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Print ISSN: [3006-2497](#) Online ISSN: [3006-2500](#)Platform & Workflow by: [Open Journal Systems](#)**A Study on Occurrence of Urdu Consonants in The Speech of Preschoolers****Nayab Gohar**

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nayab37201@gmail.com**Abstract**

The frequency of occurrence data of the consonants of a language form the basis for the design of speech perception tests, articulation assessments and auditory training hierarchies, but no frequency of occurrence data is available for Urdu from the spontaneous speech of preschool aged children. Frequency of occurrence of Urdu consonants in the natural speech of children (3-6 years) was determined in the present study according to the manner of articulation, word position and age group. A descriptive design was used. The children (78) were selected from 2 schools in Rawalpindi and Islamabad by using convenient sampling and 8 speech samples of total 247 minutes were recorded from the children during unstructured play and interaction activity with the help of audio recorder. Samples were transcribed in Urdu language, consonants were extracted against Urdu Phonetic Inventory and tallies were made of frequencies for initial, middle and final position of the word for each age group (3.1–4, 4.1–5, and 5.1–6 years). The number of words totaled 6,380 and the number of consonant occurrences was 11,982. A total of 37 consonants were obtained, 36 at the beginning, 33 at the middle and 30 at the end. The most frequent consonants across the whole corpus were /h/ (1,526; 12.7%), /r/ (1,125; 9.4%) and /n/ (831; 6.9%). Position-wise, /h/ dominated the initial position (791), /t/ the middle position (495) and /r/ the final position (501). The twenty highest-frequency consonants were /h, r, n, k, t, m, s, l, b, p, j, g, ʈʃ, d, ɽ, ʈ, dʒ, kʰ, z, tʃʰ/. The results are presented in a ranked list of targets for the auditory learning of the hearing impaired, which teachers of the hearing impaired, speech-language pathologists and audiologists could use to order the auditory learning priorities for hearing impaired students and develop phonetically balanced test items in Urdu language.

Key words:

Urdu consonants, hearing impairment, preschoolers, frequency of occurrence, phonological development, auditory training, Urdu Phonetic Inventory

Introduction

Urdu is the National language of Pakistan and medium in which Pakistan's majority children first learn literacy, give early education and also assessed with respect to their communication problems (Adnan, 2023). Nonetheless, there is an insufficient descriptive resources for the practitioners who work with children in Urdu-speaking contexts. In most of the speech and hearing clinics across Pakistan, most of the tools used for the diagnosis are from English and applied to Urdu speakers either in translation or in an unadapted form, whose results are doubtful in Urdu (Roepke & Alvi, 2023).

The relative frequency with which language's individual speech sounds occur is not the sole interest of the academic researcher. It helps to identify the sounds that are heard most frequently, and thus which sounds are acquired first and which have the highest relative functional load in natural communication (Ferguson and Goffman, 1967). Therefore, the basis for the phonetically balanced word list, the speech perception test and the articulation assessment is the frequency of occurrences. Noor and Arif (2018) suggested the estimation of frequency of occurrence of Urdu consonants as the pre-requisites of developing a phonetically balanced speech perception test in Urdu. Similar work has been done on Hindi (Sreedevi, Irfana, & Paulson, 2022) and for the Kuwait Arabic language (Alqattan, 2015) with reviews of consonant acquisition in 27 languages showing that acquisition order follows a systematic pattern, which is related to the phonological structure and frequency profile of the surrounding language (McLeod & Crowe, 2018).

This need is especially crucial for children who have a hearing impairment. Paediatric hearing loss is not uncommon for children in Pakistan; in the rural populations, there were considerable rates of paediatric hearing loss reported (Elahi et al., 1998) and levels were comparable in other developing contexts (Westerberg et al., 2005). Children with hearing impairment do not learn the phonological system by exposure; rather they learn it via explicit auditory training that involves selection and sequencing of targets (Boothroyd, 1990; Svirsky, 1996). A hearing-impaired teacher who is not familiar with which Urdu consonant is used most frequently by typical preschoolers, has no priori grounds for training first particular consonants. However, targets are selected in practice by intuition, on imitation of English language programmes or in the order of sounds in a textbook. Research on early intervention for deaf or hard of hearing children suggests that the timing and intensity of intervention are important factors in advancing children's vocabulary (Yoshinaga-Itano, Sedey, Coulter, & Mehler, 1998; Rudge, Brooks, & Grantham, 2022), making it consequential—not convenient—to select targets efficiently.

