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DEVELOPMENT OF SENTENCES FOR A TAMIL SPEECH-IN-NOISE TEST: LISTS FOR CHILDREN, YOUNGER ADULTS, AND OLDER ADULTS

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Abstract

Introduction: The present study aimed to develop and standardize sentences for speech-in-noise tests in the Tamil language for children, younger adults, and older adults.

Material and methods: A set of 300 sentences in Tamil was taken from the *Production of Language Training Materials in Major Indian Languages* (Karanth et al., 2010) and recorded. These sentences were rated by five native Tamil-speaking speech-language pathologists based on naturalness, predictability, and identifiability. Sentences rated by at least 80% of the raters for high naturalness, low predictability, and high identifiability were selected, resulting in 147 sentences for further use. These sentences were mixed with speech-shaped noise at varying signal-to-noise ratios (SNRs), ranging from +5 to –10 dB in 2.5 dB steps. Speech perception in noise was assessed in 90 normal hearing participants (30 children, 30 younger adults, and 30 older adults). The SNR-50 values – representing the SNR at which 50% of the words were correctly identified – was evaluated.

Results: Perceptual SNR-50 values were calculated for each list, based on the perceptual score obtained by each participant (separately for children, younger adults, and older adults). Statistical analysis determined that some lists had significantly different perceptual scores and were excluded. Seven lists were finalized for each age group, with mean SNR-50 values of –4.76 dB for children, –4.66 dB for younger adults, and –4.65 dB for older adults. Tests confirmed reliability and validity.

Conclusions: The study found that speech identification scores decreased with poorer SNR levels, with significant differences in SNR-50 values across children, younger adults, and older adults. Separate, equivalent test lists were created for each age group. The test materials showed high test–retest reliability and internal validity, making it possible to distinguish between individuals with normal hearing and those with hearing loss.

Keywords: speech in noise test • Tamil language • sentence development • SNR-50 values

OPRACOWANIE LIST ZDAŃ DO TAMILSKIEGO TESTU MOWY W SZUMIE: DLA DZIECI, MŁODSZYCH DOROSŁYCH I STARSZYCH DOROSŁYCH

Streszczenie

Wprowadzenie: Niniejsze badanie miało na celu opracowanie i standaryzację zdań do testów mowy w szumie w języku tamilskim dla dzieci, młodszych dorosłych i starszych dorosłych.

Materiał i metody: Zestaw 300 zdań w języku tamilskim został zaczerpnięty z *Production of Language Training Materials in Major Indian Languages* (Karanth et al., 2010) i nagrany. Pięciu logopedów, dla których język tamilski jest językiem rodzimym, oceniło zdania pod kątem ich naturalności, przewidywalności i identyfikowalności. Do dalszych prac wybrano 147 zdań, które przez 80% oceniających zostały uznane jako zdania o wysokiej naturalności, niskiej przewidywalności i wysokiej identyfikowalności. Zdania te zostały zmieszane z szumem o widmie mowy o różnym stosunku sygnału do szumu (SNR), w zakresie od +5 do –10 dB w krokach co 2,5 dB. Percepcja mowy w szumie została oceniona u 90 normalnie słyszących uczestników (30 dzieci, 30 młodszych dorosłych i 30 starszych dorosłych). Oceniono wartość SNR-50 oznaczającą SNR przy prawidłowej identyfikacji 50% słów.

Wyniki: Wartości SNR-50 obliczono dla każdej listy na podstawie wyniku uzyskanego przez każdego uczestnika (oddzielnie dla dzieci, młodszych dorosłych i starszych dorosłych). Analiza statystyczna wykazała, że dla niektórych list uzyskano znacząco różne wyniki, więc listy te zostały wykluczone. Ostatecznie utworzono po siedem list dla każdej grupy wiekowej, ze średnimi wartościami SNR-50 wynoszącymi –4,76 dB dla dzieci, –4,66 dB dla młodszych dorosłych i –4,65 dB dla starszych dorosłych. Testy potwierdziły rzetelność i trafność list.

Wnioski: Badanie wykazało, że wyniki identyfikacji mowy spadały wraz z niższymi poziomami SNR, ze znacznymi różnicami w wartościach SNR-50 u dzieci, młodszych dorosłych i starszych dorosłych. Dla każdej grupy wiekowej utworzono oddzielne równoważne listy testowe. Materiały testowe wykazały wysoką rzetelność i trafność wewnętrzną w zakresie rozróżniania osób z prawidłowym słuchem i osób z ubytkiem słuchu.

Słowa kluczowe: test mowy w hałasie • język tamilski • rozwój zdań • SNR-50

Introduction

In everyday life, speech signals are rarely identified under optimal listening conditions. Environmental factors such as background noise, reverberation, and hearing loss often impair the speech recognition, requiring increased cognitive effort to comprehend degraded signals [1]. Speech perception is a complex process involving the interpretation of language sounds by extracting acoustic and phonemic information, which is then used for higher-level language processing, such as word recognition [2]. Real-world environments often introduce overlapping or simultaneous auditory stimuli, further challenging the auditory system [3].

Understanding speech in the presence of background noise constitutes a great challenge for any listener, especially those suffering from hearing loss. Because of the challenge this task poses, its assessment can provide good insight into an individual's ability to cope with typical everyday listening environments, which are often noisy [4]. Methods to evaluate and forecast this ability have garnered significant attention in research over the past several decades.

One test that simulates speech comprehension in real-life situations is the speech-in-noise (SIN) test. The SIN test helps audiologists identify individuals who have difficulty understanding speech in noise and describes the amount of difficulty and benefit provided by amplification [5].

Demand for culturally and linguistically appropriate SIN test materials has led to their development in several languages, including Mandarin [6], Persian [7], Kannada [8], and Oriya [9]. Research supports the importance of linguistic and cultural relevance in SIN testing. Studies by Ghosh et al. [10] and Wang et al. [11] demonstrate that speech perception is significantly enhanced when individuals are assessed using materials in their native language, underscoring the need to tailor speech-in-noise tests to the linguistic and cultural contexts of the population.

