PERCEPTION OF AFFECTIVE PROSODY IN 5-7 YEAR OLD MALAYALAM SPEAKING CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT

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Certificate

This is to certify that this dissertation entitled **"Perception of Affective Prosody in 5-7 year old Malayalam speaking children with Specific Language Impairment"** is a bonafide work in part fulfillment for the Degree of Master of Science (Speech-Language Pathology) of the student (Registration No.14SLP001). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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Declaration

This dissertation entitled **"Perception of Affective Prosody in 5-7 year old Malayalam speaking children with Specific Language Impairment"**is the result of my own study under the guidance of Dr.Jayashree C.Shanbal, Reader in Language Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

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The essence of all beautiful art, all great art is gratitude

- Friedrich Nietzsche

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CHAPTER 1: Introduction

"Words mean more than what is set down on paper. It takes the human voice to infuse them with deeper meaning."

- Maya Angelou

Successful communication and social interaction are influenced considerably by expression and understanding of emotions (Banse & Scherer, 1996; Pittam & Scherer, 1993; Scherer, 2003). To humans, voices bear a special significance (Blasi, et al., 2011). In addition to communicating verbal content, voice also communicates extra verbal information that allows making inferences about the intentions and emotional states of the speaker. Emotions can be expressed in many ways, they can be expressed non-vocally in facial/ body gestures, linguistically in semantic content of speech, in the acoustic patterns of the voice that provide affective or emotional prosodic cues in speech, and/ or in nonverbal vocal productions such as laughing or crying that convey information about physical and mental status of an individual (Sauter, Eisner, Calder & Scott, 2010; Scott, Sauter & McGettigan, 2010). Thus, affective prosodic features are important in conveying information with regard to the emotional state of the speaker or the context (Crystal, 1992; Merewether & Alpert, 1990).

Affective prosody is thus defined as a neuropsychological function that encompasses all non-verbal aspects of language that are necessary for recognising and conveying emotions in communication (Leentjens, Wielaert, Harskamp, & Wilmink, 1998). Affective prosody encompasses variations in pitch, intensity and duration (Frühholz, & Grandjean, 2012).

Earlier studies were carried out which investigated the neural basis for perception or recognition of affective prosody and phonemic components of words in ten right-handed adult males using fMRI. The results of such researches concluded that language and specifically affective prosody are reported to be processed in fronto-temporal brain networks, including the temporal regions along the superior temporal gyrus/ sulcus, and frontal regions in the inferior frontal gyrus and orbitofrontal gyrus in neurotypical individuals (NT) (Buchanan, 2000; Fruhholz & Grandjean, 2012; Kotz, Kalberlah, Bahlmann, Friederici, & Haynes, 2013; Leitman, Wolf, Ragland, Laukka, Loughead et al., 2010; Schirmer & Kotz, 2006). In addition, affective prosody was found to be associated with activity in subcortical brain structures, such as the amygdala and the basal ganglia (Fecteau, Belin, Joanette, & Armony, 2007; Grandjean et al., 2005; Wiethoff, Wildgruber, Grodd, & Ethofer, 2009).While it is known from studies that semantic content is typically processed more in the left brain-hemisphere, affective prosody seems to be processed more in the right hemisphere in NT individuals (Bulman-Fleming & Bryden, 1994).

Previous studies suggest that typically developing (TD) children and adults are able to perceive and comprehend prosodic aspects automatically (Shriberg & Kent, 2003) and this skill was found to be emerging at a very early stage during a child's development (Jusczyk, Cutler, & Redanz, 1993; Mehler et al., 1988). Researches done in children from first year of age through preschool reveal that they are able to understand and apply prosodic cues during the early linguistic development stages and the typical errors during this period such as weak syllable omission, can be attributed directly to the way in which prosodic cues are interpreted (Gerken & McGregor, 1998).

The humans' capacity to understand emotional speech constitutes a relatively composite skill that is very crucial in social and cognitive behaviours. Studies in this regard of the vocal expression of emotions has started since the late 'eighties wherein children were asked to match the auditory stimulus depicting affective intonation patterns of happy, sad, neutral and angry with appropriate visual-facial representation. They concluded that children at a very young age of around 3 or 4 years were able to deduce a speaker's emotional state from his or her variations in affective prosody (Baltaxe, 1991; Stifter & Fox, 1987).

Primary emotion recognition capabilities are reported to begin to develop as early as infancy. Although results are somewhat mixed concerning the exact age at which these capabilities emerge, in general, infants are able to discriminate some basic facial expressions by the second half of the first year of life (Kestenbaum & Nelson, 1990; Ludemann & Nelson, 1988, Bornstein & Arterberry, 2003; Schwartz, Izard, & Ansul, 1985; Barrera & Maurer, 1981).There has always been a bias among researchers about the development of perception of emotion and affective prosody, interchangeably referred to as emotional prosody, from infancy to early adulthood. However, recent growing bodies of research suggest that infants become capable of discriminating some emotions in the first year of life with the processes involved in emotion recognition appearing to exhibit a protracted developmental trajectory. Cross-sectional studies of emotion recognition done in school-aged children suggest age-related improvement in emotion recognition through nine to ten years of age (Doherty, Fitzsimons, Asenbauer, & Staunton, 1999; Friend, 2000; Leppanen & Hietanen, 2001; Vicari, Reilly, Pasqualetti, Vizzotto, & Caltagirone, 2000).Certain other findings suggest continuing developments of these skills through adolescence (Lenti, Lenti-Boero, & Giacobbe, 1999; Kolb, Wilson, & Taylor, 1992).

Results from several studies done on typically developing children and adults have shown that adults follow and depend mostly on emotional prosody to understand emotional speech than semantic content, contrary to preschool and school-age children who rely on semantic content (Friend & Bryant, 2000; Morton &Trehub, 2001; Waxer & Morton, 2011). Aguert, Laval, Le Bigot and Bernicot (2010) carried out studies to investigate emotional speech comprehension in a verbal interaction task wherein the emotional prosody was varied with the situational context. They used a judgement task and found a developmental trend in the perception of emotional prosody. They concluded that there was a developmental transition found in the use of cues to understand speaker's intention, which shifted from situational context as an important cue at ages 5 and 7 years to emotional prosody in adults. This shift in pattern was thought to have appeared from age 9, with the 9-year-olds relying on both cues and a gradual shift to emotional prosody alone in adulthood.

Yet another factor that has received attention in the researches on perception of affective prosody includes gender differences in children for recognition of emotions. Individual studies in this regard have yielded inconsistent results on gender differences in children's facial emotion recognition; however, a meta-analysis of a large number of studies (McClure, 2000) indicated a significant advantage in facial expression processing for girls over boys, from infancy through adolescence. Certain other studies have concluded a null effect of gender variations on emotion perception (Morton & Trehub, 2001); hence there is a wider scope for research in this regard to conclude about the gender variations.

Need for the study

Reports and evidence from literature thus suggest emergence of recognition of affective prosody from a very young age as early as three years old (Kestenbaum & Nelson, 1990; Ludemann & Nelson, 1988, Bornstein & Arterberry, 2003; Schwartz et al., 1985; Barrera & Maurer, 1981). However, this ability in perception of affective prosody might not be seen in clinical population such as children with language impairment who could pose greater challenges in acquisition of appropriate linguistic aspects to develop adequate communication skills. Hence, they face difficulties in social interaction, because of their affective deficits which is indirectly related to linguistic/ cognitive deficiencies in them (Creusere, Alt & Plante, 2004). Evidences suggest that children with learning disability have comparatively negative social relationships with strangers as well as individuals close to them and they concluded these deficiencies to be the resultant of inability to interpret facial expressions (Holder & Kirkpatrick, 1991).

Typically, studies reported focus on deficit in the area of social communication and interaction as a trademark of children with Autism Spectrum Disorders (ASD). Yet another clinical population that has received wide attention in terms of delay/deficit in the perception of affective prosody included the children with Specific language impairment (SLI). Similar to children with ASD, studies suggest that even children with SLI face similar problems in social communication especially in the emotion recognition domain either in visual or auditory modality. Children with SLI are able to identify simple emotions easily in the visual modality (from faces) but were found to perform poorer than typically developing children in recognizing emotions through auditory mode (from voices) (Trauner, Ballantyne, Chase, & Tallal,

1993). Taylor, Maybery, Grayndler and Whitehouse (2015) compared emotion recognition ability in the auditory and visual modality in children with SLI and Autism. Results concluded that children with SLI performed similar to children with Autism (with language impairment) and concluded that these deficits in perception of affective prosody are localized to linguistic deficits in them.

According to Creusere et al., (2004) who investigated whether reported difficulties in language- impaired children in understanding vocal and facial cues to emotion can be explained partially by at least non-paralinguistic factors. They conducted an affect discrimination task in four cue situations; facial expression and unfiltered speech, low pass filtered speech only, facial expression only, and facial expression and filtered speech. Their results indicated that children with SLI performed poorer than typically developing children on only tasks requiring recognition of emotional meaning alone.

Thus, it is evident that exploring affective prosody in children with SLI requires attention as these cues may be crucial also to understand their deficits at a linguistic level. Study of affective prosody in children with SLI is lacking in general around the globe and also specific in the Indian scenario. Thus, despite having its theoretical and probably a clinical importance, the pattern in which acquisition of affective prosody occurs in typically developing children and children with SLI from Indian linguistic contexts remains unclear. The studies here are, hence designed to contribute to this issue by investigating the recognition of affective prosody in children with SLI.

Aim and objectives of the study

The aim of the current study was to investigate the perception of affective prosody in children with SLI between 5-7 years of age.

The objectives of the study were,

- To study the perception of affective prosody in typically developing children between 5-7 years of age.
- To compare the perception of affective prosody in children with SLI and matched typically developing children between 5-7 years of age.

Hypotheses: The hypotheses of the study are,

- There is no significant difference in the perception of affective prosody in typically developing children between 5-6 years of age and 6-7 years of age.
- There is no significant difference in the performance of children on perception of affective prosody between children with SLI and matched typically developing children between 5-7 years of age.

CHAPTER 2: Review of Literature

Humans have the unique ability to understand what another person feels and also about other people minds (Newen, Welpinghus & Juckel, 2015). This exclusive function is achieved by variations in prosodic features. According to Paul, Augustyn, Klin and Volkmar (2005) prosody refers to the suprasegmental features of the speech signal that modulate and enhance its meaning. Thus, the variations in the prosodic aspects refer to modulations in pitch, stress and duration. These variations imply functions at several levels including grammatical function, pragmatic function and affective function.

The affective function of prosody is a multi-level mechanism. Emotions in speech are conveyed through this affective prosody, which consists of variations in pitch, intensity, and duration (Fruhholz, Ceravolo & Grandjean, 2012). Thus, affective prosody involves decoding of simple emotions to the assessment of complex mental states. The affective prosody is hence essential to build emotional rapport as well as for understanding and conveying emotions in communication. In terms of the acoustics of affective prosody, previous research suggested that variations in fundamental frequency, perceived by listeners as pitch, was crucial for producing and perceiving different emotions through speech (Bachorowski & Owren, 2003; Monnot, Orbelo, Riccardo, Sikka, & Ross, 2003). A number of specific pitch measurements have been shown to contribute to prosodic variations between emotions, such as pitch mean, range, and variability (Mozziconacci, 2001; Scherer, 1986). Other important parameters include intensity and speech rate (Murray & Arnott, 1993).

