Development of a Deep Test of Articulation for Pressure consonants in Kannada

Ms. Sahana Muralikrishna, MASLP and Dr. Pushpavathi M., Ph.D

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Abstract

Cleft lip and palate (CLP) is a congenital condition which can result in communication impairment. The articulation, resonance and voice aspects are affected to a greater extent among children with CLP. Children with CLP have greater difficulty in producing pressure consonants. Therefore, this study aimed at developing the deep test of articulation for pressure consonants in Kannada for individuals with CLP. The study was carried out in four phases: 1) Identification of pressure consonants in Kannada language, 2) Development of word list of target pressure consonants, 3) Development of picture form for the final word list and 4) Development of sentence list of target pressure consonants. The target pressure consonants were developed in several possible vowel and consonant contexts in preceding and following milieu. The developed word list, picture form, and sentence list were given to three speech language pathologists and two preschool teachers for familiarity testing. The stimuli were finalized after the familiarity testing. The final word list compromised of 519 words (277 words in preceding context & 242 words in following context). The finalized picture form compromised of 277 pictures in preceding context and 242 pictures in the following context. The sentence list after familiarity rating comprised of 377 sentences in preceding context and 351 sentences in following context. The final list compromised of 728 sentences. The deep test using pressure consonants provides detailed information about articulation abilities of individual with CLP. The diagnostic test will be very helpful tool in diagnostic as well as therapeutic intervention.

Key words: Deep test, Pressure consonant, Familiarity testing

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Introduction

Cleft lip and palate is a congenital condition which can result in communication impairment. The presence of cleft lip and palate (CLP) may negatively impact a child's ability to communicate effectively, and therefore cause significant social, emotional, and educational hardship. The incidence of cleft lip and palate is relatively high in India. A multicentre survey conducted by the Tata Institute of Social Sciences, Mumbai in India (Raju, 2000) reported that every year 35,000 children in India are born with clefts. The incidence of cleft lip and palate in India is estimated approximately one in 500 live births (Ankola, Nagesh, Hegde & Karibasappa, 2005). Another survey done by Nagarajan, Murthy, and Raman (2005) estimated the incidence of cleft lip and palate in India as one in 781 live births.

The problems exhibited by individuals with CLP are heterogeneous in nature. The most common associated problems with cleft lip and palate are feeding difficulties, ear infections, dental anomalies, psychosocial disturbances, delay in speech and language development, hypernasality and misarticulation. The most frequently seen speech production problems demonstrated by children with CLP are those related to velopharyngeal dysfunction (VPD), including hypernasality, audible nasal air emission, weak pressure consonants, and compensatory articulation patterns.

The individuals with velopharyngeal dysfunction (VPD) cannot either adequately or consistently close the velopharyngeal port during speech. Therefore, sound energy directed orally escapes through the nasal cavity. In addition, there may be articulatory errors, including compensatory articulations and reduced voice quality. The final result is a reduction in speech intelligibility (McWilliams, Morris, & Shelton, 1990; Kuehn & Moller, 2000; Peterson-Falzone, Hardin-Jones, & Karnell, 2001).

A Brief Review

There are many studies which has emphasized that children with CLP have greater difficulty in producing pressure consonants. The plosives /p/, /b/, /t/, /d/, /k/, /g/, fricatives /f/, /v/, /s/, /ʃ/, /z/ and affricates /ʧ/, /ʤ/ have been found to be more affected than the other phonetic classes of nasals /m/, /n/, /ŋ/ and glides /j/ and /w/ (Bzoch, 1965; Spreistersbach, Darley, and

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Rouse, 1956; Counihan, 1960; Van Demark et al., 1979; Philips and Harrison, 1969). These are so called "pressure consonants" which are particularly vulnerable when there is a velopharyngeal dysfunction (VPD).

The presence of cleft of lip affects the production of stop consonants because of the inability to build up the necessary oral air pressure. The productions of fricative and affricate consonants are affected due to the presence of cleft in the palate and dental irregularities which is commonly noted among individuals with CLP. Therefore, consonants which require greater oral pressure for their production are mostly affected among individuals with CLP.

