



Segmental Intelligibility of Pakistani English for International Academia: An Experimental Phonetic Study

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Abstract: This experimental phonetic study investigates the segmental intelligibility of Pakistani English (PakE) for international academic audiences. Employing a mixed-methods design, the research analyses the production of twenty Pakistani academics and its perception by thirty listeners from inner-circle, outer-circle and expanding-circle English backgrounds. Data were elicited through a standardised word list, read sentences and spontaneous speech samples, subsequently subjected to acoustic analysis and intelligibility rating tasks. Findings reveal systematic variation in vowel quality, consonant articulation and syllable structure that differentially affects comprehensibility across listener groups. Notably, retroflexion and syllable-timed rhythm emerge as features impeding intelligibility for inner-circle listeners while facilitating comprehension for South Asian listeners. The study contributes empirical evidence to World Englishes scholarship and offers pedagogical recommendations for Pakistani higher education institutions seeking to balance linguistic identity with international communicative demands. Implications for HEC language policy and academic mobility are discussed.

Keywords: Pakistani English, segmental intelligibility, experimental phonetics, World Englishes, academic discourse, lingua franca, HEC policy

Introduction

English plays a strategic role of teaching and international academic communication in Pakistan in the higher education system. Academic appointments, research publications and international engagements, which are required by the Higher Education Commission (HEC) to grant English proficiency, makes the language necessary in acquisition of academic capital (Mansoor, 2005). Nevertheless, phonological influence in Pakistani English (PakE) is in unique ways developed by the historical and sociolinguistic and educational pressures, which no longer reside at the center of the circle (Rahman, 1990; Mahboob and Ahmar, 2004). This is a serious concern which puts important issues of intelligibility in international academic forums where speakers of different language/linguacultural backgrounds meet.

Monolithic Standard English is now giving way to pluralistic ways of thinking that recognize natural variation

among the World Englishes (Kachru, 1985; Kirkpatrick, 2007). However, the practical foundation of successful communication is intelligibility, especially in the contexts of high stakes, such as academic ones. Past studies show that segmental aspects, vowels and consonants, have profound effect on the understanding of the listener, in most cases, than suprasegmental aspects in lingua franca communication (Jenkins, 2000; Field, 2005). Nonetheless, there is a conspicuous research gap in the field of Pakistani applied linguistics research, which is the empirical phonetic study of PakE segmental intelligibility.

PakE phonology is substratally motivated by Urdu and Punjabi, as well as Pashto and other local languages and shows itself in such typical aspects as the stopping of fricatives by the tongue, retroflexion of the rhotic and the rhythmic timed patterns (Mahmood, 2009; Hashmi and Saleem, 2018). Although these features are the markers of the Pakistani linguistic identity, their effects on the international intelligibility are under-theorised. The HEC internationalisation agendas that include foreign faculty recruitment and transnational research collaborations require empirical knowledge of the possible communication obstacles. In turn, this paper responds to the current urgency of the evidence-based language policy that considers the local variation and at the same time promotes the functional international intelligibility.

Significance of the Study

The value of this study is four-fold. First, it offers the first large-scale experimental phonetic evidence on the intelligibility of PakE segmentation, a gap of crucial empirical evidence in the South Asian English research. Although there are impressionistic accounts of PakE phonology (Baumgardner, 1993; Mahboob and Ahmar, 2004), no controlled experimental studies of the Pakistani research on using modern acoustic analysis and the testing of perception have been conducted so far. This research has a high level of rigor necessitating its use within the scope of the research focus of HEC and its international publication requirements.

Second, the study has a direct impact on the pedagogy in Pakistani universities. As English as a medium of instruction is established throughout STEM and the social sciences, the faculty members are starting to resort to international conference presentations and indexed journal articles more actively. The knowledge of segmental characteristics that can hinder the intelligibility can be used to provide targeted pronunciation practice without imposing native speaker norms that are incompatible with linguistic identity and World Englishes values (Jenkins, 2006; Seargeant, 2012).

Third, the research makes a theoretical contribution to the framework of World Englishes because it involves the Lingua Franca Core (Jenkins, 2000) and empirical evidence in a South Asian variety. Although the suggestions made by Jenkins are mostly based on European experiences, this study evaluates the relevance of the suggestions and drawbacks to PakE, thus contributing to the diversity of theoretical perspectives.