The brain areas responsible for processing of affective prosody involved the fronto-temporal networks which included the temporal regions along the superior frontal gyrus and frontal regions near inferior frontal gyrus and orbitofrontal gyrus (Buchanan et al., 2000; Fruhholz & Grandjean, 2012; Kotz et al., 2013; Leitman et al., 2010; Schirmer & Kotz, 2006). Studies have also reported about subcortical brain structures such as amygdala and basal ganglia that contribute to the perception of affective prosody (Fecteau et al., 2007; Grandjean et al., 2005; Wiethoff et al., 2009). Thus, the linguistic semantic information was processed in the left hemisphere predominantly whereas the right hemisphere was associated with the perception of emotions (Bulman-Fleming and Bryden, 1994).

Evidences suggested that physiology of emotions was associated with the activation of the nervous system. That is, an emotion is a positive or negative experience that is associated with a particular pattern of physiological activity (Cacioppo, Berntson, Larsen, Poehlmann & Ito, 2000). The earliest basic model of emotions explained that each emotion is a discrete and independent category and specific neural structures and pathways sub-serve this specific emotional category. This model called the dominant theory of emotions posited that the human genre is evolutionarily endowed with a set of basic limited emotional categories (Ekman, 1992; Panksepp, 1998; Tomkins, 1962, 1963). This theory was however, rejected based on researches because they failed to explain the comorbid illnesses among the mood disorders as well as resulted in confusions over the neurophysiological underpinnings of affective disorders.

This led to the development of a more widely accepted model of emotions called the circumplex model of the affect given by Russel (1980). This model

proposed that all the emotions are due to the interactions of two basic neurophysiological systems; one related to valence and the other related to arousal. Thus, any emotion can be defined according to these two systems; valence: how positive or negative it is felt and arousal: how much of activation it corresponds to. In other words, an emotion could be considered as a linear combination of the valence and arousal systems. Figure 2.1 shows the representation of the model where the valence function is depicted across the horizontal axis and arousal to vertical axis.

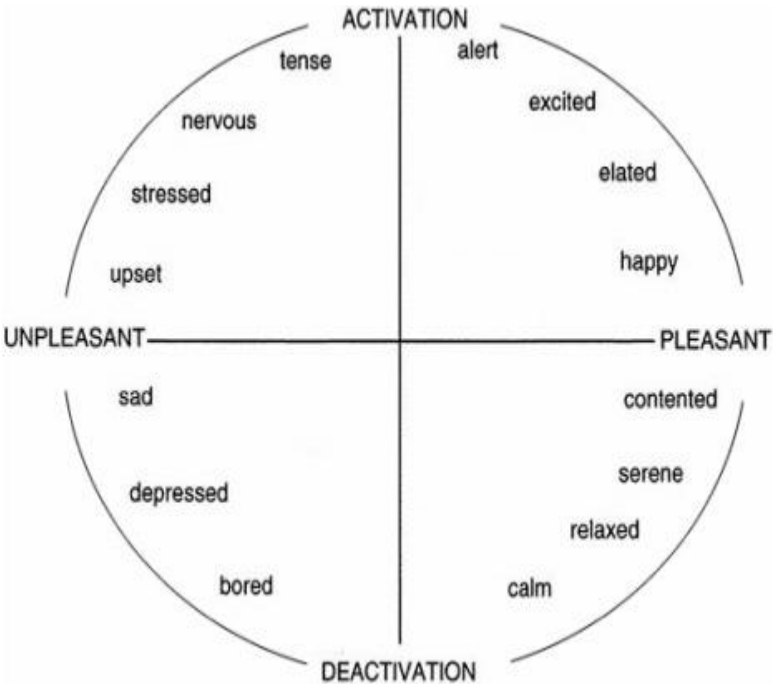

Figure 2.1: Circumplex model of the affect.

(*Source:* Adapted from "The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psychopathology", by Posner, J., Russel, J.A., and Peterson, B.S, 2005, Development and Psychopathology, 17, p.715.)

Thus, according to the figure the emotion *joy* can be considered as an emotional state associated with a strong activation and a positive valence. On the

other hand, anger would also be associated with strong of the neural systems but has a negative valence.

Several studies investigated the pattern of processing emotions using these models in typically developing individuals as well as various conditions such as autism, dementia, schizophrenia, other psychotic disorders and alcoholism. However, limited studies have investigated the pattern of processing emotions in various child language disorders such as spoken language disorder, specific language impairment etc.

The acquisition of affective prosody is considered to be an automatic process that starts at a very early age when children learn to perceive and understand emotions (Blasi et al., 2011). Young children, during the early language acquisition period, are sensitive to prosodic changes which are found to be essential in the process of language acquisition (Voorhees & Chelsea, 2008). This could be supported by the known fact that infants, before one year of age, are more sensitive to speech containing exaggerated intonation and prosodic variations, referred to as motherese (Fernald, 1993; Fisher, Plante, Vance, Gerken, & Glattke, 2007; Gerken & McGregor, 1998). Studies have reported that young children are able to identify emotions in speech and this process undergoes a developmental trend (Ford & Milosky, 2003; Morton & Trehub, 2001). Morton and Trehub (2001) investigated the emotion recognition skills in children and adults and compared the ability of children and adults to understand the linguistic and paralinguistic cues in speech. Emotional words were selected and were recorded in conflicting emotional cues. It was reported that children were found to depend more on the linguistic cues whereas adults relied more on prosodic cues. Thus, they concluded that, though, in the early developmental

periods children were found to be sensitive to prosodic variations in speech, they learn to depend on prosodic variations only with increased experience and sophistication. Thus, as children mature, they acquire the ability to interpret the emotions even when linguistic and prosodic cues are conflicting (Voorhees & Chelsea, 2008).

However, this unique process of acquisition of emotion recognition ability seemed to involve a tedious process in persons with linguistic deficits. These skills related to understanding the mind and emotions of others, affect children's communication abilities in real-life situations. Thus, there is developing knowledge in the recent past that children with specific language impairment (SLI) also demonstrate difficulties in these skills. However, evidences were lacking because since the earliest times, autism spectrum disorders, right hemisphere damage and psychotic disorders such as schizophrenia have been considered to have impaired comprehension and usage of emotions and not in children with linguistic deficits.

The vocal form of communication is considered to satisfy its function when the listener is able to understand the meaning implied in the spoken utterance. This meaning would involve processing both literal and non-literal information in the vocal information. The literal aspect would involve information in lexical content of the utterance and the non-literal aspect would imply prosodic variations in the utterance. It is well known that children with ASD pose difficulty with respect to the pragmatic function of language as well as the non-literal use of language. Hence they would find it difficult to interpret meaning of the spoken utterances when only prosodic information is available without the support of any lexis, syntax or semantics. Studies have also concluded that children with ASD pose difficulties with respect to the prosodic functions due to deficits in Theory of Mind (ToM) skills. The deficit in ToM

skills would result in their inappropriate use of prosodic functions as children with ASD fail to understand the information about a speaker's mental state. Thus, deficits in production and perception of different aspects of prosody could be due to the manifestations of impaired ToM skills. This was supported by studies which investigated the ability of children with language impairment to integrate emotion knowledge with context in order to label the character's feelings. It was found that children with language impairment failed to integrate emotion knowledge with context and these errors in inferring emotions was related to linguistic deficits. The function of integrating information was considered to be associated with ToM function (Ford & Milosky, 2003).

Specific language impairment (SLI) is considered as a disorder that can be diagnosed if a child shows significant deficits in language ability for no apparent reason, such as neurological dysfunction, hearing impairment or general cognitive impairment (ICD-10; World Health Organization (WHO) 1993). The common linguistic profile for SLI is conceptualized to centre on difficulties with respect to structural aspects of language. However, there is emerging literature that states that children with SLI might have problems or deficits with respect to social cognition or behaviour (Ford & Milosky 2003, Gillot, Furniss & Walter, 2004, Leyfer, Tager-Flusberg, Dowd, Tomblin, & Folstein, 2008).

It was concluded by Leyfer et al. (2008) that 41% of children with SLI met similar criteria as ASD on social or communication domains according to ADI-R and ADOS. They were found to have deficits in aspects such as social smile, gaze, showing interest in peer groups etc. in addition to rare repetitive behaviours as in ASD. Thus, social cognition can be defined as a specific aspect of social psychology

that focuses on how an individual would process, store and apply information about another person and his feelings in a social context. This aspect is of prior importance considering that humans are bound to live and interact in social situations on an everyday basis. It was concluded from the study conducted by Farmer (2000) that children with SLI attending school had difficulties in social communication in school. They were also found to have lower scores on social cognition compared to age matched TDC. In addition, studies have also reported that children with SLI were found to have difficulties in social interactions and building successful peer relationships (Craig, 1993; Craig & Washington, 1993).

Wells and Peppe (2003) investigated prosodic ability in children with SLI using a standardised tool Profiling Elements of Prosodic Systems- Children (PEPS-C; Peppe & Mc Cann, 2003). It was concluded that children with SLI performed poorer on the subtests of PEPS-C compared to TDC but the performance was in line with that of language- matched peers. Thus, they inferred that the linguistic difficulties in SLI did have effects on prosodic skills. Studies have reported that children with autism share similar linguistic pattern as children with SLI manifested as impaired grammatical ability with spared vocabulary and good articulation skills with impaired non-word repetition (Kjelgaard & Tager- Flusberg, 2001). Hence, it could be expected that there could be similar deficits in prosodic functions in SLI as that observed in ASD. The children with SLI would hence pose certain prosodic deficits in addition to the underlying language impairments. Therefore, it could be thought that in addition to underlying linguistic deficits, another skill (ToM) might be contributing factor to prosodic deficits in SLI (Loukusa, Mäkinen, Kuusikko-Gauffin, Ebeling & Moilanen 2014).

Trauner et al., (1993) investigated performance of children with language impairment and TDC on tests of comprehension and expression of affective intent in spoken language and facial expression. It was concluded that children with language impairments and typically developing children performed identically to emotion comprehension task through photographs whereas the performance of children with language impairment was poorer compared to TDC in the task of emotion recognition through auditory task. The children with language impairments identified emotions less often compared to typically developing children. Thus, they concluded that children with language impairment have a deficit in affective prosody which is restricted to the auditory modality. It was also found that children with language impairment made errors with respect to emotions of different valency (happy, anger) whereas the errors of typically developing children were mostly in the emotions of similar valency (anger, sad).

The manifestation of linguistic deficit of children with SLI in their perception of affective prosody was investigated by a couple of studies. Spackman, Fujiki, Brinton (2006) investigated the ability of children with language impairment to infer emotional meaning from social contexts against that of typically developing children. The authors used social scenarios involving a particular character wherein the participants were asked to conclude about the emotional situation of the character. They inferred that children with language impairment performed less accurately compared to typically developing children in identifying emotions from the task of presented story scenarios. They were also found to be impaired on the production of affective function of prosody as well. It was concluded that the difficulty posed by children with language impairment implied that they still were lagging behind TDC in

their ability to understand emotions. This difficulty in turn results in their impaired or reduced social interactions as they mature.