From various studies (Bzoch, 1965; Spreistersbach, Darley, and Rouse, 1956; Counihan, 1960; Van Demark et al., 1979; Philips and Harrison, 1969) that has been put forth in the literature; it is evident that individuals with CLP often are reported to have articulation problems. Therefore, it is very important to assess the articulation thoroughly, which can aid in the rehabilitation of an individual with CLP. Articulation testing is a procedure in which the phonemic ability of an individual in a given language is tested. The articulation tests are useful in studying phonological development as it enables one to compare the effect of particular environment and kind of stimulation and makes it possible to follow developmental pattern. They can also be used a predictors for improvement in therapeutic intervention which helps us to find out the effectiveness of the therapy. The articulation tests can be broadly classified as screening test, diagnostic tests and deep test of articulation.

The screening articulation tests helps in the identification of the articulation disorder and its function lies in assessing the general adequacy of a child's speech. The diagnostic articulation test provides methodical examination of articulation. The primary function of this test is not only to detect those children who need speech correction, but also to aid in the evaluation of children already known to be defective in articulation. The deep test of articulation is one of the diagnostic tests in which each sound is tested in all possible phonetic contexts, i.e. a sound is deep tested in a variety of phonetic contexts, as the sound is preceded and followed by vowels and as the sound is followed and preceded by each of the other consonants. This test represents a marked distinction from conventional test of articulation. The purpose of deep test of articulation is to permit evaluation of speech sounds as audible, end products of a series of overlapping,

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ballistic movements and to provide a test long enough to permit observation of the degree of vulnerability present in a speakers production.

The children with CLP encounter phonetic and phonological problems which are different from those encountered by typically developing children. Therefore, there are certain standardized assessment tests/protocols specifically developed for children with cleft lip and palate.

There have been few traditional diagnostic tests which are widely used to assess articulation among children with cleft lip and palate. They are as follows: IOWA pressure articulation test (Templin, M. & Darley, F.L., 1960), Pre-post articulation test (McCabe, R.B., & Bradley, D.P., 1973), P-B articulation test (Van Demark &. Swickard, 1980), Bzoch error pattern test (Bzoch, K., 1979) and few protocols like Great Ormond Street Speech Assessment (GOS.SP.ASS) given by Sell, D., Harding, A. &Grunwell, P. (1994), Cleft audit protocol for speech (CAPS) given by Harding, A., Harland, K., &Razell, R. (1997) & Cleft audit protocol for speech- Augmented (CAPS- A) given by John, A., Sell, D., Sweeney, T., Harding-Bell, A. & Williams, A. (2006).

Articulation tests are language specific and each language has its own phonological system. The above mentioned tests are developed in English language and the same cannot be used in Indian context. The language structure, phonological aspects of the Indian languages are different from English language. Kannada language is one of the major south Dravidian language. Kannada is spoken by the majority of people in the state of Karnataka. The distributional patterns of phonemes are simple and also specific in nature. Similarly, phonetic aspects of Kannada are significant in relation with the speech sounds. The phonemic classes of this language are in accordance with the phonological system. Thirty four (34) major consonant phonemes are found in Kannada language (Upadhyaya, 2000). The following are the main types of consonant phonemes: 20 stops (aspirated and unaspirated), 3 nasals, 4 fricatives, 2 laterals, 1 trill, and 2 semivowels. On the basis of the place/point of articulation the consonant phonemes are classified into six important groups, such as: bilabial, dental, retroflex, velar, palatal and glottal consonants. On the basis of the manner of articulation the consonant phonemes are treated as stops, nasals, fricatives, laterals, trill and semi-vowels. The aspirated stops (/p/, /b/, /ṭ/, /ḍ/, /ṯ/,

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/ḍ/, /k/ and /g/), affricates (/c/ and /j/) and fricatives (/s/, /ʃ/, /v/ and /h/) are also represented in orthography. These are considered as notable phonetic character of Kannada phonemes (Upadhyaya, 2000).

The diagnostic test protocols developed in western context (in English language) to be specifically used with CLP population cannot be used in Indian population. The language structure of English and Kannada are very much different. The differences exist in various aspects like: number of vowels, number of consonants, aspirated sounds, dental retroflexes, number of stop consonants, number of fricatives, consonant cluster combinations, occurrence of sounds in different word positions, etc. The differences are put forth in Table 1.

