DEVELOPMENT OF PHONEMICALLY BALANCED WORD LISTS IN KANNADA FOR ADULTS

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ABSTRACT

Objective: Standard word lists are used during speech audiometry for assessment of hearing of an individual. The present study aimed at developing phonemically balanced word lists in Kannada language for adults and standardizing the same. **Design:** Normative research. **Participants:** One hundred and sixty five participants with normal hearing sensitivity and 40 individuals with different degrees of hearing loss. **Method:** A total of 1200 bisyllabic Kannada words were collected from various sources. These words were evaluated for familiarity. The words that were familiar were also assessed for equivalency, to make sure that the words being used to construct the lists were of equal difficulty. Only the words that were equivalent were selected for construction of word lists. Accordingly, 769 words had a score of around 50% identification at -3 dB SNR. These words were then used to construct 25 word lists, each containing 25 words. Word equivalencies across the word list were assessed on participants with normal hearing in quiet at four sensation levels and at -3 dB SNR. The utility was also assessed on individuals with different degrees of hearing loss. **Results:** Except List 5, all other word lists were equivalent in quiet. , PI –PB function in quiet was derived at 4 SLs for all the other 24 lists. Assessment of list equivalency at -3 dB SNR revealed that the Lists 1, 4, 5 and 12 were found to be significantly different from the other lists. Among the participants with hearing loss, the speech identification scores reduced significantly with increase in severity of hearing loss. **Conclusion:** Thus, 24 word lists in quiet and 21 word lists in noise were standardized. These word lists can be used for testing adults in the routine speech identification testing, assessing hearing aid benefits and for research purposes which requires multiple word lists.

1. INTRODUCTION

Individuals with hearing problems most often complain of difficulty in understanding speech. Hence, according to Brandy (2002) when an individual poses with a complaint of reduced ability to hear and understand spoken information, evaluating his/her hearing at different frequencies with the help of pure tones is not adequate enough to understand the hearing problems faced by an individual. The concern is how an individual is able to hear and understand speech in realistic world rather than how well he/she is able to detect pure tone. Speech tests provide valuable information regarding how well our auditory system performs in the real world situations and also regarding the benefits provided by hearing devices. Speech tests thus form an important part of routine audiological evaluation (Thibodeau, 2000; Gelfand, 2009).

Carhart (1952) defined speech audiometry as "the technique wherein standardized samples of a language are presented through a calibrated system to measure some aspect of hearing ability". Fundamental speech tests usually include speech detection and speech recognition or identification. Speech detection threshold (SDT) is the lowest level of intensity at which an individual can detect the presence of a speech stimulus whereas speech recognition or reception threshold (SRT) is the lowest level of intensity at which an individual can understand at least 50% of the speech stimuli presented to him. In addition, most common way of testing speech intelligibility at suprathreshold levels is to present the individual with a list of phonemically balanced test words (Gelfand, 2009). The percentage of words correctly repeated is considered as the speech identification score or speech recognition scores (SIS or SRS).

Accuracy of assessment of speech identification depends on various factors. These factors may be categorized as factors related to the test material and its development which

includes, decisions regarding the type of test material that is used, language specificity, phonetic or phonemic balancing, number of test lists developed and familiarity of the test materials used. Factors that one must consider while administration of the test includes presentation level, live vs. recorded presentation of the material, instructions provided and the response task. In all, factors such as decisions regarding test material used, presentation format, response task can affect the analysis and interpretation of the result.

The choice of material used for testing purpose ranges from simple non-sense syllables to sentences. It depends on the purpose of the test and also on the age and the auditory or listening abilities of the subjects. Use of non-sense syllables (which was the commonly used test material earlier) will restrict the influence of the linguistic knowledge and also helps in examining phonetic errors. At the same time Tyler (1994) is of the opinion that using non-sense syllables do not have face validity and they do not represent the natural speech.

On the other hand, according to Martin and Clark (2009), sentence materials contain contextual cues and are expected to have better predictive validity when compared to words. With the help of sentence materials co-articulation as well as temporal aspects of speech can be assessed. On the other hand, these materials take longer time to be administered, and memory has an influence on the performance.

Though there is a wide variety of speech materials such as non-sense syllables (Levitt & Resnick, 1978), or sentences (Kollmeier & Wesselkamp, 1997) that can be used, word lists remain the most commonly used material as there is a fair amount of balance between face validity and redundancy when compared to non-sense syllables and sentences. The most common material for speech recognition testing is the monosyllabic words. Many

monosyllabic materials are available in English language. The Central Institute of the Deaf W-22 (CID W22) and the Northwestern University-6 (NU 6) word lists are among them.

Test material developed should be both reliable and valid. Test material that can be usedrange from simple monosyllabic words to sentences. One must address a few major issues while developing a word list. According to Martin (1997), the test material developed should have a good representation of phonemes as per the occurrence of the phonemes in the language which can be achieved by either phonemic or phonetic balancing (PB), words chosen must be familiar, words chosen must be age appropriate, there should be equivalency between the lists, and that the material used should be language specific.

1.1 Factors to be considered while developing test material

1.1.1Phonetic/Phonemic balancing

The material developed should be a representative of the phonemes or the phonetic structure of a particular language. Phonetic balancing of word lists refers to preparing words that contain all the speech sounds that occur in the everyday speech of that particular language (Egan, 1948). Lehiste and Peterson (1959) modified the concept of phonetic balancing to phonemic balancing in recognition of the fact that speech recognition is accomplished on a phonemic rather than phonetic basis. According to them, this is a real distinction because phonemes are actually groups of speech sounds (each of which is a phonetic element) that are classified as being the same by the native speakers of the language. Thus, all phonetic differences are not phonemically relevant. Thus, according to them, the term ‘phonemic balance’ is more relevant than the term ‘phonetic balance’. The test list developed with PB represents the relative frequencies of the phonemes as closely as possible to the distribution of those phonemes in the everyday speech of that particular language.

In phonemic balancing, all the phonetic variants or the allophones of a particular speech sound is considered as a single phoneme and the word lists constructed will then have these phonemes occurring with same relative frequency equivalent to that of everyday speech. Thus, phonemically balancing can be considered as a modification in the concept of phonetic balancing. As mentioned earlier, this modification in the concept of phonetic balancing was first introduced by Lehiste and Peterson (1959). The rationale behind developing such materials is to avoid overestimation or underestimation of an individual's problem.

If a listener is presented with test materials that contain phonemes that occur infrequently in normal everyday speech of that particular language, and that individual is totally unable to perceive that particular phoneme, then it doesn't make that person a severely handicapped. If the same person is unable to perceive phonemes that occur most commonly in everyday conversation, then his problem may be considered as a more severe one (Dillon & Ching, 1995; Vandana, 1998). Therefore, it is very important that the test material developed should have different phonemes appearing in the test material with the same relative frequency of occurrence as in everyday speech.

Egan (1948) developed first the monosyllabic word material to be used clinically. He developed phonetically balanced lists of 50 words each. This is known as 'PB-50' test. Hirsh, et al., (1952) modified PB-50 because it contained unfamiliar words. They prepared four lists of 50 words each by selecting 120 words from Egan's lists and added 80 other commonly used words. These were then called CID W-22 word lists.

Lehiste and Peterson (1959) believed that true phonetic balancing was not possible, hence, they modified the concept of phonetic balancing and introduced phonemic balancing. They selected a pool of 1263 CNC words from Thorndike and Lorge (1944) lists and came up with ten equivalent PB lists of 50 words. Later based on their work, North-Western

University Auditory test No. 6 or the NU-6 test was developed by Tillman and Carhart (1966). They refined the CNC word lists in an attempt to improve phonemic equivalency and equal word familiarity from list to list. They produced four equivalent lists with 50 words in each.

Martin, Champlin, and Perez (2000) conducted a study to check if there is any difference in the scores obtained for PB word lists and lists that were deliberately not balanced. The first set comprised of conventional PB word lists selected from North-Western University Auditory Test No. 6 (NU-6) (Tillman & Carhart, 1966). The second set of lists consisted of 200 randomly selected words that lent themselves to monosyllabic utterance. They administered them on subjects with normal hearing as well as on subjects with sensorineural hearing loss. The results revealed identical scores thereby questioning the need for balancing a word list. Though the authors did not find any difference between lists that were balanced or otherwise, there is no harm in balancing word lists.

1.1.2. Familiarity of the words chosen

Word familiarity plays a major role and has great effect on the speech recognition performance (Owens, 1961). Word lists that are developed should contain words that are familiar to as many individuals as possible. Rare and infrequently used words are not identified accurately as compared to the commonly used words, which affects the analysis and interpretation of the results. Any effect due to differences in educational background can also be minimized by using words that are familiar to majority of the individuals. Words that are familiar to adults need not be familiar to children. Hence, the choice of words should be such that it is appropriate for the target population.

1.1.3 List equivalency

Another issue to be addressed while developing a word list is preventing over-familiarization of the test materials. The speech tests serve more than one purpose. Thus,

usually more than one administration of the same test might be necessary. For instance, an individual who has undergone speech recognition testing for diagnostic purpose, should also be assessed for the performance in aided condition, if necessary, using different hearing aids or using different features of a same hearing aid. If the same test material is used repeatedly, with time, the individual will get familiarized with the material. This in turn affects the test results (Tillman, Carhart & Wilber, 1963). Thus, it is important to have more than one test material or different forms of the same test material to overcome the practice effect. In addition, all the alternative test forms of the same test or the multiple test lists be equivalent i.e., various alternate forms of the test should yield comparable results (Gelfand, 2009). If some of the test forms are easy while some are difficult, then one must exercise caution while administering the test and interpreting the results.

1.1.4 Language specific materials

It is most desirable that the speech material administered on an individual is inhis/her native language. Testing an individual in his/her non-native language will lead to inaccurate results. The words that are presented to them may not be familiar and also not meaningful leading to low scores. Therefore, speech tests should be administered in the client's native language/dialect, if speech test materials are available in that particular language (Lehiste & Peterson, 1959). Thus, it is important to develop standardized test materials in every language in an experimental setting (Carhart, 1952). In the Indian context, this poses a challenge as India is a multilingual country. Test material should be developed in different languages.

In summary, while constructing word lists, the effect of each of these factors must be kept in mind, so that, there can be accurate and reliable measurement of the speech perception ability of an individual.

1.2Various test materials for speech identification in English language

Supra threshold speech recognition testing was focused upon during the World War II as the tool for assessment of communication. Through the years, a number different speech recognition test materials have been developed. Recordings of many of these are commercially available. A few of these tests have been listed below.

Egan, in 1948, developed the first monosyllabic word material,'PB-50' test,to be used clinically. Hirsh,et al., (1952) modified this as CID W-22 word lists which contained four lists of 50 familiar words each.

Lehiste and Peterson (1959) believed in phonemic balancing as true phonetic balancing was not possible. They gave ten equivalent PB lists of 50 words. The Northwestern University Auditory test No. 6 or the NU-6 test with phonemic equivalency and equal word familiarity was developed by Tillman and Carhart (1966). They produced four equivalent lists with 50 words in each.

Speech perception in noise test was developed by Kalikow, Stevens, and Elliot (1977). It consists of 8 sets of 50 sentences each. Each sentence is about five to eight words. These sentences are presented in the presence of background noise. Speech babble (12 talker) serves as the background noise in this test. Half of the sentences are highly predictable while the other half is low predictable sentences. It assesses the ability of an individual to use the contextual cues and predict the words. The listener has to identify the last word in each sentence. An overall score is obtained from the difference between the scores on high and low predictable items. This allows to judge on the client's ability to make use of the contextual cues.

1.3 Speech identification tests developed in India

It is well established fact that language of the speaker and the listener influences the measurement of the speech intelligibility. India being a multilingual country, there is a need

for development and standardization of language specific materials. Widely spoken Indian languages include languages such as Hindi, Kannada, Telugu, Tamil, Bengali, Malayalam, Urdu, Oriya, Marathi, Gujarati and Assamese. Through the years, various speech recognition materials have been developed in Indian languages. Most common tests in some of these languages developed for adult listeners are listed below.

1.3.1 Speech test materials in English for Indians

Swarnalatha (1972) developed material for speech recognition in English for Indian population, both adults and children. For the adults, 200 monosyllabic words from PAL-PB words and another 200 words from CID W-22 test were taken and common words between them were eliminated. These were then administered on 56 adult listeners in the age range of 16 to 25 years. Results revealed that 100% correct response was obtained at 42 dB SL(re: SRT) for adults.

1.3.2 Phonetically balanced word lists in Hindi language

De (1973) compiled and standardized test material for speech audiometry in Hindi language for adults. He developed six phonetically balanced word lists. He obtained the test materials from various sources such as newspaper and dictionary. He collected CV, VC and CVC monosyllabic words. From these, unfamiliar or difficult words were discarded. He then developed 18 lists of 50 words each and balanced them phonetically in such a way that each word list with 50 words contained vowels in the same proportion as has been obtained in the phonetic analysis. The proportion of initial consonant were checked and suitable consonants were substituted so as to make the percentage of initial consonants in the list conform to the percentage obtained in the statistical analysis. The words were then rearranged in such a way that the list was homogenous. After the lists were rearranged, the word list was tested on normal Hindi speaking adults. These six phonetically balanced lists of words were then finalized to be used clinically.

1.3.3 Speech identification test lists in Tamil language

Samuel (1976) developed monosyllabic PB word lists in Tamil language. The words were chosen from a list of familiar words given by Rajaram (1972). These words were then given to ten native Tamil speakers for familiarity rating which resulted in 80 words rated to be familiar. The number of words was then increased to 100 by repeating some of the words that were rated as familiar and four lists of PB word lists were arrived at. The lists were then standardized on 30 listeners with normal hearing and native speakers of Tamil who obtained maximum scores at 35 dB SL (re: SRT).

1.3.4 Speech identification test materials in Manipuri language

Devi (1985) developed speech identification material in Manipuri language. Due to lack of studies on frequency of occurrence of speech sounds in Manipuri language, the lists were not phonetically balanced. The author selected various monosyllabic words from various sources such as magazines, books, phonetic reader book and normal conversational speech and gave it for familiarity rating to 10 normal native speakers. 100 monosyllabic words were chosen for construction. Four lists of monosyllabic words with 25 test items in each list were arrived at. Scrambling of these lists was made. These lists were administered to five individuals with normal hearing at different intensities. Maximum scores were obtained at 40 dB SL (re: SRT).

1.3.5 Speech identification test in Bengali language

Speech identification test material in Bengali was developed by Ghosh in 1986. Seventy-five familiar monosyllabic words were collected. They were divided into three lists of 25 words each. Each of these lists were randomized into five lists and presented at different intensities on six subjects in the age range of 18 to 25 years. Maximum scores were obtained at 40 dB SL (re: SRT).

1.3.6 Speech identification tests in Kannada language

Phonemically balanced word lists for adults in Kannada, developed by Yathiraj and Vijayalakshmi (2005), contained four lists iterated to form eight lists with 25 words each. This test is phonemically balanced and list equivalency has been assessed on 100 listeners with normal hearing sensitivity.

This is being used for routine hearing and hearing aid evaluation of clients speaking Kannada language. These lists are adequate for the routine diagnostic evaluation. However, for hearing aid trial and research purposes, limited number of word lists will risk the testing results with familiarization. In addition, practice/learning effects are associated with randomization and reuse of the same items. Tillman and Carhart (1966) have indicated that a test material should have many lists in order to avoid familiarization. This also prevents measurements and comparison of performance in multiple experimental or clinical conditions. Hence, the present study aimed at developing more number of phonemically balanced word lists for adults in Kannada language.

