Research Article

Development and Standardization of Sentences for Speech in Noise Test in Malayalam

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sentence list
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SNR loss

Abstract

The present study aimed to develop and standardize sentences for speech in noise test in Malayalam language for children and adults. A total of 500 Malayalam words were selected and evaluated for familiarity. Using 300 most familiar words, 150 syntactically and semantically correct sentences were constructed. These sentences were familiarized again by five qualified speech language pathologists. 105 most familiar sentences were carefully chosen and randomly assigned to 15 lists of seven sentences each. A four talker speech babble was added to these sentences at different SNR levels, from +5 to -10 dB SNR in 2.5 dB steps. The speech babble was added in such a way that the first sentence in each list had maximum SNR and last sentence had minimum SNR. The speech perception in noise ability was assessed on 120 normal hearing participants (60 adults and 60 children). The perceptual SNR-50 was calculated for each list, based on the perceptual scores obtained by each participant, separately for children and adults. Statistical analysis revealed that the perceptual scores for some lists were found to be significantly different from other lists, and hence, those lists were excluded from the final test. After removing these lists, seven lists were selected for children and adults, separately. The mean SNR-50 was -4.671 dB for children and -6.357 dB for adults. Reliability and internal validity results showed that the test is reliable and valid to assess speech perception in noise abilities in children as well as in adults.

Background

In day-to-day life, the identification of speech never occurs in the optimum listening situations. Noise often affects the speech perception process. Noisy backgrounds may impair the recognition of speech signals. Under such situations, listeners require more listening effort to identify the target signal (Hervais-Adelman, Carlyon, Johnsrude, & Davis, 2012; Mishra, Stenfelt, Lunner, Rönnberg, & Rudner, 2014; Rönnberg, Rudner, Foo, & Lunner, 2008; Rudner, Foo, Rönnberg, & Lunner, 2009). This task of the listeners to understand speech in noisy background is more difficult in the presence of hearing loss. Assessment of speech perception abilities in noise may help healthcare professionals to design appropriate therapeutic protocols for auditory training. Assessment of the ability of the listeners to identify speech in noisy situations has received significant research attention in the past few decades (Lagace´, Jutras, & Gagne´, 2010; Shehorn, Marrone, & Muller, 2017).

The assessment of speech perception is possible with the speech in noise tests. Speech-in-noise measures have gained important position in the audiological test battery. One of the most commonly used such test is speech in noise (SIN) test (Kalikow, Stevens, & Elliott, 1977). The speech in noise tests help to identify the difficulty in understanding speech in degraded background, and describes the degree of difficulty and the subsequent amount of benefit provided by amplification devices (Kalikow et al., 1977). Hearing in Noise Test (HINT) is another such test (Nilsson, Soli, & Sullivan, 1994), which uses sentences in the presence of continuous speech spectrum shaped noise and an adaptive procedure that gives the signal to noise ratio (SNR) required for 50% correct identification of the sentences (SNR-50). A potential limitation of these tests to assess speech perception in noise abilities is that they take long time for administration and the scoring of these tests is difficult (Killion, Niquette, Gudmundsen, Revit, & Banerjee, 2004).

Killion and his colleagues at Etymotic Research developed Quick Speech perception In Noise test (Quick SIN) with the aim to estimate SNR loss in 1-2 minutes, and which is easy to administer and score (Killion et al., 2004). The authors claimed

that the test can be used to measure SNR loss in individuals with normal hearing sensitivity and hearing impairment, with 95% confidence.

Wilson, McArdle, and Smith (2007) measured the sensitivity of QuickSIN test in identifying speech recognition performances in background noise. The perceptual abilities of the listeners with normal hearing and sensorineural hearing loss were compared on four speech-in-noise tests, viz., BKB-SIN (Bamford-Kowal-Bench Speech-in-Noise test), HINT (Hearing In Noise Test), Quick SIN (Quick Speech In Noise test), and WIN (Word In Noise test). The researchers reported that Quick SIN and WIN tests are more sensitive in identifying the perceptual performance in background noise than BKB-SIN and HINT tests. Duncan and Aarts (2006) conducted a study to determine the HINT and QuickSIN test performance in young adults with normal hearing, and commented on the clinical utility of both the tests. The researchers concluded that there is no statistically significant difference between the responses obtained from the two tests. They further stated that QuickSIN has some advantages over the HINT in terms of its clinical usage.

Sharma, Tripathy, and Saxena (2016) critically appraised the HINT, QuickSIN, BKB-SIN, LiSN-S (i.e., Listening in Specialized Noise-Sentences), and WIN test. The researchers noted that in most of the studies, QuickSIN was reported to be maximally reliable and valid tool to assess speech perception in noise abilities. The reviewers also found that all the researchers reported as participant responsiveness is best for QuickSIN with least item/instrument bias. Lee and Yi (2017) reviewed the performances of HINT, QuickSIN and Matrix test in terms of test procedure, norms, and interpretation. They reported that procedure and interpretation is easy for QuickSIN test, however, HINT and Matrix test have various multi-lingual versions; but multi-language stimulus material is not available for SIN.

The need of multi-lingual material for the speech in noise test led the researchers to develop material for speech in noise test in Mandarin (Zhou et al., 2017) and Persian (Shayanmehr, Tahaei, Fatahi, Jalaie, & Modarresi, 2015) languages. Among Indian languages, sentences for speech in noise test has been developed in Kannada (Avinash, Meti, & Kumar, 2010) and Oriya (Hota, Dutta, &Chatterjee, 2014) languages. Any such test material in Malayalam language is not available and this developed the need for the present study. Malayalam (a Dravidian language) is official language of the south Indian state of Kerala and union territories of Lakshadweep islands and some parts of Puducherry. With more than 37 million native language speakers (Campbell & Gordon, 2008), Malayalam is 26th largest language of the world (based on the number of native speakers). According to 2011 census, a total of 2.28% of the Malayalam speaking population being disabled, among which, 0.45% of the total population has hearing impairment. Thus, speech in noise test in Malayalam has a wide scope of practice in native Malayalam speakers. Considering the same, the present study is designed to develop and standardize sentences for speech in noise test in Malayalam language.

Materials and Methods

Participants

A normative research design was adapted and 120 participants with normal hearing sensitivity (PTA<15 dBHL, SRT+10 dB of PTA; SIS>90%) (re. ANSI S3.21, 2009) were selected for the present study. The participants were divided into two groups. Group 1 consisted of 60 children in the age range from 8 to 12 years and Group 2 consisted of 60 adults in the age range from 18 to 25 years. All the participants had normal auditory processing abilities as assessed using Screening Checklist for Auditory Processing (SCAP) (Muthuselvi & Yathiraj, 2010) for the participants of Group 1 and Screening Checklist for Auditory Processing in Adults (SCAP-A) (Ramya & Yathiraj, 2014) for the participants of Group 2. None of the participants reported of any neurological, psychological, visual or behavioural problems. All the participants were native Malayalam speakers. The study had been approved from the institutional ethical board to test human participants and an informed written consent was obtained from each of the participant before commencement of the study.

