Hindi Picture Word Articulation Test Development and Standardization

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Abstract

The present study aimed at constructing a picture articulation screening test in Hindi, for the hearing impaired children who have limited vocabulary. 48 Hindi Speech Sounds were tested using sixty eight familiar picturable words. Most of the sounds were tested in all the three positions in a words. The test was administered to 180 children in the age range of 3 to 6 years, to obtain norms for the acquisition of Hindi Speech Sounds. They were selected from the Vernacular schools in New Delhi.

On the basis of the criteria for acquisition of sounds as the 50th percentile point, all the Hindi Speech Sounds were found to be acquired by the Children in the age range of 3 to 31/2 years itself. The test has its applicability in studying the articulatory status of the hearing impaired.

Articulation defects are prevalent in the speech of hearing impaired children. Articulation testing is a basic pre-requisite to plan speech therapy for such a population.

Generally, picture word articulation tests are found to be more valid than "repeat-after-me" or reading tests. Naming the pictures provide a spontaneous sample of sounds to be tested. As far as the hearing impaired population is concerned, "repeat-after-me" test becomes more of an auditory discrimination or lipreading test as was observed in a study undertaken by us previously (Vasudeva, Basavaraj & Kacker, 1989). Since the hearing impaired children's reading ability could be limited', reading tests of articulation will also have limited use.

The vocabulary load of the test is another factor which has to be considered while developing an articulation test for the hearing impaired children. Knowing that they would have delayed speech and language development, lesser the vocabulary load, more applicable will be the test.

The present study aimed at constructing and standardizing a picture articulation test for the hearing impaired children.

Review of literature

Articulation of speech sounds is a skill which develops over a period of time during early childhood. It is a part and parcel of the speech and language development.

It is believed that articulation skills increase with age (Wellman et. al., (1931); Poole (1934)). A number of Indian studies have also concluded that articulation acquisition in Indian children follow the same pattern as their English counter-parts (Kumudavalli, (1973); Sreedevi (1976)).

According to Jakobson (1941) vowels are acquired first followed by the consonants. Among the consonants the bilabials are acquired first followed by the nasals, then the dental and the stops. The fricatives, affricates, trills and flaps are the last ones to be acquired.

Age of acquisition of speech sounds in Indian languages has been studied by a number of researchers. Some are given in Table-1.

Table -1

Showing the age (in years and months) of acquisition of various speech sounds as reported by various authors.

	Name of the author and the year of reporting					
Speech sounds	Wellman et. al. (1931)	Templin (1957)	Tasneem Banu (1977)	Usha (1986)	Padmaja (1988)	ArunBanik (1988)
m	3	3	3	3	2.6	2.5
n	3	3	3	3	2.6	2.5
ng	*	3	+	+	+	2.5
P	4	3	3	3	2.6	2.5
f	3	3	+	+	2.9	+
h	3	3	+	+	2.6	3.0
w	3	3	+	+	+	+
y	4	3.5	3	3	2.6	2.5
k	4	4	3	3	2.6	2.7
b	3	4	3	3	2.6	2.5
d	5	4	+	3	2.6	3.0
g	4	4	3	3	2.6	3.0
r	5	4	4.6	+	3.9	4.0
s	5	4.5	3	3	3.3	+
sh	+	4.5	5.1	6	3.6	3.0
ch	5	4.5	3.7	3	2.6	3.0
t	5	6	+	3	2.6	3.0
th	+	6	3	+	+	3.0
v	5	6	+	3	2.6	+
1	4	6	3	3	2.6	3.0
th	+	7	+	+	+	3.0
z	5	7	+	+	+	+
xh	+	7	+	+	+	4.0
j	6	7	3	3	2.6	3.0
hw	*	*	+	+	+	+

Tested but not produced correctly, + Sound was not tested or reported

There are several articulation tests developed in Indian languages. They are listed below:

1. Screening and diagnostic test of articulation in Kannada (R.M. Babu et. al; 1972).
2. Articulation test in Hindi (Pandit R. et. al; 1972).
3. Articulation test in Tamil (Usha, D., 1986).
4. Articulation test in Telegu (padmaja, 1988).
5. Articulation test in Bengali (Arun Banik, 1988).

The screening and diagnostic test of articulation in Kannada (Ram Mohan Babu, et. al; 1972), in Telegu (Padmaja, 1988) and in Bengali (Arun Banik, 1988) have been standardized, where as the others are not.

The present study aimed at constructing and standardizing a picture articulation test for the hearing impaired children.

Material And Methods

Subjects:

180 children in the age range of 3 to 6 years were selected and tested to obtain norms for the acquisition of Hindi Speech Sound in the Urban Hindi belt. These children were selected from the vernacular schools in New Delhi. The age range of 3 to 6 years was divided into 6 sub-groups with six months interval between the consecutive groups. Each sub-group had 30 children, comprising of both boys and girls. A total of 180 children were tested. Table 2 shows the breakup of boys and girls in each sub-group:

Table - 2

Showing the distribution of boys and girls in each age group.