1.4. Need for the study

The test developed by Yathiraj and Vijayalakshmi (2005), as mentioned earlier, has four lists. However, four lists iterated to form eight lists are not adequate when a person is tested in hearing evaluation (diagnostic) as well as for hearing aid trial.

Further, improvements in hearing device technology have increased the number of features in a hearing device. When these features or parameters have to be evaluated and compared on a number of conditions, a large number of such word lists are mandatory. Thus, the aim of the present study was to develop more number of speech lists to evaluate the hearing and hearing aid features.

1.4.1 Aim and Objectives

To develop and standardize word test material in Kannada language. The specific objectives were:

1. To develop a large set of word lists in Kannada language for adults
2. To standardize the developed lists in quiet and in noise, and
3. To assess the clinical utility of the test.

2. METHOD

The current study was carried out in two phases- 1) Development of word lists; 2) Standardization of the word lists.

2.1 Development of the word lists

2.1.1 Collection of words

A pool of 1200 bi-syllabic Kannada words were collected from various sources such as text books, dictionary, magazines, and also from the corpus developed by Central Institute of Indian Language. Proper nouns, words related to politics or war were not considered in the preparation of word lists.

2.1.2 Familiarity rating

The collected words were then checked for familiarity rating. For this, 15 native speakers of Kannada rated all the words using a five point (1-5) rating scale. The ratings were as follows:

- '5' being most familiar (words known well and used more frequently in conversation)
- '4' being familiar (words known well but not used often in conversation)
- '3' being familiar but not used every day (words known but not used in conversation)
- '2' being not familiar and (words heard but meaning not known)
- '1' being unknown.(words never heard)

Reponses from all the individuals were compiled and words that were rated as 'most familiar', 'familiar', and 'familiar but not used every day' were considered to construct the word lists. Out of the 1200 words a total of 820 words were selected based on this criterion.

2.1.3 Recording

All the selected words were recorded by a native female speaker having normal voice and clear articulation. The recording was done in quiet in an acoustically treated room. The speech material was recorded using the Computerized Speech Lab (CSL) system with a high fidelity microphone placed 10 cm from the mouth of the speaker. The waveforms were digitized with a 16 bit A/D converter at a sampling frequency of 44,100 Hz. The speaker was instructed to pronounce the words in a natural, clear manner and neutral intonation, while maintaining constant vocal effort. The each recorded word was normalized to 0 dB by using Adobe Audition software version 3.0. A calibration tone of 1000 Hz was generated in Adobe

Audition software version 3.0, normalized to 0 dB, and added at the beginning of each word list.

2.1.4 Test of equality between words

To ensure that all the words being used to construct the lists are of equal difficulty, the considered words were administered in four different sensation levels (SLs) (0 dB, 10 dB and 20 dB and 40 dB SL) (re:Pure Tone Average). Equivalency of the material developed is an important issue that needs to be addressed while developing test material for speech audiometry. Generally, this has been demonstrated for a large number of test material that have been developed in quiet condition (Tillman & Carhart, 1966; Hurley & Sells, 2003; Stockley & Green, 2000; Stuart, Green, Phillips, & Stenstrom, 1994; Wilson, Coley, Haenel, & Browning, 1976).

In literature, it has also been shown that when word recognition testing is done in presence of background noise, the list equivalency does not remain the same (Chermak, Pederson & Bendal, 1984; Chermak, Wagner, & Bendel, 1988; Gengel, Miller, & Rosenthal, 1981; Loven & Hawkins, 1983; Ripply, Dancer, & Piltenger, 1983; Schubert & Stenhjem, 1978). Further, in quiet condition, one can expect the possibility of observing a ceiling effect for the lists administered on individuals with normal hearing sensitivity. This might obscure the inter-list equivalency. Hence, the word equivalency was also measured in different signal-to-noise ratios (SNRs).

2.1.5 Generation of noise and testing words for equivalency in the presence of noise

Noise used for the above testing was generated such that it represents the long-term averaged spectrum of the speech stimulus used in the present study. This was done by extracting long-term averaged speech spectrum of all the words using MATLAB software (version 7.8.0.347). The white noise was filtered to mimic the extracted LTASS. This noise was used along with the words to result in -5 dB, -3 dB, 0 dB and +3dB SNR.

The words were routed through a personal computer and delivered through Senheisser HDA 200 headphones via a calibrated audiometer. All the words were presented at each of the four SNRs to five individuals with normal hearing, at their most comfortable level. Different individuals were considered for each SNR making a total of 20 normal hearing participants, mean age of 23.24 years with age range of 18 to 30 years, who had pure tone thresholds within 15 dB HL and speech identification scores above 90 % in quiet. These

participants did not report any history of otological problems and understanding speech in presence of noise. All individuals taken for the study had no otological complaints and history. This was confirmed with the routine hearing evaluation done with a dual channel audiometer GSI 61 coupled with acoustically matched TDH 39 headphones housed in MX-41 AR ear cushions and B71 bone vibrator in an acoustically treated double room. A calibrated GSI Tympstar middle ear analyzer was also used for obtaining tympanogram and acoustic reflex threshold

Pure tone air-conduction thresholds for each participant were established in octave frequencies from 250 Hz to 8000 Hz, using the modified Hughson and Westlake method (Carhart & Jerger, 1959). Bone-conduction thresholds were also established using the same method for octave frequencies from 250 Hz to 4000 Hz. Speech recognition threshold with Kannada paired-words and speech identification with phonemically balanced word list (Yathiraj & Vijiyalakshmi, 2005) were measured. The tympanometric measurements were done using a probe tone of 226 Hz at 85 dBSPL to evaluate the status of the middle ear. For acoustic reflex measurement, reflex eliciting tones of 500, 1000, 2000 and 4000 Hz were presented both ipsilaterally and contralaterally to find out the presence or absence of acoustic reflexes. A significant change of admittance value of greater than 0.03 ml was considered as the criterion for the presence of reflexes. Five participants were selected for each of the four SNRs. The words were presented monaurally to either left or right ear chosen randomly. All the participants were instructed to repeat the words presented. The SNR at which an average of 50% response was obtained was considered for further evaluation. Again at the same SNR, all the words were administered to 10 different individuals having normal hearing. The responses for all the words were then compiled and only those words that were repeated by at least 50% of the participants were finally used to construct the word lists.

2.1.6 Phonemic balancing

Ramakrishna et al. (1962) provided data for the frequency of occurrence of the phonemes in Kannada language. Though their study provides information on the frequency of occurrence, the study was carried out about 50 years back. Hence, a pilot study was carried out to find out the relative frequency of occurrence of all the phonemes in Kannada language. This was done to verify if the same data provided by Ramakrishna et al. holds good even

now. A database containing 15,000 speech sounds was collected from printed text and conversation. The frequency of occurrence of all the vowels and consonants were then derived from the collected sample. The data thus obtained were compared with the data given by Ramakrishna et al. (1962). No significant difference was observed on t-test between the two ($p>0.05$). Hence, the data provided by Ramakrishna et al. (1962) was used to phonemically balance the word lists. Twenty-five lists of bi-syllabic words were constructed with each list having 25 words.

2.2 Standardization of the word lists in quiet

2.2.1 Standardization on participants with normal hearing in quiet.

The constructed word lists were presented in quiet to 65 individuals with normal hearing sensitivity in the age range between with the mean age of 26.3 years ranging between 18 years to 55 years. The calibration tone was played and the gain for external stimuli was adjusted such that VU meter deflection was maintained to 0. A dual channel audiometer GSI 61 coupled with acoustically matched TDH 39 headphones housed in MX-41 AR ear cushions and B71 bone vibrator was utilized to estimate the pure tone threshold, speech recognition threshold with Kannada paired-words and speech identification with phonemically balanced word list (Yathiraj & Vijiyalakshmi, 2005). A calibrated GSI Tympstar middle ear analyzer was used for obtaining tympanogram and acoustic reflex threshold. The test stimulus was presented using a personal computer (32 bit Lenovo laptop) and delivered through Senheisser HDA 200 headphones of a calibrated audiometer.

Pure tone air-conduction thresholds for each participant were established in octave frequencies from 250 Hz to 8000 Hz, using the modified Hughson and Westlake method (Carhart & Jerger, 1959). Bone-conduction thresholds were also established using the same method for octave frequencies from 250 Hz to 4000 Hz. The tympanometric measurements were done using a probe tone of 226 Hz at 85 dBSPL to evaluate the status of the middle ear. For acoustic reflex measurement, reflex eliciting tones of 500, 1000, 2000 and 4000 Hz were presented both ipsilaterally and contralaterally to find out the presence or absence of acoustic reflexes. A significant change of admittance value of greater than 0.03 ml was considered as the criterion for the presence of reflexes.

2.2.2 Administration of developed word lists in quiet.

The individuals were administered with all the 25 lists in quiet. The words were routed through a personal computer and delivered through Senheisser HDA 200 headphones of a calibrated audiometer. The words were presented at 40 dB SL (Ref: PTA) to 65 participants with normal hearing sensitivity. The participants were instructed to repeat the words and the responses were recorded on a scoring sheet. Every correct response was given a score of 1 and a score of 0 was given for incorrect responses or failure to repeat the word. The word lists were also presented to 20 individuals with normal hearing sensitivity out of the 65 participants. This was done at 0 dB SL, 10 dB SL and at 20 dB SL in order to obtain a psychometric function of performance with the word lists across intensity levels, i.e., PI-PB function. The order of presentation of word lists was randomized in order to avoid order effect. In order to avoid practice effect, the word list was first presented at 0 dB SL and then at 10 dB SL. The testing was done at 20 dB SL after a break of at least five days.

2.2.3 Standardization on participants with normal hearing in noise

The data were collected from native speakers of Kannada, i.e., adult listeners in the age range from 18 to 55 years with a mean age of 33.8 years. The present study incorporated a different group of 100 individuals with normal hearing sensitivity and middle ear function. All the evaluations were carried out in an air-conditioned, well illuminated and double room acoustically treated suite with the same equipment, procedure and criteria for selection of participants as explained in the Section 2.2.1.Administration of developed word lists at quiet.

The individuals were administered with all the 25 lists in presence of noise, at -3dB SNR. An SNR of -3 dB was chosen based on the pilot study, done in order to select equally difficult words for constructing the word lists. This yielded an average of 50 % correct response at this SNR. The words were routed through a personal computer and delivered through the headphones of a calibrated audiometer. The participants were instructed to repeat the words and the responses were recorded on a scoring sheet. Every correct response was given a score of 1 and a score of 0 was given for incorrect responses or failure to repeat the word.

2.2.4 Standardization of word lists on participants with hearing impairment

The group with hearing impairment consisted of 40 participants with acquired sensorineural hearing loss having a flat type of configuration in one or both ears. The group

with hearing impairment consisted of ten individuals with age ranging from 18 to 55 years in each of the different degrees of hearing loss i.e., mild, moderate, moderately-severe and severe. The ears were selected randomly if the loss was bilateral or the ear having the required degree of hearing loss was selected for the study. If masking was required, maximum effective masking was provided in the contralateral ear. The configuration of audiogram was restricted to flat type. The speech identification scores were in agreement with the degree of hearing loss, suggesting a cochlear hearing loss (Dubno, Lee, Klein, Matthews, & Lam, 1995). All the participants had 'A' type of tympanogram and reflexes appropriate to their degree of hearing loss, either present, elevated or absent. All the participants had normal speech and language abilities as reported and observed.

Killion (1997) reported that individuals with hearing impairment have poorer recognition scores even in quiet condition. Individuals with mild hearing loss require higher SNR than those with normal hearing in the presence of noise, even when the testing is done at higher intensity levels (Killion, 1997). Hence, in the present study, the testing was done only in quiet for individuals with hearing loss. Administration and scoring was similar to Section 2.2.1.The scores obtained by the participants having different degrees of hearing loss in quiet were compared with scores obtained by individuals with normal hearing sensitivity, at 40 dB SL.

- Descriptive statistics was done to see whether all the lists were equivalent in quiet and at – 3 dB SNR
- Repeated measures ANOVA and Post-hoc Bonferroni tests were done to identify the lists that were not equivalent in quiet and at -3 dB SNR.
- Descriptive statistics was done for the final lists that were administered with participants with normal hearing and participants with hearing loss.
- Kruskal Wallis and Mann Whitney U tests were administered to compare the scores obtained between participants with normal hearing and participants with hearing loss; and also between various degrees of hearing loss.

3. RESULTS AND DISCUSSION

Standardization of the word lists in quiet on 65 individuals with normal hearing sensitivity was done at 40 dB SL. Table 3.1 gives the mean and standard deviation (SD) of number of words correctly repeated for each of the 25 word lists.

Table 3.1

Mean and SD of speech identification scores (Max. score = 25) for 25 lists in individuals with normal hearing (N=65)

	Mean	*SD*		*Mean*	*SD*		*Mean*	*SD*
List 1	24.73	0.69	List11	24.41	0.67	List21	23.88	2.72
List 2	24.56	0.69	List12	24.65	0.57	List22	24.56	0.76
List 3	24.33	0.87	List13	24.51	0.85	List23	24.58	0.53
List 4	24.61	0.82	List14	24.56	0.78	List24	24.50	1.08
List 5	23.96	1.00	List15	24.41	0.88	List25	24.38	0.95
List 6	24.15	0.95	List16	24.55	0.85			
List 7	24.53	0.70	List17	24.45	0.89			
List 8	24.56	0.81	List18	24.33	0.95			
List 9	24.65	0.79	List19	24.56	0.56			
List 10	24.46	0.87	List20	24.15	3.00			

Repeated measures ANOVA was carried out to see if there was any difference between the word lists. The test revealed that there was a significant difference in performance across the lists ($F_{24, 1416} = 2.766$) , $p<0.001$) revealing a main effect of the lists. Hence, post-hoc Bonferroni pair-wise comparison was done to identify the list/s that differed significantly. The results revealed that only List 5 was significantly different from Lists 1, 2, 4, 7, 9, 12, 14, 19, 22, 23, and 24. (Table 3.2), Hence, it was inferred that the remaining 24 word lists can be used in quiet. The list that differed from the other lists (List 5) can be used as practice list. These 24 + 1 word lists are given in the Appendix.

The scores obtained at 40 dB SL are around 98% for all the 24 lists. Similar findings ware report in literature. In a study by Ullrich and Grimm (1976), it was reported that

individuals with normal hearing sensitivity obtained a maximum score of about 99.7% at MCL. Beattie, Edgerton, and Svihovec (1977) obtained speech discrimination score of approximately 95% at 32 dB SL for individuals with normal hearing sensitivity upon administration of CID W-22 and NU-6 test materials on them.

Table 3.2

Bonferroni pair-wise comparison across 25 word lists in quiet.

Groups (A)	*Groups (B)*	*Mean Difference Of scores of (A-B)*	*Standard Error*	*Significance (p)*
5	1	0.767*	0.141	0.000
	2	0.600**	0.137	0.015
	4	0.650**	0.154	0.025
	7	0.567**	0.139	0.043
	9	0.683**	0.155	0.013
	12	0.683*	0.131	0.001
	14	0.600**	0.124	0.003
	19	0.600**	0.141	0.023
	22	0.600*	0.112	0.000
	23	0.617**	0.139	0.012
	24	0.533**	0.115	0.006

Note: *p<0.001; **p<0.05

The psychometric curve was drawn for the mean scores obtained for each word list across the four SLs (Fig.3.1.1). A sigmoid curve was obtained for the 24 word lists.

