



Exploring Rhotacism in English Spoken by Urdu Speakers in Pakistan

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Abstract

This study examines the Rhotacism of the /r/ sound among native Urdu speakers learning English, focusing on minimal pairs and medial contexts. The aim is to understand phonological transfer and improve language teaching and therapy techniques. The study analyzed formant frequencies and durations of /r/ sounds produced by early learners (exposed to English before age 10) and late learners (exposed after age 10) using a purposive sample of 20 participants. Grounded in the Critical Period Hypothesis and the Speech Learning Model (SLM), which together suggest that early language exposure leads to more native-like pronunciation and that L1 phonetic characteristics influence L2 acquisition. The findings reveal that early learners exhibit clearer formant frequencies and shorter durations, effectively distinguishing the /r/ sound from others. In contrast, late learners demonstrate overlapping frequencies and longer durations, influenced by the retroflex /r/ in Urdu. The discussion underscores the impact of L1 phonology on L2 pronunciation and the necessity for targeted pronunciation exercises and speech therapy interventions. The study concludes that early exposure to English significantly enhances phonological proficiency. However, limitations such as the small sample size and the focus on specific phonetic contexts suggest the need for further research with larger samples and diverse contexts to validate these findings and explore additional phonological features influencing L2 acquisition.

Keywords: Rhotacism, Urdu Speakers, English Pronunciation, Minimal Pairs, Medial Contexts, Critical Period Hypothesis, Speech Learning Model, Phonological Transfer

1. Introduction

Rhotacism, defined as the difficulty or inability to pronounce the /r/ sound correctly, is a notable phonological phenomenon with significant implications for language acquisition and speech patterns (Cruttenden, 2014). This research focuses on exploring the patterns of rhotacism in the English spoken by native Urdu speakers in Pakistan. Given the global importance of English and its status as a critical language in Pakistan for education, business, and international communication, understanding these phonological challenges is crucial. This investigation not only seeks to document these patterns but also aims to contribute to the development of more effective language teaching strategies and speech therapy interventions.

Pakistan is a linguistically diverse country with Urdu as its national language and English serving as an official language. Urdu, an Indo-Aryan language, is spoken by approximately 70 million people as a first language and is understood by the majority of the population (Rahman, 2002). It is characterized by its rich phonetic inventory, which includes retroflex and dental consonants that are not present in English. English, on the other hand, holds a prestigious status and is widely used in government, legal, and educational sectors (Baumgardner, 1993). The bilingual nature of many Pakistanis, with Urdu as their L1 and English as their L2, provides a unique context for studying phonological phenomena such as rhotacism.

The phonetic inventory of Urdu includes a retroflex /r/, which differs from the alveolar /r/ commonly found in many varieties of English (Mahboob&Ahmar, 2008). This difference can pose significant challenges for Urdu speakers when learning English, as the production of the /r/ sound involves distinct articulatory movements. The retroflex /r/ in Urdu is produced by curling the tongue back in the mouth, whereas the English alveolar /r/ requires the tongue to be placed close to the alveolar ridge without such retroflexion. Studies on second language acquisition have consistently shown that the phonological characteristics of a speaker's L1 influence their pronunciation in L2 (Flege, 1995). Thus, the articulatory habits formed by speaking Urdu are likely to affect how native Urdu speakers produce English sounds, including the /r/ sound.

Understanding rhotacism among Urdu speakers learning English is important for several reasons. First, it contributes to the broader field of phonetics and phonology by providing insights into how specific phonological features are transferred from L1 to L2 (Best & Tyler, 2007). Such knowledge is crucial for developing theoretical models of phonological acquisition and cross-linguistic influence. Second, it has practical implications for English language teaching in Pakistan. Pronunciation is a critical component of language proficiency, and identifying common phonological challenges can inform more effective teaching strategies and materials (Derwing& Munro, 2005). Educators can use these insights to design targeted pronunciation exercises that address specific difficulties faced by Urdu speakers. Third, the findings can aid speech therapists in developing targeted interventions for individuals struggling with rhotacism, improving their communication skills and overall confidence in using English (Shah & Pathan, 2016). By providing tailored therapy, speech therapists can help individuals overcome specific phonetic challenges, thereby enhancing their social and professional interactions.