Ford and Milosky (2003) studied the perception of affective prosody in children with language impairment. The task involved the participants to infer emotions from visual modality as well as from the verbal mode. Their results indicated that children with language impairment identified emotions of *happy, sad, anger and surprise* from drawings in a similar manner compared to that of typically developing children. Thus, they concluded that children with language impairment, as a consequence of their linguistic deficits, pose difficulties in social interaction. However, it was concluded that the difficulties in emotion identification in children with language impairment might not be wholly related to the limited language (Spackman et al., 2006) instead there would be interaction of other factors related to cognition, social contexts etc.

Berk, Doehring and Bryans (1983) investigated the emotion comprehension abilities in children with language delay and compared with that of typically developing children. The results indicated that children with language delay were less accurate in identifying the emotions *'angry, happy and sad'* relative to normals. The results were interpreted in such a way that children with language difficulties would need to pay more attention to process the verbal content in the stimuli and hence fail to encode the affective intonation cues.

Fujiki, Spackman, Brinton and Illig (2008) explored the emotion understanding by children with language impairment through a narrative passage task. It was found that the performance of children with language impairment was significantly poorer compared to that of typically developing children. They

concluded that this lowered performance would be contributed by the increased demands of language comprehension along with the relatively brief stimuli that resulted in limited context for interpretation.

On similar lines, there are a couple of studies that concludes the deficits in affective prosody could arise as a consequence of difficulties in both linguistic and pragmatic domains. Recent literature supports that children with SLI present with deficits in pragmatic abilities in addition to their abnormalities in structural language. In this regard, pragmatics is referred to as the use of language in social contexts and the deficits in pragmatics relates to the difficulties in this third component of language referred to as the use of linguistic forms in social contexts (Berko Gleason, 2005). It was believed traditionally that pragmatic functions are closely related to syntactic and semantic abilities in a child (Craig, 1995) and that children with ASD exhibit pragmatic difficulties that extend beyond their structural language limitations. Thus, pragmatic deficits are considered as hallmark features in ASD universally and would act as distinguishing factor between ASD and SLI. However, studies have documented that children with SLI were found to have problems with social interaction and peer relationships. With these evidences, researches have investigated the existence of a subgroup of SLI having relatively more problems with social cognition and in turn the pragmatic functions (Bishop & Rosenbloom, 1987). According to literature, this led to the identification of a subtype of SLI called pragmatic language impairment (PLI) (Rapin & Allen, 1983).

Redmund and Rice (1998) concluded that children with SLI were rated as having more difficulties in social interactions within school compared to TDC. They reported that these difficulties were not observed by the parents of children with SLI

at home environment. They concluded that the deficits in social communication might be situation specific and would be exhibited by the children as a consequence of their lack of social experience. This lack of experience would have arisen as a consequence of the failures in communication that these children would have faced due to their linguistic deficits in early years of life. Bishop & Norbury (2001) concluded that almost half of the group of children with SLI were found to have pragmatic difficulties in addition to their linguistic deficits. Thus, in the 1980s, it was concluded by Rapin and Allen (1983) and Bishop and Rosenbloom (1987) that there could be a subtype of SLI who exhibited difficulties in use of language and relatively spared structural aspects of language.

Though, it was well known that pragmatic difficulties are the statement feature of autism spectrum disorders which enables the condition to be considered as a distinct entity as well as act as a distinguishing factor in differentiating ASD and SLI, it could be noted from emerging studies that children with SLI also present with difficulties in social cognition and behaviour (Ford & Milosky, 2003; Gillot et al., 2004). Ozonoff, Pennington, and Rogers (1991) concluded that children with ASD performed poorer compared to typically developing children in identifying simple (happy, sad, anger etc) and complex (shame, disgust, contempt etc.) emotions from facial expression.

However, there is accumulating information suggesting that the distinctiveness in these disorders no longer exist and that the boundaries are getting merged. Studies in this path indicate that there are difficulties in individuals with ASD in the structural language domain resembling SLI (Kjelgaard & Tager- Flusberg, 2001; Lewis, Murdoch & Woodyatt, 2007; Rapin, Dunn, Allen, & Stevens, 2009). This structural

linguistic domain would include deficits in grammatical abilities involve syntax but relatively spared vocabulary and good articulation skills with relatively poor non-word repetition skills (Kjelgaard & Tager- Flusberg, 2001). In addition, a substantial number of children with SLI were found to have increased levels of social and communication characteristics similar to ASD (Bishop & Norbury 2002, Conti-Ramsden, Simkin & Bottin, 2006; Leyfer et al. 2008).

This leads to the understanding that though language was considered as an independent entity earlier, it can no longer be considered in this regard. A deficit in the linguistic domain is indeed affected and influenced by various other processes such as cognition, maturation, environment, motor etc. Kasari, Freeman, and Hughes (2001) studied the emotion recognition skills in children with Down syndrome (DS) from story recognition task. The results revealed that young children with DS perform similar to typically developing children matched on mental age. However, by four years of age children with DS performed worse compared to TDC matched on mental age. Thus, emotion recognition is a complex skill that is influenced by multiple processes. Taylor et al., (2015) compared the emotion recognition through voice between children with ASD (children with normal language and children with affected language) and children with SLI. The basis for their investigation was to identify the contribution of impaired language to emotion recognition. The results showed that both children with ASD and SLI performed poorer compared to typically developing children in identifying emotions from voice. The children with ASD (normal language) also performed lesser compared to typical children in recognizing inferred emotions. The children with ASD (impaired language) and children with SLI performed poorer compared to typical children in identifying both simple as well as

inferred emotions. Thus, they concluded that the impaired language function is an important factor that contributes to affected emotion recognition.

In fact, no studies have directly addressed affective prosody in children with SLI in the Indian scenario, though many studies have been conducted in children with ASD. Therefore the current study was taken up to investigate the perception of affective prosody in children with SLI between 5-7 years of age.

CHAPTER 3: Method

The present study followed a case-control research design with two groups- one clinical group (children with SLI) and one typical group (typically developing children as a comparative group).

The study was conducted in two phases:

Phase I: Preparation of stimuli

Phase II: Administration of stimuli for children between 5-7 years of age.

3.1 Participants

Two groups of participants were recruited called as the clinical group and the control group; all the participants with Malayalam as the mother tongue were included. The clinical group included 10 children with SLI between 5-7 years of age. The typical group included 30 typically developing children between the age ranges 5-7 years. The children in the clinical group and typical group were further subdivided into three sub-groups ($5.0 \leq A \leq 6.0$ and $6.0 \leq A \leq 7.0$ years, where 'A' is the age of the child); wherein clinical group consisted of 5 participants each in the sub-groups and the typical group consisted of 30 children in each sub-group.

The participants in the two groups were selected on the basis of the following criteria:

- The diagnosis of the children with SLI was confirmed using the criteria given by Leonard et al (1988). The objectives of Leonard's exclusionary criteria are psychological evaluation (IQ > 80), normal auditory threshold, absence of behavioral and/or emotional issues, absence of classical neurological symptoms such as cerebral palsy, intellectual deficiency.

- Screening Checklist for Auditory Processing (SCAP) (Yathiraj & Mascarenhas, 2003) checklist was used to look for auditory processing in the clinical group.
- The language skills of the participants in typical group were screened before the task.
- All the children were screened and ruled out for sensory-motor impairment using ICF-CY checklist (WHO Work group version, 2004).
- All children were selected from mid/high socio economic status using Socio Economic Status Scale (Venkatesan, 2011).

An informed consent was taken from all the participants and/ or caretakers before the actual testing. The children in the typical group were matched for age, gender and socio-economic status of children in the clinical group in the ratio of 1:3 (with one child with SLI and three matched typically developing children).

3.2 Test Material

Three sets of stimuli were prepared. In the first set (non-sense set), 25 sentences in Malayalam language were included, that were syntactically correct, but contain non-sense words making them semantically anomalous, such that sentences fit into the grammatical structure of Malayalam language (Cornew & Lauren, 2008; Grossman, Striano & Friederici, 2005). The second set (neutral set) of stimuli included 10 neutral sentences and the final set (emotional set) included 25 sentences imparting the target emotions in Malayalam language (Appendix I). The sentence length and structure were made uniform across all the sentences. By using non-sense sentences, the syntactic features of the language could be preserved and such that

semantic aspects did not affect the perception of affective prosody (Cornew& Lauren, 2008).

The sentence sets were then given to 10 native speakers of Malayalam between 18-30 years of age for perceptual judgement in order to confirm that the sentences correctly and clearly depict each of the emotions. The individuals were asked to first identify the emotion imparted by each sentence and secondly to rate the sentences as to how each of the sentences invoked the emotion. Based on the rating, 15 sentences were selected in the non-sense set, 15 in emotional set and eight in neutral set.

The sentences were then recorded by a female native speaker of Malayalam in a sound treated room in CSL software. The speaker was instructed to produce each of the sentences in emotional set in the respective emotions and the sentences in other two sets (neutral sentences and non-sense sentences set) in six emotion states (happy, sad, anger, surprise, disgust and neutral) respectively.

The final stimuli were, then given to 05 native speakers of Malayalam between 18-30 years of age for perceptual judgement in order to confirm that the sentences correctly and clearly depicted each of the emotions. The individuals were asked to identify the emotion imparted by each sentence. The sentences that fail to satisfy the criteria were eliminated selectively (Cornew & Lauren, 2008; Grossman et al., 2005).

3.3 Procedure

The sentences were presented to each participant through headphones, in a random order and a picture pointing task was employed. Six emoticons depicting the

emotions targeted were placed on card in random order. The participants were asked to listen to the stimulus and then identify the emotion conveyed by pointing to the appropriate emoticon on the card (Appendix II).

All the participants completed a short training session in order to make them understand the task. The participants were instructed that "You will hear a sentence and you should identify the emotion conveyed by the sentences by pointing to the correct pictorial depiction. The correct responses were scored as '1' and incorrect as score '0'.

3.4 Scoring, Coding and Analysis

The total score for correct identification of emotions were computed for each participant in each of the sentence sets. The obtained data was then analysed using the Statistical Package for the Social Sciences (SPSS) software package (Version 20.0) to understand the accuracy measures. Descriptive statistics were done to compute mean, median and standard deviation for the data. Normality tests including Shapiro- Wilk test was carried out to know if the data was falling within normal distribution. Level of significance considered was 0.05. All the data failed to achieve normality and hence Non-parametric tests were carried out. The Mann Whitney U test was done to determine the differences in performance of TDC and children with SLI on emotion identification tasks. The difference in performance across age groups in TDC and SLI groups were also computed using Mann Whitney U test. Wilcoxon signed rank test was used to understand the differences in perception of different sentences with each sentence sets between the two age groups.

CHAPTER 4: Results

The aim of the current study was to investigate the perception of affective prosody in children with SLI between 5-7 years of age. The objectives of the study were,

- To study the perception of affective prosody in typically developing children between 5-7 years of age.
- To compare the perception of affective prosody in children with SLI and matched typically developing children between 5-7 years of age.

