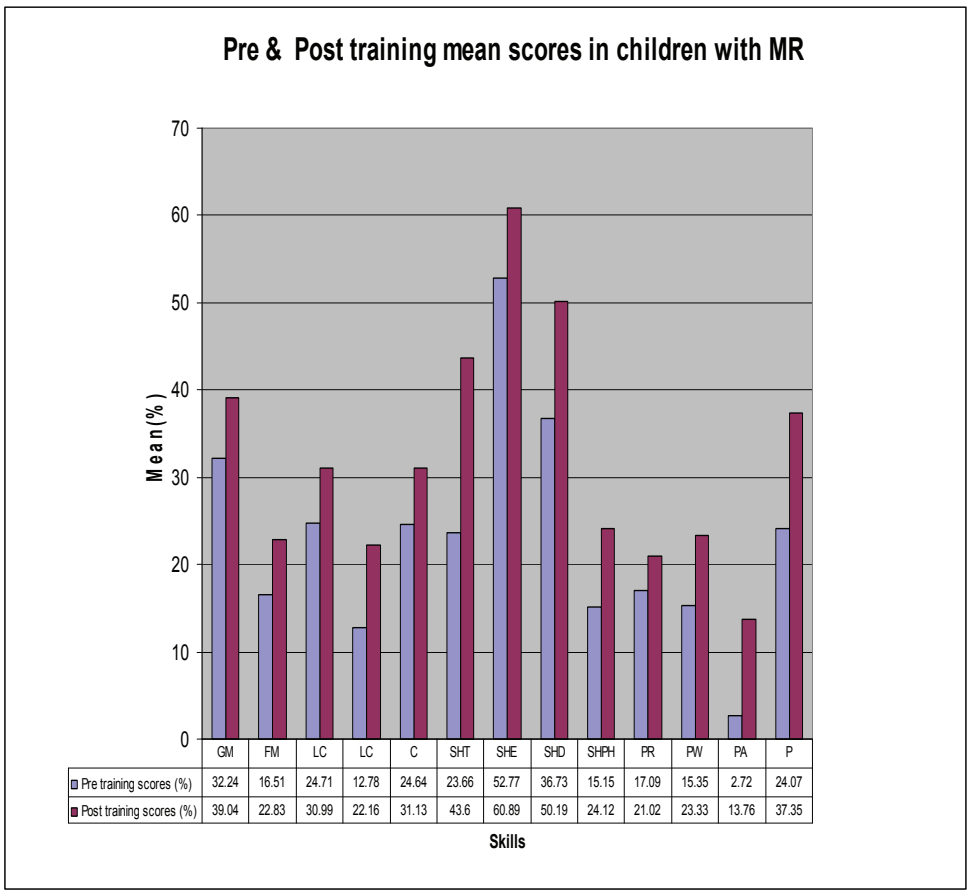
Table 4.37 summarizes the results obtained in children with mental retardation. This table depicts the domains given for training to the children with mental retardation and the results of the statistical analysis. The pre and post-training scores in percentages in children with MR is depicted in the Figure 4.29.

Table 4.37: *Pre and post training mean scores in percentages and standard deviation and the results of the Wilcoxon test in children with MR*

Sl. No.	Domains and subskills	No. of subjects (baseline)	Pre training scores (%)		No of subjects given training	Post training scores (%)		/z/ Value
			Mean	SD		Mean	SD	
1a	Language-Comprehension	9	24.71	6.42	7	30.99	10.61	2.37*
1b	Language-Expression	9	12.78	8.59	9	22.16	9.72	2.67*
2	Cognitive	9	24.64	13.43	8	31.13	17.01	2.52*
3a	Self-help-Toileting	9	23.66	25.38	8	43.60	19.98	2.53*
3b	Self-help-Feeding	9	52.77	22.48	4	60.89	21.03	1.83
3c	Self-help-Dressing	9	36.73	13.88	4	50.19	13.78	1.83
3d	Self-help-Personal - hygiene	9	15.15	18.54	8	24.12	18.64	2.31*
4a	Gross motor	9	32.24	15.55	1	39.04	16.07	2.36*
4b	Fine motor	9	16.51	11.45	4	22.83	11.04	1.83
5	Pre-reading	9	17.09	12.98	7	21.02	13.18	2.37*
6	Pre-writing	9	15.35	16.34	8	23.33	23.56	2.52*
7	Pre-arithmetic	9	2.72	6.09	4	13.76	16.18	2.03*
8	Play	9	24.07	8.04	4	37.35	8.87	1.84

[*p< 0.05]

GM-Gross motor
FM-Fine motor
LC- Language–Comprehension
LE- Language–Expression
C- Cognitive
SHT- Self-help Toileting
SHF-Self-help Feeding
SHD- Self-help Dressing
SHPH– Self-help Personal hygiene
PR- Pre- reading
PW- Pre- writing
PA- Prearithmetic
P- Play



	GM	FM	LC	LC	C	SHT	SHE	SHD	SHPH	PR	PW	PA	P
Pre training scores (%)	32.24	16.51	24.71	12.78	24.64	23.66	52.77	36.73	15.15	17.09	15.35	2.72	24.07
Post training scores (%)	39.04	22.83	30.99	22.16	31.13	43.6	60.89	50.19	24.12	21.02	23.33	13.76	37.35

Figure 4.29: *Pre and post-training scores in percentages in children with MR.*

The results indicated that there was an overall improvement in all the subjects with MR for the domains mentioned in the table. This is evident when a comparison is made between their pre-training and their post-training percentages. The post-training mean percentages are greater than the pre-training mean percentages. This indicated that the subjects in all age groups responded positively to the activities given to them for training under the specified domains.

The results of the Wilcoxon test revealed that there was a significant improvement in the children with respect to all the domains except that of fine motor, feeding and dressing subskills under the self help domain and play. This could have occurred because of the smaller sample size under these subskills. The training program for the other domains not mentioned in the table (social-emotional and sensory including auditory, visual and tactile, olfactory, gustatory) were given for training to a smaller number of children because the other subjects could not complete the previous set of training program. Hence Wilcoxon test

could not be administered, although their post-training mean were greater than their pre-training means.

Further, the information collected during the periodic follow up of clients during the training period suggested the possibility of influence of some factors such as individual differences in the children, differences with respect to the other domains, ability of the mother in understanding and executing the activities on their children, differences in the severity of the mental retardation (7 had moderate retardation and 2 had severe retardation), the health conditions of the child and the mother, the accessibility to AIISH (some were settled quite away from AIISH and therefore could not come for regular follow ups) etc.