While there is extensive research on general phonological transfer from L1 to L2, specific studies on rhotacism in Pakistani English are limited. However, related studies have highlighted various phonetic challenges faced by Urdu

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speakers when learning English, such as difficulties with vowel quality and consonant clusters (Mahboob, 2004; Rahman, 1990). These studies suggest that phonological interference from Urdu significantly impacts English pronunciation, underscoring the need for focused research on rhotacism. For instance, Mahboob (2004) discusses how the absence of certain English phonemes in Urdu leads to substitution errors, while Rahman (1990) explores the broader sociolinguistic context of English use in Pakistan. Both studies emphasize the influence of Urdu phonology on English pronunciation, yet neither specifically addresses rhotacism. This gap in the literature highlights the need for the present study, which aims to provide a detailed analysis of how rhotacism manifests in the English spoken by Urdu speakers.

1.1. Significance of Study

Understanding rhotacism among Urdu speakers learning English has significant theoretical and practical implications. Theoretically, it enriches the field of phonetics and phonology by shedding light on the transfer of specific phonological features from L1 to L2, informing models of phonological acquisition and cross-linguistic influence. Practically, the study's findings enhance English language teaching strategies in Pakistan, aiding educators in designing targeted pronunciation exercises. Additionally, the study supports speech therapists in developing effective interventions for individuals with rhotacism, thereby improving their communication skills and confidence in using English, which is crucial for their social and professional interactions.

1.2. Objectives of the Study

- i. To analyze the pronunciation of the /r/ sound in minimal pairs and medial contexts in English by the native Urdu speakers learning English.
- ii. To identify specific phonetic challenges faced by Urdu speakers in producing the English /r/ sound.
- iii. To investigate the impact of age of acquisition on the pronunciation of the /r/ sound, examining whether younger learners exhibit fewer instances of mispronunciation compared to older learners.

1.3. Research Questions

- i. How do native Urdu speakers pronounce the /r/ sound in minimal pairs and medial contexts in English?
- ii. What specific phonetic challenges do native Urdu speakers face while producing the English /r/ sound?
- iii. How does the age at which Urdu speakers are first exposed to English affect their pronunciation of the /r/ sound?

2. Literature Review

Rhotacism, the difficulty or inability to correctly pronounce the /r/ sound, is a significant area of study within phonetics and second language acquisition (SLA). This speech impairment, common among both children and adults, can affect intelligibility and communicative competence in a second language (L2). For native Urdu speakers learning English, the articulatory differences between the two languages often lead to specific challenges in pronouncing the /r/ sound correctly (Flege, 1995).

Urdu, the national language of Pakistan, includes a retroflex /r/ sound, produced by curling the tongue back towards the palate, unlike the alveolar /r/ in English which involves a different articulatory mechanism (Mahboob & Ahmar, 2008). This difference can create a substantial barrier for Urdu speakers when acquiring English phonology, leading to rhotacism where the retroflex /r/ from Urdu is substituted for the English alveolar /r/. Such phonological transfer has been well-documented in SLA research, highlighting how L1 phonetic features influence L2 pronunciation (Best & Tyler, 2007).

Age of acquisition is a crucial factor in mastering L2 phonology. The Critical Period Hypothesis posits that younger learners are more likely to achieve native-like pronunciation compared to older learners (Lenneberg, 1967). For Urdu speakers, those exposed to English at an early age demonstrate fewer instances of rhotacism and better overall pronunciation (Rahman, 2002). Additionally, consistent and prolonged exposure to English, particularly in immersive environments, can mitigate phonological transfer issues, including rhotacism (Munro & Derwing, 1995).

In Pakistan, proficiency in English is not merely a linguistic skill but a marker of socio-economic status and educational attainment (Baumgardner, 1993). Mahboob (2004) notes that this societal pressure intensifies the importance of mastering English pronunciation, including the correct articulation of the /r/ sound, thereby influencing educational and professional opportunities.

Recent research continues to explore the intersection of L1 phonology and L2 acquisition, with a particular focus on non-native English speakers. A study by Khan and Rasheed (2020) investigated phonetic challenges faced by Pakistani learners of English, identifying rhotacism as a prevalent issue among Urdu speakers. Their findings suggest that targeted pronunciation training can significantly reduce rhotacism. Similarly, Ashraf and Qureshi (2019) examined the effectiveness of phonetic training programs in Pakistani schools, concluding that explicit instruction in articulatory phonetics helps students overcome pronunciation difficulties, including rhotacism.