Fourth, the outcomes will inform HEC in the creation of policy in terms of language proficiency standards. At present, HEC is relying on the standardised tests, such as IELTS and TOEFL, which favour inner-circle norms. Evidence-based knowledge of PakE intelligibility patterns may be used to create more context-dependent assessment standards than the current one that respects the Outer Circle position of Pakistan, though achieves the practicality of communication at the international level.

Research Objectives

This study pursues three primary objectives:

1. To identify and acoustically analyse segmental features distinguishing Pakistani English from reference varieties in controlled production tasks. This involves quantifying vowel formant frequencies, consonant voice onset time (VOT) and spectral characteristics to establish PakE phonetic norms.
2. To evaluate the intelligibility of Pakistani English segmental phonology for international academic listeners from diverse linguacultural backgrounds. This includes measuring comprehension accuracy and listener effort across different listener groups.
3. To determine which segmental deviations from reference varieties most significantly impede intelligibility in academic discourse contexts, thereby establishing a hierarchy of functional importance for pedagogical prioritisation.

Research Questions

The research objectives translate into the following empirical questions:

1. What systematic segmental features characterise Pakistani English vowel and consonant production in read and spontaneous speech?
2. How does the intelligibility of Pakistani English segmental phonology vary across listener groups from inner-circle, outer-circle and expanding-circle English backgrounds?
3. Which segmental features demonstrate the strongest correlation with intelligibility breakdown, and how do these findings align with or challenge the Lingua Franca Core proposal?

These queries lead the design of the experiment and the analytical system so that the research does not go off the track and allows an exploration of emergent patterns.

Literature Review

The conceptualisation of globalisation in the English language was revolutionised by the paradigm called World Englishes, which was introduced by Kachru (1985), who dismissed the deficitist models, and asserted the validity of the indigenised varieties. The model developed by Kachru, Three Circles, places Pakistan in the Outer Circle, in which English as an institutionalised non-native variety is used. Later literature has recorded some characteristic phonological, lexical and syntactic peculiarities of PakE but the phonetic research has not been done extensively (Baumgardner, 1993; Mahboob and Ahmar, 2004). The initial study of Rahman, which established the presence of retroflexion, dental articulation of the fricatives and the syllable-timed rhythm as the hallmark phonetic features of PakE (Rahman, 1990). Mahmood (2009) further extended this by providing instrumental analysis as to show systematic vowel centralisation and consonant cluster reduction. Nonetheless, these studies have only used read speech in the studies which have limited generalisability. Most recently, Hashmi and Saleem (2018) performed an acoustic study of PakE vowels, which proved the formant patterns not to be according to Received Pronunciation and General American standards. More importantly, not one of these studies, directly quantified the effect of intelligibility, so the use in pedagogy is a speculative application. This empirical gap was filled in the current research by integrating the analysis of production with the testing of perceptions, which further extended past the descriptive accounts of phonological variation to provide the functional implication of phonological variation.

Intelligibility Research

Intelligibility is the essence of the effective communication, which is the extent to which a speaker is comprehended by his listener (Smith and Rafiqzad, 1979). Munro and Derwing (1995) differentiated intelligibility, comprehensibility and accentedness to prove that foreign accent is not always related to difficulty in comprehension. This three part difference is essential to PakE, as speakers can still have marked accents, and still be functionally intelligible. Jenkins (2000) further developed Lingua franca Core (LFC), in which some phonological aspects are necessary to international intelligibility and some are cosmetic. The LFC is more concerned with the clusters of consonants, the differences in vowel length and nuclear stress positioning, and less concerned with the interdental fricatives and vowel quality accent. Field (2005) disagreed to this and proved the primacy of lexical stress in the comprehension of listeners. In the criticism of intelligibility studies, Rajadurai (2007) stated that the ideological bias of the research and design is evident in the sense that inner-circle hearing norms predominantly affect the results. This study is involved in this debate with empirical PakE data, where the predictions of LFC were tested against the patterns of South Asian English and the variation of listeners in the Three Circles defined by Kachru, and so the criticism of theoretical Eurocentrism was met.

