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RESEARCH PAPER

Voice Onset Time (VOT) Analysis of Saraiki Stops: Phonological and Perceptual Implications

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ABSTRACT

The purpose of current study is to investigate Voice Onset Time (VOT) for Saraiki stops of the Multani dialect and their subsequent effects on the vowel duration. The nature of this study is descriptive, and it has employed an experimental and descriptive research design. By employing criterion purposive sampling technique (Dörnyei, 2007), five participants from native Saraiki speakers between the age of 20-35, and specifically from native Multani Dialect have been selected. The Saraiki 16 stops (bilabials, dental, retroflex, velar and uvular) were recorded from five Saraiki speakers of the Multani dialect. These stops were recorded in a CVC pattern where the initial consonants were meant for analysis. The Praat software has been used for generating spectrograms and waveforms of each stops and their effects of Vowel length have been measured and marked. The findings revealed that among all the stops, dental / ʈ / has the shortest VOT duration (0.009 ms), whereas the bilabial aspirated / **bʰ** / has the longest VOT duration (0.140 ms). In Saraiki voiceless stops, the dental / **ʈ /** has the shortest VOT duration (0.009 ms), and bilabial aspirated/ **pʰ** / has the longest VOT duration (0.028). In Saraiki voiced stops, the alveolar / **ɖ /** has the shortest VOT duration (0.40 ms) while bilabial aspirated / **bʰ** / has the longest VOT duration (0.140 ms). The results also revealed vowel sound was longer after the voiced bilabial aspirated **/bʰ/** (0.197 ms) and shorter after voiceless stop **/k/** (0.136 ms). Overall VOT and vowel length was found higher in aspirated as compare to un aspirated stops. The study recommends the comparison of VOT of Saraiki stops with other regional languages.

KEYWORDS Multani Dialect, Phonological Features, Saraiki Language, VOT of Saraiki Stops

Introduction

In Pakistan people can speak and understand more than two languages that is why it is called a multilingual country. Punjabi, Balochi, Sindhi, Pashto, Urdu and Saraiki are main indigenous languages of Pakistan. There are diverse claim regarding the total numbers of native languages in Pakistan. According to Tariq Rehman (2002) 59 languages are spoken in Pakistan but Ethnologue claimed the figure of 72 languages. Most of the spoken languages belong to Indo-Iranian, Indo-Aryan, Turkic and Indo-European languages (Gordon, 2005).

According to Latif (2006) Saraiki has origin from Indo Aryan Language family. It has similarity with Punjabi and Sindhi as it has 85% lexical similarity with Sindhi and 68%

with Odki, Dhakti and Sansi (Latif, 2006). As in 7th century Saraiki speaking area was the part of Sindh that is why it is sometimes called the sister of Sindhi language. Later Multan was separated from Sindh in 8th century due to this reason it is also referred as Multani language as well (Kula & Syed, 2020)). It was in 1980, it has been called a pure form of Saraiki by Rasoolpuri (Awan et al. 2012).

The word 'Saraiki' was first used in Bazm-e- Saqafat held in Multan in 1962 (Awan et al. 2012). Later during the reign of Zia-ul-Haq it was given an independent status of language (Latif, 2006). Hence, during the census of 1981 it was treated as individual language with the population of 9.83% in Pakistan (Rehman T., 2002). According to Farooq et al. (2018), 20,000 speakers of Saraiki are in India and 13,943,106 are in Pakistan. Saraiki is local regional language of Pakistan but broadly spoken in South Punjab, some areas of Khyber Pakhtunkhwa, Balochistan and Sindh (Awan et al, 2012). It is well-thought-out a first language in central Pakistan but a second language for the rest of Pakistanis. Hence, it is considered a commonly known language (Haq, 1967). Six dialects of Saraiki have been identified by Awan et al (2012) and Shackle (1976): Shahpuri, Sindhi, Jhangi, Southern, Central variety, Northern variety (Shackle, 1976). Central variety belongs to Multan, Muzaffargarh, D.G.Khan, Bahawalpur, and it is considered a standard dialect of Saraiki. There is a debate about the history of Saraiki. Mughal (2007) has, however, demonstrated that this language is the oldest of all languages of the Sub-continent. Kalanchvi (1989) has also stated it to be the first-born of all the languages of Indus Valley.

