

**VOWEL DURATION AND L1 INFLUENCE IN PAKISTANI ENGLISH: AN
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Abstract

This study investigates vowel duration among Pakistani speakers of English, focusing on variations influenced by the first language (L1) of participants. The research draws on acoustic analysis to explore the durational properties of monophthongs in Pakistani English (PakE), with attention to how these properties vary across different L1 backgrounds. A total of 80 participants, equally divided by gender and selected from the major linguistic regions of Pakistan, were recorded reading the poem The North Wind and the Sun. The study utilised Praat software to analyse 4,800-word tokens, examining the mean duration of front and back vowels across four language groups: Balochi, Pashto, Punjabi, and Sindhi. The findings reveal significant differences in vowel duration among these groups, with Pashto speakers consistently exhibiting the most extended durations, particularly for the vowels /i:/ and /æ/. In contrast, Punjabi speakers displayed the shortest vowel durations, suggesting a phonetic reduction or simplification in their vowel production. The study's results indicate that phonetic and articulatory factors influence vowel duration in PakE and sociolinguistic and regional norms associated with each L1 group. These findings contribute to a deeper understanding of PakE phonology and underscore the importance of considering L1 influences in studying English spoken in multilingual contexts.

Keywords: Vowel Duration, Pakistani English, Acoustic Analysis, L1 Influence, Monophthongs, Phonology.

1. BACKGROUND AND INTRODUCTION

The vowel system of English and the languages of Pakistan considerably vary in terms of the number of vowels and their location in the inventory, articulatory vowel space and the form of diverse durational structures. The vowel duration formulae a vigorous relationship with stressed and unstressed syllables (Safeer et al. 2024). According to Toivonen (2015), the duration of a vowel is one of numerous diverse illustrations of vowel uniqueness. However, the several durational marks of vowels may have developed from variances in their biomechanical origins (Safeer et al., 2023). There is a physiological basis for the cross-linguistic tendency, although this tendency has only been phonologized in some languages and not others (Toivonen, 2015, p.70).

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Vowel duration is pivotal in phonetic research, particularly in studying non-native English varieties such as Pakistani English (PakE). The durational characteristics of vowels are influenced by various factors, including the phonological systems of speakers' first languages (L1s) and the articulatory settings employed during L2 acquisition. The variation in vowel duration across languages highlights the intersection between phonetic norms and sociolinguistic influences (Ladefoged & Johnson, 2014). In the context of PakE, speakers from diverse linguistic backgrounds and different languages exhibit distinct phonetic and phonological characteristics that can affect vowel production in English. Vowel duration, as an acoustic parameter, reflects these underlying differences and provides valuable insights into the influence of L1 on L2 pronunciation (Simmons & Tatham, 2016). For instance, research has shown that vowel duration can vary significantly depending on the speaker's L1 phonological system. Punjabi speakers, whose native language tends shorter vowel durations, often produce English vowels with reduced duration compared to speakers of other languages (Gowda & Wang, 2017). This phenomenon may be attributed to the phonetic characteristics of Punjabi, which influence vowel production patterns in English.

Conversely, Pashto speakers, whose L1 has a different vowel quality and duration pattern, tend to exhibit longer vowel durations in English. This can be linked to the phonetic properties of Pashto, which may lead to a transfer of L1 articulatory habits into their English vowel production (Hussain et al., 2020). Such differences underscore the impact of L1 phonetic norms on L2 vowel duration and highlight the need for detailed acoustic analyses to capture these variations accurately. The interaction between sociolinguistic factors and phonetic characteristics further complicates the study of vowel duration. For example, regional accents and dialectal variations within Pakistan contribute to the complexity of vowel duration patterns in PakE. Balochi and Sindhi speakers with unique phonological attributes display vowel durations that reflect their native linguistic influences (Ali & Sharma, 2018). Balochi speakers may exhibit vowel duration patterns influenced by their language's specific phonetic rules, while Sindhi speakers might demonstrate unique vowel duration characteristics that reflect regional phonological norms (Zafar & Iqbal, 2021). Incorporating these sociolinguistic and phonetic considerations into acoustic analyses provides a more nuanced understanding of vowel duration in PakE (Hussain et al., 2022). Such studies are crucial for elucidating how L1 influences vowel production in a multilingual context, and they contribute to a broader understanding of phonetic variation and second language acquisition (Flege, 1995). By examining the durational properties of monophthongs across different linguistic backgrounds, researchers can gain insights into the phonetic landscape of PakE and the broader implications for language teaching and pronunciation assessment.

This research uses acoustic quantities to present noticeable correspondences with articulatory characteristics of vowels. The investigation explores variations of vowel length or duration, referring to how long a specific vowel can be articulated. The vowel length governs the sounds segmented into short and long vowels.

Research Questions

This study answers the following questions;

1. How does vowel duration in Pakistani English (PakE) vary among speakers from different first language (L1) backgrounds, specifically Balochi, Pashto, Punjabi, and Sindhi?
2. To what extent do sociolinguistic and regional factors associated with each L1 influence the durational properties of monophthongs in Pakistani English?