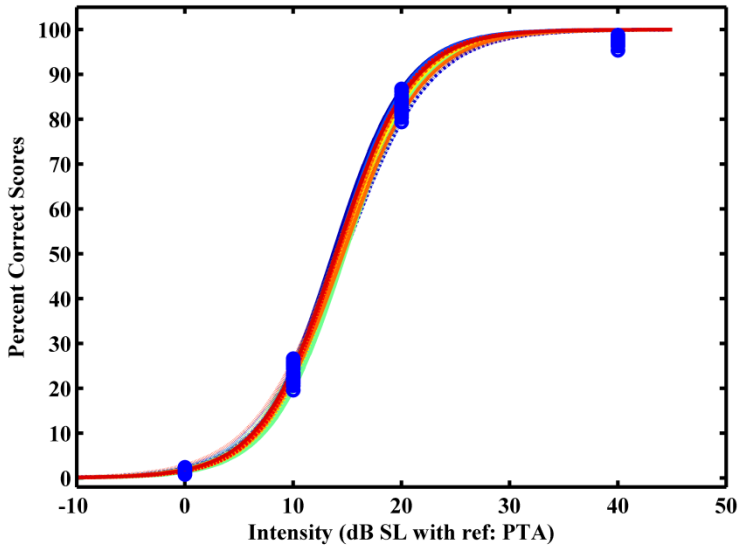

Fig 3.1.1: Graph showing psychometric function curve for different word list represented as different coloured curve and blue dots indicating mean scores.

Standardization of the word lists on 100 individuals with normal hearing sensitivity was done at -3 dB SNR. Table 3.3 gives the mean and standard deviation (SD) of number of words correctly repeated for each of the 25 word lists.

Table 3.3

Mean and SD of speech identification scores (Max. score = 25) for 25 lists in individuals with normal hearing (N=100)

	SIS			*SIS*			*SIS*	
	Mean	*SD*		*Mean*	*SD*		*Mean*	*SD*
List 1	10.05	2.02	List11	10.31	1.78	List21	11.07	1.81
List 2	12.19	2.84	List12	12.64	2.06	List22	12.22	2.50
List 3	11.34	2.61	List13	11.22	2.37	List23	11.70	2.10
List 4	11.23	2.00	List14	11.70	1.81	List24	11.45	2.24
List 5	11.34	3.17	List15	11.70	2.24	List25	11.94	1.89
List 6	11.22	2.28	List16	12.24	2.21			
List 7	12.84	2.82	List17	10.64	2.16			
List 8	10.42	2.13	List18	11.30	1.96			
List 9	10.96	2.30	List19	11.78	2.47			
List 10	11.71	2.70	List20	11.81	1.86			

It can be observed from Table 3.3 that the mean SIS does not vary much across the lists except for list 1, 7 and 12. The SD is also uniform across the lists except for List 5. To determine if the difficulty level was similar across lists or if there was any statistical difference across lists, the difference between each individual's score for each list and the listener's mean score i.e., scores averaged for all the lists for that individual, was calculated to obtain modified mean scores. This is one way of statistically comparing the scores between different lists (Spahr et al., 2012). Table 3.4 presents the mean and SD of these modified mean scores. Repeated measures ANOVA was done on these modified mean (MM) values to see if there was any difference between the lists.

Table 3.4

Average and SD of Modified Mean (N=100) of word recognition scores.

	MM	*SD*		*MM*	*SD*		*MM*	*SD*
List 1	1.60	0.99	List11	1.47	1.02	List21	1.10	0.71
List 2	1.40	1.13	List12	1.66	1.20	List22	1.47	1.08
List 3	1.28	0.77	List13	1.24	0.65	List23	1.07	0.81
List 4	0.91	0.73	List14	1.15	0.89	List24	1.14	1.03
List 5	1.70	0.90	List15	1.15	1.12	List25	1.07	0.94
List 6	1.29	0.89	List16	1.33	0.82			
List 7	1.65	1.52	List17	1.43	1.07			
List 8	1.40	0.99	List18	1.20	0.85			
List 9	1.26	0.87	List19	1.41	1.10			
List 10	1.32	1.14	List20	1.33	0.92			

It can be observed from the Table 3.4 that the deviation from the average mean score and the SD for all the lists showed similar values. However, the repeated measures ANOVA revealed that there was a significant difference in performance across the lists [$F(24, 2376) = 4.526$, $p<0.001$], revealing a main effect of the lists. Hence, post-hoc Bonferroni pair-wise comparison was done to find out the lists that differed significantly. The results of the pair-wise comparison are given in the Table 3.5. The results reveal that List 1 was significantly different from the Lists 4, 21, 23 and 25; and List 4 was significantly different from the Lists 1, 2, 5, 7, 8, 11, 12, 16, 17 and 22. Further, List 5 was significantly different from the Lists 4, 13, 14, 18, 21, 23, 24 and 25; and List 12 was different from the Lists 4, 21, 23 and 25.

Table 3.5

Bonferroni pair-wise comparison across 25 word lists at -3 dB SNR.

Groups (A)	*Groups (B)*	*Mean Difference (A-B)*	*Standard Error*	*Significance (p)*
List1	List 4	0.694**	0.128	0.000
	List 21	0.505*	0.128	0.044
	List 23	0.528*	0.123	0.012
	List 25	0.530*	0.133	0.041
List4	List 1	-0.694**	0.128	0.000
	List 2	-0.490*	0.122	0.035
	List 5	-0.795**	0.117	0.000
	List 7	-0.740*	0.173	0.013
	List 8	-0.487**	0.094	0.000
	List 11	-0.565**	0.115	0.001
	List 12	-0.749**	0.143	0.000
	List 16	-0.417*	0.105	0.038
	List 17	-0.523*	0.129	0.030
	List 22	-0.557**	0.117	0.002
List5	List 4	0.795**	0.117	0.000
	List 13	0.468*	0.110	0.014
	List 14	0.550**	0.121	0.005
	List 18	0.500*	0.116	0.011
	List 21	0.606**	0.104	0.000
	List 23	0.629**	0.112	0.000
	List 24	0.562*	0.141	0.039
	List 25	0.631**	0.131	0.001
List12	List 4	0.749**	0.143	0.000
	List 21	0.560**	0.121	0.003
	List 23	0.583**	0.130	0.006
	List 25	0.586**	0.133	0.008

Note: * $p<0.05$; ** $p<0.00$

One of the requirements of word lists for speech audiometry is equivalency between the lists. Hence, the lists 1, 4, 5 and 12 were eliminated from the test. Repeated measures ANOVA for the final 21 lists was done in order cross-check the equivalency. The results revealed no significant difference [$F(20, 1960)=2.565$, $p>0.05$]. Hence, all these 21 word lists were retained in the final test.

After removing the lists 1, 4, 5 and 12, the normative performance of the 100 individuals with normal hearing sensitivity at -3 dB SNR was 11.51 (mean value of the number of words correctly repeated), which is 46.04%,. Wilson, McArdle, and Roberts (2008) compared the speech recognition performance in speech spectrum noise using CID W-22, NU-6 and W-1 spondaic words. They found the 50% point to be around 1 dB SNR. This is comparable to the results found in the present study. In the present study, around 46% was obtained at -3 dB SNR, the 50% would be at SNRs higher than -3 dB. All the 21 equivalent lists are renumbered and given as List 1 to List 21 in the Appendix.

In Phase III, The clinical utility of the test material developed was evaluated on 40 individuals with hearing loss; i.e., clinical group with mild, moderate, moderately-severe and severe sensorineural hearing loss, with ten participants in each degree of hearing loss. This was also tested and in 40 individuals with normal hearing sensitivity who were not part of the test earlier. Thus, including the normal group, there were a total of five groups assessed in this phase. Table 3.6 gives the mean and SD of correctly identified words (average value for all the lists) for all the five groups. Though data were collected for all the 25 word lists in all the groups, the results are presented only for the equivalent 24 lists as these were included in the final test material.

Table 3.6

Mean and SD of speech identification scores (SIS) (Max score = 25 or 100%) by the five groups.

Groups	*Number*	*Age in years Mean (Range)*	*Mean SIS (percentage scores)*	*SD*
Normal hearing	40	28.2 (18 to 55)	24.66 **(98.64%)**	0.24
Mild hearing loss	10	36.7 (22 to 56)	23.58 **(94.32%)**	0.45
Moderate hearing loss	10	52.5 (23 to 60)	18.85 **(75.50 %)**	0.78
Moderately severe hearing loss	10	51.4 (35 to 61)	15.16 **(60.64 %)**	1.27
Severe hearing Loss	10	57.8 (41 to 71)	10.53 **(42.12 %)**	0.37

From Table 3.6, it can be observed that the mean word recognition scores decreased with increase in severity of hearing loss. The scores are similar for the groups with normal hearing and mild hearing loss.

Kruskal-Wallis statistical analysis was done to evaluate if the difference in mean word recognition scores between the groups was statistically significant. The results revealed that statistically significant difference between groups was present between the groups for all the 24 lists ($p<0.01$). Hence, pair-wise comparison was made using Mann-Whitney U test. Table 3.7 presents the results of this. The table shows that the difference in speech identification scores was significant ($p<0.01$) between all the groups.

Table 3.7

Significant difference between the five groups of participants (Mann Whitney U test)

Groups (A)	*Groups (B)*	*Z*	*Significance (p)*
Mild HL	Moderate HL	-3.79*	0.00
	Moderately-severe HL	-3.79*	0.00
	Severe HL	-3.84*	0.00
	Normal	-4.91*	0.00
Moderate HL	Mild HL	-3.79*	0.00
	Moderately-severe HL	-3.78*	0.00
	Severe HL	-3.84*	0.00
	Normal	-4.91*	0.00
	Severe HL	-3.84*	0.00
	Normal	-4.91*	0.00
Moderately Severe HL	Normal	-4.91*	0.00
	Severe HL	-3.84*	0.00
Severe HL	Normal	-4.91*	0.00

Note: *p<0.000

In the present study, the group with normal hearing obtained a mean Speech Identification Score of 98.64% when the lists were presented in quiet at 40 dB SL. Similar findings were obtained by Beattie, Edgerton, and Svihovec (1977). They obtained speech discrimination score of approximately 95% at 32 dB SL for individuals with normal hearing sensitivity upon administration of CID W-22 and NU-6 test material on them.

It can also be observed that the scores follow a decreasing trend as the degree of loss increased, with highest scores obtained for mild group and lowest score for the severe group. Beattie, Barr, and Roup (1997) found that subjects with mild-to-moderate hearing impairment obtained a score of 85% in quiet condition upon administration of CID W-22 word lists. These results are similar to the results obtained in the present study. In the present study, a score of 85% was obtained when the mild and moderate groups were combined.

Further, the effect of severe hearing impairment on speech identification scores is well known. The drastic decrease in speech identification ability in these individuals may be attributed to the loss of cochlear non-linearity, decreased frequency selectivity, decreased temporal resolution, increased upward spread of masking and possible presence of dead regions (Moore et al., 2000; Moore, Lynch & Stone, 1992; Plomp, 1994). Some of these factors could result in poor speech perception even in quiet (Pekkerinan, Salmivalli, & Suonpa, 1990). Hence, it can be inferred that the developed material is sensitive to differences in speech identification abilities across different degrees of hearing loss.

Based on the above results, the word lists numbering were reorganized such that the lists that were finalized and can be used for testing were put in the beginning. All the 25 word lists are provided in the Appendix A. For convenience, the word lists are re-named and numbered so that they can be used in quiet and in noise. The word lists 1 to 21 (renamed as AKW List 1 to AKW List 21) and practice list 1, 2 and 4 (renamed as AKW List 22, ARF AKW List 23, AKW List 24) can be used for testing in quiet (given in Appendix B) and lists 1 to 21 (AKW List 1 to AKW List 21) can be used for testing in noise (given in Appendix C). The practice list 3 (AKW Practice List) can be used as practice list while testing in quiet and in noise.

4. SUMMARY AND CONCLUSION

The phonemically balanced (PB) words list is an important tool in the regular speech identification testing in audiological test battery. The study was aimed to develop multiple PB word lists in Kannada language. In Phase I, a total of 1200 bisyallabic Kannada words were taken from various sources and out of these words 769 words were considered for constructing phonemically balanced word lists based on word familiarity rating and equal difficulty of words. The words were administered at different SNRs to check the equivalency. At – 3 dB SNR, 769 words out of 1,200 words were found to have equal difficulty. Finally, 25 PB lists with 25 words each were constructed that were equivalent.

In Phase II, these lists were administered on 65 individuals with normal hearing and another 100 individuals with normal hearing at -3 dB SNR for the standardization of these lists. Out of the 25 lists, one list was found to be significantly different from others in quiet. Four lists out of 25 lists were found to be significantly different in the speech identification scores at -3 dB SNR.

In Phase III, these lists were tested for the clinical utility. A total of 40 individuals with normal hearing and 40 individuals with different degrees of hearing impairment were administered with all the 24 lists. There was a significant difference between individuals with normal hearing sensitivity and individuals with hearing impairment. There was also a significant difference between the different degrees of hearing impairment, with poorer scores for higher degrees of hearing loss.

Hence, these developed and standardized 24 PB word lists can be used in quiet and 21 PB word lists can be used in noise conditions in Kannada for adults during the routine speech identification testing. These lists can also be used for assessing hearing aid benefits and for research purposes which requires multiple word lists.

