

LANGUAGE IN INDIA

Strength for Today and Bright Hope for Tomorrow

Volume 12 : 7 July 2012

ISSN 1930-2940

Managing Editor: M. S. Thirumalai, Ph.D.

Editors: B. Mallikarjun, Ph.D.

Sam Mohanlal, Ph.D.

B. A. Sharada, Ph.D.

A. R. Fatihi, Ph.D.

Lakhan Gusain, Ph.D.

Jennifer Marie Bayer, Ph.D.

S. M. Ravichandran, Ph.D.

G. Baskaran, Ph.D.

L. Ramamoorthy, Ph.D.

Assistant Managing Editor: Swarna Thirumalai, M.A.

Development of Speech Material for Punjabi Speaking Children

Sreevidya Sherla, M.Sc. (ASLP) and Garima Gupta, M.Sc. (ASLP)

=====

Introduction

To be able to hear and comprehend speech it requires good auditory integrity. In children, hearing is most significant because the ability to develop and use oral language is closely related to the ability to process speech through ears. Research carried out by several investigators has shown that children perform better with speech stimuli when compared to pure tones (Bunch, 1934; Hardy and Bordley, 1951; Clawson and Matkin, 1970). Hence, there is the need to create linguistically appropriate speech material to be used to evaluate the speech recognition and perception abilities of children speaking Punjabi.

Justification for Development of Speech Test for Children

- Among the clinical population, it is found that pediatric population is difficult to assess.
- Hardy and Bordley (1951) pointed out that, children pay closer attention to verbal stimuli than to nonverbal stimuli. Bunch (1934), reported that speech items have higher face validity than non-speech items.

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- Clawson (1966), observed that mentally retarded children show an arousal to speech stimuli at significantly lower level than they do for pure tones.
- Olsen and Matkin (1979) found that children find speech tests easier and less abstract than pure tone tests and are willing to participate.
- The above reason proves the use of speech as stimuli for assessing young children.

Need for the Study

1. To ascertain the level at which subjects repeat correctly 50% of the test items.
2. The effect of presentation level on speech identification scores.
3. To check the inter list variability.
4. To plot articulation curves.

Review of Literature

The ability to communicate meaningfully and to understand speech has been considered as an important factor in differentiating humans from other forms of life (Sanders, 1982). Almost from birth, an infant begins the process of learning language which forms the basis for the other aspects of development. An infant with adequate hearing will learn language skills primarily through the auditory channel communication of thoughts and ideas are essential for natural learning of language. Even though communication can occur through pointing, writing and gestures, speech is the most often used way to communicate with the immediate environment as we live in oral-aural society. Thus, it forms the prerequisite for effective participation in our complex auditory world (Martin, 1987).

The onset of auditory impairment in an individual impedes the ability to communicate meaningfully and to understand speech. Therefore, it is the foremost duty of an audiologist to evaluate and rehabilitate these aurally handicapped individuals. Hence, the most measurable aspect of human auditory function should be the ability to understand speech. Speech is used in different ways during an informal test of hearing because it is readily available acoustic stimulus. Speech utterances are still used for the purpose of hearing screening. Notations often are made relative to the distances at which either whispered and/or voiced speech are heard.

The classical basic audiological battery for each ear includes four essential measures of

- (1) Pure tone air conduction thresholds
- (2) Pure tone bone conduction thresholds

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

(3) Spondee thresholds

(4) An estimation of the child's discrimination ability.

The hearing impairment inferred from a pure-tone audiogram cannot depict, beyond the gross generalizations, the degree of disability in speech communication caused by hearing loss.

- Speech audiometry is an important element in the audiological test battery.
- Every day listening situations does not involve the ability to detect sound.
- Pure tone audiometric results provide information on detection of the sound of certain frequency and intensity but not on the receptive auditory communication of the individuals which is given by speech audiometry.
- The need for speech audiometry arises mainly because; speech is by far the most important class of sound that one hears.

Uses of Speech Tests

Speech stimuli have become an indispensable tool in clinical evaluation.

