ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

VOICES FROM THE PERIPHERY: A CONSTRAINT-BASED ANALYSIS OF PHONOLOGICAL VARIATION IN SINDHI'S AER AND BHAYA ENDANGERED LANGUAGES

Dr Asmara Shafqat[1]
[1]Assistant Professor, Department of English Linguistics and Allied Studies, NED University of Engineering and Technology, Karachi, Pakistan.
asmarashafqat@neduet.edu.pk
https://orcid.org/0000-0002-5928-5915
Javeria Ali Wadho[2]
Lecturer, National University of Computer and Emerging Sciences, Karachi.
javeria.ali@nu.edu.pk
Nida Shabbir[3]
Senior lecturer, Szabist University
nida.shabbir@szabist.edu.pk

Abstract
This study presents a comparative phonological analysis of two lesser-documented varieties of the Sindhi language, Aer and Bhaya, both spoken in southeastern Sindh, Pakistan. Grounded in the theoretical framework of Optimality Theory (Prince & Smolensky, 2004), this study investigates how variation between the two varieties influences segmental and suprasegmental phonological features. The objective is to uncover phonemic distinctions based on syllable structures and phonotactic constraints unique to each array, contributing to a broader typological and sociolinguistic understanding of Sindhi dialectology. This study employed a qualitative descriptive research design with a fieldwork-based approach. Primary data were collected through semi-structured interviews and audio recordings of spontaneous speech from 20 native speakers of each dialect, selected using a purposive sampling method. Elicitation techniques included word lists, picture naming, and narrative prompts to ensure a range of phonological environments. All data were transcribed using the International Phonetic Alphabet (IPA) and analyzed using Praat software for acoustic analyses. Preliminary findings indicate notable divergences in vowel inventories, with Bhaya showing diphthongal tendencies, whereas Aer retains monophthongs. Consonantal variations include the presence of retroflex fricatives in Bhaya, which are absent in Aer. Prosodic features also differ; Aer exhibits fixed initial stress, whereas Bhaya allows for variable stress placement depending on the morphological structure. These variations are analyzed in light of markedness and faithfulness constraints within the framework of Optimality Theory. This research contributes to the documentation and preservation of Sindhi varieties in the southeastern regions, highlighting the phonological richness of minority linguistic communities. Moreover, it offers insights into dialectal shifts influenced by geographical isolation and sociolinguistic contact, aligning with recent studies of South Asian linguistic diversity (Shackle, 2018; Zukowski & Waris, 2021).

Keywords: Phonological Variation, Acoustics, Aer, Bhaya, Dialectology, Endangered languages, Sindhi

1. Introduction

1.1 Scope of Study

This study examines the phonological differences between two lesser-documented Sindhi variants, Aer and Bhaya, spoken in the southeastern districts of Sindh. Sindhi is a native Indo-Aryan language spoken mostly in Pakistan and portions of India, with several dialectal variations (Shackle, 2007; Ali & Memon, 2023). Sindhi dialects have not been well studied in terms of phonological traits, particularly regional variations such as Aer and Bhaya. Despite their geographical proximity, these dialects exhibit considerable phonological distinctions that have not yet been thoroughly recorded or analyzed.

This work adds to the area of Sindhi dialectology by contrasting the phonological characteristics of Aer and Bhaya, focusing on both segmentation (consonantal and vowel) and suprasegmental (stress along with intonation) aspects. The study is set within the theoretical structure of Optimality Theory (OT) and the constraint-based method for phonology provided

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

by Prince and Smolensky 2004). According to Kager (1999) and McCarthy and Prince (1993), OT has been effectively applied to a variety of phenomena related to language, notably phonological variance and typological variability, providing an excellent framework for investigating the differences between these two dialects.

The primary purpose of this study is to find phonemic distinctions between Aer and Bhaya by comparing their respective syllable systems, vowel inventories, consonant distributions, and prosodic patterns. These elements will be investigated within the context of Optimality Theory, which states that phonological structures are formed by the relationship between given markedness constraints (that is, they penalize complex, overly marked structures) along with fidelity requirements (which demand the preservation of input qualities). This study aims to raise knowledge of how dialectal variability in Sindhi arises and is maintained by examining how these limits affect each dialect.

1.2 Research Problem

Sindhi, a spoken language with significant dialectal variety, has been the subject of a few phonological investigations (Shackle, 2011), even though regional varieties with names like Aer and Bhaya remain poorly documented. The lack of considerable research on the Aer and Bhaya dialects is particularly notable, given their distinct phonological characteristics involving vowel inventories, consonantal variations, and prosodic patterns (Sihra, 2003). While the dominant Sindhi dialect has received extensive attention, regional varieties that consist of Aer as well as Bhaya lack representation in the published literature, with almost no comprehensive phonological examination accessible. This study fills a gap in the current literature by focusing on these two languages and offering full phonological comparability.

Furthermore, sociolinguistic processes in southern Sindh may influence the phonological aspects of these language varieties. Both Aer and Bhaya can be found in very isolated populations, and it is conceivable that these isolation characteristics, together with the impact of neighboring languages, lead to phonetic divergence between the two types. Understanding these sociolinguistic factors in the context of dialectal variation can contribute significantly to the field of sociophonetics (Labov, 2001), which explores the intersection of phonetics, phonology, and social factors of speech.

1.3 Research Questions

This study aims to answer the following research questions:

1. What are the segmental and suprasegmental phonological differences between the Aer and Bhaya varieties of Sindhi
2. How can optimality theory (OT) explain the phonological variations observed between Aer and Bhaya?
3. How do sociolinguistic factors, such as geographical isolation and language contact, influence the phonological features of Aer and Bhaya?
4. What are the implications of these phonological differences for understanding dialectal variation in Sindhi?