In recent years efforts have started to bridge the descriptive gap for Urdu. A review of the available evidence on phonological development in Urdu speaking children by Ambreen and To (2021) revealed the lack of normative data as the major hurdle to a valid assessment of phonological development and Ambreen and To (2022) later produced Urdu Speech Assessment Test for children up to 8 years of age. Ali (2017) investigated the acquisition of Urdu consonants in typically developing children between 5-6 years. There is no profile for spontaneous, unelicited language that is based on the frequency of language use of pre-school children. Single word productions elicited in the assessment test indicate if the child can produce a sound; they do not indicate how often the sound is produced during spontaneous conversation with peers. The two measures are different and the second should form the basis for the sequencing of auditory training.

The present study aims to fill this gap. It provides the incidence of the consonants of Urdu language in children's spontaneous speech from age 3 to 6 years on the basis of the manner of articulation, position of the consonant in the word and the age group.

Statement of the Problem

Children's Urdu speech corpus is not available in Urdu language in any frequency-ordered inventory of Urdu consonants as compared to teachers of children with hearing impairment, speech-language pathologists and audiologists working in Urdu speaking environment. If such information is not available, then there are no empirical targets for auditory training and items for articulation assessments or early literacy material. The problem that this study has attempted to address is the lack of frequency of occurrence data of Urdu consonants on word position and age level with respect to spontaneous speech of preschool aged children.

Research Objectives

- To analyse the frequency of Urdu consonants by manner of articulation, that is, plosives, nasals, affricates, fricatives, approximants, flaps and the trill.
- To determine the frequency of Urdu consonants by position in the word, that is, initial, middle and final position.
- To compare consonant frequencies across the age groups 3.1–4, 4.1–5 and 5.1–6 years.
- To identify the highest-frequency Urdu consonants for use in the auditory training and speech assessment of children with hearing impairment.

Research Questions

1. Which Urdu consonants occur most frequently in the spontaneous speech of children aged 3 to 6 years?
2. How does the frequency of Urdu consonants vary with position in the word?
3. How does the frequency of Urdu consonants vary across the three age groups examined?

Significance of the Study

The study produces a ranked inventory of the Urdu consonants, which can be directly applied in four practical contexts. For teachers of the hearing impaired it offers a sequence for auditory training based on research, where the sounds the child will hear the most will be taught first. It provides frequency weights for speech-language pathologists to use in creating articulation tests and determine if an error pertains to a high-load or low-load phoneme. It helps audiologists in developing phonetically balanced material for speech perception testing in Urdu which was started by Noor and Arif (2018). For young investigators it pinpoints the consonants often used in phonics instruction that should be learned first, and has been well documented that children's knowledge of sound level is integral to the process of beginning reading (Catts, 1993; Tang, 2018). The study further adds descriptive information to the general body of knowledge related to consonant frequency and acquisition in South Asian languages.

LITERATURE REVIEW

Perhaps one of the strongest findings from the reading literature is that of the relationship between phonological knowledge and later literacy. Phonological awareness is shown to correlate with reading ability, as shown by Catts (1993), and early phonological processing problems have been shown to be related to subsequent reading disability, as indicated by Aram and Hall (1989). Mann & Foy (2017)

followed up the relationship between speech development patterns and phonological awareness for preschool children and concluded that articulation accuracy and knowledge of sound structure are correlated. Consonants and vowels are handled differently during reading; as demonstrated by Lee, Rayner and Pollatsek (2002), using fast priming techniques. This is one of the reasons why it is common to use consonant inventories for assessment and instruction, not vowel inventories. Later, Tang (2018) puts phonics in the context of early literacy learning development, while the utility of phonics instruction at the preschool level in Pakistan has been mentioned (Dot & Line, 2023).

