

Consonants in Pashto

Yukki Baldoria, Keitaro Mitsuhashi, Rin Tsujita

International Christian University

Abstract

Pashto is an Eastern-Iranian language in which the native speaker is mainly seen in Afghanistan and Pakistan. The sound system of the Pashto language consists of a rich consonant inventory. The paper provides a brief description and analysis of the consonant system of the Pashto language based on the Swadesh list in which the data was collected from a male native speaker of Pashto. First, we make a comparison between the consonant system of our findings and three previous research, being David and Brugman (2014), Shafeev (1964), and Robson and Tegey (2012), observing the descriptive difference between each research. Following this, in the discussion section, we analyze some of the features in Pashto, which being the labial fricative, lateral approximant, allophone, and consonant length. The allophone section consists of the rhotic sounds and velar nasals.

1 Introduction

As a language of the Indo-Aryan family primarily spoken in Pakistan and Afghanistan, Pashto, or Pashtu (Pukhto) as it is known by native speakers, is a language with number of speakers estimated to be at a range from around 13 million (MacKenzie, 1992) to 20 million (Inozemtsev, 2001) in earlier studies and 30-50 million by Austin (2008). Within the Indo-Aryan languages, it is more closely related to Iranian languages like the Pamir languages, Persian, and more, rather than the Nuristani languages, Urdu, Punjabi and more (David & Brugman, 2014). While there are multiple dialects of Pashto with differences mostly residing in the phonological nature, this paper focuses on elicitations from a Native Pashto speaker of the Northern Variety and compared the data set to David and Brugman (2014), which discusses different grammars of Pashto, Shafeev (1964), and Robson and Tegey (2012).

David and Brugman (2014) outlined a total of 32 consonants including the approximants with all of them written in a one-to-one correspondence between the segment and the segment except for the two affricates /ts/ and /dʒ/. Additionally, they also state that out of the 32 consonants, eight are only present in loanwords, which are the aforementioned affricates /ts/ /dʒ/ and the fricatives /f/ /z/ /s/ /z/ /ç/ /j/.

On the other hand, Shafeev (1964) presents 30 consonants in Pashto with the difference between this and David and Brugman (2014) being on the absence of /ç/ /j/ /w/ in Shafeev (1964) with the inclusion of /v/, which is not in David and Brugman (2014).

Finally, Robson and Tegey (2012) outline 33 consonants with approximants, with the difference between this and the previous research being the absence of /v/ in Shafeev (1964) but the inclusion of /f/ /ʒ/ and the existence of a voiceless palatal front velar fricative that is between the velar and the palatal.

The present study only found 25 different consonants including the approximants. One of the main differences between this paper and previous studies are on the labials. In previous studies, labial fricatives were labelled as the labiodental fricatives /f/ v/, but in the present study, they are marked as bilabial fricatives /F/ /B/. Furthermore, the glottal stop /ʔ/ was also not seen through our elicitations. We were also unable to find retroflex stops /t/ /d/ nor did we find the retroflex fricatives /ʃ/ /ʒ/. The palatal fricative pair /ç/ /j/ was also not seen as well as the velar fricatives /x/ /ɣ/ as reported in David and Brugman (2014), but in its stead we found uvular fricatives /χ/ /ʁ/ as well as the different rhotic that occur in different environments, namely /r/ /r̥/ /r̄/ and are therefore allophonic to each other. We also found the presence of aspiration limited to one example of a word on the Swadesh list with the possibility of it also occurring with other plosive stops. This paper is structured as follows. A section on data elicitation methods will first be presented (Section 2), followed by a comparison between previous research (Section 3). This paper will conclude on a discussion of the findings (Section 4).

2 Data Collection

The data was collected in person through multiple sessions from a native male Pashto speaker of the Northern Variety. The consultant was born in the 1980s and was from Peshawar City. However, the medium of instruction in school was Urdu and then English during university, meaning that although he uses Pashto with friends and family, he formally used Urdu and English within an academic environment as well as a professional environment. Nonetheless, he is fully literate in Pashto and uses it daily.

Regarding data collection, a Tascam DR-100 MK-III recorder set to 44.1 kHz with 16-bit depth, mono was used to record the different elicitation sessions from the consultant. A head-worn SHURE WH30 unidirectional microphone with an XLR connector was also used to record the sessions, with the distance of about 10 cm between the microphone and the consultant's mouth. Additionally, the Swadesh list in English by Bower (2015) was first translated into Pashto by the consultant before being repeated three times. Then, the recordings were processed and visualized in Praat (Boersma and Weenink, n.d.), with figures with the spectrogram and textgrid being created with said program as well. Textgrids have the following four tiers in descending order: segment, IPA, orthography, gloss, ID, and global ID. As for the still shots, they were taken out from a slow-motion recording done with an iPhone 11 (software version 14.4.2).

