



Ellipsis in Urdu Content Words

Mahwish Farooq, University of Management and Technology, Lahore, Pakistan, mahwishfarooq4@gmail.com
Dr. Muhammad Asim Mahmood, Dean, Faculty of Arts and Social Sciences, Government College University, Faisalabad, Pakistan, masimrai@gmail.com

Abstract- Presently, this work deals with the phonological rules for understanding the role of ellipsis in re-syllabification of Urdu content words, at larger scale, in speech of Pakistani Urdu speakers. The 10 hours audio-corpora has become the source of motivation for the current study due to its multiple pronunciations (Farooq & Mumtaz, 2016), (Farooq & Mahmood, 2020). The annotated speech data has multiple information i.e., same parts-of-speech (POS), spellings and meanings but different pronunciations which ultimately becomes the cause of re-syllabification at different places and contexts. Therefore, that annotated speech corpus is used as baseline of this research (Mumtaz, et al., 2014), (Habib, Hijab, Hussain, & Adeeba, 2014) but the selected words' list includes only those words which have different pronunciations occurred due to phoneme ellipsis. Later this list has been shared and asked to record by 29 native Urdu speakers in Pakistan. Thus, data analysis has confirmed different reasons for causing ellipsis in Urdu; (i) contextual variations, (ii) inter-speaker variations, (iii) stress variations, (iv) multilingual effect, etc. All these variations become the reasons for alternative pronunciations. It is also confirmed that alternative pronunciations are present in the speech data of all speakers but a speaker can use a single pronunciation at a time. Therefore, all different pronunciations have attained the status of alternative/multiple pronunciations (Farooq & Mumtaz, 2016) in Urdu in Pakistan.

Keywords: ellipsis, restructuring, re-syllabification, alternative pronunciations

I. INTRODUCTION

The current work is based on a hypothesis that ellipsis directly influence re-syllabification by causing restructuring therefore known as major cause of multiple pronunciations in Urdu speech of Pakistani Urdu speakers. Linguistically, ellipsis refers a missing phonological form that construct the same meaning which it should has to denote. Therefore, the mismatches requires an associated gap between phonological form and its meaning. Thus, the sense of ellipsis differs from deletion, so, ellipsis requires the missing Phonetic Form (PF) to refer the information that is given in a linguistic context (Szczeplniak, 2018). Grammatically, ellipsis appears when a speaker left out an item which s/he would have to articulate normally but without effecting the meaning of the grammatical unit (Ellipsis).

Urdu language belongs to the Indo-Aryan group of languages and has multiple pronunciations and accents based on 100 million speakers around the world. In Pakistan, Urdu is the National and official language (Farooq, 2015) but most importantly a 'lingua franca' therefore is esteemed more than any other native language. Currently, the vowel ellipsis has been reported and analyzed in Urdu content words of Pakistani Urdu speakers' speech and becomes the important reason of restructuring and multiple pronunciations. Data analysis has confirmed that these Urdu content words have same parts of speech, spellings and meanings but with different transcriptions. For example, a word آخرت (hereafter /a:xɪrət/) (Urdu Lughat: Tarixi Usul Per, 2013) has another alternative pronunciation i.e., /a:x.rət/) but are interestingly and equally comprehensible by all native Urdu speakers in Pakistan. Therefore, the motivation of the current study is the investigation of phonological reasons behind ellipsis and restructuring in Urdu content words.

Phonological rules are the information of all possible phonemic combinations in a given language which deal with the alternative pronunciations of a word (Odden, 2005). So, phonological rules concern with the words' morphology and morpheme combinations to form meaningful words (Jehsen, 2004). Different researches have reported the inevitable occurrences of phonological variations in the speech of native speakers (John, NA) which ultimately become the reason of restructuring of vocabulary therefore may cause confusion among non-native speakers. Therefore, 10 hours speech corpus of a female speaker has been used as a reference point for initiating this research. That speech has been comprised of unique tokens and duplicates; in the current research, only those duplicates have been used which appear due to ellipsis.