The phonological system is consolidated during preschool. This was confirmed and greatly extended by Ferguson and Goffman (1967) who showed that the pattern in consonant acquisition does not follow any universal sequence but rather is language specific. McLeod and Crowe (2018) reviewed the consonant acquisition trajectories in 27 languages in a cross-linguistic study. Although general patterns have been noted, including early acquisition of nasals and stops, the time needed for the acquisition of individual sounds varies between them, according to the frequency and distribution of sound types in the speech of the ambient language. In this country where the majority of the preschool children come in contact with Urdu language in tandem with a native language from the region, the role of the practitioners in supporting the language is discussed by Denham, Bassett and Wyatt (2007) in relation to language development and socialisation of the preschool child.

A number of languages have undertaken frequency of occurrence studies of explicit concern for the development of clinical tools. Sreedevi, Irfana and Paulson (2022) identified the frequency of occurrence of phonemes in Hindi, a language that is typologically similar to Urdu. In this study, Alqattan (2015) investigated the acquisition of early phonology in the Arabic of Kuwait. Bhimte and Rangasayee (2018) designed a test of early speech perception for Hindi language to follow the rationale given by Tyler (1993) for designing speech perception test in children. Frequency estimation was taken as the initial step in the work, Urdu and Arif (2018) developed and validated a phonetically balanced speech perception test with data collected from three recorded speech samples of children age 4–14 years who resulted in 45 consonants. Shabbir and Zahra (2016) created a non-standardised list of words for Urdu speech sound assessment. Khan (2014) wrote a description of the patterns and processes involved in the phonological development of Urdu speaking children and early observational data of consonant production of preschool children in Peshawar was reported by Cowan (1968).

Consonant productions are dependent on the availability of auditory feedback for a child who has a hearing impairment. In 1996, Swirsky was able to show the importance of phonological development and of consonant production in relation to auditory feedback, while Boothroyd (1990) focused on signal processing needs when dealing with profound deafness. Geers, Brenner and Tobey (2003) accounted for a variety of factors that influence the long-term speech perception and production outcomes of children with cochlear implants and DesJardin and Eisenberg (2007) determined the role of maternal language input in these outcomes. Ermer (2001) reported the detail of typical phonological changes of the hearing impaired children. Early intervention has been found to have a significantly better effect on language outcomes than later identification (Yoshinaga-Itano et al., 1998), and the number of early intervention sessions has been shown to impact expressive vocabulary development in very young children who are deaf and hard-of-hearing (Rudge, Brooks, and Grantham, 2022). In developing countries, where trained

staff and validated tools are both in limited supply, Sharma and Mishra (2010) point out that children with hearing impairment may present unique challenges when it comes to delivering speech therapy.

Research gap

This literature provides two implications. First, children with a hearing impairment should receive interventions in accordance with the frequency profile of the target language, which should not be imported, but drawn from the language itself. Second, the frequency data available for Urdu are derived from: (i) elicited single-word production in tests (Ambreen & To, 2022) or; (ii) a large age range of samples (Noor & Arif, 2018). Neither offers a child of the hearing impaired what she needs: how often the Urdu consonants happen in spontaneous connected Urdu speech of the age group of children she is teaching. That description is provided in the present study.

Methodology

Research design

The study was descriptive in nature. To determine and measure the incidence of Urdu consonants in spontaneous speech of children of different ages. There was no experimental manipulation, intervention or control. The researcher had children in a quiet separate classroom, observing and recording their independent speech, which was later transcribed, and analyzed for frequencies. A descriptive design is appropriate when the research question is a question of distribution, not a test of an effect - that is, when the researcher wants to count naturally occurring events, rather than test an effect.

Population and Sample

Population consisted of children aged 3-6 years from government and private pre-schools, Rawalpindi and Islamabad. Two institutions – Government Boys High School, Dhoke Charagh Din, Rawalpindi and Air Foundation School System (AFSS), H-13, Islamabad were conveniently selected. The decision to use convenient sampling was made due to the accessibility of preschool classrooms in Pakistan, where permission to access the classroom in Pakistan needed to be obtained and cooperation from the class teachers was essential to the project; and due to the need for the recording of natural speech, which would require the researcher to be present in the classroom for an extended period without disrupting classroom routine.

A total of 78 children were sampled from a population of 210 children of age 3-6 years enrolled in the respective English and Urdu schools. A samples of 78 children was taken from 210 children in the age group of 3-6 years enrolled in respective English and Urdu Schools. The population and sample by institution is outlined in table 2.