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APPENDIX A

Sl no.	List 1		List 2		List 3		List 4		List 5	
1.	ದೀನ	diːna	ಸುರಿ	suri	ಪೊದೆ	poɖe	ರೆಂಬೆ	rembe	ಹದ	haɖa
2.	ಚಿತ್ತ	ʧiʈʈa	ಶಂಕೆ	ʃaŋke	ಜೋಳ	ʤoːḷa	ದಂಗು	ɖangu	ಕಾವು	kaːvu
3.	ಮೋಸ	moːsa	ದನಿ	ɖani	ಮಸಿ	masi	ಪದ್ಯ	paɖja	ಗಾಳಿ	gaḷi
4.	ಪೌರ	paura	ತಾವು	ʈaːvu	ಬರ	bara	ಶಿಲೆ	ʃile	ರಕ್ತ	rakʈa
5.	ನುಗ್ಗು	nuggu	ಕಲಿ	kali	ದಟ್ಟ	ɖaʈʈa	ಹಿಡಿ	hiḍi	ತೆನೆ	ʈene
6.	ಮಾತು	maːʈu	ನೋಟ	noːṭa	ಲಂಚ	lanʧa	ಗುಣ	guṇa	ಮಣಿ	maṇi
7.	ಕೊಬ್ಬು	kobbu	ಕೈಗೆ	kaige	ಸಸಿ	sasi	ತೂಕ	ʈuːka	ಸೊಳ್ಳೆ	soḷḷe
8.	ವೇಳೆ	veːḷe	ತಳ	ʈaḷa	ಗೆದ್ದು	geɖɖu	ಕೋಟೆ	koːʈe	ಚೀಟಿ	ʧiːṭi
9.	ಮಾರ್ಗ	maːrga	ದಯೆ	ɖaje	ನುಂಗು	nuŋgu	ನೀಚ	niːʧa	ಪುಡಿ	puḍi
10.	ನಾರಿ	naːri	ಪಾವು	paːvu	ವೈರಿ	vairi	ಮರಿ	mari	ಬೇರೆ	beːre
11.	ಕನ್ಯೆ	kanje	ಸುತ್ತ	suʈʈa	ದಣಿ	ɖaṇi	ಕದ	kaɖa	ಕಾಲ	kaːla
12.	ವಾದ	vaːɖa	ಬೀದಿ	biːɖi	ಕಾರ್ಯ	kaːrja	ಯುಗ	juga	ವನ್ಯ	vanja
13.	ವಾರ್ತೆ	vaːrʈe	ಮಣ್ಣು	maṇṇu	ನಾವು	naːvu	ಮಾವು	maːvu	ಸಂಗ	saŋga
14.	ಸೆಳೆ	seḷe	ಗದ್ಯ	gaɖja	ತಗ್ಗು	ʈaggu	ಸಿರಿ	siri	ರೋಮ	roːma
15.	ದಿಟ	ɖiṭa	ಸಾಲು	saːlu	ರಸ್ತೆ	rasʈe	ತಾಳು	ʈaːḷu	ಶ್ಲೋಕ	ʃloːka
16.	ಜಯ	ʤaja	ಮೌನ	mauna	ಗತಿ	gaʈi	ವಾದ್ಯ	vaːɖja	ಜಾಲ	ʤaːla
17.	ಕಂದ	kanɖa	ದರ್ಜೆ	ɖarʒe	ವೀರ	viːra	ತಿನ್ನು	ʈinnu	ನಿದ್ದೆ	niɖɖe
18.	ಲೆಕ್ಕ	lekka	ರಾಗಿ	raːgi	ಹಾದಿ	haːɖi	ಚಕ್ರ	ʧakra	ದೂರ	ɖuːra
19.	ಶೂಲ	ʃuːla	ಚೂರಿ	ʧuːri	ಸೇನೆ	seːne	ಸೇವೆ	seːve	ತಂತಿ	ʈanʈi
20.	ಹಾಳೆ	haːḷe	ಹನಿ	hani	ಯಮ	jama	ನಾಗ	naːga	ಮೌಲ್ಯ	maulja
21.	ರಾಯ	raːja	ಜಾವ	ʤaːva	ಡಿಕ್ಕಿ	ḍikki	ದೈವ	daiva	ವನ	vana
22.	ದುಡಿ	ɖuḍi	ಗಡಿ	gaḍi	ವಾರ	vaːra	ಜಿಲ್ಲೆ	ʤille	ದಯ	ɖaja
23.	ಸಿಂಹ	simha	ರೆಕ್ಕೆ	rekke	ಶೂನ್ಯ	ʃuːnja	ನರ	nara	ಗುರಿ	guri
24.	ಗಣಿ	gaṇi	ಲಯ	laja	ಲತೆ	laʈe	ಹಳೆ	haḷe	ಸವಿ	savi
25.	ಗಲ್ಲ	galla	ವರ	vara	ಕಾಳು	kaːḷu	ಸಲ	sala	ಗೆದ್ದ	geɖɖa

Sl no.	List 6		List 7		List 8		List 9		List 10	
1.	ದತ್ತು	ɖaʈʈu	ಶುರು	ʃuru	ಚೂಪು	ʧu:pu	ಸಾಕು	sa:ku	ದುಡ್ಡು	ɖuɖ̣ɖu
2.	ಕಣ	kaɳa	ಜೀವಿ	ʤi:vi	ಹಣೆ	haɳe	ಮಂಗ	manga	ರಜೆ	raʤe
3.	ಜನ್ಮ	ʤanma	ಕೊಡ	koɖa	ಬೆಲ್ಲ	bella	ಹಾರೆ	ha:re	ಶುಚಿ	ʃuʧi
4.	ಸರಿ	sari	ದರ್ಪ	ɖarpa	ಜಗಿ	ʤagi	ಚಿಂದಿ	ʧindi	ಮುದ್ದು	muɖdu
5.	ದಡ	ɖaɖa	ದುಂಬಿ	ɖumbi	ದಂಡೆ	ɖanɖe	ಗಿರಿ	giri	ತಂಪು	ʈampu
6.	ಸಾವು	sa:vu	ಸೇರಿ	se:ri	ನೌಕೆ	nauke	ಮಾಲೆ	ma:le	ನಕ್ಕ	nakka
7.	ಬೆಲೆ	bele	ಹೆಣ್ಣು	heɳɳu	ರೀತಿ	ri:ʈi	ತಿಂದು	tiɳdu	ಸಣ್ಣ	saɳɳa
8.	ಕಾಯ	ka:ja	ಸತಿ	saʈi	ದೂರು	du:ru	ಯೋಗ	jo:ga	ಬಂದ	banda
9.	ದರ	ɖara	ಮನ	mana	ಮಾಯೆ	ma:je	ನಟ	naʈa	ತೋಳ	ʈo:ɭa
10.	ತೆಂಗು	ʈengu	ಚಟ	ʧaʈa	ಕಲಿ	kali	ಬೀಜ	bi:ʤa	ಕೀವು	ki:vu
11.	ದೇವಿ	ɖe:vi	ಕೆಲ	kela	ಸರ್ವ	sarva	ನಾಶ	na:ʃa	ಹೊರ	hora
12.	ಕೋಟೆ	ko:ʈe	ತಿಳಿ	ʈiɭi	ತಾರೆ	ʈa:re	ಸೆರೆ	sere	ಸಾಲ	sa:la
13.	ತಾನು	ʈa:nu	ನಿಂತ	ninʈa	ದಾಟು	ɖa:ʈu	ತೇವ	ʈe:va	ವ್ರತ	vraʈa
14.	ವಶ	vaʃa	ವಾಸ	va:sa	ಪಲ್ಯ	palja	ಗಣ್ಯ	gaɲja	ಕೂಸು	ku:su
15.	ಗಾಳ	ga:ɭa	ದಾರಿ	da:ri	ವೇಗ	ve:ga	ವಜ	vaʤa	ಗಾದೆ	ga:de
16.	ಸದ್ಯ	saɖja	ಗುಪ್ತ	guptʈa	ಶೋಕ	ʃo:ka	ಪಾದ	pa:ɖa	ಮಗ	maga
17.	ನನ್ನ	nanna	ನೆಲೆ	nele	ದಾತ	ɖa:ʈa	ಕುಳ್ಳ	kuɭɭa	ಲೀನ	li:na
18.	ಗೀರು	gi:ru	ಗಾಯ	ga:ja	ಗಾಲಿ	ga:li	ತನಿ	ʈani	ಯುಕ್ತಿ	jukʈi
19.	ಬಾಹ್ಯ	ba:hja	ಪಾಲು	pa:lu	ನೀವು	ni:vu	ದ್ರವ	ɖrava	ಕ್ರಿಯೆ	krije
20.	ಹಾಳು	ha:ɭu	ದ್ವಾರ	dva:ra	ಸುಳಿ	suɭi	ಚಕ್ಕೆ	ʧakke	ಲಾಗ	la:ga
21.	ಸಾಗು	sa:gu	ಯುವ	juva	ಗಂಡ	ganɖa	ಸೋರು	so:ru	ದಿನ	ɖina
22.	ಮಚ್ಚೆ	maʧʧe	ಗಾನ	ga:na	ದೇವ	ɖe:va	ಲೀಲೆ	li:le	ವೆಂಗ್ಯ	vengja
23.	ಕುರ್ಚಿ	kurʧi	ಬೇಗ	be:ga	ಸೈನ್ಯ	sainja	ನವ್ಯ	navja	ಹಿಟ್ಟು	hiʈʈu
24.	ಲಾಲಿ	la:li	ರೋಗ	ro:ga	ಗರಿ	gari	ಕೊಡೆ	koɖe	ಕೊಳೆ	koɭe
25.	ಪುರಿ	puri	ವೈದ್ಯ	vaiɖja	ನೀಳ	ni:ɭa	ದಳ	ɖaɭa	ರನ್ನ	ranna

Sl no.	List 11		List 12		List 13		List 14		List 15	
1.	ತಾಗು	ʈaːgu	ತೀರ್ಪು	ʈiːrpu	ಹರ	hara	ಸಿಪ್ಪೆ	sippe	ಗೂಡೆ	guːɖe
2.	ಚಳಿ	ʧaḷi	ಲಾಟಿ	laːʈi	ಕೂಗು	kuːgu	ಜಾರು	ʤaːru	ಸಸ್ಯ	sasja
3.	ಕಾಡು	kaːɖu	ಬಾಯಿ	baːji	ಶಾಯಿ	ʃaːji	ಕೊಂದ	konɖa	ಜಾಣ	ʤaːṇa
4.	ಬಿಲ್ಲು	billu	ಜಗ	ʤaga	ದೊಣ್ಣೆ	ɖoṇṇe	ಬಾಳಿ	baːḷi	ತೀರ	ʈiːra
5.	ರೊಕ್ಕ	rokka	ಕರು	karu	ಕರ	kara	ತಟ್ಟು	ʈaṭṭu	ಕದ್ದು	kaɖɖu
6.	ಶೈಲಿ	ʃaili	ವಂಶ	vamʃa	ಮೀಸೆ	miːse	ರಚ್ಚೆ	ratʃʧe	ಮಾವ	maːva
7.	ಸಜ್ಜು	sadʒdʒu	ರೋಗಿ	roːgi	ನೈಜ	naidʒja	ಕೊಂಚ	kontʃa	ನ್ಯಾಯ	njaːja
8.	ಮೋರಿ	moːri	ಮಾಂಸ	maːmsa	ಬೇರು	beːru	ಹದ್ದು	haɖɖu	ಲೇಪ	leːpa
9.	ತೆಳು	ʈeḷu	ವಿದ್ಯೆ	viɖje	ವಾಕ್ಯ	vaːkja	ಶ್ರೇಣಿ	ʃreːṇi	ರಸ	rasa
10.	ಸೊನ್ನೆ	sonne	ನಲಿ	nali	ಹೌದು	haudu	ಮನ	mana	ತಂಗಿ	ʈangi
11.	ಯೋಗಿ	joːgi	ಕೊಳ	koḷa	ರಂಪ	rampa	ಕಿರಿ	kiri	ದಾವೆ	ɖaːve
12.	ಕಸ	kasa	ಯಾನ	jaːna	ನಗು	nagu	ತ್ಯಾಗ	ʈjaːga	ನೋವು	noːvu
13.	ತುದಿ	ʈuɖi	ಹಾಸು	haːsu	ಸದ	saɖa	ಮಾಸ	maːsa	ಕೆನ್ನೆ	kenne
14.	ಗ್ರಹ	graha	ಗೂಳಿ	guːli	ಲೇಸು	leːsu	ತೈಲ	ʈaila	ಗ್ರಾಮ	graːma
15.	ನಾರು	naːru	ಸುಣ್ಣ	suṇṇa	ಲೂಟಿ	luːʈi	ಗಂಡು	gandu	ಕಾಟ	kavʈa
16.	ದಾಸ	ɖaːsa	ಪಾರು	paːru	ಗಡ್ಡ	gaɖɖa	ತಡ	ʈaɖa	ನೆರೆ	nere
17.	ನವ	nava	ದೂತ	ɖuːʈa	ಯಾತ್ರೆ	jaːʈre	ಲಗ್ಗೆ	lagge	ವಸ್ತು	vasaʈu
18.	ಲೋಪ	loːpa	ನಮ್ಮ	namma	ಮೂಲ	muːla	ನಾದ	naːɖa	ಹೊಂದು	hoɳɖu
19.	ವ್ಯಯ	vjaja	ದೋಚು	ɖoːʧu	ತಮ್ಮ	ʈamma	ನುಲಿ	nuli	ಗೇಲಿ	geːli
20.	ಗವಿ	gavi	ರಾಶಿ	raːʃi	ವೆಚ್ಚ	veʧʧa	ವಾಯು	vaːju	ರಚ್ಚೆ	ratʃʧe
21.	ದಾನಿ	ɖaːni	ನೆಲ	nela	ನಿದ್ರೆ	niɖre	ನೆವ	neva	ಚೆಲ್ಲು	ʧellu
22.	ಪೂರ್ಣ	puːrṇa	ಗುಡ್ಡೆ	guɖɖe	ತಳ್ಳಿ	ʈaːḷḷi	ಸದ್ದು	saɖɖu	ತಿದ್ದು	ʈiɖɖu
23.	ಮುದಿ	muɖi	ಕವಿ	kavi	ಗೋಳು	goːḷu	ವ್ಯಕ್ತಿ	vjakʈi	ಶಾಪ	ʃaːpa
24.	ನಂಟು	naṇʈu	ದೊನ್ನೆ	ɖonne	ನಟಿ	naʈi	ಗೋಂದು	goːnɖu	ಬಳ್ಳಿ	baḷḷi
25.	ವೇದ	veːɖa	ತಿವಿ	ʈivi	ದಿಂಡು	ɖiṇɖu	ಸ್ವರ	svara	ಶೂರ	ʃuːra

Sl no.	List 16		List 17		List 18		List 19		List 20	
1.	ಸೋಲು	soːlu	ಚಾಟಿ	tʃaːt̪i	ಕ್ರಮ	krama	ಕುದಿ	kud̪i	ಕದ್ದ	kad̪d̪a
2.	ತೊಡೆ	t̪od̪e	ಕೋಶ	koːʃa	ಹಿಂದೆ	hind̪e	ಗಟ್ಟಿ	gat̪t̪i	ಲಾಳ	laːl̪a
3.	ಕಣಿ	kaɳi	ಯತ್ನ	jat̪na	ಪಿತ್ತ	pit̪t̪a	ನೇರ	neːra	ತಾಜ	t̪aːdʒa
4.	ತಾಸು	t̪aːsu	ಕಾಯಿ	kaːji	ದೇಶ	d̪eːʃa	ದಿಮ್ಮಿ	d̪immi	ಸ್ವರ್ಗ	svarga
5.	ಮೂಕ	muːka	ಗಾತ್ರ	gaːt̪ra	ಬರೆ	bare	ಕಲ್ಲು	kallu	ಕಂದು	kand̪u
6.	ದೋಶ	d̪oːʃa	ಬಗ್ಗೆ	bagge	ಜೇಡ	dʒeːd̪a	ವರ್ಣ	varɳa	ಲಾಟಿ	laːt̪i
7.	ನೀತಿ	niːt̪i	ಜೋಲಿ	joːli	ಚಿತ್ರ	tʃit̪ra	ಕಿಚ್ಚು	kitʃtʃu	ಗಲ್ಲಿ	galli
8.	ಕಾಲ	kaːla	ತಂಗು	t̪angu	ಸೇರು	seːru	ದೆಸೆ	d̪ese	ಹಗೆ	hage
9.	ಚೆನ್ನ	tʃenna	ದೊರೆ	d̪ore	ಗುರು	guru	ಬರಿ	bari	ಮೇವು	meːvu
10.	ಶೌರ್ಯ	ʃaurja	ಲಾಯ	laːja	ಸುತೆ	sut̪e	ಜೀವ	dʒiːva	ಸಂದಿ	sand̪i
11.	ಗೀತೆ	giːt̪e	ಮಾರು	maːru	ಕಾವಿ	kaːvi	ಶ್ವಾಸ	ʃvaːsa	ಕಂತು	kant̪u
12.	ದೃಶ್ಯ	d̪ruʃja	ವಾಸಿ	vaːsi	ನಿನ್ನ	ninna	ತೋಡು	t̪oːd̪u	ಯಾತ್ರಿ	jaːt̪ri
13.	ಜ್ವಾಲೆ	dʒvaːle	ಸಣ್ಣ	saɳɳa	ಸೀಳು	siːl̪u	ಲಿಪಿ	lipi	ನಯ	naja
14.	ರದ್ದು	radd̪u	ತುಳಿ	t̪ul̪i	ಗೊತ್ತು	got̪t̪u	ವಾಸ್ತು	vaːst̪u	ಹೊನ್ನು	honnu
15.	ಟೊಳ್ಳು	t̪ol̪l̪u	ವಕ್ರ	vakra	ಲೋಳೆ	loːl̪e	ನೂರು	nuːru	ಬೆಳ್ಳಿ	bel̪l̪i
16.	ಹಗ್ಗ	hagga	ನುಚ್ಚು	nutʃtʃu	ಲಿಂಗ	linga	ಗಿಡ	gid̪a	ನೆನ್ನೆ	nenne
17.	ವಿಶ್ವ	viʃva	ಹೋದ	hoːd̪a	ಗದೆ	gad̪e	ಕಳೆ	kal̪e	ವಿದ್ಯಾ	vid̪ja
18.	ಕ್ರೂರ	kruːra	ಮಾಡಿ	maːd̪i	ವಾಲು	vaːlu	ಬಾಲ್ಯ	baːlja	ರಾಜಿ	raːdʒi
19.	ಬೆಂದ	bend̪a	ಪೊರೆ	pore	ಕನ್ಯಾ	kanjaː	ಮೊಗ್ಗು	moggu	ಸಾರಿ	saːri
20.	ಗುಹೆ	guhe	ಹಂದಿ	hand̪i	ದೂಕು	d̪uːku	ಹಾಗು	haːgu	ಮಡಿ	mad̪i
21.	ಪುರ	pura	ಗೊನೆ	gone	ವ್ಯಕ್ತ	vjakt̪i	ಮೀನ	miːna	ಪಾಶ	paːʃa
22.	ಜಾಗ	dʒaːga	ವಸು	vasu	ದಂಟು	d̪ant̪u	ರಾಜ್ಯ	raːdʒja	ಚೂರ್ಣ	tʃuːrɳa
23.	ದಾನ	d̪aːna	ದ್ವೀಪ	d̪viːpa	ಬಣ್ಣ	baɳɳa	ತಂದ	t̪and̪a	ಮುದ್ದು	mud̪d̪u
24.	ಮಾನ್ಯ	maːnja	ದೇಶಿ	d̪eːʃi	ಮಾಯ	maːja	ನಾಳೆ	naːl̪e	ತೀವ್ರ	t̪iːvra
25.	ಸವೆ	save	ನೂಲು	nuːlu	ನಾವೆ	naːve	ಪಂದ್ಯ	pand̪ja	ಬೀಗು	biːgu