Segmental Characteristics and Understanding

Segmental phonology has a lot of effect on intelligibility especially during low context communication. Misidentification of the quality of vowels may attract lexical confusion and consonants substitutions may confuse morphological marking (Wells, 1982; Gimson, 2008). In the case of South Asian Englishes, retroflex stops of alveolar consonants, dental fricatives stopping and initial clusters reduction have often been reported (B. Kachru, 2005; Deterding, 2010). Segmental deviations are shown to have different effects on intelligibility on experimental evidence. Munro & Derwing (2006) also proved that consonant cluster simplification greatly

diminishes intelligibility in native and less so in non-native listeners. Likewise, the Outer Circle varieties have a vowel centralisation pattern, which introduces some asymmetries in the comprehension (Mesthrie and Bhatt, 2008). These results indicate that the intelligibility is moderated by listener background, which this study conducts systematic research through stratified classes of listeners who represent various linguacultural orientations.

Theoretical Framework

This article adopts a hybrid approach that combines both the Lingua franca Core proposed by Jenkins (2000) and a South Asian approach to Englishes. The LFC offers falsifiable propositions about the functional load of phonological features in foreign communication, which have had pedagogical implications that have been adopted in world syllabi in pronunciation. It should be noted, though, that its Eurocentric progress will need to be adjusted to the ecologies of the South Asian lingo, where the substrate languages influence phonological structures in different ways. Sociolinguistic realism by Kachru (1985) complements the framework as it validates PakE as a rule-based system as opposed to inadequate interlanguage. This two-sided approach allows assessing both international intelligibility requirements and the maintenance of local linguistic identity at the same time, which is essential in the case of Pakistani higher education policy.

The theoretical architecture includes three components, which are interlocked. To begin with, the acoustic phonic approach determines PakE segmental norms by quantitatively measuring formant frequencies, VOT and spectral attributes. Second, perceptual experiments are an assessment of intelligibility in a group of listeners through the measure of transcription and rating. Third, functional load analysis relates phonetic deviation and consequences of their breakdown in comprehension, which characteristics of the speech have the most devastating impact on the communication. This combined method focuses on both descriptive and applied research aims and critically reflects on Western-centric models by use of South Asian empirical evidence and thus adds theoretical variety to the scholarship of World Englishes.

Methodology

The study adopted a quasi-experimental mixed-method cross-sectional framework where quantitative method of acoustic analysis and qualitative commentary of the listeners were performed to measure the segmental intelligibility. All participants gave informed consent and ethical clearance was granted. Twenty Pakistani academicians (ten men and ten women) aged 35-50 and having a doctorate and with high frequency of academic interactions with the outside world were selected to participate in the research and thirty listeners were stratified into three groups: inner-circle, outer-circle and expanding-circle. The sample contained L2 English speakers with Urdu as their first language and the phonological data obtained were consistent. The materials consisted of a word list, read-sentences, which imitate the academic discourse, and two-minutes of spontaneous speech, which was examined through the means of high-quality audio and randomized presentation. Transcription tasks and assessments of intelligibility on a nine-item Likert scale were done to the listeners, and comprehension was verified in terms of questions. Recording was done in a silenced recording room and tests on the listeners were done at a distance. Praat (vowel formants) and SPSS (measures of consonants) were found as tools of data analysis, and the scores of intelligibilities were compared with the application of multiple regression. Listening commentary thematic analysis revealed the common challenges, which further validated quantitative and qualitative data and gives the study more strength in relation to the relationship between segmental aspects and the intelligibility of non-native English speech.

Analysis and Results

The acoustic examination showed some systematic segmental patterns between PakE and reference varieties. Space plotting of the vowels showed that there was uniform centralisation throughout the system and that front vowels had a higher F1 and lower F2 values than the RP norms. In particular, the KIT vowel had mean F1 at 460 Hz and F2 at 1850 Hz (n=20) which was compared to the RP values of 420 Hz and 1920 Hz respectively, which were more open and retracted. The STRUT vowel showed a great amount of overlapping with LOT implying the phonemic merge that was reported in the literature (Mahmood, 2009). The difference in vowel length, however, was strong with tense-lax pairs having considerable differences in terms of duration ($p < 0.001$).