Table 1

Differences in English and Kannada language

Variable	English	Kannada
Vowels	N= 5	N= 10
Consonants	N= 21	N= 32
Stop consonants (unaspirated)	N= 6 (/p/, /b/, /t/, /d/, /k/, /g/)	N=8 (/p/, /b/, /t̪/, /d̪/, / t̺/, / d̺/, /k/, /g/)
Fricatives	N= 9(/f/, /v/,/θ/, /d/, /s/, /z/, /ʃ/, /ʒ/, /h/)	N= 5 (/s/, /ʃ/, /h/, /f/, /v/)
Affricates(unaspirated)	N= 2 (/ʧ/, /ʤ/)	N= 2 (/ʧ/, /ʤ/)
Retroflex consonant	uses alveolar consonants instead of retroflexes	Retroflex consonants are present in Kannada language (Ex: /r/, /l̺/, /t̺/, /ḍ/
Aspirated sounds	N=3 (/p/, /t/, /k/)	N=10 (d̺ʰ/, / t̺ʰ/,/ʧʰ/, /pʰ/, /bʰ/, /d̪ʰ/, /t̪ʰ/, /kʰ/,/gʰ/, /ʤʰ/)
Position of sound	Initial, medial and final	Initial and medial position

Therefore, from the above mentioned table, it is clear that the phonological features of Kannada language are different from that of English language. The pressure consonants present in English and Kannada language also varies. This warrants for construction of diagnostic articulation test in Kannada language using pressure consonants. As stated by Peterson-Falzone et al. (2001), ''numerous investigations have demonstrated that children with cleft palate have more difficulty in producing pressure consonants than other classes of consonants''. The pressure consonants such as fricatives, plosives, and affricates are proven to be the best discriminators between speakers with adequate and speakers with VPD.

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Many diagnostic articulation tests are developed in various languages in India. The test of articulation in Kannada by Babu, Rathna and Bettagiri (1972), Test of articulation in Tamil by Usha (1986), Test of articulation in Hindi by Kacker et al. (1989), Articulation test in Bengali; screening and discrimination test by Arun Banik (1988), Articulation test in Telugu by Padmaja (1988), Articulation test battery in Malayalam given by Maya (1990). Recently, the Re-standardization of Kannada articulation test has been developed by Deepa (2010). Most of the above mentioned articulation tests have been developed for use with preschool children. They are used to evaluate the different speech sounds in different contexts. The scoring of each tests are done based on the frequency of occurrence of correct responses. There are no specific diagnostic articulation test developed so far using mainly pressure consonants (which the children with CLP find more difficult to produce) to assess the phonological abilities of children with CLP in Indian context. Further, the deep test of articulation helps to identify the different contexts in which a target sound can be produced correctly. The deep test of articulation (sentence form) in Kannada language developed by Rohini (1989) has included a few pressure consonants (/ɖ/, /ɖ/, /g/, /h/, /v/, /s/, /ʃ/, /ʧ/, /ʤ/).

The available test materials in India are outdated and are not sensitive enough to profile the errors of articulation in CLP population. There have not been any studies done so far in the domain of deep test of articulation for pressure consonants in Kannada language (picture and sentence form). As the incidence of CLP condition in India is high (Raju, 2000; Ankola et al., 2005 & Nagarajan et al., 2005); it reckons the need to develop articulation test material which can cater to the phonological features of different native languages. Therefore, the present study is aimed at developing the deep test of articulation for pressure consonants in Kannada for individuals with CLP.

Objective

- Selection of pressure consonants as stimuli in Kannada language
- Development of word list, picture form of word list and sentence list for pressure consonants

Method

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Phase I: *Identification of pressure consonants in Kannada language*

Kannada language is one of the major south Indian Dravidian languages. Kannada is spoken by the majority of people in the state of Karnataka. The proposed study is aimed to develop the deep test of articulation for pressure consonants in Kannada language.

For the development of deep test of articulation, the sounds which are most frequently misarticulated by the individuals with CLP were considered. The review of various research studies have put forth that pressure consonants are mostly affected in children with cleft lip and palate (Van Demark et al., 1979; Philips and Harrison, 1969, Peterson-Falzone, 2001). Therefore, the pressure consonants in Kannada language were selected as the target phonemes. The stop consonants, fricatives and affricates present in Kannada language were considered as stimuli phonemes. The resources such as internet, books related to phonetics of Kannada language were reviewed to identify the pressure consonants in Kannada language.

