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Production of Early Words in Tamil Speaking Children with Repaired Cleft Lip and Palate

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Abstract

The aim of this study was to analyse the onset of true meaningful words in Tamil speaking children with repaired cleft lip and palate. The early true meaningful words are described based on the syllable structure, word category and initial speech sound. Fourteen children with non-syndromic repaired cleft lip and palate (both lip and palate operated before one year of age) and seven typically developing children along with their mothers participated in this study. Children were followed up every month from the age of 10 to 12 months till the onset of verbalisation (defined as the production of at least one true meaningful word). Speech and language sample of the child interacting with their respective mothers during free play session was video recorded once in 25 to 30 days. The sample that marked the onset of verbalisation was transcribed and the true meaningful words produced by the children were listed and analysed. Children with cleft produced true meaningful words by the median age of 17 months, while typically developing children produced them at 13 months of age. The number of true meaningful words produced by children with cleft was significantly less than their typically developing peers. There was lot of variability in the production of early words. The similarities and differences of early words produced with respect to syllable structure, word category, and initial speech sound have been discussed. The results highlight the need for early intervention in children with cleft.

Keywords: Tamil-speaking children, early words, cleft lip and palate, word production, verbalisation, speech sound, syllable structure

Introduction

Cleft lip and palate (CLP) is one among the top five congenital abnormalities in India (Mossey & Catilla, 2003). This abnormality that originates during intrauterine life affects a range of domains including feeding, nutrition and growth, facial growth and appearance, speech and language development, dentition, hearing and otologic care, psychosocial development, parent-child adaptation and nurturance, etc. (American Cleft Palate-Craniofacial Association, 2009). The earliest impact of CLP on speech and language development can be noticed during the prelinguistic period, manifested in the form of deficient vocalisations (Sreedhanya, Hariharan & Nagarajan, 2015; Scherer, Williams, & Proctor-Williams, 2008; Willadsen & Albrechtsen, 2006; Jones, Chapman & Hardin-Jones, 2003; Chapman, Hardin-Jones, Schulte & Halter, 2001; O'Gara & Logemann, 1988). Children with cleft demonstrate a delayed onset of babbling and have reduced repertoire of speech sounds during babbling. They produce vocalisations with glottal and nasal sounds predominantly and have less number of correct stop consonants compared to their typically developing peers. These deficits influence development of language in children with CLP.

Lexical development has been reported to be delayed in children with cleft, especially beyond 15 to 17 months of age (Hardin-Jones & Chapman, 2014; Broen, Devers, Doyle, Prouty, & Moller, 1998). Children with cleft are reported to demonstrate lexical selectivity during early word production, wherein they favour words beginning with sounds requiring less intraoral breath pressure such as nasals, approximants, and vowels; and produced at the extremes of the vocal tract such as bilabials and glottals (Hardin-Jones & Chapman, 2014; Willadsen, 2013; Estrem & Broen, 1989). However, Chapman and Hardin (1992) reported no significant difference in the average number and type of consonants in spontaneous words produced by children with repaired CLP compared to their peers at around 2 years of age. The groups only differed with respect to accuracy of overall consonant production.

Development of speech and language is influenced by a combination of biological factors of the child and environmental variables and is a result of reciprocal interaction between the child and the environment in which he/she is brought up (Harrison, 2007). Speech sound development and expressive language is augmented when there is appropriate modelling and contingent reinforcements to the child's vocalisations from the environment (Goldstein, King, & West, 2003; Gros-Louis, West, Goldstein, & King, 2006; Pappas & Bowen, 2007). Such patterns of parent-child interactions are culturally determined and influenced further by the presence of a child with disability/impairment.

Therefore, one must be cautious about making generalisations across studies from varying linguistic and cultural backgrounds.