Age Group	Boys	Girls
3 t o 3 1/2yrs.	15	15
3 1/2 to 4 yrs.	12	18
4 to 41/2	16	14
4 1/2 yrs. to 5 yrs	12	18
5 to 51/2 yrs.	16	14
5 1/2yrs. to 6 yrs	16	14
Total	87	93

Grand Total = 180

Following were the criteria for the selection of children:

1. All the children belonged to lower middle income group of socio-economic status.
2. Only those children were tested who's first language was Hindi.
3. All these children had normal motor and speech developmental milestones.
4. None of the selected children had any mental subnormality.
5. Hearing screening was done for all the children and only those children who had normal hearing sensitivity (puretone average 20dB) were taken for the data collection.

The Articulation test:

48 speech sounds of Hindi language belonging to seven categories of sounds were included in the test. Table - 3 shows the categories tested and number of sounds under each of them.

Table - 3

Showing the categories of sounds tested and the number of sounds under them.

Speech sound categories	No. of sounds tested
Oral Vowels	8
Nasalized Vowels	8
Unaspirated and aspirated plosives	12
Unaspirated and aspirated retroflexives	6
Unaspirated and aspirated affricates	4
Fricatives	7
Nasals and laterals	3
Total	48

The sounds /rh/, /z/, /n/ and /|V were omitted considering their minimal frequency of occurrence in the Hindi language and also to facilitate rounding up of the total maximum score to 100 for the sake of convenience.

Picture articulation test was constructed by arriving at a list of 68 words. A careful screening was done for the selection of these words from the common vocabulary used by the hearing impaired children. More than one sound were to be tested in each word. For each sound considered, a list of picturable words was prepared. The words were then rated for familiarity on a limited number of adults and children. Later the pectures of these words were also tested on a limited number of normal adults and children. The pictures which were difficult to be identified were deleted and more appropriate pictures were selected and tested again. Thus a set of sixty eight familiar pictures were prepared to test the 48 Hindi speech sounds in different positions.

Attempts were made to test these sounds in three different positions in the word. However due to non availability of pictur- able common words which would be in the vocabulary of 3-6 years old children some sounds had to be tested in less than three positions .

Table 4 indicates the positions in which the different sounds are tested.

Scoring system:

A scoring system of '1' or '0', where '1' implies the sound correctly produced and '0' implies that it is mii,artii;ulated, was used since this was a screening test

Analysis and results:

The mean and standard deviation of the scores for the seven groups of sounds for each age range was calculated separately. The 50th, 75th, 90th and the 95th percentile points (P_{50}, P_{75}, and P_{go} and P_{95}) were also calculated.

Six separate tables were made for each age-range seperately (Table - 5 a to 5 f) showing the mean scores obtained by each age group of children against the maximum scores for the seven categories of sounds.

Criteria for acquisition of sounds was taken as the fiftieth percentile. If 50% of the children had scores more than half of the maximum attainable scores on a particular sound then the sound was considered as acquired by that population of children.

Table 4:

Scoring sheet showing the positions in which the different sounds are tested.

Speech Sounds	Position in the word			Speech Sounds	Position in the word		
	Initial	Medial	Final		Initial	Medial	Final
i: ई	1	1	1	dh ध	1	1	-
i इ	1	-	-	kh ख	1	1	1
e ए	1	1	-	gh घ	1	1	-
a अ	1	-	-	ṭ ट	1	-	1
a: आ	1	1	1	ḍ ड	1	1	-
o ओ	1	1	-	ṇ ण	-	-	1
u: ऊ	1	1	1	r ड़	-	1	1
u उ	1	1	-	ṭh ठ	1	1	1
◌ि ◌ी i: ई	1	-	-	ḍh ढ़	1	-	-
◌ि ◌ं i इं	-	1	-	rh ढ़	-	-	-
◌े e ऐं	-	1	-	c च	1	-	1
◌ॅ ◌ा: a: आँ	1	1	-	j ज	1	-	1
◌ॅ a अँ	1	-	-	ch छ	-	-	1
◌ो o ओं	1	1	-	jh झ	1	-	-
◌ू ◌ँ u: ऊँ	1	1	-	f फ	-	1	1
◌ु ◌ं u उं	1	1	-	v व	-	1	1
p प	1	1	-	s स	1	1	1
b ब	1	1	1	h ह	1	1	-
t त	1	1	1	r र	1	1	1
d द	1	1	1	s श	1	1	1
k क	1	1	1	y य	-	-	1
g ग	1	1	1	m म	1	1	1
ph फ	1	-	-	n न			
bh भ	1	1	-	ṅ ङ्	1	-	1
th थ	1	1	1	ṇ ङः			
				l ल	1	1	1

*

	Maximum Score	Subject's Score
Oral Vowels	17	-
Nasalized Vowels	12	-
Plosives (A&U)	30	-
Retroflexives (A&U)	11	-
Affricates (A&U)	6	-
Affricatives	16	-
Nasals & laterals	8	-
Total	100	

Observations:

Table 5a shows the distribution of mean scores obtained for the different categories of sounds against the various percentile points for the age group 3 - 3 1/2 years.

Table - 5(a)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 3-3 1/2 years.