Effective instructional strategies play a crucial role in addressing rhotacism among Urdu speakers. Derwing and Munro (2005) emphasize the importance of explicit phonetic instruction, including phonetic drills and auditory discrimination exercises, to improve learners' ability to distinguish and produce the English /r/ sound accurately. Additionally, computer-assisted pronunciation training (CAPT) systems offer innovative solutions by providing real-time feedback and targeted practice opportunities (Neri et al., 2008; Ali & Mahmood, 2021).

For persistent cases of rhotacism, speech therapy interventions have proven effective. Shah and Pathan (2016) discuss various techniques such as biofeedback and articulatory training that aid in correcting mispronunciations of the /r/ sound among Urdu speakers. Khan et al. (2019) advocate for specialized speech therapy programs tailored to address specific phonetic challenges encountered by Urdu-speaking learners.

Despite extensive research on phonological transfer from L1 to L2, specific studies on rhotacism in Pakistani English are limited. The existing literature addresses broader phonetic challenges faced by Urdu speakers but does not specifically explore rhotacism. This study aims to fill this gap by analyzing the production of the /r/ sound in different phonetic contexts by native Urdu speakers learning English, thereby providing a detailed understanding of this phonological phenomenon and its implications for language learning.

2.1. Theoretical Framework

This study investigates rhotacism among Urdu speakers acquiring English in Pakistan, utilizing the Speech Learning Model (SLM) and the Critical Period Hypothesis as primary theoretical frameworks. The SLM provides a foundational understanding of how phonetic features from Urdu influence the acquisition of English phonology, specifically the challenging /r/ sound. Given the articulatory differences between Urdu’s retroflex /r/ and English’s alveolar /r/, Urdu speakers often encounter difficulties in achieving native-like pronunciation. Through acoustic analysis using Praat software, this research aims to examine phonetic transfer effects, analyzing variations in /r/ pronunciation in English minimal pairs and in medial contexts. Furthermore, the Critical Period Hypothesis offers insights into age-related factors influencing phonological development. By investigating whether age of exposure to English affects the occurrence of rhotacism, this study explores whether younger learners exhibit fewer instances of mispronunciation compared to older learners. This framework underscores the significance of early language exposure in achieving proficient /r/ pronunciation in English among Urdu speakers. By integrating these theoretical perspectives, this research aims to contribute empirical insights into the complexities of second language phonology acquisition, informing effective instructional strategies tailored to the linguistic needs of Urdu-speaking learners in Pakistan.

3. Methodology

This study involved 20 native Urdu speakers from Sialkot, Pakistan, aged 15 to 30, who are learning English as a second language. Participants were selected using purposive sampling to ensure a balance between early learners (exposed to English before age 10) and late learners (exposed after age 10). Each participant was recorded pronouncing 15 English words containing the /r/ sound in medial contexts (Peripheral, Arbitrary, Territory, Participate, Refrigerator) and minimal pairs (Rare vs. Lair, Bury vs. Berry, Car vs. Card, Fear vs. Fears, vs. Pier). Recordings were conducted in a soundproof room using a high-quality microphone. Acoustic analysis of the /r/ sound was performed using Praat software, measuring formant frequencies (F1, F2, F3) and duration, examining the effects of phonetic context and age of acquisition on rhotacism. The study aimed to identify deviations from native English pronunciation and to understand the influence of L1 phonological features on L2 pronunciation.