Despite Tamil being one of the most widely spoken Dravidian languages, there is no standardized speech-in-noise test material available for its speakers. Tamil's distinctive linguistic and phonetic characteristics, including unique vowel–consonant combinations and syllabic structures, highlight the need for specialized tailoring speech-in-noise materials to ensure accurate evaluation and diagnosis. Currently, assessments for Tamil speakers often rely on tools developed for other languages, which may fail to address their specific challenges in noisy environments.

This gap limits the audiologist's ability to provide culturally and linguistically appropriate interventions for Tamil speakers, increasing the risk of misdiagnosis or ineffective rehabilitation strategies that might adversely impact communication and quality of life. Moreover, incorporating Tamil into speech-in-noise research broadens our understanding of how linguistic diversity affects auditory processing. By developing speech-in-noise materials tailored to Tamil, this study addresses a critical linguistic gap, enhances diagnostic precision, and supports culturally relevant auditory assessments. This initiative not only benefits Tamil-speaking populations but also promotes the inclusion of underrepresented languages in global audiological research.

This study aims to develop and standardize SIN test materials in Tamil for three groups: children, younger adults, and older adults. By designing and validating age-specific test lists with reliable and accurate data, the study seeks to enable accurate audiological assessments, ensure precise diagnosis, and support effective intervention strategies for Tamil-speaking individuals facing speech perception challenges in noisy environments.

Material and methods

Selection and recording of test stimuli

Three hundred sentences in Tamil were selected from a UNICEF-funded document [12]. A native female Tamil speaker with normal voice characteristics was recorded using Praat v. 5.3.53 (sampling rate 44.1 kHz) in a sound-treated room. Each sentence was saved in WAV format.

Familiarity rating of sentences

Five native Tamil-speaking speech-language pathologists rated the 300 sentences on identifiability, naturalness, and predictability [13]. Sentences rated by at least 80% of raters as highly natural, of low-predictability, and extremely identifiable were selected, resulting in 147 sentences, which were divided into 21 lists of 7 sentences each.

Adding noise to the signals

Speech-shaped noise (SSN) for each sentence was generated using the 'ssn' script of Praat. The script takes the average long-term average spectrum (LTAS) of a selection of sound objects and shapes white noise according to this average [14]. Each of the 21 sentence lists was then combined with speech-shaped noise at different signal-to-noise ratio (SNR) levels, ranging from +5 to –10 dB SNR in 2.5 dB steps using the 'Mix noise' script of Praat [15]. Speech-shaped noise was added to all the selected sentences at different SNR levels so that the first sentence in each list had the highest SNR and the last sentence had the lowest.

Participants

A normative research design was adopted, involving 90 participants with normal hearing sensitivity (PTA < 15 dB HL, SRT +10 dB of PTA; SIS > 90% according to ANSI S3.21, 2009). Participants were divided into three

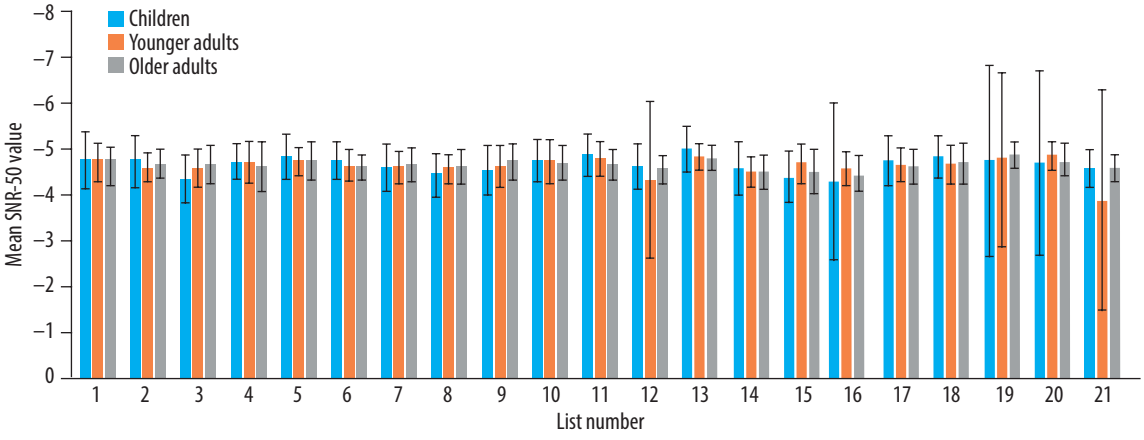

Figure 1. Mean overall SNR-50 values for children, younger adults, and older adults

groups: Group 1 consisted of 30 children aged 8 to 12 years; Group 2 consisted of 30 younger adults aged 18 to 24 years; and Group 3 consisted of 30 older adults aged 45 to 55 years. All participants had normal auditory processing abilities as assessed using the Screening Checklist for Auditory Processing (SCAP) [16] for children and the Screening Checklist for Auditory Processing in Adults (SCAP-A) [17] for younger and older adults. None of the participants reported any neurological, psychological, visual, or behavioral problems. All participants were native Tamil speakers. The study was approved by the institutional ethical board and informed written consent was obtained from each participant before the study began.

Procedure

Testing was conducted in an acoustically treated room meeting ANSI S 3.1 (1999) standards. Participants were seated comfortably in front of a laptop monitor and instructed to listen carefully to the sentences and repeat each word. Sentences were randomly presented to participants through Sennheiser HD 202 headphones connected to a personal computer (Dell Core i5 processor with Realtek high-definition audio card) using Alvin software (v. 3.2; Hillenbrand & Gayvert, 2005). Participants' responses were recorded via an omnidirectional microphone placed 10 cm from their mouths and each sentence was saved as a separate file for further analysis.

