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Development of a Screening Articulation Test Common to Multiple Languages

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Abstract: *India is undoubtedly a multilingual and multicultural country. Hence, it demands the speech language pathologist's to use language specific tests in assessment and diagnosis of various communication disorders. The scenario may exasperate when it comes to the language specific issues in the assessment of articulation disorders due to the unavailability of articulation tests developed abiding the phonological structure for many languages in India. However, sometime using language specific articulation tests to assess all the languages known would be time consuming. Hence it is worth developing a screening tool which can be used as a language independent measure. The current study provides a preliminary attempt to develop a common articulation test for Indian languages specific to Hindi, Malayalam, Kannada and Sanskrit. Initially, test material was developed using 76 Sanskrit words which are common in those languages. A total number of 60 children, with the age range of 3-8 years were involved in the study. The phonemes were embedded in the target words which were recorded in a sound treated room and analyzed. The results are discussed with respect to age of acquisition, pattern of acquisition of speech sounds. Though the test determined the acquisition and error patterns, it further requires careful selection of phonemes with target word, content validation and also sensitivity and specificity measures.*

Keywords- *Articulation, screening test, multiple languages, preliminary attempt, 3-8 years.*

I. Introduction

Our desire to express is powerful and originates from basic drives to satisfy both our physical and emotional needs. There is nothing more elemental in all existence than communication. All creatures great and small even unto the tiny amoeba are connected in an endless web and flow of message. But it is in humans, that we see its ultimate expression in the marvellous vehicle of language. Language serves as a tool in the process of communication that enables us to convey information with specificity. Oral communication is the prime channel of interaction with others for expressing feelings, ideas, disappointments and influencing others. The defective production of sounds leads to articulation disorder.

Articulation refers to the totality of motor processes involved in the planning and execution of sequences of overlapping gestures that result in speech (Fey, 1992). Normal articulation is a series of complex actions and is essential for effective speech communication. Accurate articulation requires exact placement, sequencing, timing, direction and force of articulators. Articulation is defined as a series of overlapping ballistic movements which places varying degrees of obstructions in the path of the outgoing air stream and simultaneously modifies the size, shape and coupling of the resonating cavities (Nicolisi, Harrylmen & Krescheck, 1978). The error in articulation results from relatively peripheral disturbances of articulatory processes. According to Michigan Speech-Language guidelines (2006) such motor-based errors are usually consistent. Since the sounds produced are notably different from normative productions, errors are described as 'phonetic' in nature (Bauman-Waengler, 2000). A child is said to have an articulation delay when the sounds are acquired in the expected sequence but the developmental errors persist beyond the age we expect. A child is said to have an articulation disorder when their error patterns and/or sound acquisition sequence deviate from those seen in most children of their age. Articulation tests are important tools in speech pathologist's grasp. Speech sound production errors is most common of speech disorders.

Despite the demand for assessment and remediation of speech sound production or articulation errors, development of tools has been lacking in India. Kannada articulation test is been one among the earliest test which was developed to assess articulation in Kannada and it was developed by Babu, Rathna & Bettagiri (1972). Later Maya (1990) adapted this test into Malayalam language, similarly it was adapted in Tamil (Usha, 1986), Bengali (Banik, 1988) and other Indian languages. Apart from these tests if the articulation disorder ranged from moderate to severe then certain other test of phonological disorders may prove more diagnostically valuable than traditional articulation tests (Dodd, Zhu, Crosbie, Holm & Ozanne, 2002). However, the efforts in this field have not been made since then, though India is seen distinct compared to other countries, when language becomes the issue. Thus, the articulation assessment in India necessitates language specific articulation test. Hence, it compelled us to have different articulation tests depending on the language in which testing can be carried out. Many such articulation tests have been reviewed and briefly described as screening test,

diagnostic test, single phoneme inventory etc (Peterson & Marquardt, 1994; Creaghead, Newman & Secord, 1989) Language specific tests are not widely used in India, due to the variations in the speech sounds across the languages, though they possess some of the common characteristics. It is generally accepted that, the ability to produce each of the sounds of a language is acquired at a particular age (Templin, 1957). The learning of a system of phonemes first requires the ability to produce phonetic features such as voicing, nasality, etc. of the phonemes. These phonetic features may be present in the child's vocalization in the babbling stage but the child is said to have learnt the sound, only when it is used in a way, in which it is accepted by that particular linguistic community.

