INTRODUCTION

Communication in human beings is unique in many ways and involves verbal and nonverbal forms. Verbal communication is attained through speaking, whereas nonverbal communication is carried out using means other than speech, such as hand gestures, eye-gaze, facial expressions, touch, posture, spatial behavior, physical appearance, non-verbal vocalizations and smell (Argyle, 1996).

Language development in typically developing children occurs as a continuum. In the initial stages of development, children use nonverbal communication strategies. As they develop, children transit from the use of nonverbal to verbal communication strategies. Even in the later stages when children are proficient in verbal communication, nonverbal communication plays a significant role in adding to the meaning, stating the emotions involved and others. Typically, most of the nonverbal communication is attained through body gestures such as pointing, facial expressions, eye gaze, body movements etc. Yoder & Warren, (2001a) state that gestures and vocalizations serve the same pragmatic functions (such as requests and comments) as early words.

Functions of language in typically developing children are described in various ways. Halliday (1975) described communication functions as instrumental, regulatory, interactional, personal, heuristic, imaginative and informative while Dale, (1980) included some of the semantic categories such as naming, attribution, nonexistence, rejection, denial and affirmation. These communication functions are learnt through early interactions with
significant others in the environment. Language skills, as stated by Bochner, Price, Jones, (1997) are acquired as children take part in routine exchanges with the adults who care for them. Wetherby, Cain, Yonclas and Walker (1988) observed that in early years, typically developing children use communicative functions for depicting wide range of functions such as making comments, questioning, acknowledging and also for negotiating communication breakdown.

Language acquisition is believed to develop from early non-verbal communicative behaviors, in particular the use of gestures (Franco & Butterworth, 1996; Franco & Wishart, 1995). Gestures are actions produced with the intent to communicate. The emergence and evolution of gesture is predictable and natural in developmental sequence. It is typically expressed using the fingers, hands, arms and includes facial features and body motions (Iverson & Thal, 1998). The onset of intentional communication is signaled by infants by using gestures such as eye gaze, facial expressions, touch, and other gestures to express their wishes and interests. These gestures are used for communication before speech develops and at a later stage alongside speech. As the speech skills develop, the gestures used also vary in nature. McNeill (1992) lists the various gestures as follows:

- Gestures may be produced along with speech,
- Gestures may not show duality of patterning,
- Gestures maybe rarely combined and therefore convey single idea units.

Most of these early interactions in infants are need based, and it is the mother who is involved in fulfilling them. The process of interaction between a mother and child is an
ongoing, natural and an enjoyable process and communication develops within this social interaction (Conti-Ramsden, 1994). Mothers respond to infants as if they were communicative partners from an early age of two years and this scaffolds the later emergence of intentional communicative behaviors and subsequent words (Bruner, 1983). At around the age of 2 years and 6 months, typically developing children are skilled communicators, taking an active and independent role in conversation with familiar adults (Clarke-Stewart & Hevey 1981).

During the initial period of development, infants use cry as their primary mode of communication. As they develop, they start using vocalization to indicate their physical state. This marks the beginning of a communication interaction process. Wetherby, Cain, Yonclas, Walker (1988), observed that mothers vocalize, and wait for a response from the infant. They then vocalize again, either in response to infant’s vocalization or to elicit a response from the infant. The child in turn indicates his readiness by vocalizing and/or by being quietly alert for longer periods of time. In parallel to these verbal behaviors, infants also use non verbal communication to indicate their needs through touch, gaze, smile and facial expressions. As they develop, they start using more mature gestures to indicate their needs.

Children with congenital motor impairments such as those arising from cerebral palsy (CP) show a considerable difference in the ability to communicate and interact with the communication partners. Cerebral palsy (CP) is a nonprogressive, neurological disorder with motor impairment that is diagnosed in early childhood (Pellegrino & Dormans, 1998). Depending on the neuroanatomical involvement and its physiological correlates children with
CP exhibit various motor problems, sensory issues, feeding difficulties, apart from the motivational, affective or attentional limitations that exist as co morbid disorders in such individuals. Children with CP thus are at risk for communication impairment. Some of them are verbal, with significantly unintelligible speech, while others are fairly intelligible. Children with severe speech and physical impairment (SSPI) and CP do attempt to communicate. However due to their condition, their communicative attempts get distorted, and many a times they tend to use subtle and unconventional acts that lead to confusion in interpreting their intentions (Iacono, Carter & Hook, 1998). Children with CP, especially those with severe degree of involvement often rely on nonverbal modalities for expression such as use eye gaze, facial expressions, vocalizations and movements of arms and hands. However, due to the limited motor ability in such children, the ability to use these behaviors is also limited and this in turn affects the caregiver’s use of known strategies to read the potentially communicative signals (Trad, 1994).

