

Development of Hindi Early Speech Perception Test



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Abstract

Hearing is an extremely important sensory mode for child's ability to develop speech language ability. Child developmentally shows ability of speech reception, discrimination and finally comprehension sequentially. Children with hearing impairment shows speech perception ability defect depending on degree of hearing loss and its type. The rehabilitation therapist must understand effect of hearing impairment on speech perception ability. The rehabilitation therapist needs to check routinely development of speech perception ability to assess prognosis. In the clinical set up speech therapists are using set of test battery in the areas of speech, language, reading and cognitive ability. Recent data suggest that 260 million populations are using Hindi as first language. Therefore, to cover huge number of population great need felt to develop Hindi early speech perception test for clinical use. Close set Hindi picturable items were kept in three subsections. Each section was having 12 picture items. Each section was having separate scoring procedure. The field testing was included from 3-7 years age range of normal hearing children. Four groups were formed consisting 226 subjects in each groups. Independent 't' tail test was used to compare means score of speech perception across different age range. Inter tester, test- retest reliability and contain validity score were obtained for each age group. There was significant age effect was seen over speech perception ability. Higher age group showed significant higher score in the mean speech perception ability. There was no significant gender effect was seen over speech perception ability.

Keywords: Hindi speech perception; Monosyllable words; Bisyllable words; Vowel Perception; Normal hearing

Introduction

Hearing is an extremely important sensory mode for child's to develop speech language ability. The importance of hearing can be viewed in children with hearing impairment and their speech and language delay [1-3]. Child sequentially develops speech reception, discrimination and finally comprehension. The role of normal hearing becomes important in the reception and discrimination stages [4-8]. Children with hearing impairment shows impaired speech perception ability depending on degree of hearing loss and its type [5,9-12]. The rehabilitation therapist must understand effect of hearing impairment on speech, Language and communication ability [4,5,13-15]. The rehabilitation therapist needs to check routinely development of speech perception ability to assess effectiveness of treatment Programme. In the clinical set up speech therapist are using set of test battery in the areas of speech, language, reading and cognitive ability [4,13,16-24].

The construct validity of the test can be increased by combining results from several areas [20,25-30]. Currently, numbers of speech perception tests are available which measures hierarchy of skills in children [13,14,16,22-24,31-35]. There are three important highlights reported in the literature about speech perception utility in clinical set up. Speech perception

skill is essential ability- to measures in regular audiological assessment. The information of speech perception is required to planning audiological rehabilitation that includes placement and monitoring of sensory devices and planning therapy strategies for young children with hearing loss [5,19,36-40]. The speech perception assessment tool for pediatric population differs substantially from older children, adults and therefore contain validity plays important role [23,24,28,41,42]. The pediatric assessment tool should have appropriate consideration for the selection of target stimulus. There are two general approach have been reported in the literature [43,44]. The first approach by Geer & Moog 1989 assumed that children with hearing impairment acquire speech perception skills in a hierarchical manner [45]. Second approach doesn't assume auditory development, rather believes of administration of battery of tests evaluating a range of speech perception abilities and obtained each test score [43].

Special Considerations for assessing young children

Speech of particular language contains vowels and consonants which are important for daily communication, test should utilizing speech sound are essential for speech perception assessment [28,46-48]. The particular sound of speech has specific acoustic property, that can utilized to measures the extent

of speech perception ability got impaired due to hearing loss [7,13,15,49-52]. This information not only useful to diagnosis of type and severity of the hearing loss but also facilitate to monitor aural rehabilitation [16,28,53-56]. There are internal and external parameters which need to give consideration while assessing young children with hearing impairment [14,43,50,57-59]. The internal parameters include child's receptive vocabulary, language competency, chronological age and cognitive ability [3,41,60-66]. Whereas, external parameters contain design of response task, reinforcement, amount of memory load in the response task. Before selecting speech perception test clinician needs to verify the above mentioned parameters [15,43,67-70]. Speech perception ability cannot be directly measured; it can only be inferred by child's response to sound. If child doesn't have cognitive ability, unable to follow response task, or got bored with performance activity then actual speech perception ability difficult to measure [54,71-73]. There are several types of factors such as live voice presentation, taped presentation, open set test, closed set test, unrestricted task, and restricted task which one should understand.