Scoring

Recorded responses were evaluated by native Tamil-speaking speech-language pathologists, who identified the keywords in each sentence. Correctly repeated keywords were scored as '1', while incorrectly repeated or omitted words were scored as '0'. Each sentence had four keywords, resulting in a maximum score of 4 per sentence. Perceptual scores for each participant were obtained from the recorded responses.

Data analysis

The SNR-50 value, representing the signal-to-noise ratio at which 50% of the words were correctly identified, was estimated using regression analysis. Responses for each list were analyzed using the Shapiro–Wilk test for normalcy, confirming a normal distribution. Parametric statistics were employed, with repeated measures ANOVA and Bonferroni's post-hoc analysis used to evaluate the equivalency of responses across lists. Test–retest reliability was assessed with repeated measures ANOVA, involving re-testing of 10 children, 10 younger adults, and 10 older adults after 3 months to prevent habituation to the test stimuli. Between-subject variability was measured using an independent sample *t*-test. Internal validity was determined by comparing the SNR-50 values for each list with the overall mean SNR-50 values.

Ethics

This study was conducted under the supervision of the BASLP Department of Vinayaka Mission Medical College, Karaikal.

Results

Calculation of SNR-50

The correct identification of keywords in each sentence for each participant was noted and tabulated separately. SNR-50 was calculated for each list based on the scores obtained by each participant using logistic regression with non-linear interpolation analysis. The 50th percentile, i.e., the point at which participants correctly identified 50% of the words, was interpolated from the standard curve (**Figure 1**).

Equivalency of the sentence lists

A repeated measures analysis of variance (ANOVA) with Bonferroni's multiple comparisons was used to compare the perceptual SNR-50 scores across different age groups. Results showed significant differences in perceptual scores for children [$F(1,29) = 3.09$; $p < 0.05$], younger adults [$F(1,29) = 4.38$; $p < 0.05$], and older adults [$F(1,29) = 2.83$; $p < 0.05$]. These results indicate that, of the 21 lists, some were easier, resulting in higher scores, while others were more difficult, resulting in lower scores.

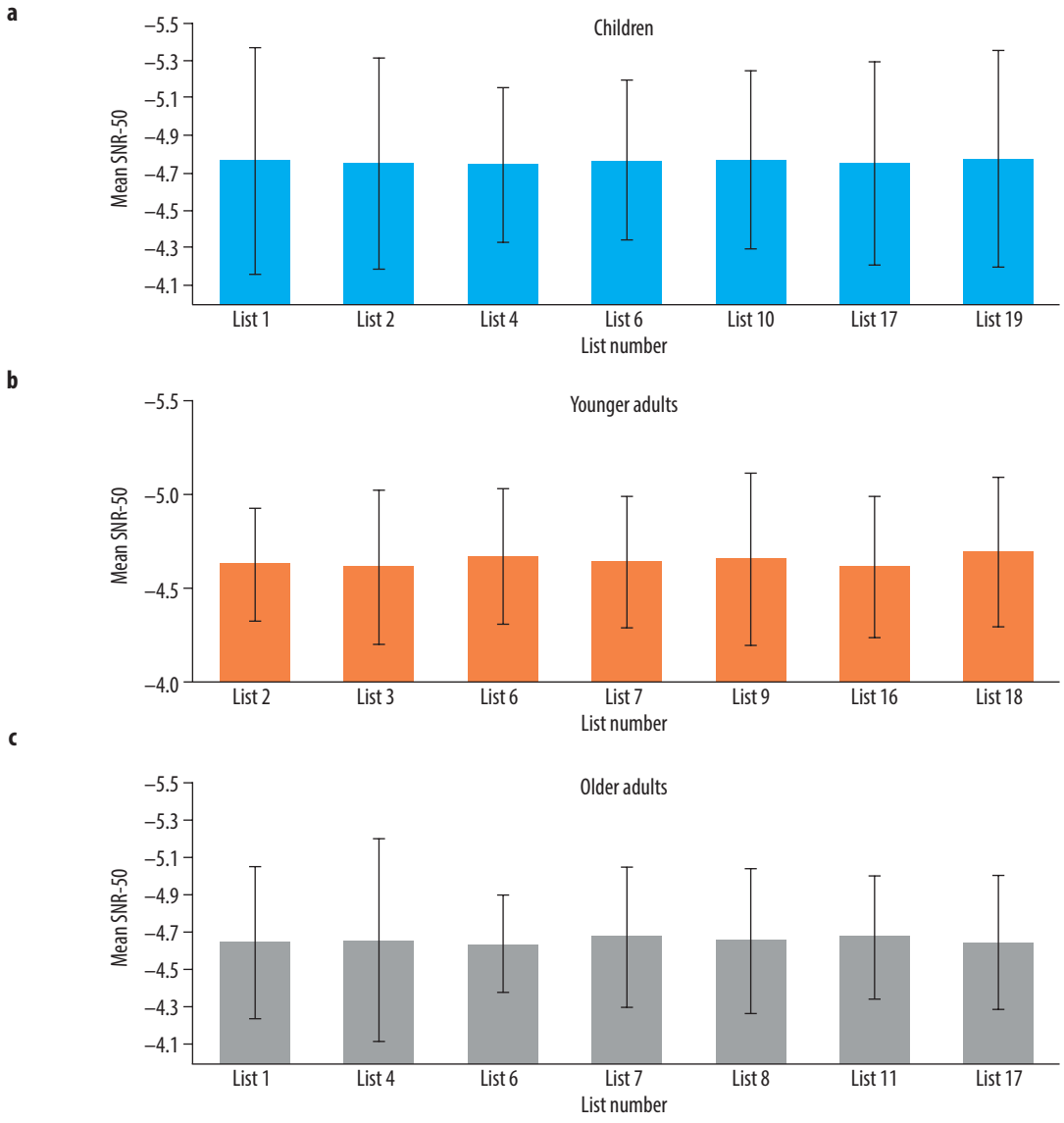

Figure 2. Mean SNR-50 scores for selected lists. **a**) for children; **b**) for younger adults; **c**) for older adults

Based on Bonferroni's multiple pairwise comparison for children, the analysis revealed that lists 5, 11, 13, and 18 were relatively simpler and had better perceptual SNR-50 scores. Lists 3, 7, 8, 9, 14, 15, 20, and 21 were harder to perceive, resulting in poorer SNR-50 scores. The remaining seven lists (1, 2, 4, 6, 10, 17, and 19) were further analyzed using repeated measures ANOVA, and showed no statistically significant difference between perceptual SNR-50 scores for any of the lists [$F(1,6) = 0.01$; $p > 0.05$]. These seven lists were selected for children.