1. They have been used to confirm pure tone threshold
2. A discrepancy in the threshold of hearing and the threshold of intelligibility indicates functional hearing loss (Ventry, 1976).
3. Speech discrimination abilities are found to be disturbed in centrally placed auditory pathologies which are not manifested in peripheral hearing loss, but can be found using a speech test (Jerger and Jerger, 1974 and Jerger and Jerger, 1971).
4. Higher auditory function can be tested using filtered speech test (Bocca & Calero, 1963, Willeford, 1969 and Hodgson, 1972) and time compressed speech test (Luterman, Welsh and Melrose, 1966; Beasley, Schwimmer and Rintelmann, 1972).
5. Speech materials are also used in hearing aid selection, prescription and rehabilitation (Markides, 1977).

Thus, speech stimuli act as versatile stimuli and speech audiometry can be considered as a major assessment tool in diagnostic audiology.

Approach for Determining the Spondee Thresholds

1. Familiarization of the word list

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

2. Instructions to the listener
3. Orientation-attending phase
4. Threshold probe phase
5. Reinforcement and closure phase

Purpose for Assessment

1. Hearing level for speech –
2. A base intensity level in calculating word discrimination scores –
3. Consistency check with pure tone average -

The review of literature brings to light that there are several variables that affect the outcome of the speech material. These variables would differ depending on whether the test is being constructed for children or adults. The effects of these variables should be kept in mind when constructing a speech material for children. No previous literature or any studies for assessing speech recognition and perception abilities of children speaking Punjabi exists. Hence there is a need for such a study in this language. Therefore, the present study aimed to develop speech material for Punjabi speaking children.

Methodology

The present study is aimed to develop linguistically appropriate speech material used to evaluate speech recognition and perception abilities of children speaking Punjabi.

The present study was carried out in following stages:

- STAGE 1 – Construction of test material
- STAGE 2 - Collection of normative data

STAGE 1- Construction of Test Material

- Bisyllabic and monosyllabic words were selected from the text books meant for the age group of 5 to 9 years and also words listed by parents, which were most familiar in their child's vocabulary. The word lists consisted of 60 bisyllabic and 150 monosyllabic words. Familiarity for words was evaluated on thirty subjects of the target age group. Each subject was tested individually. A rating was constructed ranging from "most familiar" to "least familiar" on 3 point rating scale. The items having rating of "most familiar" were selected for the study.

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- Fifty three bisyllabic and 100 monosyllabic words were found to be familiar; out of which three words were utilized as practice items and fifty words as test items. Thus the lists, which aims at assessing SRT consists of 50 bisyllabic words from a list of most familiar bisyllabic words.
- The material, which aims at assessing speech discrimination ability, consists of 100 monosyllabic words, chosen from a list of most familiar words.

The following criteria were met for the selection of these Punjabi words for this study:

(1) Sameness of word class: In the lists, all words are of the nominal (excluding proper nouns) or adjectival class, as it was felt that these fell more naturally into the frame of words in lists than did verbal forms, conjunctions or prepositions. This is also the procedure that was followed by Messouak (1956) (as cited in Alusi et al. 1974), it was found that, with these word classes, it was easier to retain similarity between literary and colloquial Punjabi.

(2) Familiarity: Words were chosen that would be familiar to most of the target population. The main sources were reading exercise books for primary school children, magazines and parents list of most familiar words. Technical vocabulary and obscure poetical and archaic vocabulary was avoided.

(3) Similarity of literary and colloquial forms: Wherever possible, words were chosen which would have similar forms in the more widely known colloquial dialects.

(4) Exclusion of unpleasant words: In view of the work of Broadbent and Gregory (1967) and others, it was considered advisable to exclude words which the hearer might be disinclined or embarrassed to repeat.

Once the lists of most familiar items were available, two list for polysyllabic words and four list for monosyllabic words were constructed each having 25 items.

STAGE 2- Collection of Normative Data

A total of 45 children, who were native speakers of Punjabi, participated in this study. The subjects age range 5-9years. (Mean age-7 years).

Subject selection criteria

- All of the participants in this study exhibited pure-tone air-conduction thresholds ≤ 15 dB HL at 500, 1000, 2000 Hz, using 10 down and 5 up method of threshold measurement (ANSI, 2004 and ASHA, 2005).