This study was carried out with the objective of probing into the onset and nature of early true words produced by children with CLP and compare them with that of typically developing children learning and speaking Tamil as the primary language. The earliest words produced by children in the two groups are described with respect to their sound structure and grammatical categories. This study is a part of a longitudinal research, analysing development of speech sounds and language in children with CLP and typically developing children between the ages of 9 and 30 months.

Method

Participants

Fourteen children (11 males and 03 females) with repaired non-syndromic complete CLP (unilateral/bilateral) served as the clinical cohort/group for this study and seven typically developing children (03 males and 04 females) without cleft served as the control group for comparison. Surgical correction of cleft was performed by a single surgeon using two-stage palatoplasty at or before 12 months of age for all children in the clinical group. Children in both groups were recruited from a reputed hospital in Chennai, Tamilnadu, India, and resided in and around Chennai city. The children were between 10 and 12 months of age when they were recruited for this study. All of them were exposed to and learning Tamil as the primary language for communication. Developmental screening test (Bharatraj, 1983) revealed that all children had age appropriate developmental levels. All the children undertook a screening by a paediatrician to rule out presence of any syndrome or associated neurological impairments. None of them had any high-risk indicators associated with permanent congenital, delayed-onset, or progressive hearing loss in childhood specified by the American Academy of Pediatrics' Joint Committee on Infant Hearing (2007).

Both groups of children participated along with their mothers in this study. Mothers of children with CLP had a mean age of 25 years (*SD*=3.9) and those of typically developing children had a mean age of 29 years (*SD*=5.8). Kuppuswamy's socioeconomic status scale - Urban (Parashar, 2009) indicated that all children in this study belonged to families of upper-middle-class strata. Mothers of children were explained about the study and they provided informed consent to participate in this study.

Procedure

Speech and language sample of the child was obtained once in 25 to 30 days by video recording the child interacting with his/her mother during a free play session at their respective houses. Mothers could use the child's routine toys and play materials and were encouraged to interact as normally as they would do with the child in the absence of the investigator. The recordings were scheduled at a suggested time when the child was comfortable and active. Sony Handycam DCR-DVD 805 mounted on a tripod stand was used for recording. A wireless bluetooth microphone was clipped on to the child to ensure a good signal to noise ratio. Whenever needed, breaks were provided during a recording session. Each recording session lasted between 60 to 90 minutes (including the breaks), with at least 45 minutes of interaction time. It was ensured that a minimum of 50 utterances were elicited from the child during each recording.

At the end of each recording, the mother was asked if the recorded sample was representative of the child's regular interactions. If the recorded sample was not representative of his/her regular interactions, another recording session was carried out within the next 15 days. Parents were requested to inform the investigator about any illness or otologic symptoms that arose at any point of time in between recordings. Recording sessions were not scheduled till the child recovered from the symptoms in such instances.

For this study, the recordings were obtained till the child uttered at least one true meaningful word. A true meaningful word was defined as one that had a semantic referent and resembled the adult form of word usage. The age at which the child had at least one true meaningful word was referred to as the onset of verbalisation.

Analysis

The recording that reflected the onset of verbalisation in each child was considered for analysis. The utterances of all children were transcribed using narrow transcription employing International Phonetic Alphabet (2005) and the symbols for compensatory articulation by the principal investigator, a speech language pathologist with experience in the assessment of speech of individuals with CLP.

The true meaningful words uttered by each child were noted and analysed based on sound structure and grammatical category.

Statistical Analysis

Non-parametric statistics was employed to analyse the data. Median was used as the measure of central tendency and interquartile range (*IQR*) was used as the measure of dispersion. The non-parametric Mann Whitney U-test was used to analyse significance of differences in the age of onset of verbalisation between the two groups. Percentage analysis was used to describe the distribution of sound structure and grammatical categories of early words in both groups.

