Urdu Phonological Rules in Connected Speech

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Urdu Phonological Rules in Connected Speech

- Phonological rules mean the information of possible and non-possible combinations of sounds in a language [3].

- The phonological rules also give information about the alternative or multiple pronunciations of a word [3].

- In other words phonological rules deal with the words' morphology and concern with the way in which morphemes combine to form a meaningful word [4].

- Studies reported that phonological variations are inevitable and unconsciously done by the native speakers [5].

Urdu Phonological Rules in Connected Speech

- Urdu is an Indo-Aryan language and it has 100 million speakers in all over the world and they have multiple pronunciations and accents [**1**].

- In this study, Urdu phonological rules are reported based on multiple pronunciations of a word, which has same spellings and part of speech i.e. a word محبت (love /məhəbbəṯ/) [**2**] has two more alternative pronunciations;
  - /mʊhəbbəṯ/
  - /mohəbbəṯ/

Urdu Phonological Rules in Connected Speech

- The **motivation of this study** is to investigate the phonological phenomena behind these alternative pronunciations.

- In connected speech production, Urdu has sound change rules almost similar to other languages i.e. alternation, assimilation, deletion, vowel lengthening, etc [**6**] which produced multiple pronunciations.

- It is also reported that few variations are speaker dependent and some are context dependent [**6**].

- However, the present study deals with only three important phonological rules;
    - segment alternation
    - segment deletion
    - segment insertion

Methodology

- **<u>Sample Size:</u>** Urdu phonological rules are extracted from the speech of 10 speakers.

- **<u>Data Collection:</u>**
  In order to confirm; whether these pronunciations are mispronunciations or multiple pronunciations,
  - firstly, 10 hours speech corpus of a native Urdu female speaker has been studied for the initial analysis.
  - Secondly, these phonological variations have been confirmed by obtaining the data from 9 native Urdu speakers (7 males and 2 females).
  - All these speakers were graduates and use Urdu and Punjabi in their daily routine.
  - Educated native speakers are deliberately selected in order to confirm; whether literacy plays any role in standard pronunciation or not.

Methodology

- 10 hours corpus is comprised of 103902 words containing;
    - 9852 unique words,
    - 13717 duplicates and
    - 80333 Urdu functional words and English loan words.
- But only duplicate words' list is used for further research.
- The word list of duplicates provides multiple instances of a word with same spellings including their transcription, parts of speech, number of syllables in a word, stress pattern and file ID.
- Analysis of word list highlights that variations may occurred due to four reasons;
    - (i)   it might be an annotation error,
    - (ii)   mismatches may occur due to homographs or homophones having different parts of speech,
    - (iii)   mismatches may occur due to different stress patterns of a word in different files and
    - (iv)   variation may occur due to alternative pronunciations.

Single Speaker Speech Analysis
Total Number of Alternative (Duplicate) Words = 13717

	Segment Alternation				Segment Alternation			Vowel Deletion				Consonant Deletion			Vowel Insertion		
	Short-to-Short Vowel T=2530	Short-to-Medial and Medial-to-Short Vowel T=458	Medial-to-Medial Vowel	Long-to-Long Vowel	Short-to-Short Vowel T=2530	Short-to-Medial and Medial-to-Short Vowel T=458	Medial-to-Medial Vowel	Disyllabic Word Short Vowel T=202		Tri-syllabic Word Short Vowel	Medial Vowel	Polysyllabic Words			Monosyllabic Words T=633 Insertion=317		
	ə→ɪ	ə→ʊ	ɪ→ə	e→ə	e→ɪ	e→æ	e:→æ:	ə→φ	ɪ→φ	ə→φ	e→φ	/j/	/h/	/v/	before /l/	before /r/	before /s/ or /z/
TW	850	850	830	165	293	448	124	157	45	79	77	4403	4742	29	210	200	211
SP	550	300	779	95	154	124	28	93	21	15	15	1578	806	3	100	100	106
AP	300	550	51	70	139	324	96	64	24	64	62	2825	3936	26	110	100	105