2. LITERATURE REVIEW

World Englishes is remarkable due to the degree of language blending and the emergence of mixed or hybrid varieties. Schneider (2016) identifies a prevalent naming formula for these varieties, often combining an indigenous language component with “nglish,” reflecting a fusion of linguistic influences from diverse backgrounds. These varieties, termed ‘X-Englishes,’ e.g. Taglish, Singlish, and Hinglish, among others, highlight the diverse linguistic landscapes shaped by the interaction of English with local languages. The evolution of these varieties, notably since the post-colonial period, has reshaped the notion of ‘World Englishes,’ introducing new approaches to understanding and learning English globally.

Bolton (2006) illuminates three interpretations of the term, highlighting its role as an umbrella term encompassing variations of English worldwide, including both standard and non-standard varieties. Additionally, ‘World Englishes’ refers to the localised varieties of English emerging in regions such as Africa and Asia, reflecting unique linguistic norms and cultural contexts. The ‘World Englishes’ concept acknowledges English’s Indigenous characteristics, incorporating local flavours and linguistic features. Whether already standardised or in the standardisation process, they constitute an integral part of the global sociolinguistic variety (Baumgardner, 1993).

Jenkins (2009) considers world English a legitimate variety with its use norms distinct from standard British and American English. Each variety exhibits distinguishing characteristics shaped by societal, cultural, and linguistic influences, resulting in a rich tapestry of linguistic diversity. The impact of native languages on emerging English varieties is evident, with phonological features often reflecting distinct phonemic inventories and realisations influenced by local linguistic contexts (Mesthrie, 2006). Crystal (2003) notes the extensive use of English by non-native speakers worldwide, underscoring the language’s global reach and adaptability to diverse linguistic environments. Wee (2002) and Quirk (1972) highlight the dynamic nature of English as it adapts to the needs of different speaker groups, resulting in the proliferation of diverse English varieties across the globe.

Phoneticians and experts in acoustic studies, exemplified by Fry (1958), meticulously analyse the features of speech sounds, considering speech as a tangible entity comprising essential acoustic components: pitch, intensity, and duration. These acoustic elements function intricately, both independently and interdependently, shaping the overall auditory experience. Koffi (2020) explains that when humans perceive speech sounds, they cannot selectively isolate one acoustic feature while ignoring others. Instead, the mammalian ear simultaneously processes pitch, intensity, and duration, highlighting the intricate relationship between these physical properties in auditory perception. Thus, speech operates uniquely, embodying a simultaneous independence and interdependence of its acoustic characteristics. Johnson (2019) delves deeper into the complex interactions between these acoustic features, revealing that pitch, intensity, and duration variations are often interlinked and contribute to the overall perception of speech sounds.

Additionally, Smith et al. (2020) demonstrated that alterations in one acoustic feature can affect the perception of others, suggesting a highly integrated system in speech perception. Furthermore, the interdependence of these acoustic features has practical implications in fields such as speech pathology and language acquisition. For instance, research by Lee and Park (2018) suggests that individuals with speech disorders may exhibit abnormalities in one or more acoustic features, leading to speech production and intelligibility difficulties. Chen et al. (2021) highlighted the role of pitch, intensity, and duration in infant language development,

emphasising the importance of early exposure to varied acoustic stimuli for language acquisition. Thus, the intricate interplay between pitch, intensity, and duration highlights the complex dynamics of speech sound features. As evidenced by ongoing research in various fields, understanding these interactions is crucial for advancing our knowledge of speech perception and production. It has practical implications for speech-related disorders and language development.

THEORETICAL FRAMEWORK

A theoretical framework encompasses concepts, their definitions, and existing theories/theories that make up the foundation stone for a particular study. It consists of concepts, definition of the concepts and theories/theories on the foundation stone that underpin a given study, known as theoretical framework. It is theoretically proven that logically, the theory has an understanding of the theories and concepts that are related to the study (Sekaran 2000). It follows that the theoretical framework leads to “every decision made in the research process” (Mertens 1998, p.3). The frameworks in this case support the researcher to see with the help of which the knowledge he wants to inspect. The second part of this research is greatly done in the second/foreign language learning theories by explaining how there is variation in the way a foreign language learner produces vowel sounds. For this research, some literature has been looked through backdrops of three models. 1. Kachru’s Concentric Model World Englishes, 2. Schneider’s Dynamic Model of Post colonial Englishes were used to study South Asian varieties of English to obtain ontological insights from 3. In order to study the acoustic features of the monophthongs of PakE, we made use of acoustic feature known as FFM. Because ‘vowels are characterised by the formants in the same way as they are in the model’, the model is by far the most operative to investigate vowel differences (Farid, 2021, pp. 34; Lindblom, 1979). With these vowels this model is used to address the relationship of the vowels. As Ladefoged and Johnson (2010) points out, the variation of vowels can be described in term of three parameters of vowel quality (the tongue height, tongue advancement or retraction and lip rounding). This research project would also make use of the model of the dynamic models of varieties of English post coloniale by Schneider (2007) as the Britishers colonised territories as well and accounted for the use of those varieties of English.