Afterwards, the wordlist is reused for recording and collecting speech data from 29 more native Urdu speakers. Consequently, this study is done to find out possible reasons for ellipsis and restructuring in Urdu content words. Thus, ellipsis (Farooq & Mumtaz, 2016), (Hussain, 2005) has been used to explain this research with the help of phonological variations causing restructuring for the alternative pronunciation(s) of the surface forms of already existed phonetic-scripts of Urdu content words. Therefore, a backend strategy is investigated in order to resolve the issues of multiple pronunciations for non-native speakers. So, the context dependent variations have only catered in this research.

This paper has proposed Urdu phonological rules for ellipsis and restructuring of Urdu content words in connected speech. The remaining paper is arranged accordingly; (i) a report on the literature review of phonological rules for ellipsis and restructuring are discussed in the second section, (ii) third section is about the experimental methodology, (iii) fourth section is about data analysis and results, (iv) fifth section concludes the proposed phonological rules for ellipsis in Urdu content words, (v) future discussion is presented in section 6 while (vi) section 7 acknowledges the contributions of research participants.

II. LITERATURE REVIEW

This research deals with the phonological rules for ellipsis which causes multiple pronunciations in Urdu content words. Number of researches have confirmed different phonological rules in various languages (Finch, 2000) e.g., Hungarian, English, Japanese, Finnish, Russian, Czech, Setswana, Dutch, and Shona (Panevov & Hana, 2010). According to American National Standards Institute (ANSI), the voice quality depends on the habitual variations of the vocal apparatus of a speaker which causes multiple pronunciations and accent variations based on momentary actions of speech segments (Kreiman, Jody; Sidtis, Diana Vanlancker; Gerratt, Bruce, 2014). Each language has different and unique phonemic inventory (Jehsen, 2004) but may lose their phonemic features in connected speech (Roach, 2009) due to the complex phonological rules (Hall, 2005). Moreover, Vander has highlighted the importance of; (i) speakers' acoustic behavior and (ii) language change variations due to phonological rules (Hulst H. V., 1979). According to Sound Change Theory (SCT), multiple pronunciations and restructuring are inevitable speech features in connected speech (Ohala, 1980) due to inherent variations of "non-programmed features" to articulate an alternative pronunciation (John, NA), (Odden, 2005). But these phonemic features are not sufficient (Hall, 2005) because auditory transcription cannot duplicate human speech with traditional phonetic symbols for identifying multiple pronunciations of a word. Therefore, the multiple pronunciations and restructuring have been catered in "phonetic grammar" of a language (Odden, 2005) after considering its phonological rules. Though, there are number of phonological rules which cause restructuring (Finch, 2000) but this research will only analyze ellipsis in Urdu content words.

2.1 Multiple pronunciations and re-syllabification caused with ellipsis

The deletion of a speech segment or a phoneme in a word is called ellipsis but such type of segment deletion does not cause meaning change of the lexical item. It is a common feature in connected speech articulation (Finch, 2000) which causes re-syllabification to produce the alternative pronunciation(s). Ellipsis may occur due to the unconscious and laziness of the native speakers (Waqar & Waqar, 2002). Basically, there are two different types of ellipsis i.e., (i) vocalic ellipsis, and (ii) consonantal ellipsis as have been observed in various languages. For example, Hindi language has reported both types i.e., a short vowel schwa is deleted if articulated before a long oral vowel [a:] and a nasal consonant may be deleted if followed by a nasal vowel (Trigo, NA). In English connected speech, the Relative Functional Load (RFL) Theory has reported, if a syllable final alveolar stop [i.e., /t/, /d/, or /n/] is preceded by an unstressed /n/ or /l/ consonant then the following consonants will become syllabic consonant after deleting its preceding short vowel schwa (Murcia, Brinton, & Janet, 2010). Moreover, a word final short vowel /ə/ will be deleted if followed by another stressed syllable. Consequently, the vowel deletion causes re-syllabification in Urdu (Nawaz, NA). Turkish language has reported the deletion of syllable-medial and syllable-final voiced velar plosive /g/ speech segment by conversion of its preceding short vowel in a long vowel (Hulst & Weijer, NA). All these types of ellipsis ultimately cause the re-syllabification for producing alternative or multiple pronunciation(s) of a single word in a given language.