Thirty typically developing children participated as the control group and ten children with SLI participated as the clinical group. The tasks for perception of affective prosody involved the participants to identify the emotions upon listening to recorded sentences depicting each of the emotions by pointing to the appropriate emoticon pictures. The correct responses were scored as '1' and incorrect as '0'.

Descriptive statistics and non-parametric tests were carried out to infer about the perception of affective prosody between typically developing children and children with SLI and also to compare the performance of children across age groups. The results of the study are described under the following sections:

4.1 Performance of TDC on perception of affective prosody

4.2 Comparison of performance of TDC and SLI on perception of affective prosody

4.1. Performance of TDC on perception of affective prosody

The results of the study are described under sections for performance of TDC on perception of emotional sentences, perception of non-sense sentences and perception of neutral sentences.

4.1.1. Performance of TDC on perception of emotional sentences

Ten sentences belonging to the emotions happy, sad, anger, surprise and disgust were used. The sentences were presented binaurally to the participants and a picture identification task of the emotions was carried out. The data obtained were scored based on the performance of the children depending on total items.

Descriptive statistics was used to compute mean, median and standard deviation (SD) values for correct identification of emotions for the TDC group across age groups. Table 4.1 shows the mean, median and SD scores of TDC on perception of emotional sentences.

Table 4.1:

Mean, median and SD scores for TDC on perception of emotional sentences

Age groups	Types of emotional sentences	Mean	Median	SD
5-6 years	Happy	1.73	2.00	0.45
	Sad	1.93	2.00	0.25
	Anger	1.73	2.00	0.45
	Surprise	1.40	1.00	0.63
	Disgust	1.00	1.00	0.84
6-7 years	Happy	1.73	2.00	0.45
	Sad	1.93	2.00	0.25
	Anger	1.73	2.00	0.45
	Surprise	1.53	2.00	0.52
	Disgust	1.27	1.00	0.45

The mean values as observed from Table 4.1 for the simple emotions such as *happy* (Mean=1.73, SD=0.45), *sad* (Mean=1.93, SD=0.25), *anger* (Mean=1.73, SD=0.45) and *surprise* (Mean=1.47, SD=0.52) were greater in TDC group against the complex emotion *'disgust'*. The values for these simple emotions are greater compared to the other emotions *surprise* (Mean=1.46, SD=0.52) and *disgust* (Mean=1.14, SD=0.45) in both age groups as well. In addition, the mean values for *happy* (Mean=1.73, SD=0.45), *sad* (Mean=1.93, SD=0.25) *and anger* (Mean=1.73, SD=0.45) is similar across the two age groups and there is an increment in the performance for emotions *surprise* (Mean=1.53, SD=0.52) *and disgust* (Mean=1.27, SD=0.45) in the higher age group. Chi-square test was done which revealed a significant difference in the perception of the emotion *'disgust'* across the age groups ($\chi^2(2)=7.361$, $p<0.05$). There was no significant difference in the perception of other emotions across the age groups.

The results revealed that more than 50% of the participants in TDC group identified the emotions *'sad', 'happy' and 'anger'* correctly in both trials whereas the emotions *'surprise' and 'disgust'* were less identified by the participants in both age groups. It could also be observed that the mean values for the correct identification of emotions *'surprise' and 'disgust'* are greater in the higher age group whereas the performance is almost equivalent across two ages for the basic emotions of *'happy', 'sad' and 'anger'.*

4.1.2. Performance of TDC on perception of non-sense sentences

Syntactically and semantically incorrect sentences were recorded in all five emotions happy, sad, anger, surprise and disgust. Picture identification task for the

emotions were carried out. Table 4.2 shows the tabulated mean, median and SD values for the performance of TDC across age groups for each of the emotions.

Table 4.2

Mean, median and standard deviation for TDC on perception of non-sense sentences

Age group	Sentences	Mean	Median	SD
5-6 years	Happy	5.53	5.00	1.40
	Sad	7.87	9.00	2.03
	Anger	4.53	4.00	2.06
	Surprise	3.73	3.00	2.31
	Disgust	1.33	1.00	1.34
6-7 years	Happy	5.20	5.00	1.82
	Sad	5.73	5.00	2.05
	Anger	4.20	4.00	2.21
	Surprise	2.67	3.00	1.49
	Disgust	0.60	0.00	0.73

The mean, median and standard deviation values for identification of emotions through non-sense sentences across the two age groups are described in the table above. It was evident from Table 4.2 that the mean values for the emotions *'happy'* (Mean=5.37, SD=1.62) *and 'sad'* (Mean=6.80, SD=2.28) are greater in both the age groups compared to that of *'anger'* (Mean=4.27, SD=2.11)*, 'surprise'* (Mean=3.20, SD=1.99) *and 'disgust'* (Mean=0.97, SD=1.13); with the least mean scores for the emotion *'disgust'.* It could also be noted that the mean values are greater in the younger age group implying a reduction in the performance of children in the older age group. Non- parametric Mann Whitney U test was carried out to find out the difference in perception of emotions through non-sense sentences across age groups. The results revealed that there was a significant difference in the perception of

emotion *'sad'* across the two age groups (|Z|= 2.719, p<0.05). This could be observed as consistent with the mean scores provided above.

In addition, Wilcoxon signed ranks test was done to understand the way the emotions were understood by children in TDC group across the age. Each emotion was compared across one another in the non-sense set, for example: NS happy- NS sad, NS happy-NS anger, NS- happy- NS surprise etc. It was found that there was significant difference observed in all the emotion combinations '*happy-sad'* (|Z|=2.89, p<0.05)*, 'happy-surprise'* (|Z|=2.18, p<0.05)*, 'happy-disgust'* (|Z|=3.43, p<0.05)*, 'anger-sad'* (|Z|=3.42, p<0.05)*, 'surprise-sad'* (|Z|=3.32, p<0.05)*, 'disgust-sad'* (|Z|=3.42, p<0.05)*, 'disgust-anger'* (|Z|=3.42, p<0.05) *and 'disgust-surprise'* (|Z|=2.95, p<0.05) except the emotion combinations *'anger-happy'* (|Z|=1.63, p>0.05) *and 'anger-surprise'* (|Z|=1.14, p>0.05) in the younger age group. On the other hand, in the higher age group, significance was obtained for all the combinations *'happy-surprise'* (|Z|=2.68, p<0.05)*, 'happy-disgust'* (|Z|=3.42, p<0.05)*, 'anger-sad'* (|Z|=2.33, p<0.05)*, 'surprise-sad'* (|Z|=3.20, p<0.05)*, 'disgust-sad'* (|Z|=3.42, p<0.05)*, 'surprise-anger'* (|Z|=2.06, p<0.05)*, 'disgust-anger'* (|Z|=3.30, p<0.05) and *'disgust-surprise'* (|Z|=2.89, p<0.05) except the combinations *'happy-sad'* (|Z|=0.85, p>0.05) and *'happy-anger'* (|Z|=1.85, p>0.05). This indicated that the children in younger age group identified all the emotions differently, however the performances was similar for the emotions *anger, happy and surprise.* In the older group the performance was found to be similar for the emotions *happy, sad and anger.*

Thus, it could be concluded that the simple emotions (*happy and sad)* are perceived better in both age groups. Qualitative analysis accounted that more than

50% of the children in the older and younger age groups were able to identify the simple emotions *happy and sad* whereas less than 40% of the children in both groups identified emotions *anger, surprise and disgust* correctly in both trials. It was also observed that the performance of the older age group was relatively poorer compared to younger age group. This observation was found to be consistent with the mean scores given in table 4.2. In addition, when combinations of emotions were compared, it was found that in the older age group the scores for identification of emotions *disgust, surprise and anger* were similar to each other. In contrast, the younger age group the emotions *anger and surprise* had similar performance.

4.1.3. Performance of TDC on perception of neutral sentences

The mean, median and SD values were calculated for the performance of TDC in emotion identification task using neutral sentences. Semantically incorrect and syntactically correct sentences were recorded in all six emotions each namely *happy, sad, anger, surprise, disgust and neutral* and a picture identification task for the emotions was carried out. Table 4.3 reveals the performance of TDC for correct emotion identification.

Table 4.3

Mean, median and standard deviation for TDC on perception of neutral sentences

Age Groups	Sentences	Mean	Median	SD
5-6 years	Happy	4.20	4.00	1.21
	Sad	5.00	6.00	1.51
	Anger	3.13	3.00	1.96
	Surprise	2.93	3.00	1.94
	Disgust	0.40	0.00	0.63
	Neutral	0.53	0.00	0.92
6-7 years	Happy	3.40	3.00	1.64
	Sad	3.93	3.00	1.62
	Anger	2.00	2.00	1.56
	Surprise	2.40	2.00	1.59
	Disgust	0.47	0.00	0.64
	Neutral	0.13	0.00	0.35

The mean, median and standard deviation scores for the emotion perception task using neutral sentences recorded in all six emotions, namely, happy, sad, anger, surprise, disgust and neutral across the two age groups in the TDC group are given in the table 4.3. The mean values as shown in Table 4.3 for the emotions *'happy'* (Mean=3.80, SD=1.57)*, 'sad'* (Mean=4.47, SD=1.63) *and 'anger'* (Mean=2.57, SD=1.83) *are greater compared to that of 'surprise'* (Mean=2.67, SD= 1.76), *'disgust'* (Mean=0.43, SD=0.63) *and 'neutral'* (Mean=0.33, SD=0.71). It could also be noted that the mean scores for emotions *'happy'* (Mean=4.20, SD=1.21)*, 'sad'* (Mean=5.00, SD=1.51)*, 'anger'* (Mean=3.13, SD=1.96), *'surprise'* (Mean=2.93, SD=1.94) *and 'neutral'* (Mean=0.53, SD=0.92) are slightly greater in the younger age group compared to that of older age group. On the other hand, there is a minimal

increment in the mean value for emotion *'disgust'* in the older age group. Non-parametric Mann Whitney U test was done to identify the perception of emotions across the two age groups. It was found that there was no significant difference in the performance of the two age groups for emotion perception using neutral sentences.