Phase II Preparation of the word list consisting of pressure consonants in different environment

The word list of 14 various pressure consonants (/k/, /g/, /ṭ/, /ḍ/, /t̪/, /d̪/, /p/, /b/, /ʧ/, /ʤ/, /s/, /ʃ/, /v/, and /h/) in different possible vowel and consonant context was prepared. The words were selected from different sources like standard Kannada textbooks used for LKG,UKG, I and II standard children, Kannada dictionary, Kannada story books for young children, Kannada phonetic reader (Upadyaya,2000) and from list of words used in Re-standardized Kannada articulation test (Deepa, 2010). The bi/trisyllabic Kannada words selected were simple, meaningful and picturable. The words from Mysore and Bangalore dialect were selected. The words were selected in all possible combinations of vowel and consonants of Kannada language. The selected words were then given to three speech language pathologists and two preschool teachers who were native Kannada speakers for familiarity check. The examiner was one of the judges. The word list was developed in such a way that each target pressure consonant were constructed as 3 different words in preceding and following context for each vowel and consonant context. The example has been showed in Table 2 & 3.

For ex: target consonant /ṭ/ in vowel /u/ context

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Table 2

Example for familiarity rating for constructed word list (Preceding context)

Context	Preceding context	Very familiar	Familiar	Unfamiliar
/u/	/ʈuppʌ/			
	/ʈuppa:ki/			
	/ʈuʈʈu/			

Table 3

Example for familiarity rating for constructed word list (Following context)

Context	Following context	Very familiar	Familiar	Unfamiliar
/u/	/huʈʈʌ/			
	/ʈuʈʈuri/			
	/kuʈʈigɛ/			

The judges were asked to rate the list of words (present in the vocabulary of typically developing preschool children) for familiarity on a three point rating scale which was as follows:

➢ 1- Very familiar (> 95%)

➢ 2- Familiar (90≤95%)

➢ 3- Unfamiliar (75≤90%)

Each of the phonemes selected for the study were tested in several possible vowel and consonant phonetic contexts. The words which were rated as very familiar by most of the judges were selected for the final list.

Phase III: Development of Picture form

The word list for pressure consonants developed was used in picture form test. The test materials were designed to be used with children population. Therefore, it was important to extract the responses by presenting the words as pictures, which would provide visual cues and aid in easy elicitation of responses from children. The picture stimuli also can be used with

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children who have not yet developed reading skills. The words which were selected after familiarity rating were given to an artist to represent them pictorially through simple line drawings. The simple line drawings were drawn by an artist. The pictures were rated on familiarity, clarity and ambiguity. The familiarity of the picture was examined by three speech language pathologists and two preschool teachers who rated the pictures on a 3 point familiarity rating scale.

Table 4

Familiarity rating scale for pictures

Familiarity	Clarity	Ambiguity
1- Very familiar (> 95%) 2- Familiar (90≤95%) 3- Unfamiliar (75≤90%)	1- Very clear (> 95%) 2- Clear (90≤95%) 3- Unclear (75≤90%)	1- Unambiguous (> 95%) 2- Slightly ambiguous (90≤95%) 3- Ambiguous (75≤90%)

The picture which was rated as very familiar, very clear and unambiguous was selected finally.

Phase IV: *Development of sentence list*

The sentence list of various pressure consonants in different possible vowel and consonant context was prepared. Three simple sentences for each pressure consonant in different contexts for various possible vowel and consonant combinations were constructed. The target consonant always appeared in the middle of the sentences. The example of the sentences constructed and the format for familiarity rating has been shown in Table 5 & 6.