Sl no.	List 21		List 22		List 23		List 24		List 25	
1.	ಚಿಪ್ಪು	ʧippu	ಬೇವು	beːvu	ಸಿಕ್ಕ	sikka	ಕರೆ	kare	ಹಿಗ್ಗು	higgu
2.	ನಾನಾ	naːna	ಕ್ರೀಡೆ	kriːde	ಮಾಜಿ	maːʤi	ಹೊಲ	hola	ಕೆಂಡ	kenḍa
3.	ಹುಲಿ	huli	ಹೇಳು	heːḷu	ಪರ್ವ	parva	ಮುದ್ದೆ	muḍḍe	ನೀಲ	niːla
4.	ಗೊಜ್ಜು	goʤʤu	ಲಜ್ಜೆ	laʤʤe	ಬಾಳೆ	baːḷe	ತಾಳ	ṭaːḷa	ಮರೆ	mare
5.	ತಾಳ್ಮೆ	ṭaːḷme	ಸಿಕ್ಕು	sikku	ದೊಡ್ಡ	doḍḍa	ರೂಪ	ruːpa	ಸತ್ವ	saṭva
6.	ಸೊತ್ತು	soṭṭu	ವರ್ಗ	varga	ತೊರೆ	ṭore	ನಾಣ್ಯ	naːṇja	ಜೋರು	ʤoːru
7.	ಗುಬ್ಬಿ	gubbi	ತತ್ವ	ṭaṭava	ದಂಡ	ḍanḍa	ಪೇಟ	peːṭa	ಚೊಕ್ಕ	ʧokka
8.	ಕೇಶ	keːʃa	ಶಿಶು	ʃiʃu	ಸಮ	sama	ಗೂಡು	guːḍu	ವೃತ್ತ	vruṭṭa
9.	ಕೇರಿ	keːri	ನಾನು	naːnu	ಕೂಲಿ	koːli	ಜ್ವರ	ʤvara	ಪೇಟೆ	peːṭe
10.	ನಿಂದೆ	ninde	ದೋಸೆ	doːse	ಚಿನ್ನ	ʧinna	ಹುದ್ದೆ	huḍḍe	ಯತಿ	jaṭi
11.	ದಾಡಿ	ḍaːdi	ಚಿರ	ʧira	ದಾಹ	daːha	ಸುಲಿ	suli	ಬಾಲೆ	baːle
12.	ಶಿರ	ʃira	ಸಾದ	saːḍa	ನೊರೆ	nore	ರತ್ನ	raṭna	ನೃತ್ಯ	nruṭja
13.	ಬಾವಿ	baːvi	ಗಂಜಿ	ganʤi	ಲೋಕ	loːka	ಶವ	ʃava	ದಾಳಿ	ḍaːḷi
14.	ಸೌದೆ	saouḍe	ನಿನ್ನ	ninna	ರೇಗು	reːgu	ನಿತ್ಯ	niṭja	ವಸ್ತ್ರ	vasṭra
15.	ಬಲಿ	bali	ಯೋಗ್ಯ	joːgja	ನಾಟ್ಯ	naːṭja	ಮಿಂಚು	minʧu	ಲಗ್ನ	lagna
16.	ವೀರ್ಯ	viːrja	ಕೂರು	kuːru	ನಿಂತು	niṇṭu	ಬಿಳಿ	biḷi	ಬೂದಿ	buːḍi
17.	ಗೋಣು	goːṇu	ಮಂದ	manḍa	ಹಣ್ಣು	haṇṇu	ಯಾಗ	jaːga	ನಶೆ	naʃe
18.	ಗಜ	gaʤa	ಬೇಳೆ	beːḷe	ರಾಗ	raːga	ದಿಕ್ಕು	ḍikku	ದೂಪ	ḍuːpa
19.	ಯಂತ್ರ	jaṇṭra	ದಿನ	ḍina	ದಶ	ḍaʃa	ಬಿಲ	bila	ವಶ	vaʃa
20.	ಪಟ	paṭa	ಮದ	maḍa	ಲಾವಾ	laːva	ದಡ್ಡ	daḍḍa	ರಂಗು	rangu
21.	ಸೇವಾ	seːva	ಲಾಡು	laːḍu	ಸತ್ಯ	saṭja	ನಗೆ	nage	ದೆಗೆ	ḍege
22.	ನರಿ	nari	ತೊಲೆ	ṭole	ಗುಟ್ಟು	guṭṭu	ವಸ್ತು	vasṭu	ಕೋಣೆ	koːṇe
23.	ಕಾದ	kaːḍa	ರಣ	raṇa	ಶಲ್ಯ	ʃalja	ಸಲ್ಲು	sallu	ಗುಂಡಿ	guṇḍi
24.	ವಲ್ಲಿ	valli	ಪಟ್ಟಿ	paṭṭi	ವಾದಿ	vaːḍi	ಕರಿ	kari	ಕೋಲು	koːlu
25.	ಮುದ್ರೆ	muḍre	ವ್ಯಯಿ	vjaji	ಗುಳ್ಳೆ	guḷḷe	ಗದ್ದೆ	gaḍḍe	ಸೀದ	siːḍa

APPENDIX B

Note: To be used in Quiet.

Sl no.	AKW Practice List		AKW List1		AKW List2		AKW List 3		AKW List 4	
1.	ಹದ	haɖa	ಸುರಿ	suri	ಪೊದೆ	poɖe	ದತ್ತು	ɖaʈʈu	ಶುರು	ʃuru
2.	ಕಾವು	kaːvu	ಶಂಕೆ	ʃaŋke	ಜೋಳ	dʒoːɭa	ಕಣ	kaɳa	ಜೀವಿ	dʒiːvi
3.	ಗಾಳಿ	gaɭi	ದನಿ	ɖani	ಮಸಿ	masi	ಜನ್ಮ	dʒanma	ಕೊಡ	koɖa
4.	ರಕ್ತ	rakʈa	ತಾವು	ʈaːvu	ಬರ	bara	ಸರಿ	sari	ದರ್ಪ	ɖarpa
5.	ತೆನೆ	ʈene	ಕಲಿ	kali	ದಟ್ಟ	ɖaʈʈa	ದಡ	ɖaɖa	ದುಂಬಿ	ɖumbi
6.	ಮಣಿ	maɳi	ನೋಟ	noːʈa	ಲಂಚ	lantʃa	ಸಾವು	saːvu	ಸೇರಿ	seːri
7.	ಸೊಳ್ಳೆ	soɭɭe	ಕೈಗೆ	kaige	ಸಸಿ	sasi	ಬೆಲೆ	bele	ಹೆಣ್ಣು	heɳɳu
8.	ಚೀಟಿ	tʃiːʈi	ತಳ	ʈaɭa	ಗೆದ್ದು	geɖɖu	ಕಾಯ	kaːja	ಸತಿ	saʈi
9.	ಪುಡಿ	puɖi	ದಯೆ	ɖaje	ನುಂಗು	nuŋgu	ದರ	ɖara	ಮನ	mana
10.	ಬೇರೆ	beːre	ಪಾವು	paːvu	ವೈರಿ	vairi	ತೆಂಗು	ʈengu	ಚಟ	tʃaʈa
11.	ಕಾಲ	kaːla	ಸುತ್ತ	suʈʈa	ದಣಿ	ɖaɳi	ದೇವಿ	ɖeːvi	ಕೆಲ	kela
12.	ವನ್ಯ	vanja	ಬೀದಿ	biːɖi	ಕಾರ್ಯ	kaːrja	ಕೋಟೆ	koːʈe	ತಿಳಿ	ʈiɭi
13.	ಸಂಗ	saŋga	ಮಣ್ಣು	maɳɳu	ನಾವು	naːvu	ತಾನು	ʈaːnu	ನಿಂತ	niʈa
14.	ರೋಮ	roːma	ಗದ್ಯ	gaɖja	ತಗ್ಗು	ʈaggu	ವಶ	vaʃa	ವಾಸ	vaːsa
15.	ಶ್ಲೋಕ	ʃloːka	ಸಾಲು	saːlu	ರಸ್ತೆ	rasʈe	ಗಾಳ	gaːɭa	ದಾರಿ	daːri
16.	ಜಾಲ	dʒaːla	ಮೌನ	mauna	ಗತಿ	gaʈi	ಸದ್ಯ	saɖja	ಗುಪ್ತ	gupʈa
17.	ನಿದ್ದೆ	niɖɖe	ದರ್ಜೆ	ɖarʒe	ವೀರ	viːra	ನನ್ನ	nanna	ನೆಲೆ	nele
18.	ದೂರ	ɖuːra	ರಾಗಿ	raːgi	ಹಾದಿ	haːɖi	ಗೀರು	giːru	ಗಾಯ	gaːja
19.	ತಂತಿ	ʈanʈi	ಚೂರಿ	tʃuːri	ಸೇನೆ	seːne	ಬಾಹ್ಯ	baːhja	ಪಾಲು	paːlu
20.	ಮೌಲ್ಯ	maulja	ಹನಿ	hani	ಯಮ	jama	ಹಾಳು	haːɭu	ದ್ವಾರ	dvaːra
21.	ವನ	vana	ಜಾವ	dʒaːva	ಡಿಕ್ಕಿ	ɖikki	ಸಾಗು	saːgu	ಯುವ	juva
22.	ದಯ	ɖaja	ಗಡಿ	gaɖi	ವಾರ	vaːra	ಮಚ್ಚೆ	matʃtʃe	ಗಾನ	gaːna
23.	ಗುರಿ	guri	ರೆಕ್ಕೆ	rekke	ಶೂನ್ಯ	ʃuːnja	ಕುರ್ಚಿ	kurtʃi	ಬೇಗ	beːga
24.	ಸವಿ	savi	ಲಯ	laja	ಲತೆ	laʈe	ಲಾಲಿ	laːli	ರೋಗ	roːga
25.	ಗೆದ್ದ	geɖɖa	ವರ	vara	ಕಾಳು	kaːɭu	ಪುರಿ	puri	ವೈದ್ಯ	vaiɖja

Sl no.	AKW List 5		AKW List 6		AKW List 7		AKW List 8		AKW List 9	
1.	ಚೂಪು	tʃu:pu	ಸಾಕು	sa:ku	ದುಡ್ಡು	ɖuɖ̣ɖ̣u	ತಾಗು	ʈa:gu	ಹರ	hara
2.	ಹಣೆ	haɳe	ಮಂಗ	manga	ರಜೆ	radʒe	ಚಳಿ	tʃaɭ̣i	ಕೂಗು	ku:gu
3.	ಬೆಲ್ಲ	bella	ಹಾರೆ	ha:re	ಶುಚಿ	ʃutʃi	ಕಾಡು	ka:ɖ̣u	ಶಾಯಿ	ʃa:ji
4.	ಜಗಿ	dʒagi	ಚಿಂದಿ	tʃinɖ̣i	ಮುದ್ದು	muɖ̣ɖ̣u	ಬಿಲ್ಲು	billu	ದೊಣ್ಣೆ	ɖ̣oɳ̣ɳe
5.	ದಂಡೆ	ɖ̣anɖ̣e	ಗಿರಿ	giri	ತಂಪು	ʈampu	ರೊಕ್ಕ	rokka	ಕರ	kara
6.	ನೌಕೆ	nauke	ಮಾಲೆ	ma:le	ನಕ್ಕ	nakka	ಶೈಲಿ	ʃaili	ಮೀಸೆ	mi:se
7.	ರೀತಿ	ri:ʈi	ತಿಂದು	tinɖ̣u	ಸಣ್ಣ	saɳɳa	ಸಜ್ಜು	sadʒdʒu	ನೈಜ	naidʒja
8.	ದೂರು	du:ru	ಯೋಗ	jo:ga	ಬಂದ	banda	ಮೋರಿ	mo:ri	ಬೇರು	be:ru
9.	ಮಾಯೆ	ma:je	ನಟ	naʈa	ತೋಳ	ʈo:ɭ̣a	ತೆಳು	ʈeɭ̣u	ವಾಕ್ಯ	va:kja
10.	ಕಲಿ	kali	ಬೀಜ	bi:dʒa	ಕೀವು	ki:vu	ಸೊನ್ನೆ	sonne	ಹೌದು	haud̪u
11.	ಸರ್ವ	sarva	ನಾಶ	na:ʃa	ಹೊರ	hora	ಯೋಗಿ	jo:gi	ರಂಪ	rampa
12.	ತಾರೆ	ʈa:re	ಸೆರೆ	sere	ಸಾಲ	sa:la	ಕಸ	kasa	ನಗು	nagu
13.	ದಾಟು	ɖ̣a:ʈu	ತೇವ	ʈe:va	ವ್ರತ	vraʈa	ತುದಿ	ʈud̪i	ಸದ	saɖ̣a
14.	ಪಲ್ಯ	palja	ಗಣ್ಯ	gaɳja	ಕೂಸು	ku:su	ಗ್ರಹ	graha	ಲೇಸು	le:su
15.	ವೇಗ	ve:ga	ವಜ	vadʒa	ಗಾದೆ	ga:de	ನಾರು	na:ru	ಲೂಟಿ	lu:ʈi
16.	ಶೋಕ	ʃo:ka	ಪಾದ	pa:ɖ̣a	ಮಗ	maga	ದಾಸ	ɖ̣a:sa	ಗಡ್ಡ	gaɖ̣ɖ̣a
17.	ದಾತ	ɖ̣a:ʈa	ಕುಳ್ಳ	kuɭ̣ɭ̣a	ಲೀನ	li:na	ನವ	nava	ಯಾತ್ರೆ	ja:ʈre
18.	ಗಾಲಿ	ga:li	ತನಿ	ʈani	ಯುಕ್ತಿ	jukʈi	ಲೋಪ	lo:pa	ಮೂಲ	mu:la
19.	ನೀವು	ni:vu	ದ್ರವ	ɖ̣rava	ಕ್ರಿಯೆ	krije	ವ್ಯಯ	vjaja	ತಮ್ಮ	ʈamma
20.	ಸುಳಿ	suɭ̣i	ಚಕ್ಕೆ	tʃakke	ಲಾಗ	la:ga	ಗವಿ	gavi	ವೆಚ್ಚ	vetʃtʃa
21.	ಗಂಡ	ganɖ̣a	ಸೋರು	so:ru	ದಿನ	ɖ̣ina	ದಾನಿ	ɖ̣a:ni	ನಿದ್ರೆ	niɖ̣re
22.	ದೇವ	ɖ̣e:va	ಲೀಲೆ	li:le	ವೆಂಗ್ಯ	vengja	ಪೂರ್ಣ	pu:rɳa	ತಳ್ಳಿ	ʈaɭ̣ɭ̣i
23.	ಸೈನ್ಯ	sainja	ನವ್ಯ	navja	ಹಿಟ್ಟು	hiʈʈu	ಮುದಿ	muɖ̣i	ಗೋಳು	go:ɭ̣u
24.	ಗರಿ	gari	ಕೊಡೆ	koɖ̣e	ಕೊಳೆ	koɭ̣e	ನಂಟು	nanʈu	ನಟಿ	naʈi
25.	ನೀಳ	ni:ɭ̣a	ದಳ	ɖ̣aɭ̣a	ರನ್ನ	ranna	ವೇದ	ve:ɖ̣a	ದಿಂಡು	ɖ̣inɖ̣u