Nine Speakers Speech Analysis Report
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	ə→ɪ	ə→ʊ	ɪ→ə	e→ə	e→ɪ	e→æ	e:→æ:	ə→φ	ɪ→φ	ə→φ	e→φ	/j/	/h/	/v/	before /l/	before /r/	before /s/ or /z/
SP 2	13	15	10	7	13	24	06	14	24	14	12	15	16	17	17	25	15
SP3	13	15	11	17	12	20	12	22	7	7	9	13	7	7	19	18	25
SP4	24	14	11	11	19	13	22	22	17	17	15	19	17	17	23	22	22
SP5	14	18	12	23	15	13	11	19	11	18	7	18	11	11	20	22	12
SP6	17	22	10	22	11	16	21	12	23	23	17	7	23	23	23	23	24
SP7	18	20	11	12	16	18	18	18	22	22	11	17	21	22	22	22	14
SP8	19	22	13	11	17	10	13	17	12	12	23	11	24	24	19	24	18
SP9	22	20	11	12	15	10	12	22	18	9	17	23	13	23	19	23	19
SP10	5	11	19	14	14	10	14	24	12	15	19	22	18	23	20	25	14
TN	145	157	108	129	132	134	129	170	146	137	130	145	150	167	182	204	163
%age	64	70	48	56	59	60	57	75	65	61	58	64	67	74	81	91	72

Data analysis and Discussion

- Like many other languages, Urdu also has sound change rules, which become the cause of multiple pronunciations of an already existed phonetic script.

- Data analysis confirms that there are three main categories of alternative pronunciations of the same vocabulary. Those are:
  - Segment Alternation
  - Segment Deletion
  - Segment Insertion

1. Segment Alternation

- According to the definition, morphology does not allow alternative pronunciations of a segment but

- phonology supplies the information at which context a segment could alternate its stereotypical features. These phonologically variant segments are called "alternants" [4].

- Urdu also has different "alternants" but native speaker articulated one "alternant" at a time.

- According to the present data analysis, Urdu native speakers switch between multiple pronunciations by substituting one vocalic segment with another. This alternation occurs in four ways;
  - Short to short vowel alternation
  - Short to medial and medial to short vowel alternation
  - Medial to medial vowel alternation
  - Long to long vowel alternation

- All these alternations are discussed in the subsequent sessions. However, the reasons of first two types are not discussed, as data indicates they might be speaker dependent variations.

a. Short to Short Vowel Alternation

- it occurs when one short vowel alternates with another short vowel e.g. in the word بلند (high /bələnd̪/),
- /ə/ is converted into /ʊ/ and formed an alternative pronunciation /bʊlənd̪/.

b. Short to medial and medial to short vowel alternation

- it occurs when a medial vowel substitutes with a short vowel or a short vowel alternates with a medial vowel e.g. the word اختلاف(conflict /ɪxt̪ela:f/) has two multiple pronunciations;
  - /ɪxt̪əla:f/
  - /ɪxt̪ɪla:f/
- The word شاعر (poet /ʃa:ɪr/) has two multiple pronunciations; the standard pronunciation /ʃa:ɪr/ and other alternative pronunciation with the medial vowel /ʃa:**e**r/.

c. Medial to Medial Vowel Alternation

- Third condition is; medial vowel alternates with another medial vowel e.g. the word احترام (respect /eḥṯera:m/) has another alternative pronunciation /æḥṯera:m/.

- In polysyllabic words, if the letters الف، ح come together at word initial place as in the word احسان (good deed /eḥas:n/) if the word is articulated with stress then /e/ medial vowel would be substituted with /æ/ medial vowel / æhas:n/

- the same is the case with the word احتجاج (protest /eḥṯedʒa:dʒ/) as /**æ**ḥṯedʒa:dʒ/.

d. Long to Long Vowel Alternation

- Fourth condition is the long vowel alternation with long vowel as in the word تیئیس (twenty three /t̠e:i:s/).

- It has two pronunciations; one is the standard one /t̠e:i:s/ and the other is the alternative pronunciation /t̠æ:i:s/ of the same word (for more examples see appendix).

- In polysyllabic words, this phenomenon has been commonly observed both at word initial and word medial positions.

- Especially, if the letters الف and ع co-occur at word initial position as in the word اعتبار (Trust /e?t̠eba:r/), this would not be wrong if we take /e:/ long vowel as a standard segment [18].

- When stress /e:/ long vowel is substituted with /æ:/ long vowel.