4. Data Analysis

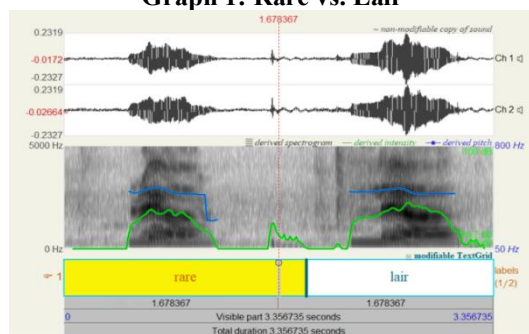
The study investigates instances of rhotacism in the pronunciation of the /r/ sound in English minimal pairs and medial contexts by native Urdu speakers. The list of words for data analysis is given below:

Minimal Pairs	Medial /r/
Rare vs. Lair	Peripheral
Bury vs. Berry	Arbitrary
Car vs. Card	Territory
Fear vs. Fears	Participate
Peer vs. Pier	Refrigerator

4.1. Minimal Pairs Graphs

Here is analysis of the graphs, which focus on minimal pairs:

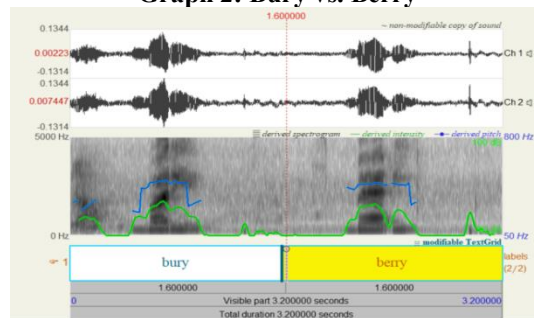
Graph 1: Rare vs. Lair



Early learners show distinct formant patterns, with /r/ at F1 ~300 Hz, F2 ~1100 Hz, F3 ~1600 Hz, and /l/ at F1 ~400 Hz, F2 ~1200 Hz, F3 ~2600 Hz. This indicates clear differentiation between /r/ and /l/. Late learners, however, exhibit

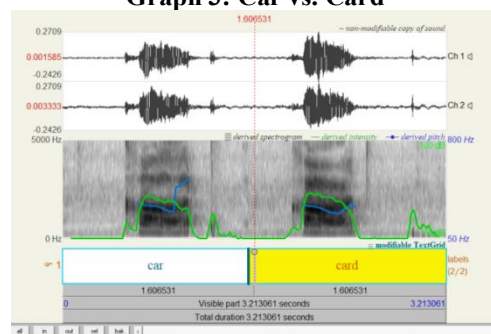
overlapping frequencies with F1 ~350-400 Hz, F2 ~1300 Hz, and F3 ~2000-2200 Hz, showing difficulty in distinguishing these sounds due to phonological transfer from Urdu. Early learners approximate native English pronunciation more closely, while late learners show overlapping formant frequencies, indicating difficulty in differentiating /r/ and /l/. This overlap suggests significant phonological transfer from the Urdu retroflex /r/ to the English alveolar /r/, potentially leading to intelligibility issues.

Graph 2: Bury vs. Berry



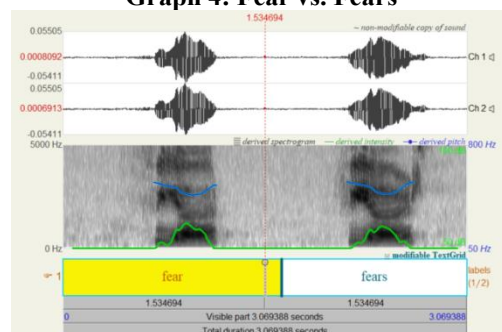
The graph illustrates variations in formant frequencies and duration between the minimal pairs. Early learners show better formant separation, with “bury” at F1 ~350 Hz, F2 ~1100 Hz, F3 ~1500 Hz, and “berry” at F1 ~300 Hz, F2 ~1200 Hz, F3 ~1600 Hz, indicating distinct /r/ sounds in different vowel contexts. Late learners have overlapping formant frequencies, with F1 ~300-350 Hz, F2 ~1300 Hz, and F3 ~1800-2000 Hz, showing difficulty in producing distinct /r/ sounds. This suggests early learners can distinguish /r/ in varying contexts better, while late learners often merge the sounds, potentially confusing listeners.

