Research Article

Development of word list in Hindi for speech sounds to work on articulation errors for children with hearing impairment

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ABSTRACT

Background: Children with Hearing Impairment often experienced inability to recognize speech sounds, delay in language acquisition, educational disadvantage, social isolation and difficulties to communicate. The study was aimed to develop the word lists in Hindi for speech sounds to work on articulation errors for children with Hearing Impairment in the age range of 0-6 years.
Methods: The different speech sounds were selected as per phonological developmental stage of the child. The selected speech sounds were given to 15 judges (5 Parents, 5 Special educators and 5 Audiologist and Speech-Language Pathologist) to validate the speech sounds. After getting validation from the judges, 10 speech sounds were selected to develop word lists (Story books for the children were used to develop the word lists).
Results: ANOVAs test was done to see the significant difference among the groups for the selected speech sounds. To signify that there was no significant difference among the groups for the selected speech sounds, intra-reliability test was done. List of words with picture were developed in each position (initial, medial and final) of the selected speech sound.
Conclusions: The word lists in Hindi will be a tool for the Parents, Teachers and Speech Language Therapists to work on different speech sounds for the hearing impaired children with articulation errors. The word lists will also help to improve articulation skills of other children with developmental disorders. However, more number of words lists needs to develop and familiarization need to be done before uses of the developed word lists.

Keywords: Hearing impairment, Word lists, Articulation, Hindi, Parents, Teachers

INTRODUCTION

Children with Hearing Impairment often experienced inability to recognize speech sounds, delay in language acquisition, educational disadvantage, social isolation and difficulties to communicate.[1] Children with hearing impairment with the hearing loss of 35-55 dB (mild to moderate loss) have some defects of articulation, 55-70 dB (moderate hearing loss) have abnormalities of articulation and voice, 70-90 dB, 90 dB and above (severe to profound hearing loss) have maximum

Articulation errors.[2] Articulation is a process in which there is a consonant flow and flux of neuromuscular adjustment with parallel acoustic signal.[3] Elbert & Gierut[4] defines articulation disorder is a difficulties with motor production aspects of speech or an inability to produce certain speech sounds.

Articulation errors are characterized by the substitution, omission, distortion, addition and incorrect sequence of speech sounds. Articulation errors are errors in the production of vowels, consonants and diphthongs.

Consonant errors are more common in English when compared to vowel and diphthong errors.[5] There are also some typical and systematic errors patterns in their speech.

Vowel errors: Vowels are very important in the speech as they are the energy carriers. Production of vowels is dependent on mouth opening; lip rounding, place and height of the tongue within the oral cavity. The articulators rarely come into contact with each other in vowel production. This results in providing little or no tactile and kinesthetic feedback to the child and is hence difficult to produce. Substitutions of vowels, diphthongization error, addition of vowels, releasing extra air before a vowel, are observed in the speech of children with HI[5]:

Consonant errors: In the speech of the hearing impaired consonants error are more common than vowel errors and the errors are errors of substitution, omission, distortion and addition.[5]

Hindi language is a member of the Indo-Aryan branch of the Indo-European family of languages. It is one of the major languages of the world. Along with English, Hindi is one of the two officially recognized national languages of India. It has significant concentrations of speakers in the Indian states of Uttar Pradesh, Uttaranchal, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Haryana, Rajasthan, Himachal Pradesh, and Delhi. https://asian.washington.edu/fields/hindi.

Word list for different speech sounds are very important for developing articulation during speech therapy. In literature, there are very few word lists available mainly in English; a consonant drill book has been developed by Goda[6] and Hegde M N.[7, 8] There are also articulation drill books are available for cleft palate population in Telugu,[9] Hindi,[10] Kannada[11] and Malayalam.[12]

However, there are no word lists in Hindi for speech sounds to work on articulation errors for children with Hearing Impairment. So, there is a need to develop a word list in Hindi for different speech sounds to work on articulation errors for children with HI.

The aim of study: To develop the word lists in Hindi for speech sounds to work on articulation errors for children with hearing impairment in the age range of 0-6 years.