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- All participants had static acoustic admittance between 0.3 and 1.4 mmhos with peak pressure between -100 and +50 daPa (ASHA, 1990; Roup, Wiley, Safady, & Stoppenbach, 1998) and ear canal volume of 0.5 to 1cc. In addition, each participant passed a screening exam, which includes presence of an ipsilateral acoustic reflex. All subjects had normal speech and language development and no medical history reported. They also had no history of poor academic performance, and had grade appropriate reading and writing skills, as informed by the school teachers.

Instrumentation

- A two channel diagnostic GSI-61, which was calibrated in accordance with the ANSI standards was used. A computer with CD ROM and media player was used to feed the speech material. The recorded words were played by computer and were fed to the CD/TAPE input of the audiometer which in turn fed to earphones (TDH-39) coupled with MX-41. AR ear cushion. Talk back system was used to record the responses.

Test environment

- Study was conducted in sound treated two room situation. One of the rooms was used as control room and the other as testing room. The calibration of frequency, intensity for pure tones and speech was done to confirm ANSI, 1989 specifications. Calibration of frequency and intensity was also done for BC vibrator. Stable power supply to the instrument was ensured by a servo controlled voltage stabilizer. The ambient noise level measured was found to be within permissible limits as recommended by ANSI 1991.

Instruction

- The subjects were given instruction in Punjabi in the following way-“Now, you will hear some words through the headphones. Listen carefully to each word and repeat the word, if you don’t understand the word just repeat whatever you could hear.

Test procedure

- Testing was done in a sound treated room. The stimuli were presented through the calibrated GSI double channel audiometer and TDH 39 headphones. The stimulus was then routed via headphones from the audiometer to the subject. The better ear was considered as the test ear for each subject. Each bisyllabic word list was presented at various intensity levels of 3 dB intervals such as 3 dBSL, 6 dBSL, 9 dBSL, 12 dBSL and 15 dBSL (establishment of 0 dB SRT) and monosyllabic word list were presented at 20 dBSL, 30 dBSL and 40 dBSL (w.r.t SRT). An input to the audiometer was calibrated to 0 VU. Testing was conducted by giving small breaks between the test procedures or when required, it was conducted on next day to avoid fatigue and discomfort to the subjects.

Reinforcement

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- Tangible reinforcement was given to the subjects so as to keep them attentive during the test procedures.

Establishing test retest reliability

- To establish test retest reliability, test was repeated on same population in the same settings after one week duration.

Statistical analysis

- The raw scores were analyzed using the SPSS version 18 software. SPSS software was used for descriptive statistics, Independent t test, Using Analysis of Variance (Gravatter, 1987).

Establishment of Speech Recognition Levels

- The most familiar words, obtained, were divided into two lists randomly.
- Each bisyllabic list thus obtained was again randomized four times forming five different lists. This was done to eliminate practice effect. Thus the 2 were randomized into ten lists.
- The testing was initiated at 3 dB above the pure-tone average (PTA; i.e., the Fletcher index, 1950, corresponding to the average of the two smallest values of hearing loss at 0.5, 1, and 2 kHz. the next presentation level was increased in 3 dB steps.

Thus, five different intensity levels at an interval of 3 dB such as 3 dBSL, 6 dBSL, 9 dBSL, 12 dBSL and 15 dBSL were presented (ref to Fletcher index). Two out of the ten lists was presented at one intensity level. The subjects were instructed to respond to the stimuli. The responses were then converted into percentage. The level at which subjects repeats correctly 50% of the test items, was taken as an average SRT lev

Establishment of Speech Identification Scores

- The 100 monosyllabic words which were most familiar as collected were divided into four lists consisting of 25 words each. Word lists were then administered at three different intensity levels such as 20 dB, 30 dB and 40 dB above subject's established SRT levels. At each sensation level fifteen subjects were tested. Each subject was tested at one sensation level only. The subjects were instructed to respond to the stimuli. Scores were then converted into percentage. The better ear was considered as the test ear for each subject.

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- Reinforcement

Tangible reinforcement was given to the subjects so as to keep them attentive during the test procedures.