Results

Age at Onset of Verbalisation

The age at onset of verbalisation was the age at which children demonstrated the usage of at least one meaningful word in the recordings. This age varied among children both across and within the two groups. Table 1 describes the median (*Mdn*) age and interquartile range (*IQR*) of age of verbalisation for the two groups. Mann-Whitney test revealed that children with CLP began verbalisation or started using meaningful words at a significantly later age when compared to their typically developing peers, U=98, p<.001, r=.80.

Table 1

Age of onset of verbalisation for children in both the groups

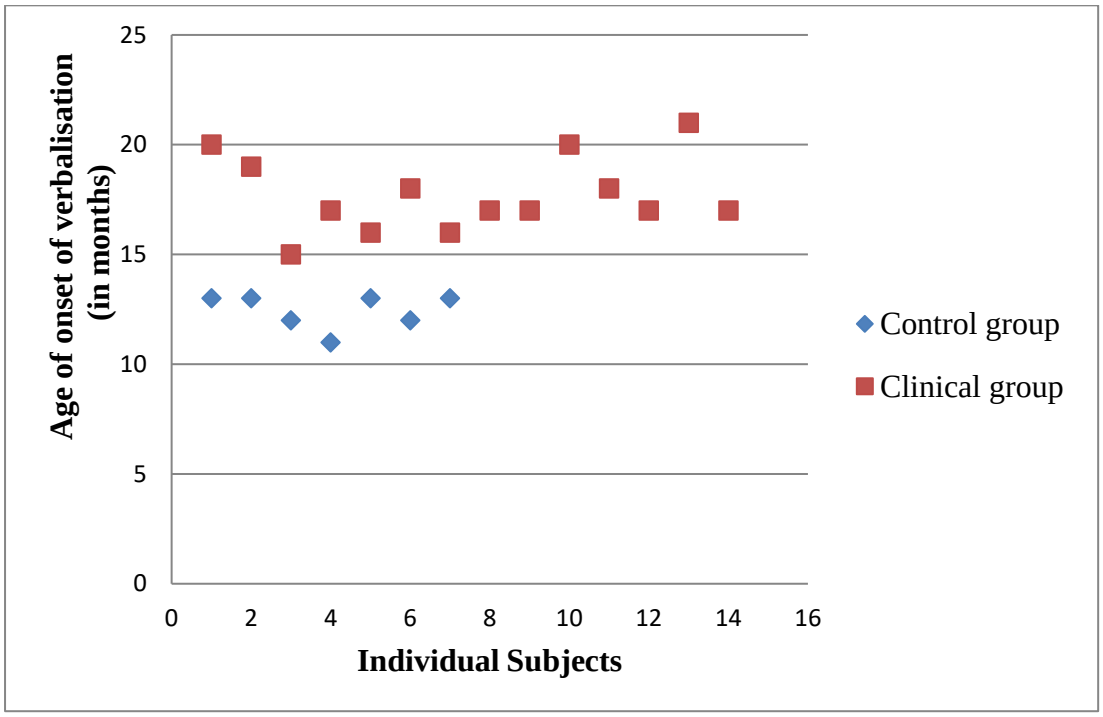
Group	N	Median (Age in months)	Interquartile Range	Range
Clinical group	14	17	16.75 – 19.25	15 – 21
Control group	7	13	12 – 13	11 – 13

Figure 1 depicts the scatter plot indicating the spread of age of onset of verbalisation across all subjects. The graph indicates that all subjects with cleft in the clinical group demonstrated verbalisation after 13 months, which is the maximum age of verbalisation among typically developing children in the control group. Even if a lax criterion of three months beyond the maximum age of verbalisation onset among typically developing children is considered, only three children with cleft began verbalisation by the age of 16 months. As many as 11 out of 14 children with cleft (78.6%)

demonstrated onset of verbalisation above 16 months, indicating a significant delay in the onset of verbalisation among children with cleft.

Figure 1

Scatter plot depicting age of onset of verbalisation across subjects in both the groups



Number of True Meaningful Words

The age of onset of meaningful words varied across children in this study. The number of true meaningful words that emerged during onset also varied across children. Table 2 summarises the number of true meaningful words produced by children in both groups at the onset of verbalisation.