For younger adults, lists 1, 4, 5, 10, 13, 17, and 20 were simpler and had better perceptual SNR-50 scores, while lists 8, 12, 14, and 21 were harder and resulted in poorer scores. The remaining seven lists (2, 3, 6, 7, 9, 16, and 18) were further analyzed, showing no statistically significant difference [$F(1,6) = 0.21$; $p > 0.05$]. These seven lists were selected for younger adults.

For older adults, lists 2, 3, 5, 9, 10, 13, 18, and 20 were simpler, with better perceptual SNR-50 scores. Lists 12, 14, 15, 16, and 21 were harder, resulting in poorer scores. The remaining seven lists (1, 4, 6, 7, 8, 11, and 17) were further analyzed, and showed no statistically significant difference [$F(1,6) = 0.09$; $p > 0.05$]. These seven lists were selected for older adults (**Figure 2**).

SNR loss

SNR loss was calculated for adults and children with normal hearing sensitivity by adapting the procedure suggested by Tillman and Olsen (1973). The SNR-50 score was obtained by multiplying 5 by 1.25 to get 6.25 (minus the total number of words repeated correctly). The SNR loss was calculated using the formula: for children, SNR loss was 6.25 – (–4.76); for younger adults, it was 6.25 – (–4.66); and for older adults, it was 6.25 – (–4.65).

Table 1. Paired sample *t*-test for test–retest reliability across children, younger adults, and older adults

Group	*df*	*t*	Significance (*p*)
Children	9	0.84	0.41
Younger adults	9	0.89	0.39
Older adults	9	0.88	0.40

Table 2. Repeated measure ANOVA (with Bonferroni's multiple comparisons) for children, younger adults, and older adults

Group	*df*	*F*	Significance (*p*)
Children	6	2.36	0.06
Younger adults	6	1.72	0.15
Older adults	6	2.36	0.06

Test–retest reliability

Test–retest reliability was measured using a paired sample *t*-test. Retesting was done for 10 children, 10 younger adults, and 10 older adults, 3 months after the original testing to avoid habituation effects. Results revealed no statistically significant difference between trials for children ($t = 0.84$, $p > 0.05$), younger adults ($t = 0.89$, $p > 0.05$), and older adults ($t = 0.88$, $p > 0.05$), indicating consistent responses across time (**Table 1**).

Validity of the tests

Internal validity was assessed by measuring the difference in SNR-50 values of each list compared to the overall mean SNR-50 values for each subject. The mean SNR-50 for the seven selected lists was calculated, and the SNR-50 value for each list was subtracted from the mean SNR-50 value. Differences in SNR-50 values were compared using repeated measures ANOVA, and showed no statistically significant differences between the 'difference SNR-50 values' for children [$F(1,29) = 2.36$; $p > 0.05$], younger adults [$F(1,29) = 1.72$; $p > 0.05$], and older adults [$F(1,29) = 2.36$; $p > 0.05$]. These results indicate that the selected lists were internally valid, and the responses obtained should be consistent (**Table 2**).

Discussion

This study has investigated speech perception in noise across three age groups – children (8–12 years), younger adults (18–25 years), and older adults (45–55 years) using Tamil speech-in-noise (SIN) test stimuli. By focusing on Tamil, a linguistically rich yet underrepresented language, the study addresses a significant gap in audiological research. Wang et al. [11] and Smits et al. [18] emphasized the need for culturally localized SIN tests, aligning with the study's aim to develop tailored assessments for Tamil speakers.

A systematic methodology was employed, beginning with the creation of 300 semantically and syntactically accurate Tamil sentences rated for familiarity by native Tamil-speaking speech-language pathologists. From this, 147 highly rated sentences were selected, divided into 21 lists of seven sentences each, and presented at varying signal-to-noise ratios (SNRs). This process reduced cognitive load and enhanced ecological validity, reflecting the emphasis of Zaar and Dau [19] on meaningful stimuli for accurate speech perception. Also, Bent and Bradlow [20] highlighted the limitations of generic SIN tools in accommodating linguistic diversity, which this study addressed.

Significant differences in perceptual SNR-50 scores across age groups revealed distinct auditory processing challenges, with older adults struggling more in noisy conditions. These findings align with Wang et al. [11], who reported similar declines among Mandarin speakers, and Pichora-Fuller et al. [21], who linked such difficulties to age-related cognitive and auditory declines. These results underscore the importance of age-specific assessments.

Seven statistically equivalent lists were identified for each age group using repeated measures ANOVA and Bonferroni multiple comparisons, ensuring that performance differences reflected auditory abilities rather than test variability. Smits et al. [18] stressed the importance of such equivalency for reliable clinical and research applications, achieved here through strict methodology.

Reliability was confirmed through a test–retest procedure 1 month after initial testing, and showed no significant differences in scores, affirming the stability of the materials. These findings are consistent with Ghosh et al. [10], who reported similar reliability with Malayalam SIN tests. Internal validity was also checked using repeated measures ANOVA and no significant differences in SNR-50 values across lists within each age group was found, ensuring the tool's precision.