Haskin 1949 developed phonetically balanced monosyllabic open set test, which has 50 monosyllabic words, which child need to hear and repeat [74]. Sanderson and Rintelmann (1976) indicated that 3½ years young children with normal hearing scored significant lower score compared to other group [75]. Therefore, they recommended that clinician must use with caution by assuring good receptive and expressive vocabulary. Bench et al 1979 used open sentence test, they emphasized that use of sentence gives more valid measurement of speech perception ability by indicating how young child cogs during daily communication with others [76]. Word Intelligibility by Picture Identification test was developed by Ross & Larman, which has 25 picture plates and each plate contains six pictures [77]. The researchers used acoustically similar words as test foils based on distinctive features. The reliability coefficients ranged from 0.87 to 0.94 with standard error of measurement ranged from 4.7 to 7.7 were observed by researchers. Hodgson (1973) compared WIPI test in open set form and close set form. Results indicated that only 10% improved score seen in close set form presentation. Jones and Studebaker 1974 reported that close set appears more productive for children with severe hearing losses whose receptive vocabulary level was very low [78]. The Northwestern University – Children's Perception of Speech (NU-CHIPS) was developed by Elliott & Katz [49]. They identified 67 monosyllabic word pictures, which were within the receptive level of 3 year old children. The test reported high test-retest score ranged from 0.83 to 0.92. Researcher had given regression score with pure tone sensitivity, chronological age and vocabulary level to predict speech perception ability. Siegenthaler & Hespel 1966 were assessed discrimination by identification of pictures test. Researcher used distinctive features separated 48 monosyllabic picture words [79]. This test showed good reliability score. Finitzo-Hieber et.al used

environmental sound to measure speech perception capability of young children to overcome vocabulary and linguistic capability. Jerger et al 1982 used 30 monosyllabic words to develop Pediatric Speech Intelligibility (PSI) test [50]. The score of this test did not differ with chronological age, child's vocabulary level and receptive language ability.

Geer & Moog assumed that children with hearing impairment acquire speech perception skills in a hierarchical manner [45]. They developed test tool having three sub sections. The early speech perception test is used to assess the closed set perception of single words through auditory alone. This test can be used for children with severe to profound hearing loss with limited vocabulary and language skills. The first part of the test uses monosyllabic – trochee - spondee test items for assessing basic level. Pattern perception, spondee identification and monosyllable identification subsections are arranged in hierarchical form. Each section has 12 stimulus items. The administration of subsection is depending upon criteria score. The child should score at least 70-75% score to attend further hierarchical level. The item selection for the test should fulfill three criteria. The test words should be familiar to most of hearing impaired children by the age of six year, word should be picturable form that can be used for the children who cannot read, and last test should be quick i.e. administration time less than 30 minutes. Geer and Moog 1994 measured reliability and validity data for the early speech perception test [80]. The standard version early speech perception test, 27 children between 8 -15 years was tested and re-tests over a 30 days period. Test-retest reliability was observed ranging from 0.78 from pattern perception to 0.94 from category placement. For the low verbal version early speech perception test, reliability data were obtained ranging from 24 children aged 4-6 years. The reliability was observed ranging from 0.75 from pattern perception to 0.89 from category placement.

Speech perception test helps therapist to assess clinical management of the children with hearing loss and for evaluating the efficacy of their amplification devices. The assessment of children's spoken word perception is clinically relevant because, it helps therapist to monitor progress following implantation or hearing aids fitment. Further, this assessment not only helps for setting or mapping each individual child's cochlear implant signal processor but also helps to determining appropriate auditory training goal. The assessing speech perception skills in the children with profound hearing loss, who use a given hearing aids allows therapist to compare the effectiveness of amplification devices, this impact on issues of cochlear implant candidacy. Indian states are using Hindi language most commonly in India. States like Delhi, Uttar Pradesh, Uttarakhand, Chhattisgarh, Himachal Pradesh, Chandigarh, Bihar, Jharkhand, Madhya Pradesh, Haryana, and Rajasthan most of people uses Hindi Language as their mother tongue (Kuiper 2010) [81]. NSSO reported that 422,048,642 i.e. 41% of total population

of India using Hindi as first language [82]. Recent data suggest that 260 million populations in Indian are using Hindi as first language (Ethnologue 2018) [83]. The Rights of Persons with Disabilities Act, (2016) indicates use of speech perception score helps to decide severity of hearing impairment [84]. Therefore, catered huge numbers of population, great need felt to develop Hindi early speech perception test. Hindi language has 11 vowels and 33 consonants, therefore, we only tried to cover all most frequent occurring consonant in test items.