Preparation of Test Stimuli

A total of 500 common words of approximately similar length in Malayalam language were selected. These words were taken from Malayalam government school textbooks. The words were given to 10 native Malayalam speakers who were primary school teachers. The teachers were asked to rate each word for familiarity on a five-point rating scale (Vagias, 2006). The five-point rating scale was '1' for 'not at all familiar', '2' for 'slightly familiar', '3' for 'somewhat familiar', '4' for 'moderate familiar', and, '5' for 'extremely familiar'. Only those words with familiarity rating of '4' or more (moderate to extremely familiar) were selected. Three hundred such words were finally selected. The school teachers were then instructed to construct 150 sentences (five key words each) using these 300 words. All the sentences were semantically and syntactically correct, as reviewed by a linguist who was a native speaker of Malayalam. The 150 sentences were given to five native Malayalam speakers, who were qualified speech language pathologists to rate them for familiarity on a five-point rating scale (Va-

gias, 2006). The sentences with the rating of 4 or more (moderate to extremely familiar) were selected for the final list. It is noteworthy that although the sentences were checked for familiarity by adults (primary school teachers and speech language pathologists), they were instructed to rate the sentences as it was present in the speech of children. This was the primary reason for selecting the school teachers and speech language pathologists. As they work closely in association with children, they are well aware of the language competence of the children. Thus, a total of 105 sentences with maximum familiarity were selected as final stimuli. The 105 selected sentences were randomly assigned to 15 lists of seven sentences each.

Recording of the Stimuli

A female adult who was a native Malayalam speaker with normal voice characteristics was selected to record the test stimulus. A calibrated microphone connected to a personal computer installed with the Praat software (version 5.3.53) was used for recording and saving the stimulus. The microphone was kept at 10 cm away from the mouth of the speaker. The sampling rate for recording was set as 44100 Hz. The speaker was requested to utter each of the sentences in the sentence lists at comfortable pitch and loudness and normal rate of speech. The entire recording was carried out in a sound treated room. All the 105 sentences were recorded and saved separately on the personal computer in .wav format. The recorded sentences were analysed perceptually by the examiner to ensure that the recording is clear and intelligible. The recorded sentences were also analysed acoustically and any extra duration in the beginning and end of the sentences were edited using Praat software. The intensity of each of the recorded sentence was normalized to 70 dBSPL using Praat software.

Adding Noise to Signal

A four-talker speech babble of 2 minutes duration was recorded using the Praat software. The procedure of recording speech babble was adapted from the study of Killion et al. (2004). Four-talker babble was used as it represents a realistic simulation of a social gathering. The recording was carried out in a classroom situation where four native Malayalam speakers were made to sit in a circular arrangement with omni-directional microphone placed in the centre. The approximate distance between the microphone and each of the speaker's mouth was 30 cm. The speakers were asked to read different Malayalam newspaper articles simultaneously. They were requested to maintain normal conversational speech loudness and rate of speech. The recorded speech babble was saved in the personal computer in .wav format. The intensity of the recorded speech babble was normalized to 70 dBSPL using Praat software.

All the sentences in 15 sentence lists were added with speech babble at different SNR levels. Seven SNR values from +5 dB SNR to -10 dB SNR, in 2.5 dB steps, had been considered. The speech babble was added in such a way that the first sentence of each list had the maximum SNR (+5 dB) and the last sentence of each list had minimum SNR (-10 dB). All the seven sentences in each list, thus, were at different SNR levels. The procedure of adding speech babble to the signal was adapted from the study of Jain, Nataraja, and Nair (2014, 2015). The speech babble was added using the MATLAB software (ver. R2017a). Each of the fifteen lists developed had seven sentences, one sentence at each SNR of 5, 2.5, 0, -2.5, -5, -7.5 and -10dB.

Procedure

The test was conducted in an acoustically treated room with adequate illumination. The sentences were randomly presented to each participant through the personal computer routed via a calibrated audiometer with standard headphones (TDH 39). The output of the audiometer through the headphones was calibrated using the instructions provided in the manual of the audiometer (Inventis Piano: User Manual). The stimuli were presented binaurally. The participants were instructed to listen to the sentences carefully and repeat each word in the sentence. The responses of the participants were recorded using audio recorder for further analysis.

Scoring

As each sentence consisted of five key words, a score of '1' was given for each key word repeated correctly, and each incorrectly repeated word was scored '0'. A score of 0.5 was given for partially correct responses, i.e., the correct responses with any minimal morphological and/or inflectional error. Any marked error in the response was considered as incorrect response only. Thus, a maximum score of 35 was given for each list. All the 15 lists of sentences were presented to each participant to obtain their perceptual scores.

Data Analysis

The SNR-50 value was estimated using regression analysis. The responses for each list was analysed using Shapiro-Wilk test, for normalcy. The data was normally distributed across each list, and hence, parametric statistics was used. The equivalency of responses across lists was measured using repeated measures analysis of variance with Bonferroni's post-hoc analysis. Test-retest reliability was also measured using repeated measures ANOVA. The re-testing was done for 15 adults and 15 children due to time constraints and availability of the participants. The re-testing was carried out after three months of the original testing; to ensure that the participant was not habituated with the test

stimuli. Between-subject variability was measured using independent sample t-test. Internal validity among the lists was carried out by measuring the difference in the SNR-50 values obtained for each list with that of mean overall SNR-50 values measured together for all the lists.

Results

Calculation of SNR-50

The correct identification of key words in each sentence was noted separately for each participant. The SNR-50 value was calculated for each of the 15 lists using logistic regression analysis, for each participant. Figure 1 is showing the mean SNR-50 value for each list, for the participants of both the groups.

A repeated measures analysis of variance with Bonferroni's multiple pair-wise comparisons were used to compare the perceptual SNR-50 scores between each list, for both group of participants, separately. This was done to see the equivalency of the perceptual responses obtained for lists in adults and children.