3 Comparison with Previous Research

In order to discuss the Pashto consonant system, first, let us compare the consonant system of our findings and the previous researches. Below are the charts of the sound system of each research.

Table 1: Our findings

	Bilabial	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Glottal
Plosive	p b	t d					k g		
Nasal	m	n					ŋ		
Trill		r							
Tap or Flap		ɾ			ɽ				
Affricate				ʈ ɖ					
Fricative	ɸ β		s z	ʃ ʒ				χ ʁ	h
Approximant						j			
Lateral Approximant			l		ɭ				

Voiced Labial-velar approximant [w]

² *We would like to thank Asif Khan for the recordings of Pashto.

Table 2: David and Brugman (2014)

	Labial	Dental	Palato-alveolar	Retroflex	Palatal	Velar	Glottal
Stops	p b	t d		ʈ ɖ		k ɡ	
Affricates		(ts ɖʒ)	ɟ j				
Fricatives	(f)	s z	ʃ (ʒ)	(ʂ ʐ)	(ç j)	x ɣ	h
Nasals	m	n		ɳ			
Lateral		l					
Approximants	w	r	y	ɾ			

Table 3: Shafeev (1964)

		Bi-labial	Labio-dental	Pre-palatal	Mid-palatal	Uvular	Guttural
S	Plosive	p b		t d	k ɡ		
	Plosive-Cerebral			ʈ ɖ			
O	Nasal	m		n			
P	Nasal-Cerebral			ɳ	•		
	Affricate			dz ʃ ts ɟ			
	Fricative	v	f	s z ʃ ʂ ʐ	y	x ɣ	h
	Fricative-Cerebral			ʃ ʒ ʂ ʐ			
	Trill			r			
	Trill-Cerebral			ɾ			

Table 4: Robson and Tegey (2012)

	Labial	Dental	Retr.	Palatal	Velar	Back Velar	Glottal	Phar.
VI Stops	<i>p</i>	<i>t</i>	<i>ʈ</i>		<i>k</i>	<i>q</i>	<i>ʔ</i>	
Vd Stops	<i>b</i>	<i>d</i>	<i>ɖ</i>		<i>g</i>			
VI Fricatives	<i>f</i>	<i>s</i>		<i>sh</i>	<i>x</i>	<i>kh</i>	<i>h</i>	<i>H</i>
Vd Fricatives		<i>z</i>		<i>zh</i>	<i>gh</i>			<i>ɣ</i>
Nasals	<i>m</i>	<i>n</i>	<i>ɳ</i>					
VI Affricates		<i>ts</i>		<i>ch</i>				
Vd Affricates		<i>dz</i>		<i>j</i> [dzh]				
Trill		<i>r</i>	<i>ɽ</i>					
Lateral		<i>l</i>						
Semivowels	<i>w</i>			<i>y</i>				

3.1 Labial As for the labial sounds, in all four, voiceless/voiced plosive sounds [p, b] are present. However, although our consonant has the voiceless/voiced bilabial fricative [ɸ, β], others have different sounds. David & Brugman (2014) and Robson and Tegey (2012) describe voiceless labiodental fricative [f] in their inventory. These two consonants do not have the voiced sounds for labial fricative. Shafeev (1964), on the other hand, has the combination of voiceless labiodental fricative and voiced bilabial fricative. It is also notable that David & Brugman (2014) implies that [f] is not present in all of the Pashto speaker's speech, and Robson & Tegey (2012) consider [f] as a sound used in loan words.

Also, the labial-velar approximant [w] also appeared in David & Brugman (2014) and Robson and Tegey (2012) same as our findings, while it does not in Shafeev (1964).

3.2 Dental/Alveolar/Post-Alveolar The four contain some common dental, alveolar, and postalveolar sounds, being the plosive [t, d], fricative [s, z]. The sounds that we considered as postalveolar fricatives [ʃ, ʒ], are likely to be considered as palatal fricatives in Robson & Tegey (2012).

The notable fact in this place of articulation is the affricate sounds [tʃ, dʒ] and [ts, dz]. While our consonant chart only has [tʃ, dʒ] as the affricate sound, the other three charts contain [ts, dz] as well (although in Robson & Tegey [tʃ, dʒ] are represented as palatal affricates). However, David & Brugman (2014) imply that, although [tʃ, dʒ] is present in all Pashto speaker's utterance, [ts, dz] is not used by every Pashto speaker.