METHODS

Participants: 15 judges (5 parents (P), 5 special educators (SE) and 5 audiologist and speech-language pathologists (ASLP)) were selected. The education levels of the parents were above pre university college level. All parents had minimum of one hearing impaired child in the age range of 4 to 6 years and reported working knowledge of English. All SEs had Diploma in Special Education-Hearing Impairment (DSE-HI), with a

minimum experience of 1 Years. All reported to working with the children with HI and had working knowledge of English. All ASLPs' had minimum a master's degree in audiology and speech language pathology and working with the children with HI and had occupational knowledge of English. There minimum work experience was 4 years. All the judges were from northern India (Delhi, Utter Pradesh and Bihar), where mostly the language spoken is Hindi.

Procedure: A covering letter which was composed of introduction of the present researcher, topic of the research and its objectives and an explanation of their role in validation, and copy of drafted speech sounds were given to all judges to validate the speech sounds. The speech sounds were in written form. The different speech sounds were chosen as per phonological developmental stage of the child.

A four point rating scale was developed to validate the written speech sounds, the rating criteria and points are as follows

- 1-Not relevant &useful: It refers to the speech sounds which are not much appropriate for daily use by the parents for developing articulation under speech and language skill for the hearing impaired child, but able to be used for a research study.
- 2-Very Limited use & relevant: It refers to the speech sounds which are very limited to use and less appropriate for daily activities by the parents for developing articulation under speech and language skill for the hearing impaired child.
- 3-Mostly suitable & useful: It refers to the speech sounds which are mostly suitable/ or relevant and able to be use by the parents for developing most of the articulation under speech and language skill for the hearing impaired child.
- 4-Most relevant & Very useful: It refers to the speech sounds which are most appropriate and very useful and able to use for daily activities by the parents for developing articulation under speech and language skill for the hearing impaired child.

The following instructions were given to judges for validation of the speech sounds:

1. Kindly rate the written speech sounds as per given four point rating scales.
2. Write your comments for the speech sounds which has been rated, 1- Not relevant & useful and 2- Very limited use & relevant.
3. Indicate changes in wording if required.
4. Please also mention your suggestions, if any to finalize the speech sounds to develop the word lists.

The speech sounds which rated as 4 (Most relevant & very useful) and 3 (Mostly suitable & useful) by the judges were retained for the development of word lists in different word positions i.e. initial word position, medial

word position and final word position. The speech sounds which rated as 2 (Very limited use &relevant) and 1 (Not relevant &useful) were not selected for the development of word lists. After getting validation from the judges, 10 speech sounds were selected to develop word lists in different word positions.

Statistics involvement: ANOVAs test was done to see the significant difference among the groups for the selected speech sounds. To signify that there was no significant difference among the groups for the selected speech sounds, intra-reliability test (spearman brown coefficient) was also done.

RESULTS

Table 1 explains the list of the speech sounds which has been selected after getting validation from the judges and the p values. And p values shows that there are no significance differences among the groups for the most of the speech sounds. However there are few speech sounds (i.e., S3, S4, S9 and S10) that approach significant level. The speech sounds which are listed in table 1 are the speech sounds which has been selected after getting validation from the judges.

Table 1: comparison among the group i.e. parents (P), special educators (SE) and ASLPs' for the selected speech sounds.

S. No	Speech Sounds	Groups	Mean	Standard deviation	p-value
1.	Sound /p/	P	4.0	0.00	0.11
		SE	3.6	0.54	
		ASLP	4.0	0.00	
2.	Sound /h/	P	3.4	0.54	0.13
		SE	3.0	0.00	
		ASLP	3.6	0.54	
3.	Sound /e/	P	3.6	0.54	0.00*
		SE	3.0	0.00	
		ASLP	4.0	0.00	
4.	Sound /t/	P	3.4	0.54	0.02*
		SE	3.2	0.44	
		ASLP	4.0	0.00	
5.	Sound /k/	P	3.0	1.00	0.05
		SE	2.6	0.54	
		ASLP	3.8	0.44	
6.	Sound /l/	P	4.0	0.00	0.11
		SE	3.6	0.54	
		ASLP	4.0	0.00	
7.	Sound /s/	P	3.2	0.83	0.09
		SE	3.0	0.00	
		ASLP	3.8	0.44	
8.	Sound /tʃ/	P	2.4	0.54	0.05
		SE	3.0	0.96	

S. No	Speech Sounds	Groups	Mean	Standard deviation	p-value
		ASLP	3.0	1.22	
9.	Sound /d/	P	2.8	1.09	0.02*
		SE	2.8	0.44	
		ASLP	4.0	0.00	
10.	Sound /a/	P	3.0	1.00	0.02*
		SE	2.8	0.44	
		ASLP	4.0	0.00	