2.2 Urdu phonological rules for re-syllabification and multiple pronunciations

Number of researches has reported different phonological rules in Urdu connected speech but only at segmental level e.g., deletion of (i) glottal fricative /h/ (Hussain, 2005), (ii) glottal stop /ʔ/ (Nawaz,

N.A.), (iii) short vowel /ə/ (Akram, 2002), and (iv) deletion of short vowels i.e., [ə/ɪ], and (v) medial vowel [e] deletion at word medial position (Farooq & Mumtaz, 2016). Therefore, the phenomenon of re-syllabification has been investigated in Urdu speech of 29 more Urdu speakers in order to confirm ellipsis in Urdu content words. Methodology and data analysis have been discussed in the subsequent sections.

III. METHODOLOGY

Currently, Urdu phonological rules have been reported to cater ellipsis which causes re-syllabification and multiple pronunciations in the connected speech of 30 native Urdu speakers in Pakistan. The objective of this study is to identify phonological reasons for ellipsis which may cause multiple pronunciations. Therefore, 10 hours Urdu recordings of Urdu speech of one female speaker has been used and this speech corpus is consisted of duplicates and unique words. But in the current research, only those duplicates have been used which appear due to ellipsis in Urdu content words. These content words have been shared with 29 more Urdu speakers for recordings. They have claimed Urdu as their first language. They have been selected conveniently from different public sector universities of Pakistan. Their age is between the range of 18-25 years and they have completed their undergraduate level of education. The speech data has been recorded at 8 KHz in an echoic chamber in PRAAT software. Speech segmentation and annotation has been done at different tiers by using Case Insensitive Speech Assessment Phonetic Alphabets (CISAMPA) in PRAAT (Mumtaz, et al., 2014). The results of data analysis are reported in section 4 for removing confusions. The results confirm the reasons for the ellipsis and multiple pronunciations which are either based on speaker dependent variations or contextual variations.

IV. RESULTS

Ellipsis is the main objective of this research as it is one important phenomenon which causes multiple pronunciations and re-syllabification of Urdu content words. 10 hours speech corpus (of 103902 wordlist) is used for initiating this research. It is consisted of a wordlist including; unique words, functional words, English loan words and duplicates. But currently after considering the scope of the research, only 9532 duplicates are used which occur due to ellipsis in Urdu content words. The speech data gives information about the multiple instances of Urdu content words with similar spellings. It also contains the information about; (i) transcriptions, (ii) POS tags, (iii) syllables' count, (iv) stress patterns and (v) file IDs. There are two main reasons for phoneme ellipsis; (i) stress variation, and (ii) multilingual effect. The standard transcription is consulted with "Urdu Lughat: Tarixi Usul Per" (Urdu Lughat: Tarixi Usul Per, 2013) and English meanings of duplicates are incorporated with the consultation of Oxford Urdu-English Dictionary (Parekh, 2013). The data analysis and results of duplicates are reported in the table 1;

Table 1

Ellipsis in Urdu Content Words							
Ellipsis of Vowel					Ellipsis of Consonant		
Short Vowel Ellipsis in Disyllabic Words			Short Vowel Ellipsis in Trisyllabic Words		In Polysyllabic Words		
Short Vowel			Short Vowel	Medial Vowel			
	ə → ∅	ɪ → ∅	ə → ∅	e → ∅	/j/	/h/	/v/
TW	157	45	79	77	440 3	4742	29
ST	93	21	15	15	157 8	806	3
AP	64	24	64	62	282 5	3936	26

Note: **TW** = Total words, **ST** = standard Transcription, **AP** = alternative pronunciations

Later, for the confirmation of phoneme ellipsis in Urdu content words, 29 male-female Urdu speakers are selected conveniently from public sector universities of Pakistan. They have at least completed their higher secondary school education. Results have confirmed the presence of alternative pronunciations in speech of 29 Urdu speakers. A list of 75 content words (i.e., 25 words of each category) has been shared with them and asked to record in Praat. This wordlist is recorded after embedding in different sentences for avoiding stress, boundary effect and confirming contextual effect. Subsequently, the results have also confirmed ellipsis in the given wordlist. The most important thing is; almost majority of speakers are more consistent in using alternative pronunciation than the standard form of the content word (details are in table 2).

