



UMT Education Review (UER)

Volume No.2, Issue No. 1, 2019

ISSN_(P): 2616-9738 ISSN_(E): 2616-9746

Journal DOI: <https://doi.org/10.32350/uer>

Issue DOI: <https://doi.org/10.32350/uer.21>

Homepage: <https://ssh.umt.edu.pk/uer/home.aspx>

Journal QR Code:



Article: **Development of Articulation Screening Tool to Assess the Articulation Errors in Urdu Speaking School Going Children**

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Online Published: 2019

Article DOI: <https://doi.org/10.32350/uer.21.02>

Article QR Code:



To cite this article: Muzaffar, H., Iftikhar, N., Khan, M. S. G., & Malik, S. N. (2019). Development of articulation screening tool to assess the articulation errors in Urdu speaking school going children. *UMT Education Review*, 2(1), 23–37.

[Crossref](#)


NUMBER OF REFERENCES

21


NUMBER OF FIGURES

01


NUMBER OF TABLES

03



A publication of the
Department of Education, School of Social Sciences and Humanities,
University of Management and Technology, Lahore, Pakistan.

The Development of Articulation Screening Tool to Assess Articulation Errors in Urdu Speaking School Going Children

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Abstract

Urdu is the national language of Pakistan and more than 100 million people speak Urdu worldwide. Urdu has 43 phonemes, however, there are some distinct phonemes in English and Urdu languages that affect the accuracy of test results. Ultimately, it leads to difficulty in assessment, diagnosis and intervention planning. This study is aimed to develop a criterion based articulation screening tool to identify articulation errors in Urdu speaking school going children. For this purpose, 500 Urdu words were selected after literature review for eliciting spontaneous single word responses at initial, medial and final positions. 10 professionals were requested to review and rate each word on a scale ranging from 1 – 5 (1=strongly disagree, 2=disagree, 3= neutral, 4=agree, 5= strongly agree). Pilot study was conducted on 25 Urdu speaking school going children to check content validity. The mean score of all the responses was calculated and the top three responses were selected for further application. In the second application, 200 school going children including 100 boys and 100 girls were included. Their responses comprising sound utterances at initial, medial and final positions were converted to mean scores. Mean scores of expert opinion, pilot study and final application of UAST were calculated using Excel spreadsheets. The minimum mean score of selected words was 3, whereas the maximum mean score was 5. Final application proves the validity of UAST. The minimum mean score of selected words was 4.5, whereas the maximum mean score was 5. The study proved that UAST is a valid screening tool to screen articulation errors in Urdu speaking school going children.

Keywords: articulation screening, Urdu Articulation Screening Tool (UAST), articulation errors, criterion based Urdu Articulation Screening Tool, articulation errors in school going children.

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Introduction

Urdu is the mother tongue of many Pakistani people and is widely spoken as a second language by 100 million people worldwide. Furthermore, 50 million people speak Urdu language in India. Due to Muslim rule over the Indo-Pak subcontinent, Persian, Arabic and Turkish words and sounds were incorporated into Urdu. It is written in Arabic script with some extra letters added to it to represent Persian and Indian sounds (Katzner, [2002](#)). These speech sounds are articulated in a specific order to convey the message to others. For clear and intelligible speech, it is compulsory that all speech sounds are pronounced properly. Moreover, conveying a message comprises a series of events rather than a single event which depends on production accuracy, length and complexity of utterances. The rate of speech and intensity noticeably varies from utterance to utterance (Flipsen, [2006](#)).

Speech is a distinct and compositional skill. Every member of a speech community has this skill and shares a specific repository of speech sounds with others, although this repository varies from one speech community to another. On the other hand, speech sounds are fundamentals of language and are used in a set of forms to send information (Oudeyer, [2005](#)). A speech sound is produced when articulators such as lips, tongue, teeth, lower jaw, soft palate, hard palate, alveolar ridge, uvula, and larynx move along with the axial muscles. Tongue is the most active or mobile articulator, whereas latent articulators include teeth, alveolar ridge and hard palate (Bowen, [2014](#)).

Distinctive brain areas are associated with planning for articulation while Broca's area is usually rendered as the control area for motor speech. However, it has been noticed that left anterior insula is mandatory for correct articulation. Thus, it is ascertained that lateral pre-motor cortex and left anterior insula plan motor speech and axial muscles receive the commands for similar actions from both hemispheres (left and right) instead of basal ganglia (Wise, Greene, Büchel, & Scott, [1999](#)).