The results obtained from the perceptual scores of children showed a significant difference between perceptual scores obtained for each list [F (14, 1624) = 61.76; p<0.001]. These results indicated that out of 15 lists, some lists were easy to perceive, and thus resulted in significantly higher perceptual scores. On the other hand, some lists were difficult to perceive and those resulted in significantly lower perceptual scores. It was found that list numbers 10, 11, 14, and 15 were relatively simpler, and hence had better perceptual SNR-50 scores. List numbers 1, 8, 9, and 13 were relatively hard to perceive and resulted in poorer SNR-50 scores. Hence, these lists were excluded from further analysis. Repeated measures ANOVA was again done with SNR-50 scores of the remaining lists as the factors. The results indicated that there was no statistically significant difference between perceptual SNR-50 scores for any of the remaining seven lists [F (1, 59) = 2.85; p>0.05].

For adults, the perceptual SNR-50 response results revealed that list numbers 13 and 15 were relatively simpler and hence had better perceptual SNR-50 scores. List numbers 1, 2, 5, 8, 9, and 12 were relatively hard to perceive and resulted in poorer SNR-50 scores [F (14, 1642) = 190.32; p<0.001]. These lists were thus excluded from the analysis. Repeated measures ANOVA indicated that there was no statistically significant difference between perceptual SNR-50 scores for any of the remaining seven lists [F (1, 59) = 3.61; p¿0.05]. Thus, seven lists were selected separately for children (list numbers 2, 3, 4, 5, 6, 7, and 12) and adults (list number 3, 4, 6, 7, 10, 11, and 14). The mean SNR-50 scores for these sentences were plotted as in Figure 2. These lists are provided in the Appendix.

SNR Loss

The SNR loss was calculated for adults and children with normal hearing sensitivity by adapting the procedure as suggested by Tillman and Olsen (1973). The researchers have described a method to calculate the SNR loss for spondee words. In their method, two spondees are presented at each SNR level, starting from the level where all spondees are repeated correctly. The level were further reduced in two dB steps until no responses are obtained for several words. The starting level plus one dB, minus the total number of spondees repeated correctly, is the spondee threshold. The SIN Malayalam has five key words per step and SNR was reduced in 2.5 dB steps. The highest SNR tested was five dB. Thus, the SNR-50 score was obtained by 5 + 1.25 = 6.25 (minus) the total number of words repeated correctly. Since SNR SNR-50 for adults with normal hearing obtained in the present study was -6.357 dB and for children was -4.671 dB, the SNR loss can be calculated using the following formula. For adults, SNR loss = 6.25-(-6.357)-total number of words correct children, SNR loss = 6.25-(-4.671)-total number of words correct.

Reliability of the Responses

In the quest to assess whether the sentences are reliable to test the speech perception in noise among children and adults, between-subject variability and test-retest reliability measures were carried out. Between-subject variability was measured using independent samples t-test. It was done by dividing the responses of 60 participants in each group randomly into two sets of 30 participants each. The comparison revealed no statistically significant difference between the two sets of participants (t = 5.17; p<0.01). The test-retest reliability was measured using paired samples t-test. The re-testing was done only for 15 adults and 15 children due to time constraints and availability of the participants. The re-testing was done three months after the original testing to avoid habituation effect. The results revealed no statistically significant difference between trials for both children and adults (t = 7.89; p>0.05), indicating that the responses were consistent across time.

Validity of the Test Stimuli

Internal validity was measured to find out whether the stimuli are reliable enough to assess the speech perception ability in noise. Internal validity among the lists were carried out by measuring the difference in the SNR-50 values of each list with that of mean overall SNR-50 values measured together for all the lists for each subject. The

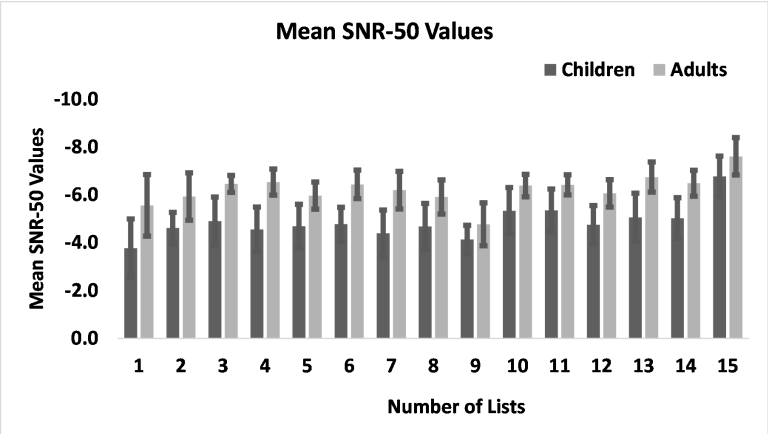

Figure 1: The mean overall SNR-50 values for children and adults.

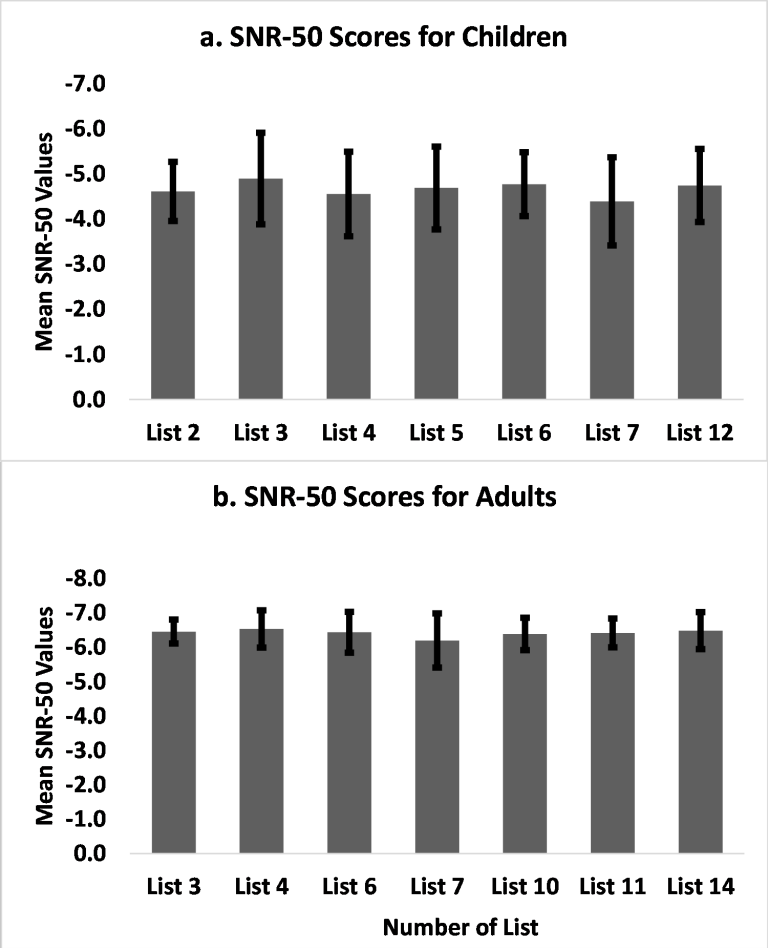

Figure 2: The mean SNR-50 scores for finally selected lists a. for children; and b. for adults.