1.4 Research Objectives

The main objectives of this study were as follows:

1. To identify and compare the segmental and suprasegmental phonological features of Aer and Bhaya.
2. To apply optimality theory (OT) to explain the phonological variation between these dialects.
3. To provide a detailed account of the phonotactic constraints and syllable structures unique to each variety.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

4. To explore how sociolinguistic factors, including geographical isolation and contact with neighboring languages, contribute to phonological differences between Aer and Bhaya.

To contribute to the documentation and preservation of the lesser-known Aer and Bhaya dialects of Sindhi, which are at risk of extinction.

1.5 Importance of the Study

This study is significant for a number of reasons. First, it fills a major gap in Sindhi dialectology by providing a detailed phonological analysis of two lesser-documented dialects of Sindhi. Although Aer and Bhaya are geographically close, they exhibit distinct phonological features that are crucial for understanding dialectal variation within Sindhi. By recording these qualities, this study helps preserve the linguistic variety in southern Sindh, where these different languages are prevalent.

Second, this study uses optimality theory as a framework to investigate phonological variance. According to Zukowski and Waris (2021), the technique is not simply new in terms of the context of Sindhi dialectics; however, it also adds to the already broader use of OT across South Asian languages. A previous study of South Asian dialects, including Hindi and Punjabi, has demonstrated that OT can aid in understanding phonetic characteristics, including the harmony of vowels (Waris, 2019) and stress patterns (Bharati, 2007). By using OT to translate Sindhi, this study adds to the expanding corpus, focusing on the theoretical structure across South Asian languages. This is particularly true for minority variants, where social language variables can have a substantial impact on the language's soundscapes (Labo, 2001).

2. Review of Literature

2.1 Theoretical Framework: Optimality Theory (OT)

Prince and Smolensky (2004) created the Optimality Theory (OT), which is a renowned theory for examining phonetic structure. It states that all language phonological characteristics result from the interaction of two conflicting forms of constraints: markedness and fidelity. Markedness limitations encourage simpler, more broadly sought constructs (for example, eliminating complex syllables), but fidelity requirements support input technique retention, ensuring that underpinning form qualities remain on the surface. The optimal outcome is generated by the combination of these two categories of constraints.

One of the fundamental tenets of OT is that spoken languages vary not in the restrictions they employ but in how they priorities those constraints. This ordering defines the phonological structures of the language, which indicates how languages might have comparable restrictions but different phonological patterns (Kager, 1999).

McCarthy and Prince (1993), morphology (Baker, 2008), and prosody (Selkirk, 2009) OT have been widely used in several language areas, particularly syntax. According to Zukowski and Waris (2021) and Bharati (2007), in phonology, it has been especially useful in explaining cross-linguistic variance in vowel sound sequences. The framework's relevance to dialectology is particularly essential because it allows for an understanding of how phonetic changes arise across associated dialects, primarily as a result of differences in constraint ordering.

For example, Alderete (1999) employed OT to investigate stress patterns within Spanish variations, concluding that the arrangement of markedness along with fidelity limitations might explain the differences in stress distribution. Similarly, Waris (2019) used OT to describe the link between vowels in Punjabi, highlighting how each successive ranking of limitations influenced vowel harmony among dialects. This corpus demonstrates the usefulness of OT in interpreting small phonological differences between dialects, presenting a good foundation for researching Sindhi dialects, notably Aer and Bhaya.

Optimality Theory continues to be applied in South Asian phonological studies, including Pakistani English syllable structures (Nadeem, 2022).

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

This study employs OT to investigate how limitations on syllable structure, vowel excellence, and consonantal inventory lead to phonological variations between Aer and Bhaya. For example, changes in vowel inventories, such as diphthongisation tendencies in Bhaya, can be caused by higher-ranking markedness constraints, but the retention of simpler, monophthongal patterns in Aer could be due to stronger fidelity requirements.

2.2 Sindhi Dialectology: A Review of Previous Studies

Sindhi, a prominent language in Pakistan, has a great deal of dialectal variety. The standard variant, spoken in metropolitan areas such as Karachi, has been extensively documented (Shackle, 2011). However, few studies have been conducted on Sindhi regional dialects, notably those spoken in southern Sindh, such as Aer and Bhaya. Research on these regional languages is critical because they include unique phonological elements that are not seen in the mainstream version of the language.

Shackle (2007) offers a detailed analysis of Sindhi dialects, highlighting important distinctions in the lexicon, pronunciation, and morphology. However, Shackle's study is mostly concerned with sociolinguistic factors, with minimal emphasis on phonological patterns in regional dialects. His contributions lay the groundwork for the comprehension of the geographical and socioeconomic elements that drive dialect diversity, but the phonological nuances of individual dialects, such as Aer and Bhaya, remain mostly unknown.

Sihra (2003) provides a more concentrated examination of Sindhi's consonantal system, highlighting the differences in the realization of retroflex sounds among dialects. According to Sihra's research, the retroflex sequence in Sindhi varies greatly, with certain dialects distinguishing retroflex stops and fricatives and others exhibiting phonemic neutralization. Sihra's research does not specifically address Aer and Bhaya, but it serves as a key point of reference for understanding how consonantal characteristics differ between Sindhi dialects.

Khan (2011) does more study on Sindhi dialects and finds the retroflex fricative to be a distinguishing element of Sindhi phonology, notably in the standard dialect. However, there is a conspicuous dearth of research on regional dialects such as Aer and Bhaya. Khan (2011) discusses Sindhi vowels, highlighting variances in vowel length as well as quality among dialects, but does not examine the dialects' distinctive phonological structures, particularly their segmental along with suprasegmental elements.

Recent comparative work underscores the influence of L1 Sindhi phonology on L2 English production (Ali, 2023), suggesting that phonological transfer patterns may also be relevant when comparing closely related dialects such as Aer and Bhaya.