Graph 3: Car vs. Card



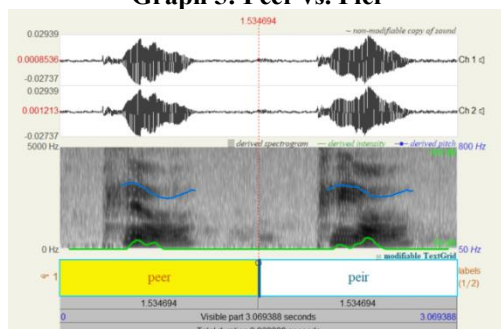
Early learners display clearer formant distinctions, with “car” at F1 ~300 Hz, F2 ~1100 Hz, F3 ~1500 Hz, and “card” at F1 ~350 Hz, F2 ~1200 Hz, F3 ~1600 Hz, indicating better control over the /r/ sound and the /rd/ cluster. Late learners struggle with the /rd/ cluster, showing overlapping frequencies with F1 ~350-400 Hz, F2 ~1300 Hz, and F3 ~2000 Hz, and longer duration in “card,” suggesting difficulty in producing the cluster correctly, possibly due to an epenthetic vowel insertion or lengthening of the consonant sound.

Graph 4: Fear vs. Fears



Early learners show consistent formant patterns with “fear” at F1 ~300 Hz, F2 ~1100 Hz, F3 ~1500 Hz, and “fears” at F1 ~320 Hz, F2 ~1150 Hz, F3 ~1550 Hz, indicating accurate production of /r/ in both forms. Late learners exhibit variability, with “fear” at F1 ~350 Hz, F2 ~1300 Hz, F3 ~1800 Hz, and “fears” at F1 ~370 Hz, F2 ~1350 Hz, F3 ~1900 Hz, suggesting challenges due to phonological transfer from Urdu. Early learners maintain consistent formant frequencies between “fear” and “fears,” while late learners show greater variability, indicating difficulty with the plural form’s influence on the /r/ sound.

Graph 5: Peer vs. Pier

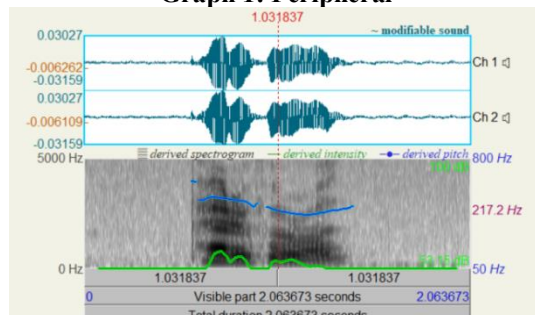


Early learners produce distinct formant patterns with “peer” at F1 ~300 Hz, F2 ~1100 Hz, F3 ~1600 Hz, and “pier” at F1 ~320 Hz, F2 ~1150 Hz, F3 ~1650 Hz, indicating better control over vowel quality and /r/ articulation. Late learners show overlapping frequencies with F1 ~350-400 Hz, F2 ~1300 Hz, and F3 ~2000 Hz, indicating difficulty distinguishing between /r/ sounds in these contexts. This results in a pronunciation that may confuse native English speakers.

4.2. Medial Graphs

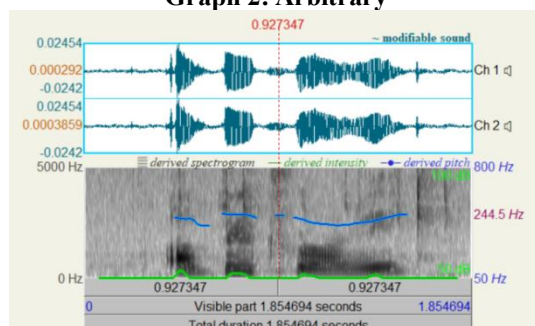
Here is analysis of the graphs, which focus on Medial /r/:

Graph 1: Peripheral



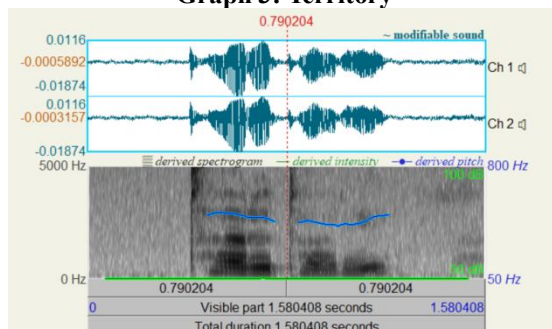
Early learners exhibit distinct separation with F1~ 300 Hz, F2~ 1100 Hz, and F3~ 1500 Hz, indicating accurate production of medial /r/. Late learners show overlapping frequencies with F1~ 350 Hz, F2~ 1300 Hz, and F3~ 1800 Hz, indicating difficulty in producing medial /r/ accurately. Early learners show lower F1 and F3 values for /r/ in “peripheral” compared to late learners. They demonstrate a distinct separation between /r/ and other sounds, whereas late learners exhibit overlapping frequencies, indicating difficulty distinguishing the /r/ sound. This suggests that early learners have a better approximation of the native English /r/ sound, while late learners are influenced by the retroflex /r/ from Urdu.