Table 1*Details of the speech samples analysed*

Sample	School	Children	Age group	Date	Duration	Stimulus material
1	Govt. Boys High School, Dhoke Charagh Din	14	5–6 years	17 Jan 2024	27 min	Course books
2	Govt. Boys High School, Dhoke Charagh Din	12	4–5 years	20 Jan 2024	31 min	Flashcards, toys, puzzles, course books, Urdu readers
3	Air Foundation School System, H-13	8	3–4 years	24 Jan 2024	30 min	Flashcards, toys, puzzles, course books, Urdu readers
4	Air Foundation School System, H-13	10	3–4 years	24 Jan 2024	38 min	Flashcards, toys, puzzles, course books, Urdu readers
5	Air Foundation School System, H-13	8	4–5 years	24 Jan 2024	22 min	Flashcards, toys, puzzles, course books, Urdu readers
6	Air Foundation School System, H-13	12	4–5 years	25 Jan 2024	31 min	Flashcards, toys, puzzles, course books, Urdu readers
7	Air Foundation School System, H-13	5	5–6 years	25 Jan 2024	38 min	Flashcards, toys, puzzles, course books, Urdu readers
8	Air Foundation School System, H-13	9	3–4 years	25 Jan 2024	30 min	Flashcards, toys, puzzles, course books, Urdu readers
	Total	78	3–6 years		247 min	

Table 2*Population and sample by institution*

School	Population (3–6 years)	Sample (3–6 years)
Govt. Boys High School, Dhoke Charagh Din, Rawalpindi	110	26
Air Foundation School System, H-13, Islamabad	100	52
Total	210	78

Table 3*Distribution of the sample by age group*

Age group	Number of children	Percentage
3.1–4 years	27	34.6
4.1–5 years	32	41.0
5.1–6 years	19	24.4
Total	78	100.0

Tool for Data Collection

The speech has been recorded built-in audio recorder. Stimulus items were the children's own course books, Urdu readers, flash cards, toys and puzzles. For transcription of consonants, the Urdu Phonetic Inventory was used as the reference standard which is maintained by the Center for Language Engineering.

The use of an audio recorder that can be moved around was chosen over a dedicated recording machine for a methodological reason. Visible recording apparatus automatically change the speech of young children by inducing self consciousness and moving them away from spontaneous interaction to performance. No attention was drawn to the telephone which was placed unobtrusively on the table, and the intention to record the speech in a natural way was not noted by the children.

Data Collection Procedure

The researcher visited the schools and obtained permission from the competent authority after them, and obtained the consent of the class teachers of the participating children with a permission letter. Principals informed the teachers to continue their collaboration.

At each site, on the first day of recording, children sat in a circle around a table in a separate room and were provided with their course books and told to talk freely amongst each other about the pictures in the books, or about any topic that came up from them. On subsequent days Urdu readers, puzzles and

toys were introduced to maintain a natural conversation. Children were aged 3–4, 4–5 and 5–6 years and were gathered in groups of 14, 12, 10, 9 and 8 respectively, and were involved in conversations with their peers, not the researcher. Stimulus materials served merely as a starting point but no questions were asked of individual children, nor were the child's answers requested or checked, nor were they corrected.

The recordings lasted a total of 22 to 38 minutes. A total of 11 speech samples (300 minutes) were recorded, out of which 247 minutes from 8 samples were retained for analysis, and 53 minutes in 3 samples were thrown out.

Data transcription and analysis

Pre-analysis, three were excluded. In the other from a private school in Rawalpindi, the teacher was asking questions that "probed" the children's grasp of what was covered in the class for that day, and hence they were not producing independent speech. Two other recordings were conducted by a volunteer who was not on site and so were not included due to procedural control. These exclusions are stated in full as they have an impact on the interpretation of the corpus: the data that are retained is spontaneous speech between peers, recorded under the direct supervision of the researcher.

The researcher in Urdu language later transcribed all the retained recordings. All the Urdu Consonants and Urdu Phonetic Inventory phonemes were then isolated from each transcript, using the Urdu Phonetic Inventory consonants of each transcript consistently for all age group samples for accuracy. Analysis did not include Urdu vowels. The number of words that were produced in each age-wise sample was counted.