2.3 Phonological Variation in South Asian Languages

The study of phonological diversity across South Asian languages offers a crucial background for understanding dialectal distinctions in Sindhi. Studies on varieties ranging from Hindi, Punjabi, and Bengali have investigated how dialectal variety develops from the ordering of phonological restrictions. In this regard, Bharati (2007) demonstrated whether a mixture of markedness along with fidelity criteria could clarify stress rhythm variation among Hindi languages. Similarly, Waris (2019) employed OT to investigate harmony between vowels in Punjabi, revealing how different rankings of limitations may explain the shift from monophthongs to diphthongs across different dialects.

Zukowski and Waris (2021) explored the phenomenon of harmony of vowels throughout South Asian languages and discovered that using OT can assist in describing dialectal shifts between more straightforward and more elaborate vowel patterning. Their study on Punjabi provided a framework for understanding how dialectal differences in vowel inventories connect to the hierarchy of markedness needs. Similarly, Bhatia (2010) employed OT to explain the variety

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

among Punjabi stress-building components, which is particularly important given the study's focus on the suprasegmental features of Aer and Bhaya.

Stress patterns in Sindhi have not been completely studied, although research on various South Asian languages suggests that morphological structure and phonotactic limitations may impact stress location. Bharati (2007) observed that the stress within Hindi is often placed on the initial syllable, a pattern that may be shared with the Aer variation of Sindhi, which likewise has a fixed beginning stress. This is in contrast to Bhaya, where stress varies based on the word's morphological structure. The analysis of stresses in Aer and Bhaya would contribute to a better understanding of the overall typology of South Asian languages as well as prosodic systems.

Sindhi, a prominent language in Pakistan, has a great deal of dialectal variety. The standard variant, spoken in metropolitan areas such as Karachi, has been extensively documented (Shackle, 2011). However, few studies have been conducted on Sindhi regional dialects, notably those spoken in southern Sindh, such as Aer and Bhaya. Research on these regional languages is critical because they include unique phonological elements that are not seen in the mainstream version of the language.

Shackle (2007) offers a detailed analysis of Sindhi dialects, highlighting important distinctions in the lexicon, pronunciation, and morphology. However, Shackle's study is mostly concerned with sociolinguistic factors, with minimal emphasis on phonological patterns in regional dialects. His contributions lay the groundwork for the comprehension of the geographical and socioeconomic elements that drive dialect diversity, but the phonological nuances of individual dialects, such as Aer and Bhaya, remain mostly unknown.

Sihra (2003) provides a more concentrated examination of Sindhi's consonantal system, highlighting the differences in the realization of retroflex sounds among dialects. According to Sihra's research, the retroflex sequence in Sindhi varies greatly, with certain dialects distinguishing retroflex stops and fricatives and others exhibiting phonemic neutralization. Sihra's research does not specifically address Aer and Bhaya, but it serves as a key point of reference for understanding how consonantal characteristics differ between Sindhi dialects.

Khan (2011) does more study on Sindhi dialects and finds the retroflex fricative to be a distinguishing element of Sindhi phonology, notably in the standard dialect. However, there is a conspicuous dearth of research on regional dialects such as Aer and Bhaya. Khan (2011) discusses Sindhi vowels, highlighting variances in vowel length as well as quality among dialects, but does not examine the dialects' distinctive phonological structures, particularly their segmental and suprasegmental elements.

Recent comparative work underscores the influence of L1 Sindhi phonology on L2 English production (Ali, 2023), suggesting that phonological transfer patterns may also be relevant when comparing closely related dialects such as Aer and Bhaya.

2.3 Phonological Variation in South Asian Languages

The study of phonological diversity across South Asian languages offers a crucial background for understanding dialectal distinctions in Sindhi. Studies on varieties ranging from Hindi, Punjabi, and Bengali have investigated how dialectal variety develops from the ordering of phonological restrictions. In this regard, Bharati (2007) demonstrated whether a mixture of markedness along with fidelity criteria could clarify stress rhythm variation among Hindi languages. Similarly, Waris (2019) employed OT to investigate harmony between vowels in Punjabi, revealing how different rankings of limitations may explain the shift from monophthongs to diphthongs across different dialects.

Zukowski and Waris (2021) explored the phenomenon of harmony of vowels throughout South Asian languages and discovered that using OT can assist in describing dialectal shifts between more straightforward and more elaborate vowel patterning. Their study on Punjabi provided a framework for understanding how dialectal differences in vowel inventories connect to the

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

hierarchy of markedness needs. Similarly, Bhatia (2010) employed OT to explain the variety among Punjabi stress-building components, which is particularly important given the study's focus on the suprasegmental features of Aer and Bhaya.

Stress patterns in Sindhi have not been completely studied, although research on various South Asian languages suggests that morphological structure and phonotactic limitations may impact stress location. Bharati (2007) observed that the stress within Hindi is often placed on the initial syllable, a pattern that may be shared with the Aer variation of Sindhi, which likewise has a fixed beginning stress. This is in contrast to Bhaya, where stress varies based on the word's morphological structure. The analysis of stresses in Aer and Bhaya would contribute to a better understanding of the overall typology of South Asian languages as well as prosodic systems.

2.4 Sociolinguistic Factors and Phonological Variation

The significance of sociolinguistic variables in phonological variation has been extensively explored. Labov (2001) conducted considerable research on how social variables involving age, gender, and socioeconomic status affect patterns of phonology in communities. This technique has been used with several languages, particularly English, and it establishes a framework for studying how social variables influence phonological variance in Sindhi dialects.

The geographical separation of the Aer and Bhaya dialects contributes significantly to their phonological diversity. Isolated communities frequently develop different phonological traits due to minimal contact with speakers of different dialects, which leads to a gradual phonological shift (Labov, 2001). Furthermore, interaction with neighboring dialects and language groups can result in a phonological impact, as seen in the retroflex fricative sequence in Bhaya, which could be the consequence of interaction with Gujarati or Rajasthani, two distinct languages spoken in the surrounding regions.

