The Vowel System of Northeastern Pashto

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1 Introduction

1.1 *Background* The Pashto language is an Indo-Iranian language with a majority of its speakers residing in Pakistan and Afghanistan. It is estimated that there are around 49.5 million Pashto speakers worldwide (David & Brugman, 2014). Being a relatively dominant language in the region, many Pashto speakers are also ethnically Pashtuun. While ethnically Pashtuun speakers of Pashto may experience language attrition due to extrinsic factors, such as relocation, these speakers are replaced by non-Pashtuuns who adopt Pashto as a second language. The language itself has multiple dialects—which mainly differ in terms of phonology—and it is this dialectal variation that has led to the different romanisations for the name of the language; Pashto and Pakhto. Additionally, the Pashto language shares an almost identical orthographic system with Arabic, though the former exhibits a wider phonetic system than the latter. The main source of this paper is from a native speaker of Pashto. Secondary sources are referenced as well, and these are Robson and Tegey (2012), David and Brugman (2014), and Shafeev (1964), though not all describe the same Pashto dialect.

This paper will briefly introduce the Pashto vowel inventory, as well as discuss some linguistic features of the vowel system that are present in the Northeastern dialect of Pashto, based on data elicited from a native speaker. The next section of this paper, Section 2, is divided into 5 subsections. The first subsection (§2.1) will include a brief description of the Pashto vowel system, as it has been observed previously by the three main sources identified above. The following subsection (§2.2) will concern our analysis of the Pashto vowel system based on collected data. Following this, features such as diphthongs (§2.3), nasalised vowels (§2.4), and stress (§2.5) will also be discussed briefly. Finally, a conclusive summary of all observations and analyses will be given in Section 3.

1.2 *Data Elicitation* The data employed in our analysis of the Pashto vowel system was collected from a male native speaker of the Northeastern dialect of Pashto (/pəχto/). The speaker likens their variety of the language to "textbook" or "standard Pashto". The consultant was born in 1983, and grew up in Peshawar, Pakistan. He tells us that Pashto is the language he primarily uses with his friends, family, relatives, and neighbours, while he also uses English and Urdu both in the workplace and at school. The languages of instruction at the schools he has attended were Urdu and English (at the university level), respectively.

With regards to the data collection process, all sound files were recorded monophonically with a Tascam DR-100 MK-III recorder, at a 44.1kHz and 16-bit sampling rate. The consultant was also made to wear a SHURE WH30 unidirectional headset microphone throughout all elicitations. The Swadesh list (Bowern, 2015) was used for eliciting Pashto words in this study. Pashto translations of each lexical item were provided by the consultant, and three repetitions were recorded for each token. All the subsequent recordings were annotated with Praat (Boersma & Weenink, 2021), and were transcribed by multiple people who were part of the recording session.

2 Vowel System

2.1 *Description* Previous descriptions of Pashto have consistently described an inventory with seven vowels (David & Brugman, 2014; Shafeev, 1964), with some also noting the partial inclusion of two additional vowel sounds originating from non-native borrowings, variously transcribed as /î/ and /û/ (Robson & Tegey, 2012) and /ī/ and /ū/ (David & Brugman, 2014), respectively. These two non-native sounds are described by David and Brugman (2014) as long vowels that sometimes emerge from "Persian or Arabic loanwords that contain an etymologically long /ī/ or /ū/" (p. 13). They also note that these sounds have been stylized 'elegant vowels', akin to their consonantal counterparts, the 'elegant consonants', and can be heard occasionally in the speech of educated speakers as well as in the northwestern dialect of Pashto.

Additionally, there appears to be some disagreement in the transcription of central and low vowels between researchers working on the Pashto language. Part of this disagreement is owed to dialectal differences in this range. To this end, we note that the central mid vowel is variously transcribed as /ə/

(David & Brugman, 2014; Shafeev, 1964), and /ɔ/ (Robson & Tegey, 2012). Similarly, most sources posit two contrastive low vowels, which are variously described as front and back (David & Brugman, 2014), and central and back respectively (Robson & Tegey, 2012, Shafeev, 1964). David and Brugman (2014) also point to inconsistencies in the transcription of the vowels in the central Waziri dialect of Pashto. They note that previous descriptions do not make a strong distinction between /o/ and /u/; that sources disagree on the distinction between the low vowel /a/ and its potentially back counterpart /ā/; as well as disagreements in the distinction between diphthongs /əy/ and /ay/, among other things.