This collected data also has same spellings and parts-of-speech but with different stress patterns and transcriptions due to ellipsis which ultimately become the reason of restructuring and multiple pronunciations. These multiple instances have been entered in an excel log-sheet for reconfirmation in order to avoid inconsistency and human errors in annotation. Log-sheet saves the time by making record of each alternative pronunciation with specific file ID. Then, ellipsis and multiple pronunciations have been confirmed only after consulting annotation errors. Alternative pronunciations may occur due to ellipsis by causing re-syllabifications of Urdu content words. These multiple pronunciations give broader perspective to reach a conclusive decision about re-syllabification of Urdu content words. This study will ultimately relax the concept of mispronunciations by accepting the alternative pronunciations as alternative variety. Results of data analysis are given in table 2 for making clarity about the context dependent or speaker dependent variations.

Table 2

	Ellipsis in Urdu Content Words						
	Deletion of Vowels				Deletion of Consonants		
	Disyllabic Word		Tri-syllabic Word		In Polysyllabic Words		
	Short Vowel		Short Vowel	Medial Vowel			
	ə → φ	ɪ → φ	ə → φ	e → φ	/j/	/h/	/v/
SP 1	14	24	14	12	15	16	17
SP2	22	7	7	9	13	7	7
SP3	22	17	17	15	19	17	17
SP4	19	11	18	7	18	11	11
SP5	12	23	23	17	7	23	23
SP6	18	22	22	11	17	21	22
SP7	17	12	12	23	11	24	24
SP8	22	18	9	17	23	13	23
SP9	24	12	15	19	22	18	23
SP10	12	15	10	7	18	11	11
SP11	14	14	10	17	7	23	23
SP12	11	12	16	18	11	19	14
SP13	13	11	17	10	12	15	10
SP14	12	15	10	7	18	11	11
SP15	14	14	11	16	7	23	23
SP16	19	11	16	18	11	19	14
SP17	12	23	17	10	12	15	10
SP18	19	11	11	16	18	11	11
SP19	12	23	16	18	7	23	23
SP20	11	11	17	10	11	19	11
SP21	14	14	10	11	21	12	23
SP22	18	12	23	15	11	19	11
SP23	22	10	22	11	16	21	12
SP24	18	12	23	15	13	7	7
SP25	10	15	13	11	19	14	14
SP26	11	20	22	21	14	18	12
SP27	23	23	23	13	17	22	10

SP28	19	11	16	18	14	18	12
SP29	12	23	17	10	13	7	17
SP30	19	11	11	16	11	21	17

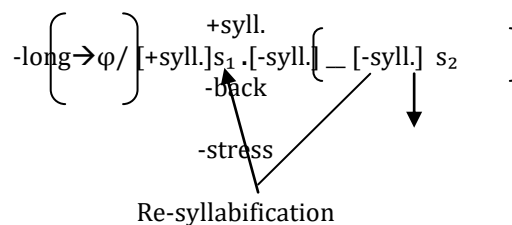
V. DATA ANALYSIS AND DISCUSSION

There are some certain Urdu phonological rules for causing ellipsis in Urdu content words which ultimately causes re-syllabification and multiple pronunciation. Ellipsis is one the main reasons for alternative/multiple pronunciations of already existed phonetic scripts of different surface forms.