II. Need For The Study

India is a multilingual country where each individual speaks at least, 2-3 languages on an average. Hence, there are many issues to be addressed, when it comes to the assessment of articulation in a linguistically diverse nation like India. Most often during the clinical assessment clinicians who are from different linguistic background tend to select the test which is specific to the examinee's native language. However, the clinician may not be having the adequate knowledge about the phonetic and phonemic aspects of the language in which the articulation needs to be tested. Thus, the effectiveness of testing can always be questionable. Further, using language specific articulation tests to assess, would be cumbersome and time consuming. This observation will be particularly true if the speech language pathologists are also not familiar with the phonological aspects of all languages. Hence it is worth developing a screening tool common to multiple languages. This study is a preliminary attempt to develop a common articulation test for Hindi, Malayalam, Kannada and Sanskrit, which borrows the common phonetic and phonemic aspects from Sanskrit. For this purpose Sanskrit language was selected which is a root language, from which all most all Dravidian and non-Dravidian languages borrowed words.

Sanskrit's greatest influence, presumably, is that which it exerted on languages of India that grew from its vocabulary and grammatical base; for instance Hindi is a "Sanskritized register" of the Khariboli dialect. However, all modern Indo-Aryan languages as well as Munda and Dravidian languages, have borrowed many words either directly from Sanskrit (Tatsama words), or indirectly via middle Indo-Aryan languages (Tadbhavawords). Words originating in Sanskrit are estimated to constitute roughly fifty percent of the vocabulary of modern Indo-Aryan languages, and the literary forms of (Dravidian) Telugu, Malayalam and Kannada. Hence in this test, Sanskrit is taken as common language source for selecting lexical items representing phonemes, because these borrowed (Tatsama and Tadbhava) words are used in Kannada, Malayalam and Hindi with similar meaning. So, this study is a preliminary attempt to develop a common articulation test for Hindi, Malayalam, Kannada and Sanskrit.

III. Aims Of The Study

1. To develop a screening articulation test common to Hindi, Malayalam, Kannada and Sanskrit, based on the Sanskrit phonology which entails the commonalities in phonological aspects across the languages considered.
2. To administer the developed test on children of each language, within the age group of 3 to 6 years and 6.1 to 8 years.

IV. Methodology

A total number of 90 children, within the age range of 3-8 years were involved in the study. The children were grouped further into two groups (3 to 6 years and 6.1 to 8 years) with the equal number of participants (30). The developed test material was administered on equal number of children (15 in each language and age-range) in Hindi, Kannada and Malayalam. This age range was selected, as the children would be matured enough to identify the pictures. The children were selected based on the subject selection criterion which was defined as, the children who are devoid of any history of speech, language, hearing or neurological problems or developmental disabilities with social, emotional/behavioural deficits. The material consists of 76 Sanskrit words (38 phonemes in initial position, 21 phonemes in medial and 20 phonemes in final) which were common to Hindi, Kannada and Malayalam, and sounded similar in pronunciation and meaning. The words were rated as acceptable in their native language by 3 male and 3 female speakers from each of the languages (Kannada, Malayalam and Hindi).Target words were recorded in a sound treated room. A male talker of 22 years old read words one by one, into a microphone kept at a distance of 6.1-8 cm. The words were recorded directly in to computer disk at 16-bit accuracy using Creative sound card at a sampling rate of 44 kHz.These words were later fed into DMDX for presentation of the stimuli. Along with auditory mode, pictorial and grapheme forms of the stimuli were also presented.