For the reasons outlined above, it would appear that the Pashto vowels system is in some respects ill-defined. These reasons may be owed to dialectal differences, disagreements in transcription and notation, as well as historical changes in dialects of the language—among them, the 'Waziri Metaphony' phenomenon, which involves the raising and fronting of a subset of vowels in the central dialects of Pashto (David and Brugman, 2014). Nevertheless, we seek to present our own interpretation of the Pashto vowel inventory in the following section, and follow it with a preliminary description of various related features, including that of diphthongization, length, and nasalization.

2.2 *Vowel Inventory* Table 1 illustrates the seven-vowel inventory that we have observed in our own data. Also note that the 'elegant vowels', characteristic of certain speakers' production of Persian and Arabic loanwords are found in the below table in parentheses. They are written in this table as /ī/ and /ū/, respectively, so as to distinguish them from other phonetically lengthened /i/ and /u/ vowels in the language, which may be etymologically unrelated to Arabic or Persian borrowings.

Table 1: The vowel inventory of Northeastern Pashto

	Front	Central	Back
Close	i (ī)		u (ū)
Mid	e	ə	o
Open		a	aː

Table 1 illustrates the seven vowels found in words of native Pashto origin, in addition to the two 'elegant vowels'. The low-back vowel has previously been described as being a longer counterpart to the more common low-central /a/ vowel (Shafeev, 1964), an observation that our data confirms. Next, (1) contains an instance of each of the seven native vowels posited in the language (i.e. not including the 'elegant vowels').

(1) Words in Pashto according to vowels

	Vowel	IPA	Gloss	ID
a.	/i/	/tíɾa/	'sharp'	SWD038
b.	/e/	/veχtə́/	'hair'	SWD076
c.	/u/	/puɾá/	'full'	SWD023
d.	/o/	/ɡodá/	'knee'	SWD090
e.	/ə/	/lə́gə/	'few'	SWD249
f.	/a/	/sam/	'correct'	SWD050
g.	/aː/	/baːd/	'wind'	SWD164

Finally, a scatter plot showing the mean F1 and F2 values of 58 instances of the seven native vowels is presented below. Ellipses illustrate the range and overlap of each of the vowel categories.