It concentrates on ‘a circularly arranged developmental process in the context of a typical formation and relocation of English in these places’ (p.5). These models provide an opportunity to study the development of a South Asian variety of Englishes such as PakE, which would be part of the outer circle and can be investigated by making and having unique vowel variations.

3. METHODS

This study explores variations in vowel intensity among Pakistani English (PakE) speakers (male & female) from diverse backgrounds. The research questions guide the selecting of participants, materials, procedures, and data analysis methods. A cross-sectional design is adopted to simultaneously assess multiple variables within a specific timeframe, providing insights into the vowel intensity variations in PakE.

Eighty participants, comprising male and female students enrolled in the BS English and ELT programs at the Departments of English (UGS), the ELT (NUML), and the Department of English at the IIUI in Islamabad, were engaged. Purposive sampling ensured representation from each province of Pakistan. Stimuli consisted of a poem, ‘The North Wind and the Sun’ (NWS), comprising 12 monophthongs, which were the basis for assessing vowel duration variations. According to the *Journal of the International Phonetic Association* (2021), the text of NWS has been used since 1975 in different acoustic analyses. Key dependent and

independent variables included vowel duration and L1, respectively. Vowel duration is operationalised as the length and time of a speech sound in milliseconds (ms).

Participants provided written informed consent and read the NWS aloud naturally, ensuring consistent articulation. Speech samples were recorded using AA-3.0 or ‘Adobe Audition 3.0 & SSF-11PRO or Sony Sound Forge 11-pro’ and were transformed into MP-3 files over Online-Audio-Converter. The analysis involved scrutinising 4,800-word tokens through Praat software version PRAAT-6.1 to measure vowel intensity. Drawing on “Kachru’s (1985) Concentric Model of World English” and “Schneider’s (2007) Dynamic Model of Post-colonial Englishes”, the study contextualises South Asian Varieties of English. Insights from Lindblom’s (1979) Formant Frequency Model (FFM) were incorporated to explore the acoustic properties of Pake monophthongs. Data analysis aimed to address the research questions and objectives outlined in the study.

Ethical approval and informed consent were obtained from the relevant institutional ethics committee before commencing data collection. Participants were assured of confidentiality, and their identities remained anonymised in all research outputs. Furthermore, participants were allowed to withdraw from the study at any point without facing any consequences. Data confidentiality and security measures were implemented to protect participants’ privacy. Additionally, all data collected were used solely for research purposes and were securely stored in compliance with data protection regulations.

4. DATA ANALYSIS, FINDINGS AND DISCUSSIONS

L1 & Comparison of Mean Duration

Descriptive statistics to define and demonstrate and summarise the necessary characteristics described in this study are provided in the present study. The descriptive statistics describe the measurements of the data sample.

Front Vowels

Table 1: Front-Vowels: Descriptive Statistics & Mean Duration

| Front Vowels | | | | |
|--------------|------|------|------|------|
| | I | i: | æ | e |
| Balochi | 0.40 | 0.55 | 0.27 | 0.38 |
| Pashto | 0.74 | 1.06 | 0.46 | 0.80 |
| Punjabi | 0.37 | 0.54 | 0.24 | 0.36 |
| Sindhi | 0.39 | 0.58 | 0.25 | 0.45 |

The values in the table above represent average (mean) durations for each of the four languages and four vowels sounds. These durational values offer details as to how long the specified front vowels were vocalised in each of the language groups. These results suggest that Sindhi and Balochi speak with slightly longer durations for some vowels, while that for all vowels in a SVO sentence is very long in Pashto speakers. Thus, they reflect differences in pronunciation pattern, linguistic characteristics and phonological specific features of the language.