mean SNR-50 was measured for seven selected lists and the SNR-50 value for each list was subtracted from the mean SNR-50 value. This was done for each participant separately. The difference in SNR-50 values were tabulated and compared with each other using repeated measures ANOVA. The results revealed no statistically significant difference between the 'difference in SNR-50 values' for any list for adults [F (1, 59) = 0.593; p>0.05] and children [F (1, 59) = 0.013; p>0.05]. The difference in SNR-50 values were similar for each list and minimally deviant from the overall mean SNR-50 values. These results indicate that the selected lists are internally valid, and thus, the responses obtained by presenting these lists should be consistent.

Discussion

The present study was designed to develop sentence material for speech in noise test in Malayalam language. Although there are a few material

available in other languages like English, Persian, Mandarin, Kannada, and Oriya, those cannot be used to test the speech perception abilities in native Malayalam speakers due to linguistic constraints. Absence of such material in Malayalam language crafted the need for the present study. It is noteworthy that, quantifying the ability of an individual to understand speech in noisy condition, in terms of SNR, helps in the hearing aid fitting process, as it reflects the real world performance of the listeners. The strategies and features which would maximize the performance in the test can be opted by the hearing care professionals during the hearing aid fitting which would likely improve the comfort of listening and consequently the hearing aid success ratio. Further, it may assist in identifying auditory processing deficits, as speech perception in noise is compromised in such individuals. However, this requires a well-furnished and standardized test material. Hence, care was taken throughout the study to ensure that the test material is homogenous and yielded reliable and valid results. .

Consequently, the present study was carried out in four phases and the sentences in the present study underwent rigorous selection criterion. The initial 15 lists of sentences each for adults and children were shortlisted to seven based on the SNR-50 values to maintain homogeneity across the lists. The strength of the study lies not only in the development and standardization of the test material, but also with reference to the development of separate test material for children and adults. Since, the abilities and needs of children and adults are different, it is recommended to use different stimulus material while testing children and adults. Further, the tests re-test reliability, between subject variability, and internal reliability measures of the developed material were also carried out which yielded affirmative results in terms of validity of the developed material.

The present test not only identified the SNR-50 values for children and adults, but also suggested measures to calculate SNR loss, based on the procedure recommended by Tillman and Olsen (1973). By estimating the SNR loss, the hearing professional can recommend the appropriate technology (e.g., omni-directional microphones, directional microphones, array microphones, and close-talking FM microphones) which may be helpful for listener to perceive speech in noisy situations. Standardized tests such as speech recognition thresholds (SRT) or speech identification scores (SIS), which are available for assessing speech understanding, do not reflect the real world performance of individuals with hearing impairment. Thus, speech in noise tests were designed, as they are more accurate predictors of speech perception in noisy situations. However, the potential limitation of such tests lies in their complexity in measuring speech perception abilities and difficulty in scoring. Killon et al. (2004) suggested Quick speech in noise test in English, which was designed to assess speech perception abilities in 1-2 minutes, with good accuracy. This measure is popular among the audiologists, and that is the reason of developing the sentence material for speech in noise test in various languages. With the development of sentence material in Malayalam language, as mentioned in the present research study, the authors expect that the material will be useful for audiologists and other related professionals to assess speech perception abilities in the relevant population.

Conclusions

The present study aimed to develop and standardize the sentences for speech in noise test in Malayalam language. The results obtained from the perceptual scores can be used to infer that with the decrease in SNR, the speech identification scores decreased. This was seen for both children as well as for adults. The scores for adults were better than that for children indicating their better speech perception ability in noise. In the present study, the authors developed separate test lists for children and adults. The lists developed for children and adults showed good equivalency. The test material had good test re-test reliability and good internal validity. The developed material may be used to differentiate between those with normal hearing and with hearing impairment based on SNR loss. It can also be used in the assessment of individuals with central auditory processing disorders.

Conflict of Interest: NIL

Source of Funding: NIL

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APPENDIX – I

Sentence list for children in Malayalam

Lists 1

1. ധൈര്യത്തോടെ നാം നമ്മുടെ പ്രശ്നങ്ങളെ നേരിടണം.
2. പുകവലിയും മദ്യപാനവും മനുഷ്യന്റെ ആരോഗ്യത്തിന് ഹാനികരമാണ്.
3. ഞാൻ എന്റെ മാതാപിതാക്കളുടെ കൂടെയാണ് ജീവിക്കുന്നത്.
4. നമ്മുടെ വീടിന് മുമ്പിൽ മാലിന്യങ്ങൾ ഇടാൻ പാടില്ല.
5. അവന്റെ പശു മൂന്ന് ലിറ്റർ പാൽ തരും.
6. വെള്ളവും വെളിച്ചവും ഇല്ലാതെ ജീവിക്കുന്നത് അസാധ്യമാണ്.
7. ആകാശത്ത് എണ്ണിയാൽ തീരാൻ പറ്റാത്തത്ര നക്ഷത്രങ്ങുണ്ട്.

Lists 2

1. സ്ത്രീകൾ മുല്ലപൂവ് തലയിൽ ചൂടാൻ ഉപയോഗിക്കുന്നു.
2. സീതയെ തട്ടിക്കൊണ്ട് പോയ രാവണനെ രാമൻ വധിച്ചു.
3. തവളയ്ക്ക് കരയിലും വെള്ളത്തിലും ജീവിക്കാൻ സാധിക്കും.
4. കേരളീയർ നവംബർ ഒന്നിന് കേരളപിറവി ആഘോഷിക്കുന്നു.
5. നിയമം കൈയ്യിൽ എടുക്കാൻ ആർക്കും അവകാശമില്ല.
6. ഈ വർഷത്തെ കൃഷിയിൽ നല്ല വിളവ് ലഭിച്ചു.
7. ചെടിയിൽ നിറയെ മഞ്ഞ പൂക്കൾ വിരിഞ്ഞു.

Lists 3

1. അവൾ എന്നും രാവിലെ നേരത്തെ എഴുന്നേൽക്കും.
2. പന്ത്രണ്ട് വർഷം കൂടുമ്പോളാണ് നീലക്കുറിഞ്ഞി പൂക്കുന്നത്.
3. വേണമെങ്കിൽ ചക്ക വേരിലും കായ്ക്കും എന്നാണ് ചൊല്ല്.