Sl no.	AKW List 10		AKW List 11		AKW List 12		AKW List 13		AKW List 14	
1.	ಸಿಪ್ಪೆ	sippe	ಗೂಡೆ	guːḍe	ಸೋಲು	soːlu	ಚಾಟಿ	ʧaːṭi	ಕ್ರಮ	krama
2.	ಜಾರು	ʤaːru	ಸಸ್ಯ	sasja	ತೊಡೆ	ṭoḍe	ಕೋಶ	koːʃa	ಹಿಂದೆ	hinḍe
3.	ಕೊಂದ	konḍa	ಜಾಣ	ʤaːṇa	ಕಣಿ	kaṇi	ಯತ್ನ	jaṭna	ಪಿತ್ತ	piṭṭa
4.	ಬಾಳಿ	baːḷi	ತೀರ	ṭiːra	ತಾಸು	ṭaːsu	ಕಾಯಿ	kaːji	ದೇಶ	ḍeːʃa
5.	ತಟ್ಟು	ṭaṭṭu	ಕದ್ದು	kaḍḍu	ಮೂಕ	muːka	ಗಾತ್ರ	gaːṭra	ಬರೆ	bare
6.	ರಚ್ಚೆ	raʧʧe	ಮಾವ	maːva	ದೋಶ	ḍoːʃa	ಬಗ್ಗೆ	bagge	ಜೇಡ	ʤeːḍa
7.	ಕೊಂಚ	kontʃa	ನ್ಯಾಯ	njaːja	ನೀತಿ	niːṭi	ಜೋಲಿ	joːli	ಚಿತ್ರ	ʧiṭra
8.	ಹದ್ದು	haḍḍu	ಲೇಪ	leːpa	ಕಾಲ	kaːla	ತಂಗು	ṭangu	ಸೇರು	seːru
9.	ಶ್ರೇಣಿ	ʃreːṇi	ರಸ	rasa	ಚೆನ್ನ	ʧenna	ದೊರೆ	ḍore	ಗುರು	guru
10.	ಮನ	mana	ತಂಗಿ	ṭangi	ಶೌರ್ಯ	ʃaurja	ಲಾಯ	laːja	ಸುತೆ	suṭe
11.	ಕಿರಿ	kiri	ದಾವೆ	ḍaːve	ಗೀತೆ	giːṭe	ಮಾರು	maːru	ಕಾವಿ	kaːvi
12.	ತ್ಯಾಗ	ṭjaːga	ನೋವು	noːvu	ದೃಶ್ಯ	ḍruʃja	ವಾಸಿ	vaːsi	ನಿನ್ನ	ninna
13.	ಮಾಸ	maːsa	ಕೆನ್ನೆ	kenne	ಜ್ವಾಲೆ	ʤvaːle	ಸಣ್ಣ	saṇṇa	ಸೀಳು	siːḷu
14.	ತೈಲ	ṭaila	ಗ್ರಾಮ	graːma	ರದ್ದು	raḍḍu	ತುಳಿ	ṭuḷi	ಗೊತ್ತು	goṭṭu
15.	ಗಂಡು	gandu	ಕಾಟ	kavṭa	ಟೊಳ್ಳು	ṭoḷḷu	ವಕ್ರ	vakra	ಲೋಳೆ	loːḷe
16.	ತಡ	ṭaḍa	ನೆರೆ	nere	ಹಗ್ಗ	hagga	ನುಚ್ಚು	nuʧʧu	ಲಿಂಗ	linga
17.	ಲಗ್ಗೆ	lagge	ವಸ್ತು	vasaṭu	ವಿಶ್ವ	viʃva	ಹೋದ	hoːḍa	ಗದೆ	gaḍe
18.	ನಾದ	naːḍa	ಹೊಂದು	honḍu	ಕ್ರೂರ	kruːra	ಮಾಡಿ	maːḍi	ವಾಲು	vaːlu
19.	ನುಲಿ	nuli	ಗೇಲಿ	geːli	ಬೆಂದ	benḍa	ಪೊರೆ	pore	ಕನ್ಯಾ	kanjaː
20.	ವಾಯು	vaːju	ರಚ್ಚೆ	raʧʧe	ಗುಹೆ	guhe	ಹಂದಿ	handi	ದೂಕು	ḍuːku
21.	ನೆವ	neva	ಚೆಲ್ಲು	ʧellu	ಪುರ	pura	ಗೊನೆ	gone	ವ್ಯಕ್ತ	vjakṭi
22.	ಸದ್ದು	saḍḍu	ತಿದ್ದು	ṭiḍḍu	ಜಾಗ	ʤaːga	ವಸು	vasu	ದಂಟು	ḍaṇṭu
23.	ವ್ಯಕ್ತಿ	vjakṭi	ಶಾಪ	ʃaːpa	ದಾನ	ḍaːna	ದ್ವೀಪ	ḍviːpa	ಬಣ್ಣ	baṇṇa
24.	ಗೋಂದು	goːndu	ಬಳ್ಳಿ	baḷḷi	ಮಾನ್ಯ	maːnja	ದೇಶಿ	ḍeːʃi	ಮಾಯ	maːja
25.	ಸ್ವರ	svara	ಶೂರ	ʃuːra	ಸವೆ	save	ನೂಲು	nuːlu	ನಾವೆ	naːve

Sl no.	AKW List 15		AKW List 16		AKW List 17		AKW List 18		AKW List 19	
1.	ಕುದಿ	kuḍi	ಕದ್ದ	kaḍḍa	ಚಿಪ್ಪು	ʧippu	ಬೇವು	beːvu	ಸಿಕ್ಕ	sikka
2.	ಗಟ್ಟಿ	gaṭṭi	ಲಾಳ	laːḷa	ನಾನಾ	naːna	ಕ್ರೀಡೆ	kriːde	ಮಾಜಿ	maːʤi
3.	ನೇರ	neːra	ತಾಜ	ṭaːʤa	ಹುಲಿ	huli	ಹೇಳು	heːḷu	ಪರ್ವ	parva
4.	ದಿಮ್ಮಿ	ḍimmi	ಸ್ವರ್ಗ	svarga	ಗೊಜ್ಜು	goʤʤu	ಲಜ್ಜೆ	laʤʤe	ಬಾಳೆ	baːḷe
5.	ಕಲ್ಲು	kallu	ಕಂದು	kanḍu	ತಾಳ್ಮೆ	ṭaːḷme	ಸಿಕ್ಕು	sikku	ದೊಡ್ಡ	doḍḍa
6.	ವರ್ಣ	varṇa	ಲಾಟಿ	laːṭi	ಸೊತ್ತು	soṭṭu	ವರ್ಗ	varga	ತೊರೆ	ṭore
7.	ಕಿಚ್ಚು	kiʧʧu	ಗಲ್ಲಿ	galli	ಗುಬ್ಬಿ	gubbi	ತತ್ವ	ṭaṭava	ದಂಡ	ḍanḍa
8.	ದೆಸೆ	ḍese	ಹಗೆ	hage	ಕೇಶ	keːʃa	ಶಿಶು	ʃiʃu	ಸಮ	sama
9.	ಬರಿ	bari	ಮೇವು	meːvu	ಕೇರಿ	keːri	ನಾನು	naːnu	ಕೂಲಿ	koːli
10.	ಜೀವ	ʤiːva	ಸಂದಿ	sanḍi	ನಿಂದೆ	ninde	ದೋಸೆ	doːse	ಚಿನ್ನ	ʧinna
11.	ಶ್ವಾಸ	ʃvaːsa	ಕಂತು	kanṭu	ದಾಡಿ	ḍaːḍi	ಚಿರ	ʧira	ದಾಹ	daːha
12.	ತೋಡು	ṭoːḍu	ಯಾತ್ರಿ	jaːṭri	ಶಿರ	ʃira	ಸಾದ	saːḍa	ನೊರೆ	nore
13.	ಲಿಪಿ	lipi	ನಯ	naja	ಬಾವಿ	baːvi	ಗಂಜಿ	ganʤi	ಲೋಕ	loːka
14.	ವಾಸ್ತು	vaːsṭu	ಹೊನ್ನು	honnu	ಸೌದೆ	saouḍe	ನಿನ್ನ	ninna	ರೇಗು	reːgu
15.	ನೂರು	nuːru	ಬೆಳ್ಳಿ	beḷḷi	ಬಲಿ	bali	ಯೋಗ್ಯ	joːgja	ನಾಟ್ಯ	naːṭja
16.	ಗಿಡ	giḍa	ನೆನ್ನೆ	nenne	ವೀರ್ಯ	viːrja	ಕೂರು	kuːru	ನಿಂತು	niṇṭu
17.	ಕಳೆ	kaḷe	ವಿದ್ಯಾ	viḍja	ಗೋಣು	goːṇu	ಮಂದ	manḍa	ಹಣ್ಣು	haṇṇu
18.	ಬಾಲ್ಯ	baːlja	ರಾಜಿ	raːʤi	ಗಜ	gaʤa	ಬೇಳೆ	beːḷe	ರಾಗ	raːga
19.	ಮೊಗ್ಗು	moggu	ಸಾರಿ	saːri	ಯಂತ್ರ	jaṇṭra	ದಿನ	ḍina	ದಶ	ḍaʃa
20.	ಹಾಗು	haːgu	ಮಡಿ	maḍi	ಪಟ	paṭa	ಮದ	maḍa	ಲಾವಾ	laːva
21.	ಮೀನ	miːna	ಪಾಶ	paːʃa	ಸೇವಾ	seːva	ಲಾಡು	laːḍu	ಸತ್ಯ	saṭja
22.	ರಾಜ್ಯ	raːʤja	ಚೂರ್ಣ	ʧuːrṇa	ನರಿ	nari	ತೊಲೆ	ṭole	ಗುಟ್ಟು	guṭṭu
23.	ತಂದ	ṭanḍa	ಮುದ್ದು	muḍḍu	ಕಾದ	kaːḍa	ರಣ	raṇa	ಶಲ್ಯ	ʃalja
24.	ನಾಳೆ	naːḷe	ತೀವ್ರ	ṭiːvra	ವಲ್ಲಿ	valli	ಪಟ್ಟಿ	paṭṭi	ವಾದಿ	vaːḍi
25.	ಪಂದ್ಯ	panḍja	ಬೀಗು	biːgu	ಮುದ್ರೆ	muḍre	ವ್ಯಯಿ	vjaji	ಗುಳ್ಳೆ	guḷḷe

Sl no.	AKW List 20		AKW List 21		AKW List22		AKW List 23		AKW List 24	
1.	ಕರೆ	kare	ಹಿಗ್ಗು	higgu	ದೀನ	diːna	ರೆಂಬೆ	rembe	ತೀರ್ಪು	t̪iːrpu
2.	ಹೊಲ	hola	ಕೆಂಡ	kenḍa	ಚಿತ್ತ	ʧit̪t̪a	ದಂಗು	d̪angu	ಲಾಟಿ	laːt̪i
3.	ಮುದ್ದೆ	mud̪d̪e	ನೀಲ	niːla	ಮೋಸ	moːsa	ಪದ್ಯ	pad̪ja	ಬಾಯಿ	baːji
4.	ತಾಳ	t̪aːl̪a	ಮರೆ	mare	ಪೌರ	paura	ಶಿಲೆ	ʃile	ಜಗ	ʤaga
5.	ರೂಪ	ruːpa	ಸತ್ವ	sat̪va	ನುಗ್ಗು	nuggu	ಹಿಡಿ	hiḍi	ಕರು	karu
6.	ನಾಣ್ಯ	naːn̪ja	ಜೋರು	ʤoːru	ಮಾತು	maːt̪u	ಗುಣ	guṇa	ವಂಶ	vamʃa
7.	ಪೇಟ	peːt̪a	ಚೊಕ್ಕ	ʧokka	ಕೊಬ್ಬು	kobbu	ತೂಕ	t̪uːka	ರೋಗಿ	roːgi
8.	ಗೂಡು	guːḍu	ವೃತ್ತ	vrut̪t̪a	ವೇಳೆ	veːl̪e	ಕೋಟೆ	koːt̪e	ಮಾಂಸ	maːmsa
9.	ಜ್ವರ	ʤvara	ಪೇಟೆ	peːt̪e	ಮಾರ್ಗ	maːrga	ನೀಚ	niːʧa	ವಿದ್ಯೆ	vid̪je
10.	ಹುದ್ದೆ	hud̪d̪e	ಯತಿ	jat̪i	ನಾರಿ	naːri	ಮರಿ	mari	ನಲಿ	nali
11.	ಸುಲಿ	suli	ಬಾಲೆ	baːle	ಕನ್ಯೆ	kanje	ಕದ	kad̪a	ಕೊಳ	koḷa
12.	ರತ್ನ	rat̪na	ನೃತ್ಯ	nrut̪ja	ವಾದ	vaːd̪a	ಯುಗ	juga	ಯಾನ	jaːna
13.	ಶವ	ʃava	ದಾಳಿ	d̪aːl̪i	ವಾರ್ತೆ	vaːrt̪e	ಮಾವು	maːvu	ಹಾಸು	haːsu
14.	ನಿತ್ಯ	nit̪ja	ವಸ್ತ್ರ	vast̪ra	ಸೆಳೆ	seḷe	ಸಿರಿ	siri	ಗೂಳಿ	guːli
15.	ಮಿಂಚು	mintʃu	ಲಗ್ನ	lagna	ದಿಟ	d̪iṭa	ತಾಳು	t̪aːl̪u	ಸುಣ್ಣ	suṇṇa
16.	ಬಿಳಿ	biḷi	ಬೂದಿ	buːd̪i	ಜಯ	ʤaja	ವಾದ್ಯ	vaːd̪ja	ಪಾರು	paːru
17.	ಯಾಗ	jaːga	ನಶೆ	naʃe	ಕಂದ	kand̪a	ತಿನ್ನು	t̪innu	ದೂತ	d̪uːt̪a
18.	ದಿಕ್ಕು	d̪ikku	ದೂಪ	d̪uːpa	ಲೆಕ್ಕ	lekka	ಚಕ್ರ	ʧakra	ನಮ್ಮ	namma
19.	ಬಿಲ	bila	ವಶ	vaʃa	ಶೂಲ	ʃuːla	ಸೇವೆ	seːve	ದೋಚು	d̪oːʧu
20.	ದಡ್ಡ	d̪aḍḍa	ರಂಗು	rangu	ಹಾಳೆ	haːl̪e	ನಾಗ	naːga	ರಾಶಿ	raːʃi
21.	ನಗೆ	nage	ದೆಗೆ	d̪ege	ರಾಯ	raːja	ದೈವ	daiva	ನೆಲ	nela
22.	ವಸ್ತು	vast̪u	ಕೋಣೆ	koːn̪e	ದುಡಿ	d̪uḍi	ಜಿಲ್ಲೆ	ʤille	ಗುಡ್ಡೆ	guḍḍe
23.	ಸಲ್ಲು	sallu	ಗುಂಡಿ	gund̪i	ಸಿಂಹ	simha	ನರ	nara	ಕವಿ	kavi
24.	ಕರಿ	kari	ಕೋಲು	koːlu	ಗಣಿ	gan̪i	ಹಳೆ	haḷe	ದೊನ್ನೆ	d̪onne
25.	ಗದ್ದೆ	gad̪d̪e	ಸೀದ	siːd̪a	ಗಲ್ಲ	galla	ಸಲ	sala	ತಿವಿ	t̪ivi

APPENDIX C

Note: To be used with noise.