Methodology

Subjects

Subjects were Hindi speaking children who speak only Hindi as their mother tongue, recruited from several kindergartens around Mumbai and different part of Hindi belt. All subjects

had normal hearing, speech, vision and physical development as reported by their parents and teachers. Detail audiological testing was conducted to for assessing normal hearing skills [28]. The number of participants and subject age groups were different for each phase of the study.

First Phase: Familiarity Checks and Item Selection

In first phase of the study mainly targeted to collect vocabulary sample. The 350 picturable words list was formed from the KG and comic books of young children.

Second Phase: Pilot Study

A pilot study was conducted in the second phase which involved 20 children between three to six years of age. There were further modification was incorporated in the monosyllabic perception section (Table 1).

Table 1: Showing the “t” test result and statistical significance value to compare different age groups.

	t-test for Equality of Means							
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
3-4 Years to 4-5 Years	Subtest 1	-15.56	450	.000	-3.66372	.23537	-4.12628	-3.20115
	Subtest2	-11.04	450	.000	-3.61062	.32677	-4.25280	-2.96844
	Subtest 3	-14.43	450	.000	-4.04867	.28048	-4.59989	-3.49746
4-5 Years to 5-6 Years	subtest1	18.485	450	.000	2.84071	.15367	2.53870	3.14272
	subtest2	29.903	450	.000	5.48673	.18349	5.12613	5.84732
	subtest3	20.181	450	.000	4.83628	.23964	4.36532	5.30724
5-6 Years to 6-7 Years	Subtest 1	.313	450	.755	.01066	.03413	-.05640	.07773
	Subtest 2	.388	450	.698	.01656	.04265	-.06726	.10037
	Subtest 3	16.426	450	.000	2.71465	.16526	2.38985	3.03946

Final phase

The final phase has three sections; each section has different numbers of subjects. Field testing was done by subjecting 226 normal hearing subjects in each age group (i.e. 2years to 2year 11month, 3years to 3 years 11 months, 4 years to 4 years 11 months, 5 years to 5 years -6years). All subjects were using Hindi as their mother tongue and studding in Hindi medium school. Hindi mother tongue subjects were enrolled in the study, 56 of the subjects involved in the final phase participated in the test-retest reliability study and another 56 subjects participated in the inter-rater reliability study.

Test retest reliability

56 subjects were retested by researcher after 30 days duration. Both the test scores were subjected to correlation analysis.

Inter tester reliability

56 subjects were retested by other than researcher after the 30 days duration. Both the test scores were subjected to correlation analysis.

Considerations in the Development of the Tests

The development of speech perception test for young children is challenging task due to their limited vocabulary and language skills [19,20,41,49,58,60,80, 85-86]. Similarly, young children are not able to read or write because limited academic skills. It is very important to make sure that test items are selected from their vocabulary list only to correct interpretation of speech perception ability [19-21,39,41,54,58,60,68,77,87,85]. Speech perception ability of young children only can be inferred by child response. There are intrinsic and extrinsic factors need to consider before constriction of speech perception test by researcher [4,20,21,39,41,49,58,68,77,85-87]. Similarly, factors like therapist’s aptitude to work with the pediatric hearing-impaired population, the general feels of the facility, and caregiver attitudes and behaviors towards speech assessment can also influence the test results. In the present study, it was insured that all selected test items were picturable form and most familiar to young children. The close set, picture pointing response task was used for testing speech perception ability. It was insured that, limitation of vocabulary and language ability

of young children should not influence test results. The selected consonant and vowels were based on frequency of occurrence of consonant in Hindi language.