Figure No.1 Distribution of Saraiki Language in Pakistan

Nevertheless, Saraiki language is particularly different from its family languages like Sindhi, Punjabi and Urdu. Shackle (2003) stated that the expansion of four implosive phonemes and the retaining of HISTORICAL ASPIRATION have made Saraiki different from Urdu and Punjabi. Pakistani languages have been divided in to two circles: iner and outer circles and Saraiki has been classified with name of the Lahnda. This term represents the direction of the sunsets that is why it has been used for the language of the people living in west Punjab (Grierson, 1916). Later, Grierson (1919) himself found no sufficient relation between Lahnda and Saraiki and contended against using this term for Saraiki. Similarly, Saraiki and Sindhi display some grammatical and morphological differences (Grierson 1919). Atta (2019) argued that Saraiki is not dialect of any other language rather it is a language of its own. As Saraiki is an Indo-Aryan language, it has a principally Indo-European lexis, nonetheless with plentiful loanwords from Urdu language. According to the Perso-Arabic script, Saraiki is also written from right to left. It represents some implosive sounds which are different from Arabic and Urdu.

Table 1.
The Saraiki Consonants system (Atta et al., 2023)

Place	Manner	Bilabial	Labio-dental	Dental/Alveolar	Retroflex	Palatal	Velar	Glottal
Plosive	Voiceless	p		ʈ̪	ʈ	c	k	

	Aspirated	pʰ		ʈʰ	ʈ̣ʰ	cʰ	kʰ	
	Voiced	b		ɖ	ɖ̣	ɟ	g	
	Voiced Aspirated	bʱ		ɖʱ	ɖ̣ʱ	ɟʱ	gʱ	
Implosive		ɓ		ɗ		ʄ	ɠ	
Affricate	Voiceless					ʧ		
	Voiced					ʤ		
Nasal		m		ɳ	ɳ̣	ɲ	ŋ	
Fricative	Voiceless		f	s	ʂ	ʃ	x	h
	Voiced		v	z			ɣ	
Lateral				l				
Tap/Flap				ɾ	ɽ			
Approximant						j		

Saraiki language has 49 consonants (Atta et al., 2023).

Literature Review

The previous researches on Phonological aspects of Saraiki language focused on the impact of mother language on the pronunciation of vowel sounds, on finding the nasality in segments of Saraiki and analyzing loanword phonology of Saraiki language through the application of optimality theory.

Few researchers' analyzed Saraiki language from the perspective of vowel sounds and in this respect, Awan, Ayoub, & Bashir (2016) carried out a research on Saraiki language to analyze the impact of mother tongue language on the pronunciation of English vowels. The researchers found out that non-native speakers of English language face difficulties in the pronunciation of English vowel sounds. The reason behind these difficulties is the difference in the spelling and pronunciation in English language. Non-native speakers find it difficult to identify the differences between spelling and pronunciation because of influence of mother tongue, lack of teachers' guidance and inconsistency of English vowels. The researchers collected data from fifty students of five government and private schools of Multan city. The selected students were made to pronounce one hundred words of English and their data was recorded in CD. The data was analyzed into percentages. The results revealed that students' incorrect pronunciation was due to errors in written language, improper guidance by teachers, influence of mother tongue, lack of teachers' training and ineffective teaching method. The researchers also suggested some means to improve pronunciation of English vowels.

Analyzing the aspects of Saraiki consonants, Hussain (2018) analyzed voice on set time of stops and its variations with respect to places of articulation of ten languages namely Pashto, Wakhi, Punjabi, Jangli, Shina, Sindhi, Urdu, and Siraiki and Burushaski. The results revealed a clear VOT distinction between voiceless aspirated and voiceless unaspirated stops. A shorter voicing lag VOTs was observed in un aspirated stops than in voiceless aspirated stops. Similarly, Syed and Malik (2016) analyzed attrition of saraiki language from the perspective of gender, attitude, markedness, frequency of use and incomplete acquisition. The researchers worked on the speech of 61 Pakistani Saraiki migrants in Delhi and 57 speakers of their progeny. The participants were made to produces words of alveo-palatal nasal [ɲ], implosives [ɓ ʃ ɗ ɠ], breathy voiced sonorants [mh nh lh ɲ h ɳ h] and fricatives [z x ɣ] of Saraiki language. The results revealed that the Saraiki speakers who were affiliated to Hindi language were more inclined towards losing their Saraiki consonants as compared to those who were less affiliated to Hindi language. With respect to age factor, it was observed that young Saraiki speakers lost Saraiki phonemes faster than those who were adult at the time of migration. It was concluded that markedness has contributed to the loss of language.