On the whole the results indicated that there was an overall significant improvement in all the children with HI and MR for the self help (personal hygiene), cognitive, speech-language, pre-reading, pre-writing, and pre-arithmetic domains. The other domains that showed a significant improvement in children with HI were sensory (auditory), self-help (dressing) and social domains and the domains that showed a significant improvement in children with MR were gross motor and self help (toileting) domains. There were improvements seen in the children with HI and MR in the other domains too, but those were insignificant probably because of the reduced sample size who could undertake specific skill training programmes. This indicated that both the children with HI and MR in different age groups responded positively to the activities given to them for training under the specified domains. The training program for the other domains (emotional and sensory including tactile, olfactory and gustatory) were given for training to a smaller number of children because they could not complete the previous set of training program. Hence Wilcoxon test could not be administered for these domains. However their post-training means were greater than their pre-training means for these domains, which indicated that the children did respond positively to the activities in these domains too.

In general, the results of the present study revealed that children with hearing impairment and mental retardation do benefit from the activities mentioned in the intervention modules for different skills. This reflects on the module implying the fact that the module can be effectively used with these children and bring about a positive change in their abilities.

SUMMARY AND CONCLUSIONS

As soon as the child is born, he/she announces his/her presence in the world through a cry which forms the first signs of communication. This sets the platform for further development. However, communication development is only a part of human development. As children grow, they develop a variety of other skills. This development is a slow and gradual process. The human development proceeds simultaneously in several domains and in a reasonably predictable sequence. A simultaneous mutual interaction occurs among these domains since abnormally advanced or delayed development in one domain may accelerate, compensate or attenuate the interdependent development in other domains. Each of these domains is represented by its own developmental cycle.

The acquisition, development and maintenance of various skills in human beings are dependent on the adequate functioning and appropriate integration of distinct neural networks. Majority develop these skills without effort over lifetime. But, for some individuals, development breaks down or is arrested/hindered because of several factors such as brain damage caused during parental, natal (birth) or postnatal period, due to sensory deficits, severe emotional disorders etc. which results in a communication disorder which may range in severity from mild to profound and which can be developmental (present since birth) or acquired (develop later in life).

Thus such children with communication problems face great difficulty in acquiring speech and language and other related skills without extra support from both parents as well as professionals. In order to develop their potential, these children with special needs require support services beyond those that are considered sufficient for the development of their same age peers. The rehabilitation of such children has been in existence for more than half a century and during this period, efforts have been made to rehabilitate them right from infancy through preschool and school years. It has been realized gradually over the years that children with communication problems benefit maximally if rehabilitation is instituted right from preschool age with a well-formed and specific curriculum and strategies.

This paved way for the preschool training centers for such children which adopted specialized methods of teaching. Although there are many preschools for children with communication problems in different parts of our country and a few curriculums available, an informal observation indicates that there is no standard, uniform widely accepted preschool

curriculum available to the teachers working in these special schools. Due to the non-availability of a curriculum, the teachers are forced to either prepare their own syllabus or use textbooks meant for normal children. This exerts an extra pressure on these handicapped children and they fail to reach their full potential. Moreover the existing curriculums available are either for use with normal children or children with a particular disorder and mainly focused on training or development of one or more of the following aspects of child development. Curriculums which focus on the all round development of the child by providing training in all the skills are scanty.

Thus a need to prepare a curriculum for such children was felt by the speech-language pathologists and special educators working with special children. It is with this intention that this study was planned, the main aims of the study being development of an intervention module preschool children with communication disorders between 0-3 years incorporating ten different skills viz. self help, social, motor, cognitive, sensory, speech and language, play, pre-reading, pre-writing and pre-arithmetic skills and activities to facilitate these skills. In addition, there was a need felt to assess the sensitivity of this module on children with communication disorders and hence this was taken up as an AIISH Research Fund project.

The first step in the development of the intervention module was to develop checklists to assess the functional level of a child with respect to ten different skills. Once these were developed, the face validity and the content validity of the items were established. A pilot study was undertaken following which the checklists were finalized. The final checklists of all the skills comprised of 466 items. This was then administered to 185 typically developing children in the age group of 0-36 months (10 in each age group) for standardizing the checklist. All the subjects were exposed to Kannada and had Kannada as their mother tongue. Those children with no history of language, hearing, neurological, developmental, academic, intellectual or emotional and orofacial abnormalities were included in the study. Ethical procedures were used to select the subjects. Their parent's education, socio economic status and other variables were controlled**.** The following scoring procedure was used to assess the current functioning level and the responses were scored and entered in the score sheet: 0-Not applicable/absent, 0.5-totally dependent/physical/verbal prompt, and 1-consistent and independent. The responses were recorded in the prepared data sheet for the purpose of standardization. The checklists were standardized and the test items were arranged in a developmental hierarchy. The goodness of the checklists was also established.

To accomplish the second aim of the study, viz. sensitivity assessment, activities to enhance the development of the items present in the checklists were prepared. A sample of 42 subjects with communication disorders {33 with hearing impairment (HI) and 9 with mental retardation (MR)} were tested on a home training program which consisted of the activities prepared from different domains for a duration of three months. Their baseline scores were assessed using the checklists. The skills were given in sets of three starting from the skills which they were most poor at for the three month training program. Following this the checklists were re-administered to obtain the post-training scores. These scores were converted into percentage scores and this was subjected to further statistical analysis using SPSS (version 10). It was observed that there was a significant improvement in the subject's post-training scores when their pre-training scores were compared. This was seen in both the groups of children. It is also observed that the children of all age groups responded positively to the activities mentioned in the module. A non-parametric test, Wilcoxon Signed Ranks Test was performed to find out if there was a significant difference between the pre and post-training means in various skills. The results revealed that in children with hearing impairment there was a significant improvemtn in all the skills except the toileting subskill under the self help domain and the visual subskill under the sensory domain. In children with mental retardation, a significant improvement was seen with respect to all the skills except that of fine motor, eating & dressing subskills under the self help domain and play. This could have occurred because of the smaller sample size under these subskills for the training program.

In sum, it can be concluded that the activities in the intervention module were effective in training the children with communication disorders and brought about a significant improvement in the child's developmental level. It can also be inferred that the checklists in the intervention module are sensitive to the changes in the child's development and therefore provide an easy and accurate measurement of the progress in children over a period of time; more specifically helps in easy comparison of pre and post therapy results. The module also enables easy selection of goals and facilitates planning of a treatment program by parents and professionals as it provides user friendly and simple activities which will bring about a positive change it the child. This would further help in training both the normal and special children of the preschool age and facilitate integration. However, there are a few limitations of the study. One of the limitation of the study is that a control group was not considered for the sensitivity assessment. The investigators of the present study do realize that the sample size especially in the group of children with mental retardation is less and that the children are not

distributed equally in the different age groups considered. Future investigations can include the sensitivity assessment of the module on children with other communication disorders. Further work can also be undertaken to translate the modules in different Indian languages so that it can be accessed and used all over the country by different sections of people.