Test Procedure

Item Selection

The first phase of the study, 350 words list was formed. All selected items were picturable taken from the KG, Comic, senior Hindi books. 42 parents of young children were given selected item list to check familiarity. The three point scale was used to rate the familiarity level (i.e. familiar, fairly familiar and not familiar). Similarly, to avoid parental biases all the 42 young children subjected for receptive vocabulary test individual basis. 4 point forced choice test method was used, one target picture with three distracters by researcher. The parental rating and the receptive vocabulary test obtained score were cross checked for making final word list. After finalization of word list artist made black and white stimulus plates were formed.

Pilot Study

Final versions of test items were administered on control 20 subjects. The following age groups were studied 2-3 years, 3-4 years, 4-5 years, 5-6 years, and 6-7 years by five subjects in each age group. The necessary changes were incorporated based on pilot finding.

Pilot Testing Protocol

The test was administered in a quiet room with minimum or no visual and audible distractions. It was insured that the adequate lighting conditions in the test room to facilitate good visibility of picture plates. Child and researcher were seated next to each other with the tester's chair slightly behind that of child's chair to avoid any visual cues.

Tests Composition

Speech perception test was having three components; first section contains 12 items for assessing word length perception in which mono-syllable, bi-syllable and tri-syllable words. The second section contains 12 bi-syllable words items, and final section contains 12 mono-syllable words items.

First Section

Syllable Length Perception: In Hindi language pattern words are not seen which generally observed in English language. Therefore, while adapting the test we used syllable length perception to measure durational aspect. The word is counted correct for syllable length perception, if a word with the same number of syllable is selected. For example, if the word given was /gubaaraa/ and the child pointed to the picture of the /Almari/, the response would be counted as correct for perception of syllable length. The word need not be correctly identified to be scored as correct since identification of number of syllable is all that is being evaluated in this section.

Scoring: Each word was presented twice, so a perfect score was 24 words correctly categorized. Responses were marked on part of the response sheet that has been printed with bold-outlined boxes to illustrate words of similar category. This makes it easy to score, as words contained within the bold-outlined boxes were considered correct for syllable length. A child who scores at least 17 out of 24 meets the criteria to qualify for administration of further section i.e. bi-syllable test identification subtest.

Second Section

Bi Syllable Identification Test: The Bi-syllable identification subtest evaluates word recognition ability of profoundly hearing-impaired children who demonstrate the ability to perceive durational patterns in words (i.e., they scored at least 17 correct out of 24 on the pattern perception subtest). The 12 bi-syllable with widely differing vowels and consonants that comprise. The words were presented like /medhak/, /hiraan/ etc. in Hindi version of test. The words were presented auditory-only in random sequence until each word has been presented twice. The child was expected to point to the picture representing the spoken word.

Scoring: The score sheets for the word identification subtests having A1, A2, and AV in three spaces for responses. For each word one for the audiovisual response in the column headed by AV, and two for the listening or auditory-only condition headed by A-1 and A-2. A plus (+) can be given if the word was correctly identified, a minus (-) if the word was incorrectly identified. A perfect score on this test is 24 words correctly identified. A child who correctly identifies 8 out of 24 words demonstrates sufficient word recognition skill for conducting further section i.e. monosyllable perception test.

Third Section

Monosyllable Identification Test: The closed set of Monosyllabic words was designed to provide a more challenging test of word recognition ability. Twelve quite similar words are included in this set identification of the words requires finer vowel discriminations than was required in the bi-syllable set. The administration procedures were the same as those just described for the bi-syllable identification subtest. /t/, /k/ phonemes were used for Hindi language which having different vowel in combination.

Scoring: Responses to the monosyllable identification subtest were recorded and scored same as the disyllabic identification subtest.

Field-Testing: All test items were field-tested 224 subjects on each age group 2-3 years, 3-4 years, 4-5 years, 5-6 years, and 6-7 years. The similar protocol of pilot study was used while field testing. The Mean, standard deviation and other scores were recorded for further analysis.

Content Validity: Content validity evidence of the for all test items were collected from experience group of panelists that consisted of five audiologist & five speech therapist, five postgraduate audiology & speech sciences students. All members of the panel were native Hindi speakers and received Hindi education in primary and secondary schools. The members had experiences in administering speech tests and had basic knowledge on language development. Content validity was performed prior to pilot study.