In addition, Wilcoxon signed ranks test was done to understand the way the emotions were understood by children in TDC group across the age. Each emotion was compared across one another in the neutral set, for example: happy- sad, happy-anger, happy- surprise etc. It was found that there was significant difference observed in all the emotion combinations *'happy-anger'* (|Z|=2.13, p<0.05)*,'happy-surprise'* (|Z|=2.25, p<0.05)*, 'happy-disgust'* (|Z|=3.43, p<0.05)*, 'happy-neutral'* (|Z|=3.43, p<0.05)*, 'anger-sad'* (|Z|=2.72, p<0.05)*, 'surprise-sad'* (|Z|=3.08, p<0.05)*, 'disgust-sad'* (|Z|=3.45, p<0.05)*, 'neutral-sad'* (|Z|=3.44, p<0.05)*, 'disgust-anger'* (|Z|=3.22, p<0.05)*, 'neutral-anger'* (|Z|= 3.21, p< 0.05)*, 'disgust-surprise'* (|Z|=3.07, p< 0.05) *and 'neutral-surprise'* (|Z|=3.13, p<0.05) except the emotion combinations *'happy-sad'* (|Z|=1.96, p=0.05), *'anger-surprise'* (|Z|=0.60, p>0.05) *and 'neutral-disgust'* (|Z|=0.71, p>0.05) in the younger age group. In the older age group, significance was achieved for all the emotion combinations *'happy-anger'* (|Z|=2.19, p<0.05)*, 'happy-disgust'* (|Z|=3.42, p<0.05)*, 'happy-neutral'* (|Z|=3.42, p<0.05)*, 'anger-sad'* (|Z|=2.94, p<0.05)*, 'surprise-sad'* (|Z|=2.32, p<0.05)*, 'disgust-sad'* (|Z|=3.43, p<0.05)*, 'neutral-sad'* (|Z|=3.43, p<0.05)*, 'disgust-anger'* (|Z|= 2.97, p< 0.05), *'neutral-anger'*(|Z|=3.21, p<0.05)*, 'disgust-surprise'* (|Z|=2.83, p<0.05)*, 'neutral-surprise'* (|Z|=3.19, p<0.05) *and 'neutral-disgust'* (|Z|=2.24, p<0.05) *except 'happy-sad'* (|Z|=1.08, p<0.05)*, 'surprise-happy'* (|Z|=1.43, p<0.05) *and 'surprise-anger'* (|Z|=0.71, p<0.05). The data indicated the performance of the children in the younger age group was similar between the emotions *happy-sad*, *anger-surprise* and *neutral-*

disgust. On the other hand, children in the older group performed similarly on emotions *happy-sad, surprise-happy and surprise anger.*

The data upon qualitative analysis indicated that less than 50% of children in both groups identified the emotions *happy and sad* correctly and around 30% children in both age groups identified *anger* correctly. However, less than 10% correct responses were obtained for the emotions *surprise and disgust* in both groups. Thus, it can be concluded that the performance of the groups slightly varied than the results for emotional or non-sense sentences in the sense that, the performance of the groups did not differ significantly. On the other hand, when data was compared within groups there was greater performance for the emotions *'happy' and 'sad'* observed compared to the other emotions. In addition, the performance for the emotion combinations *'anger-surprise'* in the younger age group and *'surprise-happy' and 'surprise-anger'* were similar indicating that these emotions were frequently confused by the children when depended only on the prosodic aspects.

4.2. Comparison of performance of TDC and children with SLI on perception of affective prosody

The performance of children with SLI on emotion identification task using emotional, neutral and non-sense sentences differed considerably from that of TDC. The current section will compare the performance of the two groups on each of the tasks.

In general, the performance of children with SLI was found to be poorer compared to that of the TDC group. However, there were variations in certain parameters.

4.2.1. Performance of children with SLI on perception of emotional sentences

Descriptive and inferential statistics were computed to study the performance of children with SLI on perception of emotional sentences. Table 4.4 shows the performance of the children with SLI for perception of emotional sentences.

Table 4.4

Mean, median and standard deviation for children with SLI on perception of emotional sentences

Age groups	**Sentences**	**Mean**	**Median**	**SD**
5-6 years	Happy	1.80	0.45	2.00
	Sad	2.00	0.00	2.00
	Anger	0.40	0.55	0.00
	Surprise	0.20	0.45	0.00
	Disgust	0.00	0.00	0.00
6-7 years	Happy	1.80	0.45	2.00
	Sad	2.00	0.00	2.00
	Anger	1.00	0.00	1.00
	Surprise	1.40	0.55	1.00
	Disgust	0.60	0.55	1.00

The mean values as shown in Table 4.4 indicated that the emotions *'happy'* (Mean=1.82, SD=0.42) *and 'sad'* (Mean=2.00, SD=0.00) were identified better compared to other emotions *'anger'* (Mean=0.70, SD=0.48), *'surprise'* (Mean=0.80, SD=0.89) and *'disgust'* (Mean=0.30, SD=0.48). The emotion *'disgust'* (Mean=0.00,

SD=0.00) was identified the least indicating that none of the children in the younger age group identified the emotion correctly. In addition, the mean values for the emotions *'happy' and 'sad'* are almost equivalent in the two age groups. On the other hand, the mean values for the emotions *'anger'* (Mean=1.00, SD=0.00)*, 'disgust'* (Mean=1.40, SD=0.55) *and 'surprise'* (Mean=0.60, SD=0.55) are greater in the older age group compared to the values in the younger age group.

The results revealed that the performances of children with SLI on perception of emotional sentences was better for the emotions 'happy' and 'sad' compared to the other emotions. The data showed that more than 80% of the children with SLI could identify the emotions 'happy' and 'sad'. The data also indicated clearly that the responses of the SLI group differed across the two age groups. The performance of children in the younger age group were relatively poorer compared to that of the older age group for the emotions 'anger', 'surprise' and 'disgust'.

4.2.2. Comparison of performance of TDC and children with SLI on perception of emotional sentences

The mean values were analysed to compare the performance of TDC and children with SLI on perception of emotional sentences. Figure 4.1 indicates the performance of the two groups of children (TDC and SLI) on the task of emotion identification using emotional sentences.

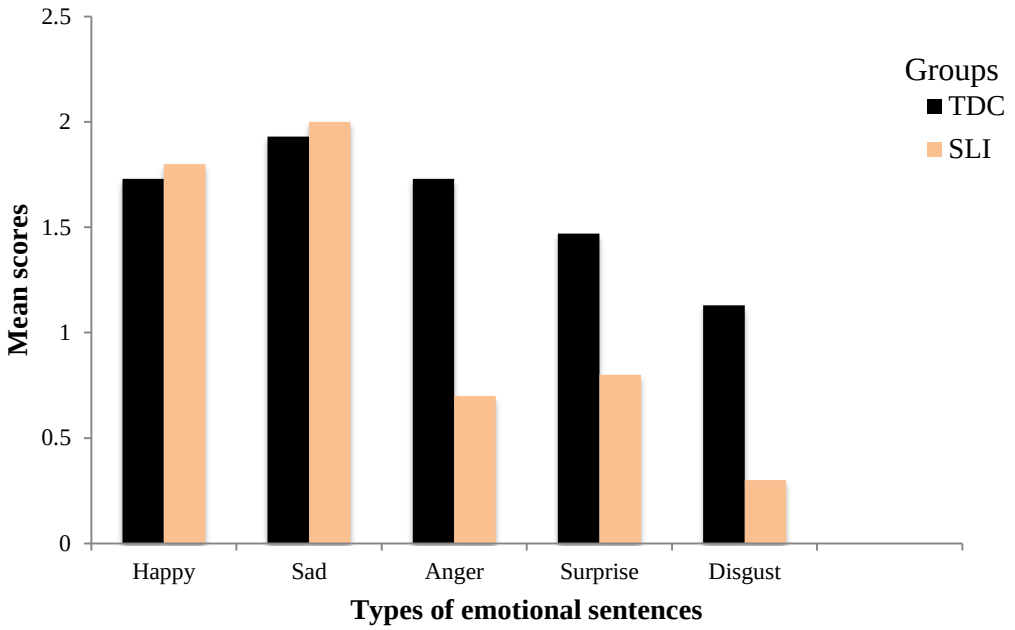

Figure 4.1: Performance of TDC and children with SLI on perception of emotional sentences

From the figure, it is evident that the performance of TDC and children with SLI were almost similar on perception of emotions *'happy' and 'sad'*. However, the performance of children with SLI was poorer compared to the performance of TDC on perception of emotional sentences.

Chi-square test was carried out to compare the performance of the two groups in the task. The test showed no significant association between the performance of the two groups for the emotions *'happy'* (χ^2=0.18, p>0.05) *and 'sad' (*χ^2=0.70, p>0.05*)* implying that the two groups performed in a similar fashion for the emotions specified. On the other hand, there was significant association observed for the performance between the groups for the emotions *'anger' (*χ^2=20.08, p< 0.05), *'surprise' (*χ^2=9.56, p<0.05) *and 'disgust' (*χ^2=10.97, p<0.05).

The data upon qualitative analysis indicated that more than 70% of the children in younger age group of TDC group as well as children with SLI could

identify the emotions *'happy' and 'sad'* correctly in both trials. On the other hand, more than 70% of the children in TDC group could identify the emotion *'anger'* correctly whereas none of the children in SLI group could identify the emotion anger correctly in both trials. In addition, 40% of children with SLI identified the emotion *'anger'* correctly in one of the two trials. It was also evident from the data that less that 30% of children in SLI group could identify the emotions correctly in one of the two trials compared to greater than 40% in TDC group. These findings could be found to be consistent with the mean scores of performance of children with SLI on perception of emotional sentences.

4.2.3. Performance of children with SLI on the perception of non-sense sentences

Sentences recorded in five emotions were presented binaurally and picture identification task was carried out to understand the perception of emotions without the support of linguistic cues. Performance of children with SLI on emotion identification using non-sense sentences were computed using descriptive statistics as well as inferential statistics. Table 4.5 shows the performance of children with SLI on perception of non-sense sentences.

Table 4.5

Mean, median and SD values for children with SLI on perception of non-sense sentences

Age groups	Sentences	Mean	SD	Median
5-6 years	Happy	3.00	0.70	3.00
	Sad	5.20	0.83	5.00
	Anger	3.60	1.52	3.00
	Surprise	0.80	0.84	1.00
	Disgust	0.00	0.00	0.00
6-7 years	Happy	5.40	1.14	5.00
	Sad	6.40	1.14	6.00
	Anger	3.00	0.71	3.00
	Surprise	3.00	1.00	3.00
	Disgust	1.60	0.55	2.00

The mean, median and standard deviation values for identification of emotions through non-sense sentences are described in the table above. The mean values for the emotions *'happy'* (Mean= 4.20, SD= 1.55) *and 'sad'* (Mean= 5.80, SD= 1.14) were greater compared to the other emotions. In addition, the mean values for all the emotions were higher as the age increased indicating a positive age affect.

4.2.4. Comparison of performance of TDC and children with SLI on perception of non-sense sentences

The performance of children with SLI on perception of non-sense sentences were compared with that of TDC by computing the mean scores for both groups. Figure 4.2 reveals the mean scores for the two groups on the task of emotion identification using non-sense sentences on a single plane.