Along with brain functions, there are four unique systems which work together systematically enabling a person to deliver a speech sound. These include 1) Respiratory system (lungs provide required air pressure and maintain its flow); 2) Phonation (air passing through vocal cords which cause them to vibrate); 3) Articulation (air passing through lips, teeth, and

tongue) and 4) Resonation (air exhaling through nose) (Home, [2014](#)).

Air passing through the trachea from the lungs and into the pharynx shakes the vocal cords. They adduct and abduct and during these different movements a small puff of air is discharged into the pharynx that begins the wave of sound. Such sound waves keep augmenting while passing through the pharynx. When air passes through the mouth, it helps articulators to move and to produce a meaningful sound called speech sound (Clinic, [2014](#)). In short, articulation is sequenced as a series of complex actions, depending upon sequential movements and specific timings matched with the required push of the articulators (Shipley & McAfee, [2008](#)).

Vocal tract can be constricted at various degrees based upon sound requirements, for example, for the consonants (phonemes) there might be full closure of the vocal tract to produce a stop. Contrarily, the glides need partial occlusion. English consonants are typically classified according to the place of articulation, manner of articulation and voicing (Secord, Boyce, Donohue, Fox, & Shine, [2007](#)).

Speech sound production capacity is created at various rates in various children. Nonetheless, the speech of a two year old child is 50 – 75% understandable, while intelligibility of the speech of a three year old might vary between 75 – 100 %. It is also found that generally articulation skills are more rapidly developed among girls than boys (Rosenberg's, [2014](#)).

Speech development does not occur suddenly; rather, its acquisition is spread over years. Therefore, this period is divided into four stages. The first stage starts from birth and extends to the age of 1 year. In this stage, a child learns to discriminate between speech sounds and starts producing a small number of consonants, vowels, syllables, and prosody. The second stage starts from the age of 1 year and ends when the child is 2 years old. The child becomes a word user and his/her perception of sounds is generally good. The third stage begins when the child turns 2 years old and lasts till the age of 5 years. In this stage, the child masters a wide range of sounds, syllables, prosody etc. The final stage extends from approximately the age of 5 years to adolescence.

A child's speech abilities increasingly become adult-like. He starts utilizing his speech in formal, educational and other settings. Although he still has some problems in producing some individual consonants or clusters (Bleile, [2004](#)).

If a child does not acquire the correct speech sounds during the age of language acquisition, he/she may have an articulation delay or disorder. It is the most common childhood communication disorder. [NIDCD](#) is a general term used to explain articulation disorder about the way consonants and vowels are produced in isolation during a child's speech. If problems in producing the correct sounds persist, then the pathologist of speech/language diagnoses the fundamental reasons of the errors in speech so that it can be learned, whether it is a simple delay or a disorder. Such commonly occurring errors usually become the habit of a child if they are not corrected in time (Kaufman Children's Center for speech, [2014](#)).

During diagnosis and assessment of the articulation disorders, the basic difference between articulation differences and articulation disorders must be kept in mind. Articulation differences are due to different dialects or accents of people belonging to specific groups or regions, countries or states, which a child may adopt during the learning of language. At the same time, this difference of accent or dialect is understood as the variety of ways a sound can be uttered. Contrarily, if the sound is created by incorrect positioning of tongue, teeth, and/or lips which are set in the wrong place, it would be pronounced as a disorder of articulation (Home, 2014).

To measure the degree of articulation disorders, a descriptive term 'severity' is used. It is the fundamental characteristic in clinical decision making that determines whether an individual needs intervention or not. However, all individuals who produce articulation errors do not produce it at the same level; some show up with only slight articulation errors whereas some others produce a great many articulation errors. The errors can be assessed on a scale of mild, moderate and severe errors. Tools usually assess their severity using scales or percentages. Most commonly, the approach used to describe the nature of severity is known as the Percentage of Correct Consonants (PCC) which is the percentage of correctly articulated consonants divided by the total number of consonants uttered by the individual. The calculated percentage shows normal or mild difficulties at 85%, mild-to-moderate problems between 65% and 85% and moderate-to-severe difficulty level between 50% and 65%. If the percentage is 50% or below, it is classified as severe. However, if the speech is unintelligible, subjective estimates of intelligibility are not very useful for diagnosis or treatment planning; an articulation screening tool/test is an objective and a better alternative (Abou-Elsaad, Baz & El-Banna, [2009](#)).