(*: Significant)

Word list for the speech sound /p/:

Initial word position	Medial word position	Final word position
/pɑ:ni/	/pepər/	/pɑ:pɑ/
/pətnɑː/	/tʃɑ:pɑ:kəl/	/sɑ:np/
/pɑ:pɑ/	/sapənɑː/	/jɑ:p/
/pənkʰɑː/	/jalpɑ:n/	/dʰup/
/pəpitɑ/	/pəpitɑ/	/bʰɑ:p/
/pensIl/	/ədʰyɑ:pək/	/mɑ:p/
/pItɑ/	/ədʰyɑ:pIkɑ/	/kəp/
/pepər/	/nɑ:pənɑ/	/pəmp/
/pətəng/	/jɑ:pɑ:n/	/topi/
/pet/	/əpənɑ/	/pɑ:p/
/pəhlɑ/	/sipɑ:hi/	/top/
/patɑ:kʰɑ/	/tɑ:pənɑ/	/lep/
/pair/	/mɑ:pnɑ/	/ɑ:p/
/pətlɑ/	/lɑ:pətɑ/	/pɑ:pi/
/pul/	/kɑ:pənɑ/	/nɑ:p/

Word list for the speech sound /h/:

Initial word position	Medial word position	Final word position
/həl/	/pəhIyɑ/	/tʃuhɑ/
/hɑ:tʰi/	/nəhɑ:nɑ/	/lohɑ/
/həldi/	/dəhej/	/dəhi/
/həwɑ:Ijəhɑ:j/	/jəhɑ:j/	/syɑ:hi/
/hɑ:tʰ/	/məhəl/	/subəh/
/həwɑ/	/nəhər/	/vIvɑ:h/
/hɑ:r/	/bɑ:hər/	/bɑ:rəh/
/həsnɑ/	/lohɑ:r/	/terəh/
/həjɑ:r/	/bəhən/	/tʃəudəh/
/həmələ/	/dɑ:hInɑ/	/səmuh/
/hətyɑ:rɑ/	/bəhɑ:dur/	/nIkɑ:h/
/həns/	/bəhɑ:nɑ/	/dohɑ/
/həlkɑ/	/pəhəlɑ/	/soləh/
/hɑ:rnɑ/	/mohən/	/sIpɑ:hi/
/hɑ:lət/	/rɑ:hət/	/lɑ:h/

Word list for the speech sound /e/:

Initial word position	Medial word position	Final word position
/ikʰ/	/pəpitɑ/	/mItʰɑ:i/
/it/	/pəsinɑ/	/pəktʃsi/
/inɑ:m/	/nukilɑ/	/mətʃli/
/indʰen/	/bəgitʃɑ/	/pedʰɑ:i/
/imel/	/mərij/	/mɑ:li/
/iswer/	/kaintin/	/motʃi/

/irɑ:n/	/ɑ:inɑ/	/sIpɑ:hi/	/ləttu/	/soləh/	/tɑ:lɑ/
/irsʰyɑ/	/pətʃis/	/rəsoi/	/lɑ:ləten/	/khIlɑ:unɑ/	/sɑ:ikəl/
/isɑ/	/tʃʰebis/	/səvɑ:ri/	/lɑ:l/	/lɑ:ləten/	/kənkɑ:l/
/id/	/kʰəridənɑ/	/kəsɑ:i/	/litʃi/	/mɑ:lIk/	/kɑ:lɑ/
/itr/	/rɑ:jiv/	/baingeni/	/lIkʰnɑ/	/məlɑ:i/	/pilɑ/
/ikɑ:i/	/rənjit/	/ikɑ:i/	/lərkɑ/	/bIlli/	/pʰul/
/imɑ:ndɑ:r/	/aəjit/	/pItɑ:ji/	/lərki/	/bɑ:lək/	/pʰəl/
/idgɑ:h/	/əmir/	/mɑ:tɑ:ji/	/lərɑ:i/	/mɑ:lIn/	/mətʃʰəli/
/gitɑ/	/ləkir/	/ləki/	/ləkir/	/mulɑ:yəm/	/kelɑ/

Word list for the speech sound /t/:

Initial word position	Medial word position	Final word position
/təbəlɑ/	/pətəng/	/kutɑ/
/tərbuj/	/kItɑ:b/	/sʰərbət/
/totɑ/	/səntrɑ/	/ɑ:urət/
/terəh/	/bərtən/	/totɑ/
/təkIyɑ/	/vətən/	/pətɑ/
/tərɑ:ju/	/sətɑ:is/	/lətɑ/
/tələlbɑ/	/tʃʰətəri/	/kɑ:gəjɑ:t/
/tɑ:lɑ/	/bətək/	/vəstu/
/tərkɑ:ri/	/pustək/	/tʃʰət/
/tɑ:lɑ:b/	/pItɑ:ji/	/ɑ:dət/
/təng/	/mɑ:tɑ:ji/	/pətɑ/
/təkəlif/	/bətɑ:nɑ/	/pItɑ/
/tɑ:r/	/tʃətur/	/mɑ:tɑ/
/tɑ:nɑ/	/nɑ:tin/	/nɑ:ti/
/tutəlɑ:nɑ/	/nərtəki/	/pəpitɑ/

Word list for the speech sound /s/:

Initial word position	Medial word position	Final word position
/səntrɑ/	/həsnɑ/	/paisɑ/
/soləh/	/pustək/	/rəs/
/seb/	/pensIl/	/sətɑ:is/
/sIhn/	/ɑ:iskrim/	/dəs/
/siti/	/rəssi/	/rəsi/
/sonɑ/	/bəstɑ/	/gʰɑ:s/
/sətɑ:is/	/sərswəti/	/bʰains/
/syɑ:hi/	/rəsgulɑ/	/tʰərməs/
/subəh/	/vəstu/	/gIlɑ:s/
/sIr/	/kIsɑ:n/	/bəs/
/sainIk/	/dost/	/dIvəs/
/surəj/	/pəsənd/	/udɑ:s/
/saiər/	/ɑ:sɑ:n/	/pyɑ:s/
/səjɑ/	/kʰubəsurət/	/mɑ:usɑ/
/sɑ:t/	/ɑ:smɑ:n/	/mɑ:usi/

Word list for the speech sound /k/:

Initial word position	Medial word position	Final word position
/kutɑ/	/təkIyɑ/	/nɑ:k/
/kəngɑ:ru/	/tərkɑ:ri/	/dʰolək/
/kek/	/tIkət/	/kek/
/kəməl/	/məkɑ:n/	/pɑ:lək/
/kItɑ:b/	/sɑ:ikəl/	/bətək/
/kəngən/	/ikətis/	/nɑ:ukɑ/
/kədu/	/ikis/	/lɑ:uki/
/kɑ:m/	/kənkɑ:l/	/pustək/
/kəl/	/ləkəri/	/nok/
/kɑ:lɑ/	/nɑ:ukəri/	/ek/
/kənkɑ:l/	/lokəl/	/rok/
/kɑ:tənɑ/	/vyəktI/	/kɑ:kɑ/
/kəlɑ:kɑ:r/	/nIkəlnɑ/	/kɑ:ki/
/kIsɑ:n/	/mukɑ:blɑ/	/bɑ:lək/
/kəlɑ/	/kəndəktər/	/bɑ:lIkɑ/

Word list for the speech sound /tʃ/:

Initial word position	Medial word position	Final word position
/tʃuhɑ/	/betʃənɑ/	/kəvtʃ/
/tʃɑ:r/	/nɑ:tʃənɑ/	/litʃi/
/tʃəmətʃ/	/kətʃəori/	/tʃontʃ/
/tʃini/	/ətʃɑ:r/	/kɑ:ntʃ/
/tʃɑ:dər/	/kItʃər/	/kətʃu/
/tʃərkhɑ/	/pətʃis/	/motʃi/
/tʃitɑ/	/bətʃɑ/	/bətʃɑ/
/tʃɑ:ku/	/kətʃu/	/bəgitʃɑ/
/tʃɑ:nd/	/pətʃɑ:si/	/tʃəmətʃ/
/tʃɑ:lək/	/pətʃɑ:s/	/nitʃe/
/tʃor/	/kəntʃən/	/nɑ:tʃ/
/tʃɑ:tʃɑ/	/ɑ:ntʃəl/	/tʃɑ:tʃɑ/
/tʃɑ:y/	/ətʃɑ:nək/	/pɑ:ntʃ/
/tʃɑ:tʃi/	/tʃɑ:tʃɑ:ji/	/tʃɑ:tʃi/
/tʃərənɑ/	/sotʃənɑ/	/sərpəntʃ/

Word list for the speech sound /l/:

Initial word position	Medial word position	Final word position
/lohɑ/	/gulɑ:b/	/kəməl/
/lɑ:tʰi/	/dʰolək/	/dʰol/
/lotɑ/	/pɑ:lək/	/bIlli/
/ləddu/	/sʰəlgəm/	/tʰielɑ/
/ləkəri/	/gələt/	/pensIəl/
/lɑ:uki/	/kələm/	/tʃɑ:pɑ:kəl/

Word list for the speech sound /d/:

Initial word position	Medial word position	Final word position
/dəs/	/bəndər/	/gend/
/dɑ:nt/	/ədrək/	/tʃɑ:nd/
/dəvɑ/	/əndər/	/pərdɑ/
/dərvɑ:jɑ/	/ɑ:dəmi/	/kendɑ/
/do/	/jɑ:dugər/	/nədi/
/dəmkəl/	/bəndɑ:gobʰi/	/nəndi/

/dəroɡɑ/	/kudənɑ/	/nəkəd/
/dəvɑːt/	/tʃɑːdər/	/fendɑ/
/dəntəmənjən/	/kudɑːl/	/gond/
/duɑ/	/ɑːdər/	/ɑːulɑːd/
/dost/	/məjedɑːr/	/id/
/dɑːmɑːd/	/mədəd/	/jɑːdu/
/dɑːɡ/	/paidəl/	/dɑːdɑ/
/dɑːl/	/bəhɑːdur/	/nind/
/dəhi/	/sundər/	/bɑːd/

Word list for the speech sound /a/:

Initial word position	Medial word position	Final word position
/əmrud/	/dərbɑːjɑ/	/pɑːpɑ/
/ənɑːr/	/ənɑːr/	/totɑ/
/ətʃɑːr/	/bəndɑːgobʰi/	/səntrɑ/
/ənɑːnɑːs/	/ətʃɑːr/	/tɑːlɑ/
/ədʰyɑːpək/	/tʃɑːpɑːkəl/	/sonɑ/
/ədrək/	/dəvɑːt/	/kɑːlɑ/
/ədʰyɑːpIkɑ/	/ənɑːnɑːs/	/bətʃɑ/
/əndər/	/jɑːpɑːn/	/bəgitʃɑ/
/ɑːdəmi/	/pətʃɑːsi/	/həsnɑ/
/ənt/	/pərIvɑːr/	/tokənɑ/
/əmər/	/lohɑːr/	/bʰolɑ/
/ənjɑːn/	/sonɑːr/	/kIlɑ/
/əmən/	/gIlɑːs/	/kelɑ/
/ərmɑːn/	/ɑːwɑːj/	/ronɑ/
/əndɑːj/	/sIpɑːhi/	/bɑːlɑ/

DISCUSSION

Development of word lists for the different speech sounds: 15 speech sounds were written and it was given to all the judges to rate and validate. Out of 15 speech sounds, total 10 speech sounds were selected to develop word list in different word position to work on articulation errors for children with hearing impairment. A similar pattern of finding was observed in the study done by Ranjan R & Banik A,13 in which they developed and validated different set of objectives to develop an activity manual for the Parents. Total fifteen words in Hindi were developed in different word position for the selected speech sounds. The different word positions were in initial word position, medial word position and final word position. The words were taken from the story books for the children. While selecting the words it was kept in the researcher mind that the words should be very easy and simple to read the word as in print. The developed words were the mixture of bi-syllabic to multisyllabic and most of the words were developed to use in different routine in day to day activities at home. The developed word lists are given in the appendix I.

Reliability of selected speech sounds: To know the reliability of the speech sounds among the judges, intra-reliability test (spearman brown coefficient) was done. And intra-reliability test (spearman brown coefficient) value, i.e., Alpha value was > 0.5 for all the groups. This

indicates good reliability for the speech sounds by all the judges.

The developed word lists will be added in the Section V. Articulation, under developing 'Language stimulation home training activity manual in Hindi for Parents of children with hearing impairment'.[14] The word lists in Hindi will be a tool for the Parents, Teachers and Speech Language Therapists to work on different speech sounds for the hearing impaired children with articulation errors. And the word lists will also help to improve articulation skills of other children with developmental disorders. However, more number of words lists with pictures needs to be developed and familiarization need to be done before the word lists are used. And also the pictures should be added to each developed word under each speech sounds. Therefore, the children with HI will understand better during the practicing sessions for the articulation.

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