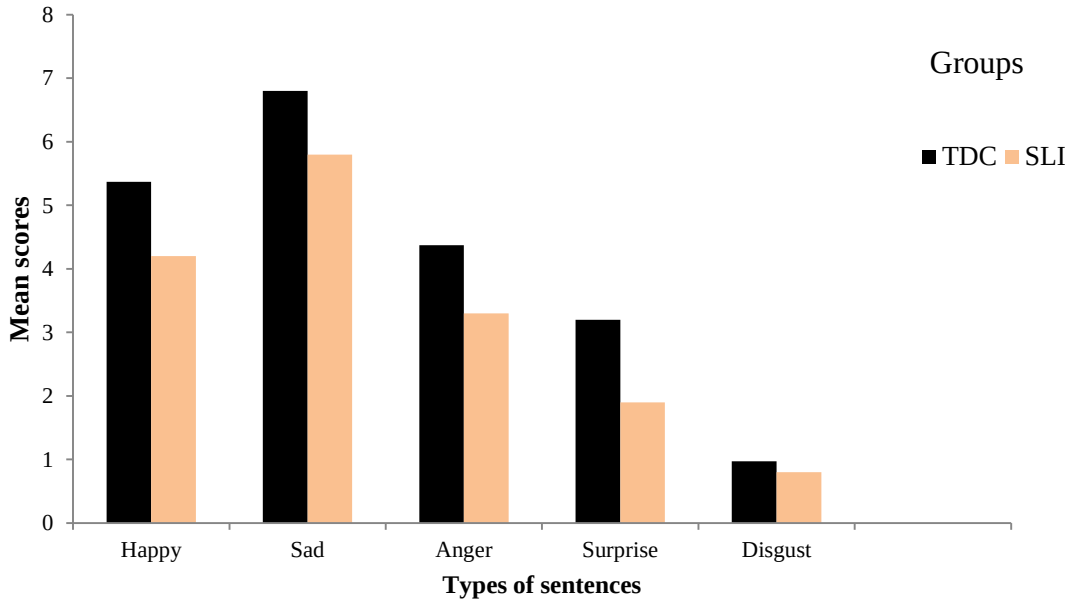

Figure 4.2: Performance of TDC and children with SLI on perception of non-sense sentences

It is evident from figure 4.2 that the performance of children with SLI on emotion identification using non-sense sentences were considerably lesser compared to that of TDC. In addition, the performance of children in both groups was better for the simple emotions (*happy, sad, anger, surprise)* and reduced for complex emotions (*disgust*).

Inferential statistics were computed to compare the performance of two groups on the emotion identification task using non-sense sentences. The Mann Whitney U test revealed no significant difference notable in the performance of children in the two groups for each of the emotion identification tasks using non-sense sentences.

4.2.5. Comparison of performance of children with SLI and TDC across age groups perception of non-sense sentences

The Mann Whitney U test revealed a significant difference in the perception of emotion *'sad'* across age in the control group ($|Z|=2.72$, $p<0.05$). There was no

significant difference in the perception of other emotions across age in the control group.

In addition, the Mann Whitney U test revealed significant difference in performance of children across age groups for the emotions *'happy'* ($|Z|=2.55$, $p<0.05$)*, 'surprise'* ($|Z|=2.46$, $p<0.05$) *and 'disgust'* ($|Z|=2.83$, $p<0.05$). There was no significant difference observed with respect to other emotions using non-sense sentences.

When the data was compared qualitatively between TDC and SLI, it was found that nearly 50% of TDC and children with SLI could identify the emotions *happy and sad* correctly. However, for the emotions *anger and surprise* more than 40% TDC identified emotions correctly whereas less than 30 % of children with SLI identified these emotions correctly. It was also found that younger children with SLI did not identify the emotion *disgust* in any of the sentences whereas nearly 20% of the higher age group identified *disgust* correctly. This was found to equate with the performance of TDC in younger age group. The younger children in TDC group, on the other hand, were found to perform better compared to the older age group.

Thus, it could be concluded that children with SLI performed relatively poorer compared to that of TDC in emotion identification from non-sense sentences.

4.2.6. Performance of children with SLI on perception of neutral sentences

The performances of children with SLI on task of emotion identification using neutral sentences were computed using descriptive statistics. Table 4.6 reveals the performance of children with SLI across age groups on perception of neutral sentences.

Table 4.6

Mean, median and SD values for children with SLI perception of neutral sentences

Age groups	Sentences	Mean	Median	SD
5-6 years	Happy	2.40	3.00	0.89
	Sad	3.40	3.00	0.55
	Anger	2.00	2.00	0.71
	Surprise	1.00	1.00	0.71
	Disgust	0.43	0.00	0.55
	Neutral	0.33	1.00	0.89
6-7 years	Happy	4.40	4.00	0.55
	Sad	5.40	6.00	0.89
	Anger	3.40	3.00	0.55
	Surprise	3.40	3.00	0.55
	Disgust	1.60	2.00	0.55
	Neutral	1.60	2.00	1.14

The mean scores for the emotions *'happy'* (Mean=3.40, SD=1.27) *and 'sad'* (Mean=4.40, SD=1.27) were greater compared to other emotions. In addition, the mean values for perception of all emotions such as *'happy'* (Mean=4.40, SD=0.55), *'sad'* (Mean=5.40, SD=0.89), *'anger'* (Mean=3.40, SD=0.55), *'surprise'* (Mean=3.40, SD=0.55), *'disgust'* (Mean=1.60, SD=0.55) *and 'neutral'* (Mean=1.60, SD=1.14) were greater in the older age group compared to that of younger age group.

4.2.7. Comparison of performance of emotions across TDC and children with SLI on perception of neutral sentences

The mean values for the two groups; TDC and children with SLI indicated that the performance of the children with SLI were almost equivalent to that of TDC group on perception of neutral sentences.

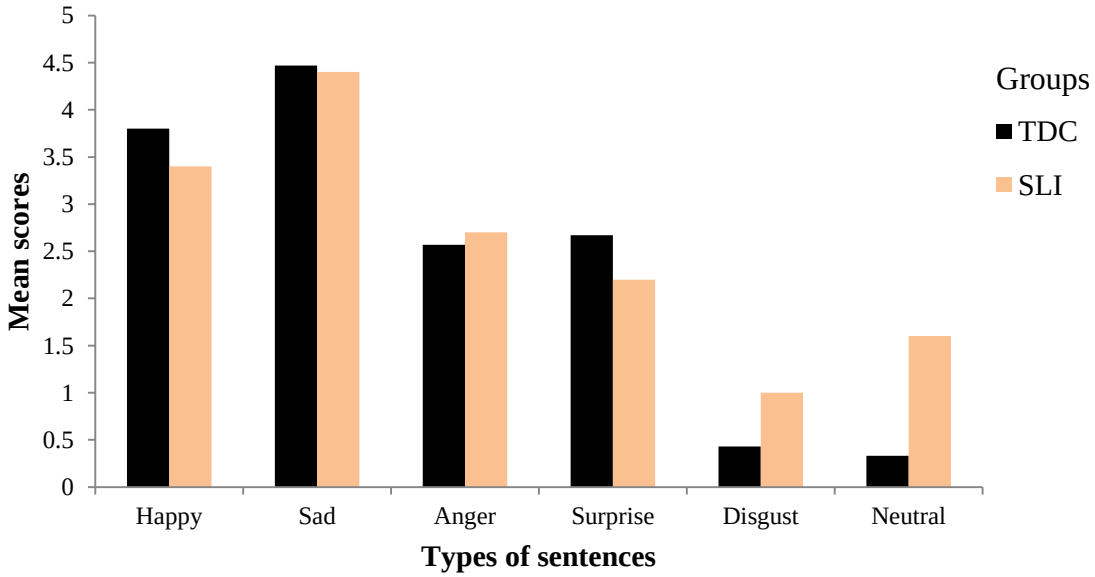

Figure 4.3: Performance of TDC and children with SLI on perception of neutral sentences

Figure 4.3 shows the mean values of emotion identification for both TDC and children with SLI. It could be observed that the performance of the two groups were almost equivalent for the identification of emotions *happy, sad, anger and surprise.* Interestingly, the performance of children with SLI was greater relatively for identification of the emotions *disgust and neutral.* This could be evidenced in the results of Mann Whitney U test which indicates a significant difference in performance of children in clinical and control group for *'disgust'* ($|Z|=2.08$, $p<0.05$)

and 'neutral' (|Z|=3.84, p<0.05) emotions and no significant difference in the performance of two groups for the tasks of perception of other emotions.

This indicated that the groups (TDC and SLI) performed in a similar fashion for the identification of emotions *'happy' and 'sad'* whereas the performance of the two groups were significantly different for the emotions *'surprise' and 'disgust'.*

4.2.8. Comparison of performance of children with SLI and TDC across age groups on perception of neutral sentences

Inferential statistics using Mann Whitney U test were computed. The scores do not reveal any significant age effect with improvement in scores in higher age group for performance of children in the control group. On the other hand, a significant age effect was notable in the clinical group in the emotion identification task using neutral sentences for the all emotions, *'happy'* (|Z|=2.69, p<0.05), '*sad'* (|Z|=2.45, p<0.05), '*anger'* (|Z|=2.41, p<0.05), '*surprise'* (|Z|=2.69, p<0.05) *and 'disgust'* (|Z|=2.32, p<0.05) except neutral state.

When the data was qualitatively analysed, it was found that more than 40% of children with SLI and TDC identified the emotions *happy, sad, anger and surprise* accurately in both age groups. The results thus, indicated that children in both groups performed in a similar fashion for the identification of emotions *happy, sad, anger and surprise.* This could be found in consistent from the mean scores for the two groups as well as from the significance values.

In summary, it is found that TDC was able to identify the emotions *happy and sad* relatively better than other emotions in all the emotional sentence sets. The

performance of TDC was found to be relatively better for emotional sentence set compared to non-sense and neutral sentence sets. The children with SLI were found to perform poorer compared to that of TDC in emotion identification of all sentence sets. In addition, there was a positive developmental trend observed in emotion identification across age groups for both the TDC and children with SLI.

CHAPTER 5: Discussion

The aim of the current study was to investigate the perception of affective prosody in children with SLI between 5-7 years of age. The performance of children with SLI was compared with that of typically developing children (TDC) for perception of affective prosody. The objectives of the study were

- To study the perception of affective prosody in typically developing children between 5-7 years of age.
- To compare the perception of affective prosody in children with SLI and matched typically developing children between 5-7 years of age.

The results of the study are discussed in terms of the following sections:

5.1 Performance of TDC on perception of affective prosody

5.2 Comparison of performance of TDC and children with SLI on perception of affective prosody

5.1 Performance of TDC on perception of affective prosody

The findings of the study revealed that the emotions *happy and sad* were identified correctly in all the three tasks on perception of affective prosody. Literature suggests that emotions could be considered as simple and complex emotions on a broad purview (Ozonoff, et al., 1991) and that children learn to recognize the simple emotions at an earlier stage compared to complex emotions (Ozonoff, et al., 1991; Golan et al., 2006, 2007).

The findings of the current study revealed that the performance of TDC for the emotions *happy, sad and anger* was relatively better than that of *surprise and disgust* in all the sentence types. On the tasks of identification of emotions using emotional sentences and neutral sentences, more than 50% of the participants in TDC group identified the emotions *'sad', 'happy' and 'anger'* correctly in both the trials whereas the emotions *'surprise', 'disgust' and 'neutral'* were less identified by the participants in both the age groups. The performance of TDC on perception of emotional sentences was found to be better compared to perception of non-sense and neutral sentences. In addition, a positive age effect was also found in the TDC group with better performance of TDC in the emotion identification for all the sentence sets.

Studies have shown that the improvement in the performance for *'surprise' and 'disgust'* could be attributed to maturation effect. It was found that typically developing children identified simple emotions (happy, sad, anger and surprise) earlier compared to complex emotions (disgust, shame and contempt) which are acquired at a later age (Ozonoff, et al., 1991). Several researches have concluded that older children are more accurate in recognizing emotions compared to that of younger children. Thus, a developmental trend is also observed in the emotion recognition ability with age (Friend, 2000; Morton & Trehub, 2001).