Since speech intelligibility is dependent on clear articulation and if articulation is impaired then the child's needs cannot be communicated to others smoothly, his/her survival may be at risk. Furthermore, an affected child's social life would be restricted and psychological life would be imbalanced, which will augment the level of psycho-social stressors in him/her, as well as among his/her parents and teachers (Beitchman, Nair, Clegg, Ferguson, & Patel, [1986](#)). This will restrict the opportunities of professional and personal growth for the child. Although there are many standardized screeners and tests available such as Clinical Predictive Screening Test of Articulation (PSTA), Goldman Fristoe Test of Articulation-2 (GFTA-2), Photo Articulation Test-Third Edition (PAT-3), and Weiss Comprehensive Articulation Test (WCAT) but these tests are designed according to a specific culture and norms (ASHA, [2014](#); Bleile, [2004](#)). Culturally and phonemically acceptable articulation tests are always needed. Such a test gives highly reliable and valid, easy and complete results; saves administration time and represents the basic norms of articulation competence in children (Glascoe et al., [1992](#)). Hence, there is an immense need to develop a norm referenced tool to measure the articulation errors in Urdu language by Urdu speaking children. The aim of this study is to compare the phonemes of normal Urdu speaking children with those experiencing articulation disorders by developing an Urdu articulation screening tool. This tool will be constructed by using familiar and verbally clear words used as a criterion for Urdu speaking children with articulation disorders.

2. Methodology

The study design is descriptive in nature. The target population included school going children in government and private schools, academies and home tuition centers. Convenient sampling technique was used.

The articulation screener was developed in three stages including the 1) design stage; (2) validation stage; and (3) application stage.

2.1. Design Stage

Recommendations based upon previous research were used to collect age appropriate data for developing the screening tool for Urdu speaking children. Five words consisting of Urdu consonants and vowels were selected to produce spontaneous single word utterances at all possible positions (initial, medial and final). Blends and aspirated sounds were also

included. The Urdu Articulation Screening Tool (UAST) comprises culturally proper words which are familiar to young children and above all can be pictured without ambiguity.

2.2. Validation Stage

To check whether the items of the screening tool can correctly evaluate the articulation skills of Urdu speaking school going children or not, expert opinion was taken from 10 professionals. They rated each item according to the following scale,

1=strongly disagree, 2= disagree, 3= neutral, 4=agree, 5=strongly agree.

To check the content validity, a pilot study was conducted on randomly selected 25 school going Urdu Speaking children. All these children were with normal speech and language development. It was also considered that school going children of both genders with roughly the same socioeconomic status were equally included in the pilot study. Based on the results, a highly rated string of three words comprising each Urdu consonant applicable at every possible position was selected for tool application stage.

2.3. Application Stage

The data was collected from government and private schools and academies. Permission was taken from the school authorities and then school going children of both genders within the age range of 4 to 11 years and with roughly the same socioeconomic status were randomly selected. All the students were with normal speech and language development, hearing and oral motor mechanism. Children with any type of temporary or permanent hearing loss or any morbid condition were excluded while developing the research criteria. Results were tabulated on Microsoft Office Excel sheets.

2.4. Inclusionary Criteria

- School going children of both genders were included.
- Children with normal speech and language development were included in the research.

2.5. Exclusionary Criteria

- All children with any disorder which can affect the ability of sound production were excluded.
- Children with any type of hearing loss were also excluded.

2.6. Sample Size

The calculated sample size was 320 school going Urdu speaking children.

2.7. Sampling Technique

Purposive sampling technique was used.

3. Results

3.1. Demographics

The study was conducted on 200 school going children of both genders who were equally included in the study.

3.2. Age Range

The age range of students included in this study was 4-11 years. The comparison of age is shown in the figure 2.