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APPENDIX I
Assessment checklists developed for various domains
ASSESSMENT CHECKLIST FOR SELF-HELP DOMAIN

Case name: **Case No.:** **Age/sex:** **Date:**
Language: **Examiner:** **School/Class:**
Class teacher/Clinician:
Instructions: Rate self-help skills of the child for each of the items based on the scoring pattern given.
Scoring: **0**-Not applicable/absent; **0.5**-Totally dependent/physical/verbal prompt, **1**-Consistent and independent
Note: **FD-** Feeding, **D**-Dressing, **T**-Toileting, **PH**-Personal hygiene

FEEDING SUBSKILL

Level and age gp. in months	Item code	Item
I 0-3	FD-1	Sucks milk/water
	FD-2	Swallows milk/ water
II 4-6	FD-3	Spontaneously brings hand to mouth
	FD-4	Spontaneously opens mouth in response to food
III 7-9	FD-5	Swallows food already in mouth before taking another spoonful
	FD-6	Bites voluntarily
IV 10-12	FD-7	Chews food item by munching
	FD-8	Drinks from a cup with support
	FD-9	Exhibits control over drooling (saliva coming out of the mouth)
V 13-15	FD-10	Self feeds solid food items using fingers, e.g., chapatti, biscuits etc.
	FD-11	Licks food around the mouth
VI 16-18	FD-12	Sucks liquid from a glass through a straw, e.g., sweetened water, badam milk, etc.
	FD-13	Identifies own plate/spoon/cup
VII 19-21	FD-14	Drinks independently from a cup without spilling
VIII 22-24	FD-15	Chews food item with rotary jaw movement
	FD-16	Feeds self with fingers with some spilling, e.g., rice
IX 25-27	FD-17	Distinguishes between eatable and non-eatable items
	FD-18	Eats seeded fruits with sufficient mastery (e.g. orange, sapota etc.)
X 28-30	FD-19	Peels off fruits e.g., banana
	FD-20	Unwraps a chocolate e.g., éclairs
XI 31-33	FD-21	Releases water after rinsing the mouth
XII 34-36	FD-22	Feeds self with fingers or spoon with minimal spilling

DRESSING SUBSKILL

VI 16-18	D-1	Actively cooperates during dressing and undressing (lifts leg, holds out arm, etc.)
	D-2	Pulls off head wear, e.g., clip, hair band, hat etc.
	D-3	Identifies own clothes and the place where they are kept
VII 19-21	D-4	Spontaneously removes shoes or sandals after they are unfastened
	D-5	Puts on a simple garment, e.g., hat
VIII 22-24	D-6	Independently undresses self completely except for fasteners/buttons
IX 25-27	D-7	Removes pair of socks
X 28-30	D-8	Puts shoes or sandals on with assistance
XI 31-33	D-9	Unzips front separating zipper on own clothes independently
	D-10	Zips front zippers on own clothes when already fastened at the bottom
XII 34-36	D-11	Puts on pants or underpants with elastic band independently
	D-12	Puts on (not buttons) front opening shirt or sweater independently
	D-13	Independently undoes snaps on sandals or shoes

TOILETING SUBSKILL

VII 19-21	T-1	Spontaneously indicates wet or soiled pants or diaper by pointing and/or vocalizing
VIII 22-24	T-2	Reaches the toilet/designated place (potty chair) by self
	T-3	Indicates/tells toilet need consistently with rare day time accidents (bowel control)
IX 25-27	T-4	Pours water after using the toilet
X 28-30	T-5	Indicates toilet need with rare day time accidents (bladder control)
XI 31-33	T-6	Pulls down and puts on pants before/after toileting
XII 34-36	T-7	Indicates the need to go to toilet at all times consistently

PERSONAL HYGIENE SUBSKILL

VII 19-21	PH-1	Reaches for his tooth brush
	PH-2	Reaches the bathroom to have a bath
VIII 22-24	PH-3	Indicates nose to be wiped or cleaned
	PH-4	Washes and dries hands with assistance
	PH-5	Brushes teeth with assistance
IX 25-27	PH-6	Washes and dries feet with assistance
X 28-30	PH-7	Pours water and soaps some parts of the body with assistance
XI 31-33	PH-8	Brushes teeth without physical assistance after adult preparation
	PH-9	Washes and dries hands and feet independently
XII 34-36	PH-10	Washes and dries face independently
	PH-11	Wipes, blows and cleans nose independently

ASSESSMENT CHECKLIST FOR SOCIAL AND EMOTIONAL DOMAIN

Note: **S**- Social, **E**- Emotional

SOCIAL SUBSKILL

Level and age gp. in months	Item code	Item
I 0-3	S-1	Maintains eye to eye contact
	S-2	Responds to the caregiver by smiling
II 4-6	S-3	Enjoys being hugged
	S-4	Demands attention, e.g., fusses if left alone
	S-5	Responds to the caregiver when he/she talks by making sounds/showing excitement with whole body
	S-6	Demonstrates social gestures, e.g., hold arms out to be picked up
III 7-9	S-7	Begins to imitate activities such as cough, sticking out tongue etc.
	S-8	Smiles towards familiar people/own image
	S-9	Enjoys and expects repetition of simple games, e.g., peek-a -boo
	S-10	Discriminates strangers and cries when mother or father leaves
IV 10-12	S-11	Shows specific preferences for certain people and toys
	S-12	Shows increasing interest to please caregiver e.g., behaves in a specific way
	S-13	Waves goodbye on request
V 13-15	S-14	Shows or offers a toy
	S-15	Initiates interactions with familiar people
	S-16	Kisses and hugs parents without urging
	S-17	Enjoys being the center of attraction
VI 16-18	S-18	Imitates behavior of others, especially adults and older children and mostly housework
VII 19-21	S-19	Greets others by using words like hello, hi on request
	S-20	Is enthusiastic about company of other children
	S-21	Comforts a distressed friend or parent
	S-22	Shows awareness of parental approval or disapproval for his/her actions
	S-23	Shows increased independence from caregiver, e.g., insists on doing his/her work independently
VIII 22-24	S-24	Helps family members in cleaning up messes or putting away things
	S-25	Has awareness of family relationships
IX 25-27	S-26	Plays side by side with other children without exchanging ideas or materials
X 28-30	S-27	Exhibits social gestures while playing, e.g., cooperating with others, sharing materials etc.
	S-28	Begins to notice difference between safe and unsafe environment, e.g., notices dangers like hot iron box, steep stairs, big animals etc.
XI 31-33	S-29	Waits for his/her turn
XII 34-36	S-30	Participates actively in group games