Most of the children with severe CP have difficulty in speaking and as a part of rehabilitation measures, they are suggested use of ‘Augmentative and Alternative communication’ (AAC) strategies. Augmentative and alternative communication helps in compensating for temporary or permanent impairments, activity limitations, and restricted participation of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication" (ASHA, 2005). The unaided modes of communication in AAC rely completely on the user’s body to convey messages such as gestures, sign language/ systems and facial expressions. The aided communication modes in AAC require the use of tools in addition to the user’s body. It can
range from use of low-tech systems (e.g. line drawings) to high tech systems such as dedicated devices with digitized speech output (Johnston, Reichle & Evans, 2004). In most instances, such augmentative and alternative communication strategies might develop on their own as a means to convey intent, needs and feelings or it might be taught to them by significant others or professionals. In most of the instances however, due to the limitations that the condition imposes, children with CP use non-verbal symbols which are slow and effortful, and are not associated with the required facial expressions and body movement.

There has been substantial body of research undertaken to describe the interaction between children with severe speech and physical impairment (SSPI) and cerebral palsy (CP) and their parents or other partners involved in communication. Most of these studies which describe the communication interaction in the dyads (SSPI with CP and their communication partners) describe the functions of communication and the various modalities used to express such functions. Pennington and McConachie (2001), described communication interactions in this population as highly constrained in terms of conversation structures with seldom use of commands or questions and production of more yes/no answers and acknowledgements to others. They further added that communication partners most often used high levels of directive functions such as requests for objects and actions, and requests for information.

Communication modes used by children with SSPI and CP are reported by various researchers and several patterns have been noted. It is reported that natural modes of communication such as vocalization, eye pointing, gesture and body movements are preferred by children using augmentative devices. Harris (1982), while discussing the choice
of modes to communicate, observed that some children prefer quickest form of communication. Few other researchers have hypothesized that modality preference is function dependent. Smith, (1994) and Light, Collier and Parnes, (1985c) observed that children confirmed, denied, requested for objects/actions, and attention by using gesture and/or vocalization while provision of information, especially relating to absent objects, or not relating to present context and clarification using aided communication devices.

Need for the study:

There is a significant contribution of maternal stimulation and interaction style in communication development of infants. However, there are very few reports on mother-child interaction in children with cerebral palsy, especially because they form a unique group of individuals with severe speech and physical impairment. It would be thus interesting to view communication interaction between children with severe speech and physical impairment (SSPI) and cerebral palsy (CP) and their mothers. Children, who are verbal, play a significant role in the kind of stimulation they receive. On similar lines, children with cerebral palsy especially those who depend on nonverbal communication would also have a role to play in the kind of language stimulation they receive. It is essential for rehabilitators to have a data on the communicative functions in children with SSPI and CP, especially when they are dependent on unaided i.e. naturally available nonverbal communication strategies.

Most of the reported studies address issues such as partner interaction with nonspeaking children with physical impairment using various AAC communication
strategies. There are no studies evaluating mother-child interaction in children with SSPI and CP who have not undergone any kind of speech and language stimulation or prescribed AAC strategies. Hanzlik (1989), studied children with a mean age range of 16 months but this study included children with CP with varying degrees of physical impairment (included quadriplegic, hemiplegic, diplegic of mild moderate and moderate-severe degrees). Basil (1992) studied children with CP in the higher age range (7.4-8.8 years) with poor receptive language age using communication boards while interacting with parents (mothers and fathers).

Light, Collier and Parnes (1985 b & c) studied communicative interaction patterns of eight congenitally nonspeaking physically disabled children using aided AAC (between the ages of 4 and 6 years) and their primary caregivers. Pennington and McConachie, (1999) conducted an in-depth analysis of interaction between mothers and their severely physically disabled children between the age ranges of 2-10 years whose speech was unintelligible out of context to their parents. Most of them were also provided with aided communication systems. Restricted conversation patterns were evident in these children, along with maternal directiveness. Further, Pennington and McConachie, (1999) suggest that interaction for children with severe motor and speech impairments becomes “fossilized” as their age progress.

The outcome of most of the previously conducted studies cannot be generalized due to limited control over variables such as type and severity of cerebral palsy, receptive and expressive language skills of children with CP, clear designation of communication partners,
their age, education, and socio economic status. Most of the children included as subjects in these studies cited were dependent on aided communication systems, thus not revealing baseline communication interaction patterns. Besides, most of the reported findings are from the Western countries. Significant differences are to be expected in the Indian scenario due to different cultural and socioeconomic factors (Westby & Ford, 1993). In addition, differences are to be expected in terms of the type of communication strategies that are used, that is, whether it is augmentative and alternative communication (AAC strategies) in the Indian scenario.