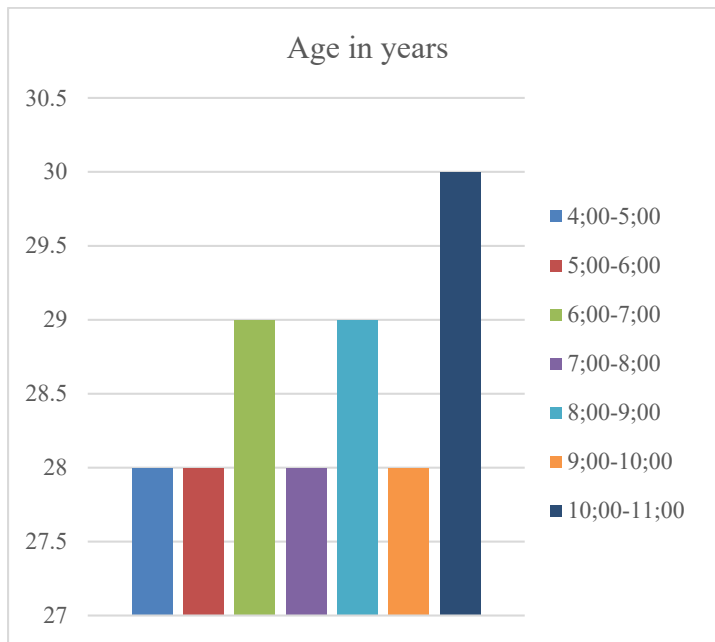


Figure 2. Comparison of age

Urdu Articulation Screening Tool development results have been derived in three steps, that is, the expert opinion, pilot study and the final study.

Expert opinion was taken on Urdu Articulation Screening Tool from 10 professionals. The mean score was calculated through spreadsheets. The words which scored below 3 were excluded from the study.

Table 1

Mean score of consonant sounds at initial, medial and final position

| Sr.No | Sound | Initial | Mean | Medial | Mean | Final | Mean |
|-------|---------|---------|------|--------|------|-------|------|
| 1 | ب | بلی | 5 | چابی | 4.8 | سیب | 4.9 |
| 2 | پ | پاؤں | 4.6 | چپل | 4.7 | کپ | 4.5 |
| 3 | ح/ھ | ہاتھ | 4.9 | چوہا | 4.6 | پتہ | 4.7 |
| 4 | م | مرغی | 4.7 | امرود | 4.6 | آم | 5 |
| 5 | ن | ناک | 4.9 | پانی | 4.9 | کان | 4.6 |
| 6 | ت/ط | طوطا | 5 | بوٹل | 4.7 | درخت | 4.8 |
| 7 | ٹ | ٹانگ | 4.6 | روٹی | 4.9 | بوٹ | 4.8 |
| 8 | د | درخت | 4.9 | دودھ | 4.7 | امرود | 4.8 |
| 9 | ڈ | ڈبا | 4.9 | انڈا | 4.9 | بیڈ | 5 |
| 10 | ف | فراک | 4.8 | صوفہ | 4.7 | برف | 4.7 |
| 11 | ک/ق | کیلا | 4.8 | لڑکی | 4.6 | ناک | 4.9 |
| 12 | گ | گائے | 4.7 | انگور | 4.9 | جگ | 4.8 |
| 13 | و | وین | 4.9 | بوٹل | 5 | آلو | 4.8 |
| 14 | انگ | انگور | 4.9 | بینگن | 4.8 | پتنگ | 4.8 |
| 15 | س/ص/ث | سیب | 5 | بستہ | 4.9 | گلاس | 4.9 |
| 16 | ج | جہاز | 5 | گاجر | 4.9 | سورج | 5 |
| 17 | چ | چوزہ | 4.9 | بچہ | 4.7 | چمچ | 4.7 |
| 18 | ژ/ی | یکہ | 4.7 | عینک | 4.9 | روٹی | 4.9 |
| 19 | ش | شیر | 5 | رکشہ | 4.8 | برش | 4.7 |
| 20 | ل | لوٹا | 4.9 | گلاس | 4.7 | بوٹل | 4.9 |
| 21 | ر | رکشہ | 4.8 | تریوز | 4.8 | شیر | 4.8 |
| 22 | ز/ذ/ض/ظ | زبان | 4.9 | چوزہ | 4.8 | جہاز | 4.8 |
| 23 | خ | خرگوش | 4.8 | درخت | 4.9 | بطخ | 4.7 |
| 24 | ڑ | - | - | چڑیا | 4.8 | پھاڑ | 4.5 |
| 25 | غ | غبارا | 4.9 | مرغی | 4.9 | باغ | 4.8 |

A pilot study was also conducted after taking expert opinion to check content validity on 25 school going Urdu speaking children between the age

of 4 years and 11 years. The mean score was calculated in the spreadsheet and after interpreting these results three words for each sound at every possible position were selected. The minimum mean score for these words was 3 and the maximum score was 5.