EMOTIONAL SUBSKILL

I **0-3**	E-1	Communicates feelings of pleasure/distress/disgust through gestures, noises and expressions
II **4-6**	E-2	Laughs when tickled
III **7-9**	E-3	Responds to other people's expression of emotions and changes in tone of voice
	E-4	Vocalizes displeasure when an object is taken away
	E-5	Reacts to adult anger; cries when scolded
	E-6	Expresses anger through facial expressions
	E-7	Feels shy or anxious with strangers
IV **10-12**	E-8	Begins to show fears of going to bed and being left alone
	E-9	Shows denial by shaking head or moving arms, e.g., putting hands in front of face to avoid having it washed
	E-10	Experiences joy when a goal is achieved
	E-11	Reacts to restrictions with frustration
V **13-15**	E-12	Shows affection towards caregiver
	E-13	Starts to exhibit a temper when angry
	E-14	Laughs at appropriate times
	E-15	Imitates, understands and responds to gestures and facial expression
VI **16-18**	E-16	More evident temper tantrums to command/demand needs
VII **19-21**	E-17	Expresses self-conscious emotions like pride, e.g., on being appreciated repeats the task
	E-18	Displays ownership of objects
VIII **22-24**	E-19	Demonstrates increasing awareness of self as separate from others, e.g. tells their name and others names
IX **25-27**	E-20	Exhibits fears of harmless objects, e.g., strange looking toys like dolls or models of insects, animals etc.
X **28-30**	E-21	Temper tantrums begin to decrease
XI **31-33**	E-22	Separates easily from parents (separation anxiety decreases)
XII **34-36**	E-23	Indicates awareness of people having different feelings and desires in different situations

ASSESSMENT CHECKLIST FOR MOTOR DOMAIN

Note: G-Gross motor subskill, F-Fine motor subskill

Level & age gp. in months	Item code	Item
I 0-3	G-1	Stretches legs out when lying on stomach or back
	G-2	Has neck control and can support upper body with arms when lying on stomach
II 4-6	G-3	Brings hands together to the midline/center of the body
	G-4	Raises head and moves it side to side when lying on stomach
	G-5	Turns over
	G-6	Makes creeping movements when lying on stomach
	G-7	Sits with support
III 7-9	G-8	Sits without support
	G-9	Claps
	G-10	Gets to sitting position without assistance
	G-11	Crawls and creeps on hands and knees/shuffles around in sitting position
IV 10-12	G-12	Rolls ball in specific direction from sitting position
	G-13	Pulls from sitting to standing position and lowers from standing to sitting position
	G-14	Kneels
	G-15	Stands with support and later without support
	G-16	Walks holding on to a hand or furniture
V 13-15	G-17	Walks independently
	G-18	Pulls toys behind him and carries a large toy or several toys while walking
VI 16-18	G-19	Squats and gets up by self
	G-20	Walks in different directions, e.g., walks backward, in circle etc.
	G-21	Bounces to music and shows some rhythmic bodily movements
	G-22	Runs
	G-23	Hurls ball in a specified direction
VII 19-21	G-24	Climbs onto and down from furniture unsupported
	G-25	Walks up and down stairs holding on to support
VIII 22-24	G-26	Sits crossed legged
	G-27	Jumps in place with both feet
	G-28	Catches a rolled ball and rolls it forward
IX 25-27	G-29	Jumps down from a step of approximately 1 foot height
	G-30	Walks down stairs independently, placing both feet on each step
X 28-30	G-31	Swings leg to kick ball
	G-32	Bends over easily without falling
XI 31-33	G-33	Marches to rhythm/instructions
	G-34	Stands on one foot up to 5 seconds
XII 34-36	G-35	Jumps 10-24 inches across space (broad jump)
	G-36	Catches a large ball thrown
	G-37	Ascends or descends stairs with alternating feet unassisted
	G-38	Throws a ball overhead with accuracy (4-6 foot distance), e.g., aiming a ball into a bucket
	G-39	Pushes large sized boxes across a distance of 10 feet

GROSS MOTOR SUBSKILL

FINE MOTOR SUBSKILL

Level and Age gp In months	Item code	Item
II 4-6	F-1	Holds objects with one/both hands, e.g., rattle (palmer grasp)
	F-2	Fisting eliminated in both hands
III 7-9	F-3	Rakes at a small object with fingers (not thumb) (raking grasp)
	F-4	Reaches out for small objects hung in front/dropped
	F-5	Transfers objects from hand to hand
	F-6	Reaches out or pats image in the mirror
	F-7	Bangs two objects together
IV 10-12	F-8	Releases objects
	F-9	Has thumb finger opposition to pickup large objects (pincer grasp), e.g., crayon, book, biscuit, dolls etc.
	F-10	Places and takes large objects in and out of container, e.g., toys
	F-11	Points to objects with index finger
V 13-15	F-12	Favors one hand
	F-13	Has thumb finger opposition to pick up small objects (pincer grasp), e.g., raisin, pulses etc.
	F-14	Turns over container to pour out contents
	F-15	Turns pages singly of a card board book
VI 16-18	F-16	Stacks 2-4 one inch blocks
	F-17	Holds two small blocks in one hand
VII 19-21	F-18	Transfers small objects into a container
	F-19	Rolls, pounds, and squeezes clay/dough
VIII 22-24	F-20	Colors with a large crayon holding it appropriately (tripod grasp)
	F-21	Screws and unscrews jar lids
	F-22	Operate (open, close, turn) door knobs/latches
IX 25-27	F-23	Strings five large beads on a shoelace
	F-24	Towers 8-10 one-inch blocks
	F-25	Fills and dumps container with sand
X 28-30	F-26	Moves fingers independently, e.g., counting numbers
	F-27	Inserts key into lock
	F-28	Folds a piece of paper/kerchief into four folds
XI 31-33	F-29	Holds scissors of small size and makes an attempt to cut
	F-30	Unzips or zips clothes or leather items, e.g., bags, purses etc.
XII 34-36	F-31	Inserts money into piggy bank

