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URDU SPONDEE WORDS; DEVELOPMENT AND CONTENT VALIDATION

MUHAMMAD ZUBAIR *
PhD Student, Lincoln University College, Malaysia. *Corresponding Author Email: mzubair@licoln.edu.my

SATHEESH BABU NATARAJAN
Associate Professor, Lincoln University College, Malaysia. Email: satheeshbabu@lincoln.edu.my

WAQAR AHMED AWAN
Professor, Riphah International University, Islamabad, Pakistan. Email: waqar.ahmed@riphah.edu.pk

Abstract

Background: Spondees are disyllabic words with equal stress on both syllables. The words very common and used for speech reception measurement. In many languages, spondee words are important component of speech reception threshold tests. It helps in diagnosing hearing impairment and fitting of hearing aids. **Objective:** Development and content validation of Urdu spondee words for Adults Urdu speakers. **Methodology:** Initially 164 spondee words were collected, and familiarity rating was done among 60 Urdu speaking persons by using a Google survey form. Then content validity assessment was done among 9 experts by using three 5-point Likert scales of familiarity, relevance and appropriateness. The words were recorded in sound treated room and pilot testing of remaining words was conducted among 12 normal hearing Urdu speakers to validate the words. Speech spectrogram analysis was done to assess the equal stress on both syllable of spondee words. **Results:** The words rate less than 70 % familiar were excluded which led to elimination of 30 words. Content validation by 9 experts bring out removal of more 13 words as they could not fulfil the criteria of minimum CVI score 0.78. To validate the remaining words a pilot testing resulted in removal of 14 words with content validity ratio was less than 0.94. Finally acoustic analysis of audio file of remaining words was done to measure the equal stress level on both syllable and average intensity difference between two syllables was 0 to 7.08 dB. **Conclusion:** A word bank consisting of 107 Urdu spondee words was compiled, with sufficient evidence of content validity based on familiarity, appropriateness, and relevance.

Keywords: Urdu Spondee Words, Audiometry, Speech, Content Validation, Language.

INTRODUCTION

Spondees are disyllabic words that have equal stress on both syllables. These are common, simple and familiar words.[1] It is important that test words be consistent with regards to comprehension which increases the confidence to determine speech threshold. It allows for fewer test items thus reducing the test duration and fatigue of listener.[2]

Pure-tone audiometry is insufficient to measure patient's hearing as we communicate through complex speech, which can be tested using speech audiometry.[3] Speech tests has high importance for several reasons as speech stimulus is foundation for daily communication and the perception of speech is necessary for combination and integration into society.[4]

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Speech reception threshold (SRT) is an important element of speech audiometry test.[5]. SRT determines the speech threshold and validate the results of pure tone audiometry. It serves as reference level for word recognition scores testing.[6] Since the SRT is time efficient and useful clinically to assess the understanding of conversational message. The SRT determines the ability to replay or repeat the disyllabic words 50 % of time. It is often expressed in dB HL.[7]

Standardized speech material in the subject's native language can increase the validity and accuracy of speech audiometry.[8] The standardized and high quality speech audiometry material has been generated and extensively used initially in English and many other languages. However, there is still lack or limited availability of such material in many languages of the world.[9]

The familiarity of spondee words is essential to ensure the validity of the test. The words should be easy, common and well known to ensure that speech test measures threshold rather than vocabulary.[10] The words should be phonetically different and unique that eliminates the hearing discrimination. The patient is told to repeat the words even if they are very faint or dim. The words are presented at comfortable level, it helps to familiarize with approximately 8-10 test words which can be used in actual test.[11]

Researcher and audiologists have acknowledged the importance of developing diagnostic tools that are suitable for several languages, consequently spondee words used in speech audiometry developed in Arabic[3], Garhwali[12], Thai[13], Korean[14], Japanese[15] and Spanish[16] have been developed. Although, over than 230 million people speak Urdu worldwide[17],but limited or no standardized and reliable material had been established.