The consonant occurrences were recorded separately for each sample for the beginning, middle and end of a word and the number of times they occurred tallied by age group was used to determine their frequency of occurrence. Percentages were then calculated as a percentage of all the consonant occurrences made by the 3–6 year old age group. The twenty most common consonants were ranked from most to least common for each age group (3.1-4, 4.1-5 and 5.1-6 years) and the combined age group (3-6 years).

For classification of articulation, the Urdu Phonetic Inventory was followed and 18 plosives, 2 nasals, 4 affricates, 9 fricatives, 2 approximants, 2 flaps and 1 trill were obtained.

Ethical Considerations

Permission to gather data was obtained from the appropriate authorities and class teachers (acting in loco parentis) within the school context was secured for all groups involved in the data collection. No names have been given throughout on any child, recordings are simply referenced by sample number, and by school and age band. Only phonetic transcription was done using recordings, which were not shared elsewhere. No child was subjected to any testing, correction or assessment procedure whatsoever, and participation consisted nothing more than the normal activity of speaking with peers in the classroom. No records were analysed if the procedural conditions were not met.

RESULT

Across the 78 children in the 8 retained speech samples, a total of 6,380 words were produced, with a total of 11,982 consonant occurrences. In the whole corpus these 37 Urdu consonants were recorded. Of these, 30 happened in 'last position', 33 in 'medial position' and 36 in 'forth position'. According to

the age groups, 36 consonants were produced by the children between 3.1 years and 4 years and 37 consonants were produced by the children between 4.1 years and 5 years and 35 consonants were produced by the children between 5.1 years and 6 years.

Dominant consonants by manner of articulation and word position

Table 4 presents the highest-frequency consonant within each manner class at each position in the word for the full 3–6 year sample.

Table 4

Highest-frequency Urdu consonant by manner of articulation and word position (3–6 years)

Manner class	Initial position	Middle position	Final position
Plosive	/k/ (544)	/t/ (495)	/k/ (86)
Affricate	/tʃ/ (179)	/tʃ/ (60)	/tʃ/ (48)
Fricative	/h/ (791)	/h/ (260)	/h/ (475)
Nasal	/m/ (452)	/n/ (460)	/n/ (141)
Trill	/r/ (182)	/r/ (442)	/r/ (501)
Approximant	/j/ (303)	/l/ (340)	/l/ (169)

In initial position, the most frequent consonant was /h/ with 791 occurrences, in middle position it was /t/ with 495 occurrences and in final position it was /r/ with 501 occurrences. The affricate /tʃ/ was the most common affricate at all three positions, and the trill /r/ was the most common at the final position, with a strong positional gradient, from 182 initially, to 442 medially and 501 finally.

Age-wise dominance by word position

Table 5 shows the single highest-frequency consonant at each word position for each age group.

Table 5

Highest-frequency consonant by word position and age group

Word position	3.1–4 years	4.1–5 years	5.1–6 years
Initial	/h/ (237)	/h/ (375)	/k/ (207)
Middle	/n/ (253)	/t/ (158)	/r/ (126)
Final	/r/ (226)	/h/ (202)	/r/ (85)

In the two younger groups, the initial position was fricative /h/, in the oldest group it was plosive /k/. Middle position was changed in each age group, from the nasal /n/ to the plosive /t/ to the trill /r/. In final position, /r/ was strongly favoured in the youngest and oldest groups.

The number of times a frequency occurred and the percentage of the time that frequency occurred.

All 37 Urdu consonants have been included in the whole corpus and their occurrences are presented in terms of frequency and percentage in Table 6.

Total frequency and percentage of occurrence

Table 6 presents the frequency and percentage of occurrence of all 37 Urdu consonants in the whole corpus.