There is scarcity of information on mother-child interaction patterns involving children with cerebral palsy, especially because they form a unique group of individuals with significant speech and physical impairment. Children with cerebral palsy especially those who depend on nonverbal communication have a role in the kind of language stimulation they receive. It is essential for rehabilitators to have data on the communication interaction patterns in children with SSPI and CP, in the absence of speech, especially when they are dependent on unaided i.e. naturally available nonverbal communication strategies. There are hardly any studies in India which have evaluated mother-child interaction in non speaking children with cerebral palsy who have not undergone any kind of speech and language stimulation specific to Indian context

Aims of the study: The major objective of the study was to analyze communication interactions of children with severe speech and physical impairment (SSPI) and cerebral palsy (CP) with their mothers during instructed play. The specific aims were to study:
Section A:

- ‘Communication functions’ used by mothers and children with SSPI and CP
- Responses of mothers and children with SSPI and CP to the ‘communication functions’ used by each in the dyad.
- ‘Communication modalities’ used by the mothers and children with SSPI and CP.
- Responses of mothers and children to the communication ‘modalities’ used by each in the dyad.

Section B:

The secondary objective of the study was to describe how mothers’ participating in the study viewed their children’s disability; specifically communication impairment linked to SSPI and CP, their sensitivity towards physical limitation that the condition imposes and their concerns about the condition and prognosis.

METHOD

The participants were selected from various rehabilitation centers which were mainly involved in the rehabilitation of children with physical impairment of neurological origin. Informed consent was obtained from mothers prior to their inclusion along with their children in the study. Ten Kannada speaking dyads between the age ranges of 2; 1 to 3; 11 years (mean age range of 2.8 years) with the diagnosis of severe quadriplegic cerebral palsy belonging to middle socio economic status [as on the adapted version of NIMH Socioeconomic status scale (NIMH, 1994)] participated in the study.
Receptive language of the children were found to be within ± 3 months of their chronological age as assessed using ‘Assessment Checklist for speech and language skills’ (Geetha, 2007). A checklist based on items and guidelines from ‘The nonspeech receptive and expressive language scales’ by Huer (1988) was prepared to specifically assess the nonverbal receptive and expressive language skills in children included in the study. Receptive and expressive language in children and choice of modality by the children was noted down using the checklist. None of the children in the study had undergone formal speech and language therapy except one participant who attended speech and language therapy for duration of a month. Mothers involved in the study were in the age range of 21-30 years (mean age range of 25 years) and had a minimum qualification of 12th grade. None of them had any speech and language impairment or any sensory issues.

Toys and activities suitable for children in the selected age range were provided to mothers and they were told to interact with their child as they would normally do at home. Few trial recordings of interactions were carried out with different set of toys for familiarizing the participants to the testing procedure and desensitizing the participants towards the camera. Mother-child interaction was video recorded in a quiet room with limited distraction for 15-20 minutes in a comfortable setting during instructed play situation. Four interactive sessions of fifteen minutes each were recorded in order to provide maximum opportunity for the occurrence of communication functions and to rule out the contextual limitations if any (as in selection of a particular toy). Following this, a semi-structured interview was carried out using a detailed closed ended questionnaire. It was specifically
prepared for the purpose of obtaining mother’s views about various factors contributing
towards the acceptance of a communication system and towards communication efficiency.

The investigator as the third judge transcribed in entirety the mothers’ communication interaction strategies by viewing the video recorded samples. Communication functions used by mothers included verbal, nonverbal or combined strategies whichever was applicable at that instance. The children with SSPI and CP participating in this study were nonverbal. Hence, communicative strategies used by these children included only the nonverbal strategies. The nonverbal strategies used by mothers and children were not identified at this stage by the investigator as transcribing these nonverbal strategies would provide details of the modalities which had to be later coded by trained judges.

Two professionals, who were post graduates in speech and language pathology and had a minimum of 2 years of experience in intervention of childhood language impairment, were selected as judges. The investigator also participated as the third judge in the coding process. Taxonomy to describe communication interaction in dyad involving children with SSPI and CP was compiled after reviewing studies cited in literature. The judges were familiarized with the operational definitions for the various communicative strategies used by the mothers and children. Training was provided to the judges using a sample video recorded clip of a 6-year-old child meeting all the criteria as specified for children included in this study, except for the age. The actual recorded samples were played to both the judges. The judges viewed the communication interaction and coded the dyadic communication
interaction for functions, modalities and responses of mothers and children to the functions and modalities used by their partners in the dyad.

The judges utilized the transcription along with the taxonomy provided to them during the training phase as the bases for coding the communication interaction in the dyad. The judges coded the following:

- ‘Communication functions’ and ‘communication modalities employed by mothers and their children,
- Responses of mothers and children with SSPI and CP to the communication functions and communication modalities used by each in the dyad.

