The Short Vowels /i/ and /u/ in Iranian Balochi Dialects

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Abstract

The aim of the present paper is to study the status of the short vowels /i/ and /u/ in five selected Iranian Balochi dialects. These dialects are spoken in Sistan (SI), Saravan (SA), Khash (KH), Iranshahr (IR), and Chabahar (CH) regions located in province Sistan va Baluchestan in the southeast of Iran. This study investigates whether these two vowels have the same qualities as the short /i/ and /u/ do in the Common Balochi inventory (i, iː, u, uː, a, aː, eː, oː). The Common Balochi inventory is the vowel system represented generally for Balochi language, which is a North-Western Iranian language, a sub-branch of the Indo-Iranian family. The data for this survey are gathered from villages, rural areas, and cities in these regions in the forms of free speech and verbal elicitation from more than 20 literate and non-literate male and female language consultants, 2 males and 2 females for each dialect. The investigation reveals that the short /i/ and /u/ show strong tendencies towards a lower position. This study suggests phonemic systems in which the short /i/ is modified to short /e/ in all dialects, but /u/ is modified to /o/ only in SI, SA, and CH; the lowering of the short /u/ to short /o/ in KH and IR may still be in the transition stage. It is possible that Persian, as the dominant language has had its influence on these dialects causing a lowering tendency in the two vowels under study.

Keywords: Balochi, Iranian Balochi Dialects, Common Balochi, Vowels, Language Contact, Persian

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1. Introduction

Balochi has been considered a North-Western Iranian language (Jahani, 2003, p. 114), which is most closely related to "Kurdish, Tati, Talyshi and other North-Western Iranian languages", and structurally more similar to "Parthian, Middle Persian, and classical New Persian than to Modern New Persian." Paul (2003, p. 61) argues that there is no clear-cut division between North-Western and South-Western Iranian languages, but "rather a scale of 'Northwesternness' or 'Southwesternness', on which each language is 'more or less' NW or SW." Korn (2003, pp. 51, 58) points out that, under the influence of language contact in the past, Balochi has taken over "some innovations" from Persian and shows more similarities to that language than, e.g., Zazaki does; Zazaki also belongs to the North-Western Iranian languages and is not very influenced by Persian due to less contact (Paul, 2009). Regarding the historical sound changes, Korn (2005, p. 329) points out that Balochi, and Kurdish "occupy a position between the NWIr. and the SWIr. languages and might in this respect be called 'Transitional Western Iranian languages'." Jahani and Korn (2009, p. 636) have broadly divided the Balochi dialects into the three groups of Eastern, Western, and Southern Balochi; they *(ibid)* mention that there are some dialects, such as Saravani, which show transitional characteristics between the Western and Southern groups. Factors such as geographical distribution and contact with surrounding languages are responsible for the many dialect variations of this language.

The Balochi dialects in Iran (including those spoken in Sistan va Baluchestan province) are surrounded by Standard Persian and also by some Persian dialects, such as Sistani and Birjandi dialects, as well as some other

languages such as Brahui, Bashkardi[1], Jadgali, Mazandarani and Qashqai. The Baloch of the young generation, who receive education, are normally particularly influenced by the language of education. Jahani (2005, pp. 159–160) states that education in Persian "considerably strengthens the Persian influence" on Balochi. She *(ibid)* uses the term "superstrate"[2] influence to refer to the Persian structural and lexical influence on the Balochi dialects spoken in Iranian Balochistan. Rzehak (2009, p. 117), who deals with the phenomenon of language contact and its effects on the Balochi language spoken in Sistani, points out that Persian, as the dominant language, can influence Balochi, the dominated language, to copy (imitate and adapt) new elements into its lexicon and phonology, etc.