Analysis of consonants confirmed typical retroflexion of alveolar stops as well as mean burst frequency was reduced to 3000 Hz, whereas in RP speakers it was 4500 Hz. Interdental fricatives were stopped by the teeth in 87 per cent of tokens giving realisations of [t] and [d]. There was a significant difference between voice onset time of voiceless stops ($M=18\text{ms}$, $SD=4.2$) and RP values ($M=58\text{ms}$, $SD=6.1$), which demonstrate substratal influence. Primary consonant cluster-reduction substitution took place in 34 per cent. of tokens and mainly by schwa epenthesis, as opposed to schwa deletion.

Different intelligibility patterns were obtained in perception testing. The overall transcription accuracy was estimated at 71 per cent amongst all listeners with a marked difference among groups ($F(2, 27)=12.4$, $p=0.001$). In the case of inner-circle listeners, it was 62 per cent, outer-circle listeners 79 per cent and expanding-circle listeners 72 per cent. The outer-circle advantage indicates more knowledge of the South Asian phonological patterns, which helps to prove the hypothesis regarding the listener background which was stated by Rajadurai (2007).

Specific segmental cues of breakdown of intelligibility were found to be affecting the study through qualitative analysis. Interdental fricative stops produced the greatest disturbance to inner-circle listeners with 45 per cent of them confusing think with tink or sink. Retroflexion was also troublesome with those lexical items in which place-of-articulation differentiates minimal pairs, but context usually disambiguated meaning. Vowel centralisation had an influence on proper noun recognition where listeners misidentified Pakistani place names and academic terms.

Discussion

The results of this experimental phonetic study not only follow up on, but also extend pre-existing descriptive explanations of PakE phonology in the international scholarship literature, as well as offering the first systematic intelligibility measures of this variety in international academic environments. The instrumental study by Hashmi and Saleem (2018) also provides the same data on acoustic vowel as the systematic centralisation is proven, and the arguments of the total collapse of the length distinctions are disproved. The trend is an expression of substratal influence of Urdu and Punjabi systems of vowels and phonological economy principles that occur in the varieties of contact (Mesthrie and Bhatt, 2008). The centralisation effect, which implies that front vowels exhibit elevated F1 and unstable F2 values, implies that phonetic compromise exists between native language vowel ranges and English targeting. These patterns are common with speakers and are not due to random approximation errors but are consistent across speakers, which is a sign that there are emergent systemic norms important to institutionalised varieties of the Outer Circle (Kachru, 1985). The fact that vowel length differentiation, even though the quality changed, remains intact is also significant because it is contrary to the statements about the total reconfiguration of the vowel system in some New Englishes studies (Wells, 1982). This retention is probably due to functional pressure to preserve morphological differences, like the past tense marking with vowel alternation and, thus, it confirms Jenkins (2000) argument that those phonological aspects which have functional consequences are more functionally loaded. The time difference between tense-lax pairs, which is statistically significant at $p<0.001$, proves that PakE speakers have restructured the English vowel system, retaining prosodic differences and allowing them to vary in quality, accommodating phonemic limitations of the first language. This selective accommodation plan is a sign of advanced phonological competence and not unsuccessful acquisition, and it is difficult to argue that deficit-based views are complete and unchallenged, and it is difficult to argue that an Outer Circle variety is an approximation of inner-circle standards in various languages.

The consonantal analysis also demonstrates the same systematic patterns with complicated implications on the intelligibility theory. The results of confirmation of characteristic retroflexion, which is demonstrated by the reduced burst frequencies down to 3000 Hz, coincide with a large body of literature concerning South Asian English phonology (B. Kachru, 2005). Nevertheless, the contribution of the current study is the quantification of the exact acoustic parameters and the association of this with the results of the perceptions. The significant reduction of voice onset time of voiceless stops ($M=18\text{ms}$ vs RP $M=58\text{ms}$) is a systematic phonetic carryover of Urdu, where aspiration and not VOT is used to make the fortis-lenis distinction. This is because compression of

VOT results in ambiguity in the perception of inner-circle listeners accustomed to longer lag times as indicator of voicing, but rapid adaptation in outer-circle listeners accustomed to South Asian phonology, which implied that intelligibility boundaries are not insurmountable through exposure. This is corroborated by the high rate of dental stopping (87 per cent of interdental fricative tokens) which is a consistent sociolinguistic mark of PakE identity although its effects on intelligibility in all listeners groups differ widely, the results of which problematise universal intelligibility models.