The development and validation of spondee Urdu words list is important in audiological assessment of Urdu speaking adults. Currently there is limited linguistically appropriate speech reception threshold test stimuli available for Urdu speakers. Because language is so important in communication, the test material must be linguistically and culturally appropriate for effective assessment and rehabilitation. By creating a valid list of Urdu spondee words, researcher and clinician can make SRT test results more reliable and comparable. It will improve clinical practice and audiology research in Urdu speaking communities. So, objective of the study was to develop and validate a list of spondee words for speech reception threshold measurement.

METHODOLOGY

This cross-sectional study was conducted in Avicenna Medical Complex Islamabad, Pakistan, from August 1, 2023, to March 05, 2024. All participants, including both healthy persons and experts, gave written informed consent, and their identities were kept anonymous. There was a total n: 60 men and women participant, age 15-60 years in the study. The entire individuals were from different parts of Pakistan and speak different native language. Initially most appropriate 164 spondee words were collected, and their

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familiarity rating was accompanied. Then expert validation was done from the professionals. Following steps were taken for this study

Selection of Words: The spondee words were collected form daily national Urdu newspapers, articles, magazines and books. [18] The most common and simple words were preferred. Misinterpreted, homophonic and culturally or religiously sensitive words were eliminated from the corpus.[19]

Familiarity Rating: This rating ensured the selected words are simple and understandable to Urdu speakers. This phase aligned the list and removed the unfamiliar words. A survey of familiarity assessment was conducted among Urdu speakers who have a variety of native linguistic background, education levels and age classifications. A google form survey was used to assess the familiarity of each word. The Likert scale familiarity rating (1-5) was used, and then binary outcomes were established. Most and very familiar (1-2) ratings were considered as “Agreed” whereas average, rarely and very rarely (3-5) rating considered as “Not agreed”.[20] The percentage of rating of each word was calculated and words with familiarity rating under 71% were removed from the corpus.

Content Validation: This step was accomplished by using three essential scales; relevance, appropriateness and familiarity. The expert opinions facilitated to refined and validate the list. A panel of 9 experts including 2 Urdu linguists, 3 audiologist and 4 speech and language pathologist validated the list. Each word was assessed on 5-point Likert scale for its relevance, appropriateness and familiarity. Then expert rating (1-5) was converted into binary scale. The rating 1 and 2 (Highly relevant, relevant, highly appropriate, appropriate, most familiar and very familiar) were considered as “agreed” while the remaining (3-5) rating considered as “not agreed”. The words with content validity index (CVI) scores less than 0.78 were removed from the list.[21] The expert evaluation ensured that words were culturally and linguistically appropriate for speech reception threshold testing.

Pilot Testing: A pilot study was carried out to validate the rest of 121 words. Pure tone audiometry, tympanometry, and acoustic reflex assessments were performed on 12 participants to confirm normal hearing thresholds (better than 20 dB HL). The participants were familiarized with the words and the words were presented randomly at two levels, audiogram average (500, 1000, 2000 Hz), and 20 dB above the PTA average. The responses of participants were recorded as either repeated correctly or not. The words with content validity ratio less than 0.94 were omitted from the list.

Acoustic analysis: There was an ambiguous opinion among experts regarding equal stress levels on both syllables’ spondee words. Hence, we made acoustic analysis of these words on Praat program which was created by Paul Boersma & David Weenink.[22] It has numerous features with regards to speech analysis including spectral, formant, pitch, intensity analysis, manipulation and annotation. The words were recorded in a doubled walled sound treated room of studio that does not exceed standards for

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maximum permissible noise levels for audiometric test room. The Praat software was used to analyze the audio files of individual words. The words were evaluated by using spectrogram and intensity analysis.

RESULTS

The familiarity rating group had 60 individuals with various native linguistic background and 1:1.2 men to women ratio. Their average age was 32.5 years and SD 8.6. Most participants held bachelor's or master's degrees. Additionally, most of experts held postgraduate degrees along with 5 years' experience.