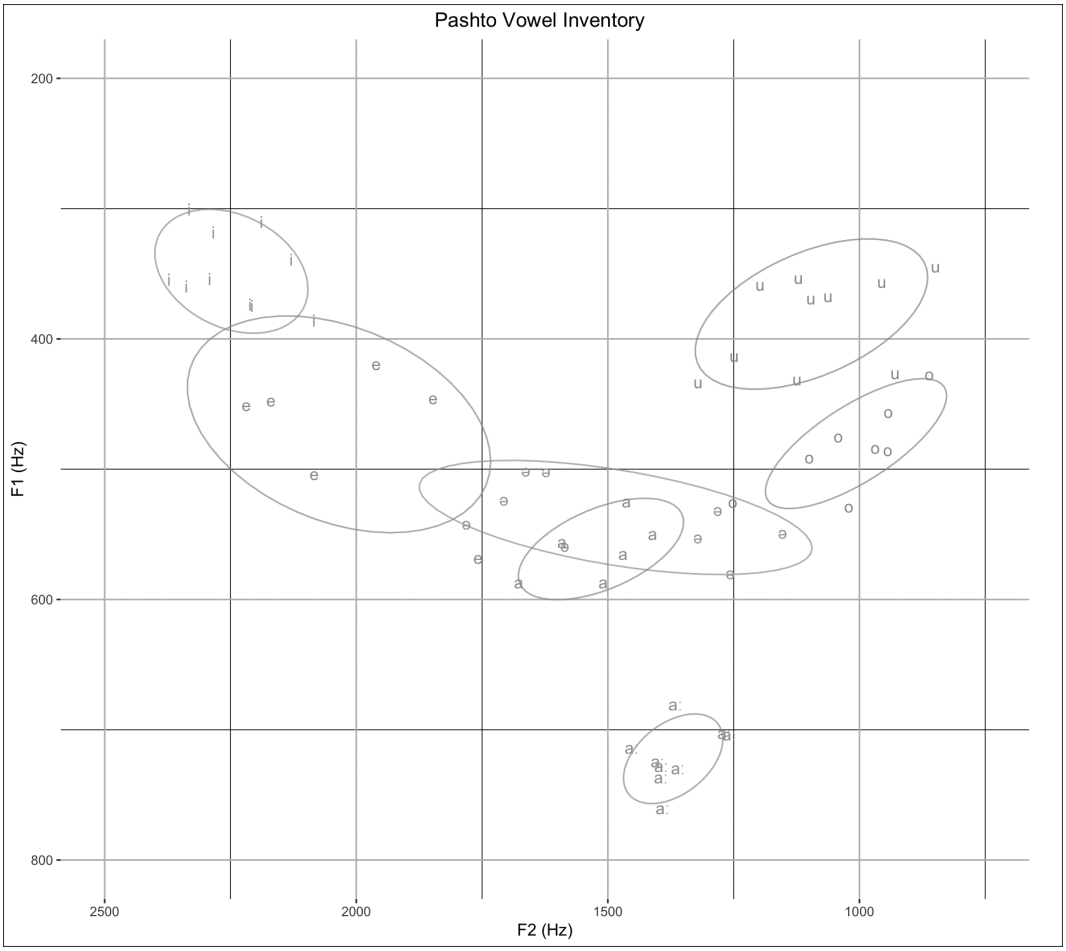

Figure 1: Scatterplot of the 7 Native Vowels of Pashto

As mentioned, this study reports a 7-vowel system for Pashto, comprised of the high vowels /i, u/, the mid-front and mid-back vowels /e, o/, the central vowel /ə/, the low central vowel /a/, and the long low back vowel /aː/. This confirms the finding of previous studies, which also propose a 7-vowel system (David & Brugman, 2014, Robson & Tegey, 2012, Shafeev, 1964). Based on the scatterplot in Figure 1, the central vowel /ə/ has considerable overlap with the low central vowel /a/ in terms of height and backness.

Another interesting point of discussion lies in the distinction between the low central vowel /a/ and the long low back vowel /aː/. Previous studies have noted this distinction (Robson & Tegey, 2012, David & Brugman, 2014, Shafeev, 1964). Using a formant analysis, we observed that the long /a/ in the present data is indeed produced lower and more back than its shorter counterpart. The long vowel /aː/ consistently displayed a higher F1 value of around 700Hz as opposed to around 550Hz for the short vowel /a/; it also showed a lower F2 value of around 1400Hz as opposed to 1550Hz. There was also a minimal pair in the elicited data for these vowels, showing that the contrast between these two vowels may be phonemic. The minimal pair is given below:

(2) Minimal pairs of /a/ and /aː/

	Vowel	IPA	Gloss	ID
a.	/a/	/bad/	‘bad’	SWD030
b.	/aː/	/baːd/	‘wind’	SWD164

However, it is unclear as to whether vowel length alone is contrastive in Pashto. Shafeev (1964) reports that /e/, /o/, and /a/ are acoustically long, as opposed to /i/, /ə/, and /u/ which are acoustically short. It is not stated in the study whether vowel length is contrastive phonemically. The other studies referenced in this paper also do not make any mention of contrastive vowel length. Besides the lengthened low-back vowel /aː/, mentioned above, we found that other peripheral vowels /i, e, u, o/ also had acoustically long counterparts, which is listed below:

(3) Long peripheral vowels in Pashto

	Vowel	IPA	Gloss	ID
a.	/iː/	/ʃmiːɾál/	‘count’	SWD202
b.	/eː/	/deːɾ/	‘many’	SWD247
c.	/uː/	/muːŋg/	‘we’	SWD231
d.	/oː/	/toːr/	‘black’	SWD124

These long vowels tend to occur before voiced sounds, such as rhotics and laterals, and occasionally voiced obstruents. Unlike with the low back vowel /aː/ and its short counterpart /a/, we observed no minimal pairs for the vowels in (3) and their short counterparts. Thus, it is difficult to say at present whether length is a contrastive feature of the native vowel inventory.