For ex: target consonant /b/ in vowel /a/ context

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Table 5

Example for familiarity rating for constructed sentence list (Preceding context)

Context	Preceding	Very familiar	Familiar	Unfamiliar
/a/	/ nʌnʌgɛ **bʌɭɛ** bɛku/			
	/nʌnʌgɛ **bʌɭʌpʌ** bɛku/			
	/simhʌ **bʌlɛjʌlli** silukiḏɛ/			

Table 6

Example for familiarity rating for constructed sentence list (Following context)

Context	Following	Very familiar	Familiar	Unfamiliar
/a/	/ ʌḏu **kʌbbiɳʌḏʌ** ka:rkʰa:nɛ/			
	/a: **ḏʌbbi** nʌnnʌḏu/			
	/nʌnʌgɛ **kʌbbu** bɛku/			

The sentences were then given to three speech language pathologists and two preschool teachers who were native Kannada speakers for familiarity check. The examiner was one of the judges. The judges were asked to rate the list of sentences for familiarity (whether the sentences could be present in comprehensive vocabulary of preschool children) on a three point rating scale which was as follows

➢ 1- Very familiar (> 95%)

➢ 2- Familiar (90≤95%)

➢ 3- Unfamiliar (75≤90%)

Results and Discussion

Selection of pressure consonants in Kannada language:

The development of deep test meant to assess the contextual effects of different vowels and consonants on various pressure consonants. Since children with CLP have greater problems in production of pressure consonants (Bzoch, 1965; Spreistersbach, Darley, and Rouse, 1956; Counihan, 1960; Philips and Harrison, 1969), those phonemes were focused for developing the deep test.

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The phonemes in Kannada language are represented in Table 7. On the basis of the place/point of articulation the consonant phonemes are classified into six important groups. Such as: bilabial, dental, retroflex, velar, palatal and glottal consonants. On the basis of the manner of articulation the consonant phonemes are treated as stops, nasals, fricatives, laterals, trill and semi-vowels. The pressure consonants in Kannada were identified by reviewing the Kannada phonetic reader (Upadhyaya, 2000). There are 14 pressure consonants (without aspirated consonants) in Kannada language. The aspirated pressure consonants were not considered as they are not much used in our colloquial conversations.

Table 7

Phonemes in Kannada language (Upadhyaya, 2000)

Vowels/ Consonants	Total number
Vowels	Short vowels -5, Long vowels- 5
Diphthongs	2
Stop consonants(aspirated and unaspirated)	16
Nasal consonants	4
Fricatives	5
Affricates(aspirated and unaspirated)	4
Laterals	2
Trills	1
Semivowels	2

There are 14 pressure consonants (without aspirated consonants) in Kannada language (Upadhyaya, 2000). They are as follows:

Stops: /p/, /b/, /ʈ/, /ɖ/, / t̪/, / d̪/, /k/, /g/

Fricatives: /s/, /ʃ/, /h/, /v/ (aspirated consonant /f/ was not considered)

Affricates: /ʧ/, /ʤ/

The phonemes / ʧ/ and /ʤ/ were represented as /c/ and /j/ orthographically in the Kannda phonetic reader by Upadhyaya (2000).

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Development of the word list

The word list prepared was given to three SLP's and two preschool teachers for familiarity rating. The word list of 14 different pressure consonants in preceding and following contexts of various vowels and consonants were rated as very familiar, familiar and unfamiliar. Each pressure consonants were tested in all possible vowel and consonant contexts. The word list prepared consisted of minimum of 1 word and maximum of 3 words in each context in preceding and following milieu. The word list comprised of 578 words in preceding and 402 words in following context. The judges rated 321 words as very familiar, 165 words as familiar and 92 words as unfamiliar in preceding context. In the following context, 227 words were rated as very familiar, 121 words as familiar, and 54 as unfamiliar. If there were more than 1 word which was rated as very familiar in any context, the word which was rated as very familiar by most number of judges was selected. The example of the said scenario is shown in Table 8.

For ex: target consonant /p/ in /a/ vowel context

Table 8

Selection of the final word list after familiarity rating

Context	Familiarity	Judge 1	Judge 2	Judge 3	Judge 4	Judge 5
/pa:pu/	Very familiar	✓		✓		✓
	Familiar		✓		✓	
	Unfamiliar					
/pi:pi/	Very familiar		✓		✓	
	Familiar	✓		✓		✓
	Unfamiliar					
/pʌppa:ji/	Very familiar					
	Familiar	✓	✓	✓	✓	✓
	Unfamiliar					

In the above mentioned example, /pa:pu/ was rated as very familiar by three judges and /pi:pi/ was rated as very familiar by two judges. Therefore, the word which was rated as very familiar by three judges was selected as the final word in that context.