Intelligibility hierarchy deviated significantly as compared to Lingua Franca Core predictions by Jenkins (2000), whose findings have high theoretical and pedagogical implications. Although consonant cluster reduction was witnessed in 34 per cent of tokens, the functional effect was surprisingly small and the listeners quickly adjusted to these situations by contextually regulated strategies and lexical prediction strategies. This flexibility implies that listeners when in lingua franca situations use compensatory processing systems that reduce the influence of surface-form variation as long as grammatical information is not lost (Munro and Derwing, 2006). Interdental fricative stopping, to which Jenkins categorically allocated the non-core label, and was thus pedagogically peripheral, in turn, was a major source of intelligibility impairment to inner-circle listeners, whose misidentification of critical lexical items was 45 per cent. This also questions the LFC as a generalized approach, as well as indicates the necessity of diversity-specific intelligibility studies that compare core propositions with empirical evidence of an array of English ecologies (Rajadurai, 2007). The mismatch can be probably explained by the fact that Jenkins LFC was created based mostly on the interactions in the European lingua franca when interlocutors are phonologically accustomed to the presence of these fricatives. Dental stops phonemically stable in South Asian contexts generate puzzling comprehension challenges in unfamiliar listeners in inner-circles, who are not used to this type of phoneme replacement. This observation requires theoretical revisions: feature criticality is not only a function of linguistic functionalism, but also of listener expectation and exposure and therefore renders intelligibility an interactionally constructed and non-static phenomenon of phonological forms. What this means to the World Englishes theory is that the pedagogical priorities should be negotiated at the local level, taking into account the profile of a speaker and interlocutor target audience as opposed to being imported based on Eurocentric constructs.

Background effects were also exaggerated as was the theoretically important listener backgrounds indicating a hierarchy of understanding that reversed traditional assumptions of the native speaker supremacy. The high level of understanding among the outer-circle listeners (79 per cent accuracy) confirms the statement that Kachru (1985) made that common non-native norms make communication in the Outer Circle easier and the process is referred to as accommodation without assimilation in recent literature (Cogo & Dewey, 2012). This is not due to the mere familiarity with South Asian accents alone as the expanding-circle listeners, in spite of the similar non-native status, only managed to reach 72 per cent accuracy. Instead, outer-circle advantage represents systematic exposure to, receptive competence in phonological patterns typical of South Asian Englishes, acquired via academic mobility in the region, media exposure and professional contact. This has some practical consequences to the internationalisation strategy of HEC, indicating that South-South academic relationships can be met with less linguistic obstacles than traditionally supposed and that this can shift the priorities of collaboration to regional networks with their communicative efficiency maximised. Despite the fact that the intermediate performance of the expanding-circle listeners means linguistic distance is the predictor of intelligibility as opposed to native-speaker status, Kirkpatrick (2007) argument that the developing regionally relevant pedagogical models need to focus on understanding between current interlocutors as opposed to the hypothetical native-speaker judges is valid.

The theoretical implications of PakE have implications beyond the study of intelligibility design, and are seen as challenging several fundamental assumptions of such studies. In the majority of works the inner-circle listeners are implicitly or explicitly introduced to define the understanding of the in-group, thus introducing ideological bias in the empirical research (Rajadurai, 2007). That type of design would deliberately underestimate the functional intelligibility of PakE in its most probable contexts of application, i.e., in interactions with other members of the outer-circle and expanding-circle academia. This methodological criticism has some far-

reaching consequences on HEC policy, which, so far, uses standardised tests that are normed upon inner-circle usage. The results indicate that proficiency standards must be redefined as contextual and not global, and various communicative standards can be used in various purposes of international engagement. In the case of European or North American cooperation, interdental fricative articulation can be a particular issue to be trained, and in the case of South Asian or Southeast Asian counterparts, there is not much difficulty in preserving the particular PakE features and it can even become the source of a closer relationship due to non-native membership.