On the other hand, Syed (2012) carried out a research on nasality of Saraiki language and found out level of nasality in segments of Saraiki. The researcher also analyzed the phonotactics of Saraiki to handle the co-occurrence of nasalization with voicing. The observance of word-media nasal was also part of the research. At the end, the researcher analyzed the relation between independent and contextual nasalization.

Shafi and Syed (2021) analyzed loanword phonology of Saraiki language through the application of optimality theory. The researchers found out the changes which occur in Saraiki loanwords of Arabic origin to provide solution to the constraints of L1 grammar. According to researchers, the Saraiki language stresses heaviest syllables in the word. In two syllable word, the stress falls on the left syllable which leads to insertion or deletion in the Arabic loanwords. This results in gemination of bisyllabic words and degemination of trisyllabic words. Many words of Arabic language with *Light-Heavy (LH)* syllable changed into Heavy-Heavy (HH) syllable. For example, (Arabic /abu:/ àSaraiki /ˈəb.buː/). On the other hand, Saraiki speakers also delete consonants in the left syllable to satisfy the constraint which requires stress on heavy syllable. This phenomenon determines 'stress penultimate' constraints and 'Weight-to-Stress principle'. This research focuses on the acoustic analysis of Saraiki consonants with particular focus on Voice Onset Time and aspiration.

Material and Methods

The current study was experimental and descriptive in nature. The purpose of the study was to find out the VOT duration Saraiki Stops. It also described the change in the duration of vowel in case of change in Saraiki stops. Criterion purposive sampling technique (Dörnyei, 2007) was adopted to collect the data. Five participants of Multani dialects, between the age of 20 to 35, and particularly monolingual were selected from the city of Multan for the purpose of data collection. Data was collected through mobile phone voice Recorder. Written list of minimal set of 16 Saraiki stops with initial stops and same vowel in the middle with same consonant in the end was prepared by the researcher. The participants were given that list of minimal set of stops. The selected participants were taught to read in neutral way. The data was recorded in sound proof room where each participant one by one recorded the voice by reading the list of minimal set.

Table 2
The list of Minimal set of Saraiki Stops for Analysis of the Current Study

S. No.	Phoneme/Stop	Word with Target Stop	Meaning
1	P	par	feather
2	B	bar	measure
3	pʰ	pʰar	again
4	bʰ	bʰar	fill
5	ʈ	ʈar	cross
6	ɖ	ɖar	door
7	ʈʰ	ʈʰar	desert
8	ɖʰ	ɖʰar	to give
9	T	tar	to swim
10	ɖ	ɖar	get afraid
11	tʰ	tʰar	be happy
12	ɖʰ	ɖʰar	to fall
13	K	kar	to do
14	G	gar	to lost
15	kʰ	kʰar	to stop
16	gʰ	gʰar	home

The aforementioned words in the table were given to the participants. First the researcher asked them to pronounce, once researcher confirmed that they can pronounce

well, and then they were asked to pronounce in neutral way. Their pronunciation was recorded carefully by the researcher on mobile phone voice recorder. The collected data was analyzed through Praat software. For analyzing the VOT of stops the acoustical analysis was conducted for waveforms. The spectrograms were generated through Praat software. The duration of vowel was also analyzed through Praat.

Results and Discussion

The following Table 3 shows the VOT duration for all stops (Voiceless unaspirated, voiceless aspirated, voiced unaspirated and voiced aspirated) of Siraiki language.

Table 3
VOT duration for Siraiki Stops

S. No.	Phoneme/Stop	VOT	Vowel Length
1	**P**	0.020	0.144
2	**B**	0.136	0.149
3	**pʰ**	0.028	0.148
4	**bʰ**	0.140	0.197
5	**ʈ**	0.011	0.152
6	**ɖ**	0.122	0.166
7	**ʈʰ**	0.018	0.143
8	**ɖʰ**	0.091	0.160
9	**T**	0.009	0.143
10	**ɖ**	0.040	0.143
11	**tʰ**	0.021	0.136
12	**ɖʰ**	0.060	0.150
13	**K**	0.010	0.136
14	**G**	0.127	0.178
15	**kʰ**	0.014	0.137
16	**gʰ**	0.093	0.157

Table 3 three shows VOT for different stops of Siriaki. They are sixteen in number and are divided into four groups. They are voiceless unaspirated, voiced unaspirated, voiceless aspirated, and voiced aspirated.