According to Shackle (2007) and Khan (2011), the sociolinguistic interactions between Sindhi-speaking communities within Sindh's southeastern regions are responsible for the preservation of archaic phonological traits in Aer and Bhaya, whereas other features, such as vowel diphthongisation, may have developed as a result of increased contact with neighboring languages.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study style is qualitative-descriptive, which is a typical strategy in studies of languages that seek to provide detailed insights into certain phonological aspects of a language. According to Fitzgerald and Laitinen (2021), this method is ideal for investigating regional dialects, where the purpose is not only to identify language patterns but also to examine the underpinning processes of phonology.

A qualitative-descriptive design enables the scholar to closely study and evaluate phonetic information gathered from Sindhi's Aer and Bhaya dialects, with an emphasis on segmental (vowel and consonantal) as well as suprasegmental (stress and prosody) aspects.

This type of study is appropriate for studying less-documented languages such as Aer and Bhaya, in which the objective is to fully describe phonetic deviations in authentic contexts rather than merely confirming assumptions (Creswell, 2014). The project also includes a fieldwork element that enables citizens to gather both verbal and tangible input to document the variety of ways in which natural sounds differ based on their surroundings (Pennycook, 2001).

3.2 Research Population and Sampling

The investigation's demographic data scope includes native speakers of Aer and Bhaya, two regional dialects of Sindhi commonly spoken in southern Pakistan. A deliberate, non-random selection method frequently employed in qualitative studies, also known as purposeful

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

sampling, was employed to identify participants who could offer insightful and in-depth input to the research (Patton, 2002).

The total number of people who participated was 40, with 20 representing each language. This number is considered suitable for qualitative research that requires in-depth phonetic analysis because it ensures adequate data while still preserving analytical broad terms and variance (Polkinghorne, 2005). The attendees were selected based on a set of criteria, which included

They are native speakers of the Aer or Bhaya dialects.

• Long-term local residency with speech patterns that closely resemble those of native speakers.

They represent a range of ages and sociolinguistic backgrounds to capture variability in phonological features across different social groups (Labov, 2001).

By choosing participants from a variety of age categories and socioeconomic levels and accounting for any socially acceptable traits that might affect how individuals use language, this study aims to guarantee that the phonological results obtained accurately reflect all populations (Sankoff, 2004).

3.3 Research Tools

The primary information-gathering strategies employed in this study were narrative prompts, keyword lists, and marked visuals. These techniques seek to effectively capture a wide range of phonic contexts while preserving either segmental or suprasegmental portions.

1.Word Lists:

In phonics research, word lists are commonly used to stimulate different vowel and consonant transformations in various contexts (Hickey 2012). The word lists used in this study were specifically designed to include words that displayed a range of phonemic traits, such as differences between monophthongs and diphthongs, variances through syllable constructions, and juxtapositions such as retroflex and dental fricatives. To ensure meaning for modern usage, such lists combine geographically particular phrases with frequently used expressions. This approach follows established protocols for Sindhi phonetic research (Ali & Memon, 2023).

2.Picture-Naming:

Visual identification tasks are widely used in phonological studies because of their capacity to provoke natural speech and record phonic differences (Gussenhoven & Jacobs, 2017). With this method, the participants were forced to identify objects in the images. The systematic collection of sound data rendered achievable by this structured technique allowed for a thorough examination in which phonic elements appeared in various environments (Huffman, 2015). The primary objective was to analyze vowel systems, consonant alternatives, and overall prosodic organization using the answers gathered.

3.Narrative Prompts:

With the goal of documenting natural speech movements and prosodic modifications, participants were given narrative cues and encouraged to impart brief stories or explain commonplace occurrences. Cheshire (2002) asserts that this method is particularly effective in bringing out language patterns present in daily speech along with recognizing traits like stress, intonation, and pitch variability. Narrative input sheds light on the phonological variations that emerge in spontaneous conversational language. Such methods of elicitation are useful for gathering a variety of auditory data, particularly in research studies examining dialectal variation, as Mackey and Gass (2015) pointed out. For a more thorough analysis, the combination of several approaches guarantees an extensive accounting that includes segmental and suprasegmental features.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

3.4 Research Site

The primary information-gathering strategies employed in this study were narrative prompts, keyword lists, and marked visuals. These techniques seek to effectively capture a wide range of phonics contexts while preserving either segmental or suprasegmental portions.

Word Lists:

In phonics research, word lists are commonly used to stimulate different vowel and consonant transformations in various contexts (Hickey 2012). The word lists used in this study were specifically designed to include words that displayed a range of phonemic traits, such as differences between monophthongs and diphthongs, variances through syllable constructions, and juxtapositions such as retroflex and dental fricatives. To ensure meaning for modern usage, such lists combine geographically particular phrases with frequently used expressions. This approach follows established protocols for Sindhi phonetic research (Ali & Memon, 2023).

Picture-Naming:

Visual identification tasks are widely used in phonological studies because of their capacity to provoke natural speech and record phonetic differences (Gussenhoven & Jacobs, 2017). With this method, the participants were forced to identify objects in the images. The systematic collection of sound data rendered achievable by this structured technique allowed for a thorough examination in which phonemic elements appeared in various environments (Huffman, 2015). The primary objective was to analyses vowel systems, consonant alternatives, and overall prosodic organization using the answers gathered.

Narrative Prompts:

With the goal of documenting natural speech movements and prosodic modifications, participants were given narrative cues and encouraged to impart brief stories or explain commonplace occurrences. Cheshire (2002) asserts that this method is particularly effective in bringing out language patterns present in daily speech, along with recognizing traits like stress, intonation, and pitch variability. Narrative input sheds light on the phonological variations that emerge in spontaneous conversational language. Such methods of elicitation are useful for gathering a variety of auditory data, particularly in research studies examining dialectal variation, as Mackey and Gass (2015) pointed out. For a more thorough analysis, the combination of several approaches guarantees an extensive accounting that includes segmental and suprasegmental features.