5.1 Re-syllabification and Ellipsis

Ellipsis is a process of phoneme deletion in connected speech and is also called elision. It is an important and common Urdu phonological rule and may appear due to coarticulation (Finch, 2000) which becomes the reason for restructuring and re-syllabification (Kahn, 1976) in Urdu content words. People may articulate lazily and consequently their pronunciation changes (Waqar & Waqar, 2002) e.g. Urdu word بس (to live /bəsər/) is alternatively pronounced as /bəsɾ/, آخرت (hereafter /a:xɪrət/) is alternatively pronounced as /a:x.rət/, اعتماد (trust /e:ʔema:d/) is alternatively pronounced as /e:ʔ.ma:d/, اعتراض (objection /e:ʔera:z/) is alternatively pronounced as /e:ʔ.ra:z/, احتجاج (protest /ehʔedʒa:ʒ/) is alternatively pronounced as /ehʔ.dʒa:ʒ/, امر (eternal /ə.mər/) is alternatively pronounced as /əmr/, جبل (mountain /dʒə.bəl/) is alternatively pronounced as /dʒəbl/, اعتراض (objection /e:ʔera:z/) is alternatively pronounced as /e:ʔ.ra:z/. Phoneme deletion causes reduction in number of syllables therefore re-syllabification occurs. Data analysis and results have reported five types of ellipsis occur due to the deletion of; short vowel, medial vowel (Parekh, 2013), /v/, /h/, and /j/ consonantal phonemes in disyllabic, tri-syllabic and polysyllabic content words. All these types of ellipsis are not appeared randomly rather follow some phonological conditions. Some of these are discussed here;

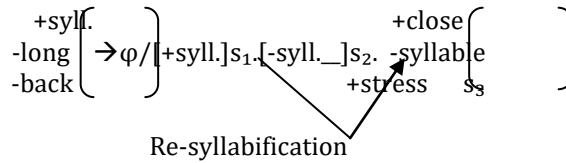
1. In monosyllabic Urdu content words, vowel ellipsis is not possible.
2. Ellipsis of a long vowel is not observed in whole speech corpus.
3. In Urdu content words, phonemic ellipsis always appears at word medial and word final syllables but it is not observed at word initial position. But in data analysis, it has been observed that only the glottal stop /ʔ/ can be omitted at all levels in a word i.e., word initial [علی (proper noun /ʔəli:/) is articulated as /əli:/], word medial [اعجاز (miracle /eʔdʒa:z/) is articulated as /e.dʒa:z/] and word final positions [اطلاع (massage /iʔiləʔ/) alternatively articulated as /iʔila:/].
4. Urdu consonantal ellipsis converts its preceding short vowel in to a long vowel at word final position. i.e., deletion of glottal stop [ʔ] and glottal fricative [h].
5. Short and medial vowel ellipsis is observed only in disyllabic and polysyllabic words.
6. Stress variations play an important and primary role in segment elision e.g., Unstressed speech articulation causes vowel reduction and re-syllabification in polysyllabic words.
 - a. Unstressed articulation of disyllabic Urdu words occurs in two steps; initially, a short vowel deletion arises in the last syllable by causing re-syllabification, which makes consonant clusters at coda position. For example, the word امر (eternal /ə.mər/) converts into /əmr/ by following subsequent phonological rule;



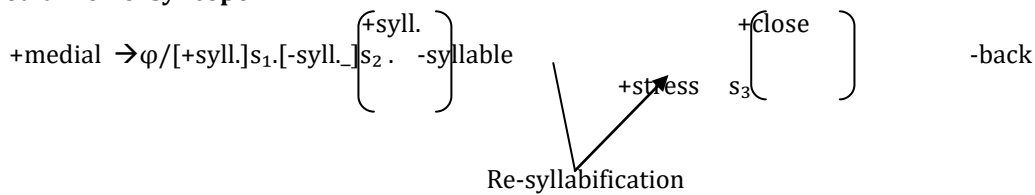
- b. Vowel ellipsis occurs only at word final or medial position but not at word initial position. But in Urduized loan and borrowed words, ellipsis may occur at word initial position e.g., [ɪsku:l] as [sku:l].
- c. Due to unstressed articulation, the vocalic ellipsis occurs in penultimate syllable of tri-syllabic words which causes vowel deletion and re-syllabification. Therefore, it is called vowel syncope (Nierfeld & Theo, 1974) as vowel is considered a nucleus in the syllable therefore vocalic ellipsis demands re-syllabification (Roach, 2009). Ellipsis and re-syllabification is a complicated phenomenon because it depends on phonotactic rules (Kahn, 1976). For instance, Urdu phonotactic rules restrain consonant clusters (i.e., /xr/, /df/, /tʃ/, /ʔm/, etc.) at onset position. For example, a tri-syllabic word