4. അദ്ധ്വാനിച്ച് ഉണ്ടാക്കിയ കാശ് കൊണ്ടാണ് വീട് പണിതത്.
5. താജ്മഹൽ ലോകത്തിലെ ഏഴ് അത്ഭുതങ്ങളിൽ ഒന്നാണ്.
6. മൃഗശാലയിൽ വിവിധ തരം മൃഗങ്ങളും പക്ഷികളുമുണ്ട്.
7. എന്റെ കൂട്ടുകാരൻ ധാരാളം സംസാരിക്കുന്ന വ്യക്തിയാണ്.

Lists 4

1. പ്രാതലിന് മുൻപ് വ്യായാമം ചെയ്യുന്നത് നല്ലതാണ്.
2. അറബിക്കടലിന്റെ റാണി എന്ന് വിശേഷിപ്പിക്കുന്ന നഗരമാണ് കൊച്ചി.
3. ഞാൻ ആറുമണിയോട് അടുപ്പിച്ച് വരും.
4. ദിവസവും വ്യായാമം ചെയ്യുന്നത് ആരോഗ്യത്തിന് നല്ലതാണ്.
5. അമ്മക്കിളി കുഞ്ഞിനെ ചിറകിന്റെ കീഴിൽ സംരക്ഷിക്കുന്നു.
6. കുട്ടികൾ കടയിലേക്ക് മിഠായി വാങ്ങിക്കാൻ പോയി.
7. ഒരു വർഷത്തിൽ മുന്നൂറ്റി അറുപത്തിയഞ്ച് ദിവസങ്ങൾ ഉണ്ട്.

Lists 5

1. സംസാരിക്കുന്നതിന് മുമ്പ് രണ്ട് തവണ ചിന്തിക്കുക.
2. കഴിഞ്ഞ തവണ അവൾക്ക് പരീക്ഷ എളുപ്പമായിരുന്നു.
3. വീട്ടിൽ വരുന്ന അതിഥികളെ നന്നായി സത്കരിക്കണം.
4. ആഹാരം മറ്റുള്ളവർക്ക് ദാനം ചെയ്യുന്നത് പുണ്യമാണ്.
5. ആന കൊടുത്താലും ആശ കൊടുക്കരുത് എന്നാണ് ചൊല്ല്.
6. ശിശിരകാലത്തിൽ മരങ്ങളിലെ ഇലകൾ കൊഴിയും.
7. വർഷം തോറും സർക്കാർ വിദ്യാഭ്യാസത്തെ പരിഷ്കരിച്ചു കൊണ്ടിരുന്നു.

Lists 6

1. നമ്മൾ എല്ലാ ദിവസവും ദൈവത്തോട് പ്രാർത്ഥിക്കണം.

2. ജാതി–മത വ്യത്യാസം ഇല്ലാതെ കേരളീയർ ഓണം ആഘോഷിക്കുന്നു.
3. മാതാപിതാക്കളെയും ഗുരുക്കന്മാരെയും ദൈവത്തിന് തുല്യമായി കണക്കാക്കണം.
4. ഗുരുക്കന്മാർ ശിഷ്യന്മാർക്ക് അറിവ് പകർന്ന് നൽകുന്നു.
5. നമ്മുടെ സുരക്ഷിതത്വം നമ്മുടെ കൈയ്യിൽ തന്നെയാണ്.
6. കാണം വിറ്റും ഓണം ഉണ്ണണം എന്നാണ് ചൊല്ല്.
7. ഭാരതത്തിന്റെ രാഷ്ട്ര പിതാവ് മഹാത്മ ഗാന്ധിയാണ്.

Lists 7

1. ഞാൻ എല്ലാ ഞായറാഴ്ചയും പള്ളിയിൽ പോകും.
2. അണ്ണാൻ കുഞ്ഞിനെ മരം കേറാൻ പഠിപ്പിക്കണമോ?
3. മുടി വളരാൻ മൈലാഞ്ജി വളരെ നല്ലതാണ്.
4. അച്ഛൻ പുതിയ ഉടുപ്പ് വാങ്ങി തന്നു.
5. തെറ്റു ചെയ്തതിന് അമ്മ കുട്ടിയെ ശാസിച്ചു.
6. നാലിനെ രണ്ട് കൊണ്ട് ഗുണിച്ചാൽ എട്ട് കിട്ടും.
7. അത്തം പത്തിനാണ് കേരളീയർ ഓണം ആഘോഷിക്കുന്നത്.

Sentence list for children in IPA

List 1

1. / ðɑirjʌθoːde naːm nam̂ude praʂnaŋale neːriḍaṇʌm/
2. /pukavalijum maðjʌpaːnʌvum manuʃjante aːɾoːgyʌθiň haːniːkarama:ṋ̣/
3. /ñaːn ente maːṯaːpiṯaːk̂ʌlude koodejaːṇu dziːvik̂uñʌt̆/
4. /namˆude vˈiːdiň munbɪl maːlinjʌŋʌl̩ idaːn paːdiÎɑ/
5. /ɑvʌntɛ pʌʂu muːn̂u litʌr̩ pɑːl ṯʌɾum/
6. /vɛÎʌvum vɛḷitʃʌvum ɪÎaːθɛ dzɪːvɪk̂uñʌt̆ asaːðjʌmɑːṋ̣/
7. /aːkɑːʂʌt̆ ɛṇ̂ijaːl θɪːraːn patˆaːṯʌṯra nakʃɑθɾʌŋʌl̩uṇd̆/

List 2

1. /st̪ɽi:kʌɭ mul̂a pu:v̆ t̪ʌlʌjɪl tʃu:dɑ:n upajogik̂uɲ̂u/
2. /si:θʌjɛ t̪aʈikondʌ po:ja ra:ʋʌɳʌnɛ rɑ:mʌn ʋʌðɪtʃu/
3. /θʌʋʌɭʌjk̆̂ karajɪlum ʋɛɭ̂ʌθɪlum dzɪ:ʋik̆ɑ:n sa:ðik̂um/
4. /ke:rʌɭi:jʌɽ nʌʋʌmbʌɽ on̂iň kɛrɑɭʌpɪɽʌʋɪ ɑ:koʃɪk̂uɲ̂u/
5. /nɪjamam kaijil eduk̂ɑ:n ɑ:ɽk̂um aʋʌkɑ:ʂʌmil̂a/
6. /i: ʋʌɽʃʌθɛ kɽɪʃɪjɪl nal̂ɑ ʋɪɭʌʋ̆ labitʃu/
7. /tʃɛdɪjɪl niɽʌjɛ maññʌ pu:k̂ʌɭ ʋɪrɪɲu/