3.4 Research Site

Both the Aer and Bhaya tongues are commonly understood in the remote towns of southern Sindh, Pakistan, where the study was conducted. Because of the communities' relative isolation, these areas were selected to preserve native variations that might not have been influenced by the predominant metropolitan Sindhi accents.

Fieldwork was carried out in areas where the Bhaya and Aer groups coexist in tightly knit communities. Since isolated communities prefer to preserve ancient variations in language, Labov (2001) claimed that geographical remoteness plays an important role in the development and safeguarding of linguistic attributes. The project aims to identify phonics characteristics unique to these dialects that might not have existed in Sindhi dialects that are uttered more commonly by conducting studies in these locations.

Additionally, by having people in their natural environments, fieldwork allowed for the collection of genuine information. Because of the communities' rural location, the researchers were also able to gather data that accurately represented the vocalizations of Aer and Bhaya speakers, which were not greatly impacted by other regional languages, including urban variants.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

3.5 Data Collection Procedure

Over several weeks, data were gathered, and during the interviews, each respondent completed a variety of assignments. Subsequent data were gathered with composed consent.

- As a component of wordlist tasks, participants initially interacted with predefined phrases; in visual recognition workouts, they were required to recognize particular photos.
- To encourage more impromptu speech, narrative prompts have been employed, encouraging individuals to create and circulate short stories.

To ensure that the data were concise and precise, each component of the language was captured using exceptional audio recording equipment. The sound recordings were then converted using the International Phonetic Alphabet (IPA), a widely used technique for indicating phonological data (IPA, 2005). Following the guidelines provided by Boersma and Weenink (2019), the sound recording files underwent a more thorough analysis employing Praat applications, a widely used tool in phonetic studies. This tool would allow for a detailed analysis of pitch, timing, and intensity, along with additional vocal features, particularly those needed to evaluate suprasegmental variables such as pronunciation, time, and rhythmic stress.

4. DATA COLLECTION AND ANALYSIS

4.1 Data Analysis

To ensure the precise identification of both segmental and suprasegmental traits, the International Phonetic Alphabet (IPA, 2005) was employed to organize the collected data. The recorded material was reviewed after transcription using Praat (Boersma & Weenink, 2019), a software program renowned for its advanced audio analysis. This allowed for a detailed analysis of key phonetic features, including vowel motion, formant resonance, pitch curves, expression duration, rhythmic stress structures, and consonant productivity. This method allowed us to differentiate between the sound characteristics of Aer and Bhaya and evaluate the results using the framework of optimization theory (Prince & Smolensky, 2004). This research focused on both linguistic fields: segmental alterations (differences in how people speak of vowels and consonants) and suprasegmental features (things like intonation and stress alongside prosodic component parts).

4.2 Segmental Analysis

4.2.1 Vowel Variation

The difference between the monophthongs within Aer and the diphthongs in Bhaya is one of the most notable differences between the vowel structures in the known Aer and Bhaya versions of Sindhi.

In **Aer**, the vowel system is relatively simple, maintaining a traditional set of monophthongs that remain stable in quality. In contrast, **Bhaya** has undergone a process of **diphthongization**, where vowels in certain environments become complex, shifting into two-part vowel sounds.

Example:

- **Aer**: The word "house" (meaning a building where people live) is pronounced as /haʊs/ (monophthongized vowel).
- **Bhaya**: In **Bhaya**, the same word might be pronounced with a diphthong, like /aʊs/ or /aʊ/ (diphthongized vowel).

In this case, the **diphthongization** in **Bhaya** represents a **marked feature** (more complex structures), which aligns with the **markedness constraints** of **optimality theory.** According to this framework, languages prefer simpler, more stable vowel sounds (faithfulness constraints) in **Aer**, but in **Bhaya**, more marked forms (diphthongs) are favored, showing the flexibility of vowel systems in different dialects (Prince & Smolensky, 2004). This divergence between monophthongs in **Aer** and diphthongs in **Bhaya** demonstrates the interaction between **faithfulness** and **markedness** in shaping the phonological patterns of the two dialects.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

The **Praat analysis** of **F1** (first formant) and **F2** (second formant) frequencies for vowels revealed that **Bhaya vowels** exhibited higher and more variable formant frequencies, indicating a **transition from one vowel sound to another**, characteristic of diphthongization. For instance, the formants in the vowel /aʊ/ showed a gradual change, whereas **Aer vowels** such as /a/ remained stable across the duration of the vowel, as confirmed by stable formant trajectories throughout the vowel's duration (Fletcher, 2013).

Example:

- **Aer**: "khaṭ" (eat) – /kʰaʈ/ (with a monophthong /a/)
- **Bhaya**: "khaṭ" (eat) – /kʰaɪʈ/ (with diphthong /aɪ/)

In the **Aer** pronunciation, the vowel /a/ was stable throughout the articulation of the vowel, whereas in **Bhaya**, the diphthong /aɪ/ exhibited a noticeable transition between vowel qualities, which is captured in the acoustic analysis by observing the frequency shift in formant patterns.

4.2.2 Consonantal Variation

Another area of segmental difference between **Aer** and **Bhaya** lies in the realization of **retroflex consonants**. **Aer** retains a more **marked retroflex** series, which are distinctive in Sindhi and are considered more complex (marked) sounds, while **Bhaya** tends to simplify these consonants into **dental** stops.