اعتراض (objection /e:ɾera:z/) may be converted into a disyllabic word with the vocalic ellipsis at word medial position /e:ɾ.ra:z/ but does not allow consonant cluster. The phonological rule for vowel ellipsis and re-syllabification can be explained by following the subsequent phonological representation;

Short vowel syncope



Medial vowel syncope

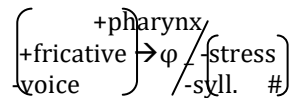


d. Consonantal deletion /h/ occurs at word medial and final positions. Therefore, it follows some specific conditions in connected speech articulation i.e.,

a. a word is articulated in an unstressed or spontaneously. For example an Urdu word بادشاہ (king /ba:ɖʃa:h/) is articulated as /ba:ɖʃa:/ simply by deleting word final /h/ consonant.

b. In another case, /h/ omission causes vowel lengthening of its preceding short vowel e.g. بچہ (child /bətʃəh/) converted into /bətʃa:/(Hussain, 2005). The whole phenomenon could be summarize by using the subsequent rule;

$h \rightarrow \varphi / [- \text{stressed}] \#$

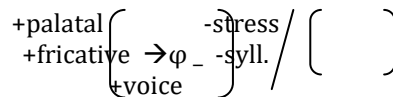


e. /j/ deletion always arises between two vowels in two different ways; (i) making diphthongs and (ii) without making diphthongs. For example,

a. The phonemic deletion /j/ occurs at word medial position by making a diphthong as in Urdu word کیوں (why /kijū:/) as /kiū:/ and کیا (what /keja:/) as /kea:/(Bhatti, 2016).

b. Though, /j/ consonant is deleted even without producing diphthongs e.g., in a word لیے (for /lije:/) as /li.e:/ and حیثیت (status /hæ:sijət/) as /hæ:sɪ:ət/ but in an unstressed articulation.

$j \rightarrow \varphi / [- \text{stressed}]$



f. The phonemic deletion /v/ occurs by substituting /v/ consonant with a vowel. The deletion of /v/ consonant always appears inter-vocally in two different ways; (i) making diphthongs and (ii) without making diphthongs. For example;

a. A disyllabic Urdu word ہونی (was /huvi:/) transforms into a monosyllabic word /hu:i:/ by making a diphthong (Bhatti, 2016).

b. The unstressed articulation may cause the deletion of /v/ consonant but without making a diphthong. For example, in the word ہندوون (Hindu /hndu:v/) /v/ deletion appears as /hndu:õ:/ by following subsequent rule;

v → φ / [-stressed]

$$\left. \begin{array}{l} +\text{labiodental} \\ +\text{fricative} \\ +\text{voice} \end{array} \right\} \rightarrow \left. \begin{array}{l} \phi \\ -\text{stress} \\ -\text{syll.} \end{array} \right\}$$

Finally, we can say that ellipsis is a common but important feature in connected speech, (Finch, 2000). Moreover, it is a complicated phenomenon because it causes re-syllabification of words (Kahn, 1976). People articulate minimum due to their laziness consciously or unconsciously and ultimately produce alternative pronunciation (Waqar & Waqar, 2002). Phonemic ellipsis may reduce number of syllables which directly become a cause of re-syllabification. For example, vowel elision directly causes syllabic deletion while consonantal elision may or may not cause syllable reduction but causes restructuring and re-syllabification in Urdu content words.