Table 6

Total frequency and percentage of occurrence of Urdu consonants (3–6 years)

Sr.	Phoneme	Frequency	%	Sr.	Phoneme	Frequency	%
1	/b/	532	4.4	20	[dʒʰ]	52	0.4
2	[bʰ]	107	0.9	21	[tʃ]	287	2.4
3	/p/	456	3.8	22	[tʃʰ]	108	0.9
4	[pʰ]	49	0.4	23	/x/	90	0.8
5	/t/	740	6.2	24	/z/	118	1.0
6	[tʰ]	87	0.7	25	/ʒ/	4	0.0
7	/t/	235	2.0	26	/s/	703	5.9
8	[tʰ]	29	0.2	27	/ʃ/	103	0.9
9	/d/	277	2.3	28	/ʁ/	60	0.5
10	[dʰ]	14	0.1	29	/f/	89	0.7
11	/d/	49	0.4	30	/h/	1526	12.7
12	[dʰ]	11	0.1	31	/m/	725	6.1
13	/ʔ/	49	0.4	32	/n/	831	6.9
14	/q/	38	0.3	33	/r/	1125	9.4
15	/k/	757	6.3	34	/ɾ/	248	2.1
16	[kʰ]	164	1.4	35	[ɾʰ]	19	0.2
17	/g/	334	2.8	36	/l/	631	5.3
18	[gʰ]	106	0.9	37	/j/	442	3.7
19	/dʒ/	185	1.5				

The three most common consonants in the corpus were the trill /r/ 1125 (9.4%), the fricative /h/ 1526 (12.7%) and the nasal /n/ 831 (6.9%). The rarest consonant was /z/, appearing only four times, and not being used by members of the 3.1–4 or 5.1–6 groups of children. The breathy-voiced series was very scarce, appearing only in less than 1% of all occurrences of the [d^h] series (14) and [d^h] series (11) and series (19). The stops were less consistent with voices that range from [k^h] (164 occurrences) to [t^h] (29 occurrences).

Frequency of consonants by age group

Table 7 shows the top 20 most common consonants by age group and the frequency.

Table 7

Twenty highest-frequency Urdu consonants by age group

Rank	3.1–4 years	f	4.1–5 years	f	5.1–6 years	f
1	/h/	574	/h/	648	/h/	304
2	/r/	466	/r/	426	/k/	253
3	/n/	431	/k/	279	/r/	233
4	/t/	353	/s/	252	/s/	216
5	/m/	322	/l/	223	/m/	215
6	/b/	256	/n/	214	/t/	188
7	/l/	235	/t/	199	/n/	186
8	/s/	235	/m/	188	/l/	173
9	/j/	230	/b/	172	/b/	104
10	/k/	225	/p/	153	/p/	101
11	/p/	202	/j/	139	/g/	85
12	/g/	147	/g/	102	/d/	81
13	/tʃ/	135	/tʃ/	97	/j/	73
14	/d/	120	/t/	96	/tʃ/	55
15	/ɾ/	105	/ɾ/	93	/z/	51
16	/t/	98	/d/	76	/ɾ/	50
17	/dʒ/	84	/z/	60	/dʒ/	48

Rank	3.1–4 years	f	4.1–5 years	f	5.1–6 years	f
18	[k ^h]	83	/d̪z/	53	/t/	41
19	[b ^h]	57	/f/	50	[t̪ ^h]	36
20	[g ^h]	48	/ʃ/	46	[k ^h]	36

The fricative /h/ was the first sound for all three age groups. The top ten consonants were highly stable across age and consisted of the same ten consonants (also with slightly different ordering): /h, r, n, k, t, m, s, l, b, p/ and /j/. Only the youngest showed the differences at the lower end of the ranking as the breathy voiced phonemes [b^h] and [g^h] made it into the top twenty for them, and /z/ and /f/ into the top twenty for the older groups.

Overall ranking

Table 8 summarizes the top 20 most common consonants in Urdu from the 3-6 year age groups.

Table 8

Twenty highest-frequency Urdu consonants in the speech of 3–6 year old children

Rank	Phoneme	Frequency	Rank	Phoneme	Frequency
1	/h/	1526	11	/j/	442
2	/r/	1125	12	/g/	334
3	/n/	831	13	[t̪ ^h]	287
4	/k/	757	14	/d/	277
5	/t/	740	15	/ɾ/	248
6	/m/	725	16	/t/	235
7	/s/	703	17	/d̪z/	185
8	/l/	631	18	[k ^h]	164
9	/b/	532	19	/z/	118
10	/p/	456	20	[t̪ ^h]	108

Thus, the set of twenty highest frequency Urdu consonants, occurring in the preschoolers' speech, were /h, r, n, k, t, m, s, l, b, p, j, g, t̪^h, d, ɾ, t̪, d̪z, k^h, z, t̪^h/. The 20 phonemes made up the significant majority of all the consonant occurrences in the corpus, and a small residual percentage of the consonant occurrences were made up of the remaining 17 consonants.