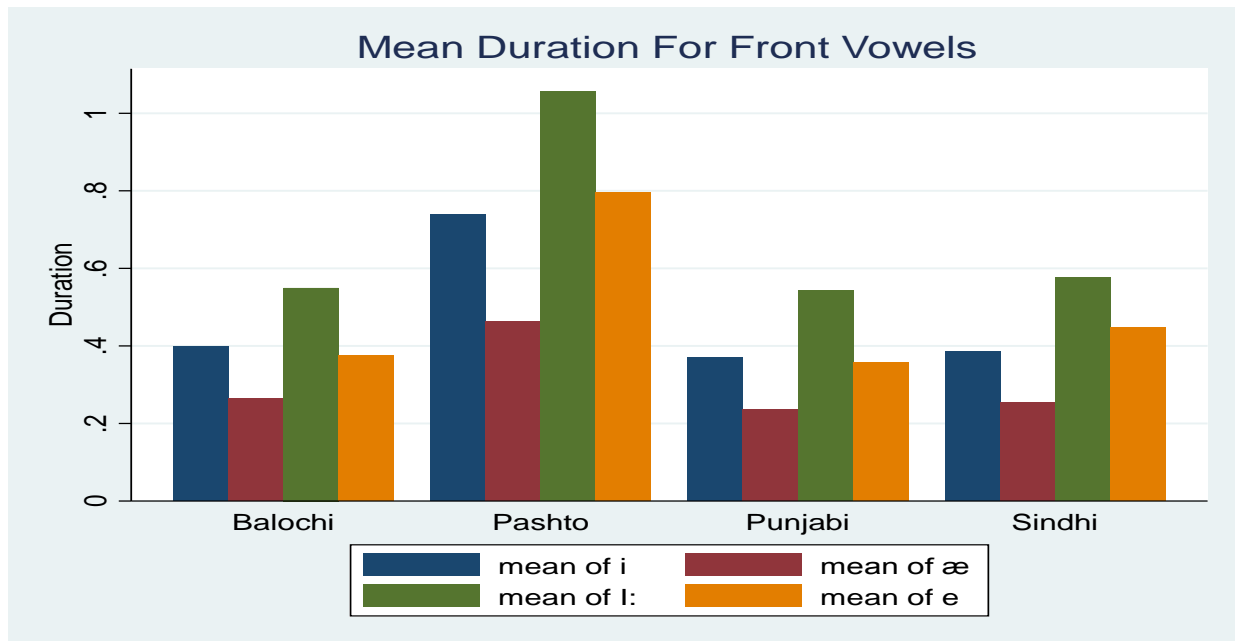


Figure 1: Bar-Graph for Front Vowels

The mean duration of all graphed subjects is above, and the mean values of Pashto students is the highest and Punjabi is the lowest. In the same manner, Sindhi speakers experience highest duration for /i/, while Pashto speakers possess the second highest duration. With Balochi displaying high mean duration and Pashto being still prominent for vowel /æ/, it was for these two languages where variability was observed. Also, the /e/ front vowel is pronounced with more duration, and higher (in comparison to all other groups).

Linguistic Analysis of Mean Durations of Front-Vowels

Descriptive statistic about the mean duration of front vowels for Balochi, Pashto, Punjabi and Sindhi language groups is given in Table 1. To explain these findings, they are linguistically analysed in the study to determine possible phonetic and sociolinguistic causes. In other words, vowel duration can be affected by articulatory factors, which are tongue position and mouth shape of the vowel production (Ladefoged, 2001). Some longer durations for particular vowels such as /i:/ in Pashto represent some evidence for possible differences in tongue tension and vowel quality. Much like there are sociolinguistic norms and regional dialectal and cultural identity associated patterns of variance in mean duration so too do there exist variances in mean duration that reflect sociolinguistic norms and regional dialectal and cultural identity associated patterns of variance in mean duration (Eckert, 1989).

Vowel duration may also be subject to sociocultural factors such as language contact and bilingualism (Labov 2006). The largest mean duration of the vowel /i:/ vowel suggests phonetic differences and precision of the Pashto phonology for Pashto speakers especially for the segments that demonstrate the highest durational variation. Durations for /i:/ are shorter for Balochi and Sindhi speakers than for Pashto, which may suggest differences in articulation and tongue placement, as well (Ladefoged, 2001). However, mean duration of the /æ/ vowel for the Pashto speakers is longer than that of other language groups, which may be attributable to differences in vowel quality and articulatory settings (Ladefoged, 2001; Eckert, 1989). Mean

duration for /æ/ is the shortest for Punjabi speakers, which may indicate phonetic simplification of or reduction in vowel length. Pashto speakers have the longest mean duration for /e/ vowel, which suggests vowel quality and articulatory precision might be different in some instances of Pashto phonology (Fujimura & Ladefoged, 1985; Ladefoged, 2001). If Balochi speakers do distinguish longer and shorter /e/, then they show briefer durations than Pashto, and this may indicate changes in vowel articulation and mouth shape. Mean duration of front vowels under linguistic analysis reveals possible phonetic and sociolinguistic factors that affect vowel production. The phonetic variation as well as specific phonological features inside a multi lingual context are highlighted.

Back-Vowels

Table 2: Back-Vowels: Descriptive Statistics & Mean Duration

| Back-Vowels | | | | | |
|--------------------|----------|----------|-----------|-----------|-----------|
| | ʊ | ɒ | o: | a: | ɔ: |
| Balochi | 0.27 | 0.34 | 0.32 | 0.34 | 0.49 |
| Pashto | 0.53 | 0.64 | 0.68 | 0.76 | 0.93 |
| Punjabi | 0.25 | 0.31 | 0.34 | 0.35 | 0.49 |
| Sindhi | 0.27 | 0.35 | 0.31 | 0.36 | 0.53 |

Mean duration values of back vowels for four language groups are offered in table 2 to examine the average duration of back vowels within the specified language groups. The high durations shown by Pashto consistently in all years are consistent with results. Thus, Sindhi speakers on average consumed longer durations for some vowels and presented different pronunciation forms and linguistic features in various ways from the unique features of language-specific phonological structures as well as phonetic differences.