The participants provided their perceptions on 164 Urdu spondee words in familiarity assessment. It ranges from 48% to 96%. The familiarity of 30 words was below 70% and removed from the list. The remaining 134 words had everyday jargon. Some words like "سموار" and "امیر غریب" had highest familiarity while other such as "روپ سروپ" were poorly rated. This finding shows various levels of familiarity associated with words.

Table 1: Familiarity rating from 60 participants grouped by native language

Mother tongue	Most Familiar (%)	Very Familiar (%)	Average Familiar (%)	Rarely Familiar (%)	Very Rarely Familiar (%)
Saraiki n=11	45.95	29.82	19.67	3.93	0.60
Sindhi n=2	26.52	36.89	21.95	10.97	3.65
Punjabi n=14	44.77	36.97	12.10	3.52	2.61
Pashto n=5	18.17	50.60	17.80	5.60	7.80
Balochi n=3	12.19	63.61	18.90	3.86	1.42
Urdu n=23	47.90	30.88	10.63	6.73	3.84
Balti n=1	78.04	6.09	3.65	0.60	11.58
Pahari n=1	81.70	5.48	7.31	1.82	3.65
Average	44.40	32.54	14.00	4.63	4.39

*n= number of participants belong to native language

There are numerous interested trends that emerge from findings of familiarity rating with various native dialects. The Pashto native speakers showed high familiarity with Urdu spondee words as very famous (50.60%) followed by most familiar. The Saraiki speakers also shown high familiarity with these words as most familiar and very familiar (75.77%). The Punjabi speakers had similar pattern to Saraiki speakers as (81.74%) words were most and very familiar to them. The Sindhi speakers shown relatively lower familiarity as compared to Punjabi, Saraiki and Pashto speakers. Unsurprisingly, Urdu speakers showed the highest level of understanding with these words among all groups. The overall average familiarity rating was quite high (over 75% rated for most or very familiar) demonstrating that these words are well understood by the participants irrespective of their mother tongue.

A total of 13 words were excluded from the list due to their CVI scores fall below 0.78. The words having CVI 0.78 or higher shows strong agreement among experts. The words that have higher CVI such as "چھوٹا موٹا" (1.00) and "کھیل کود" (1.00) demonstrate high level

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of agreement among experts indicating that these words are widely recognized and suitable for inclusion. Furthermore, kappa statistics remarks show these words have excellent content validation. Conversely, words like "شان وشوکت" (0.74) and "گھاس پھوس" (0.59) had lower CVI suggesting some disagreement among experts about their acceptance. This validation process assures that these final words had achieved strong agreement among expert regarding their appropriateness, relevance and familiarity.

Total 14 words were omitted from the list in pilot test as their content validity ratio less than 0.94 or they were incorrectly repeated more than once. This resulted in development of 107 Urdu spondee words.