Pedagogical Implications

The results of the study can inform the development of evidence-based pronunciation teaching among Pakistani scholars, with the emphasis on changing the focus on approximation of native speakers on optimization of functional intelligibility. Instead of seeking native like norms, speakers do not need or want, pedagogical emphasis should be on features of high functional load in target interlocutor groups. This is an extreme contrast to the traditional ways of teaching pronunciation in Pakistan where traditionally, the Received Pronunciation or General American paradigms have been the dominating forces at the expense of speaker confidence and linguistic self-esteem (Mahboob and Ahmar, 2004). The statistics show that the Pakistani scholars are in need of specific segmental intervention and getting clear permission to maintain variation with a low functional cost and high identity worth. This practice can be reconciled with postcolonial pedagogues that are anti-imperialistic lingualism and realistic communicative needs (Phillipson, 1992; Canagarajah, 1999).

In the inner-circle communication context, interdental fricative articulation should be explicitly taught, as it has an unfairly high effect on intelligibility. The 45 per cent rate of misidentification by the British, American and Australian listeners portrays that dental stopping entails enough ambiguity to interfere with the academic discourse when accuracy in terms is of utmost importance. Nevertheless, training should not be in the form of decontextualised exercises but rather as a part of high-frequency academic words. Lexical contrast Minimal pair exercises (/th/ /th/ /t t/) with lexical tasks like theory, thesis, method, ethical and authoritative would build on phonetic control and at the same time build discipline-based lexis. This phonological- lexical developmental integration satisfies the special needs of the Pakistani academics who do not need conversational fluency, but precision of their specialised registers. The pedagogy must be clear regarding the sociolinguistic position of this phenomenon: it is a strategic adaptation to the expectations of the speaker to the inner-circle instead of the correction of an alleged error, and the speaker agency should be preserved without the psychological burden of deficits discourses.

Although acoustically distinguished and statistically different than RP norm, vowel centralisation was not as disruptive to intelligibility as expected: pedagogical tolerance should be tolerated in most communicative activities. The fact that tense-lax length differences are still strong and salient puts a straightforward instructional emphasis of maintaining contrasts in length with allowing quality variation that reflects Pakistani phonetic identity. This observation directly questions conventional syllabus of pronunciation that focuses on the precision of the vowel quality, usually by subjecting them to painful and uninspiring articulatory training. In its place, it is possible that the computer-based pronunciation training based on visual feedback of the formant pattern can help the speakers maintain the length contrasts and at the same time the quality variation that fits into the Pakistani identity. This can be presented using software like Praat or dedicated language laboratory systems, which can show real-time plots of vowel production so that speakers can see how they are producing them (when compared to quality duration parameters) but not force them to conform quality. This technology mediation enhances independent learning wherein academics will acquire phonological awareness and self-monitoring ability under the loose parameters that do not undermine their current competence.

The articulation of the consonant clusters should have a very specific pedagogical solution with consideration of the complicated sociolinguistic and functional complex. The fact that the cluster reduction method via epenthesis has little effect on intelligibility, as the study does, is indicative of the fact that there is no need to completely and wholly eradicate the method, as doing so could cause an additional cognitive load on the speaker and a reduction of the speaker's fluency. Instead of eliminating epenthesis, lesson need to be providing

instruction on preserving perceptual distinctiveness and not to insert grammatical mark up in morphologically sensitive situations where it may confuse grammatical marking. As an exemplar, epenthesis in strength will be [sength] with the least communicative risk, but insertion as in past tense asked, will potentially blur the morpheme -ed, which will cause confusion in time. This difference is consistent with the principle of Jenkins (2002), which states that it is better to keep grammatical information intact rather than the surface form, but it modifies it to PakE-specific trends. The material of instruction must contain consciousness-raising exercises in which Pakistani scholars will analyse their own speech samples to find the situations when epenthesis poses a danger to morphological transparency, and learn to develop the skills of autonomous editing instead of using external correction. This strategy builds linguistic self-efficacy and acknowledges the legitimacy of the PakE phonological processes and focuses on the cases that have a definite and valid functional outcome.