ASSESSMENT CHECKLIST FOR COGNITIVE DOMAIN

Note: CG- Cognitive domain

Level and age gp. in months	Item code	Item
I 0-3	CG-1	Makes simple associations, e.g., bottle-drink
	CG-2	Attends/tracks to moving objects in and around the vicinity
II 4-6	CG-3	Demonstrates memory for objects and faces seen
	CG-4	Can manipulate other's actions by acting in a specific way, e.g., if smiles gets kissed
III 7-9	CG-5	Retains one object when given another and pays attention to both
	CG-6	Finds hidden toys after watching it disappear and hence shows the awareness that objects exist when not seen
IV 10-12	CG-7	Knows that people and things have labels, e.g., looks at fan, light etc. when asked
	CG-8	Learns to do something after demonstration, e.g., rock doll, hit balloon etc.
V 13-15	CG-9	Relates an action to an object, e.g., spoon-stirring, car-pushing etc.
	CG-10	Demonstrates understanding of cause and effect, e.g., open/shut, push/pull etc.
VI 16-18	CG-11	Identifies that a picture is upside down
VII 19-21	CG-12	Matches two identical objects
	CG-13	Matches objects parts with others, e.g., round lid – bottle etc.
	CG-14	Begins to solve problems, e.g., obtaining objects beyond reach
	CG-15	Identifies objects by category, e.g., car- toy, crow-bird etc.
	CG-16	Has attention span of 3-4 minutes
	CG-17	Exhibits auditory memory of at least one item (selects one picture or object correctly out of a choice of 5-6)
VIII 22-24	CG-18	Dismantles and re-arranges the objects, e.g., tries to fix broken parts of toys
	CG-19	Has good memory of self and people around, e.g., tells names of self, parents and siblings
	CG-20	Preserves coins or notes as money
	CG-21	Associates use with most of common objects, e.g., towel -to wipe
IX 25-27	CG-22	Places triangle, circle and square in shape board
	CG-23	Aware of daily routine (different activities go on different times of the day)
	CG-24	Uses one object to represent many objects, e.g., stick as gun, phone etc.
	CG-25	Attends to a task for a longer duration (5-10 minutes) with increased concentration
X 28-30	CG-26	Puts two parts of a whole together, e.g., completes puzzles with 2 to 3 pieces
	CG-27	Matches similar pictures
	CG-28	Discriminates 'more-less' in liquids
	CG-29	Makes mechanical toys work, e.g., keying toys
	CG-30	Sorts coins from other metallic objects
	CG-31	Recalls three objects/pictures presented visually
XI 31-33	CG-32	Acts out a simple story
	CG-33	Matches and sorts 2 to 3 objects by color, shape, size and use
	CG-34	Begins to ask how and why things work
	CG-35	Understands the concept of same/different
	CG-36	Constructs sets of blocks when given a model
	CG-37	Pairs related objects and pictures, e.g., shoe and socks
	CG-38	Reasons, e.g., "Show me something that rolls"
	CG-39	Plans and describes an action
	CG-40	Relates time to clock
	CG-41	Differentiates 'now- later'
	CG-42	[illegible]

ASSESSMENT CHECKLIST FOR SENSORY DOMAIN

Note: A-Auditory subskill, V-Visual subskill, T- Tactile subkill, O- Olfactory subskill, G-Gustatory subskill

AUDITORY SUBSKILL

Level & age gp in months	Item code	Item
I 0-3	A-1	Exhibits awareness of environmental sounds by startling/smiling/ stilling/sleep arousal/moving eyes in search of source
	A-2	Exhibits awareness of human voice by startling/smiling/stilling/sleep arousal/moving eyes in search of source
II 4-6	A-3	Begins to turn head towards sounds as loud as normal conversation
	A-4	Listens intently to sounds made by him/her
III 7-9	A-5	Responds to changes in vocal inflections
	A-6	Starts to associate meaning to sound, e.g., responds to own name occasionally, listening to toy sounds etc.
	A-7	Exhibits awareness of music/sounds from radio/tape recorder/TV commercials
	A-8	Differentiates between nonverbal and verbal auditory stimuli, e.g., name call vs. sounds of toys etc.
	A-9	Differentiates between long and short sounds, e.g., meow vs. ku---ku---chuk---) or fast and slow sounds, e.g., clapping fast and slow
	A-10	Differentiates between two non verbal sounds that are entirely different, e.g., clap vs. calling bell etc.
	A-11	Differentiates between two non verbal sounds that are minimally different, e.g., clap vs. table tap etc.
	A-12	Differentiates between soft and loud voices or noises
	A-13	Locates sounds coming from the sides
IV 10-12	A-14	Discriminates speaker's voice from background noise
	A-15	Associates meaning to words, e.g., come, give, bye etc.
	A-16	Localizes directly to the sounds coming from below
V 13-15	A-17	Discriminates between short and long words/utterances, e.g., fruits vs. butterfly, big ball vs. the lion is sleeping etc.
	A-18	Identifies more words like body parts and common objects
	A-19	Follows one step directions with 2 linguistic elements and thereby processes simple language, e.g., **bring** the **plate**, **point** to your **eye** etc.
VI 16-18	A-20	Identifies at least three animal or vehicle sounds

VII **19-21**	A-21	Discriminate words with minimal differences, e.g., **c**at vs. **m**at, **m**an vs. **p**an, sh**i**p vs. sh**ee**p etc.
	A-22	Follows one step directions with 3 linguistic elements, e.g., **give** me the **book** and **pencil**
	A-23	Localizes sounds from all angles
	A-24	Exhibits auditory memory up to two items (selects two pictures/objects correctly out of a choice of 5-6 in a sequence)
VIII **22-24**	A-25	Listens to sounds from a distance of more than 10 feet
	A-26	Discriminates familiar songs/rhymes
IX **25-27**	A-27	Exhibits auditory memory of three items (selects three pictures/objects correctly out of a choice of 5-6)
X **28-30**	A-28	Sequences two pieces of information together, e.g., sequences a small story or an incident
XI **31-33**	A-29	Repeats simple sentences of six words, e.g. I am a great big boy or a sequence of three numbers, e.g., 8-3-5
XII **34-36**	A-30	Responds to questions about a story/event
	A-31	Follows two step directions with 4 linguistic elements, e.g., **close** the **door** wash your **hands**; **go** to the **kitchen** and get a **glass** etc.

VISUAL SUBSKILL

Level & age gp in months	Item code	Item
I 0-3	V-1	Focuses eyes on familiar objects/faces and recognizes them from a distance
	V-2	Tracks moving objects/persons in and around the vicinity
II 4-6	V-3	Begins to watch own hand and fingers, coordinates hand with eyes
	V-4	Turns head toward bright colors and lights
	V-5	Identifies mother among a group of people
III 7-9	V-6	Has increased ability to track/follow movement of fast-moving objects
	V-7	Perceives depth (afraid of height and falling)
	V-8	Looks and reaches for a toy that is taken out of visual field or dropped by someone
	V-9	Removes cloth/hand from face that obscures vision
	V-10	Watches activities/inspects objects and persons around him/her for longer periods of time
	V-11	Looks without crossing or squinting his/her eyes
IV 10-12	V-12	Uses both hands and visually follows hand movements
V 13-15	V-13	Points to objects or people using words 'look' or 'see', e.g., "See dog"
VI 16-18	V-14	Smiles while viewing favorite objects and people
VII 19-21	V-15	Recognizes self in mirror and photo
	V-16	Likes looking through various viewing instruments, e.g., like binoculars, magnifying glass etc.
	V-17	Chooses one object/picture from a group of five upon request
	V-18	Watches own hand while scribbling
VIII 22-24	V-19	Dismantles and re-arranges the objects, e.g., tries to fix broken parts of toys in place
IX 25-27	V-20	Places objects on their outlines, e.g., places square, triangle and circle in a shape board
	V-21	Keeps coloring on the paper
X 28-30	V-22	Matches similar pictures
	V-23	Recalls three objects/pictures presented visually
XI 31-33	V-24	Matches and sorts objects by size, color and/or shape
XII 34-36	V-25	Identifies objects when part of it is shown in a picture
	V-26	Sequences three pictured events from a familiar story