The importance of culturally relevant SIN materials is evident. Ghosh et al. [10] showed how native-language stimuli enhance SIN performance by leveraging linguistic familiarity, while Mattys et al. [22] highlighted that familiarity with linguistic patterns reduces cognitive load and improves intelligibility in noise. By incorporating Tamil's unique linguistic characteristics, this study enabled accurate and meaningful assessments for Tamil speakers.

This study contributes to global evidence supporting age-specific and culturally sensitive SIN assessments. Wang et al. [11] and Smits et al. [18] emphasized adapting

SIN tools to linguistic and cultural contexts, and extending these methodologies to Tamil broadens audiological research and highlights the universality of SIN perception challenges.

By developing and standardizing SIN test materials in Tamil, this study addresses a gap in auditory assessment. It emphasizes the importance of culturally relevant tools for accurate diagnoses and effective interventions, advancing audiology, and supporting inclusivity in auditory healthcare. Future research could expand these findings by exploring broader age ranges, various Tamil dialects, and sociolinguistic factors affecting SIN perception, enhancing the clinical and research applications of SIN tools.

Conclusions

This study has developed and validated speech-in-noise (SIN) test materials for children, younger adults, and older adults, addressing a need for culturally and age-specific auditory assessments. Significant age-related differences in SIN perception underline the importance of tailored tools that account for linguistic and cognitive variations. Using a rigorous methodology, the study ensured the reliability, validity, and clinical relevance of the Tamil SIN tests, enhancing accuracy and minimizing cognitive load. By advancing culturally sensitive auditory assessments, this research provides a foundation for exploring Tamil dialects and sociolinguistic factors, promoting inclusivity and precision in auditory healthcare.

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Appendix

Tamil sentence lists for children (IPA format)

List 1

1. /kəɳɳɑ:dɪ/ /t̪əmlərɪl/ /t̪əɳɳi:r/ /ɪɾʉkkɪɾəɖʉ/
2. /mərət̪t̪ɪn/ /ɪləj/ /pɛɾɪɖɑ:gə/ /ɪɾʉkkɪɾəɖʉ/
3. /əɳɖə/ /nɑ:ʈkɑ:lɪ/ /ʊɖəjɳɖʉ/ /ɪɾʉkkɪɾəɖʉ/
4. /pəjjən/ /oɾʉ/ /pəlu:nəj/ /u:ɖʊgɪɾɑ:n/
5. /əʊərgəl/ /rəjɪlɪl/ /pəjənəm/ /sɛjɖɑ:rgəl/
6. /sɪɾɪjə/ /pərəʊəjgəl/ /ʊɑ:nət̪t̪ɪl/ /pərəkkəʊɪlləj/
7. /əɳɖə/ /pɛɳ/ /sɑ:ləjjɪl/ /nədəɳɖɑ:l/

List 2

1. /əʊərgəl/ /kɑ:l/ /pəɳɖʉ/ /ʊɪləjjɑ:/ /ɖʉgɪɾɑ:rgəl/
2. /ko:ʊɪl/ /mənɻjəj/ /əɖɪt̪t̪ʉ/ /koɳɖɪɾʉɳɖɑ:n/
3. /oɾʉ/ /mənɪɖən/ /səʈʈəjjəjp/ /po:ɖʉʊɑ:n/
4. /nɑ:j/ /t̪o:ʈʈət̪t̪ɪn/ /əɾʉge/ /ɪɾʉkkɪɾəɖʉ/
5. /pɑ:ppɑ:/ /pɑ:ləjk/ /kʊɖɪkkə/ /ʊəjkkəppəɖʉgɪɾəɖʉ/
6. /ɪɳɖək/ /kɪɳɳəm/ /əɖəjʊɪɖə/ /sɪɾɪɖɑ:gɪɾənɖəɖʉ/
7. /t̪oləjkkɑ:ʈtʃɪ/ /pɛʈʈɪ/ /pɛɾɪɖɑ:gə/ /ɪɾʉkkɪɾəɖʉ/

List 3

1. /əɳɖə/ /kʊɖəjjɪl/ /ʊɑ:jəjppəjəm/ /ɪɾʉkkɪɾəɖʉ/
2. /oɾʉ/ /pɛɳ/ /kəɖɪɖəm/ /ɛjʉɖɪɾʉkkɪɾɑ:l/
3. /oɾʉ/ /pɛɳ/ /t̪ʉɳɻjəjəj/ /t̪ʉʊəjppɑ:l/
4. /oɾʉ/ /sɪɾʉmɪ/ /t̪ələjjəj/ /ʊɑ:ɾɪjɪɾʉkkɪɾɑ:l/
5. /əʊər/ /kəʈʈəjjɪn/ /ʊɖəʊɪjɑ:l/ /nədəkkɪɾɑ:r/
6. /me:dʒəjjɪn/ /me:l/ /t̪əʈʈʉgəl/ /ɪlləj/
7. /ɪɳɖə/ /mərət̪t̪ɪl/ /pəɻəŋgəl/ /ɪɾʉgɪnɖʳənə/

List 4

1. /əʊəl/ /kɑ:lʉɾəjjəj/ /po:ʈʈʉ/ /ɪɾʉɳɖɑ:l/
2. /mərət̪t̪ɪn/ /ɪləj/ /pɛɾɪɖɑ:gə/ /ɪɾʉkkɪnɖʳənə/
3. /əʊən/ /mɪɖɪvəɳɖɪˑ/ /oʈʈɪk/ /koɳɖɪɾʉkkɪɾɑ:n/
4. /əʊən/ /pəl/ /t̪əjt̪t̪ʉk/ /koɳɖɪɾʉkkɪɾɑ:n/
5. /pəjjən/ /pɑ:bɑ:ʊʉkkʉ/ /pəɳɖʉ/ /koɖʉt̪t̪ɑ:n/
6. /dʒənnəl/ /kəɳɳɑ:dɪ/ /ʊɖəjɳɖʉ/ /ʊllə̪ɖʉ/
7. /ko:ɻjʉm/ /kʊɾʊʊɪjʉm/ /əɾɪsɪjəj/ /t̪ɪnnʉgɪnɖʳənə/