In each, there are four sounds and they are represented through their respective spectrograms which are given below in Figure 1, 2, 3, and 4. Their VOT values are given in Table 3 showing the VOT duration. In all of the sounds, the voiceless unaspirated phonemes have less VOTs than their counterpart voiced unaspirated phonemes. Similarly, voiceless aspirated phonemes have less VOT values than their voiced aspirated counterparts.

The following are the Spectograms for Siraiki voiceless unaspirated stops.

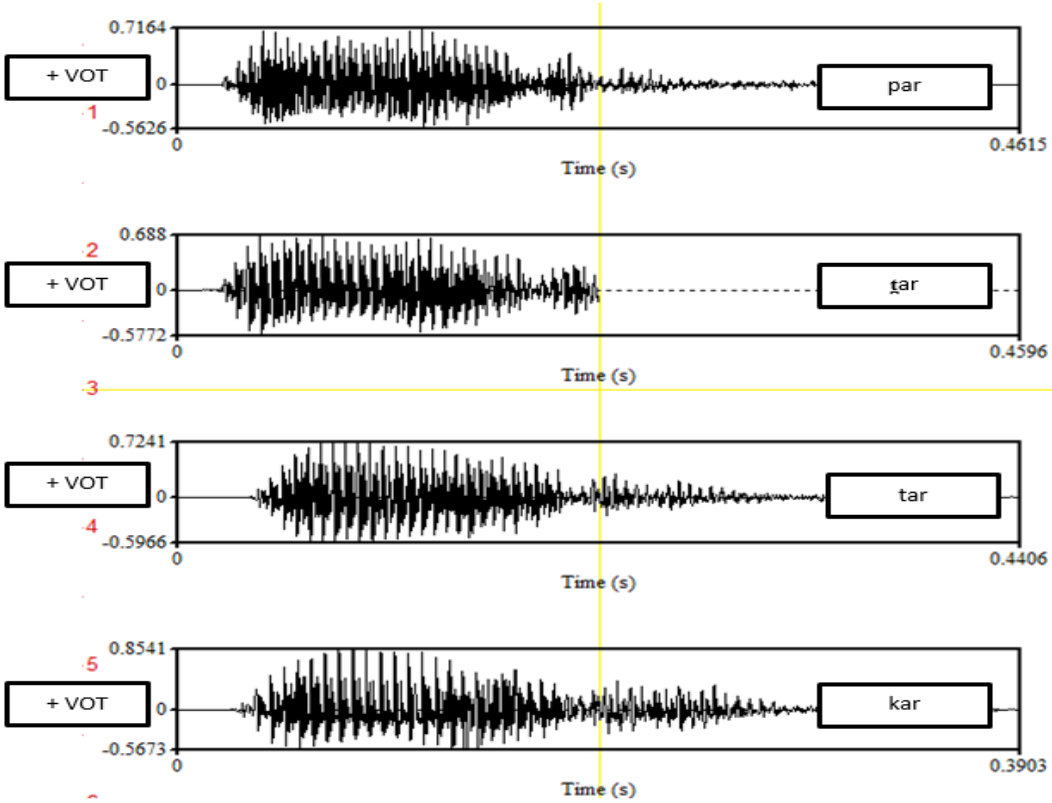

Figure 2. Spectograms for voiceless unaspirated stops

The spectrograms given in Figure 1 show the VOT values of four voiceless unaspirated stops /p, ṭ, t, k. All of the voiceless unaspirated stops have positive VOT values. Their respective boundaries were marked and their values were taken in which the /t/ has lesser values 0.009 and the /p/ has the greater value 0.020.