Lists 3

1. /aʋʌl̠ eɲ̂um ra:ʋɪlɛ ne:raθɛ ejuɲ̂e:lk̂um/
2. /pʌnðɽʌɳdʌ ʋʌɽʃʌm ku:dumbo:ja:ň ni:lak̂uɽɪɲ̃ɪ pu:k̂uɲ̂ʌt̪̆/
3. /ʋe:ɳʌmɛŋɪl tʃʌk̂ɑ ʋe:rɪlum kɑ:jk̂um eɲ̂ɑ:ɳ̆ tʃol̂̆/
4. /að̂ʋɑ:nitʃunda:k̂ɪja ka:ʂ̆ konda:ɳ̆ ʋi:ď paɳɪθaθ̆/
5. /t̪a:dzmʌhʌl lo:kaθ̂ilɛ e:ǰ ɑlbuθʌŋʌɭɪl oɲ̂ɑ:ň/
6. /mɽɪgaʂa:lajil ʋɪʋɪðɑ θʌrʌm mɽɪgaŋaɭum pakʃɪkaɭumuɳď/
7. /ɛnte ku:ʈuka:rʌn ðɑ:ra:ɭʌm samsa:rɪk̂uɲ̂a ʋeikt̪ɪja:ɳ̆/

List 4

1. /pɽɑ:θʌlinu munp̆ ʋjɑja:mʌm tʃɛĵuɲ̂at̪̆ nal̂ʌθa:ɳ̆/
2. /aɽabikadalinte ɽa:ɳɪ ɛň̂ ʋɪʂe:ʃɪpɪk̂uɲ̂a nagarama:ɳʌ kotʃɪ/
3. /ɲ̃a:n a:ɽu maɳɪjo:de adupitʃ̆ ʋʌrum/
4. /ðɪʋɑsɑʋum ʋjɑja:mʌm tʃɛĵuɲ̂at̪̆ a:ro:gjaθɪnʌ nal̂ʌθa:ɳ̆/

5. /am̂ʌk̂ɪl̟ɪ kuññɪnɛ tʃɪr̟akɪintɛ ki:jil samrʌkʃɪk̂un̂u/
6. /kut̟ikʌl̟ kadʌjile:k̂̆ mit̟a:jɪ ⱱa:ŋɪk̂a:n po:ji/
7. /oru ⱱar̟ʃʌθɪl mun̂u:tɪ ar̟upatθ̂ʌndž ðɪⱱɑsʌŋʌl̟ un̟ď/

List 5

1. /samsa:rik̂un̂aθɪň munƃ ranď θʌⱱʌn̟a tʃɪnðɪk̂uka/
2. /kajiña θʌⱱan̟a avʌl̟k̂̆ pari:kʃɑ el̟up̂ama:run̂u/
3. /ⱱi:t̟ɪl ⱱarun̂a aθɪðɪkal̟ɛ nan̂a:ji salkarik̂an̟ʌm/
4. /a:ha:rʌm mat̂ul̟̂ʌvʌr̟k̂ʌ ða:nʌm tʃɛǰuňʌθ̆ pun̟jama:n̟̆/
5. /a:na kodut̯a:lum a:ʂa koduk̂aruθ̆ en̂a:n̟̆ tʃol̟̂̆/
6. /ʂɪʂɪra ka:laθ̂ɪl maraŋalile ɪlakʌl̟ koɻɪjum/
7. /ⱱar̟ʃʌm θo:r̟um sʌr̟k̂a:r̟ ⱱɪðja:bjasaθ̂e pariʃkarɪtʃ̆ kon̟dɪrun̂u/

List 6

1. /nam̂ʌl̟ el̂a: ðɪⱱʌsʌⱱum ðeiⱱaθo:ď pr̟a:r̟θɪk̂an̟ʌm/
2. /dza:θɪ maθʌ ⱱjeθja:sam ɪl̂a:θɛ keral̟i:jʌr̟ ɔ:n̟ʌm a:koʃik̂un̂u/
3. /ma:θa:pit̯a:k̂ʌl̟ejum guruk̂ʌnma:rejum ðeivaθɪň θuljara:ji kan̟ak̂a:k̂ʌnʌm/
4. /guruk̂ʌnma:r̟ ʂɪʂjanma:rk̂ʌ ar̟ɪv̆ pakʌr̟n̂ʌ nalkun̂u/
5. /nam̂ude surakʃiθʌt̯ⱱʌm nam̂ude kaijɪl θan̂eja:ň/
6. /ka:nʌm ⱱɪt̂um ɔ:n̟ʌm un̟̂ʌn̟ʌm en̂a:n̟ʌ tʃol̂ʌ/
7. /bʰa:raθt̯̂ɪnte ra:ʃtr̟a pɪθa:v̆ maha:θma ga:nðɪja:n̟̆/

List 7

1. /ña:n eÎa: ña:jaɻa:ɻʈʃʌjum paÎijɪl pɔ:kum/
2. /aɲ̂a:n kuñɪne mʌrʌm keɻa:n padipiǩaɳamo:/
3. /mudi vaɻara:n maila:ndzɪ vaɻare naÎʌθa:ň/
4. /atʃʧʃʌn puθɪja uduṕ vɑ:ŋɪ θʌn̂u/
5. /θeť̂ tʃeiθʌθɪn̆ am̂a kuʈɪje ʂa:sɪtʃu/
6. /na:line raɳd̆ kɔnd̆ guɳitʃa:l eť̂ kiʈum/
7. /aʈ̂ʌm pʌθ̑ina:ň kerali:jaɻ ɔ:ɳʌm a:koʃɪǩuñʌθ̑/

APPENDIX – II

Sentence list for adults in Malayalam

Lists 1

1. സ്ത്രീകൾ മുല്ലപൂവ് തലയിൽ ചൂടാൻ ഉപയോഗിക്കുന്നു.
2. സീതയെ തട്ടിക്കൊണ്ട് പോയ രാവണനെ രാമൻ വധിച്ചു.
3. തവളയ്ക്ക് കരയിലും വെള്ളത്തിലും ജീവിക്കാൻ സാധിക്കും.
4. കേരളീയർ നവംബർ ഒന്നിന് കേരളപിറവി ആഘോഷിക്കുന്നു.
5. നിയമം കൈയ്യിൽ എടുക്കാൻ ആർക്കും അവകാശമില്ല.
6. ഈ വർഷത്തെ കൃഷിയിൽ നല്ല വിളവ് ലഭിച്ചു.
7. ചെടിയിൽ നിറയെ മഞ്ഞ പൂക്കൾ വിരിഞ്ഞു.