Table 2

Number of true meaningful words produced by children in both groups

Group	N	Median (Number of words)	Interquartile Range	Range
Clinical group	14	04	3 - 5	2 – 8
Control group	7	06	5 - 8	5 – 10

All children demonstrated usage of more than one true meaningful word in the recording. Children with cleft produced 60 true meaningful words and typically developing children produced 48 words all together. Mann Whitney U test revealed that children with CLP produced significantly less number

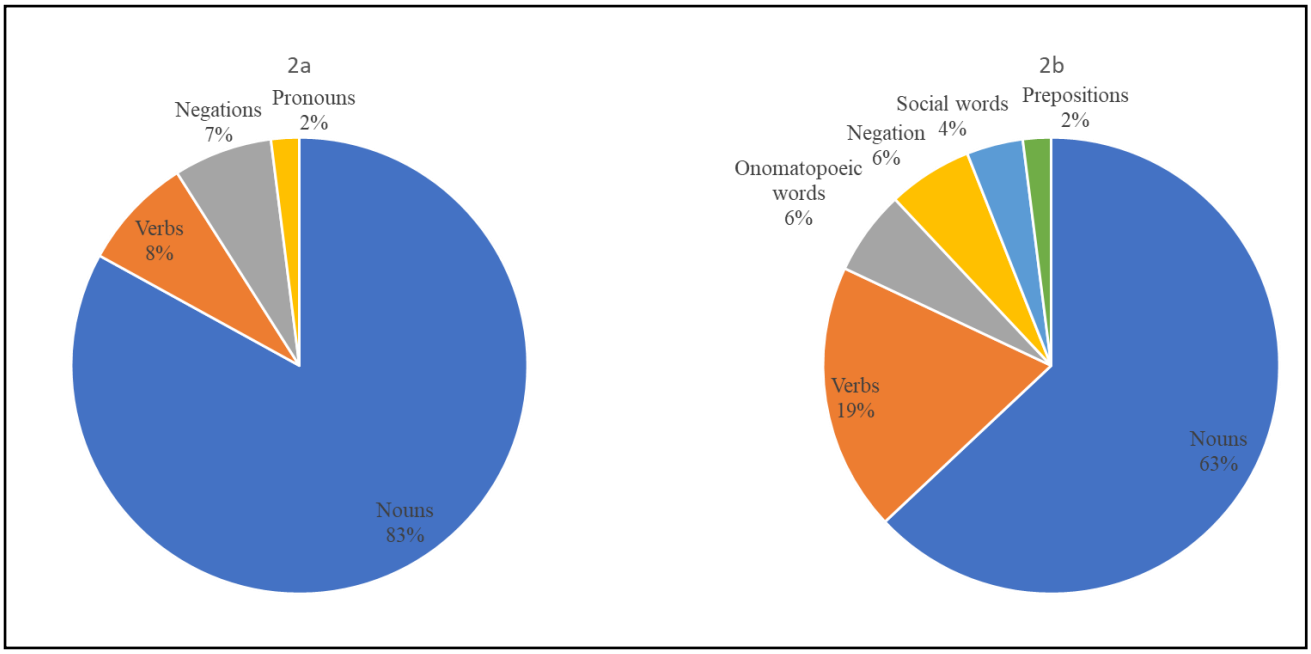
of true meaningful words than their typically developing peers at the onset of verbalisation, *U*=15, *p*=.007, *r*=0.0.

Description of Early Words

The early words produced by children in both groups were analysed with respect to word category, sound structure and initial sound. Majority of early words produced by children in both groups were nouns. Figure 2a and 2b depict the distribution of early words based on word category in both groups of children.