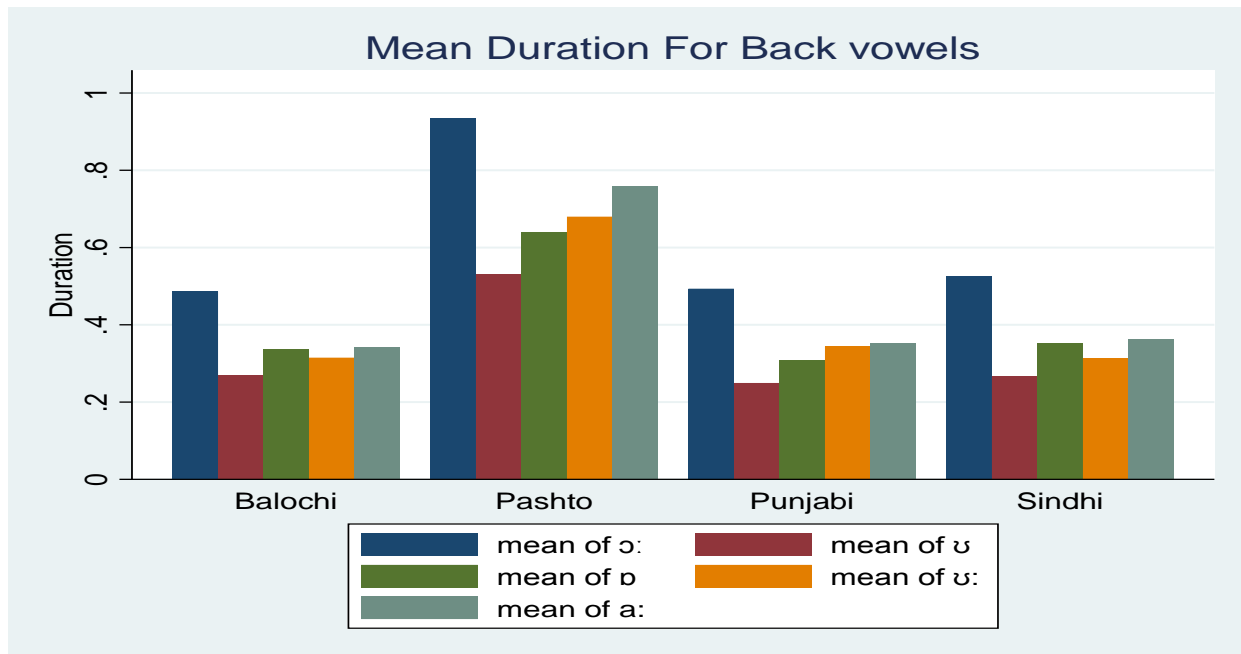


Figure 2: Bar-Graph for Back Vowels

Bar graph 2 shows mean duration of back vowels and the highest articulation value for Pashto and the lowest for Sindhi speakers in the case of the /u, u:/ sounds. English speakers had shorter aspiration durations and more resonance on /u:/ than speakers of both Pashto and Punjabi. On the whole, Pashto is being written for all, while Punjabi and Sindhi speakers spend a lot of time talking about most of the sounds.

Linguistic Analysis of Mean Duration of Back Vowels

It is possible to attribute variation of mean duration of back vowels to articulatory factors like tongue position, lip rounding and the vowel quality (Ladefoged, 2001). Some evidence on differences in articulatory precision and vowel resonance are suggested by longer duration of certain vowels such as /ɔ:/ in Pashto. Mean duration alterations across language groups could for example signal sociolinguistic factors like contact with other languages, bilingualism and the sociocultural impact on speech patterns (Labov, 2006). Vowel duration may be influenced by sociocultural norms and linguistic identities related to regional dialects, and variations on the vowel may be due to belonging to a speaker in one regional dialect or another. Mean duration for /ɔ:/ shows shorter duration in Balochi speakers than in Pashto and Punjabi which might indicate probable difference in lip rounding and vowel quality (Ladefoged, 2001). Pashto speakers have the longest mean duration for the /u/, /u:/, /a:/ and /ɔ:/ vowels, which is possibly because they are differentiated by quantity, quality, resonance, lip rounding and accuracy in articulation, within Pashto phonology (Fujimura & Ladefoged, 1985). Pashto speakers display the highest mean duration for the /ɒ/ vowel, which could indicate different tongue sets as well as articulatory settings in the different language groups (Ladefoged, 2001). There exists potential phonetic simplification or reduction in vowel length as observed in the shortest mean duration in Punjabi speakers for /ʊ/. With Sindhi speakers, mean duration for /ɒ/ is longer relative to Balochi and Punjabi suggesting variability in vowel articulation and /a:/ in longer mean duration than in Punjabi possibly reflecting variability in tongue locating and vowel quality (Ladefoged, 2001). Both the Balochi and Punjabi speakers show shorter mean duration for /ɔ:/ preceding had in

comparison with Pashto and Sindhi, which reflects the possible variation in articulatory precision and the quality of a vowel (Ladefoged, 2001). Mean duration of back vowels is a good candidate for linguistic analysis that might uncover partial visions into phonetic and sociolinguistic factors in determining vowel production in different language groups. Finally, these findings reveal a multilingual context and the variability of all three articulation and language-specific phonological features.