Lists 2

1. അവൾ എന്നും രാവിലെ നേരത്തെ എഴുന്നേൽക്കും.
2. പന്ത്രണ്ട് വർഷം കൂടുമ്പോളാണ് നീലക്കുറിഞ്ഞി പൂക്കുന്നത്.
3. വേണമെങ്കിൽ ചക്ക വേരിലും കായ്ക്കും എന്നാണ് ചൊല്ല്.
4. അദ്ധ്വാനിച്ച് ഉണ്ടാക്കിയ കാശ് കൊണ്ടാണ് വീട് പണിതത്.
5. താജ്മഹൽ ലോകത്തിലെ ഏഴ് അത്ഭുതങ്ങളിൽ ഒന്നാണ്.
6. മൃഗശാലയിൽ വിവിധ തരം മൃഗങ്ങളും പക്ഷികളുമുണ്ട്.
7. എന്റെ കൂട്ടുകാരൻ ധാരാളം സംസാരിക്കുന്ന വ്യക്തിയാണ്.

Lists 3

1. സംസാരിക്കുന്നതിന് മുമ്പ് രണ്ട് തവണ ചിന്തിക്കുക.
2. കഴിഞ്ഞ തവണ അവൾക്ക് പരീക്ഷ എളുപ്പമായിരുന്നു.
3. വീട്ടിൽ വരുന്ന അതിഥികളെ നന്നായി സത്കരിക്കണം.

4. ആഹാരം മറ്റുള്ളവർക്ക് ദാനം ചെയ്യുന്നത് പുണ്യമാണ്.
5. ആന കൊടുത്താലും ആശ കൊടുക്കരുത് എന്നാണ് ചൊല്ല്.
6. ശിശിരകാലത്തിൽ മരങ്ങളിലെ ഇലകൾ കൊഴിയും.
7. വർഷം തോറും സർക്കാർ വിദ്യാഭ്യാസത്തെ പരിഷ്കരിച്ചു കൊണ്ടിരുന്നു.

Lists 4

1. നമ്മൾ എല്ലാ ദിവസവും ദൈവത്തോട് പ്രാർത്ഥിക്കണം.
2. ജാതി–മത വ്യത്യാസം ഇല്ലാതെ കേരളീയർ ഓണം ആഘോഷിക്കുന്നു.
3. മാതാപിതാക്കളെയും ഗുരുക്കന്മാരെയും ദൈവത്തിന് തുല്യമായി കണക്കാക്കണം.
4. ഗുരുക്കന്മാർ ശിഷ്യന്മാർക്ക് അറിവ് പകർന്ന് നൽകുന്നു.
5. നമ്മുടെ സുരക്ഷിതത്വം നമ്മുടെ കൈയ്യിൽ തന്നെയാണ്.
6. കാണം വിറ്റും ഓണം ഉണ്ണണം എന്നാണ് ചൊല്ല്.
7. ഭാരതത്തിന്റെ രാഷ്ട്ര പിതാവ് മഹാത്മ ഗാന്ധിയാണ്.

Lists 5

1. കുട്ടികൾ കടൽതീരത്ത് പട്ടം പറത്തി കളിക്കുന്നു.
2. ചുവപ്പ് നിറം അപകട സാധ്യതയെ സൂചിപ്പിക്കുന്നു.
3. മരങ്ങൾ നട്ട് നമ്മൾ പ്രകൃതിയെ സംരക്ഷിക്കണം.
4. ജലം അമൂല്യമാണ്, ഒരിക്കലും പാഴാക്കാൻ പാടില്ല.
5. ഉത്തരം പറയാത്തതിനാൽ അദ്ധ്യാപകൻ വിദ്ധ്യാർത്ഥിയെ പുറത്താക്കി.
6. അമ്മ പാത്രത്തിൽ നിറയെ ചോറ് വിളമ്പി.
7. കേരളത്തിൽ ധാരാളമായി കാണുന്ന മരമാണ് തെങ്ങ്.

Lists 6

1. മാവേലി എല്ലാ വർഷവും ഓണത്തിന് നാട് കാണാൻ വരും.

2. നൈലാണ് ലോകത്തിലെ നീളം കൂടിയ നദി.
3. അവൻ അവൾക്ക് പുസ്തകം വായിക്കാൻ കൊടുത്തു.
4. ഡിസംബർ മാസത്തിൽ നല്ല മഞ്ഞും തണുപ്പും ഉണ്ട്.
5. വിഷുവിന് കുട്ടികൾ പടക്കം പൊട്ടിച്ച് ആഘോഷിക്കുന്നു.
6. കനത്ത മഴയിൽ അവരുടെ കൃഷി നശിച്ചു
7. നെഹ്റുവിന്റെ ജന്മദിനം നമ്മൾ ശിശുദിനമായി ആഘോഷിക്കുന്നു.

Lists 7

1. പതിനാല് ജില്ലകൾ ഉൾപ്പെടുന്ന സംസ്ഥാനമാണ് കേരളം.
2. അദ്ധ്യാപകർ പറയുന്നത് കുട്ടികൾ ശ്രദ്ധയോടെ കേൾക്കണം.
3. കുയിൽ കാക്കയുടെ കൂട്ടിലാണ് മുട്ട ഇടുന്നത്.
4. അവൾ പത്ത് വർഷം സംഗീതം പഠിച്ചു.
5. കനത്ത കാറ്റിൽ കപ്പൽ ആടി ഉലഞ്ഞു.
6. അവന്റെ കുതിര വേലിക്കു മുകളിലൂടെ ചാടി.
7. നമ്മൾ പുറത്ത് പോകുമ്പോൾ വീട് പൂട്ടണം.