2.3 *Diphthongs* Previous research has reported on the occurrence of diphthongs in Pashto. David & Brugman (2014) lists the following diphthongs: /ay/, /aw/, /əy/, /uy/, and /oy/ (where /y/ is assumed to correspond to /j/ in IPA notation). All diphthongs reported here are of the construction: vowel-semivowel. Similar diphthongs are also reported in Shafeev (1964) that lists: /ay/, /əy/, /au/, /ou/, /āy/, /āu/, and /oy/. Robson & Tegey (2012), on the other hand, though they do report vowel-semivowel constructions in Pashto, argue that vowel-semivowel constructions are of the shape VC rather than diphthongs. In the present study, a total of five diphthongs were produced across the recordings. These are listed below:

(4) Diphthongs in Pashto

	Vowel	IPA	Gloss	ID
a.	/au/	/waúɾa/	‘snow’/‘ice’	SWD166
b.	/ej/	/néwei/	‘new’	SWD024
c.	/oj/	/póidəl/	‘know’	SWD220
d.	/uj/	/luí/	‘big’ (unmarked)	SWD001
e.	/ia/	/ziáɭ/	‘yellow’	SWD122

Though not present in the David & Brugman (2014) data, the /au/ we observe in northeastern Pashto appears to correspond to the /au/ listed in Shafeev (1964). We also note that /ei/, /oi/, and /ui/, as we have transcribed them above, correspond to /əy/, /oy/, and /uy/, which have each been reported in previous studies. Interestingly, the VV-sequence /ia/ was observed in the present data as well, but does not appear to have been mentioned in the works we consulted on diphthongs across Pashto dialects. Thus, it remains to be seen whether this sequence in particular may be considered a unique diphthong in the language, as well as whether these sequences ought to be analyzed as VV or VC sequences at all.

2.4 *Nasalized Vowels* Though seemingly non-phonemic, Pashto appears to nasalize the low /a/ vowel fairly often preceding the retroflex lateral sound /ɭ/ (as this is not described in other dialects, it may thus be a feature unique to the Northeastern dialect). These vowels are markedly distinct from the regular short /a/ sound, particularly in the range of F1, which is higher in the nasalized variants (compare the values for a and b with those from c and d). The /a/ sound in the pre-/ɭ/ environment also appears to more closely resemble the formant characteristics of regular long /aː/ (compare the values for a and b with those from e and f). Whether these differences prove significant is still open to further study and interpretation, though we present some preliminary details below:

(5) Nasalized low vowel /ãː/ in Pashto

	IPA	Gloss	F1 (Hz)	F2 (Hz)	ID
a.	/pa̰ːɭa/	‘leaf’	749.67	1301.50	SWD140
b.	/ka̰ːɭe/	‘stone’	725.62	334.12	SWD156

(6) Low-central vowel /a/ in Pashto

	IPA	Gloss	F1 (Hz)	F2 (Hz)	ID
c	/dak/	‘full’	558.32	1474.31	SWD022
d.	/bad/	‘bad’	547.38	1412.72	SWD030

(7) Low-back vowel /aː/ in Pashto

	IPA	Gloss	F1 (Hz)	F2 (Hz)	ID
e.	/baːd/	‘wind’	706.34	1290.82	SWD164
f.	/maːr/	‘snake’	696.21	1140.42	SWD064

As a final note on nasalized vowels in Pashto, we will mention that only the low vowel /aː/ appears to be nasalized in the data encountered so far. This nasalization appears to occur only preceding the retroflex lateral /ɭ/, and otherwise is relatively imperceptible preceding or following nasal segments. A wider set of data including more instances of such phonotactic environments, paired with the collaborative judgements of trained phoneticians may reveal more insights into this matter—that is, why is the nasalized quality so apparent in this environment in particular? For the time being, we shall consider this aspect of Pashto vowel phonetics a footnote for future study.

2.5 *Stress* Robson and Tegey (2012) point out that Pashto is unique among the Iranian languages with respect to its system of phonemic stress. Shafeev (1964) states that stress in Pashto is marked by strength of pronunciation, and that the language is ‘free’ in that any syllable in polysyllabic words may undertake primary stress, regardless of vowel length. Stress may also shift based on morphology and derivation, and the meaning of a word can depend on stress alone. Robson and Tegey (2012, p. 725) propose the following minimal pairs, among others (transcription of segments has been modified to reflect current IPA standards; stress is marked with high tone marker in order to maintain uniformity with the rest of the data presented in this paper):

(8) Phonemic stress contrast in nouns (from Robson & Tegey, 2012, p. 725)

	IPA	Gloss	IPA	Gloss
a.	/ʈɑ́n.ga/	‘pear tree’	/gó.ra/	‘look’
b.	/ʈɑn.gá/	‘cart’	/go.rá/	‘fair-skinned’

(9) Phonemic stress contrast in pronouns (from David & Brugman, 2014, p. 15)

	IPA	Gloss
a.	/haɣə́/	‘he/she/it’
b.	/háɣə/	‘that’