Discussion

The aim of the study was to find out the most commonly occurring Urdu consonants in spontaneous speech of pre-school children and their variation as per the position of the consonant in the word and age difference. Three of these findings are worthy of special mention.

The first is the dominance fricative /h/—this was used 1526 times or 12.7 per cent of all fonts of the consonants, and ranked first in all age groups, both on initial and final position. Such is the structure of Urdu, not an anomaly of the sample: /h/ is under heavily grammaticalized in Urdu and is always present in high frequency constantly, even though it is not present in the sample. The implication for the training of auditors is quite direct. A child that is unable to perceive or produce /h/ is losing access to approximately 1 occurrence of each consonant per 8 occurrences, not per content word. Therefore, it is concluded that /h/ should have a high priority in any Urdu language phoneme hierarchy for children with HI and Urdu language, and this would not come out of a phoneme hierarchy based on articulatory ease or follow the instructions of imitating English language materials.

The second is the positional distribution. The trill /r/ had a distinct gradient (182 times at the beginning, 442 times in the middle, 501 times at the end) and the fricative /h/ was very strongly represented at the beginning and end, but not at the middle. For each manner class other than the affricates and the trill, the dominant consonant was different, depending on its position. Such a sampling of word initial productions will then be inaccurate as an assessment or training tool for the phonological requirements the language poses to a child. This is consistent with Ambreen and To (2022) who stated that the production opportunities need to be wide-ranging and diverse in phonetic context for the child's phonological skills to be represented accurately.

The third finding is to do with developmental stability. Across the three age groups, the twenty most frequently used consonants were very similar: the rank order in each age group shows the same basic set of consonants composed of eleven phonemes in the top ranks. The centre of the distribution was not affected as the periphery was. The breathy-voiced phonemes [b^h] and [g^h] made their way into the top twenty only in the youngest children while /z/, /f/ and /j/ made their appearance in the older children, which is also what would be expected given the patterns of vocabulary development in the formal and loanword domains where those phonemes are found. The overall inventory also increased and then decreased slightly between age bands (36 consonants at 3.1-4 years, 37 at 4.1-5 years and 35 at 5.1-6 years). The latter must be taken in the context of the sample size - the 5.1-6 year group was the smallest (19 children) and the low frequency phonemes are the first to drop from the smaller sample. The same interpretation applies to the absence of /ʒ/ from two age groups: Its distribution across groups is related to corpus size; with only four occurrences in the entire corpus, development status is not a factor of its absence.

These results are placed in context by comparing them to existing Urdu work. Noor and Arif (2018) took the first step towards making a Urdu phonetically balanced speech perception test by collecting three speech samples from the children aged 4-14 years to identify 45 consonants. The present study investigated a selected age range (3 – 6 years) and more speakers and found 37 consonants occurring in the speech. This discrepancy may be due to age: The larger inventory studied is for older children whose speech development may lack phonemes not found in preschoolers' speech.

It is instructive to compare with Ambreen and To (2022) in a different sense. Children (maximum of 8) complete their Urdu Speech Assessment Test, which calls for 38 consonants with 36 consonants being in initial position and 37 in middle position and 31 consonants in final position. The number of consonants in the present spontaneous speech corpus were 37, of which 36 appeared as initial consonants, 33 as medial consonants and 30 as final consonants. The convergence in initial position is close; the divergence in medial and final position is informative: An elicitation instrument can offer the opportunity for the occurrence of every phoneme in each legal position, while spontaneous speech can only involve those found in the child's personal vocabulary. Not only are the two methods complementary to each other, but they are also necessary to get the most out of your horse. The kind of reportage of frequencies in this box is NOT an assessment test, establishing capacity, but rather a frequency count-establishing load. The second is used to make sequencing decisions for intervention. Two studies vary in classificatory basis, too. Ambreen and To (2022) classify by place of articulation, manner of articulation, voicing and aspiration, while the present study classifies by manner only, having 18 plosives, 2 nasals, 4 affricates, 9 fricatives, 2 approximants, 2 flaps and 1 trill to their 18 plosives, 3 nasals, 4 affricates, 9 fricatives, 2 approximants, 1 flap and 1 trill. The difference is limited to the nasal, flap categories, and is due to the different treatment of the velar nasal and of the retroflex flap series in the reference inventory used.