3.3 Palatal The palatal sound that we found in the Swadesh list is the palatal approximant [j], which is also found in the other three consonant chart as well. David & Brugman (2014) reports that palatal fricative [ç, j] are sometimes present in Pashto speech.

3.4 Velar/Uvular The velar plosive [k, g] is present in all four. Robson & Tegey (2012) also reports that in some borrowings the back-velar (which supposedly refers to uvular) plosive [q], which are often pronounced as [k] in informal speech.

The major difference between our chart and the others in this place of articulation is the description of fricative sounds. While our chart and Shafeev (1964) have uvular fricative [χ, ʁ], the sounds are described as velar fricatives [x, ɣ] in David & Brugman (2014) and Robson & Tegey (2012). Robson & Tegey (2012) distinguish between voiceless velar fricative (represented as [kh]) and voiceless front-velar fricative (represented as [x]).

3.5 Glottal/Pharyngeal Among all charts, the voiceless glottal fricative [h] is present.

Although three charts only have [h] in this place of articulation, Robson and Tegey (2012) report the presence of glottal stop and pharyngeal fricatives [ħ, ʕ] (they are transcribed as [H, y] in the chart), which is not present in our findings. The pharyngeal fricatives, however, are explained as sounds that occur in loan words.

3.6 Nasal As for the nasal sounds, our chart has bilabial nasal [m], alveolar nasal [n], and velar nasal [ŋ]. On the other hand, the three previous research also have [m, n] in their inventory. However, instead of having [ŋ], the charts describe it as a retroflex nasal [ɲ].

3.7 Rhotic The rhotic sounds in our chart are alveolar trill [r], alveolar tap [ɾ], and retroflex tap [ɽ].

In contrast, David and Brugman (2014) and Robson and Tegey (2012) similarly have alveolar trill [r] and retroflex trill, transcribed [ɽ]. Since we do not have a retroflex trill in the IPA chart, the retroflex trill supposedly is an alternate of the retroflex tap.

Shafeev (1964) has dental approximant [ɹ] (transcribed [r]) and retroflex approximant [ɻ] (transcribed as [ɽ]), which is different from the other three charts. It is interesting that his research reports such variety.

3.8 Lateral All the charts have the alveolar lateral [l]. However, compared with the other three research, the lateral approximant [ɭ] is unique in our chart.

3.9 Retroflex Although in our inventory, the retroflex that are present are only retroflex tap [ɽ] and retroflex lateral [ɭ], the other charts also contain the retroflex plosive [ɽ, ɽ̥].

Also, Shafeev (1964) claims the presence of retroflex fricative [ɻ, ɻ̥]. Unlike Robson and Tegey (2012), Shafeev has [ɻ, ɻ̥] and [ɻ̥, ɻ̥̥] simultaneously.

3.10 Additional features Our findings did not have the aspirated [tʰ] and [pʰ].

4 Discussion

4.1 Bilabial labiodental Previous research have categorized the labial fricatives as labiodental fricatives as seen in Shafeev (1964), Robson and Tegey (2012), and David and Brugman (2014) where they all listed the voiceless /f/ as a consonant in the Pashto sound system. However, only Shafeev (1964) also mentions the voiced /v/ counterpart. Yet, through our study, it was found that the labiodental fricatives were actually being produced as labial fricatives from our consultant, namely as /ɸ β/, which is supported by observing the position of the mouth during the articulation of [ɸíkar kól] *think* and [βína] *blood*, both of which did not show the consultant biting the lower lip with the upper teeth, which is characteristic for labiodentals. In these instances, the consultant put his upper and lower lips together while producing the labial fricatives, allowing us to conclude that they are bilabial fricatives and not labiodental fricatives as listed in previous literature.³ The production of the voiceless labial fricative by our consultant is represented in Figure 1 and the voiced counterpart in Figure 2.

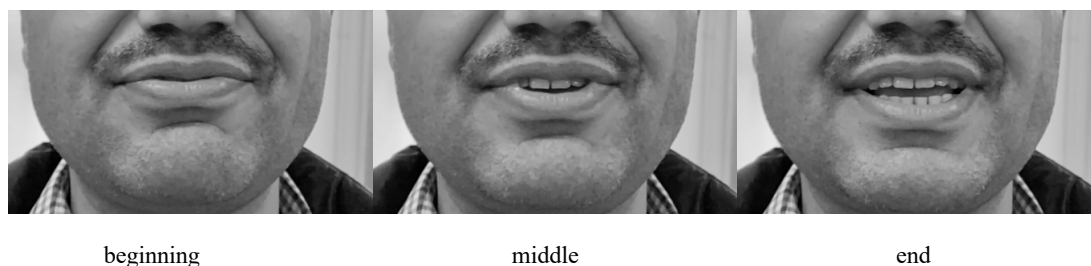


Figure 1. Still shots of a slow-motion video of the beginning, middle, and end point of the production of the voiceless bilabial fricative [ɸ]. Video was taken with an iPhone 11 (software version 14.4.2).