TACTILE, OLFACTORY AND GUSTATORY SUBSKILL

Level & age gp in months	Item code	Item
I 0-3	T-1	Pouts when lips are tapped slightly on surface
	T-2	Closes fingers when touched in the palm
II 4-6	T-3	Turns to the direction where cheek is touched
	T-4	Reacts to light and firm touch, e.g., feels comfortable when touched/carried by mother
	T-5	Laughs when tickled
III 7-9	T-6	Has awareness of 'sweet taste'
	T-7	Explores characteristics of objects by touch, e.g., by moving parts, poking, pulling etc.
	T-8	Likes to hold soft objects, e.g., soft toys
IV 10-12	T-9	Has awareness of unevenness of surface, e.g., crosses thresholds carefully on the floor with or without help
V 13-15	T-10	Enjoys touching textures, e.g., plays with sand, play-dough, etc.
	T-11	Has awareness of hot and cold
VI 16-18	O-12	Smells things on his/her own as a part of exploration and shows awareness
VII 19-21	O-13	Has awareness that some things have smell and some don't, e.g., face powder vs. ball
	T-14	Discriminates 'hot-cold'
VIII 22-24	G-15	Has awareness of the 'sour' taste
IX 25-27	T-16	Discriminates and identifies two basic textures, e.g., smooth and rough
X 28-30	G-17	Discriminates and identifies sweet and sour taste
XI 31-33	O-18	Discriminates between pleasant and unpleasant smell odors and associates with their source
XII 34-36	T-19	Matches grossly different textures with eyes closed, e.g., jute, cotton, sandpaper, satin etc.

ASSESSMENT CHECKLIST FOR SPEECH-LANGUAGE DOMAIN

Note: C- Comprehension, **E-** Expression

Level & age gp. in months	Item Code	Item (Comprehension)	Item Code	Item (Expression)
I 0-3	C-1	Regards speakers' face and shows interest in the process of talking	E-1	Cries to indicate discomfort/pain/ hunger
	C-2	Looks about in search of the speaker	E-2	Vocalizes and uses some intonation patterns
II 4-6	C-3	Stops crying when someone talks to him/her	E-3	Plays by making sounds and noises (cooing)
	C-4	Regularly localizes source of voice with accuracy	E-4	Vocalizes in response to others' speech
III 7-9	C-5	Frequently appears to listen to whole conversations between others	E-5	Utters series of syllables (babbling) and longer vocalizations with varied intonation patterns
	C-6	Responds to pitch and loudness changes in voice of others (distinguishes emotions)	E-6	Mimics the sounds and syllables used by others (repetitive & variegated babbling)
	C-7	Responds to name call	E-7	Often uses jargon (short sentence like utterances of four or more syllables without true words)
IV 10-12	C-8	Recognizes family members (parents)	E-8	Mimes/vocalizes when an action is named, e.g. how does a car go?
	C-9	Gives or points to objects when named	E-9	Utters at least a word meaningfully, generally 'amma' to indicate mother
	C-10	Understands denial (responds to the word 'no')	E-10	Says 'finished' to signify completion of action
V 13-15	C-11	Points to body parts when named	E-11	Asks for objects by saying give or naming the object
	C-12	Comprehends many words (nouns such as common objects, animals, and vehicles)	E-12	Imitates sounds of animals or vehicles, e.g., 'bow bow - dog', 'meow - cat, 'drrrrr – car' etc.
	C-13	Comprehends simple instructions, e.g., "Bring the plate", "Point to your eyes" etc.	E-13	Begins naming objects, animals etc. using some true words along with gestures

VI 16-18	C-14	Comprehends simple 'what' and 'whose' questions, e.g., "What is this?", "Whose shirt is this?" etc.	E-14	Begins repeating words overheard in conversation, has an expressive vocabulary of 20-30 words
	C-15	Comprehends simple, 'who' and 'where' questions, e.g., "Who is this?", "Where is the ball?" etc.	E-15	Utters sounds like /m/, /w/, /b/, /p/, /t/, and /d/ consistently; speech is 25% intelligible
	C-16	Carries out two consecutive directions with any object, e.g., "Take the ball and roll it" etc.	E-16	Begins to use 1-2 word utterances and requests for actions, e.g., 'Papa come', 'Mama give' etc.
VII 19-21	C-17	Selects an item from a group of five or more varied items	E-17	Rejects and protests, if not satisfied with others' decision or opinion, ('don't want', 'no')
	C-18	Understands around fifty words (other nouns such as fruits, household materials, birds, food items etc.)	E-18	Uses question markers (what & where) and thereby requests for information
	C-19	Points to action verbs in pictures, e.g., eating, running etc.	E-19	Uses possessives, e.g., daddy's, mummy's etc.
	C-20	Remembers and associates new words by categories, e.g., cake-food, lion-animal, etc.	E-20	Greet others by saying 'hello' or 'hi' on request
VIII 22-24	C-21	Detects simple rhymes (responds by action, if a familiar rhyme is heard)	E-21	Says his/her name
	C-22	Comprehends pronouns (I, mine, you, this, that)	E-22	Has expressive vocabulary of minimum 30-50 words
	C-23	Comprehends questions concerning habitual behavior of named agents, e.g., "What does mummy cook?" etc.	E-23	Imitates/verbalizes 2 or 3 word sentences, e.g., "Mama give bikki" etc.
	C-24	Comprehends complex verbal sentences, e.g., "When we get to the stores, I'll buy you an ice cream" etc.	E-24	Utters more sounds like /n/, /h/, /k/, /g/; speech is 25-50% intelligible
IX 25-27	C-25	Understands more number of words (nouns such as clothes, vegetables, flowers, stationary items etc.)	E-25	Asks for help with some personal needs such as washing hands, going to toilet etc.
	C-26	Recognizes other pronouns (he, she, him, her and they)	E-26	Uses pronouns and possessives (I, my, you, me, mine, this, that)
	C-27	Recognizes possessives (his, her, and your)	E-27	Initiates topic for conversation and takes one or two turns with a topic
	C-28	Understands size differences, e.g., big vs. small	E-28	Uses past, present and future tense appropriately to describe events
X 28-30	C-29	Understands the meaning of kinship terms such as 'grandma', 'uncle', 'aunty' etc.	E-29	Uses negatives (not, won't and can't), e.g., "The ball is not there", "I won't do", "I can't do" etc.
	C-30	Identifies objects by use, e.g., "What do you cut with?" etc.	E-30	Modifies speech in relation to social situations, e.g., talking to dolls, young children etc.
	C-31	Comprehends prepositions, e.g., in, on, out, under, in front and behind	E-31	Produces a yes-no question by adding a rising intonation to the end of a sentence, e.g., "You took ball?" etc.
	C-32	Recognizes common adjectives and adverbs, e.g., fat, thin, short, tall, dry, wet, slow, fast, etc.	E-32	Uses some verbs, prepositions, adjectives and adverbs
	C-33	Comprehends 'how' questions,	E-33	Uses pronouns and possessives (he,