Results

Hindi early speech perception test score of each age group were subjected for statistical analysis using SPSS16 version.

Age Effect

To check mean difference of Hindi early speech perception test score between different age groups independent “t” tail was used. The mean score of early speech perception test results of 3-4 years age group was compared with the 4-5 years group. Similarly, 4-5 years group compared with 5-6 years and 5-6 years compared with 6-7 years. The Table 2 indicates that means Hindi early speech perception test scores have statistical significant difference across all age groups. The 5-6 years and 6-7 years group’s subtest 1 and subtest 2 showed statistical no significant differences (i.e. subtest 1 sig value 0.755 and subtest 2 sig value 0.698).

Table 2: Showing descriptive analysis of male and female subject’s Hindi early speech perception test score across different age groups.

		Group	N	Mean	Std. Dev	Std. Error Mean
3-4 years	Subtest 1	M	149	17.59	2.72	.22
		F	77	16.85	2.60	.29
	Subtest 2	M	149	14.59	3.97	.32
		F	77	14.96	4.31	.49
	Subtest 3	M	149	11.18	2.86	.23
		F	77	11.83	3.58	.40
4-5 years	Subtest 1	M	131	21.38	2.11	.18
		F	95	20.49	2.40	.24
	Subtest 2	M	131	18.24	2.82	.24
		F	95	18.36	2.62	.26
	Subtest 3	M	131	15.39	2.80	.24
		F	95	15.52	2.85	.29
5-6 Years	Subtest 1	M	142	23.85	.35	.029
		F	84	23.84	.36	.039
	Subtest 2	M	142	23.81	.42	.035
		F	84	23.80	.42	.046
	Subtest 3	M	142	20.27	2.21	.185
		F	84	20.30	2.30	.251
6-7 Years	Subtest 1	M	128	23.91	.28	.024
		F	98	23.87	.41	.042
	Subtest 2	M	128	23.82	.43	.038
		F	98	23.81	.50	.050
	Subtest 3	M	128	22.96	1.10	.097
		F	98	23.03	.94	.095

Gender Effect

The gender effect was analyzed with independent ‘t’ tail test. The mean of Hindi early Speech Perception scores were compared between female and male subjects. (Table 3) Showing descriptive analysis of male and female subject’s Hindi early speech perception test score across different age groups. The (Table 4) indicates that there was no significant difference was seen in the mean score of female and male subjects. The gender effect over the speech perception ability found to be no significant.

Test-Reliability

Hindi early speech perception test was administered over the 56 subjected by the two speech therapists in the same day and the mean score was compared.

Reliability of Test Score Between Two Tester

The Table 5 indicating that Pearson Correlation test score i.e. 0.89 when same test was administered by two different testers. Result of the test indicated that 0.89 score, which shows that Hindi early speech perception test score highly correlated and reliable between two testers.

Table 3: showing 't' tail test analysis of male and female subject's Hindi early speech perception test score across different age groups.

	t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
3-4 years Age Group	Subtest 1	1.96	224	.051	.37712	-.00299	1.48333
	Subtest 2	.645	224	.520	.57433	-1.50221	.76134
	Subtest 3	-1.80	224	.140	.43914	-1.51533	.21541
4-5 Years Age Group	Subtest 1	2.93	224	.064	.30249	.29085	1.48304
	Subtest 2	.336	224	.737	.36930	-.85190	.60361
	Subtest 3	.340	224	.734	.38041	-.87902	.62028
5-6 Years Age Group	Subtest 1	.139	224	.890	.04943	-.09053	.10428
	Subtest 2	.127	224	.899	.05831	-.10752	.12228
	Subtest 3	-.113	224	.910	.30974	-.64526	.57550
6-7 Years Age Group	Subtest 1	2.96	224	.123	.04670	.04652	.23058
	Subtest 2	.18	224	.851	.06272	-.11180	.13540
	Subtest 3	-.50	224	.618	.13943	-.34444	.20509

Table 4: Showing Pearson correlation test value of inter-tester mean value of Hindi early speech perception

Speech perception score Between two tester	Inter-tester reliability checked								
		3-4 years		4-5years		5-6years		6-7years	
		score	Score	score	Score	score	Score	score	Score
Pearson Correlation	1	.834**	1	.884**	1	.901**	1	.953**	
Sig. (2-tailed)		.000		.000		.000		.000	
Pearson Correlation	.834**	1	.884**	1	.901**	1	.953**	1	
Sig. (2-tailed)	.000		.000		.000		.000		

Table 5: Showing Pearson correlation test value of test - retest mean value of Hindi early speech perception test.