Communication acts included two components: function or meaning (request for information, request for attention, request for objects, information, instruction for action, instruction for speech, confirmation and denial) that the mother/child intended to convey and the actual behavior or means (vocal, eye, facial, part body and combination gestures). Responses of mothers and children to the various functions and modalities used were analyzed based on ‘response’, ‘no response’ and ‘response not expected’. Frequency of occurrence of functions, modalities and responses for various functions and modalities were also calculated.

Inter and Intra-judge reliability measures using alpha co-efficient was carried out for the:

- transcriptions,
• communication functions and modalities used by mothers and children with SSPI and CP,

• responses of mothers and children for the functions and modalities employed by each in the dyad.

The results obtained are presented and discussed under two main sections (A & B)

Section A:

• ‘Communication functions’ used by mothers and children with SSPI and CP

• Responses of mothers and children with SSPI and CP to the ‘communication functions’ used by each in the dyad.

• ‘Communication modalities’ used by the mothers and children with SSPI and CP

• Responses of dyad to the communication ‘modalities’ used by each in the dyad.

Section B:

Mother’s responses to the questionnaire were analyzed to understand their attitudes towards various issues in children with SSPI and CP as well as their knowledge about the condition. Variation in responses of mothers’ on the questionnaire versus the communication acts as coded by the judges are also presented with respect to two main parameters namely:

• Communication functions and modalities employed by children with SSPI and CP

• Children’s responses to various communication functions used by the mothers

RESULTS

The findings of the study are presented under 2 sections (Section A and B).
Section A:

The following ‘communication functions’ used by mothers and children with SSPI and CP were analyzed. Communication functions included were the following:

- Request for information (general)
- Request for information (yes/no)
- Request for attention
- Request for objects
- Information
- Instruction for action
- Instruction for speech
- Confirmation and
- Denial

The following ‘communication modalities’ used by the mothers and children with SSPI and CP were analyzed. Communication modalities included were the following;

a. Vocal gestures
   - Vocalization
   - Verbalizations

b. Eye gestures
   - Looking at object
   - Looking at person
   - Looking at location
   - Combination of looking at object/person, location
   - Eye blink
c. Facial gestures
d. Part body gestures
   - Showing
   - Pointing
   - Ritualized
e. Combination gestures:
   - Sequential (specify)
   - Simultaneous (specify)

Responses of mothers and children to the communication ‘functions’ and ‘modalities’ used by each in the dyad were analyzed and defined as those functions and modalities:
   - that received a response;
   - that did not receive a response; and
   - where responses were not expected

Section B:
The secondary objective of the study was to describe the attitudes of the mothers in the dyad towards their children’s disability. It specifically aimed to study issues linked to SSPI and CP in terms of:
   - Indication of needs by their children
   - Various communication functions utilized by their children
   - Responses from children for various maternal functions
   - Modalities that facilitate understanding communication attempts of children
• Impact of physical disability in children in various spheres of development
• Prognostic expectations by mothers about their children’s condition
• Role of various strategies in rehabilitation
• Concerns that mothers’ have about their children
• Knowledge about aids
• Impact of nonverbal communication in communication development of their children

Individualistic variations in ‘communication functions’, ‘communication modalities’ and responses of mothers’ and children for the various communications and modalities used were evident. Hence individual data was profiled and group behavior wherever applicable was described. Responses to the questionnaire were also qualitatively discussed.

Implications of the study

The study was designed to examine the communication functions and modalities in instructed play situation between mothers and children with SSPI and CP. This is one of the first attempts in such a population in Indian context. The study contributes to the empirical database in understanding the communication behavior of children with SSPI and CP who have not received any formal speech-language training/therapy. The outcome of the study points towards the need and importance of sensitizing parents/caregivers and professionals dealing with children with SSPI and CP regarding various nonverbal communication attempts in such children and how it has to be encouraged to fulfill the communication cycle.
Furthermore, it specifies the communication functions and modalities that need to be boosted or dampened to promote communication between the dyads involving mothers and children with SSPI and CP. In this sense the outcome of the study not only helps in evaluation of nonverbal communication in other such dyads, but also helps in setting goals in intervention.

Limitations of the study:

1. The stringent criteria followed in the method to select a homogenous group of dyads gave way to a limited sample size of ten dyads. Hence there was no scope for statistical verification of the results as individual variability across the ten dyads studied was high.

2. The study profiled a wide range of communication functions and modalities used by children with SSPI and CP with mothers during instructed play situation only.

3. In the analysis, no attempt was made to study and control external variables such as parenting styles, individualistic communication patterns, acceptance of the physical impairment and parental beliefs as well their practices.

4. Only a close ended questionnaire was used to tap the mothers’ attitudes and this by itself could have limited the responses of mothers on the same.