2. Segment Deletion

- In a connected speech, segment deletion of a phoneme is also called elision.
- It is common in casual connected speech [**13**] which causes re-syllabification [**24**] e.g. the word بسر(to live /bəsər/) has another alternative pronunciation as /bəsr/.
- Different types of phonemic deletions are observed in this research;
    - short or medial vowel deletion,
    - /h/ deletion
    - /j/ deletion
    - /v/ deletion
- Segment deletion always occurs at word medial or word final syllable.
- Sometimes consonantal deletion converts its preceding short vowel into long vowel e.g. in the word حصّ (portion /hɪssəh/) changes into /hɪssa:/
- Vowel deletion reduces number of syllables as well.
- Long vowel deletion is not possible.
- Short or medial vowel deletion has been observed in disyllabic and tri-syllabic word.
- unstressed articulation causes vowel deletion in bi and tri-syllabic (polysyllabic) word.

a. Vowel Deletion

1. By reducing stress in disyllabic words, firstly short vowel deletion occurs in the last syllable then syllabic reformation takes place. The re-syllabification occurs due to consonant clusters at coda position. For example, the word امر (eternal /ə.mər/) converts into /əmr/.

2. Vowel deletion occurs in tri-syllabic (polysyllabic) words due to the unstressed articulation of the penultimate syllable of a word, which not only causes segment deletion but also becomes reason for reformation of syllables in the word. This phenomenon is called vowel syncope [25]. For example the word آخرت (hereafter /aːxɪrət̪/) converts into /aːxrət̪/.

b. Consonant Deletion

3. /h/ deletion occurs at word final position if it is articulated in connected speech without stress as the word بادشاه (king /ba:d̪ʃa:h/) turned into /ba:d̪ʃa:/ and بچہ (child /bət͡ʃt͡ʃəh/) converted into /bət͡ʃt͡ʃa:/ [6].

4. Usually, /j/ deletion occurs word medially to form a diphthong e.g. the word کیوں (why /kɪjũ:/) as /kɪũ:/ and کیا(what /keja:/) as /kæa:/ [26]. However in some cases /j/ deletion occurs without making diphthong as in the word حیثیت (status /hæ:sɪjjət̪/) as /hæ:sɪ:ət̪/ and لیے (for /lɪje:/) as /lɪe:/

5. /v/ deletion occurs by the substitution of /v/ consonant with the vowel. /v/ deletion occurs inter vocalically in two ways; by making diphthongs i.e. the word ہوئی (was /hʊvi:/) converts into a monosyllabic word /hu:i:/ [26]. While on the other hand, unstressed articulation also causes /v/ deletion, without making diphthong as in the word ہندووں (Hindues /hɪnd̪ʊvõ:/) v deletion occurs without making a diphthong /hɪnd̪u:õ:/.

3. Segment Insertion

- The addition of a phonemic segment in a word is called insertion or epenthesis [19].

- Articulation time of articulators is the major reason for the segment insertion [7] and it may be speakers' attitude i.e. hypercorrection and generalization about rules because people overdo things when they like and dislike them [11].

- In Urdu connected speech, the segment insertion, especially the insertion of /ə/ has been commonly observed phenomenon among ten speakers' speech.

- Multiple pronunciations of monosyllabic words occur due to the insertion of a short vowel which ultimately increases number of syllables in a word. [20].

- For example, the word امر(work) has two multiple pronunciations; one is the standard pronunciation /əmr/. The other is the alternative pronunciation /əmər/ with /ə/ insertion and syllabic reformation. This insertion might be the effect of over generalization of the word امر (eternal, /əmər/).

- Vocalic segment insertion (only short vowel /ə/) takes place in order to break word final consonant cluster and this insertion happens in three contexts which are as follows;

  a) If consonant is followed by a liquid sounds /l/ or /r/ e.g. قبر(grave /qəbr/) as / qəbər/ and اصل(original /əsl/) as /əsəl/.

  b) If consonant is followed by a bilabial nasal sound /m/ e.g. in the word کرم (fate /kərm/) as /kərəm/.

  c) If consonant is followed by an alveolar fricative consonant /s/ or /z/ e.g. in the word حبس (congestion /həbs/) as /həbəs/.

Results

- It is confirmed after analyzing speech corpus that multiple pronunciations of words occur due to different phonological rules in Urdu language.

- All these reported rules are discussed and marked after taking consents from Urdu native speakers.