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If none of the words were selected as very familiar in any context, preferences were given to the words which were rated as familiar. The example has been given in Table 9. The words which were rated as unfamiliar were eliminated from the word list.

For ex: target consonant /b/ in consonant /t̺/ context

Table 9

Selection of the final word list after familiarity rating

Context	Familiarity	Judge 1	Judge 2	Judge 3	Judge 4	Judge 5
/bʌt̺t̺ɛ̥/	Very familiar					✓
	Familiar	✓	✓		✓	
	Unfamiliar					
/baːt̺ukoːl̥i̥/	Very familiar					
	Familiar	✓	✓	✓	✓	✓
	Unfamiliar					
/bʌt̺aːsu/	Very familiar					
	Familiar					
	Unfamiliar	✓	✓	✓	✓	✓

In the above mentioned example, the word / bʌt̺t̺ɛ̥/ was rated as very familiar by only one judge, and the word /baːt̺ukoːl̥i̥/ was rated as familiar by most of the judges, then the word which was rated as familiar was selected as the final word from that context. The final list compromised of 519 words (277 words in preceding context & 242 words in following context) of 14 different pressure consonants in different vowel and consonant contexts. The distribution of words of different pressure consonants in various vowel and consonant, preceding and following contexts prepared is put forth in Table 10 given below. The final list of words selected after familiarity rating is also mentioned in the same table.

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Table 10

Distribution of words across different pressure consonants

Target sound	Context	Total words constructed	Very familiar	Familiar	Unfamiliar	Total words selected
/k/	P	56	35	13	8	29
	F	36	18	11	7	22
/g/	P	49	31	11	7	22
	F	38	18	15	5	24
/ʈ/	P	24	13	8	3	13
	F	39	23	13	3	20
/ɖ/	P	13	4	3	6	7
	F	21	15	6	0	16
/t̪/	P	47	20	15	12	21
	F	37	20	10	7	19
/d̪/	P	44	25	12	7	19
	F	34	20	8	6	19
/p/	P	47	25	11	11	25
	F	35	25	8	2	20
/b/	P	61	37	14	10	28
	F	35	22	9	4	20
/ʧ/	P	36	18	10	8	16
	F	21	10	6	5	11
/ʤ/	P	41	26	10	5	19
	F	23	15	4	4	15
/s/	P	52	24	20	8	26
	F	39	23	11	5	20
/ʃ/	P	24	10	11	3	11
	F	11	4	5	2	9
/v/	P	24	11	11	2	15
	F	26	12	12	2	17
/h/	P	59	42	15	2	26
	F	12	5	5	2	10

⋆P- Preceding, F- Following

The distribution of the words among various pressure consonants is depicted in Graph 1.

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Graph 1

Distribution of words across 14 pressure consonants

Distribution of words across various pressure consonants
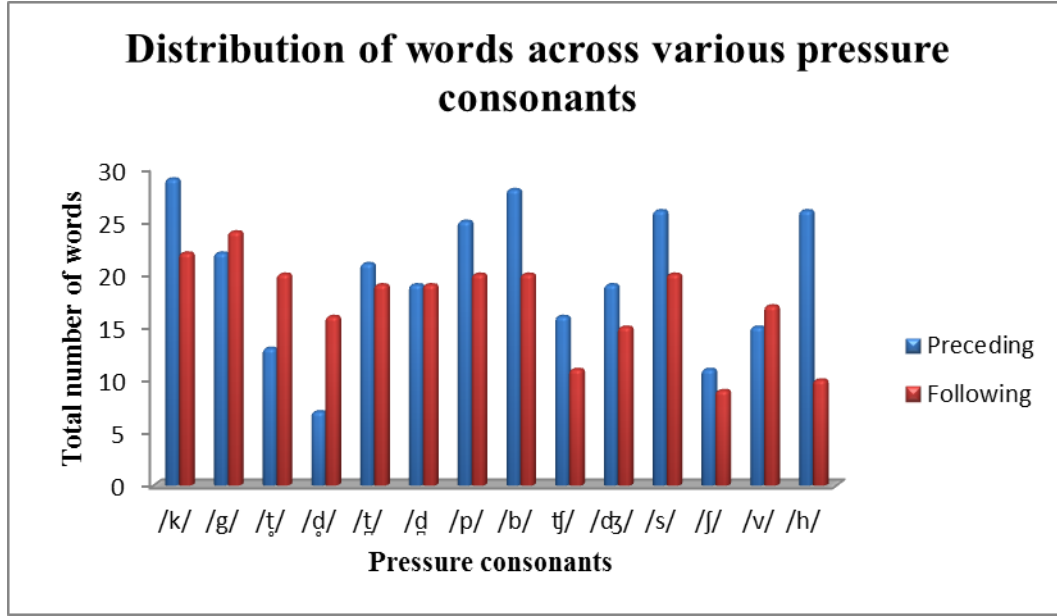
Development of the picture form