It was also observed in the findings of the present study that the children in TDC group made most errors in identifying the emotion *disgust* followed by *surprise* in all the sentence sets. The TDC were often found to make greater errors on the emotion *disgus*t by identifying it as *sad.* These errors were found in both the age groups as well. Studies have reported that children learned the emotions that are

frequently used by the immediate adult community such as happy, sad and anger earlier compared to other complex emotions such as disgust which are acquired at later stages (Denham & Couchoud, 1990). This could be considered as a possible reason for the relatively poorer performance for recognition of disgust. It was also concluded from previous studies that TDC tend to make errors with similar valence than different valence (Ford & Milosky, 2003); for example., the emotions *happy, joy, pleasure* are considered as positive valence emotions whereas the emotions *anger, sad, disgust* are considered as negative valence emotions (Russel, 1980). Thus, the error recognition of *disgust* as *sad* was because both these emotions were negative valence emotions implying a similar valence. In addition, the emotion disgust was identified as sad by most of the participants, which could be due to the similarity in their acoustic profile. Both these emotions have been found to have a falling, low monotonous fundamental frequency acoustic profile leading to increased confusions during identification. That is, emotions with similar valence had similar acoustic profile as well which resulted in confusions between them (Scherer, 1986).

In addition, it was observed from the findings that there was a difference in performance of the children across different sentence sets. This could be attributed to the differences in linguistic information that was coded in each of the sentence sets where the emotional set consisted of syntactically and semantically correct sentences, the non-sense set contained syntactically and semantically incorrect sentences and the final set contained syntactically correct but semantically incorrect neutral sentences. Evidences have shown that children required more stimulus information than adults to attain accurate recognition of emotions (Cornew & Lauren, 2008). These stimulus related information included the linguistic aspects such as semantic information and prosodic or paralinguistic aspects such as changes in speaking rate, pitch, voice

quality and facial expressions. Further, from studies it has been found that adults rely on the paralinguistic attributes to label a speaker's emotional state whereas young children use both linguistic as well as prosodic aspects in an utterance (Morton & Trehub, 2001). The inherent characteristics within these kinds of sentences also contribute to identification of emotions. Thus, a spoken utterance conveying emotion *happy* has been reported to have a rapid rate, high pitch and rapid voice quality (Scherer, 1986) along with the semantic information and adult listeners depended more on the former aspects whereas younger children depended on both former and latter (Morton & Trehub, 2001). This could be a probable reason for the differences in performance of the children across the different emotional sentences.

5.2 Comparison of performance of TDC and children with SLI on perception of affective prosody

The findings of the current study revealed that performance of children with SLI were deviant from that of TDC on all emotion identification tasks. In the tasks on perception of emotional sentences, non-sense sentences and neutral sentences, TDC and children with SLI performed on a similar fashion on recognition of emotions happy and sad whereas the children with SLI performed less accurately than TDC on recognition of emotions anger, surprise and disgust. However, there were individual variations in performance as well. This was in congruence with earlier studies that investigated the performance of TDC and children with language impairment on emotion recognition from face and voice which concluded that children with language impairment identified emotions of *happy, sad, anger and surprise* from drawings in a similar manner compared to that of typically developing children whereas, they were less accurate in identifying emotions from voice compared to TDC (Boucher, Lewis,

& Collis, 2000; Creusere et al. 2004; Ford & Milosky, 2003). This difference in performance between emotion recognition from face and voice was found to be due to the difficulty in processing auditory affective information such as prosody or speech sounds (Fisher et al. 2007).

The findings of the present study indicated that the performance of TDC and children with SLI was similar in the perception of emotional sentences for identification of the emotions *'happy' and 'sad'.* The findings also indicated that more than 70% of the children in the TDC group and 70% of children with SLI could identify the emotions *'happy' and 'sad'* correctly in both the trials. On the other hand, more than 70% of the children in TDC group could identify the emotion *'anger'* correctly whereas none of the children in SLI group (< 10%) could identify the emotion *anger* correctly in both trials.

The findings were consistent with earlier literature that the emotion recognition is dependent on both linguistic and prosodic features of language (Morton & Trehub, 2001). Thus, in children with SLI the deficits in emotion recognition could be due difficulty in integrating prosodic and semantic information to interpret affective prosody. Hence the deep rooted language difficulties that are central to SLI would influence their emotion recognition ability (Taylor et al., 2015). This was supported by certain studies that explored the connection between language comprehension and Theory of Mind (ToM) who concluded that the ability to infer characters' feeling by integrating emotion knowledge with event context was related to language comprehension performance (Ford & Milosky 2003). Thus, children with SLI

experience difficulty on the different aspects of emotion understanding which is attributed to the underlying linguistic deficits (Spackman et al., 2006).

It was also observed from the current study that children with SLI could identify the emotions *happy and sad* more accurately compared to the other emotions *anger, disgust and surprise.* This performance was however, poorer compared to that of TDC. Thus, a developmental trend could be in TDC group in emotion recognition abilities whereas in the SLI group the relatively lesser performance could be due to a delay in their developmental trend. This was supported by studies that concluded that children with SLI were found to have deficits in social cognition at a very early age (Loukusa, et al., 2014). Thus, though communication in daily life involves primarily linguistic forms, this linguistic function is ruled by cognitive abilities such as ability to infer others' intentions and understand others' state (Miller, 2006).Thus, the deficient linguistic functions in children with SLI would in turn be manifested as their difficulties in perception of affective prosody due to their impaired social cognition added on to the linguistic delay.

In addition, the poorer performance of the children with SLI compared to TDC could be due to their inability to integrate both linguistic and prosodic aspects of the spoken utterance. This finding was in concordance with previous evidences that reported that as children become older they begin to rely more on the paralinguistic attributes to label a speaker's emotional state whereas young children use both linguistic as well as prosodic aspects in an utterance (Morton & Trehub, 2001). Hence, children with SLI have to pay more attention to the linguistic content in the emotional speech to identify the corrective intent of the speaker resulting in deviant performance (Berk et al., 1983) when compared to TDC. Therefore, lack of linguistic

abilities in children with SLI could also be attributed to poor identification of affective prosody for emotions such as anger, surprise and disgust which require additional linguistic cues for identification.

Additionally, children with SLI, as a consequence of their linguistic delay have difficulty in understanding the linguistic information. Hence they might require additional cues with respect to the semantic information in the utterance in order to understand the meaning. This can be supported by the findings of the current study which indicated that both TDC and children with SLI performed relatively poorer on emotion identification using non-sense sentences compared to their performance on emotional sentences. Thus, it could be inferred that children rely more on linguistic information than prosodic aspects to identify the affective content in speech. Poor linguistic skills of children with SLI in comparison to TDC could be possibly attributed to poorer performance on nonsense sentences lacking linguistic (semantic and syntactic) information. Thus, children failed to identify the inherent characteristics loaded within the different types of emotional sentences for correct identification.

Several other studies have found that children with language impairment could identify simple emotions such as *happy, sad and anger* from faces accurately as to typically developing children. However, they performed poorer in the task of emotion identification from voices than controls for the same emotions (Trauner et al., 1993) as a result of the inability or difficulty in processing auditory information with regard to affective function such as subtle variations in duration, rate or pitch changes (Fisher et al. 2007).

The findings of the present study also revealed that the performance of TDC and children with SLI improved with age. Several studies have reported that the emotional recognition abilities improve as the age increases wherein they learn to rely more on prosodic aspects of the utterance than linguistic information in interpreting emotions from voices. This finding is indicative of a developmental lag in children with SLI for recognition of emotional sentences.

The current findings indicated that children with SLI performed poorer compared to that of TDC in emotion identification using non-sense sentences. It was also found that the performance of children in both groups was better for the simple emotions (*happy, sad, anger, surprise)* and reduced for complex emotions (*disgust*). In this identification task, semantically and syntactically incorrect sentences were used. Thus, there was no linguistic information coded in these stimuli and identification of the emotions was solely depended on the prosodic aspects. This could be one of the probable reasons for the increased errors in non-sense sentences task that were observed in the performance of TDC as well as children with SLI. Thus, compared to emotional sentences, children are probably depending only on the prosodic features in the emotion recognition using non-sense sentences. This was supported by the evidence that children required more stimulus information in particular to the linguistic content than adults to attain accurate recognition (Cornew & Lauren, 2008).

Thus, on the whole, the performance of children with SLI was poorer compared to that of TDC. This would be a manifestation of the linguistic deficits in these children. This was supported by earlier investigations that inferred children with SLI have deficits with respect to social cognition and behaviour resulting in impaired

ability to understand others' emotions imposed on linguistic deficits (Ford & Milosky, 2003; Gillot et al., 2004; Leyfer et al., 2008).

It is already known that younger children depend on both linguistic as well as prosodic information loaded in a spoken utterance to interpret the speaker's emotional state (Morton & Trehub, 2001). Therefore, in the emotion identification task using non-sense sentences, the linguistic information is controlled. Hence, children with SLI show greater difficulty in emotion identification because of the limited linguistic ability when compared age matched TDC. The erroneous identification by children with SLI in turn arose in their attempt to interpret the linguistic content as well as inability to rely only to the prosodic information to recognize the emotion. Another prominent observation from the findings of the present study indicated that children with SLI also performed better in emotion recognition with increment in age, however, had not reached the performance level in TDC. Thus, delayed emotion identification ability was observed in children with SLI.

This could be added on to the fact that the subtle deficits on emotion recognition observed in children with SLI give the impression that they would continue to perform poorer compared to TDC later on as they grow older which would be manifested later on as more profound deficits in social- pragmatic aspects of communication, if not intervened (Miller, 2006).

The findings of the current study showed that for recognition of emotions using neutral sentences, though the sentences were linguistically correct, the information contained in them was not semantically appropriate and the performance of TDC was similar to their performances on emotional sentence set. The findings also indicated

that the performance of the two groups were almost similar for the identification of emotions *happy, sad, anger and surprise.* Interestingly, the performance of children with SLI was better relatively for identification of the emotions *disgust and neutral.*

It was found that the use of these stimuli in the current study infers the influence of linguistically correct sentence on emotion recognition. Thus, rather than cutting down all the linguistic information, some aspects of the syntactic correctness were implemented in the sentences. Hence, compared to the performance of children with SLI and TDC on non-sense sentence set, there is a relatively better performance for groups here. It could be inferred that TDC depend on both linguistic and prosodic information to interpret emotions. Hence, when linguistic information is incorrectly coded with the prosody children try to pay more attention on to the linguistic aspects, resulting in a decrement in the performance of the group for emotions *disgust and neutral.* On the other hand, children with SLI performed better or equivalent to TDC in identification of all emotions in the neutral set. This could be inferred as the lack of awareness of these children to change in type of sentences. The lack of awareness could be due to their inability to integrate linguistic and prosodic information in spoken utterance (Morton & Trehub, 2001) as well as due to in-depth deficits in ToM skills (Ford & Milosky, 2003).