- It is observed that in connected speech production;
  - i.   phonological variations occur only in open class words i.e. noun, adjective etc.
  - ii.   unstressed articulation causes segment deletion of /ə/, /h/, /j/ and /v/
  - iii. segment deletion always occurs in disyllabic or tri-syllabic words
  - iv.   segment deletion always occurs at word medial or word final position
  - v.   sometimes consonantal segment deletion converts preceding short vowel into long vowel
  - vi.   long vowel deletion is not possible.
  - vii. Moreover, segment insertion took place in consonant clusters at coda position when a consonant is followed by liquid sound, bilabial nasal sound or an alveolar fricative.
  - viii. It is also noticed that segmental alternations have occurred due to stress
  - ix.   speakers' education is not the guarantee for the articulation of standard pronunciation

Conclusion and Future Discussion

- Using these rules, the existed Urdu lexicons can be updated as they give only morphological information of the word without incorporating new language changes. Incorporation of phonological information will be help in finding out alternative pronunciations of the word.

- There are other issues as well which have not been discussed here but would be investigated in future research. This includes study of
    i.   short vowel insertion in polysyllabic Urdu words
    ii.   alternative selection of short or medial vowel in a word,
    iii.   /h/ deletion at word medial position
    iv.   multiple pronunciations of proper nouns
    v.   Moreover, the role of socio-cultural and educational background of the person.

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Appendix

Short Vowel Alternation

Words	English	SP	AP
بلند	high	bələnd	bʊlənd
محبت	love	məhəbbət	mʊhəbbət

Short to Medial and Medial and Medial to Short Vowel Alternation

Words	English	SP	AP	
ارتکاب	committing an offence	ɪrtẹka:b	ɪrtṛka:b	ɪrtẹka:b
استعمال	use	ɪstẹma:l	ɪstṛma:l	ɪstẹma:l
محمد	Proper noun	mʊhəmməd	mohəmməd	

Medial to Medial Vowel Alternation (e → æ)

Words	English words	SP	AP	
			SS	US
اعرام	respect	ehtẹra:m	æhtẹra:m	ehtẹra:m
احتجاج	Protest	ehtẹdʒa:dʒ	æhtẹdʒa:dʒ	ehtẹdʒa:dʒ
احتیاط	Care	ehtịja:t	æhtịja:t	ehtịja:t
احرام	Unstitched white cloth for Hajj	ehra:m	æhra:m	ehra:m
احساس	Feeling	ehsa:s	æhsa:s	ehsa:s
	Good deed	ehsa:n	æhsa:n	ehsa:n

	mountain	dʒə bəl	dʒəbl
جبل			
اعراض	objection	e: tẹ ra:z	e:ṭ ra:z
آخرت	hereafter	a: xɪ rəṭ	a:x rəṭ

Short Vowel /ə/ Insertion before Liquid Sounds

List of Words	English Words	SP	Word final Consonant Cluster	Manners of Articulation	AP
اصل	Original	əsl	Alveo-Fricative+ Lateral	Any Consonant followed by Laterals /l/ or /r/ consonant; triggered schwa insertion	əsəl
غسل	Bath	xʊsl	Alveo-Fricative+ Lateral		xʊsəl
مثل	Example	mɪsl	Alveo-Fricative+ Lateral		mɪsəl
فضل	Bounty	fəzl	Alveo-Fricative+ Lateral		fəzəl
عدل	justice	ədl	Dental + Lateral		ədəl
عقل	Wisdom	əql	Uvular + Lateral		əqəl
ذکر	account/talk	zɪkr	Velar + trill		zɪkər
عصر	Time Period	əsr	Alveo-Fricative + trill		əsər
قبر	Grave	qəbr	bilabial + trill		qəbər
کفر	unbelief	kufr	Labiodental + Lateral		kufər
قدر	Value	qədr	Dental + trill		qədər
	cruelty	dʒəbr	bilabial + trill		dʒəbər

Medial to Medial Vowel Alternation (e → æ)				
Words	English words	SP	AP	
			SS	US
احترام	respect	eht̪eraːm	æht̪eraːm	eht̪eraːm
احتجاج	Protest	eht̪edʒaːdʒ	æht̪edʒaːdʒ	eht̪edʒaːdʒ
اعتیاط	Care	ehtijaːt̪	æhtijaːt̪	ehtijaːt̪
احرام	Unstitched white cloth for Hajj	ehraːm	æhraːm	ehraːm
احساس	Feeling	ehsaːs	æhsaːs	ehsaːs
احسان	Good deed	ehsaːn	æhsaːn	ehsaːn
احکام	pillar	ehkaːm	æhkaːm	ehkaːm
اقتام	phlebotomy	eht̪emaːm	æht̪emaːm	eht̪emaːm