List 5

1. /pɑ:l/ /ʊɛllə̪j/ /nɪɾəmɑ:gə/ /ɪɾʉkkɪɾəɖʉ/
2. /əɳɖə/ /pɛɳ/ /ɪʊəlʉɖəjjə/ /əmmɑ:/
3. /ɛlɪgəl/ /roʈʈɪjəjjəj/ /t̪ɪnɖʳʉ/ /koɳɖɪɖʉgɪnɖʳənə/
4. /pəɳɖʉ/ /kʊɖəjjɪn/ /ʊl/ /ɪɾʉkkɪɾəɖʉ/
5. /pərəʊəj/ /dʒənnəl/ /ʊəɻjɑ:gə/ /sɛnɖʳəɖʉ/
6. /sɪɾʉmɪ/ /pəl/ /t̪ʉʊəkkəʊəjkkə/ /pəɖʉgɪɾɑ:l/
7. /əɳɖə/ /pəjjənɪn/ /səʈʈəj/ /əɻʉkkɑ:jɪɾɳɖəɖʉ/

List 6

1. /əɳɖə/ /pɛɳ/ /pɪnnɪ/ /koɳɖɪɾʉkkɪɾɑ:l/
2. /oɾʉ/ /pɛɳ/ /kəɖɪɖəm/ /ɛɻʉɖʉʊɑ:l/
1. /oɾʉ/ /pəjjən/ /pəlʉnəj/ /u:ɖʊgɪɾɑ:n/
3. /pʊt̪t̪ɑ:kkəm/ /pɛʈʈɪjɪn/ /me:l/ /ɪɾʉkkɪɾəɖʉ/
4. /əɳɖə/ /sɪɾʉmɪ/ /ʊi:ʈʈʉkkʉ/ /po:gɪɾɑ:l/
5. /pɛɳ/ /sɪɾʉmɪkkʉ/ /pu/ /koɖʉkkɪɾɑ:l/
6. /əʊəl/ /t̪i:kkʉtʃtʃɪjɑ:l/ /mɛɻʉgʊʊɖɪjəjəj/ /e:t̪t̪ʳɪnɑ:l/

List 7

1. /kəɖəʊɪn/ /sɑ:ʊɪ/ /ʊələjət̪t̪ɪl/ /ɪɾʉkkɪɾəɖʉ/
2. /oɾʉ/ /mənɪɖən/ /kəɖəlɪl/ /ni:ɳɖʉʊɑ:n/
3. /oɾʉ/ /mənɪɖən/ /kəɖəlɪl/ /ni:ɳɖʉgɪɾɑ:n/
4. /oɾʉ/ /pɛɳ/ /t̪ʉɳɻjəjəj/ /t̪ʉʊəjkkɪɾɑ:l/
5. /oɾʉ/ /sɪɾʉmɪ/ /t̪ələjjɑ:jə/ /ʊəɾʉgɪɾɑ:l/
6. /pɛɳ/ /nɑ:t̪t̪ʳəkkɑ:lɪɾʉɳɖʉ/ /ki:ɻe/ /ʊɻʉɳɖɑ:l/
7. /sɪʊəppʉ/ /t̪əmlərɪl/ /ni:r/ /ɪɾʉkkɪɾəɖʉ/

Tamil sentence lists for younger adults (IPA format)

List 1

1. /əʋərgəl/ /kaːl/ /pəɳɖʉ/ /ʋɪləjjaː/ /ɖʉgɪraːrgəl/
2. /koːʋɪl/ /mənɻjəj/ /əɖɪʈʈʉ/ /koɳɖɪrʉɳɖaːn/
3. /oɾʉ/ /mənɪɖən/ /səʈʈəjjəjp/ /poːɖʉʋaːn/
4. /naːj/ /ʈoːʈʈəʈʈɪn/ /əɾʉge/ /ɪrʉkkɪrəɖʉ/
5. /paːppaː/ /paːləjk/ /kʊɖɪkkə/ /ʋəjkkəppəɖʉgɪrəɖʉ/
6. /ɪɳɖək/ /kɪɳɳəm/ /əɖəjʋɪɖə/ /sɪrɪɖaːgɪrəɳɖəɖʉ/
7. /ʈoləjkkaːʈtʃɪ/ /pɛʈtɪ/ /pɛrɪɖaːgə/ /ɪrʉkkɪrəɖʉ/

List 2

1. /mɪləgaːj/ /mɪgə/ /kaːɾəmaːgə/ /ɪrʉkkɪrəɖʉ/
2. /puːʋɪn/ /meːl/ /ʋəɳɖʉppuːtʃtʃɪ/ /ʲɪrʉkkɪrəɖʉ/
3. /pəjjən/ /oɾʉ/ /pəluːnəj/ /uːɖʊʋaːn/
4. /paːppaː/ /pʊʈɪjɪl//paːl/ /kʊɖɪkkɪrəɖʉ/
5. /pəjjən/ /ʋɪləjjaːʈtʉ/ /pomməjjəjjəj/ /ɪʇʉkkɪraːn/
6. /ɪʋən/ /əʋənəjʋɪɖə/ /kʊʈtəjjaːgə/ /ɪrʉkkɪraːn/
7. /əmmaːʋʉm/ /əppaːʋʉm/ /pəɖɪʈʈʉ/ /koɳɖɪrʉkkɪraːrgəl/