Figure 2

Distribution of early words based on word categories in children with cleft (2a) and typically developing children (2b)



With reference to sound structures, bisyllabic words with CVCV structure was the most common followed by VCCV structure among both groups of children. Majority of words had vowels as the initial sound in both groups. Table 3 and 4 depicts the distribution of early words with respect to syllable structure and initial sound respectively in both groups of children.

Table 3

Distribution of early words with respect to syllable structure in both groups of children

Groups	Percentage of words			
	CV	VCV	VCCV	CVCV
Clinical group	10	7	40	43
Control group	19	13	27	41

Table 4

Distribution of early words with respect to initial speech sound in both groups of children

Groups	Percentage of words					
	Vowels	Liquids/ Glides	Nasals	Bilabial stops	Dental/Alveolar /Retroflex stops	Velar stops
Clinical group	46.5	5	26.5	5	10	7
Control group	40	10	12.5	12.5	17	8

Discussion

Children with CLP have a delay of around 04 to 09 months in the onset of first meaningful words compared to typically developing children. The onset of first words generally occurs at around one year of age and is an indication of increase in the proportion of consonants and multisyllabic utterances among children (Oller, Jr., Oller, & Badon, 2006; Wetherby, Cain, Yonclas, & Walker, 1988; Vihman & Greenlee, 1987). However, children with cleft in this study demonstrated onset of first words only at around 18 months of age. Lexical development has been reported to be delayed among children with cleft, owing to the impact of altered patterns of babbling or pre-speech vocalisations (Chapman, Hardin-Jones, & Halter, 2003; Hardin-Jones & Chapman, 2014). Sreedhanya, Hariharan, and Nagarajan (2015) reported that Tamil speaking children with cleft demonstrate smaller consonant repertoires compared to their typically developing peers between 11 and 18 months of age. This could influence the onset of meaningful words. It is evident from table 2 that the number of meaningful words produced by children with cleft are also significantly less compared to typically developing children. Despite delay, there is also a reduction in the expressive language output of children with cleft. Deficits in expressive language have been reported to be evident in Tamil speaking

children with cleft even at the age of 30 months (Hariharan, Raghunathan, Sreedevi, & Ramanan, 2017).

Children with cleft produced lesser variety of word categories compared to typically developing children, as depicted in Figure 2. Majority of early words produced by children in both groups belonged to the category of nouns. The varieties of nouns produced in decreasing order of frequency included names of family members (such as 'amma', 'akka', 'anna', etc.), body parts, common objects/toys, animals, birds, vehicles, and food items. Nelson (1973) reported that the early vocabulary of typically developing children includes a variety of grammatical classes, with almost 50% of them being common nouns. The prevalence of nouns could be due to the adults' usage of large number of words for labelling objects while talking to children (Goldfield, 1993). Words heard more often become part of the productive vocabulary earlier in children.

The two groups did not differ much with respect to the syllable structure of words produced. The structures of words produced were restricted to mono- and bi-syllables. The early vocabularies of children generally represent the words that are among the most frequent and shortest in the language (Goodman, Dale & Li, 2008). Children with cleft produced greater proportion of words beginning with vowels and nasals compared to their peers. The proportion of words beginning with stop consonants was less among children with cleft compared to their peers. Stop consonants being the common sound during babbling appear frequently in the early words of typically developing children (Vihman, Macken, Miller, Simmons, & Miller, 1985). However, children with cleft are reported to demonstrate lexical selectivity and prefer words with sounds requiring less intraoral breath pressure (Hardin-Jones & Chapman, 2014; Willadsen, 2013; Estrem & Broen, 1989).

Conclusion

Delay in the onset of meaningful words and reduction in the number of words produced at the onset of verbalisation clearly warrants the need for early intervention in children with CLP. These deficits are persisting even after surgical correction of cleft palate. It is therefore essential for speech language pathologists to sensitise parents about the impact of cleft on speech and language development while counselling them at the time of palate repair. Strategies to enhance speech sound production and development of language should be demonstrated and children should be followed up to track their development of language.

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