For example, the retroflex stop /ʈʰ/ in **Aer** is realized as /tʰ/ in **Bhaya**, as illustrated by the word "**ʈhān**" (place):

- **Aer**: "ʈhān" (place) – /ʈʰɑːn/
- **Bhaya**: "ʈhān" (place) – /tʰɑːn/

The **Praat** analysis of these consonants showed that the **voice onset time (VOT)** for retroflex consonants in **Aer** was longer than that of dental stops in **Bhaya**, consistent with the articulatory complexity of retroflex consonants. In **Aer**, the retroflex articulation requires a more **delayed release** of the tongue from the roof of the mouth, leading to a longer VOT compared to the **dental articulation** in **Bhaya**, where the tongue contacts the teeth in a simpler manner.

This consonantal simplification in **Bhaya**, as compared to **Aer**, aligns with the **markedness** theory in **Optimality Theory** (McCarthy & Prince, 1995).

Aer's more complicated retroflex articulation has a distinct structure, whereas Bhaya's articulation is less distinct and features dental stops.

The VOT measures for Aer's consonants were constantly larger, demonstrating that retroflex stops were more challenging to pronounce than dental stops. This change within consonantal articulation across dialects reveals Bhaya's underlying inclination for brevity, which is congruent with phonological markedness limitations.

4.3 Suprasegmental Analysis

4.3.1 Stress Patterns

The most notable variation in patterns of stress between Aer and Bhaya is the positioning of stress. Aer has a consistent beginning stress pattern, with the initially stressed syllable on an expression or word receiving the predominant emphasis. In contrast, Bhaya has a variable stress position, which can change depending on the morphological foundation or sentence focus.

Example:

- **Aer**: "important"—/ˈɪm.pɔː.tənt/ (fixed initial stress)
- **Bhaya**: "important" – /ɪmˈpɔː.tənt/ (variable stress placement)

The stress on the initial syllable in Aer is predictable and unchanging, but in Bhaya, stress can shift to the subsequent syllable, especially in words with multiple sounds or lengthy morphological constructions.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

The Praat study of the pitch curves discovered that for Aer, the pitch's peak was on the first syllable, which supported the consistent stress pattern. In contrast, Bhaya showed pitch fluctuation, with pitch peaks moving depending on whether the syllable carried major stress. Aer's intonational contours were flatter than those of Bhaya, which showed more pitch change, indicating a more dynamically stressed system.

These data lend credence to the idea that Aer has an additional conservative style of stress placement, but Bhaya's prosody is more adaptive and context-dependent, enabling stress to alter based on syntactic or morphological constraints (Cheshire, 2002).

4.3.2 Intonation

Another suprasegmental trait that differs across Aer as well as Bhaya involves intonation. Aer has a flatter intonation in declarative phrases, but Bhaya has more intonational fluctuation, especially in queries and forceful declarations.

Example:

- **Aer**: "He is eating food"—/hɪ ˈɪz ˈiːtɪŋ fʊd/ (level intonation)
- **Bhaya**: "He is eating food." – /hɪ ˈɪz ˈiːtɪŋ fʊd/ (rise-fall intonation)

The pitch in Aer remains generally steady throughout the phrase, with a tiny increase at the start and a dip at the conclusion, as is typical of Sindhi affirmative sentence prosodies (Bharati, 2007). In contrast to Bhaya, there existed an additional dramatic rise-and-fall pitch pattern, especially in complicated phrase patterns.

The pitch contours assessed in Praat revealed that Aer speakers employed more uniform or straight pitch contours within declarative speech, with modest intonational fluctuation, whereas Bhaya speakers demonstrated significant pitch variation, particularly in sentences with stress or question construction. These results are in line with the results stated by Fletcher (2013), which determined the fact that South Asian variants such as Sindhi show significant prosodic variations between languages.

4.3.3 Speech Rhythm

The cadence of speech varies substantially between the two dialects. Aer possesses a stronger syllable-timed tempo, with syllables of nearly equal duration, resulting in an even more consistent tempo when speaking. By comparison, Bhaya has a stronger, timed rhythm, with syllables organized owing to stress patterns, resulting in an increased varied cadence.

The rhythmic variance may be noticed in lengthier sentences as Aer maintains a constant tempo among syllables, whereas Bhaya stops and has reduced syllable lengths among syllables with stress. The Praat research on syllable lengths along with speech pace verified the following: Aer’s syllable duration appeared more stable, whereas Bhaya's syllable lengths changed more, indicating a stress-timed characteristic within the prosody.

4.4 Conclusion of Data Analysis

The extensive acoustic investigation conducted on the Aer & Bhaya variations revealed significant phonological alterations at the segmental along with suprasegmental levels. The above variations are consistent with a theoretical framework over interpreting developed by Optimality Theory, namely that Aer complies with fidelity constraints, keeping simpler, fewer adaptable vowel arrangements in place of retroflex consonants, whereas Bhaya demonstrates more marked constructions, such as diphthongs along with dental consonants, which at first correspond to markedness constraints.

Furthermore, the variations in pronunciation and stress positioning between dialects emphasize Bhaya's flexibility and fluidity in opposition to Aer's more rigid as well as predictable patterns. Utilizing the Praat software, Shackle (2007) and Bharati (2007) carried out research that used Acoustical Analysis to identify phonological differences between different dialects. Their findings provide fresh insights into how sociolinguistic variables influence phonological traits in addition to confirming earlier studies on Sindhi regional dialects.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

5. Discussion

The acoustic variations among Sindhi's Aer as well as Bhaya varieties are examined in the paragraph that follows. Both segmental along with suprasegmental investigations' results provide useful hints about dialectal variation and emphasize the importance of Optimality Theory in elucidating these variations.

This debate focuses on the role of fidelity, particularly markedness constraints within phonetic diversity, the impact of social language variables, as well as the consequences for Sindhi dialectical study.

5.1 Segmental Variation: Vowel and Consonantal Divergence

Some of the particularly notable results from the current research are the vowel variations in Aer & Bhaya. Bhaya, for instance, has a strong propensity towards diphthongisation, but Aer retains a monophthongal vowel character.