³ It is interesting to note that when asked to produce words with labiodental fricatives in English, such as [fʌɪv] or [vi:ɪkl], the consultant also produced them as bilabial fricatives, indicating how his Pashto knowledge is affecting his articulation of certain English consonants.



Figure 2. Still shots of a slow-motion video of the beginning, middle, and end point of the production of the voiced bilabial fricative [β]. Video was taken with iPhone an 11 (software version 14.4.2).

4.2 Lateral approximant Shafeev (1964), David and Brugman (2014), Robson and Tegey (2012), say that Pashto language has [l]. The place where it is pronounced is different depending on the studies, but their studies indicate that Pashto language has one lateral approximant sound. However, according to the data collected from our Swadesh list, Pashto language has two lateral approximant sound, [l] and [ɭ].

[l] appears in word-initial, word-medial, and word-final position as shown in (1).

(1)	IPA	Gloss
a.	luɾ	‘big’
b.	plən	‘wide’
c.	sɣál	‘drink’

On the other hand, [ɭ] appears in word-medial and word-final position.

(2)	IPA	Gloss
a.	s:á:ɭə	‘cold’
b.	kál	‘stone’
c.	dúɭa	‘dust’
d.	s:óɭ	‘cold’
e.	zó:ɭ	‘old’
f.	ziáɭ	‘yellow’

When a native speaker of Pashto language were asked to compare [l] and [ɭ] in [sɣál] ‘drink’ and [s:óɭ] ‘cold,’ he recognized them as different consonants. Therefore, it is assumed that [ɭ] is in the Pashto phonetic inventory. Further research is needed to distinguish whether it is an allophone of /l/ or if they are two different phonemes by investigating if minimal pairs with [l] and [ɭ] exist or not.

4.3 Allophones Multiple allophones were found during the present study that were not listed in previous studies, namely: the alveolar tap /ɾ/ and the velar nasal /ŋ/. In this section, we will discuss how these consonants are allophones and not separate phonemes as well as explain why previous research did not list them as part of the Pashto sound system.

4.3.1 Rhotic To begin, we will look at the rhotic category, where we found /ɾ/ /ɽ/ /ɽ/ in our study. Starting with the retroflex tap /ɽ/, previous research has also listed it as a part of the sound system of Pashto but did not mention the environment in which it occurs. Our preliminary data collected from the Swadesh list shows that it only occurs in word-medial positions, as seen in (3).

(3)	IPA	Gloss
a.	wəɽkɛ́	‘small’
b.	dɽɛ	‘three’
c.	taɽɿ	‘tie’

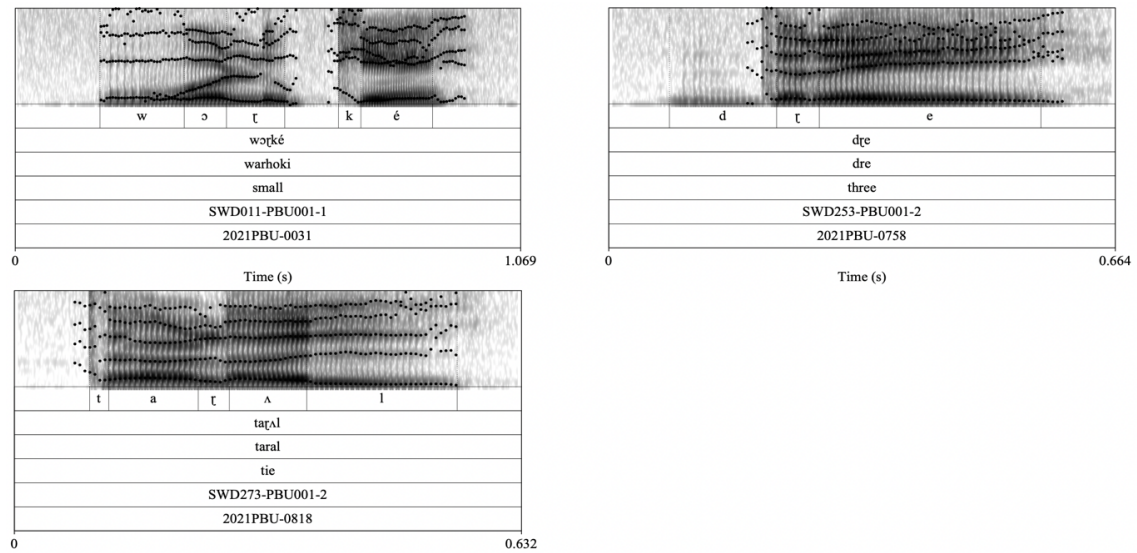


Figure 3: /ɽ/ in [wɔɽkɛ́], [dɽe], and [taɽl].