V. Results And Discussion

The present study aimed at developing an articulation test in Sanskrit, which is the root language, from which almost all Dravidian and non- Dravidian languages have borrowed words. Hence this study is a preliminary attempt to develop a common articulation test for Hindi, Malayalam, Kannada and Sanskrit.
Inventory of phonemes selected and their position in word is given in the table 1. In the present study, the performance of the children from different linguistic background is considered as a mixed sample group for the analysis.

Table 1: Phoneme Inventory Used In The Study

	Initial position	Medial position	Final position
No. of phonemes	38	21	20
Phonemes	Vowels	/a/,/aː/,/i/,/iː/,/u/,/uː/,/eː/,/oː/,/əu/	
	Consonants	/k/,/kʰ/,/g/,/gʰ/,/tʃ/,/tʃʰ/,/dʒ/,/t/,/d/,/dʰ/,/ŋ/, /p/,/pʰ/,/b/,/ bʰ/,/m/,/ð/,/θ/,/ɖ/,/ɖʰ/,/n/,/s/, /ʃ/,/h/,/v/, /j/,/l/,/r/	

This test was administered on Hindi, Malayalam and Kannada native speaking children with the age range of 3-8 years. The test was administered in two groups, i.e. 3-6 years and 6.1-8 years. Since, the inaccurate production of vowel and consonant sounds provides an estimate of norms; all analysis is based on these estimates of errors produced by the subjects. Articulation errors consisted of substitution, omission, distortion, and addition. In this study omission errors were most common and hence no sub classification of inaccurate production is made. The percentage of error in the two groups for three languages is given in Table 2.

Table 2: Percentage Of Errors In The Study Group

Languages	Kannada		Hindi		Malayalam	
Age-range	3-6 years	6.1-8 years	3-6 years	6.1-8 years	3-6 years	6.1-8 years
Phonemes	Error percentage					
/uː/	33.6%	0%	33.9%	0%	33.5%	0%
/eː/	20.3%	0%	20.2%	0%	20.9%	0%
/oː/	33.7%	0%	33.5%	0%	33.5%	0%
/k/	2.8%	0%	2.4%	0%	2.6%	0%
/kʰ/	20.1%	0%	20.3%	0%	20.5%	0%
/g/	4.2%	0%	4.6%	0%	4.9%	0%
/gʰ/	20.1%	0%	20.3%	0%	20.3%	0%
/tʃ/	33.9%	0%	33.6%	0%	33.4%	0%
/dʒ/	20.2%	0%	20%	0%	20.7%	0%
/tʃʰ/	11.4%	0%	11.5%	0%	11.2%	0%
/ð/	16.9%	0%	16.6%	0%	16.1%	0%
/pʰ/	20%	0%	20.3%	0%	20.4%	0%
/t/	13.7%	0%	13.9%	0%	12.9%	0%
/ɖ/	6.4%	0%	6.6%	0%	6.8%	0%
/n/	8.5%	0%	7.7%	0%	8.4%	0%
/s/	40%	0%	40.2%	0%	39.3%	0%
/ʃ/	6.6%	0%	6.5%	0%	5.4%	0%
/h/	4.6%	0%	4.7%	0%	4.3%	0%

From Table 2, it can be seen that 6.1-8 years aged children obtained 0% error production, also shows that by 8 years of age almost all the phonemes are acquired. It is also evident that 3-6 years aged children, present difficulty in the production of back vowels /u/ and /o/. Among the consonants, affricates,/tʃ/ and aspirated consonant,/gʰ/ are most difficult for 3-6 years old. The maximum errors seem to be for sibilant /s/. All these difficulties seem to be overcome by 6.1-8 years.