Speech perception score of test - retest reliability	test -retest reliability checked								
		3-4 years		4-5years		5-6years		6-7years	
		score	Score	score	Score	score	Score	score	Score
Pearson Correlation	1	.784**	1	.814**	1	.913**	1	.934**	
Sig. (2-tailed)		.000		.000		.000		.000	
Pearson Correlation	.784**	1	.814**	1	.913**	1	.934**	1	
Sig. (2-tailed)	.000		.000		.000		.000		

Table 6: Showing normative value of Hindi early speech perception test score across different age groups.

	Test	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
3y-3y.11months	Sub-test 1	11.00	13.00	24	17.34	2.7	.52	-.27
	Sub- test 2	16.00	8.00	24	14.7	4.08	.20	-.82
	Sub- test 3	21.00	3.00	24	11.4	3.13	.92	4.23
4y-4y.11months	Sub- test 1	10.00	14.00	24	21.00	2.28	-.53	-.49
	Sub- test 2	11.00	13.00	24	18.29	2.73	.25	-.90
	Sub- test 3	10.00	10.00	24	15.45	2.817	-.13	-.95
5y-5.11months	Sub- test 1	1.00	23.00	24	23.8	0.35	-1.96	1.89
	Sub- test 2	2.00	22.00	24	23.81	0.42	-2.14	3.90
	Sub- test 3	9.00	15.00	24	20.28	2.24	-.47	-.26

6y-6.11months	Sub- test 1	1.00	23.00	24	23.85	0.35	-2.01	2.09
	Sub- test 2	3.00	21.00	24	23.82	0.46	-2.95	9.63
	Sub- test 3	5.00	18.00	24	22.99	1.03	-1.18	2.13

Reliability of Test Score Between Test-Retest

Hindi early speech perception test was conducted over the 56 subjects after 30 days by the researcher and the means score was compared with statistical test. The Table 6 indicating that Pearson Correlation test score i.e. 0.864 when same test was administered after 30 days. Result of the test indicated that 0.86 score, which shows that Hindi early speech perception test score highly correlated and reliable when same test administered after 30 days.

Content Validity

All of the members of the panel (100%) rated the test item. Some panel members suggested that certain items were difficult for the three-year-olds. The test items were modified based on the panel’s comments.

Newly Developed Normative Data of Hindi Early Speech Perception Test

Discussion

The present test was arranged in hierarchical manner to increase fine speech perception ability. The first section was having 12 items for measuring syllabic length perception, as Indian language doesn’t contain trochee words. Therefore, we tried to measure syllabic length perception to evaluate durational aspect of syllable. Similarly, we used simple bisyllable word perception in the second section. In the last section, it was very difficult to find picturable monosyllabic words with constant phoneme - acoustic with varying in vowel. Therefore, we used /p/ and /b/ two phonemes to measure vowel perception ability. In the last section most of the item words were not fully master by young children, therefore showed lower score even in normal hearing subjects.

Several items modifications were done after the pilot study result. The present Hindi Early Speech Perception test has developed normative value for different age groups (i.e. 3-7 years). The 6-7 years age group showed maximum scored reached in most of the areas. The test reliability was checked by repeated administration of test after 30 days and high correlation value was obtained. It indicates that the test results are reliable and repeatable. Similarly, inter tester reliability was measured by administering same test by two speech therapist. The mean score again showed high correlation value indicating reliability of the test. Content validity was tried to increase by taking rate on three point scale from the parents. Similarly, we limited parental biases by measuring individual child’s receptive vocabulary. The analysis results revealed that all subjects performed well in the all test items. We tried to kept items from the vocabularies that

were mastered by children as young as three years old. Hence, the present test is suitable for as young as three year-old.