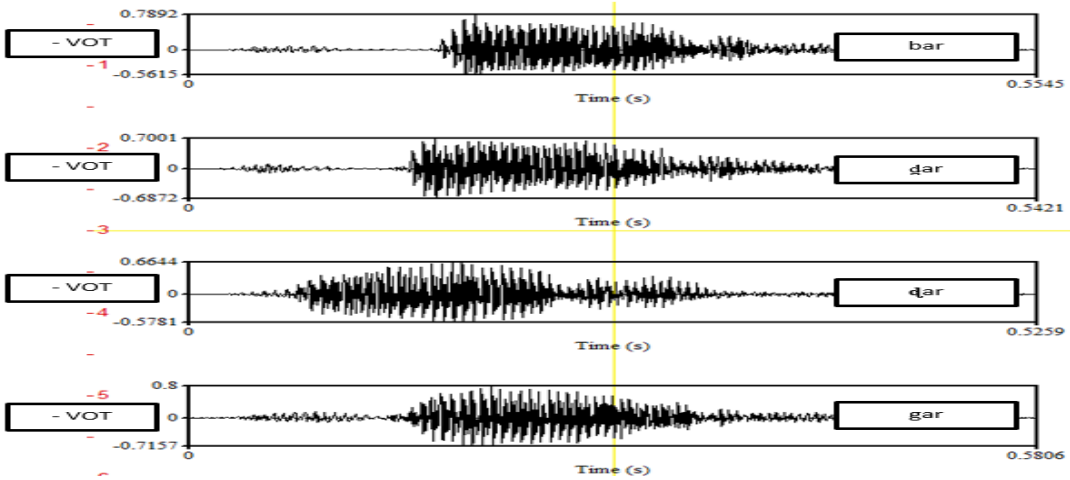

Figure 3. Spectograms for voiced unaspirated stops

The spectrograms given in Figure 2 show the VOT values of four voiced unaspirated stops /b, ḍ, ɖ , g,. They have different VOT values. All voiced unaspirated stops have negative VOTs. Their physical aspects were identified by marking their retrospective boundaries and values were noted. In which, the phoneme /b/ has greater negative values 0.136, and ɖ has shorter negative value 0.040

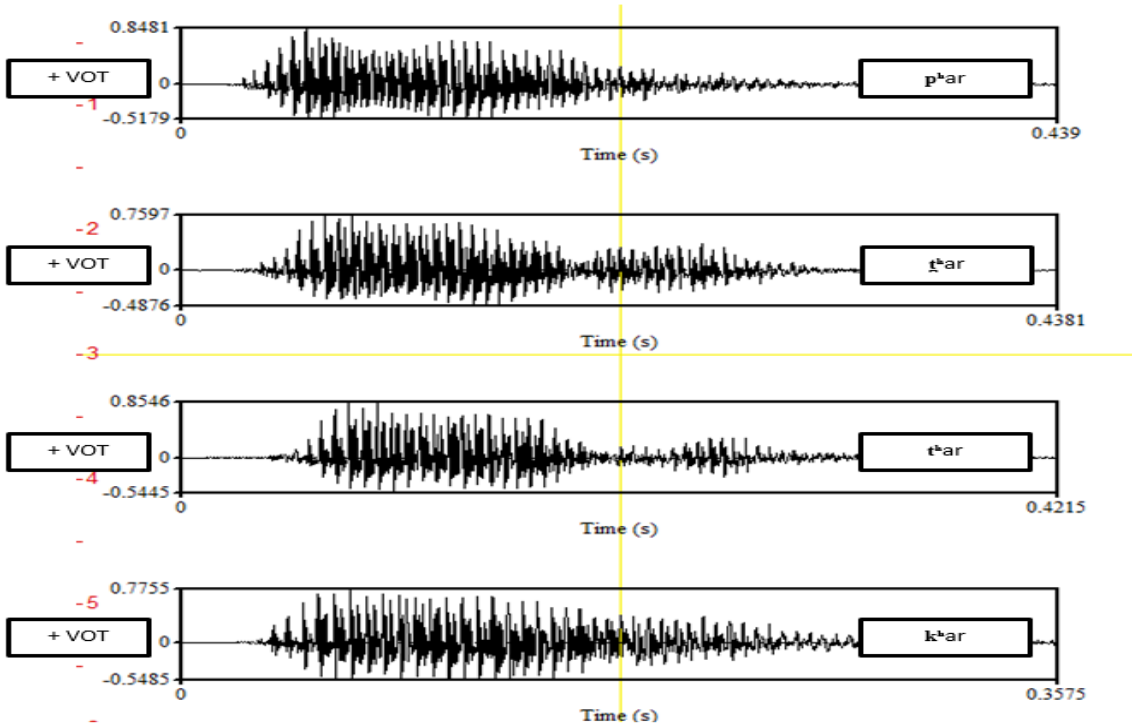

Figure 4. Spectograms for voiceless aspirated stops

The spectrograms given in Figure 3 show the VOT values of four voiceless aspirated stops /pʰ, t̪ʰ, tʰ, kʰ/. They show the positive values of these phonemes. All of them have positive VOTs. Their respective boundaries were marked and their values were taken which identified that the phoneme /tʰ/ has the greater values 0.021, and the phonemes /kʰ/ has the shorter value 0.014 value.