As the data indicates, it can occur immediately following a vowel and preceding a consonant, as in the case of (3a), following a consonant and preceding a vowel, as in the case of (3b), or between two vowels, as in the case of (3c). While retroflexes usually have a lower F3, the research in Tabain et al. (2018) suggest that this lowering of F3 is more noticeable during consonant onset rather than offset in retroflex stops, which would explain why F3 lowering was not as distinctly marked here as it would be in an onset.

Next, the alveolar trill /r/ was also found in our study, which is also supported by other research. Unlike the retroflex, the trill was found to occur as shown in (4), which is also illustrated in the spectrums in Figure 4.

- | (4) | IPA | Gloss |
|-----|----------|-----------|
| a. | ró:ɣ | ‘correct’ |
| b. | gáɽzedəl | ‘walk’ |
| c. | pɪr | ‘thick’ |

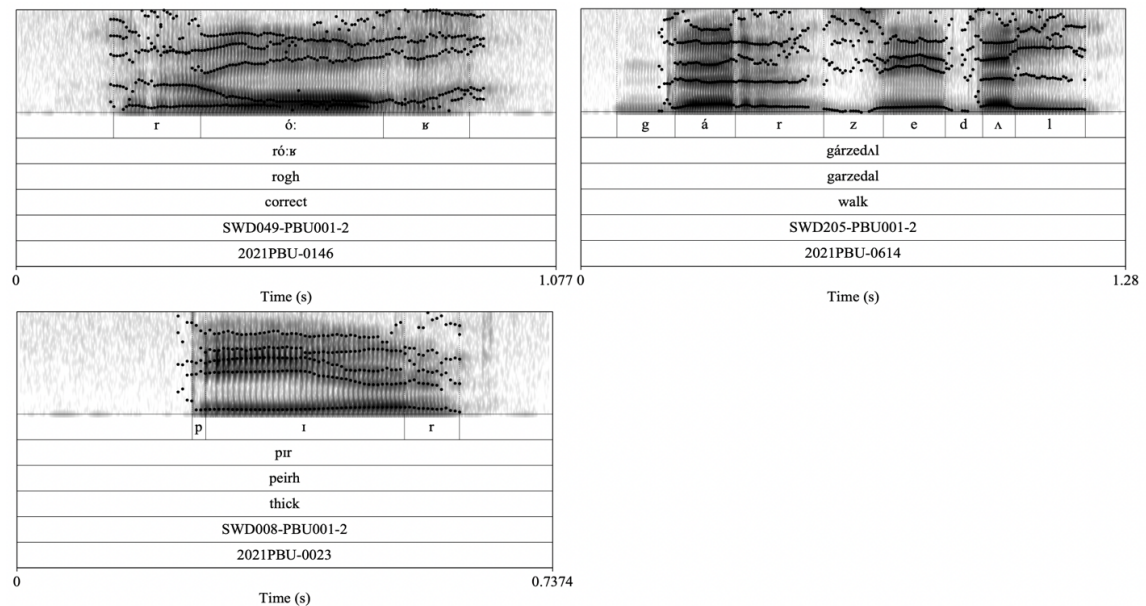


Figure 4. /r/ in [ró:ɣ], [gáɽzedəl], and [pɪr].

Finally, the rhotic tap /ɾ/ was not discussed in previous research, but through our elicitation sessions, we found it present in our data in word initial, medial, and final positions, as in (5).

- | (5) | IPA | Gloss |
|-----|--------|------------|
| a. | ɾaxkəl | ‘pull’ |
| b. | purá | ‘full’ |
| c. | ɸar | ‘mountain’ |