List 3

1. /əʋəl/ /kaːlʉɾəjjəj/ /poːʈtʉ/ /ɪrɯɳɖaːl/
2. /məɾəʈʈɪn/ /ɪləj/ /pɛrɪɖaːgə/ /ɪrʉkkɪnɖʳənə/
3. /əʋən/ /mɪɖɪvəɳɖɪˑ/ /oʈtɪk/ /koɳɖɪrʉkkɪraːn/
4. /əʋən/ /pəl/ /ʈəjʈʈʉk/ /koɳɖɪrʉkkɪraːn/
5. /pəjjən/ /paːbaːʋʉkkʉ/ /pəɳɖʉ/ /koɖʉʈtaːn/
6. /dʒənnəl/ /kəɳɳaːɖɪ/ /ʊɖəjɳɖʉ/ /ʊllədʉ/
7. /koːɻɪjʉm/ /kʊɾʊʊɪjʉm/ /əɾɪsɪjəj/ /ʈɪnnʉgɪmɖʳənə/

List 4

1. /əʋəlaːl/ /maːmbəɻəʈʈəj/ /pəɾɪkkə/ /mʊdɻjʉm/
2. /əɳɖə/ /mənɪɖən/ /kʊɳɖaːgə/ /ɪrʉkkɪraːn/
3. /oɾʉ/ /pɛɳ/ /kədɪɖəm/ /ɛjʉɖɪrʉkkɪraːl/
4. /pɛɳ/ /kɪɳəʈʈʳɪlɪrʉɳɖʉ/ /ʈəɳɳiːr/ /ɪrəjkkɪraːl/
5. /pəjjən/ /sʊʋəɾəj/ /ʈaːɳɖəʋəjkkə/ /pədʉgɪraːn/
6. /əɳɖə/ /kʊɻəɳɖəjkkʉ/ /ʊdəlnələm/ /seːɾɪjɪləj/
7. /ɪɳɖə/ /ʋiːdʉ/ /sɪrɪɖaːgə/ /ɪrʉkkɪrəɖʉ/

List 5

1. /ʈoləjkkaːʈtʃɪjɪl/ /pədəm/ /paːrʈʈʉ/ /koɳɖɪrʉʈʈəl/
2. /əɳɖə/ /mənɪɖərgəl/ /kʊɳɖaːgə/ /ɪrʉkkɪraːrgəl/
3. /oɾʉ/ /pəjjən/ /səʈʈəjjəj/ /poːdʉʋaːn/
4. /əɖʉ/ /mɪɖɪvəɳɖɪ/ /oʈtɪk/ /koɳɖɪrʉkkɪrəɖʉ/
5. /pʊnəj/ /naːrkkaːlɪkkʉ/ /əɖɻɪl/ /ɪlləj/
6. /ɪɳɖə/ /səʈtəj/ /əɖəjʋɪɖə/ /niːləmaːkkɪrʉkkɪrəɖʉ/
7. /meːdʒəjjɪn/ /meːl/ /peːɳaː/ /ɪrʉkkɪrəɖʉ/

List 6

1. /əɳɖə/ /məɾəm/ /pɛrɪɖaːgə/ /ɪrʉkkɪrəɖʉ/
2. /oɾʉ/ /mənɪɖən/ /səʈtəjjəj/ /poːʈtɪrʉkkɪraːn/
3. /əʋəl/ /mɪɖɪvəɳɖɻəj/ /oːdɪkkoɳɖɪrʉkkɪraːl/
4. /ʈəmləɾɪlə/ /ʊl/ /ʈəɳɳiːr/ /ɪrʉkkɪrəɖʉ/
5. /ɪɖʉ/ /əʋəɾʉdəjjə/ /muːkkʉ/ /kəɳɳaːdɪ/
6. /pəjjən/ /sɪrʉmɪjəjəjʋɪdə/ /kʊɳɖaːgə/ /ɪrʉkkɪraːn/
7. /əɳɖə/ /pəjjən/ /kədəjkkʉ/ /poːgɪraːn/

List 7

1. /əɳɖə/ /sɪrʉmɪgəl/ /ʋəɾəjɳɖʉ/ /koɳɖɪrʉkkɪraːrgəl/
2. /oɾʉ/ /mənɪɖən/ /kədəlɪl/ /niːɳɖɪrʉkkɪraːn/
3. /əʋəl/ /ʈən/ /kaːlgəlaːl/ /ʊɖəjkkɪraːl/
4. /əʋərgəl/ /miːɖɪvəɳɖɪgələj/ /oʈtɪkkoɳɖʉ/ /ɪrʉkkɪraːrgəl/
5. /əʋəl/ /peːɾʉɳɖɪl/ /pəjəɳəm/ /sɛjgɪraːl/
6. /sɪrʉmɪ/ /paːʋaːdəj/ /əɳɻjəʋəjkkə/ /pədʉgɪraːl/
7. /sɪrʉmɪ/ /sɛɖɪgəlʉkkʉ/ /ʈəɳɳiːr/ /ʊʈʈʳəʋəjkkəppədʉgɪraːl/

Tamil sentence lists for older adults (IPA format)

List 1

1. /əʊərgəl/ /kɑːl/ /pəɳɖʉ/ /ʊɪləjjɑː/ /ɖʉgɪrɑːrgəl/
2. /koːʊɪl/ /mənɻjəj/ /əɖɪʈʈʉ/ /koɳɖɪrʉɳɖɑːn/
3. /oɾʉ/ /mənɪɖən/ /səʈʈəjjəjp/ /poːɖʉʊɑːn/
4. /nɑːj/ /ʈoːʈʈəʈʈɪn/ /əɾʉge/ /ɪrʉkkɪrəɖʉ/
5. /pɑːppɑː/ /pɑːləjk/ /kʊɖɪkkə/ /ʊəjkkəppəɖʉgɪrəɖʉ/
6. /ɪɳɖək/ /kɪɳɳəm/ /əɖəjʊɪɖə/ /sɪrɪɖɑːgɪrəɳɖəɖʉ/
7. /ʈoləjkkɑːʈtʃɪ/ /pɛʈtɪ/ /pɛrɪɖɑːgə/ /ɪrʉkkɪrəɖʉ/