VI. CONCLUSION AND FUTURE DISCUSSION

Finally, the speech analysis of Urdu corpus has confirmed the multiple pronunciations occur due to the ellipsis in Urdu content words. The results have also confirmed Urdu phonological rules at larger scale. All the above mentioned rules have been confirmed after collecting the consent of native Urdu speakers in Pakistan. (i) Unstressed or spontaneous speech causes ellipsis and re-syllabification of Urdu content words. (ii) Phonemic elision has reported only in multisyllabic words. Moreover, (iii) ellipsis occurs only at word medial and final positions (iv) but in Urduized loan words, ellipsis may occur at word initial position. Presently, dictionaries only incorporate morphological information but phonological information is not the part of any dictionary which should be incorporated in new dictionaries in order to cater alternative pronunciations of Urdu vocabulary.

VII. ACKNOWLEDGEMENT

This paper is extracted from my Ph.D. research. I am obliged to my supervisor for his valuable guidance and also thankful to all volunteer speakers who help me out in finding the solution of my hypothesis.

REFERENCES

1. Akram, B. (2002). Analysis of Urdu Syllabification Using Maximal Onset Principle and Sonority Sequence Principle. (pp. 160-166). Center for Research in Urdu Language Processing.
2. Bhatti, R. (2016). Identification of Diphthongs in Urdu and their Properties. *Conference for Language and Technology, CLT16*. Lahore.
3. Chomsky, N., & Halle, M. (1968). *The Sound Pattern of English*. 49 East 33rd Street, New York, N.Y. 10016, The United State of America: Harper & Row Publishers.
4. *Ellipsis*. (n.d.). Retrieved July 27, 2020, from Cambridge Dictionary: [ellipsis%20-%20English%20Grammar%20Today%20-%20Cambridge%20Dictionary.html](https://www.cambridge.org/dictionary/ellipsis)
5. Farooq, M. (2015). *An Acoustic Phonetic Study of Six Accents of Urdu in Pakistan* (Vol. Thesis). University of Management and Technology, Johar Town, Lahore, Pakistan.
6. Farooq, M., & Mahmood, A. (2020, June). Acoustic Effect of Urdu Phonological Rules on English Connected Speech (Unpublished). *Journal of Language and Literature Review (LLR)*.
7. Farooq, M., & Mumtaz, B. (2016). Urdu Phonological Rules in Connected Speech. *Conference of Language and Technology (CLT16)*. Lahore: Center for Language Engineering, University of Engineering and Technology, Lahore.
8. Finch, G. (2000). Phonetics and Phonology. In J. Peck, & M. Coyle (Eds.), *Linguistic Terms and Concepts* (1st ed., Vol. 1, pp. 33-76). New York: St. Martin's Press, INC.
9. Habib, W., Hijab, R., Hussain, S., & Adeeba, F. (2014). Design of Speech Corpus for Open Domain Urdu Text to Speech System Using Greedy Algorithm. *Conference on Language and Technology (CLT14)*. Karachi, Pakistan.