The picture form of the word list finalized after familiarity testing was developed. The colorful line drawings of depicting the words were drawn by a professional artist. The pictures drawn were also rated for familiarity, clarity and ambiguity by judges. The judges rated 825 pictures in the preceding context and 720 pictures in following context. The pictures which were rated as very familiar, very clear and unambiguous were selected. The finalized picture form compromised of 277 pictures in preceding context and 242 pictures in the following context. The example of the picture form drawn by the artist has been shown in table 11/

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Table 11

Example of picture form

Target consonant /h/ with /k/ consonant context (preceding)	Target consonant /p/ with /ʈ/ consonant context (following)
ಹಕ್ಕಿ	ಟೋಪಿ

Development of the sentence list

The sentence list prepared was given to three SLP's and two preschool teachers for familiarity rating. The word list of 14 different pressure consonants in preceding and following contexts of various vowels and consonants were rated as very familiar, familiar and unfamiliar. Each pressure consonants were tested in all possible vowel and consonant contexts. The sentences were simple and sentence length was restricted to a maximum of 3 words. The sentence list prepared consisted of minimum of 1 sentence and maximum of 3 sentences in each context in preceding and following milieu. The sentence list comprised of 597 sentences in preceding and 498 sentences in following context. The sentences which were rated as very familiar were selected for the final list. The sentences which were rated as unfamiliar were eliminated from the final list. The sentences were selected in the same suit as the words were selected. The sentence list after familiarity rating comprised of 377 sentences in preceding context and 351 sentences in following context. The final list compromised of 728 sentences. The distribution of sentences selected after familiarity testing has been shown in Table 12 and is graphically represented at Graph 2.

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Graph 2

Distribution of sentences across 14 pressure consonants
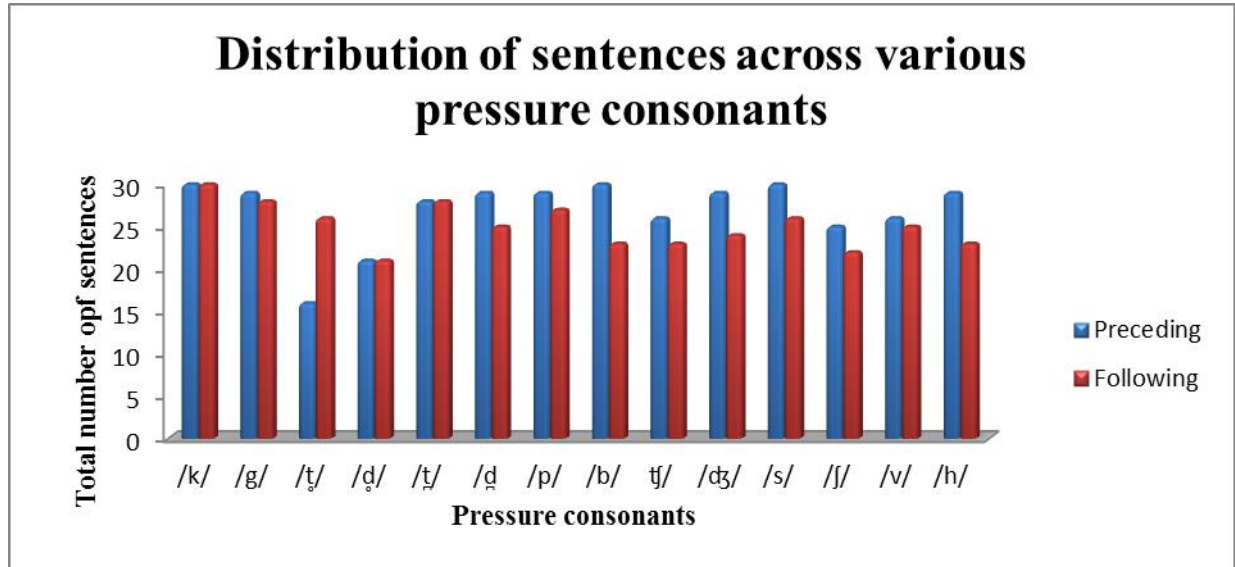