Sl no.	AKW Practice List		AKW List1		AKW List2		AKW List 3		AKW List 4	
1.	ಹದ	haɖa	ಸುರಿ	suri	ಪೊದೆ	poɖe	ದತ್ತು	ɖaʈʈu	ಶುರು	ʃuru
2.	ಕಾವು	kaːvu	ಶಂಕೆ	ʃaŋke	ಜೋಳ	dʒoːl̥a	ಕಣ	kaɳa	ಜೀವಿ	dʒiːvi
3.	ಗಾಳಿ	gal̥i	ದನಿ	ɖani	ಮಸಿ	masi	ಜನ್ಮ	dʒanma	ಕೊಡ	koɖa
4.	ರಕ್ತ	rakʈa	ತಾವು	ʈaːvu	ಬರ	bara	ಸರಿ	sari	ದರ್ಪ	ɖarpa
5.	ತೆನೆ	ʈene	ಕಲಿ	kali	ದಟ್ಟ	ɖaʈʈa	ದಡ	ɖaɖa	ದುಂಬಿ	ɖumbi
6.	ಮಣಿ	maɳi	ನೋಟ	noːʈa	ಲಂಚ	lantʃa	ಸಾವು	saːvu	ಸೇರಿ	seːri
7.	ಸೊಳ್ಳೆ	sol̥l̥e	ಕೈಗೆ	kaige	ಸಸಿ	sasi	ಬೆಲೆ	bele	ಹೆಣ್ಣು	heɳɳu
8.	ಚೀಟಿ	tʃiːʈi	ತಳ	ʈal̥a	ಗೆದ್ದು	geɖɖu	ಕಾಯ	kaːja	ಸತಿ	saʈi
9.	ಪುಡಿ	puɖi	ದಯೆ	ɖaje	ನುಂಗು	nuŋgu	ದರ	ɖara	ಮನ	mana
10.	ಬೇರೆ	beːre	ಪಾವು	paːvu	ವೈರಿ	vairi	ತೆಂಗು	ʈengu	ಚಟ	tʃaʈa
11.	ಕಾಲ	kaːla	ಸುತ್ತ	suʈʈa	ದಣಿ	ɖaɳi	ದೇವಿ	ɖeːvi	ಕೆಲ	kela
12.	ವನ್ಯ	vanja	ಬೀದಿ	biːɖi	ಕಾರ್ಯ	kaːrja	ಕೋಟೆ	koːʈe	ತಿಳಿ	ʈil̥i
13.	ಸಂಗ	saŋga	ಮಣ್ಣು	maɳɳu	ನಾವು	naːvu	ತಾನು	ʈaːnu	ನಿಂತ	niɳʈa
14.	ರೋಮ	roːma	ಗದ್ಯ	gaɖja	ತಗ್ಗು	ʈaggu	ವಶ	vaʃa	ವಾಸ	vaːsa
15.	ಶ್ಲೋಕ	ʃloːka	ಸಾಲು	saːlu	ರಸ್ತೆ	rasʈe	ಗಾಳ	gaːl̥a	ದಾರಿ	daːri
16.	ಜಾಲ	dʒaːla	ಮೌನ	mauna	ಗತಿ	gaʈi	ಸದ್ಯ	saɖja	ಗುಪ್ತ	gupʈa
17.	ನಿದ್ದೆ	niɖɖe	ದರ್ಜೆ	ɖarʒe	ವೀರ	viːra	ನನ್ನ	nanna	ನೆಲೆ	nele
18.	ದೂರ	ɖuːra	ರಾಗಿ	raːgi	ಹಾದಿ	haːɖi	ಗೀರು	giːru	ಗಾಯ	gaːja
19.	ತಂತಿ	ʈanʈi	ಚೂರಿ	tʃuːri	ಸೇನೆ	seːne	ಬಾಹ್ಯ	baːhja	ಪಾಲು	paːlu
20.	ಮೌಲ್ಯ	maulja	ಹನಿ	hani	ಯಮ	jama	ಹಾಳು	haːl̥u	ದ್ವಾರ	dvaːra
21.	ವನ	vana	ಜಾವ	dʒaːva	ಡಿಕ್ಕಿ	ɖikki	ಸಾಗು	saːgu	ಯುವ	juva
22.	ದಯ	ɖaja	ಗಡಿ	gaɖi	ವಾರ	vaːra	ಮಚ್ಚೆ	matʃtʃe	ಗಾನ	gaːna
23.	ಗುರಿ	guri	ರೆಕ್ಕೆ	rekke	ಶೂನ್ಯ	ʃuːnja	ಕುರ್ಚಿ	kurtʃi	ಬೇಗ	beːga
24.	ಸವಿ	savi	ಲಯ	laja	ಲತೆ	laʈe	ಲಾಲಿ	laːli	ರೋಗ	roːga
25.	ಗೆದ್ದ	geɖɖa	ವರ	vara	ಕಾಳು	kaːl̥u	ಪುರಿ	puri	ವೈದ್ಯ	vaiɖja

Sl no.	AKW List 5		AKW List 6		AKW List 7		AKW List 8		AKW List 9	
1.	ಚೂಪು	tʃu:pu	ಸಾಕು	sa:ku	ದುಡ್ಡು	ɖuɖ̣ɖ̣u	ತಾಗು	ʈa:gu	ಹರ	hara
2.	ಹಣೆ	haṇe	ಮಂಗ	manga	ರಜೆ	radʒe	ಚಳಿ	tʃaḷi	ಕೂಗು	ku:gu
3.	ಬೆಲ್ಲ	bella	ಹಾರೆ	ha:re	ಶುಚಿ	ʃutʃi	ಕಾಡು	ka:ɖu	ಶಾಯಿ	ʃa:ji
4.	ಜಗಿ	dʒagi	ಚಿಂದಿ	tʃinɖi	ಮುದ್ದು	muɖ̣ɖ̣u	ಬಿಲ್ಲು	billu	ದೊಣ್ಣೆ	ɖoṇṇe
5.	ದಂಡೆ	ɖaṇḍe	ಗಿರಿ	giri	ತಂಪು	ʈampu	ರೊಕ್ಕ	rokka	ಕರ	kara
6.	ನೌಕೆ	nauke	ಮಾಲೆ	ma:le	ನಕ್ಕ	nakka	ಶೈಲಿ	ʃaili	ಮೀಸೆ	mi:se
7.	ರೀತಿ	ri:ʈi	ತಿಂದು	tinɖu	ಸಣ್ಣ	saṇṇa	ಸಜ್ಜು	sadʒdʒu	ನೈಜ	naidʒja
8.	ದೂರು	du:ru	ಯೋಗ	jo:ga	ಬಂದ	banda	ಮೋರಿ	mo:ri	ಬೇರು	be:ru
9.	ಮಾಯೆ	ma:je	ನಟ	naṭa	ತೋಳ	ʈo:ḷa	ತೆಳು	ʈeḷu	ವಾಕ್ಯ	va:kja
10.	ಕಲಿ	kali	ಬೀಜ	bi:dʒa	ಕೀವು	ki:vu	ಸೊನ್ನೆ	sonne	ಹೌದು	haudu
11.	ಸರ್ವ	sarva	ನಾಶ	na:ʃa	ಹೊರ	hora	ಯೋಗಿ	jo:gi	ರಂಪ	rampa
12.	ತಾರೆ	ʈa:re	ಸೆರೆ	sere	ಸಾಲ	sa:la	ಕಸ	kasa	ನಗು	nagu
13.	ದಾಟು	ɖa:ṭu	ತೇವ	ʈe:va	ವ್ರತ	vraʈa	ತುದಿ	ʈuɖi	ಸದ	saɖa
14.	ಪಲ್ಯ	palja	ಗಣ್ಯ	gaṇja	ಕೂಸು	ku:su	ಗ್ರಹ	graha	ಲೇಸು	le:su
15.	ವೇಗ	ve:ga	ವಜ	vadʒa	ಗಾದೆ	ga:de	ನಾರು	na:ru	ಲೂಟಿ	luːṭi
16.	ಶೋಕ	ʃo:ka	ಪಾದ	pa:ɖa	ಮಗ	maga	ದಾಸ	ɖa:sa	ಗಡ್ಡ	gaɖ̣ɖ̣a
17.	ದಾತ	ɖa:ʈa	ಕುಳ್ಳ	kuḷḷa	ಲೀನ	li:na	ನವ	nava	ಯಾತ್ರೆ	ja:ʈre
18.	ಗಾಲಿ	ga:li	ತನಿ	ʈani	ಯುಕ್ತಿ	jukʈi	ಲೋಪ	lo:pa	ಮೂಲ	mu:la
19.	ನೀವು	ni:vu	ದ್ರವ	ɖrava	ಕ್ರಿಯೆ	krije	ವ್ಯಯ	vjaja	ತಮ್ಮ	ʈamma
20.	ಸುಳಿ	suḷi	ಚಕ್ಕೆ	tʃakke	ಲಾಗ	la:ga	ಗವಿ	gavi	ವೆಚ್ಚ	vetʃtʃa
21.	ಗಂಡ	gaṇḍa	ಸೋರು	so:ru	ದಿನ	ɖina	ದಾನಿ	ɖa:ni	ನಿದ್ರೆ	niɖre
22.	ದೇವ	ɖe:va	ಲೀಲೆ	li:le	ವೆಂಗ್ಯ	vengja	ಪೂರ್ಣ	pu:rṇa	ತಳ್ಳಿ	ʈaḷḷi
23.	ಸೈನ್ಯ	sainja	ನವ್ಯ	navja	ಹಿಟ್ಟು	hiṭṭu	ಮುದಿ	muɖi	ಗೋಳು	goːḷu
24.	ಗರಿ	gari	ಕೊಡೆ	koɖe	ಕೊಳೆ	koḷe	ನಂಟು	naṇṭu	ನಟಿ	naṭi
25.	ನೀಳ	niːḷa	ದಳ	ɖaḷa	ರನ್ನ	ranna	ವೇದ	ve:ɖa	ದಿಂಡು	ɖiṇḍu

Sl no.	AKW List 10		AKW List 11		AKW List 12		AKW List 13		AKW List 14	
1.	ಬಾಳಿ	baːl̥i	ತೀರ	t̪iːra	ತಾಸು	t̪aːsu	ಕಾಯಿ	kaːji	ದೇಶ	d̪eːʃa
2.	ತಟ್ಟು	t̪at̪t̪u	ಕದ್ದು	kad̪d̪u	ಮೂಕ	muːka	ಗಾತ್ರ	gaːt̪ra	ಬರೆ	bare
3.	ರಚ್ಚೆ	ratʃtʃe	ಮಾವ	maːva	ದೋಶ	d̪oːʃa	ಬಗ್ಗೆ	bagge	ಜೇಡ	dʒeːd̪a
4.	ಕೊಂಚ	kontʃa	ನ್ಯಾಯ	njaːja	ನೀತಿ	niːt̪i	ಜೋಲಿ	joːli	ಚಿತ್ರ	tʃiːt̪ra
5.	ಹದ್ದು	had̪d̪u	ಲೇಪ	leːpa	ಕಾಲ	kaːla	ತಂಗು	t̪angu	ಸೇರು	seːru
6.	ಶ್ರೇಣಿ	ʃreːn̪i	ರಸ	rasa	ಚೆನ್ನ	tʃenna	ದೊರೆ	d̪ore	ಗುರು	guru
7.	ಮನ	mana	ತಂಗಿ	t̪angi	ಶೌರ್ಯ	ʃaurja	ಲಾಯ	laːja	ಸುತೆ	suːt̪e
8.	ಕಿರಿ	kiri	ದಾವೆ	d̪aːve	ಗೀತೆ	giːt̪e	ಮಾರು	maːru	ಕಾವಿ	kaːvi
9.	ತ್ಯಾಗ	t̪jaːga	ನೋವು	noːvu	ದೃಶ್ಯ	d̪ruʃja	ವಾಸಿ	vaːsi	ನಿನ್ನ	ninna
10.	ಮಾಸ	maːsa	ಕೆನ್ನೆ	kenne	ಜ್ವಾಲೆ	dʒvaːle	ಸಣ್ಣ	san̪n̪a	ಸೀಳು	siːl̥u
11.	ತೈಲ	t̪aila	ಗ್ರಾಮ	graːma	ರದ್ದು	rad̪d̪u	ತುಳಿ	t̪ul̥i	ಗೊತ್ತು	got̪t̪u
12.	ಗಂಡು	gandu	ಕಾಟ	kaʋt̪a	ಟೊಳ್ಳು	ʈol̥l̥u	ವಕ್ರ	vakra	ಲೋಳೆ	loːl̥e
13.	ತಡ	t̪aɖa	ನೆರೆ	nere	ಹಗ್ಗ	hagga	ನುಚ್ಚು	nutʃtʃu	ಲಿಂಗ	linga
14.	ಲಗ್ಗೆ	lagge	ವಸ್ತು	vasat̪u	ವಿಶ್ವ	viʃva	ಹೋದ	hoːd̪a	ಗದೆ	gad̪e
15.	ನಾದ	naːd̪a	ಹೊಂದು	hond̪u	ಕ್ರೂರ	kruːra	ಮಾಡಿ	maːd̪i	ವಾಲು	vaːlu
16.	ನುಲಿ	nuli	ಗೇಲಿ	geːli	ಬೆಂದ	bend̪a	ಪೊರೆ	pore	ಕನ್ಯಾ	kanjaː
17.	ವಾಯು	vaːju	ರಚ್ಚೆ	ratʃtʃe	ಗುಹೆ	guhe	ಹಂದಿ	hand̪i	ದೂಕು	d̪uːku
18.	ನೆವ	neva	ಚೆಲ್ಲು	tʃellu	ಪುರ	pura	ಗೊನೆ	gone	ವ್ಯಕ್ತ	vjakt̪i
19.	ಸದ್ದು	sad̪d̪u	ತಿದ್ದು	t̪id̪d̪u	ಜಾಗ	dʒaːga	ವಸು	vasu	ದಂಟು	d̪an̪t̪u
20.	ವ್ಯಕ್ತಿ	vjakt̪i	ಶಾಪ	ʃaːpa	ದಾನ	d̪aːna	ದ್ವೀಪ	d̪viːpa	ಬಣ್ಣ	ban̪n̪a
21.	ಗೋಂದು	goːnd̪u	ಬಳ್ಳಿ	bal̥l̥i	ಮಾನ್ಯ	maːnja	ದೇಶಿ	d̪eːʃi	ಮಾಯ	maːja
22.	ಸ್ವರ	svara	ಶೂರ	ʃuːra	ಸವೆ	save	ನೂಲು	nuːlu	ನಾವೆ	naːve