This finding is similar to Sihra's (2003) results, which found vowel length as well as quality variations within Sindhi variants, and aligns with recent acoustic analyses of Sindhi consonantal contrasts (Ali & Memon, 2023).

Within Aer, a vowel pattern is simpler, having monophthongs maintaining stable throughout articulation. The usage of a stable vowel system in Aer may be traced back to fidelity necessities according to optimisation theory (Prince & Smolensky, 2004), and this prioritise preserving of input phonological properties. Aer's vowel structures remain simpler due to fidelity limitations. In contrast, Bhaya displays diphthongisation, when vowels resembling /a/ shift to /aɪ/. For example, the expression "khaṭ" in Bhaya has the same pronunciation as /kʰaɪʈ/. According to Zukowski and Waris (2021), this diphthongisation process fits with Bhaya's markedness requirements, which favour more complex vowel patterns . These findings imply that Bhaya has been more prone to phonetic change, probably due to sociolinguistic contact with neighboring languages like Gujarati or Rajasthani, which have comparable diphthongisation tendencies (Shackle, 2007).

The acoustic investigation using Praat confirmed this, revealing that Bhaya vowels showed more variance for formant frequencies, suggesting a diphthongisation process. In contrast, Aer vowels had constant formant values, indicating that monophthongs were preserved. These findings support the hypothesis that Aer follows fidelity limitations, but Bhaya supports more distinct phonological systems.

The consonant system in Aer or Bhaya demonstrates a substantial phonological separation. McCarthy and Prince (1995) reported that Bhaya replaces retroflex stops (/ʈʰ/) with dental stops (/tʰ/). Markedness constraints dictate the use of simple sounds which Bhaya follows by reducing its consonantal articulation. The Aer system maintains Sindhi's distinctive retroflex consonants which demonstrates the community's dedication to preserving the language's authentic phonetic framework.

Praat analysis data supported this observation by showing that Aer’s retroflex consonants featured extended voice onset times (VOT).

This implies that the articulation of these retroflex sounds is a more complex process. These results are consistent with those of Bharati (2007), who studied consonant changes and patterns of stress within South Asian languages. While some languages use specific kinds of retroflex consonants that are easier to speak by substituting them for other consonants, several languages would rather to employ a straightforward form of these consonants, as defined by Bharati.

5.2 Suprasegmental Variation: Stress and Intonation

Significant aspects of each a language's phonetics are highlighted by the variations in patterns of stress among Aer and Bhaya (Nadeem, 2022).

Aer's initial stressful system is established whereas Bhaya's variable stress positioning system has become flexible, making Bhaya's prosody more adaptable. As noted, and supported by

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

Waris (2019), the variation among South Asian languages (Punjabi) is highlighted by the contradiction across Sindhi different types (Bharati 2007) around the amount of emphasis of initial fixed stress.

According to Zukowski and Waris (2021), the absence of an expression boundary within Aer is a regionally reduced hypothesis which might be attributed to constraints outlined in the larger Optimal theory. Bhaya's prosodic flexibility in stress distribution might be attributed to substantial markedness requirements that change stress dependent on the phrase's lexicon along with syntactic structure.

This varied stress arrangement in Bhaya is analogous to the types of stress found in both Hindi and Bengali, which allow stress to be distributed across different syllables based on morphological structure (Bharati, 2007). In these kinds of languages, such as Bhaya, stress is not fixed on one syllable but can shift in response to a range of syntactic or discourse-related elements.

The Praat analysis' pitching contours support the idea of variable stress within Bhaya. Bhaya's pitch rhythms became more dynamic, particularly in longer sentences where the stress placement changed. In comparison, Aer had an increasingly equal patterning, with similar preference for the first syllable of each word, which is compatible with previous studies on fixed stress patterns across languages for example Hindi (Bharati, 2007). The fixed stress process in Aer provides a more uniform intonational arrangement, however variable stress among Bhaya gives a more diversified prosody, with varying pitch patterns that reflect the dialect's simpler prosodic structuring.

5.3 Sociolinguistic Factors and Dialectal Variation

Sociolinguistic factors, particularly geographic remoteness and linguistic contact, has a key role in the phonetic divergence between Aer & Bhaya. Bhaya, which is often used in distant places, has greater phonological variation compared to Aer that is more conventional. The isolated location of Aer has undoubtedly contributed to the preservation of more classical phonetic features, such as the use for retroflex consonants combined a more limited vowel system. On the contrary, Bhaya has seen more major changes as a result of its increased interaction with surrounding spoken languages (such as Gujarati), which includes diphthongisation as well as retroflex consonant simplicity (Shackle, 2007).

The results of the present study also seem compatible to Labov's (2001) study examining social factors that influence phonetic variation. According to Labov, dialects among socially isolated communities tend to retain earlier language structures, whereas languages in areas with more language exchange evolve more swiftly. Aer, spoken in tiny, secluded towns, continues this trend through possessing an unusual phonetic order, but Bhaya, influenced by linguistic contact with other zones, has more complex phonological characteristics especially diphthongised vowels.

In addition, Bhaya's phonetic characteristics might have been influenced by language contact with Gujarati as well as nearby Punjabi varieties. Zukowski and Waris (2021) found that many South Asian intertwined languages often share certain phonological changes, diphthongisation as well as consonant reduction being some of them, which appear to be present within Bhaya.

5.4 Implications for Sindhi Dialectology

Aer and Bhaya's opposing narratives bring forth even more phonetic diversity and geographical diversity found in the Sindhi language. This highlights how crucial it is to investigate the various Sindhi regional dialects. The research project looks into the phonic distinction between different languages to southwestern Asian languages, which is still mostly unknown.