Sentence list for adults in IPA

List 1

1. /st̪ri:kʌl̪ mul̂a pu:vˇt̪ʌlʌjɪl tʃu:dɑ:n upajogik̂un̂u/
2. /si:θʌjɛ t̪at̪ikondʌ po:ja ra:vʌn̪ʌnɛ rɑ:mʌn vʌðɪtʃu/
3. /θʌvʌl̪ʌjǩ karajɪlum vɛl̪̂ʌθɪlum dzɪ:vɪǩɑ:n sa:ðik̂um/
4. /ke:rʌl̪i:jʌr̪ nʌvʌmbʌr̪ on̂iň kɛrɑl̪ʌpɪr̪ʌvɪ ɑ:koʃɪk̂un̂u/
5. /nɪjamam kaijil eduk̂ɑ:n ɑ:r̪k̂um avʌkɑ:ʂʌmil̂a/
6. /i: vʌr̪ʃʌθɛ kr̪ɪʃɪjɪl nal̂ɑ vɪl̪ʌvˇ labitʃu/
7. /tʃɛdɪjɪl nir̪ʌjɛ mañña pu:k̂ʌl̪ vɪrɪñu/

List 2

1. /avʌl̪ enˆum ra:vɪlɛ ne:raθɛ ejunˆe:lk̂um/
2. /pʌnðɽʌɳdʌ vʌɾ̪ʃʌm ku:dumbo:ja:n̆ ni:lak̂uɽ̥ɪñɪ pu:k̂unˆʌt̪̆/
3. /ve:ɳʌmɛŋɪl tʃʌk̂ɑ ve:rɪlum kɑ:jk̂um enˆɑ:ɳ̆ tʃol̆̂/
4. /aðˆ̂vɑ:nitʃunda:k̂ɪja ka:ʂ̆ konda:ɳ̆ vi:d̆ paɳɪθaθ̋/
5. /t̪̆a:dzmʌhʌl lo:kaθ̈ɪlɛ e:ǰ ɑlbuθʌŋʌl̪ɪl onˆɑ:n̆/
6. /mɽ̥ɪgaʂa:lajil vɪvɪðɑ θʌrʌm mɽ̥ɪgaŋal̪um pakʃɪkal̪umuɳd̆/
7. /ɛnte ku:ʈuka:rʌn ðɑ:ra:l̪ʌm samsa:rɪk̂unˆa veikt̪̆ɪja:ɳ̆/

List 3

1. /samsa:rik̂unˆaθɪn̆ munb̆ rand̆ θʌvʌɳa tʃɪnðɪk̂uka/
2. /kajiña θʌvaɳa avʌl̪k̆ pari:kʃɑ el̪upˆama:runˆu/
3. /vi:ʈɪl varunˆa aθɪðɪkal̪ɛ naˆna:ji salkarik̂aɳʌm/
4. /a:ha:rʌm matˆul̪̂ʌvʌɽ̥k̂ʌ ða:nʌm tʃɛǰuñʌθ̋ puɲjama:ɳ̆/
5. /a:na koduʈ̪a:lum a:ʂa kodukˆaruθ̋ enˆa:ɳ̆ tʃol̆̂/
6. /ʂɪʂɪra ka:laθ̈ɪl maraŋalile ɪlakʌl̪ koɻjum/
7. /vaɾ̪ʃʌm θo:ɽ̥um sʌɽ̥k̂a:ɽ̥ vɪðja:bjasaθ̋e pariʃkarɪtʃ̆ koɳdɪruˆnu/

List 4

1. /naˆmʌl̪ el̂a: ðɪvʌsʌvum ðeivaθo:d̆ pɽ̥a:ɽ̥θɪk̂aɳʌm/
2. /dza:θɪ maθʌ vjeθja:sam ɪl̂a:θɛ keral̪i:jʌɽ̥ ɔ:ɳʌm a:koʃik̂unˆu/
3. /ma:θa:piʈ̪a:k̂ʌl̪ejum gurukˆʌnma:rejum ðeivaθɪn̆ θuljara:ji kaɳak̂a:k̂ʌnʌm/
4. /gurukˆʌnma:ɽ̥ ʂɪʂjanma:rk̂ʌ aɽ̥ɪv̆ pakʌɽ̥ˆnʌ nalkunˆu/

5. /nam̂ude surakʃɪθʌt̪vʌm nam̂ude kaijɪl θañeja:ň/
6. /ka:nʌm vɪt̂um ɔ:n̪ʌm un̂ʌn̪ʌm eña:n̪ʌ tʃoÎʌ/
7. /bʰa:raθt̪̂ınte ra:ʃt̪ra pɪθa:vˇ maha:θma ga:nðɪja:ň/

List 5

1. /kuʈɪkʌl̪ kadalθi:rʌt̪̆ paʈʌm paɻaθɪ kal̪ɪk̂uñu/
2. /tʃuvˇap̆ niɻʌm apakada sa:ðjat̪ʌje su:tʃɪpik̂uñu/
3. /maraŋal̪ naʈʌ nam̂al̪ pɻakɽɪt̪ije samrakʃɪk̂aŋʌm/
4. /dzʌlʌm amu:ljama:n̪ʌ ɔrɪk̂alum pa:ɻa:k̂a:n pa:diÎa/
5. /uθʌrʌm paɻaja:θʌθɪna:l aðða:pakʌn vɪða:ɻ̣θɪje puɻaθa:k̂i/
6. /am̂a pa:θ̣aθɪl nɪrɻje tʃɔ:ř vɪl̪ʌmbi/
7. /ke:ral̪ʌθɪl ða:ra:l̪ʌma:ji ka:n̪uñ̂a mʌrʌma:ň θɛğ/

List 6

1. /ma:veli eÎa: vʌt̪̆ʃʌvum ɔ:n̪aθɪň na:d̆ ka:na:n vˇʌrum/
2. /naila:ň lo:kaθɪle ni:l̪ʌm ku:dija nʌðɪ/
3. /avˇʌn avˇʌl̪k̆ pusθakʌm va:jik̂a:n koduʈ̪u/
4. /dɪsʌmbʌt̪̆ ma:saθɪl naÎa mañum θan̪up̂um un̪da:kum/
5. /vɪʃuviň kuʈikʌl̪ padak̂ʌm poʈɪtʃ̆ a:kɔ:ʃɪk̂uñu/
6. /kʌnʌθʌ mʌɻʌjɪl avˇʌrude kɻiʃi naʂitʃu/
7. /nehruvinte dzanmaðinʌm nam̂ʌl̪ ʂɪʂuðɪnama:ji a:kɔ:ʃɪk̂uñu/

List 7

1. /paθina:ǐ dziÎakʌl̩ ul̩p̂eduña sʌmsθa:nʌma:nʌ keral̩ʌm/
2. /aðja:pakʌn paɾ̩ʌjuñaθ̍kuʈikʌl̩ ʂɾ̩aðʌjo:de ke:l̩k̂aɳʌm/
3. /kuʃɪl ka:k̂ajude ku:ʈila:ň muʈa iduñaθ̍/
4. /avʌl̩ paʈ̂ʌ vaɾ̩ʃʌm saŋgi:θʌm paditʃu/
5. /kanaʈ̂a ka:t̂ɪl kap̂ʌl a:di ulañu/
6. /avʌnte kuθɪra ve:lǐ̌ mukalilu:de tʃa:di/
7. /nam̂al̩ puɾ̩aθ̍pɔ:kumbo:l̩ vi:ď pu:ʈanʌm/