Sl no.	AKW List 15		AKW List 16		AKW List 17		AKW List 18		AKW List 19	
1.	ಕುದಿ	kuḍi	ಕದ್ದ	kaḍḍa	ಚಿಪ್ಪು	ʧippu	ಬೇವು	beːvu	ಸಿಕ್ಕ	sikka
2.	ಗಟ್ಟಿ	gaṭṭi	ಲಾಳ	laːḷa	ನಾನಾ	naːna	ಕ್ರೀಡೆ	kriːde	ಮಾಜಿ	maːʤi
3.	ನೇರ	neːra	ತಾಜ	ṭaːʤa	ಹುಲಿ	huli	ಹೇಳು	heːḷu	ಪರ್ವ	parva
4.	ದಿಮ್ಮಿ	ḍimmi	ಸ್ವರ್ಗ	svarga	ಗೊಜ್ಜು	goʤʤu	ಲಜ್ಜೆ	laʤʤe	ಬಾಳೆ	baːḷe
5.	ಕಲ್ಲು	kallu	ಕಂದು	kanḍu	ತಾಳ್ಮೆ	ṭaːḷme	ಸಿಕ್ಕು	sikku	ದೊಡ್ಡ	doḍḍa
6.	ವರ್ಣ	varṇa	ಲಾಟಿ	laːṭi	ಸೊತ್ತು	soṭṭu	ವರ್ಗ	varga	ತೊರೆ	ṭore
7.	ಕಿಚ್ಚು	kitʃʧu	ಗಲ್ಲಿ	galli	ಗುಬ್ಬಿ	gubbi	ತತ್ವ	ṭaṭava	ದಂಡ	ḍanḍa
8.	ದೆಸೆ	ḍese	ಹಗೆ	hage	ಕೇಶ	keːʃa	ಶಿಶು	ʃiʃu	ಸಮ	sama
9.	ಬರಿ	bari	ಮೇವು	meːvu	ಕೇರಿ	keːri	ನಾನು	naːnu	ಕೂಲಿ	koːli
10.	ಜೀವ	ʤiːva	ಸಂದಿ	sanḍi	ನಿಂದೆ	ninde	ದೋಸೆ	doːse	ಚಿನ್ನ	ʧinna
11.	ಶ್ವಾಸ	ʃvaːsa	ಕಂತು	kanṭu	ದಾಡಿ	ḍaːdi	ಚಿರ	ʧira	ದಾಹ	daːha
12.	ತೋಡು	ṭoːḍu	ಯಾತ್ರಿ	jaːṭri	ಶಿರ	ʃira	ಸಾದ	saːḍa	ನೊರೆ	nore
13.	ಲಿಪಿ	lipi	ನಯ	naja	ಬಾವಿ	baːvi	ಗಂಜಿ	ganʤi	ಲೋಕ	loːka
14.	ವಾಸ್ತು	vaːsṭu	ಹೊನ್ನು	honnu	ಸೌದೆ	saouḍe	ನಿನ್ನ	ninna	ರೇಗು	reːgu
15.	ನೂರು	nuːru	ಬೆಳ್ಳಿ	beḷḷi	ಬಲಿ	bali	ಯೋಗ್ಯ	joːgja	ನಾಟ್ಯ	naːṭja
16.	ಗಿಡ	giḍa	ನೆನ್ನೆ	nenne	ವೀರ್ಯ	viːrja	ಕೂರು	kuːru	ನಿಂತು	niṇṭu
17.	ಕಳೆ	kaḷe	ವಿದ್ಯಾ	viḍja	ಗೋಣು	goːṇu	ಮಂದ	manḍa	ಹಣ್ಣು	haṇṇu
18.	ಬಾಲ್ಯ	baːlja	ರಾಜಿ	raːʤi	ಗಜ	gaʤa	ಬೇಳೆ	beːḷe	ರಾಗ	raːga
19.	ಮೊಗ್ಗು	moggu	ಸಾರಿ	saːri	ಯಂತ್ರ	jaṇṭra	ದಿನ	ḍina	ದಶ	ḍaʃa
20.	ಹಾಗು	haːgu	ಮಡಿ	maḍi	ಪಟ	paṭa	ಮದ	maḍa	ಲಾವಾ	laːva
21.	ಮೀನ	miːna	ಪಾಶ	paːʃa	ಸೇವಾ	seːva	ಲಾಡು	laːḍu	ಸತ್ಯ	saṭja
22.	ರಾಜ್ಯ	raːʤja	ಚೂರ್ಣ	ʧuːrṇa	ನರಿ	nari	ತೊಲೆ	ṭole	ಗುಟ್ಟು	guṭṭu
23.	ತಂದ	ṭanḍa	ಮುದ್ದು	muḍḍu	ಕಾದ	kaːḍa	ರಣ	raṇa	ಶಲ್ಯ	ʃalja
24.	ನಾಳೆ	naːḷe	ತೀವ್ರ	ṭiːvra	ವಲ್ಲಿ	valli	ಪಟ್ಟಿ	paṭṭi	ವಾದಿ	vaːḍi
25.	ಪಂದ್ಯ	panḍja	ಬೀಗು	biːgu	ಮುದ್ರೆ	muḍre	ವ್ಯಯಿ	vjaji	ಗುಳ್ಳೆ	guḷḷe

Sl no.	AKW List 20		AKW List 21	
1.	ಕರೆ	kare	ಹಿಗ್ಗು	higgu
2.	ಹೊಲ	hola	ಕೆಂಡ	kenḍa
3.	ಮುದ್ದೆ	muḍḍe	ನೀಲ	niːla
4.	ತಾಳ	ṭaːḷa	ಮರೆ	mare
5.	ರೂಪ	ruːpa	ಸತ್ವ	saṭva
6.	ನಾಣ್ಯ	naːṇja	ಜೋರು	dʒoːru
7.	ಪೇಟ	peːṭa	ಚೊಕ್ಕ	tʃokka
8.	ಗೂಡು	guːḍu	ವೃತ್ತ	vruṭṭa
9.	ಜ್ವರ	dʒvara	ಪೇಟೆ	peːṭe
10.	ಹುದ್ದೆ	huḍḍe	ಯತಿ	jaṭi
11.	ಸುಲಿ	suli	ಬಾಲೆ	baːle
12.	ರತ್ನ	raṭna	ನೃತ್ಯ	nruṭja
13.	ಶವ	ʃava	ದಾಳಿ	ḍaːḷi
14.	ನಿತ್ಯ	niṭja	ವಸ್ತ್ರ	vasṭra
15.	ಮಿಂಚು	mintʃu	ಲಗ್ನ	lagna
16.	ಬಿಳಿ	biḷi	ಬೂದಿ	buːḍi
17.	ಯಾಗ	jaːga	ನಶೆ	naʃe
18.	ದಿಕ್ಕು	ḍikku	ದೂಪ	ḍuːpa
19.	ಬಿಲ	bila	ವಶ	vaʃa
20.	ದಡ್ಡ	daḍḍa	ರಂಗು	rangu
21.	ನಗೆ	nage	ದೆಗೆ	ḍege
22.	ವಸ್ತು	vasṭu	ಕೋಣೆ	koːṇe
23.	ಸಲ್ಲು	sallu	ಗುಂಡಿ	gunḍi
24.	ಕರಿ	kari	ಕೋಲು	koːlu
25.	ಗದ್ದೆ	gaḍḍe	ಸೀದ	siːḍa

Comments / Suggestions	Action taken
Title page	
Should read as 'Ph.D.' instead of P.hD'	Incorporated in title page
Abstract	
Lines 4 & 5: Should not start a sentence with numbers written as digits. Should be written in words.	Incorporated in page No. 4
Line 9: Replace 'were' with 'was'	Incorporated in page No. 4
Line 13: Mention that the list equivalency is for measurements done at -3 dB SNR and not when done in quiet.	The list equivalency in quiet has also been established and incorporated
Introduction	
Page 12, Para 2: Incomplete information since the heading does not mention that the material is specifically only for adults.	Incorporated in page No. 12, para 2.
Page 12: Section on speech identification tests in Indian languages does not have information of tests have been developed in other Indian languages.	Was incorporated in the earlier report from Page 11 to 14
Page 12, Line 23: the word 'lists' to be deleted	Incorporated in Page 12, line 23.
Page 14, Line 13 & 14: Need to mention why 4 lists are not adequate when it has been randomized to produce 8 lists.	The explanation is incorporated in page No.14, para 2.
Method	
Page 16, Line 12: Details of the participants for the different sections should be given separately	Incorporated in each section(2.1.5 – para 2, 2.2.1- para 1, 2.2.3 - para 1 ,2.2.4 - para 1)
Page 16, Line 12: The description of the 5-point rating scale does not clearly indicate how '4' is different from '3' and how '2' is different from '1'.	Incorporated in page 16 in 2.1.2
Page 6: As the recorded material has not been scaled/normalized, there is bound to be variations in the intensity of the speech signal. Further, as no calibration tone have been recorded with the word lists, variations in intensity could have taken place when the stimuli were played.	Recorded material was normalized, but was not included in the earlier report. Incorporated in page 16 in the section 2.1.3. Calibration tone was incorporated in the beginning. Now, the tone has been incorporated in every list.
Page 17, para 1: the aim of the study does not mention that speech identification material is being developed for testing in the presence of noise. Thus, the aim and the method do not match	Additional objective incorporated in page 15.
Page 17, last para: The information in this para is not about generation of noise though the heading states " Generation of Noise".	The heading has been changed appropriately in page 17, last para.
Page 17, Line 28: the selection criteria of the 20 participants have not been given	Incorporated in page 18, para 1.
Page 18, Line 10 & 11: more details regarding the comparison needs to be provided.	More details were not given as it was not the objective of the study
Page 18, line 17: Mean age is to be given	Incorporated in page 17, last para
Page 18, line 22: the test used to measure SRT	Incorporated in page 18, para 2.

should be given	
Page 18, line 24: Details of the PC used is to be given	Incorporated in page 19, section 2.2.1
Page 19, line 9: The presentation level has not been mentioned.	Incorporated in page 20, para 1
Page 19, line 10 to 12: Nowhere in the pilot study has it been mentioned that the purpose of using different SNR was to select one of them for further evaluation. The findings of the pilot study do not give a basis for the sentence "An SNR of -3 dB was chosen based on the pilot study, done in order to select equally difficult words for constructing the word lists. This yielded an average of 50% correct response at this SNR".	Incorporated in page 20, para 3.
Page 19, line 17: The term standardization is inappropriate when only 40 participants were selected with only 10 in each of the 4 degrees of hearing impairment that were considered.	- The testing in quiet now has data from 65 individuals. - The numbers mentioned in the Research Proposal has been followed in the study for groups with hearing impairment.
Page 19, line 18: inadequate information has been provided about the selection criteria of the individuals with hearing impairment (age, gender, education, language fluency, acquired hearing loss or not, duration of hearing loss.	The selection criteria included are age, acquired hearing loss, normal speech and language skills has been included in page 20, section 2.2.4
Page 19, line 22: Mention the reference of the criteria that was used to decide that there existed an agreement between the speech identification score and degree of hearing loss.	Incorporated in page 20, para 1
Page 19, Last line to page 20, 1st para: The relevance of this information is the context of the method is not clear.	Modified in page 21, para 2
Page 19: What was the reason Senheisser 200 HDA headphones were selected instead of TDH 39 Headphones?	Senheisser HDA 200 can also be used for routine conventional testing as it has a wider frequency response compared to TDH 39. The audiometer that was used for data collection was calibrated with this earphone. Hence, Senheisser HDA 200 was used.
Page 20, line 6: Mention the procedure that was used to establish MCL.	Incorporated in section 2.2.4 page 21.
Results	
Page 20, line 10 to 21: The first two paras, and first sentence of the 3rd para deal with the method and cannot be considered as results	Modified
Page 21, Table 3:1: WRS should be expanded the first time it occur and not when it occurs later.	Incorporated in page 22, table 3.1
Maximum possible score should be mentioned.	Incorporated in table 3.1, page 22
If normal hearing individuals get scores <50%, it	The aim was to establish equivalency

indicates that the test is too difficult to be used in individuals with hearing impairment. The study done by Spahr et al was publishes in 2012 and not 2011. Spahr et al 2012) used sentences and obtained a mean score of 85%. Whereas the present study has used words and hence using a -3 dB SNR makes the task difficult even for normal hearing individuals. The criteria used for sentences does not apply for isolate words. The impact of different SNRs varies depending on whether isolated words are used or sentences are used.	at midpoint of psychometric function, i.e., at 50%. However, at quiet, at 40 dB SL, the score is around 98% . This has been included in the discussion section
Page 21, l2 of Para 1: the word should read as 'lists and not 'list'.	Incorporated in page 22
Page 21, Last but one line: Not clear what is meant by 'these modified scores', since nowhere earlier is it mentioned as to how it was calculated and what was the need to modify the scores.	Incorporated in page 25. It is one of the statistical measure to compare and approved by the statistician.
Page 22, table 3.2: Mention the maximum possible score. Extrapolating from information given in the method section, it is assumed that the maximum possible score is 25. In the event that the maximum possible score is 25, if normal hearing individuals obtain such poor scores (.91 to 1.65), it will not be possible to use the test on individuals with hearing impairment.	Table 3.2 shows the modified mean and not the absolute mean. The absolute mean is given in Table 3.4. and the range is 10.05 to 11.94 for noise. In quiet, at 40 dB SL, it is 23.80 to 24.73 (as given in table 3.1).
Page 22, Last 3 lines of para 1: No discussion as to why some of the lists were different.	Though raw scores were not differing much, statistical difference was noticed.
Page 28, Line 19: need to mention the lists are equivalent only at -3 dB SNR and not in quiet condition.	The equivalency of the list was established in quiet also. This has been included in the report.
Page 32: the reference 'Spahr, A. J. et al. (2011) Development and Validation of the AzBio Sentence Lists. *Ear and Hearing*, 32(4), 1-6.' Is incorrect. The reference is Spahr, A. J. et al. (2012) Development and Validation of the AzBio Sentence Lists. *Ear and Hearing*, 33(1), 112-117.	Incorporated in reference.