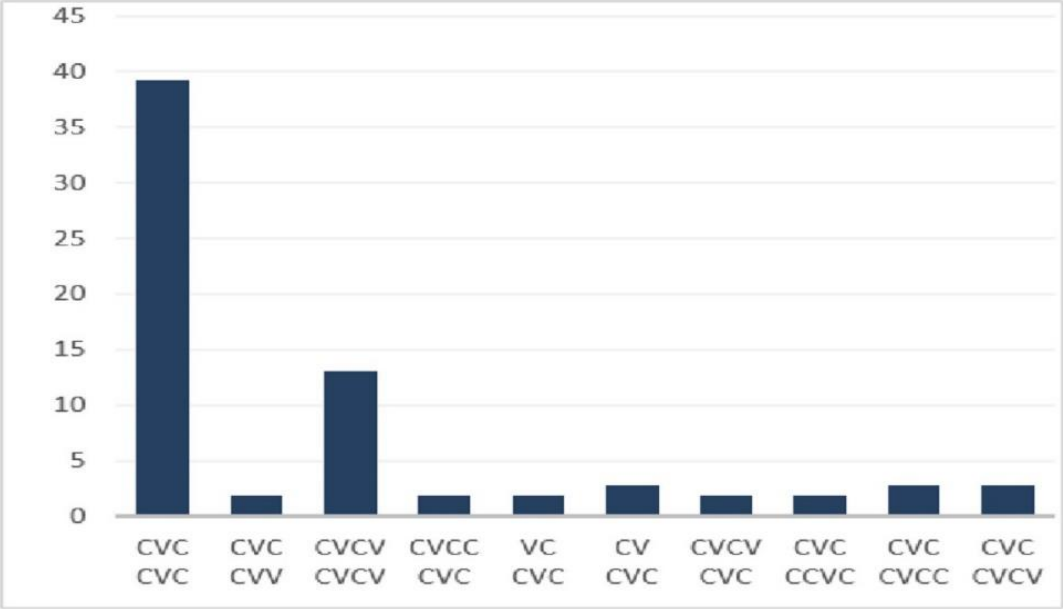

Figure 1: Syllable Structures and their corresponding percentages of common Urdu spondee words

*CVC =consonant vowel consonant, CVV= consonant vowel vowel; CVCV= consonant vowel consonant vowel; CVCC= consonant vowel consonant consonant; VC= vowel consonant; CCVC=consonant consonant vowel consonant

The most of words have CVC CVC syllable structure while 23% of the words have least common syllable structure that does not match with other words. There were 17% words that have 2 or 3 matching syllable structures.

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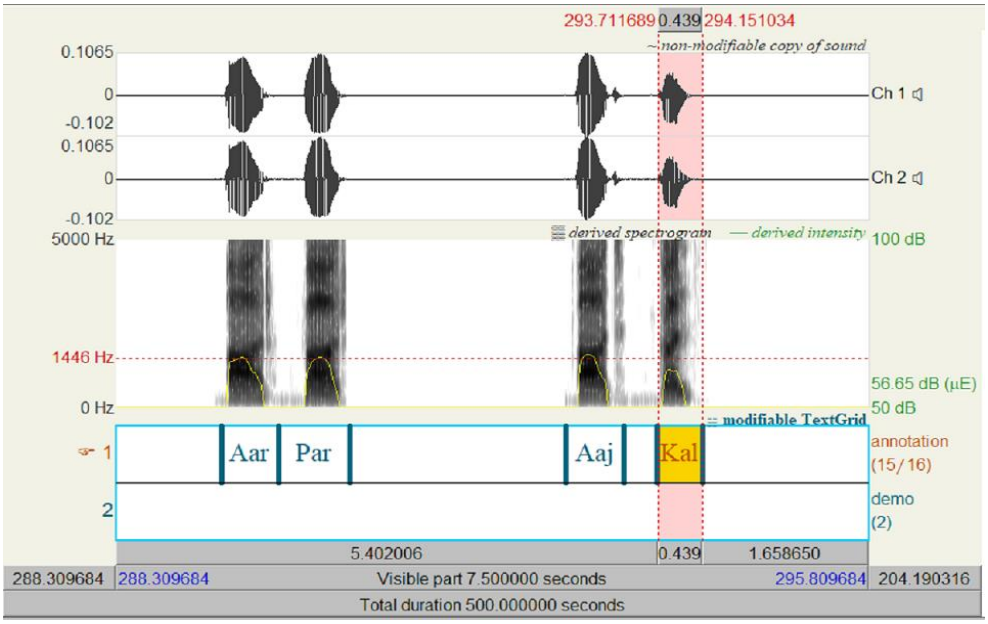

Figure 2: Speech Spectrogram for words Aar Par and Aaj Kal

Spectrogram of two words Aar Par and Aj Kal is attached in Fig. 2. The difference in maximum intensity levels of all the words varies from 0 to 7.08 dB HL while difference at minimum intensity levels is 0.06 to 6.75. The result shows that all the words are very near to ear other in audibility. The acoustic analysis shows that this list shows homogeneity with regards to audibility of words and can be used for speech reception threshold testing.