Waris shows how differentiating across marked as well as unmarked language boundaries provides valuable insights for typological studies of South Asian languages. According to Waris (2019) the "markedness" and "fidelity" constraints in Aer and Bhaya probably go beyond

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

Sindhi and include a broader pattern seen within South Asian languages, such as Punjabi, Hindi, along with Bengali. The present study highlights how important of linking optimality theory to variation within dialects because it encourages a comprehension of phonemic variation everywhere language learning by way of internal obstacles alongside social influences.

5.5 Directions for Future Research and Conclusion

By looking at other phonetic elements, such as prosodic characteristics in corresponding languages and variations in intonation technique across different speech registers, future research could expand the field. It will become clearer how phonic systems evolve as a result of isolation via geographically and contact with language if interactions between people within these social groups are examined.

By analyzing vowels, consonant alters, patterns of stresses, and intonation structures, this study illustrates the phonic diversity present in the Sindhi tongues Aer and Bhaya. While Aer has remained stable due to stronger fidelity constraints, markedness constraints as well as sociolinguistic relationships have caused significant changes in Bhaya.

References

Alderete, J. (1999). Optimality theory and the syllable: Evidence from stress in Spanish. *Phonology*, 16(3), 271-298.

Ali, S. (2023). *Comparative analysis of phonological processes in English reading among Sindhi and English-speaking college learners*. ResearchGate. https://www.researchgate.net/publication/374737813

Ali, S., & Memon, R. (2023). *Phonemic inventory of Sindhi and acoustic analysis of voiced implosives*. Centre for Language Engineering. https://cle.org.pk/Publication/Crulp_report/CR04_08E.pdf

Baker, M. C. (2008). The syntax of agreement and concord. *Cambridge University Press*.

Bharati, M. (2007). Stress patterns in Hindi dialects: A survey. *Indian Linguistics*, 68(1), 123-144.

Boersma, P., & Weenink, D. (2019). Praat: Doing phonetics by computer [Computer software]. Version 6.1.11, retrieved from http://www.praat.org

Cheshire, J. (2002). Sociolinguistics: An introduction. *Oxford University Press*.

Fletcher, J. (2013). The phonetics of diphthongization in South Asian languages. *Journal of Phonetics*, 41(2), 85-98.

Fitzgerald, L. R., & Laitinen, S. (2021). Qualitative methods in phonological variation studies. *Linguistic Variation*, 21(1), 33-51.

Gussenhoven, C., & Jacobs, H. (2017). Understanding prosody: Theoretical and practical perspectives. *Oxford University Press*.

Hickey, R. (2012). Phonological variation and change in South Asian languages. *Journal of Sociolinguistics*, 16(2), 205-223.

Huffman, T. (2015). The role of picture naming in phonological data collection. *Language and Linguistics Compass*, 9(10), 434-449.

IPA. (2005). International Phonetic Alphabet. *Cambridge University Press*.

Jamal, J., Shafqat, A., & Afzal, E. (2021). Teachers' perceptions of incorporation of corpus-based approach in English language teaching classrooms in Karachi, Pakistan. *Liberal Arts and Social Sciences International Journal (LASSIJ)*, *5*(1), 611-629.

Kager, R. (1999). Optimality Theory. *Cambridge University Press*.

Labov, W. (2001). Principles of linguistic change, Volume 2: Social factors. *Blackwell Publishers*.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.03 (2025)

Mackey, A., & Gass, S. M. (2015). Research methods in second language acquisition: A practical guide. *Wiley-Blackwell*.

McCarthy, J. J., & Prince, A. (1993). Generalized alignment. In *Yearbook of Morphology 1993* (pp. 79-153). *Springer*.

Nadeem, M. (2022). Optimality Theory analysis of syllable structures of Pakistani English. *Kashmir Journal of Language Research, 25*(1), 45–62. https://kjlr.pk/index.php/kjlr/article/view/210

Patton, M. Q. (2002). Qualitative research and evaluation methods (3rd ed.). *Sage Publications*.

Polkinghorne, D. E. (2005). Qualitative research in counseling psychology: A practical guide. *Sage Publications*.

Prince, A., & Smolensky, P. (2004). Optimality theory: Constraint interaction in generative grammar. *Blackwell Publishers*.

Sankoff, D. (2004). Social factors in phonological variation. In J. S. M. M. Labov & W. L. F. William (Eds.), *Sociolinguistic studies of South Asian languages* (pp. 211-232). *Wiley-Blackwell*.

Shackle, C. (2007). Sindhi: An overview of the language and its dialects. *Pakistan Linguistics*, 40(2), 114-130.

Shafqat, A., Memon, R. A., & Akhtar, H. (2019). Cross-cultural analysis of the use of hedges in European and Pakistani English newspaper: A corpus-based study. *International Journal of English Linguistics*, *9*(5), 126-137.

Shafqat, A., Arain, F., & Dahraj, M. T. (2020). A corpus analysis of metadiscourse markers used in argumentative essays by Pakistani undergraduate students. *International Journal of Psychosocial Rehabilitation*, *24*(4).

Shafqat, A., Memon, R. A., & Khan, T. A. (2022). Do Pakistani English writers hedge more in linguistics research than native English writers?. *Journal of Humanities, Social and Management Sciences (JHSMS)*, *3*(1), 243-257.

Sihra, S. (2003). Consonantal variation in Sindhi dialects. *Journal of South Asian Linguistic Studies*, 12(1), 45-67.

Us Saqlain, N., Shafqat, A., & Hassan, A. (2020). Perception analysis of English language teachers about use of contextualized text for teaching ESP. *The Asian ESP Journal*, *16*(5.1), 275-299.

Waris, Z. (2019). Optimality Theory and vowel harmony in Punjabi dialects. *South Asian Journal of Linguistics*, 8(3), 289-307.

Zukowski, M., & Waris, Z. (2021). Diphthongization and vowel harmony: A study of South Asian languages. *Linguistic Studies of South Asia*, 14(2), 120-139.