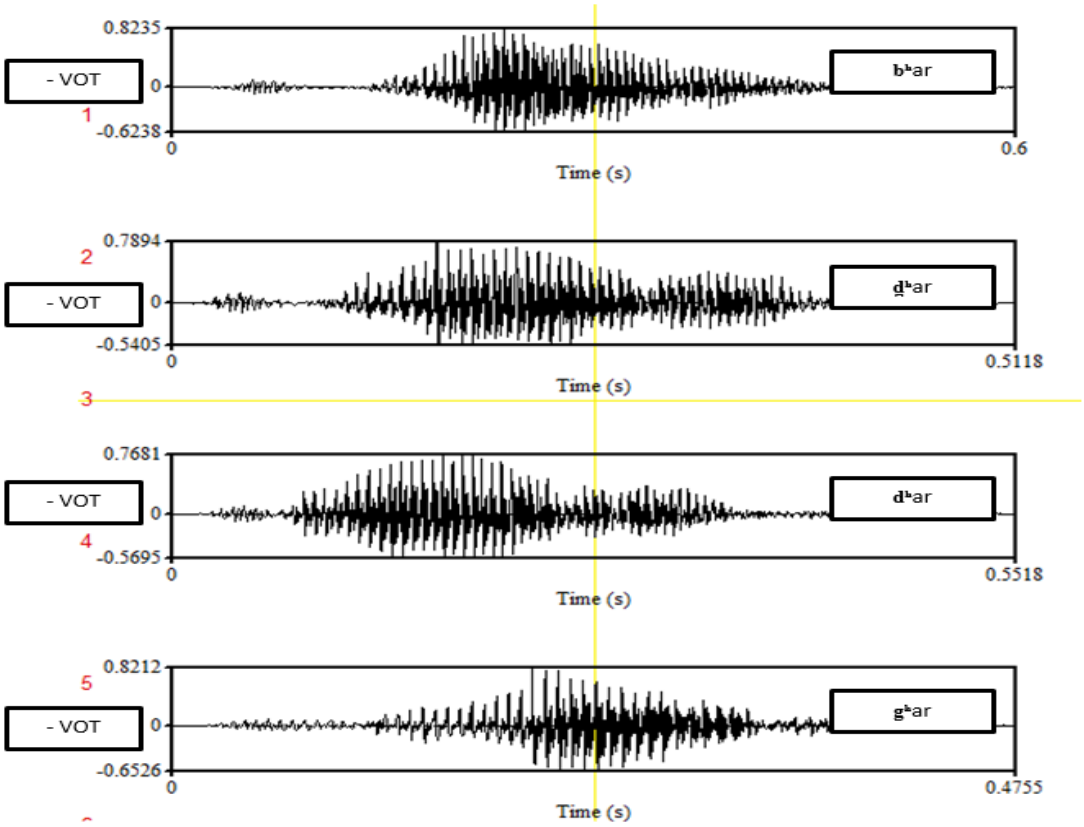

Figure 5. Spectograms for voiced aspirated stops

The spectrograms given in Figure 4 show the VOT values of four voiced aspirated stops /bʰ, d̪ʰ, **ɖʰ,** gʰ,. They show different values which are negative VOTs. Their physical aspects were identified through marking their respective boundaries and their values were noted. Among them, the phoneme /bʰ/ has greater negative value 0.140 and **ɖʰ** has shorter value 0.060.

Conclusions

The purpose of this study was to describe the VOT of Saraiki Stops and to explore the length of vowel after these stops. In order to achieve the purpose of the study the analysis on Praat was conducted and the findings revealed that the Overall VOT and vowel length was found higher in aspirated as compare to un aspirated stops. The findings of the analysis revealed that among all the stops, dental / **ʈ** / has the shortest VOT duration (0.009 ms), whereas the bilabial aspirated / **bʰ** / has the longest VOT duration (0.140 ms). In Saraiki voiceless stops, the dental / **t /** has the shortest VOT duration (0.009 ms), and bilabial aspirated/ **pʰ** / has the longest VOT duration (0.028). In Saraiki voiced stops, the alveolar / **ɖ/** has the shortest VOT duration (0.40 ms) while bilabial aspirated / / **bʰ** / has the longest VOT duration (0.140 ms). The results also revealed vowel sound was longer after the voiced bilabial aspirated /**bʰ/** (0.197 ms) and shorter after voiceless stop **/k/** (0.136 ms).

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