Central-Vowels

Table 3: Central-Vowels: Descriptive Statistics & Mean Duration
Central-Vowels

| | ə | ʌ | ɜ: |
|---------|------|------|------|
| Balochi | 0.19 | 0.43 | 0.31 |
| Pashto | 0.39 | 0.82 | 0.52 |
| Punjabi | 0.17 | 0.43 | 0.24 |
| Sindhi | 0.23 | 0.43 | 0.29 |

Mean duration values of the central vowels produced by speakers of Balochi, Pashto, Punjabi and Sindhi are presented in Table 3. Some of the results showed that Pashto, Balochi and Sindhi were the most prominent in vowel articulation. Mean duration variance among languages is due to distinctive articulatory forms, distinctive phonetic forms, and distinctive phonological structures of languages.

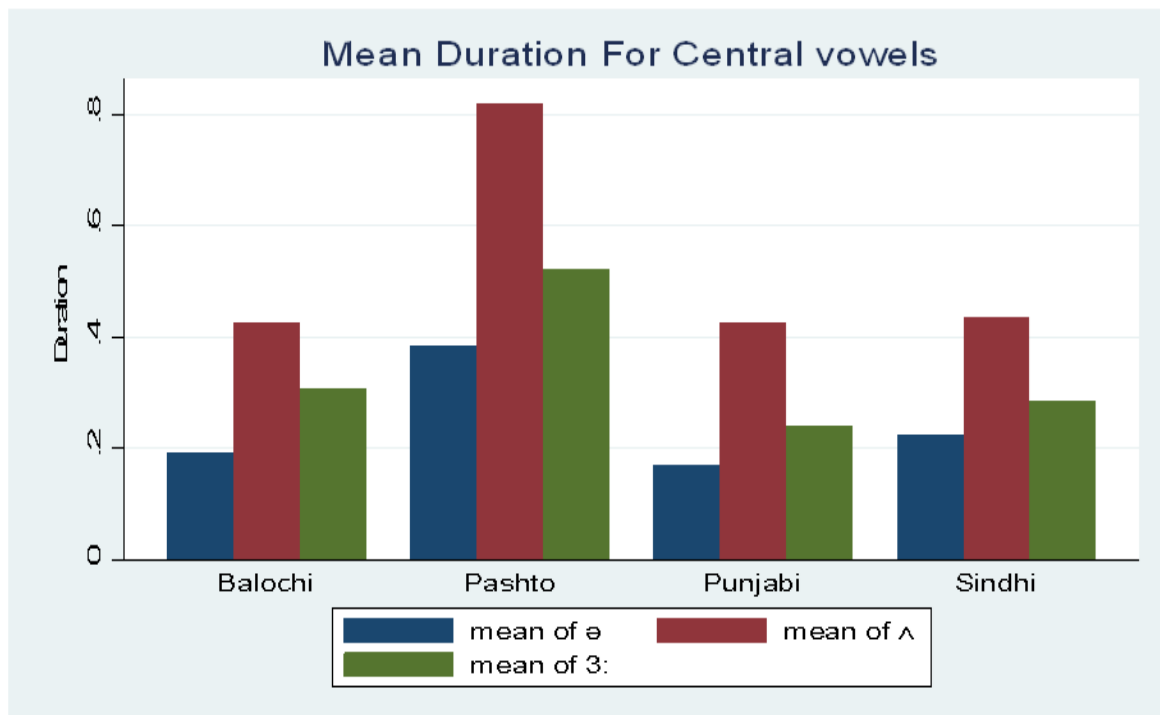


Figure 3: Bar-Graph of Central Vowels

Bar graph 3 shows the mean duration of the central vowels in the different language groups and the mean duration in Pashto reveals a longer time the size of the vowel in Pashto, all of which are larger than that of any of the other language groups. As in the case of Sindhi speakers of English, Balochi and Punjabi speakers also have higher durational values. It was found that the reading of Balochi, Punjabi and Sindhi speakers showed the same durational values for the vowel /ʌ/. Balochi and Sindhi speakers differ with higher duration by the Pashto speakers, with narrower difference in the mean values of the duration of /ɜ:/ sound.