ASSESSMENT CHECKLIST FOR PLAY DOMAIN

Note: P- Play domain

Level & age gp. in months	Item code	Item
I 0-3	P-1	Exhibits exploratory play with own hands or legs
II 4-6	P-2	Exhibits exploratory play with toys, e.g., grabbing rattles, hitting objects or mouthing them
III 7-9	P-3	Enjoys playing games with adults, e.g., peek-a-boo.
	P-4	Finds hidden toys after watching it disappear
IV 10-12	P-5	Exhibits non participant play/onlooker play i.e. passive observation of others at play with out participating
	P-6	Exhibits functional play by manipulating objects in a functional manner, e.g., pushing a toy vehicle, dialing telephone etc.
V 13-15	P-7	Plays simple imitative games and enjoys taking turns
	P-8	Exhibits solitary play (playing alone and independently in adult's proximity without relating to others who may be playing nearby)
VI 16-18	P-9	Plays with shadows or hide and seek games
VII 19-21	P-10	Finds toys invisibly hidden under 2-3 covers
VIII 22-24	P-11	Exhibits symbolic play on self (e.g., pretending to sleep/drink) and later beyond self (e.g., brushing doll's hair, feeding doll/ mother etc.) on single object/people at a time
IX 25-27	P-12	Exhibits symbolic play- performs pretend activities on multiple objects/people, e.g., feeding self, doll and mother; putting spoon into a cup, etc.
	P-13	Exhibits representational play i.e. uses pretended objects in place of real ones, e.g., uses a block as a piece of cake; some paper pieces as food or pretends to be adults - mummies, daddies, doctors etc.
	P-14	Represents daily experiences taking several roles at once, e.g., playing 'house' using realistic objects wherein the child becomes mummy, daddy or baby (events are short, isolated with no true sequences)
	P-15	Exhibits play with blocks, sand and water
	P-16	Exhibits parallel play, i.e. playing side-by-side with other children without any exchange of activities and materials

X **28-30**	P-17	Exhibits enactive play, i.e. representing events less frequently experienced or observed (events being short) e.g., store shopping etc.
	P-18	Exhibits associative play, i.e. playing with other children sharing activities, ideas, and materials (enjoys being in proximity)
	P-19	Plays by standing in head down position as though initiating a somersault
	P-20	Blows bubbles from soapy water
XI **31-33**	P-21	Plays in a longer sequence, e.g., child cuts vegetables, cooks a dish, serves it and later washes the dishes; or doctor checks patient, calls ambulance, takes patient to hospital and operates etc.
	P-22	Engages in rhythm play, e.g., clapping hands and playing in a rhythmic way and guessing games, e.g., guessing the sides of a coin, guessing the card having picture etc.
	P-23	Awaits turn during play
	P-24	Plays on slide and swing in sitting position
XII **34-36**	P-25	Participates actively in group games

ASSESSMENT CHECKLIST FOR PRE-READING DOMAIN

Note: PR-Pre-reading domain

Level and age gp. in months	Item code	Item
II 4-6	PR-1	Follows movements of objects from left to right
III 7-9	PR-2	Shows interest in pictures
IV 10-12	PR-3	Anticipates body gestures when a familiar nursery rhyme or song is verbalized
V 13-15	PR-4	Points/identifies familiar pictures from books when named
	PR-5	Demonstrates enjoyment in looking at books together
VI 16-18	PR-6	Turns pages singly of a cardboard book or pages of less thickness randomly (2-3 at a time), e.g., notebooks, magazines, etc.
	PR-7	Identifies that the picture is upside down
VII 19-21	PR-8	Finds details in favorite picture book or on object
	PR-9	Understands that books can be read (differentiates books from toys)
VIII 22-24	PR-10	Joins in when you read the rhymes especially for the sounds or lines that repeat
	PR-11	Responds happily/shows interest in the stories being read
IX 25-27	PR-12	Matches objects based on sizes
	PR-13	Understands that reading is top to bottom from left to right and is able to turn pages in right direction
	PR-14	Matches an object in hand or room to a picture in a book
	PR-15	Turns pages one at a time of notebooks, magazines, newspapers etc.
X 28-30	PR-16	"Reads" pictures in the book
	PR-17	Looks at books independently
	PR-18	Matches similar pictures
XI 31-33	PR-19	Recognizes familiar environmental print, e.g., "X", "√" or pictorial representation of any real object
	PR-20	Holds books properly
	PR-21	Pretends to read a book
	PR-22	Asks questions while stories are read to him
XII 34-36	PR-23	Recognizes few letters
	PR-24	Identifies objects when part of it is shown in a picture
	PR-25	Sequences upto three pictured events from a familiar story

ASSESSMENT CHECKLIST FOR PRE-WRITING DOMAIN

Note: PW- Pre-writing domain

Level and age gp. in months	Item code	Item
II 4-6	PW-1	Co-ordinates eye with hand movements, e.g., looking at a doll by holding it
III 7-9	PW-2	Holds crayon in fist, thumb up position (palmer grasp)
IV 10-12	PW-3	Holds crayon to make a mark on paper
	PW-4	Imitates scribbling
	PW-5	Identifies writing implements, e.g., chalk, crayon, pencil, pen etc.
V 13-15	PW-6	Scribbles in a back and forth motion
VI 16-18	PW-7	Imitates circular scribble
VII 19-21	PW-8	Exhibits finger dexterity and hand strength, e.g., transfers small objects to container, stacks blocks, tears paper etc.
VIII 22-24	PW-9	Holds a crayon correctly when coloring (tripod grasp)
	PW-10	Demonstrates proper postures while drawing or coloring
IX 25-27	PW-11	Develops left-right progression
	PW-12	Traces and imitates drawing of horizontal and vertical lines
	PW-13	Traces curved and zigzag lines
	PW-14	Tries to imitate representational drawing
X 28-30	PW-15	Imitates a 'V' stroke (diagonal lines)
	PW-16	Imitates a circular stroke
	PW-17	Draws horizontal and vertical lines independently
XI 31-33	PW-18	Begins to draw a face with a few facial parts (may not be in proper alignment, no arms or legs)
	PW-19	Begins to draw round or oval shapes
	PW-20	Distinguishes between drawing and writing
XII 34-36	PW-21	Copies a plus ('+') and a cross ('X')
	PW-22	Pretends to write (writes letters using scribbles and wavy lines, e.g., 
	PW-23	Begins to trace and copy some letters