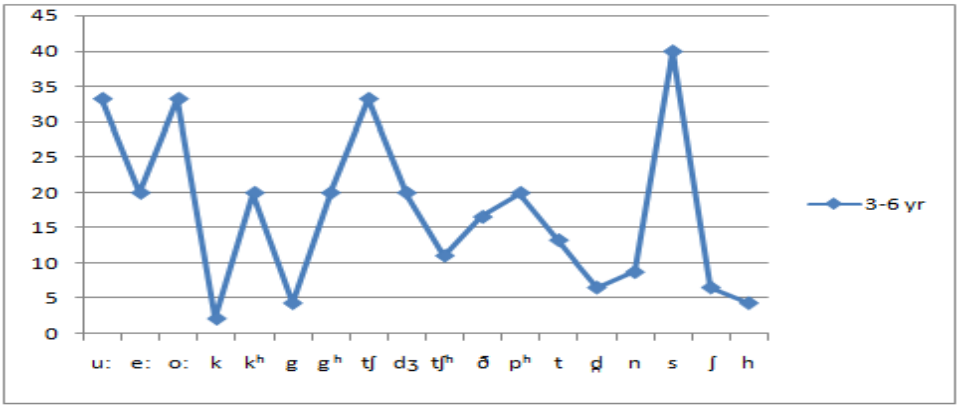

Figure1: Percentage error for 3–6 years age

The fig.1 represents the percentage error scores of 3-6 years old children. 6.1-8 years children can produce all the words with 100% accuracy and 0% errors as mentioned in Table 1. Hence the articulation development is complete. Thus it appears to validate the word list in the present test.

The mean comparison was made using Analysis of variance in order to find out if the statistical significant difference exists between the groups across the languages. However, the ANOVA revealed there was no statistically significant difference between the languages [F (2, 57) = 2.22, p > 0.05] in which the performance was assessed indicating, the performance across all three languages and it remained same for both the age group. The language variations did not yield the differential performance on developed test.

In general the errors observed from the present test across languages represent the developmental pattern. It can be further extrapolated that this common articulation test can discriminate 3-6 years age group children from 6.1-8 years age group children.

According to Templin (1957) consonants /k^h/, /g^h/, /h/ are developed by the age of 6 years. It can be seen from the results that, approximately 2-20.3% of error production is present, which is effectively identified by the screening test. As well as the late acquired sound shows higher percentage of errors up to 40.2%. The type of errors, most predominant was omission and substitution.

As 6.1-8 years children can produce all the words with 100% accuracy, it shows that the articulation development is complete. Hence detection of inability to produce sounds in 3-6 years and identifying full range phonemes in 6.1-8years validates the use of the test. The correct repetition of words also shows that, by 8 years of age almost all the phonemes are acquired.

In general, screening multilingual articulation test can clearly distinguish articulatory acquisition in typically developing children in 3-6 and 6.1-8 years age group children. However the present study is exploratory in nature. Further, analysis of phonological error patterns, need to be done to establish the developmental pattern of phonemes in present subjects.

VI. Summary And Conclusion

Misarticulation which are the disturbances of speech sound productions are probably the most common type of speech disorder. A speech and language pathologist should be in a position to differentiate the normal population from the abnormal group. This can be achieved through the administration of appropriate articulation tests.

From the present study it appears that the possibility of having a screening articulation test common to Hindi, Malayalam, Kannada and Sanskrit languages is a possibility. The method of presentation using laptop screen, providing auditory and visual cues appears to be practical in using with children. The entire test duration of 10-15 minutes per child is reasonably economical, particularly because the analysis can be done by the Speech and Language Pathologists later. It was seen that 6.1-8 years aged children obtained 0% error production, also shows that by 8 years of age almost all the phonemes are acquired. It is also evident that 3-6 years aged children, present difficulty in the production of back vowels /u/ and /o/. Among the consonants, affricates like/$t\int$/ and aspirated consonant like /g^h/ are most difficult for 3-6 years old. But according to Banu (1977) affricates were acquired by 3.7 years in typically developing Kannada speaking children and the percentage of accuracy was 90% (Prathima, 2009). The maximum errors seem to be for sibilant /s/. All these difficulties seem to be overcome by 6.1-8 years.

Hence this articulation test can be used as an effective screening tool. But, this study has not included language specific phonological variation, and the norms obtained from the data could not be finalised due to lack of time. Future studies can be done on larger population representing each language speaking population. Correlation between familiar and unfamiliar languages used by speech language pathologists on the same population can be taken.

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