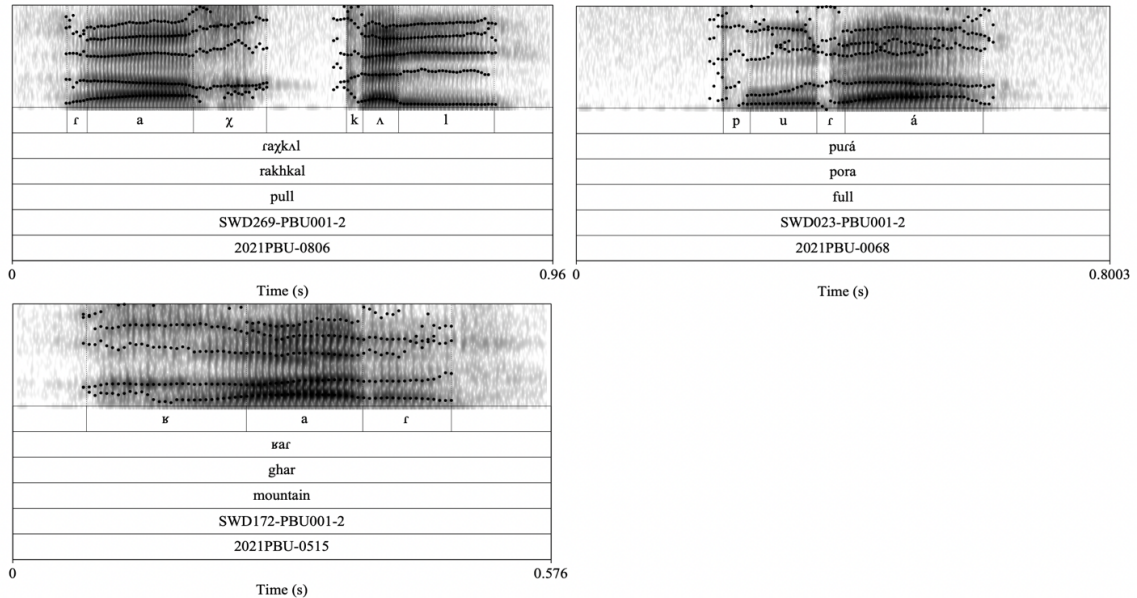


Figure 5. /ɾ/ in [ɾaxkəl], [purá], and [ɸar].

Analysis comparing words with the three allophonic rhotic in the word medial position showed that the retroflex /ɽ/ in [dɽe] *three* had the lowest F3 value at 2653 Hz compared to the trill /r/ in [gárzedəl] *walk* at 2784 Hz and the tap /ɾ/ in [purá] *full* at 2740 Hz. While more words with the allophonic rhotic in the word medial position should be analysed and the F3 value averaged, there is an inclination suggesting that the /ɽ/ is a separate sound in Pashto. Between /r/ and /ɽ/, there is only one clearly visible tongue flap in [purá] but at least three visible flaps can be seen with [gárzedəl], suggesting that they are different phonemes.

4.3.2 Velar nasal As for the velar nasal /ŋ/ our study found it occurring in three instances of the Swadesh list, and it only occurred when it preceded the velar stops /k g/, which is contrasted against the alveolar nasal, which occurred in multiple environments. Thus, the velar nasal [ŋ] is a surface form of the alveolar nasal /n/ and can be represented in the following SPE rule.

- (6) /n/ → [ŋ] / _ [+velar]

A comparison of the spectrograms of the alveolar nasal in [iná] *liver* and velar nasal [zánɣun] *knee* are shown in Figure 6, where we see that the F2 and F3 values of the velar nasal are much closer together than that of the alveolar nasal, which is supported by the research in Oostendorp and Sebrechts (2020) on Dutch consonants, where the same can be seen, providing further evidence that [ŋ] is an allophone of /n/.

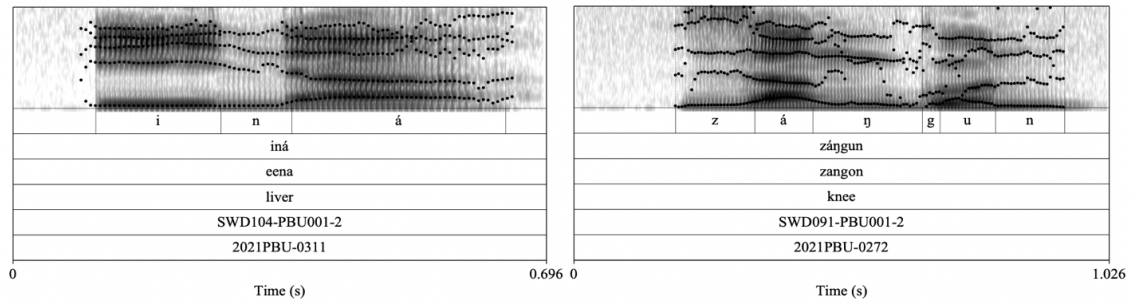


Figure 6. A comparison of /n/ in [iná] and [ŋ] in [zángun]

4.4 Long consonants The data collected from our Swadesh list shows that Pashto language has five long consonants, [m:], [n:], [s:], [p:], [t:]. Long [m] and [n] appear in word-initial positions, see (7)⁴.