Graph 2: Arbitrary



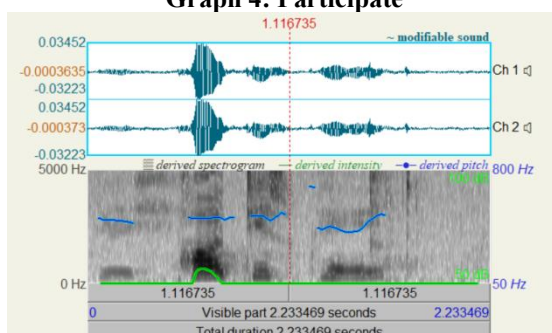
There is a clear differentiation in the formant frequencies between early and late learners. Early learners have distinct patterns with F1~ 300 Hz, F2~ 1100 Hz, and F3~ 1500 Hz, showing accurate production of medial /r/. Late learners exhibit longer durations and less clear formant patterns with F1~ 350 Hz, F2 ~ 1300 Hz, and F3~ 1800 Hz, indicating difficulty in producing medial /r/ accurately. The duration of the /r/ sound in “arbitrary” is longer for late learners, indicating possible articulatory adjustments. Early exposure to English helps in achieving native-like pronunciation, while late learners’ pronunciation is affected by the phonetic properties of their L1, leading to less clear formant patterns.

Graph 3: Territory



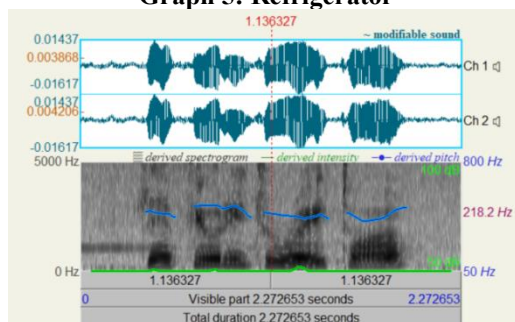
Early learners show consistent patterns with F1 ~300 Hz, F2 ~1100 Hz, and F3~ 1500 Hz, indicating accurate production of the /r/ sound. Specifically, early learners demonstrate lower F1 and F3 values for the /r/ sound in “territory,” suggesting better articulation. They exhibit more consistent formant patterns, whereas late learners show greater variability. This variability in late learners may indicate a stronger influence of Urdu phonology, highlighting the benefit of consistent English exposure from an early age in achieving accurate /r/ pronunciation.

Graph 4: Participate



For the medial /r/ in “participate,” early learners produce distinct formant patterns with F1 ~ 300 Hz and F3~1500 Hz, indicating accurate and well-defined articulation. They also maintain consistent durations, supporting their effective production of the sound. In contrast, late learners show overlapping formant frequencies (F1 ~350 Hz, F3~ 1800 Hz) and longer durations, reflecting difficulties in achieving the correct acoustic properties of the medial /r/. This variation and the extended duration further highlight the challenges late learners face in producing the sound accurately.

Graph 5: Refrigerator



For the medial /r/ sound in “refrigerator,” early learners exhibit precise formant patterns, with F1 ~ 300 Hz and F3~ 1500 Hz, indicating accurate production of the sound. These clear formant values suggest that early learners have developed a good ability to articulate the medial /r/. On the other hand, late learners show overlapping formant frequencies, with F1 approximately 350 Hz and F3~ 1800 Hz, and their production has longer durations. This overlap and increased duration highlight challenges in producing the medial /r/ sound accurately, suggesting that late learners have difficulty achieving the correct acoustic properties of this sound.