Long to Long Vowel Alternation (eː → æː)				
Words	English words	SP	AP	
			SS	US
اعجاز	miracle	eʔdʒaːz	æːdʒaːz	eːdʒaːz
اعتماد	Trust	eʔt̪emaːd	æːt̪emaːd	eːt̪emaːd
اعتراض	objection	eʔt̪eraːz	æːt̪eraːz	eːt̪eraːz
اعلان	to announce	eʔlaːn	æːlaːn	eːlaːn
اعتبار	Trust	eʔt̪ebaːr	æːt̪ebaːr	eːt̪ebaːr

Words	English	SP	Consonant Cluster	Articulation Manners	AP
عدل	justice	ədl	Dental + Lateral	consonant; triggered schwa insertion	ədəl
عقل	Wisdom	əql	Uvular + Lateral		əqəl
ذکر	account/talk	zɪkr	Velar + trill		zɪkər
عصر	Time Period	əsr	Alveo-Fricative + trill		əsər
قبر	Grave	qəbr	bilabial + trill		qəbər
کفر	unbelief	kufr	Labiodental + Lateral		kufər
قدر	Value	qəd̪r	Dental + trill		qəd̪ər
جبر	cruelty	dʒəbr	bilabial + trill		dʒəbər

Short Vowel /ə/ Insertion before /m/					
Words	English Words	SP	Consonant Cluster	Articulation Manners	AP
قسم	Kind	qɪsm	Alveo-Fricative+ Bilabial Nasal		qɪsəm
حکم	Order	hukm	Velar + Bilabial Nasal	Any Consonant followed by bilabial nasal /m/	hukəm
جرم	sin	dʒʊrm	liquid+ Bilabial Nasal		dʒʊrəm
کرم	fate	kərm	liquid+ Bilabial Nasal		kərəm
علم	education	ɪlm	liquid+ Bilabial Nasal		ɪləm

Long to Long Vowel Alternation (e: → æ:)

Words	English words	SP	AP	
			SS	US
اعجاز	miracle	eʔdʒaːz	æːdʒaːz	eːdʒaːz
اعتماد	Trust	eʔtemaːd	æːtemaːd	eːtemaːd
اعتراض	objection	eʔteraːz	æːteraːz	eːteraːz
اعلان	to announce	eʔlaːn	æːlaːn	eːlaːn
اعتبار	Trust	eʔtebaːr	æːtebaːr	eːtebaːr

Vowel Deletion

Words	English Words	SP	Deletion
اعتماد	Trust	eːtemaːd	eːt̪ maːd
اعتراض	objection	eːteraːz	eːt̪ raːz
آخرت	hereafter	aː xɪ rət̪	aːx rət̪
احتجاج	Protest	ehtedʒaːdʒ	eht̪ dʒaːdʒ
امر	eternal	ə mər	əmr

Words	English Words	SP	Consonant Cluster	Articulation Manners	AP
قسم	Kind	qɪsm	Alveo-Fricative+ Bilabial Nasal	Any Consonant followed by bilabial nasal /m/	qɪsəm
حکم	Order	hukm	Velar + Bilabial Nasal		hukəm
جرم	sin	dʒurm	liquid+ Bilabial Nasal		dʒurəm
کرم	fate	kərm	liquid+ Bilabial Nasal		kərəm
علم	education	ɪlm	liquid+ Bilabial Nasal		ɪləm

Short Vowel /ə/ Insertion before Alveo-fricative Consonants

Words	English Words	SP	Word final Consonant Cluster	AP
اخذ	extract	əxz	velar + alveo-fricative	ə xəz
حبس	congestion	həbs	Bilabial stop + alveo-fricative	həbəs
لفظ	word	ləfz	labiodental + alveo-fricative	ləfəz
قرض	loan	qərz	trill + alveo-fricative	qərəz
قبض	constipation	qəbz	bilabial stop + alveo-fricative	qəbəz

Thank You