(7) Long nasal consonants

	IPA	Gloss
a.	n:úk	‘fingernail’
b.	m:ár	‘sun’

Compared the spectrum of (7a) to the one of [na:má] ‘name’ in Figure 8, [n:] in (7a) is produced longer (0.14 msec) than [n] in [na:má] (0.08 msec).

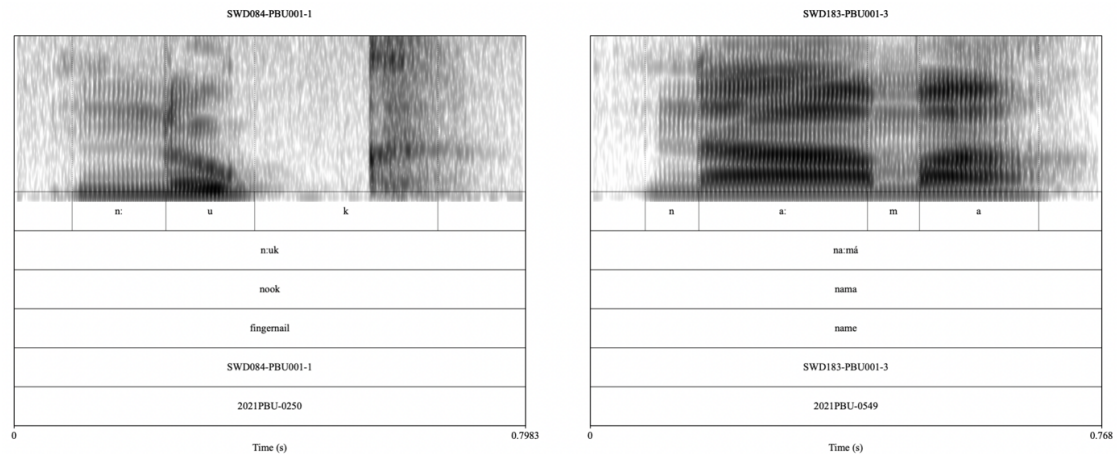


Figure 8: Comparison of [n:] and [n].

Similarly, [m:] in (7b) pronounced longer (0.32 msec) than [m] in [má:r] ‘snake’ (0.10 msec) as shown in Figure 9.

⁴ [m:ár] ‘sun’ is also pronounced as [nəmar]. It is assumed that [m] becomes long because of compensatory lengthening due to the deletion of [nə].

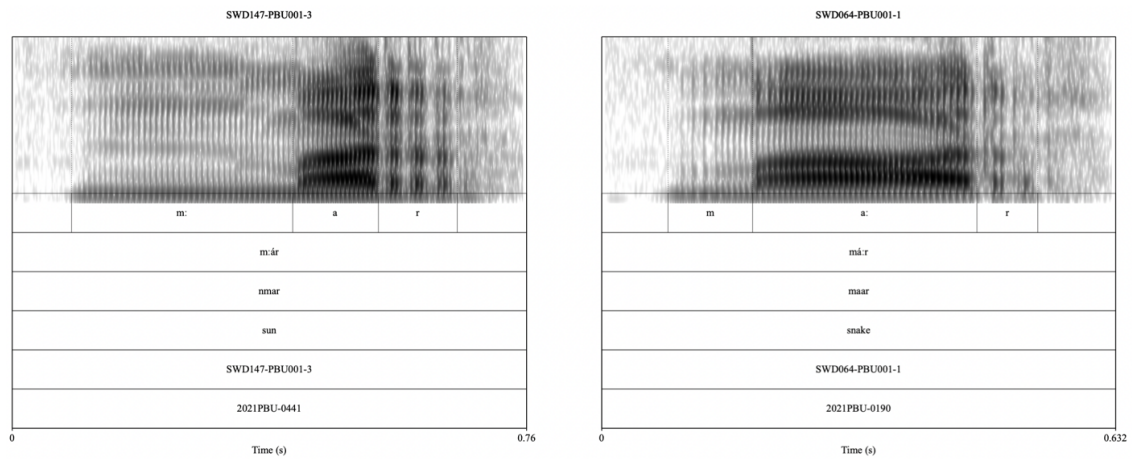


Figure 9: Comparison of [m:] and [m].

One thing should be noted is that [n:úk] ‘fingernail’ can be pronounced as [nuk] so [n:] and [n] are inter-changeable.

There are three words that has long [s] in the data, see (8).