Linguistic Analysis of Mean Duration of Central Vowels

It is known that the articulatory factors such as the position of the tongue, jaw opening, and vowel quality have an effect on variation of the mean duration in the central vowels (Ladefoged, 2001). Given this, variations in articulatory precision and resonance might be encouraged for the vowels involved for cases of certain durations like the lengthier durations of certain vowels (e.g. /ʌ/ in Pashto). Mean duration alterations across language groups are explained by sociolinguistic factors of language contacts, dialectal variants, and cultural pressure on speech patterns (Labov, 2006). The present research shows that the speakers' loyalty to sociocultural norms as well as to linguistic identities related to regional dialects influence the speakers' tendency to phonetically vary in vowel duration. Results of the Pashto speakers show extended mean duration for the schwa vowel, which may suggest that there are vowel quality and perhaps even articulatory incorrectness differences among Pashto phonemes. Additionally, the mean duration for the /ʌ/ vowel is probably the result of differences in tongue position and articulatory settings from other groups of language (Ladefoged, 2001). The /ɜ:/ vowel has longest mean duration among Pashto phonological features and they exhibited the most prolonged mean duration for the /ɜ:/ vowel, thus indicating the differences in vowel resonance within the Pashto phonology (Fujimura & Ladefoged, 1985). Mean duration of Punjabi speakers for /ə/ and /ɜ:/ is the shortest and this indicates a possible phonetic simplification or reduction in vowel length (Eckert, 1989). The mean duration of /ʌ/ and /ɜ:/ in Balochi, Punjabi and Sindhi speakers are all similar, suggesting possibly shared phonetic features or articulatory patterns within these groups of languages. Mean duration of central vowels are linguistically analysed in order to glean phonetic and sociolinguistic factors affecting vowel production across a language group. The findings here are pertinent to cognition of phonetic variation and phonological feature effects in a multilingual setting.

Using PRAAT spectrograms and resulting statistical analysis represented in bar graphs and tables, the investigation on vowel duration has offered priceless insights on the phonetic nature of English vowels produced by Pakistani speakers. This study sought to expose the unique lengths of vowels in words and if there was any discernible difference between long and short vowel sounds through the careful investigation of vowel duration. The results showed that there is a discernible pattern in which female participants presented longer durations on specified vowels, specifically /i/, /i:/, /e/, /ʊ/, /ɒ/. Their male counterparts in turn had higher values for durational values of /æ/, /ʊ:/, /e/, /ə/, and /ʌ/. As can be deduced from Ahmed (2005) and Abbasi and Hussain (2015) who did similar type of study among the Malaysian and the English speakers respectively, these detected distinctions not only confirm but go beyond previous research findings.

Neel (2008, p.12) also highlighted the large disparities between articulation of the vowels by adult and young speakers, making the demographic impact apparent in shaping phonetic patterns. Furthermore, the analysis of vowel duration variations of speakers based on their first language

background and sex offered by the present study provides an insight into how linguistic and sociolinguistic factors combine to affect speech production acoustically. The theoretical phonetics gains from this nuanced perspective on phonetic variation, and so does practical language teaching methodology. This research helps to provide strong foundation on the influence of linguistic variables and vowel duration on the cross-linguistic phonetic variation in English as a second language context for investigations within a larger population of speakers.

Females (Language-based)

It provides interesting insights into the discrimination of vowel articulations, i.e., front, back and central vowels in female speakers from different languages. Front vowels such as /i/ and /e/ were articulatorily more similar across languages, but more different in articulation (much more different than the back vowels /u/ and /o/, although with still less differences than /a/ and /ə/). For instance, the longer and higher formant frequencies of Balochi speakers, as compared to speakers of other languages, or the shorter and lower frequencies of Sindhi speakers, compared to speakers of other languages were therefore observed. Also, front vowels measured in longer variants (/i:/) displayed shorter duration and lower formant frequencies in Punjabi speakers than the Balochi speakers. Similarly, back vowel formant values and duration for /u/ and /ɔ:/ differed according to language background. For instance, the formant frequency and duration of the /u/ was significantly shorter for the Balochi speakers than the /u/ for the Balochi speakers (for the lengthening vowel), and significantly lower in the case of the Punjabi speakers than the Balochi speakers (for Punjabi speakers) for the vowel /ɔ:/ as well. Furthermore, Sindhi speakers had shorter durations and lower formant frequencies for /ɒ/, compared to Balochi speakers. In particular, they analysed central vowels such as /ə/ and /ʌ/ which showed language related differences in articulation, where Punjabi speakers tended to have shorter durations and lower formant frequencies than they are found for other languages. The second study compared Sindhi with Punjabi pronunciation of the central vowel /ɜ:/, and noted smaller durations, and lower formant frequencies for the Sindhi speakers. Finally, the observed differences are related to language background, which is the main determinant of them. Findings show that female speakers' language specific pronunciation patterns are responsible for articulate vowels significantly, and each linguistic group has their own articulatory pattern based on their speakers' language background.