Table 2

Mean score of aspirated sounds at initial, medial and final position

| Sr.No | Sound | Initial | Mean | Medial | Mean | Final | Mean |
|-------|-------|---------|------|---------|------|--------|------|
| 1 | بھ | بھالو | 4.9 | - | - | - | - |
| 2 | پھ | پھول | 5 | - | - | - | - |
| 3 | کھ | کھڑکی | 5 | پنکھا | 4.9 | آنکھ | 5 |
| 4 | چھ | چھتری | 4.9 | مچھلی | 4.9 | مگرمچھ | 4.6 |
| 5 | دھ | دھوبی | 4.8 | گدھا | 4.8 | دودھ | 4.9 |
| 6 | تھ | تھالی | 4.7 | ماتھا | 4.8 | ہاتھ | 4.7 |
| 7 | ٹھ | ٹھیلا | 4.7 | میٹھائی | 4.8 | آٹھ | 5 |
| 8 | ڈھ | ڈھول | 4.9 | - | - | - | - |
| 9 | جھ | جھولا | 4.9 | - | - | - | - |
| 10 | ڑھ | سیڑھی | 5 | - | - | - | - |
| 11 | گھ | گھوڑا | 5 | کنگھی | 4.8 | - | - |

Table 3

Mean score of /s/ and /r/ blends

| | ر کے بلینڈز | گرم | فریم | کریم | ٹرین | ڈرم | |
|------------|-------------|-------|------|------|-------|------|-----|
| Mean score | 4.7 | 4.5 | 4.5 | 4.6 | 4.9 | | |
| | س کے بلینڈز | سویٹر | نمر | سلیٹ | سپاہی | بسکٹ | سٹہ |
| Mean score | 4.6 | 4.7 | 4.8 | 4.5 | 4.7 | 4.9 | |

4. Discussion

Speech intelligibility is dependent on clear articulation and if a person lags behind in this specific area, his survival may be at risk in different situations of life. His social life would be restricted and psychological life

would be imbalanced and as a result, the level of psychosocial stressors will increase. There are different screening, assessment and diagnostic tools available worldwide to measure the articulation errors and to provide the baseline therapy. However, there are different languages spoken in different continents and these languages have different speech sounds, such as Urdu, German, and French etc. Urdu language is in the top 25 languages spoken worldwide and more than 100 million people speak the Urdu language in different countries. It is Pakistan's national language as well. Urdu language has 43 phonemes; however, there are few phonemes whose existence is still not determined and they were not considered in this study. There are 12 sounds in Urdu which are distinct from English speech sounds including /kh, rr, gh/ etc. and aspirated sounds including /jh, ph, bh, kh,/ etc. So, internationally valid formal and informal tests are also not completely applicable in Pakistani context.

It is essential that children must be screened accurately for the accurate articulation of all Urdu speech sounds at all possible positions. For this purpose, there is an immense need to have a criterion based articulation screening tool which can screen each sound at its initial, medial and final positions. Accurate screening will make the accurate referral for the child, which will lead to early intervention. Furthermore, it has been proved in the past that culturally and phonemically unbiased tools are always required. These tools give accurate results which are valid and reliable. Speech and language pathology is an emerging field in Pakistan and there are very few available resources which are norm-referenced and criterion based. Urdu Articulation Screening Tool development is an effort to meet the requirements of this field in this country.

During the study it was observed that many school going children with articulation errors are not referred to speech and language pathologists due to the lack of awareness of school management, teachers and parents. Secondly, there is no screening tool available by which such errors can be screened in school going children.

The first step of this screener development was quite time consuming due to a lot of research on literature so that culturally familiar and age appropriate items could be selected and pictured easily.

Five words for each sound at initial, medial and final positions were selected. However, there is no word available with /t/ sound and /b^h, p^h, j^h,

r^h/ sounds at its medial and final position and with /g^h/ sound at final position which can be pictured.

The first draft of the checklist was developed and sent to 15 professionals for their expert opinion and a continuous follow up was done to get the response from these professionals. Ten professionals gave their expert opinion on the checklist. This checklist was also administered on 25 school going children.