India has multi lingual culture and follows three languages educational policy. Young child need to learn first language as the mother tongue mainly regional language. India has been divided different state on the basis of regional language used. The three language policy includes regional language, English as second language and Hindi as national language. The literature reported that Indian children face multi-lingual situation, which make us difficult to measure speech perception ability due to their limited receptive language ability [88,89]. All items used in present study were organized on the basis of acoustical property of words. Thus, potential users of this test should use cautiously, when interpreting the test result, as present study result showed that even normal hearing children had different scores in each age group and section.

All the age groups were compared with same age group with female and male gender difference. There was no significant difference was observed in all age groups. It indicates that female and male gender difference doesn’t effect speech perception ability. In the same age group female and male perceive speech similar level. Previous literature reported that speech perception ability in developing children did have gender effect [33,49]. Present results various with literature indicate that speech and language development found to be superior among females. The speech perception ability among female and male could not reflect difference may be due to smaller sample size. Larger test group required to generalize the comment on the speech perception differences. Present result shows that all three sub-sections have statistical significant difference with age. The higher age shows better ability to discriminate and perception speech. The age group 5-6 and 6-7 years first two subtest did not showed significant difference. The syllable length perception and bisyllabic perception showed ceiling effect as reached maximum score by the age of 5 years. The finding of present study was consistent with previous literatures which reported in India [88,89].

The criterion of test-retest and inter-rater reliability were met, if the correlation coefficient between tests were 0.90 and above [59]. However, some social researcher might argue that the 90% criterion for reliability was too high given the complexity of speech and language functioning and disorders. Additionally, the variability in daily performance that arises from different speech and language disorders suggests that 0.90 criterion is fairly high. Thus, Jacob Cohen 1988 suggested that correlation coefficient as low as 0.80 was considered as the threshold of acceptability for reliability. Thus, the present study set 0.76 and

0.8 correlation coefficients as the standard for strong reliability. In any study involving test-retest and inter rater reliability, an appropriate length of test-retest interval is important. A short interval between the tests will lead to learning practice effect, yet, a long interval between the tests might be invalids a result of maturation effect [65,55]. Garson 2008 suggested that a typical interval of several weeks (i.e. 3-4 weeks) [65]. Hence, in the present study, the test-retest interval selected was one month. The reliability study showed that the test-retest and inter-rater correlation coefficients the set criterion for correlation coefficient (0.76).

Conclusion

The implementation of newborn hearing screenings and early identification of hearing loss across the country, there is increased interest in measures to assess the speech perception abilities of children. Hindi speech perception test was developed in this study to quantify the ability of Hindi speech sound perception in the age range between three to seven-years old. The present test had three sub-sections for measuring hierarchical speech perception ability. The study reported normative data for each age group of normal hearing children. The mean score of each age group are varying due to complicity of the test items. The phoneme acoustic property of words was kept in final section, which showed variation in score as children had not fully mastered few items. Hence, tester should check the normative data before interpretation of speech perception ability. The gender effect was not seen in the female and male group. The test was also found to be reliable and valid. Hence, it is recommended that this test can be used in clinical setting for assessment, management and monitoring of intervention strategies for young children.

Future Direction

The individual differences seen in the performance of speech perception ability due to cognitive and attention contribute. While, measuring speech perception ability speech therapist should aim to check the effect of auditory memory, visual memory, selective attention and integration of auditory and visual information [25,27,48,71,72]. Future study should try to explore the various reasons for variation in speech perception development with cochlear implant and hearing aids users. Currently clinical used test are aimed to asses primary level of feature and phoneme discrimination and identification or identification of single word perception in constrained conditions [4,19,35]. We need to assess speech perception ability in open set word recognition form to predict real item comprehension of larger units of spoken language like in sentence level or longer paragraph or connected speech. Speech perception is not isolated task but an integral part of the daily communication. Children with hearing impairment receives degraded signals though their amplification devices to acquire speech perception ability. Speech perception alone does not adequately document the nature of communication difficulty, nor does it provide sufficient

information to implement aural rehabilitation activities. We must examine new ways to relate speech perception abilities to speech perception. We should develop test to measure not only in isolated single word production but also to generalize it in new listening skills into every day situation. This auditory input from their hearing aids or cochlear implant helps to develop spoken language skills.

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