Moreover, the authors note that “while stress is not predictable, as a general rule, stress is on the last syllable ending in a consonant, and on the penultimate syllable if the last syllable ends in a vowel” (Robson & Tegey, 2012, p. 725). Additionally, they note that cases of predictable stress are restricted to a small number of affixes, each of which demands to be stressed. Similarly, Shafeev (1964) states that stress always falls on the final syllable in infinitives (any word that ends with /-əl/). However, this stress pattern was not observed in the transcriptions of the data elicited from our consultant, and stress was also found to have fallen on the penultimate or antepenultimate syllable, depending on the word. This is illustrated in (10):

(10) Stress placement in polysyllabic infinitive verbs

	IPA	Gloss	ID
a.	/swazedə́l/	‘burn’	SWD170
b.	/gaɾáwəl/	‘scratch’	SWD195
c.	/álwatəl/	‘fly’	SWD204

3 Discussion

In this description, we outlined the Pashto vowel system based on data elicited from a native speaker of the northeastern dialect of the language. We also briefly analyzed some of the components contributing to the quality of these vowels. In section 2.2 we report a native seven vowel system, consistent with previous descriptions of the language (see David & Brugman, 2014; Robson & Tegey, 2012; Shafeev, 1964). Here, we also discuss the existence of long vowels in the language, found in both the ‘elegant vowels’ of Persian and Arabic loanwords, as well as in certain phonotactic positions, and also potentially phonemically—as in the distinction between /bad/ ‘bad’ and /baːd/ ‘wind’. This is followed by a short description of the diphthongs in section 2.3, observed in the northeastern dialect of Pashto, which includes /ia/, in addition to the previously-attested /au, uj, ej, oj/ (see David & Brugman, 2014; Shafeev, 1964); (section 2.4) a brief discussion of the similar formants values between /aː/ and its nasalized

counterpart, in contrast to the short low vowel /a/; (section 2.5) and finally an outline of the contrastive system of stress in the language.

We add that future studies ought to take certain considerations into account when furthering research on the vowel systems of Pashto dialects, particularly by keeping in mind what factors may contribute to vowel lengthening (and whether the language distinguishes between long and short vowels phonemically), in what way should diphthongs be analyzed (i.e. as vowel-semivowel sequences or otherwise in the shape VV), and finally, what factors contribute to the emergence of nasalization in the language.

4 Acknowledgements

We would like to extend our sincere thanks to our speaker-consultant for his invaluable intuitions and observations on the language, which forms the basis of the data employed in this study, in addition to our professor and fellow students in ICU's field methods class in spring 2021 for their contributions in transcription and collaborative approach in the classroom.

5 Appendix

1. Formant data for Figure 1

Vowel	F1 (Hz)	F2 (Hz)	Vowel	F1 (Hz)	F2 (Hz)
a	586.72	1509.48	u	358.1	1197.47
a	586.83	1676.93	u	426.23	928.68
a	555.8	1590.95	u	353.09	1120.89
a	564.64	1469.79	u	344.22	848.73
a	549.26	1411.06	u	355.95	955.53
a	524.7	1462.91	u	368.75	1096.38
ə	541.69	1780.89	o	483.22	968.36
ə	548.49	1152.76	o	474.58	1042.1
ə	501.06	1662.83	o	528.32	1020.9
ə	558.74	1585.78	o	484.98	943.81
ə	579.87	1256.96	o	455.84	942.61
ə	501.18	1622.68	o	524.77	1251.31
ə	531.3	1281.26	o	426.73	861.08
ə	552.3	1321.07	o	490.99	1099.58
ə	523.13	1706.51	e	568.04	1758.18
i	359.35	2337.64	e	503.6	2083.57
i	338.91	2129.04	e	447.01	2169.19
i	373.58	2210.94	e	445.31	1847.00
i	374.53	2206.78	e	450.75	2218.52
i	385.73	2083.76	e	418.93	1960.26
i	310.11	2188.52	a:	729.15	1360.63
i	318.04	2284.06	a:	713.66	1452.39
i	300.44	2331.96	a:	702.26	1268.28
i	353.7	2290.98	a:	703.32	1258.69

i	354.37	2371.82	a:	759.96	1391.02
u	366.81	1062.38	a:	736.3	1394.53
u	432.9	1320.68	a:	727.43	1393.78
u	413.06	1249.01	a:	724.12	1400.91
u	430.94	1123.92	a:	680.39	1365.45

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