In addition to the aspects of segmentation, the methodology and results of the study imply more general pedagogical changes of the manner in which English pronunciation is instructed in Pakistani higher education. The existing HEC guidelines do not specify the standards of pronunciation in detail and instead provide only generic allusions to the concept of intelligibility, with the individual institutions using an unsuitable model of norms of the native speakers. The study advocates the creation of a Pakistan-based pronunciation curriculum based on the empirical intelligibility-based information instead of the imported inner-circle models. It is using such a syllabus that a core of characteristics that need to be addressed in international communication and a peripheral set of markers of Pakistani identity that should be actively nurtured and an intermediate area where variation is not a concern would be identified. This three-part framework offers guidance to instructors and learners in a clear, research-informed, framework that can minimise the anxiety and inconsistency that the current practice entails. Moreover, the syllabus must be incorporated into a critical language awareness curriculum that involves Pakistani academics in discussions regarding linguistic rights, ownership of English and resistance to native-speakerism (Holliday, 2005; Lowe and Pinner, 2016), which will turn pronunciation teaching into socially situated practice.

Policy Recommendations

In the case of HEC and the Pakistani universities, the study recommends the radical change of the language proficiency standard of academic appointments, promotions, and international mobility opportunities. The existing policy is based on the use of standardised tests like IELTS and TOEFL which encourage the norms of the inner-circle and punish the natural variation, causing structural imbalances to Pakistani scholars whose competence in English is not assessed accurately by these tools. The evidence of the study helps to recommend the development of the additional intelligibility tests used to assess functional communication during the real academic activities instead of accent similarity of the native speakers models. These tests may involve the observed presentations of research, rated by trained raters with varied linguacultural backgrounds, oral defence simulations, with international scholars, or interactive tasks of repair and negotiation strategies. These supplementary measures would offer a more legitimate measure of the ability of Pakistani academics in the field of international scholarly communication and lessen the economic load and cultural bias of standardised testing.

At the institutional level, the Pakistani universities are to develop pronunciation support centres that are specifically set to meet the academic staff needs but not the needs of general learners of English. The centres would be different to current language labs, given that they would exclusively concentrate on disciplinary discourse, in that individualised phonological profiling by the presence of intelligibility benchmarks based on the current research. Acoustic analysis software would help experts to define the specific patterns of features in each academic, rank them as features to develop according to their target audience of interlocutors, and offer specific interventions using short-term, intensive workshops. This would normalise the process of pronunciation development as a professional capacity building measure as opposed to a remedial process of correcting deficiencies and this is congruent with HEC faculty development programmes. Importantly, these centres must hire Pakistani experts to teach phonetics sociolinguistically aware so that they deliver their lessons in a culturally sensitive way that does not recreate ideologies of native speakers.

These findings should also be used by HEC in making transnational partnership strategies. The information

about high intelligibility of the outer-circle listeners implies that the academic cooperation of the South with the South can be more linguistically efficient than one might have thought and more investment should be made in the regional networks with India, Bangladesh, Sri Lanka, Nigeria and other countries of the Outer Circle. These alliances maximise communicative efficacy and promote epistemic justice since they focus non-Western knowledge production and normalise other forms of academic Englishes. The internationalisation policy of HEC should thus spread its interest beyond the traditional Northern relationships to generate sources of funds, mobility programs and research partnerships which expressly appreciate the South-South exchange. Such a shift would decrease linguistic fear in Pakistani scholars, increase the level of publications in reachable localized journals, and foster unity among scholastics of World Englishes who are revolting against native-speaker dominance in academic publications.

Lack of Constraints and Future Study

Though the current study offers the first extensive experimental information on the subject of PakE segmental intelligibility, there are a number of limitations that should be mentioned and indicate where future research should be conducted. The biggest limitation is the demographics of the participants: they were Urdu-dominant Punjabi scholars of prestigious HEC-approved universities, and this group may not be representative of the Pakistani ethnolinguistic diversity. A speaker with a Sindhi, Pashto, Balochi, Saraiki and other language origin can have varied substrate transfer, especially in the area of retroflexion, vowel nasalisation and consonant inventory. Further studies should use a stratified sampling approach reflecting the great ethnolinguistic groups in Pakistan so as to examine whether unitary that is, unitary or regional varieties portraying distinctive intelligibility profile can be found. This kind of research would make the HEC policies differentiate pedagogical recommendation based on the region or have a national standard.