List 2

1. /əɳɖə/ /kʊɖəjjɪl/ /ʊɑːjəjppəjəm/ /ʲɪrʉkkɪrəɖʉ/
2. /oɾʉ/ /pɛɳ/ /kədɪɖəm/ /ɛjʉɖɪrʉkkɪrɑːl/
1. /oɾʉ/ /pɛɳ/ /ʈʉɳɻjəjəj/ /ʈʉʊəjppɑːl/
3. /oɾʉ/ /sɪrʉmɪ/ /ʈələjjəj/ /ʊɑːrɪjɪrʉkkɪrɑːl/
4. /əʊər/ /kəʈʈəjjɪn/ /ʊɖəʊɪjɑːl/ /nədəkkɪrɑːr/
5. /meːdʒəjjɪn/ /meːl/ /ʈəʈʈʉgəl/ /ɪlləj/
6. /ɪɳɖə/ /mərəʈʈɪl/ /pəɻəŋgəl/ /ɪrʉgɪnɖʳənə/

List 3

1. /əʊəl/ /kɑːlʉrəjjəj/ /poːʈʈʉ/ /ɪrʉɳɖɑːl/
2. /mərəʈʈɪn/ /ɪləj/ /pɛrɪɖɑːgə/ /ɪrʉkkɪnɖʳənə/
3. /əʊən/ /mɪɖɪvəɳɖɪˑ/ /oʈʈɪk/ /koɳɖɪrʉkkɪrɑːn/
4. /əʊən/ /pəl/ /ʈəjʈʈʉk/ /koɳɖɪrʉkkɪrɑːn/
5. /pəjjən/ /pɑːbɑːʊʉkkʉ/ /pəɳɖʉ/ /koɖʉʈʈɑːn/
6. /dʒənnəl/ /kəɳɳɑːdɪ/ /ʊdəjɳɖʉ/ /ʊlləɖʉ/
7. /koːɻɪjʉm/ /kʊrʊʊɪjʉm/ /əɾɪsɪjəj/ /ʈɪnnʉgɪnɖʳənə/

List 4

1. /əʊəlɑːl/ /mɑːmbəɻəʈʈəj/ /pəɾɪkkə/ /mʊdɻjʉm/
2. /əɳɖə/ /mənɪɖən/ /kʊɳɖɑːgə/ /ɪrʉkkɪrɑːn/
3. /oɾʉ/ /pɛɳ/ /kədɪɖəm/ /ɛjʉɖɪrʉkkɪrɑːl/
4. /pɛɳ/ /kɪɳəʈʈʳɪlɪrʉɳɖʉ/ /ʈənɳiːr/ /ɪrəjkkɪrɑːl/
5. /pəjjən/ /sʊʊəɾəj/ /ʈɑːɳɖəʊəjkkə/ /pədʉgɪrɑːn/
9. /əɳɖə/ /kʊɻəɳɖəjkkʉ/ /ʊdəlnələm/ /seːɾɪjɪləj/
7. /ɪɳɖə/ /ʊiːdʉ/ /sɪrɪɖɑːgə/ /ɪrʉkkɪrəɖʉ/

List 5

1. /ʊɛlləj/ /puːnəj/ /pɑːl/ /kʊɖɪʈʈəɖʉ/
2. /əʊəl/ /ʈʉɳɻjəjəj/ /ʈʉʊəjʈʈʉk/ /koɳɖɪrʉɳɖɑːl/
3. /sɪrʉmɪ/ /ʈən/ /pəlləjʈ/ /ʈeːjgɪrɑːl/
4. /poːʈʈʉ/ /nɛʈʈʳɪjɪn/ /meːl/ /ɪrʉkkɪrəɖʉ/
5. /sɪrʉmɪ/ /ʈən/ /kəppɪl/ /kʊɖɪkkɪrɑːl/
6. /sɪrʉmɪ/ /ʈən/ /pəllɪkkʉ/ /poːnɑːl/
7. /sɪʊəppʉ/ /koːppəj/ /pɛrɪɖɑːgə/ /ɪrʉkkɪrəɖʉ/

List 6

1. /sɪŋgəm/ /oɾʉ/ /kəʈʈʉ/ /ʊɪləŋgʉ/
2. /əɳɖə/ /nɑːrkkɑːlɪgəl/ /ʊdəjɳɖʉ/ /ɪrʉkkɪnɖʳənə/
3. /pəʈtɑːm/ /puːtʃtʃɪ/ /ʊələjjɪl/ /ɪrʉkkɪrəɖʉ/
4. /ɑːdʉ/ /ʊɛlləj/ /neːrəmɑːgə/ /ɪrʉkkɪrəɖʉ/
5. /pəjjən/ /ʈɑːləj/ /kəɖɪrɪkkəʊəjkkə/ /pədʉgɪrɑːn/
6. /kiːɻəj/ /ʊɪɻʉɳɖɑːl/ /peːʈtɪ/ /ʊdəjɳɖʉʊɪdʉm/
7. /ɪrəʊɪl/ /əʊən/ /ɛɻʉɖɪ/ /koɳɖɪrʉɳɖɑːn/

List 7

1. /əɳɖə/ /pɛɳ/ /pɪnnɪ/ /koɳɖɪrʉkkɪrɑːl/
2. /oɾʉ/ /pɛɳ/ /kədɪɖəm/ /ɛɻʉɖʉʊɑːl/
3. /oɾʉ/ /pəjjən/ /pəlʉnəj/ /uːɖʊgɪrɑːn/
4. /pʊʈʈɑːkkəm/ /pɛʈtɪjɪn/ /meːl/ /ɪrʉkkɪrəɖʉ/
5. /əɳɖə/ /sɪrʉmɪ/ /ʊiːʈʈʉkkʉ/ /poːgɪrɑːl/
6. /pɛɳ/ /sɪrʉmɪkkʉ/ /pu/ /koɖʉkkɪrɑːl/
7. /əʊəl/ /ʈiːkkʉtʃtʃɪjɑːl/ /mɛɻʉguʊəɖɪjəjəj/ /eːʈʈʳɪnɑːl/