ASSESSMENT CHECKLIST FOR PRE-ARITHMETIC DOMAIN

Note: PA- Pre-Arithmetic domain

Level & age gp. in months	Item code	Item
VII 19-21	PA-1	Repeats one digit
VIII 22-24	PA-2	Understands the concept of 'one'
	PA-3	Repeats two digits, e.g., 1,2
	PA-4	Rote counts to three
IX 25-27	PA-5	Understands the concept of big- small
	PA-6	Places triangle, circle and square in shape board
X 28-30	PA-7	Has the concept of more-less, many-one
	PA-8	Understands the concept of 'two'
	PA-9	Rote counts to five
	PA-10	Understands the concept of long-short
XI 31-33	PA-11	Understands the question 'how many' and can meaningfully count objects up to five
XII 34-36	PA-12	Traces numbers
	PA-13	Matches and sorts objects according to size and shape
	PA-14	Arranges sizes in ascending or descending order
	PA-15	Recognizes few written numerals

APPENDIX II

DOMAIN ASSESSMENT DATA FORM

Client name: **Number:** **Date of birth:**
Age/ Gender: **Mother tongue:** **Provisional**
Diagnosis:
Examiner:
Address, Ph. No. & e-mail:
Language exposure: 1- Monolingual; 2-Bilingual; 3-Multilingual
Age range: I- 0 to 3 m; **II**- 3 to 6 m; **III** -6 to 9 m; **IV**- 9 to 12 m; **V**-12 to 15 m; **VI** -15 to 18 m **VII**- 18 to 21 m; VI**II**- 21 to 24 m; **IX** - 24 to 27 m; **X**-27 to 30 m; **XI**-30 to 33 m; **XII**-33 to 36 m
Parent Education: Illiterate / School level / PUC/ Undergraduate / Postgraduate / Professional
Occupation: NA / Nil / Unskilled / Semiskilled / Skilled / Semi professional / Professional
Total property: NA / Nil / <1 lakh / 1-5 lakh / 5-10 lakh / >10 lakh
Total family income per month: Nil / NA / Not available / <5000/ 6000-10,000/ 11,000-15,000/ 16,000-20,000/ >21,000
Socio Economic Status (SES) of the family: SES 1 / SES 2 / SES 3 / SES 4 / SES 5
Family status: Nuclear /Joint / Extended / Other (specify)
Current living environment: Rural / Semi-urban / Urban / Other (specify)
Age of onset of the problem: < 6 months / 6 m-1yr / 1-2 / 2-3
Severity of the problem: Minimal / mild / moderate/ moderately severe / severe / profound
Associated problems: Nil / Sensory / Motor / Other (specify)
Consanguinity: Absent/ Present (specify) I degree / II degree / III degree
Family history of speech and language problems: Positive / Negative / Not available
Family history of hearing loss: Positive (I degree / II degree / III degree) / Negative/ Not available

Details of therapy attended

Type of hearing aid: Body level / BTE analog / BTE digital / ITE / Cochlear implant / NA
Hearing age: < 6 months / 6 m-1yr / 1-2 / 2-3 / 3-4 / 4-5 / >5yrs / NA
Age of intervention: < 6 months / 6 m-1yr / 1-2 / 2-3 / 3-4 / 4-5 / >5yrs
Type of therapy attended: Listening training / speech-language therapy / physiotherapy / occupational therapy / behavior therapy/ any other
No. of therapy sessions: Nil / <15 / 15-30 / 30-60 / >60
Type of stimulation: Naturalistic / Structured
Who looks after the child at home: Mother / Father / Grandparent / Maid / Caregiver/ Other
Home training: Yes/ No
Duration of home training: Nil, 1/2-1hr/day / 1-2hrs/day / 2-3hrs/day / 3-4hrs/day
No. of individuals involved in home training: 1 / 2 / >2
Follow up visits: Nil / One / Two / >Two
P.S: NA-Not applicable, BTE: Behind the Ear, ITE: In the Ear

CONSOLIDATED SCORE SHEET

Instructions: Rate the abilities of the child for each of the items based on the scoring pattern given.
Scoring: **0**-Not applicable/absent, **0.5**-Totally dependent/physical/verbal prompt, **1**-Consistent and independent

Item no.	Self-help				Social Emotional		Motor		Cognitive	Sensory			Speech-language		P	PR	PW	PA	Remarks
	FD	D	T	PH	S	E	GM	FM	CG	A	V	TOG	C	E					
1																			
2																			
3																			
4																			
5																			
6																			
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43																			
44																			
45																			
46																			
Total score																			
Examiner's name and signature																			

P.S: FD-Feeding, D- Dressing, T- Toileting, PH- Personal hygiene, S-Social, E-Emotional, GM-Gross motor, FM-Fine motor, CG-Cognitive, A-Auditory, V-Visual, TOG- Tactile, Olfactory, & Gustatory, C-Comprehension, E-Expression, P-Play, PR- Pre-reading, PW- Pre-writing, PA-Pre-arithmetic

Overall remarks:

APPENDIX III
List of materials included in the kit for assessment and training

Sl.No.	Materials required for assessment and training
1	Mechanical toy (Monkey)
2	Toy car
3	Colour ribbons
4	Laser torch
5	Rattle
6	Soft ball
7	Dice
8	Fruit models
9	Spring bangle
10	Kitchen set
11	Animal models
12	Cloth clips
13	Puzzles
14	Story picture cards
15	Stacking cups (built up cubes)
16	Stacking rings
17	Beads
18	Post box (Piggy bank)
19	Blocks
20	Doll
21	Shoe brush
22	Ohno cards
23	Fevisitck
24	Watch strap
25	Tool set
26	Common objects such as comb, tooth brush, paste, powder, mirror etc.
27	Thick crayons and thin crayons
28	Whistle
29	Rabbit to pull along
30	My first play pack
31	Matchbox
32	Small scissor
33	Picture cards (different categories)
34	Binoculars
35	Purse with zip
36	Clay
37	Colorful soft balls
38	Straw (wide and short, narrow and long)
39	Hand puppets-2
40	Face Mask
41	Eye mask
42	Pieces of clothes (sensory skill)
43	Candle
44	Peg mosaic
45	Pencil box
46	Interlocking blocks
47	Intellect room for shape matching
48	Model of insects
49	Water colours
50	Letter, word and number cards