Males (Language-based)

Analysis of male speakers' pronunciation patterns as compared in various vowel categories uses a language based comparative analysis and demonstrates that the identified differences are dictated by the speakers' linguistic backgrounds. Vowel durations and formant values are compared among male speakers of different language because vowels such as /i/, /i:/, /e/, /æ/ show variation in duration and formant values. The differences can be attributed to the phonetic and phonological values of vowel production specific to the language. The findings support theoretical models of this study which adopt dependence of pronunciation patterns in language on diversity of language and historical trajectories. Variations in front vowels articulation among the group of male speakers that together with other phonetic variation cause the richness and diversity of speech sound is indicated by it. Analysis of back vowels /u/, /u:/, /ɔ:/, /ɒ/, /a:/ shows differences between male speakers of different linguistic background in duration and in formant values. It is attributed to the cause of variation in these features, the idiomatic phonetic characteristic and a rule that governs vowel production in speakers of diversity as well as historical trajectory in Balochi, Punjabi, Sindhi, and Pashto vowel articulation pattern in the male speakers. Using male speakers from different language backgrounds, central vowels /ə/, /ʌ/, /ɜ:/

are analysed according with their pronunciation patterns. The diversity of the speech sounds is due to the duration and formant values that show language specific phonetic features and phonological rules of vowel production. Results indicate that language affects the patterns of pronunciation of central vowels in the case of male speakers, as well as the different ways in which types of speech production are organised in different languages. The language based comparative analysis generally helps to understand how linguistic background affects vowel articulation patterns among male speakers. They show the diversity of sounds of speech produced by variation in duration and formant values that reflect the phonetic and phonological properties of different languages and dialects.

5. CONCLUSION AND RECOMMENDATIONS

This study has provided a comprehensive examination of vowel duration in Pakistani English (PakE) across speakers from diverse first language (L1) backgrounds specifically Balochi, Pashto, Punjabi, and Sindhi. Through the acoustic analysis of monophthongs, the study has illuminated significant variations in vowel duration, shedding light on how L1 influences L2 pronunciation and highlighting the role of regional and sociolinguistic factors in shaping phonetic patterns in PakE. The findings highlighted the variability in vowel duration across different L1 groups. Pashto speakers were found to exhibit the longest vowel durations, particularly for vowels like /i:/ and /æ/, likely due to the unique articulatory features of Pashto that extend into English pronunciation. In contrast, Punjabi speakers demonstrated the shortest vowel durations, reflecting the phonetic characteristics of their native language, where vowels tend to be shorter. This reduction in vowel length is consistent with previous studies on Punjabi speakers' vowel production in English. Balochi and Sindhi speakers exhibited intermediate vowel durations, with Balochi speakers generally producing longer vowels compared to Sindhi speakers, who showed shorter vowel durations and distinct formant frequencies. These differences suggest that each L1 background imposes specific phonetic constraints on the vowel duration patterns of PakE speakers. In addition to the L1 influence, gender-based differences in vowel duration were also observed. Female speakers generally produced longer vowel durations for certain vowels, such as /i/, /i:/, /e/, /o/, and /ɒ/, whereas male speakers exhibited higher durational values for vowels like /æ/, /ʊ:/, /e/, /ə/, and /ʌ/. These findings reinforce previous research that highlights the intersection of gender and linguistic factors in shaping vowel production. The gendered differences in vowel duration may be attributed to social and cultural influences on speech, as well as potential physiological factors related to voice pitch and resonance.

One of the most significant contributions of this study is the detailed acoustic analysis of vowel production within a multilingual context. By analyzing vowel duration across a wide range of speakers from different linguistic regions of Pakistan, the study provides a nuanced understanding of how sociolinguistic and phonetic factors interact in the production of PakE. This understanding is essential not only for theoretical phonetics but also for practical applications in language teaching and pronunciation assessment. The variability in vowel duration across L1 groups highlights the importance of considering L1 influences in English pronunciation instruction, especially in multilingual contexts where L2 learners may bring different phonetic and phonological habits to their English speech. Furthermore, the study underscores the need for more targeted investigations into the influence of L1s on the phonetic characteristics of PakE. The diverse vowel production patterns observed in this research suggest that regional and linguistic backgrounds play a significant role in shaping pronunciation norms.

Future research could expand on these findings by incorporating more L1 groups, exploring additional phonetic features such as vowel quality, and examining the role of socio-economic factors in language variation.

The study also aligns with broader theoretical frameworks, such as Kachru's Concentric Model of World Englishes and Schneider's Dynamic Model of Postcolonial Englishes, which emphasize the ongoing evolution and diversity of English varieties in postcolonial contexts. The findings further contribute to our understanding of the phonetic diversity of PakE and underscore the significance of regional and L1-based phonological influences in the global spread of English. This research contributes valuable insights into the phonetic variation of PakE, offering a deeper understanding of vowel duration patterns and the influence of L1s on L2 speech. The study's findings highlight the intricate relationship between language, gender, and sociolinguistic factors in shaping vowel articulation. By advancing our knowledge of how L1 influences L2 vowel production, this research paves the way for more informed approaches to English language teaching, pronunciation assessment, and the study of phonetic variation in multilingual contexts. Future research could expand on this study by exploring additional phonetic features, such as vowel quality and intonation patterns, across a wider range of L1 groups in Pakistan and beyond. It would also be beneficial to investigate the role of age, education, and socio-economic status in shaping vowel duration and other phonetic characteristics in PakE. Longitudinal studies could provide deeper insights into how vowel duration patterns evolve over time with increasing exposure to English and formal education. Additionally, examining the impact of regional dialects and the influence of urban vs. rural speech communities could further enrich our understanding of sociolinguistic factors affecting pronunciation in multilingual contexts.

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