Selected private and government schools and academies were conveniently approached. Student selection was random but it was ensured that school going children of both genders with normal speech and language development was included in the research. Therefore, students with any disorder which may affect the ability of sound production were excluded, such as the children with oro-nasal deformity or any type of hearing loss.

To confirm the normal hearing as well as oral motor mechanism structure of such a large number of children was also quite time consuming. On the other end, the checklist contained a big amount of data. During the pilot study, 36 speech sounds were identified and these sounds occurred in 5 words at initial position, in 5 words at medial position and in 5 words at final position. This factor could affect the proper utterance of words.

The data was tabulated in the spreadsheets and the mean was calculated for the expert opinion as well as the pilot study. The top three high ranked words were selected to further screen the children.

Afterwards, the second application of this screening tool was performed and during its performance it was observed that there was plaque on the teeth of children. A very interesting finding was that sound production by those children who had lost their milk incisors was clear and there was no difference between them and other children. One child in every ten showed up with some intensity of articulation problem, however, this intensity was higher in the younger age group. This application was less challenging in the way that only three high rated words were selected for this application which saved time as well as reduced the fatigue factor for the children. This application was performed on 200 school going children. The results of this application validated the screening tool and came up with final words at initial, medial and final positions for each sound. In the design of UAST, it was specifically considered that the pictures used for this tool were transparent and there was not any ambiguity in these pictures. Full color

pictures were used to give visual stimuli to children so that the consistency of the responses would be maintained. The appendix of these words can be seen at the end.

5. Conclusion

This tool represents the phonemically and culturally appropriate words for the screening of articulation disorders in school going Urdu speaking children and these words can be transparently pictured as well. It is concluded that Urdu Articulation Screening Tool is a valid tool for screening articulation errors in school going children within the age range of 4-11 years.

6. Recommendations

1. The future study must be performed with a larger sample.
2. The reliability of this screening tool must be calculated accordingly.
3. The age of acquisition of Urdu speech sounds /ʎ/, /ɽ/, /x/ is not available, so a further study needs to be conducted on it.

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Appendix

| Sound | Initial | Medial | Final | Sound | Initial | Medial | Final |
|-------|---------|--------|-------|-------------|---------|---------|---------|
| ب | بلی | چابی | سیب | ر | رکشہ | تریوز | شیر |
| پ | پاؤں | چپل | کپ | ز/ذ/ض/ظ | زبان | چوزہ | جهاز |
| ح/ھ | ہاتھ | چوہا | پتہ | خ | خرگوش | درخت | بطخ |
| م | مرغی | امرود | آم | ڑ | - | چڑیا | پھاڑ |
| ن | ناک | پانی | کان | غ | غبارا | مرغی | باغ |
| ت/ط | طوطا | بوٹل | درخت | بھ | بھالو | - | - |
| ٹ | ٹانگ | روٹی | بوٹ | پھ | پھول | - | - |
| د | درخت | دودھ | امرود | کھ | کھڑکی | پنکھا | آنکھ |
| ڈ | ڈبا | انڈا | بیڈ | چھ | چھتری | مچھلی | مگر مچھ |
| ف | فراک | صوفہ | برف | دھ | دھوبی | گدھا | دودھ |
| ک/ق | کیلا | لڑکی | ناک | تھ | تھالی | ماتھا | ہاتھ |
| گ | گائے | انگور | جگ | ٹھ | ٹھیلا | میٹھائی | آٹھ |
| و | وین | بوٹل | آلو | ڈھ | ڈھول | - | - |
| انگ | انگور | بینگن | پتنگ | جھ | جھولا | - | - |
| س/ص/ث | سیب | بستہ | گلاس | ڑھ | سیڑھی | - | - |
| ج | جہاز | گاجر | سورج | گھ | گھوڑا | کنگھی | - |
| چ | چوزہ | بچہ | چمچ | ر کے بلینڈز | گرم | فریم | کریم |
| ڑ/ی | یکہ | عینک | روٹی | | ٹرین | ڈرم | |
| ش | شیر | رکشہ | برش | س کے بلینڈز | سویٹر | ثمر | سلیٹ |
| ل | لوٹا | گلاس | بوٹل | | سپاہی | بسکٹ | سٹہ |