Categories Of sounds	Max score	Percentile Points P50	P75	P90	P_{95}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	28	30	30	30
Retroflexives	11	6	9.25	11	11
Affricates	6	6	6	6	6
Fricatives	16	13	15.25	16	16
Nasals & laterals	8	8	8	8	8
Total mean score	100	87	94	97	98.35

In Table 5a the total score at the various percentile points can be interpreted as follows:

50% of the children scored more than 87% and the other 50% scored not less than 87% and so on.

The scores of 50th percentile shows that, at this level itself the maximum possible scores for oral vowels, nasalized vowels, affricates, nasals and laterals, were achieved. It implies that all the children scored the maximum indicating complete acquisition of these categories of sounds. The maximum score for plosives was achieved at 75th percentile. At the 50th percentile level the maximum score was short by two responses. For retroflexives and fricatives and maximum scores was obtained at the level of 90th percentile. For retroflexives the maximum scores at P_{60} & P_{75} were less than 5 points and 1.75 points respectively. The scores for fricatives at P_{50} & P_{75} were less than the maximum by 3 points and 0.75 points respectively.

With the criterion adopted for acquisition of a sound in the present study, it can be seen that all the speech sound had already been acquired by the 3 - 3 1/2 years old children.

Similarly it can be seen from Table -5 (b, c, d, e and f) that all the sounds tested were acquired by children of all the other age groups.

Table - 5(b)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 3 1/2-4 years.

Categories Of sounds	Max score	Percentile Points	P_{75}	P_{90}	P_{95}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	29	30	30	30
Retroflexives	11	9	11	11	11
Affricates	6	6	6	6	6
Fricatives	16	15	16	16	16
Nasals & laterals	8	8	8	8	8
Total mean score	100	95	98	100	100

Table - 5(c)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 4-4 1/2 years.

Categories Of sounds	Max score	Percentile Points			P_{95}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	30	30	30	30
Retroflexives	11	11	11	11	11
Affricates	6	6	6	6	6
Fricatives	16	16	16	16	16
Nasals & laterals	8	8	8	8	8
Total mean score	100	100	100	100	100

Table - 5(d)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 41/2-5 years.

Categories Of sounds	Max score	Percentile Points P50	P75	P90	P_{96}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	30	30	30	30
Retroflexives	11	11	11	11	11
Affricates	6	6	6	6	6
Fricatives	16	16	16	16	16
Nasals & laterals	8	8	8	8	8
Total mean score	100	94	99	100	100

Table - 5(e)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 5-51/2 years.

Categories Of sounds	Max score	Percentile Points P50	P_{75}	P_{90}	P_{95}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	30	30	30	30
Retroflexives	11	11	11	11	11
Affricates	6	6	6	6	6
Fricatives	16	16	16	16	16
Nasals & laterals	8	8	8	8	8

Table - 5(f)

Showing the distribution of scores at various percentile points for the different categories of sounds for the age group 51/2-6 years.

Categories Of sounds	Max score	Percentile Points P50	P75	P_{90}	P_{95}
Oral vowels	17	17	17	17	17
Nasalized vowels	12	12	12	12	12
Plosives	30	30	30	30	30
Retroflexives	11	11	11	11	11
Affricates	6	6	6	6	6
Fricatives	16	16	16	16	16
Nasals & laterals	8	8	8	8	8

Discussion:

Eventhough there are several articulation tests developed in Indian languages (including Hindi), only few of them have been standardized. Articulation testing techniques posed certain unique problems when dealing with the hearing impaired children. As far as possible, the factors of auditory discrimination and the vocabulary load should be kept apart while testing articulatory status in the hearing impaired children. The picture atriculation test is one of the ways of keeping apart the influence of auditory discrimination while eliciting responses. Knowing that the hearing impaired children would have delayed speech and language development, minimizing the vocabulary load in the test would facilitate elocution of more and more spontaneous responses. Besides these points in mind, the present articulastion test was developed and standardized on normal children. The analysis has shown that all the speech sounds are acquired by and large by the 3 - 31/2 years old children itself. The 'plateau' of responses established in terms of complete acquisition, by testing normal children till the ages of 6 years would now assist in comparing the articulatiory development by the hearing impaired children with that of the normals.

Summary And Conclusion

The present study was carried out to construct a tool for testing the articulation of the hearing impaired children with limited vocabulary. Since standardizing the test on normals would increase its applicability to normals as well as hearing impaired population, the test was standardized on a normal population.

The test was constructed to test 48 Hindi speech sounds, using sixty eight appropriate familiar pictures. Most of the sounds were tested in all the three word positions and some of them were not. A 1/0 scoring system was used. Total scores add up to an even 100.

It was found that with the criteria for acquisition of sounds as the 50th percentile point, all the speech sounds were acquired by the children in the age range of 3 to 31/2 years as reported by the other Indian studies conducted so far.

This test will now, specifically be used to evaluate the articulatory status of the hearing impaired children under the PL-480 funded project, "Selective Auditory Filter Amplification for the hearing impaired" undertaken at RUAS, ENT Department of A.I.I.M.S., New Delhi.

The test has been found to be useful tool for testing articulation in normals as well.

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