The pool of listeners, stratified by membership of circles, was not very large and was nevertheless too homogeneous academically, to generalise to the wider international academic contexts. Further research is needed that will increase the number of listeners and involve subjects in fields that have different levels of tolerance to phonological accuracy. As an example, more phonologically confusable language engineering or natural sciences, in which technical terms can be less phonologically confusable, or law and humanities, which involve more subtle lexical differences with higher semantic importance, may exhibit higher intelligibility limits. Also, the longitudinal exposure studies would help in exploring the mechanisms through which listeners adapt over time, to determine whether the initial intelligibility challenges can be reduced with contact, which could help in establishing the malleability of comprehension thresholds as Jenkins (2000) argues. This study would lead to direct consequences in the academic exchange programme design, which should indicate that a short-term orientation period may be very beneficial in ensuring communication success.

The experimental design gave investigations a high priority in clearing and control rather than ecological validity, which was extensively adopted using read speech tasks. Although the data of spontaneous speech were gathered and analysed the controlled conditions might undermine the context facilitative effect in the controlled conditions where visual cues and interactional repair mechanisms are used in natural academic speech. Further studies are to utilize video-mediated activities, simulated conference presentation using visual aid and study of real international conference interactions to determine the use of multimodal support as a means of compensating segmental deviation. Moreover, the study of intelligibility when stakes are high and redundancy is low, e.g. in a thesis examination or a pitch to funders, would help to stress the validity of the existing evidence on the topic. This ecologically valid design would give more specific advice to HEC on situations when the precision of the segments is more important.

Lastly, in this study, segmental features were used exclusively, which was an intentional decision to separate their role in intelligibility. Yet, the segmental and suprasegmental intervals are interactive in natural speech with rhythm, stress and intonation perhaps offsetting or increasing segmental variation. Marriage of acoustic research of prosody with segmental research should be a part of future research to help formulate a comprehensive model of PakE intelligibility. The initial data indicates that PakE syllable-timed rhythm can be, in fact, more comprehensible to the listeners who are accustomed to such patterns, but poses a processing challenge to stress-

timed listeners (Deterding, 2010). By comprehending such interactions, it would be possible to conduct more advanced pedagogical intervention to nurture the awareness of speakers regarding the combination of segmental and suprasegmental attributes to form a comprehensible academic speech. Longitudinal research following the intelligibility development after specific instruction of the specific intervention would prove causality than the current cross-sectional correlation and consequently offer the evidence base that would enable HEC to invest without fear in large-scale pronunciation development programs.

Conclusion

The present experimental phonetic research offers the first systematic study of the Pakistani English segmental intelligibility, where the systematic trend is found and further implicates important consequences on Pakistani policy in higher education and education. The evidence indicates that PakE displays some degree of phonological regularities, which, as different as they are compared to inner-circle varieties, do not affect functional intelligibility in the minds of various international interlocutors. The background of the listeners is found to be a significant moderating variable whereby the outer-circle listeners are found to be more understanding, thus proving the native speakers as hegemonies in academic communication.

The results partially confirm and at the same time substantially redefine the Lingua Franca Core, suggesting that the functional load of phonological characteristics in different varieties of English and audiences that they address is highly diverse. Among Pakistani scholars, this would require evidence-based pronunciation teaching which focuses on high-impact segmental characteristics such as interdental fricatives and allows variation in vowel quality and rhythm which characterizes Pakistani linguistic identity.

With HEC carrying on with its internationalisation, the present research can be seen as offering empirical basis to a subtle language policy that can balance the global communication demands with the sociolinguistic reality. Instead of blindly following the norms of inner circles, Pakistani universities would need to develop confident PakE speakers who can be phonologically competent and able to be international, but at the same time have the right to declare linguistic difference. The empirical foundation should be extended in the future, adding the linguistic diversity of Pakistan and examining real-life situations of academic discourse context to develop an overall framework of intelligibility of Pakistani English.

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