Table 12

Distribution of Sentences across different pressure consonants

Target sound	Context	Total number of sentences constructed	Total sentences selected
/k/	P	53	30
	F	43	30
/g/	P	47	29
	F	40	28
/ṭ/	P	18	16
	F	38	26
/ḍ/	P	31	21
	F	39	21
/t̪/	P	43	28
	F	41	28
/d̪/	P	38	29
	F	36	25
/p/	P	48	29
	F	37	27
/b/	P	73	30
	F	43	23

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/ʧ/	P	39	26
	F	23	23
/dʒ/	P	41	29
	F	35	24
/s/	P	52	30
	F	36	26
/ʃ/	P	29	25
	F	24	22
/v/	P	32	26
	F	33	25
/h/	P	53	29
	F	30	23

*P- Preceding, F- Following

The development of deep test of articulation for pressure consonants in Kannada language is a preliminary attempt in revisiting the diagnostic tests developed in India. Kannada is one of the major Dravidian languages of India, predominantly spoken in the state of Karnataka. Native speakers of Kannada are called as Kannadigas, and they number approximately 40 million, making it the 32nd most spoken language in the world. It is one of the scheduled languages of India in the Constitution of India and is the official and administrative language of the state of Karnataka. As mentioned earlier, the diagnostic tests developed in English do not satisfy the phonological requirements of native Dravidian languages. Therefore, it is essential to develop and employ the test materials in native languages. This will facilitate speech language pathologists to assess the articulation of individuals with more certainty. The articulation tests in Kannada was developed by Babu, Rathna and Bettagiri (1972) and it was standardized by Tasneem (1977). The Re-standardization of Kannada articulation test was recently done by Deepa, A. (2010). The deep test of articulation (sentence form) in Kannada language developed by Rohini (1989) comprises of 9 different pressure consonants. The available diagnostic tests are outdated and needs to be revisited to upgrade the diagnostic procedures. The present study is a preliminary attempt to develop a deep test of articulation for pressure consonants in Kannada language. The test developed has to be standardized and appropriate statistical procedures will be applied to derive the normative score.

The developed diagnostic test will be instrumental in assessing the articulation of individuals with CLP as the test mainly constitutes pressure consonants which are of interest

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among those populations. The contextual testing will also provide a baseline regarding the articulation skills of individuals with CLP for interventional purposes.

Summary and Conclusion

The assessment of articulation provides baseline for the therapeutic intervention and therefore, has to be meticulously carried out. The assessment of articulation among individuals with CLP is a very phenomenal task for providing platform for rehabilitation. The present study aims to develop a deep test of articulation for pressure consonants in Kannada language which can be used with CLP population. The deep test was developed in picture (519 words) and sentence form (728 sentences). The test was developed after familiarity testing by three SLP's and two preschool teachers on a 3 point rating scale. The target speech sounds were tested in different vowel and consonant context in preceding and following milieu. The deep test using pressure consonants provides detailed information about articulation abilities of individual with CLP. The standardized diagnostic test will be very helpful tool in diagnostic as well as therapeutic intervention.

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Ms. Sahana Muralikrishna
Junior Research Fellow
All India Institute of Speech and Hearing
Mysore 570 006
Karnataka
India
sahanaaslp@yahoo.co.in

Dr. Pushpavathi M.
Professor
Department of Speech Language Pathology
All India Institute of Speech and Hearing
Mysore 570 006
Karnataka
India
shivanna.pushpa@gmail.com

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