DISCUSSION

The overall goal of current study was to develop and validate Urdu Spondee words list for speech reception threshold testing. A list of 121 words were established after careful evaluation of familiarity rating and content validation. The familiarity of a word is dependent on its frequency of usage in a language and is also associated with improvement in word intelligibility. Additionally, the selection of familiar words reduces the impact of educational disparities among subjects thus it supports the criteria of word selection.[23] Studies have shown that phonetic balance is less important as most common and significant words improve speech recognition which emphasize necessity for the inclusion of familiar words.[24],[25] Thus, the current study focused on the familiarity of words instead of phonetic balance.

In TR Hennig's study, word familiarity was evaluated by 17 experts and non-experts raters using only extremely familiar and very familiar words.[18] In contrast, current study included 69 expert and non-expert raters and consider a broader range of frequency levels. Most and very familiar words were selected for further assessment based on 70% or higher familiarity. Speech reception threshold testing has been utilized in audiology clinics worldwide since the 1950s, it still counters challenges. The most of the challenging

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issue is to make sure the words used in SRT are appropriate for target papulation in term of language, context and clinical aspects.[26] In clinical audiology, spondees are reliable means to find speech reception thresholds. They are convenient, quick, and simple to use, as well as easily and equally understandable.[27] Furthermore, Carhart (as cited in Hodgson, 1980) observed that SRTs found by using spondee words were similar to SRTs obtained by using sentences.[28] Therefore, in this study spondee words were given preference.

Every spondaic word was evaluated using the content validity Index. The CVI is an appropriate approach to select or remove the test items. According to Yusoff MSB study the minimum acceptable CVI is based on number of experts who evaluating the validity. CVI score of 0.78 is acceptable for 9 experts.[21] At this stage 121 words received higher score than acceptable. A recent study conducted by Tehreem et al. focused on 22 Urdu spondee words. The researcher conducted familiarity assessments on 50 students of grade four to grade eight class and analyze the acoustic properties.[22] However, in the present study, a total of 164 words were collected and subjected to thorough evaluation for familiarity among 60 adult Urdu speakers and content validity by experts. As a result, a final list of 107 words was developed.

We found only 4 words common in both studies, since the study population was different, so we didn't exclude these words from our study. Children in grade 4-8 and adults differ in speech comprehension, cognition, developmental and experimental aspects. Adults have completely developed linguistic, cognitive and auditory processing skills that enables them to understand speech more effectively.[29] The intensity levels were assessed by using PRAAT software. The maximum and minimum intensity level of each syllable was measured to see homogeneity of words. The difference in audibility was 0 to 7.08 dB. According to the literature, to ensure that all words are heard at the same intensity when speaking normally, it is recommended to record each syllable at the same intensity level. In the present study, we used the same approach. The criteria for evaluating the maximum and lowest sound intensity levels to maintain homogeneity of spondee words were also considered in the previous studies by Tehreem et al and Dutta and Chatterjee, They found a variable in intensity level of 2.5 -8 dB. [22], [30]

The present research serves as a helpful tool for creating a word list for use in speech reception threshold test. The Kappa statistics showed that the inter-rater reliability was quite high, and the content validity index values for the expert opinions were considerably higher than 0.78. Thus, this tool will serve the audiologist to evaluate the hearing impairment in a better way. It will help in hearing aid fitting and programming of cochlear implant. It can be a valuable resource for future studies.

Limitations and suggestions: Although current study has reported high reliability of developed tool, it is limited to small number of participants with different mother tongue. Further research is required to include more participants with more different local languages in Pakistan to increase the generalizability.

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CONCLUSION

A word bank of 107 Urdu spondee words was created, with adequate evidence of content validity based on word appropriateness, familiarity and Relevance. This list can be helpful for Urdu speakers as an evaluation tool for their hearing assessment.

Ethical Considerations: This study committed to ethical standards, which ensured that the confidentiality and privacy of the participants were protected during the entire process of carrying out the research. All participants provided their informed consent.

Conflict of Interest: The authors declare no conflict of interest.

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Data Availability Statement:

The data supporting this study's findings are available on request from the corresponding author.

Author's contribution:

MZ: Data collection, Methodology, Manuscript writing,

SBN: Conception of work, Critical Revision

WAA: Literature Review, Data analysis, Interpretation of data

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