5. Findings and Discussion

The study uncovers distinct patterns of rhotacism among early and late learners of English, particularly focusing on minimal pairs and medial contexts. For example, in minimal pairs such as “rare” vs. “lair” and “bury” vs. “berry,” early learners exhibit clear separation in formant frequencies, indicating their ability to better differentiate between /r/ and other sounds. Conversely, late learners show overlapping formant frequencies, reflecting their struggle to distinguish these phonemes effectively. Similarly, in the pairs “car” vs. “card” and “fear” vs. “fears,” early learners demonstrate better management of the /rd/ cluster and plural forms, respectively, with clear formant distinctions. Late

learners, however, show longer durations and variability, often with the insertion of epenthetic vowels. Medial context words such as “peripheral,” “arbitrary,” “territory,” “participate,” and “refrigerator” highlight the superior articulation of /r/ by early learners. They exhibit lower F1 and F3 values and consistent formant patterns, while late learners present significant overlap and variability, indicating the influence of Urdu phonology on their English pronunciation. The findings provide robust support for the Critical Period Hypothesis, suggesting that exposure to English before the age of 10 leads to more native-like pronunciation. In contrast, those exposed later face greater challenges, including longer durations and less distinct formant patterns for the /r/ sound. These differences underline the critical role of early language exposure in achieving proficient L2 phonology.

The study’s findings underscore the significant impact of L1 phonological features on L2 pronunciation, particularly the influence of the retroflex /r/ in Urdu on the production of the English alveolar /r/. This phonological transfer manifests in the overlapping formant frequencies and extended durations observed in late learners, aligning with existing research on second language acquisition. These results suggest the necessity for targeted pronunciation exercises that focus on differentiating between the retroflex and alveolar /r/ sounds, which could substantially benefit English language learners, especially those exposed to English later in life. Moreover, the findings highlight the need for speech therapy interventions that address the specific phonological challenges faced by Urdu speakers. Techniques such as biofeedback and articulatory training can play a crucial role in correcting mispronunciations and enhancing overall communication skills. The data supporting the Critical Period Hypothesis emphasize the importance of early and immersive English language instruction. This advocacy for language policies promoting early exposure to English aims to improve phonological proficiency and reduce instances of rhotacism. Future research should consider expanding the sample size and exploring a broader range of phonetic contexts to further validate these findings. Additionally, longitudinal studies that track pronunciation development over time would provide valuable insights into the effectiveness of various instructional and therapeutic interventions. Such studies would contribute significantly to the understanding of phonological transfer and second language acquisition, offering practical implications for language teaching and speech therapy in multilingual contexts.

6. Limitations of the Study

This study’s limitations include a small sample size of 20 participants, which may not represent the broader population of Urdu speakers learning English. Additionally, the research focused specifically on minimal pairs and medial contexts, which might not encompass all relevant phonetic environments where rhotacism could manifest differently. Future research should include larger, more diverse samples and examine a wider array of phonetic contexts to validate and expand upon these findings.

7. Implications of the Study

The findings have practical implications for both language teaching and speech therapy in Pakistan. Educators can design pronunciation exercises targeting the specific phonetic challenges identified, thereby enhancing the effectiveness of English language instruction. Speech therapists can use these insights to develop tailored interventions for individuals with rhotacism, improving their communication skills and confidence in English. Additionally, the study underscores the importance of early language exposure, advocating for language policies that promote early English learning to improve phonological proficiency.

8. Conclusion

The study sheds light on the phenomenon of rhotacism among native Urdu speakers learning English, highlighting the impact of L1 phonology on L2 pronunciation. The research underscores the significant challenges posed by the retroflex /r/ in Urdu when producing the alveolar /r/ in English, particularly among learners exposed to English later in life. The findings support the Critical Period Hypothesis, suggesting that early exposure to English results in more native-like pronunciation and fewer instances of rhotacism. Additionally, the study emphasizes the need for explicit phonetic instruction and targeted speech therapy to address these pronunciation difficulties. Despite its limitations, this research provides a foundational understanding that can inform both theoretical models of phonological acquisition and practical approaches in language teaching and therapy. Future studies should aim to build on this work by including larger, more diverse samples and exploring additional phonetic contexts to provide a more comprehensive understanding of rhotacism and its implications for English language learners in Pakistan.

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