It was found that performance of TDC was relatively high for emotional sentences compared to non-sense sentences. This indicated that children depended on linguistic information also in order to identify emotions. On the other hand, performance of children with SLI was poorer on emotional sentences and non-sense sentences compared to TDC. Thus, it is evident that children with SLI fail to integrate prosodic and linguistic information in utterances to interpret the emotions. This was

supported by the improved responses of older age group of TDC on emotion identification of emotional and non-sense sentences implying that TDC were able to integrate the prosodic cues alone for emotion identification. This was in concordance with previous studies that concluded that children with language impairment exhibited difficulty in identifying emotions from filtered speech which could be attributed to their inability to extract the prosodic information and interpret the emotions based on the prosodic information alone (Trauner et al., 1993).

In addition, it could be concluded that the difficulty posed by children with language impairment implied that they still were lagging behind TDC in their ability to understand emotions. This lag was in turn a manifestation of their inability to integrate linguistic and prosodic information in spoken utterances in a social context. This difficulty, thus, results in their impaired or reduced social interactions as they mature (Spackman et al., 2006). As reported widely in literature, children with SLI might also present with difficulties in pragmatic functions linked to comprehension of affective prosody (Bishop & Rosenbloom, 1987; Rapin & Allen, 1983). On similar lines, though the present study did not identify the subgroups of children with SLI who could have presented with pragmatic language impairment, presence of such subgroups cannot be denied in the present scenario. Hence, difficulties in emotion identification in children with SLI could also be a manifestation of the deficits in pragmatic function of language. Although, children with PLI were not specifically enrolled in the current study, the findings would in some way hint that there could be a sub-group of SLI exhibiting pragmatic difficulties as mentioned in earlier studies (Bishop & Rosenbloom, 1987; Rapin & Allen, 1983) especially in the social domain.

Summary and Conclusions

The present study aimed at investigating the perception of affective prosody in children with SLI between 5-7 years of age. The performance of children with SLI was compared with that of typically developing children for perception of affective prosody. The objectives of the study were

- To study the perception of affective prosody in typically developing children between 5-7 years of age.
- To compare the perception of affective prosody in children with SLI and matched typically developing children between 5-7 years of age.

The study employed an emotion identification task which required 30 typically developing children and ten children with SLI to carry out a pointing task of appropriate picture of the emoticon upon listening to sentences recorded in different emotions such as *happy, sad, anger, surprise, neutral and disgust.* Three sets of sentences were prepared; first set included linguistically correct sentences with emotional content (emotional sentence set), second included syntactically and semantically incorrect sentences (non-sense sentence set) and the third included syntactically correct but semantically incorrect sentences (neutral sentences). Statistical non-parametric tests were carried out to analyse the performance of the two groups on perception of affective prosody.

The findings of the present study indicated that the performance of TDC was relatively better for emotions *happy and sad* compared to the other emotions such as *anger, surprise and disgust* in all the sentence sets. The performance of TDC was also

found to be better in the higher age group for identification of emotions in all the sentence sets. The performance for identification of *happy and sad*, however, remained relatively similar in the two age groups. Thus, there is a developmental trend that can be evidenced in the pattern of emotion identification with *happy and sad* being identified earlier and easier compared to *anger, surprise and disgust.*

When performance of children with SLI was compared with that of TDC, it was found that children with SLI made relatively more errors in identification of emotions than TDC. In the SLI group also, it was found that children identified the emotions *happy and sad* relatively better compared to the other emotions in all sentence sets. In the emotional and non-sense set, children with SLI performed poorer compared to TDC whereas in the neutral set children with SLI performed better compared to TDC on identification of *anger, surprise and disgust.* In addition, between emotional and neutral sets, it could be inferred that both the groups of children performed relatively poorer in the non-sense set than emotional set. Thus, the hypotheses of the present study were rejected as a significant improvement was observed on perception of affective prosody in the older age group than the younger age group. Also, children with SLI performed poorer compared to that of TDC in identification of emotions.

Though, studies have reported that children depend on both linguistic and prosodic information in order to interpret the affective meaning, it could be concluded from the current study that there is relatively higher reliance on the linguistic aspects than the prosodic aspects in TDC as well as children with SLI. It was also concluded from the study that children with SLI as an attempt to interpret the right emotions in speech, try to pay more attention to the linguistic meaning in the utterance rather than

the prosodic functions. Thus the deficits in children with SLI could be the manifestation of their inability to integrate the linguistic and prosodic aspects in speech.

It could also be inferred from the current study that even though SLI is considered as a child language disorder characterized primarily by deficits in the linguistic domain (segmental functions), there are difficulties experienced by these children with SLI in understanding the suprasegmental aspects as well that contribute to difficulty in recognition of emotions. The deficits in perception of affective prosody therefore revealed that children with SLI follow a delayed pattern of development in the suprasegmental domain in addition to the segmental functions.

Though, SLI is traditionally considered as a disorder restricted to linguistic function, it is evident that children with SLI are found have deficits in areas of emotion recognition which would be manifested in their everyday social interactions at home, schools or during play. It could also be speculated that there could be difficulties in pragmatic function along with impaired emotion identification in children with SLI, leading to difficulties in perception of affective prosody.

Implications of the study

It could be inferred from the present study that there is a developmental pattern that could be observed in emotion recognition ability of sentences in children. The study also concluded that children with SLI in addition to their linguistic deficits are presented with difficulties in emotion identification. Thus, observing the findings from the current study and understanding the nature of such deficits in SLI implies

that there can be involvement of both segmental and suprasegmental aspects of language leading to deficits in affective prosody in children with SLI.

The ability to identify emotions in speech, referred to as perception of affective prosody is considered as a multi-level mechanism that involves the integration of linguistic and prosodic features (Morton & Trehub, 2001). Younger children learn to understand emotions in speech by integrating both linguistic and prosodic information in spoken utterance whereas as children grow they begin to rely more on prosodic aspects than in a linguistic direction (Morton & Trehub, 2001). The findings of the current study implicated that children do rely on both linguistic and prosodic features in the spoken form, however, children in both groups were found to adhere relatively more on linguistic features.

The findings of the study also hint that probably children with SLI have to pay more attention to the linguistic content in the emotional speech to identify the corrective intent of the speaker resulting in deviant performance (Berk et al., 1983). Therefore, lack of linguistic abilities in children with SLI could also be attributed to poor identification of affective prosody for emotions such as anger, surprise and disgust which require additional linguistic cues for identification. Additionally, children with SLI, as a consequence of their linguistic delay have difficulty in understanding the linguistic information. Hence they might require additional cues with respect to the semantic information in the utterance in order to understand the meaning.

The study, thus, would provide possible insight into the differences in the perception of affective prosody in children with Specific Language Impairment (SLI) compared to typically developing children. Based on previous literature, it was

concluded that children with linguistic deficits have difficulties with the perception of affective prosody as evident in their social communication abilities (Creusere., 2004). The current study, hence would throw light on how children with SLI performed on recognition of affective prosody and what probably would be linked to such a deficit, whether linguistic or non-linguistic aspects. It also directs into the importance of assessing and intervening non-linguistic prosodic deficits in children with SLI other than their linguistic functions.

The present study addresses the pattern of recognition of affective prosody in children with SLI compared with typically developing children, but the generalization would be difficult due to small sample size. The number of sentences that were used in the emotional sentence set is also less compared to the other sets.

Future directions for research

Investigating the direct implications of impaired emotion recognition in their everyday social activities at different situations can be a scope for reserach. The study provides scope for extensive researches in this domain with respect to different child language disorders (CLD) so as to give insight into assessment and intervention aspects of the different CLDs. Future research will also be required to develop test materials to assess prosodic-linguistic functions in children in the Indian scenario. Future researches can also aim at investigating the social interactions of children with SLI on a broader purview. Additionally, assessment of pragmatic skills in children with SLI could provide a pragmatic profile for identification of subtle deficits or deviations in the pragmatic functions of language which could be studied in relation to understanding of affective prosody in SLI.

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APPENDIX I

Emotional sentence set

I. Happy

1) നാളെ എൻറെ പിറന്നാൾ ആണ്
2) നാളെ എനിക്ക് പരീക്ഷ തീരും
3) ചേട്ടൻ എനിക്ക് മിട്ടായി തന്നു

II. Sad

1) എൻറെ പട്ടിക്കുട്ടി ചത്തു പോയി
2) ഞാൻ വീണു കാലു മുറിഞ്ഞു
3) എൻറെ കയ്യിൽനിന്ന് പൈസ പോയി

III. Anger

1) എനിക്ക് നിന്നോട് ദേഷ്യം വരുന്നു
2) ഞാൻ ഇനി നിന്നോട് മിണ്ടില്ല
3) നീ ഇനി ഇവിടെ നിൽകണ്ട

IV. Surprise

1) എൻറെ അച്ഛന് ലോട്ടറി അടിച്ചു
2) അതാ അവിടെ ഒരു ആന
3) അയ്യോ അപ്പുവിനെ വണ്ടി ഇടിച്ചു

V. Disgust

1) പിന്നെ എനിക്ക് നിന്നെ പെടിയല്ലേ
2) നീ എന്താണീ ചെയ്തു വച്ചത്
3) നിന്നെക്കൊണ്ട് എനിക്ക് മടുത്തു

Non-sense Sentence set

1) നാളെ എന്നോട് വിളിച്ചു പിറന്നാൾ
2) നാളെ എനിക്ക് ചാടി പരീക്ഷ
3) ചേട്ടൻ എൻറെ മിട്ടായി ആടി
4) എന്നെ പട്ടിക്കുട്ടി പറത്തി ചത്തു
5) എൻറെ കയ്യിൽ പഠിച്ചു പൈസ
6) ഞാൻ കാണും കാലു ഊരി
7) എനിക്ക് കട്ട് ദേഷ്യം കളിച്ചു
8) ഇനി ഞാൻ മിണ്ടുന്നു കിട്ടി
9) നീ ഇനി ഇവിടെ കുത്തി
10) ഇന്ന് അച്ഛന് ലോട്ടറിയുടെ തിന്നു
11) അതാ അവിടേക്ക് കട ആന
12) അയ്യോ അപ്പുവിനോട് വണ്ടി കടിച്ചു
13) നീ എന്താണീ പാടി കുടിച്ചു
14) നിന്റെ കൊണ്ട് എൻറെ കഴിക്കും
15) പിന്നെ എൻറെ നിന്നെ ചാടിയില്ല

Neutral Sentence set

1) ആ മരത്തിനു പച്ച നിറമാണ്
2) സൂര്യൻ കിഴക്കാണു ഉദിക്കുന്നത്
3) രാത്രി ആവുമ്പോൾ ഇരുട്ട് ആവും
4) മഴ വന്നാൽ കുട ചൂടും
5) ആകാശത്തിന് പച്ച നിറം ആണ്
6) പക്ഷികൾ ആകാശത്തിൽ ആണ് പറക്കുന്നത്

7) വെള്ളം ഒഴിച് മുറ്റം നനച്ചു

8) പൂവിനു ചുവപ്പ് നിറം ആണ്

APPENDIX II

Emoticons used for emotion identification task