10. Hall, C. K. (2005). Defining Phonological Rules over Lexical Neighbourhoods: Evidence from Canadian Raising. In J. Alderete, C. -h. Han, & A. Kochetov (Ed.), *Proceeding of the 24th West Coast Conference on Formal Linguistics: Somerville MA: Cascadilla Proceedings Project* (pp. 191-199). USA: Cascadilla Press.
11. Hulst, H. V. (1979). Rule Conversion in Phonology. *Dutch Lexicological Institute Leiden*, 336-349.
12. Hulst, H. v., & Weijer, J. v. (N.A.). Topics in Turkish Phonology.
13. Hulst, H. v., & Weijer, J. v. (NA). Topics in Turkish Phonology.
14. Hussain, S. (2005). Phonological Processing for Urdu Text to Speech System. *Localisation in Pakistan, in Localisation Focus: The International Journal for Localisation*, 3(4).
15. Jehsen, J. T. (2004). Distinctive Features. In J. T. Jehsen, & K. E. Korener (Ed.), *Principles of Generative Phonology* (iv ed., pp. 79-106). The Netherlands, USA: John Benjamins Publishing Company, Amsterdam/Phila Delphia.
16. John, O. J. (NA). The Application of Phonological Universals in Speech Pathology. Phonology Laboratory, Department of Linguistics, University of California, Berklay, California.
17. John, O. J. (NA). The Application of Phonological Universals in Speech Pathology. Phonology Laboratory, Department of Linguistics, University of California, Berklay, California.
18. Kahn, D. (1976, August 9). Syllable Based Generalizations in English Phonology. *1, 1*, 218. (P. Kiparsky, Ed.) Massachusetts Institute of Technology.
19. Kreiman, Jody; Sidtis, Diana Vanlancker; Gerratt, Bruce. (2014, June). Defining and Measuring Voice Quality. *Sound to Sense* (pp. 163-168). New York, USA: MIT.
20. Mendoza, D. R. (N.A.). Phonological Progresses. Philippines. Retrieved September 28, 2015
21. Mendoza, D. R. (n.d.). Phonological Progresses. Philippines. Retrieved September 28, 2015
22. Mumtaz, B., Hussain, A., Hussain, S., Mahmood, A., Bhatti, R., Farooq, M., & Rauf, S. (2014). Multitier Annotation of Urdu Speech Corpus. *CLT14 - 5th Conference on Language and Technology*. Karachi.
23. Murcia, M. C., Brinton, D. M., & Janet, M. (2010). *Teaching Pronunciation Hardback with Audio CDs (2): A Course Book and Reference Guide* (2nd, illustrated, reprint ed.). Cambridge University Press.
24. Nawaz, S. (n.d.). *Deletion Rules in Urdu Language*. Center for Research in Urdu Language Processing, CRULP, Lahore.
25. Nawaz, S. (N.A.). *Deletion Rules in Urdu Language*. Center for Research in Urdu Language Processing, CRULP, Lahore.
26. Nierfeld, G., & Theo, V. (1974). Restructuring. *Lingua*, 33, 137-156.
27. Nierfeld, G., & Theo, V. (1974). Restructuring. *Lingua*, 33, 137-156.
28. Odden, D. (2005). Feature Theory. In D. Odden, *Introducing Phonology* (pp. 129-168). Cambridge, , United States, NewYork: Cambridge University Press.
29. Ohala, J. J. (1980). The Application of Phonological Universals in Speech Pathology. *Speech and Language: Advances in Basic Research and Practice*, 3(0-12-608603-6), 75-94.
30. Ohala, J. J. (1993). Coarticulation and Phonology. *Language and Speech*, 2(36), 155-170.
31. Panevov, J., & Hana, J. (2010, October 13). Intro to Linguistics _ Phonology. 1-5.
32. Panevova, J., & Hana, J. (2010, October 13). *Intro to Linguistics - Phonology*. Retrieved September 28, 2015, from <https://ufal.mff.cuni.cz/~hana/teaching/2013wi-ling/04-Phonology.pdf>
33. Parekh, R. (Ed.). (2013). *Oxford Urdu-English Dictionary*. *1, 1*, 1165. (S. M. Saleem ud Din, & S. Anjum, Compilers) Pakistan: Oxford Publication.
34. Roach, P. (2009). *English Phonetics and Phonology: A Practical Course* (4th ed., Vol. 1). Cambridge University Press.
35. Szczegielniak, A. (2018, April 26). *Ellipsis*. doi:10.1093/OBO/9780199772810-0218
36. Trigo, P. (N.A.). LX 513 Phonology. *Hindi (GP)*, 175-76.
37. Trigo, P. (NA). LX 513 Phonology. *Hindi (GP)*, 175-76.
38. Urdu Lughat: Tarixi Usul Per. (2013, June). *Urdu Lughat: Tarixi Usul Per, 1-22, 3rd*. (D. M. Haq, D. A.-u.-L. Siddiqi, D. S. Sabzvvari, M. N. Amrohvi, & M. Arif, Compilers) Muhit e Urdu Press, Urdu Lughat Board, Karachi.
39. Waqar, A., & Waqar, S. (2002). Identification of Diphthongs in Urdu and their Acoustic Properties. (pp. 16-26). Lahore, Pakistan: Center for Language Engineering, University of Engineering and Technology, Lahore.