- (8) Long [s]
- | | IPA | Gloss |
|----|-------|--------|
| a. | lá:s: | ‘hand’ |
| b. | pás: | ‘dull’ |
| c. | gəs: | ‘left’ |

On our Swadesh list, all the [s]s in the final positions are long. Therefore, it is assumed that [s] becomes long at word-final positions. Figure 10 shows the spectrum of (8a). The [s] is longer (0.37 msec) than the long vowel [a:] (0.26 msec).

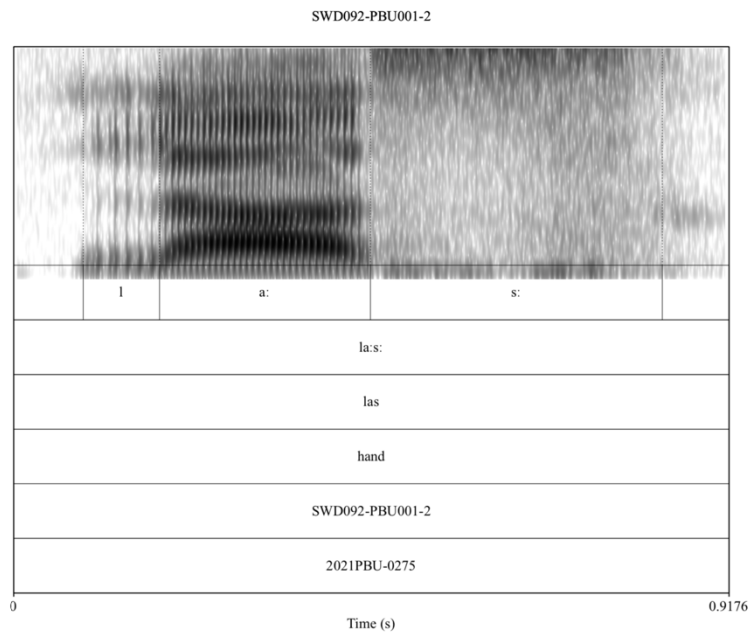


Figure 10: Spectrum of [lá:s:]

Finally, we examine long [p] and [t] which are found in the words in (9).

(9)	Long [p] and [t]	
	IPA	Gloss
a.	sp:óga	‘louse’
b.	sát:	‘neck’

These consonants are long due to a longer closure duration. As the spectrum in figure 11 indicate, after [ʌ], there is a closure until the next [t] is pronounced.

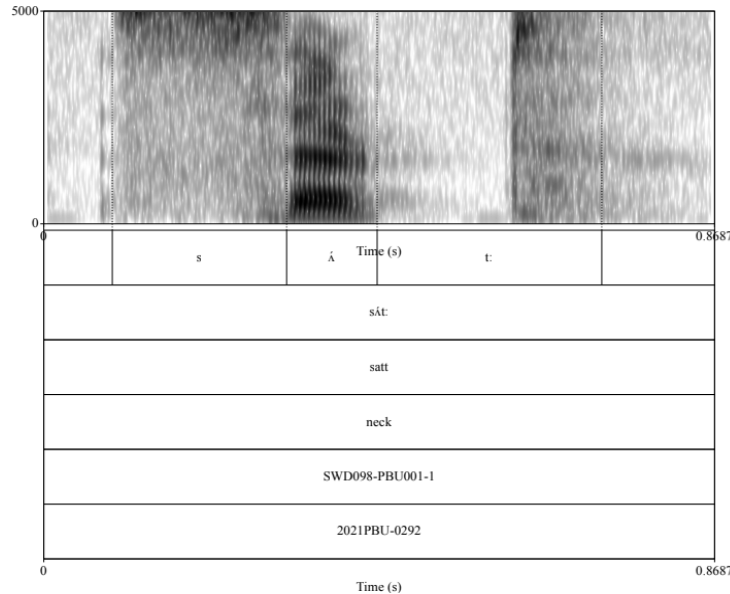


Figure 11: Spectrum of [sát:]

5 Conclusion

The squib describes the consonant system of Pashto. The paper, in Section 3, first makes a comparison between the findings of our research and the previous research: David and Brugman (2014), Shafeev (1964), and Robson and Tegey (2012). Following, Section 4 further discusses some of the features of Pashto consonant systems. Section 4.1 first shows the rationale of the description for the bilabial fricative in our findings. Followingly, Section 4.2 discusses the lateral approximant which differed from other findings. Lastly, Section 4.3 discusses the allophones of Pashto consonants in the following order: rhotic, velar nasal, aspiration, and long consonants. The description covers the basic consonant system in Pashto. However, in order to determine whether the distinction between the previous research is due to dialectal features, further research is required.

6 References

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