Recording of Responses

- The subjects repeated the word and the examiner recorded the correct responses. The responses were recorded on a score sheet. Correct responses were given a score of one and incorrect responses were given a score of zero. The percentage of correct responses was calculated for each subject. Total score percentage = Total no of correct response/Total no of words presented*100.

Recording

- As per ANSI guidelines (ANSI S3.1, 1991), stimuli were recorded in a sound treated room.
- Recording was made by an adult female talker whose mother tongue was Punjabi, recording using CSL software and M-audio recording system.
- Distance between microphone and speaker was maintained between 6-9 inches from mouth (Penrod, 1994).
- Speaker was asked to say the word with flat tone and keep loudness constant across words. Signal was digitized at a sampling rate of 44.1 kHz using 16 bit AD & DA converter housed within a computer. Each word was saved as a separate file. Stimuli were edited to carry out noise and hiss reduction. Amplitude normalization of signal was done using adobe audition 3.0. software. Inter-stimulus interval between two words was set to 5 seconds. A calibration tone of 1 kHz was inserted before beginning of word list. All the test items were recorded preceded by a carrier phrase "*hun bolo*". A total of 45 children, who were native speakers of Punjabi, participated in this study. The subjects age range 5-9 years. (Mean age-7 years).

Establishing Test Retest Reliability

- Statistical Analysis. The raw scores were analyzed using the SPSS version 18 software. SPSS software was used for descriptive statistics, Independent t test, Using Analysis of Variance (Gravatter, 1987).

Results

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

The level at which subjects repeated correctly 50% of the test items, which is considered as mean SRT level, was attained at 7 dB SL (w.r.t Fletcher average). There was a significance improvement in speech identification scores with increase in presentation level. There was no significant difference between the two bisyllabic word lists with reference to the speech recognition levels. There was no significant difference between the four monosyllabic word lists with reference to the speech identification scores. There was a significant positive correlation between the scores obtained in test-retest measure for both the bisyllabic word lists. There was a significant positive correlation between the scores obtained in test-retest measure for all the monosyllabic lists

Implications of the Study

- The test developed can be administered to any Punjabi speaking children of the target age group (5-9 years).
- Both the bisyllabic word list were found to be essentially equivalent and can be used interchangeably because for both the word list, equivalent scores were obtained.
- All the monosyllabic word lists were found to be essentially equivalent and can be used interchangeably because for all the four word lists, a maximum score of 100% word recognition score was obtained at 40 dBSL.
- The developed material can be used to selecting amplification devices for the pediatric population.

The test material developed can be also used to monitor progress of an auditory training program.

Limitations of the Study

- As the sample size was small, the development of speech material in Punjabi lacks standardization.
- Picture cards were not used to elicit responses.
- Recording on the Compact Disc Recorder could also have affected the quality of the sound. A variable that has shown to have detrimental effects on the performance of subjects in similar tasks is the quality of the recording (Beattie et al., 1977, Goetzenger, 1978).

Recommendations for Future Research

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children

- Using the test material developed in the present study, the following research studies can be carried out.
- The test can be administered on large group of normal hearing children to standardize the test material.
- Picturable test can be considered to evaluate performance.
- Performing the test at different signal-to-noise ratios.
- Standardizing the test on deviant/clinical population such as hearing impaired, mentally retarded and cerebral palsied children.
- Using the same material diotic, dichotic, time compressed and filtered speech test can be developed for the pediatric population. This will be useful for diagnosing central auditory processing disorders.

=====

Sreevidya Sherla, M.Sc. (ASLP)
Lecturer
Hellen Keller's Institute of Research & Rehabilitation for the Disabled Children
Sri Colony, Opposite G.K.Colony Bus Stop
R. K. Puram
Secunderabad- 500056.
Andhra Pradesh, India
srividyakusuma@gmail.com

Garima Gupta
Audiologist & Speech-Language Pathologist
1-5-958/3 Plot no-331
Citizen Colony
Old Alwal
Secunderabad - 500010
Andhra Pradesh
India
garima2018@gmail.com

Language in India www.languageinindia.com

12 : 7 July 2012

Sreevidya Sherla and Garima Gupta

Development of Speech Material for Punjabi Speaking Children