In comparison to the cross-linguistic literature, the results are generally in line with the expectations. McLeod and Crowe (2018), in their review of 27 languages, reported that early acquired (sonorous and nasals) compared to late-acquired (fricatives) consonants are acquired in different ways in different languages, and that the detailed order of acquisition is affected by language-specific frequency. The present data clearly reveal this profile in Urdu with the nasals /n/ and /m/, stops /k/, /t/, /b/ and /p/, liquid /l/ and the trill /r/, holding two topmost positions during the preschool years. The pattern was found to be similar for frequency of occurrence of phonemes in Hindi by Sreedevi, Irfana and Paulson (2022) in a typologically similar language, lending confidence that the present data do not constitute a sampling artefact.

The findings' applied value are directly dependent on the position gained in the intervention literature. Since auditory feedback is the key to consonant development (Svirsky, 1996) and the timing and intensity of early intervention impact language outcomes for deaf and hard of hearing children (Yoshinaga-Itano et al., 1998; Rudge et al., 2022), early intervention is crucial.

Conclusion

This study isolated the occurrence of Urdu consonants in 78 pre-school children (3-6 years) of government and private schools in Rawalpindi and Islamabad. In 6,380 words of natural speech (total of 247 minutes), 11,982 consonant occurrences were transcribed and counted.

Thirty-seven Urdu consonants were obtained, 36 in initial position and 33 in middle position and 30 in final position. The most common consonant overall and for all age groups was the fricative /h/ followed by the trill /r/ and nasal /n/. Initial position /h/, medial position /t/ and final position /r/ were found to have their position-specific dominance. A list of twenty consonants which were most frequently used by preschoolers in the Urdu speech was generated as /h, r, n, k, t, m, s, l, b, p, j, g, t̪, d, ɽ, t̪ɽ, kʰ, z, t̪ʰ/. The composition of this list remained similar across the three age groups studied.

The results of this study give the first frequency-ordered list of urdu consonant phonemes from spontaneous utterances of preschool children. They provide a scientific foundation for teachers of the hearing impaired, speech-language pathologists, audiologists and early childhood educators for auditory training for Urdu language, building assessment material and selection of phonics targets and descriptive data for the larger study of the consonant frequency and phonological acquisition of SA languages.

RECOMMENDATIONS

Based on the results, the following are recommended.

1. *The sequencing of the auditory training.* The programmes for auditory training to be offered to Urdu-speaking HI children need to present the high consonants of the target language first, starting with consonant /h/, followed by consonant /r/, and then consonant /n/, consonant /k/ and consonant /t/ and not from English language materials.
2. *Position-specific practice.* Positional information should be taken into account when creating training and/or assessment content, as the distribution of position can vary greatly across the inventory of target consonants.
3. *The development of teaching materials.* is the one with which we are more familiar. Urdu word lists, flashcards, picture books and Urdu phonics material for preschool and special education students should contain a higher proportion of high-frequency consonants resulting from this study.
4. *Professional development.* The teacher of the hearing impaired should be instructed on how to use the frequency data when planning speech and auditory work, and should discover that the target should be an evidence-based choice, not an intuitive one.
5. *Working with speech-language pathologists.* Discussions between teachers and speech-language pathologists should be a regular part of the school's curriculum for hearing-impaired students, and a system for making the conversation more meaningful should be set up based on a frequency-based teaching goal/progress monitoring system.
6. *Parental involvement.* Simple guidance should be given to parents about which consonants to use frequently and all parents should be encouraged to structure the use of these with their homes, as the home environment is where a lot of the language inputs to the preschool child will happen.
7. *Monitoring and evaluation.* Progress towards good consonant acquisition should be assessed on a frequency list and not a non-differentiated list of consonants, to ensure that progress towards functionally important phonemes is noted.
8. *Future research.* The study needs to be replicated with children with hearing impaired status with larger sample ranges in Urdu (5-6 years band) and across other regions in Pakistan and with the involvement of vowels to provide a comprehensive phonetic frequency profile of Urdu.

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