From a historical point of view, Mahmoodzahi (2003, p. 148) points out that "Balochi and Persian must have been to at least a certain degree in constant contact with each other for centuries", and in the modern times, he (*ibid:* 149–151) refers to different factors such as education in the official language, Persian, the completion of the electrification of the province after the Islamic Revolution, mass media, and intermarriages between Baloch and Persian speakers, which have increased the linguistic contacts between the two languages. Jahani (2003, p. 129) and Spooner (1967, p. 56) also remark on the contact-linguistic influence of Persian on the Balochi spoken in Iran, specifically as observed in the area of Saravan. They point out that among the Balochi variants spoken in Iran, the Saravan dialect is different from the others and seems to be closer to Persian, and that this can be attributed to the

[1] Also Bashgardi

[2] Jahani (2005) defines "superstrate" as a type of influence which a dominant language exercises on a dominated language.

presence of many Persian speakers, mainly the Afghan immigrants of centuries ago, in the Saravan region.

With the aid of instrumental analysis, this study investigates the quality of the short vowels /i/ and /u/ in five Iranian Balochi dialects, SI, SA, KH, IR, and CH, spoken in the Sistan va Baluchestan[3] province in the southeast of Iran. This survey, which attempts to compare the status of these vowels with the ones in the Common Balochi inventory (*i, iː, u, uː, eː, oː a, aː*, first put forward by Morgenstierne 1948 as a general vowel inventory for all dialects of Balochi, see Rossi, 1979, p. 177), is the first work applying empirical acoustic analysis on a large body of recorded data in the Iranian Balochi dialects. The data for this survey were gathered from villages, rural areas, and cities in these regions in the forms of free speech and verbal elicitation from more than 20 literate and non-literate male and female language consultants. A total of four consultants, 2 males and 2 females, were used for the spectral (i.e., formant) measurements of vowels for each dialect, altogether 10 males and 10 females. The discussion is also informed by an impressionistic analysis of the data elicited from all of the consultants, even those whose data were not subjected to acoustic measurements. No data were elicited using read speech, and thus all speech material for the present study can be regarded as unscripted speech. The majority of the consultants were middle aged (40 to 70), although a few were younger (25 to 38) and older (70 to 82).

The verbally elicited material included a series of specially constructed sentences in which a target vowel sound was intended to occur in a phonological and prosodic context amenable to phonetic analysis. The sentences were elicited from the consultants by asking them to translate the exact Persian sentences or words into Balochi and to repeat them four times (in

[3] This is the official English spelling used in Iran, also Sistan va Baluchestan.

Balochi). The data were labeled using Wavesurfer (Sjölander & Beskow, 2000) and the labeling was used as the basis for automatic extraction of spectral information. For the formant analysis, Praat,[4] was used. Numerical analysis and graphing were done using MS Excel as well as the statistical program Minitab. The different number of tokens of vowels used in the analysis (represented in the tables) is attributed to the different reasons such as technical recording problems or uttering synonyms or unwanted words by some speakers, which led to the exclusion of some of the data.

1.1. An Overview of Previous Research on Balochi Vowel Systems

With regard to the previous works on Balochi language, almost the same series of vowels is represented for all Balochi dialects in general. Regardless of the dialectal grouping, this series of vowels, *i, iː, u, uː, eː, oː a, aː*, is found not only in the oldest works on Balochi, such as Dames (1891[5] and 1907 respectively) Geiger (1898–1901) Gilbertson (1923), but also in the recent ones, such as Barjasteh Delforooz (2010). This series was first referred to as the Common Balochi vowel system by Morgenstierne (1948, see Rossi, 1979, p. 177) as a general vowel inventory for all dialects of Balochi. Just as many languages of the world have the basic vowels *a, e, i, o, u* in their vowel inventories (Ladefoged, 2005, p. 36), the Common Balochi vowel system also includes

[4] http://www.fon.hum.uva.nl/praat/

[5]Dames (1891, p. 3), studying the Eastern dialects, distinguishes the long vowels *aː, iː, uː*, the short vowels *a, i, u,* and the vowels *e, ai, o, au,* which he groups under the name of diphthongs. He refers to *e* and *o* as diphthongs, but he does not mention why he classifies them as such. He considers the vowel sounds in Balochi to be similar to those of Khorasani Persian in general, and as a noticeable difference from Persian, he refers to the substitution of the series *iː, i, e* for *uː, u, o* in Balochi and also in some Arabic loanwords, e.g., *diːr <duːr* 'far'.

these five vowel qualities, but, in addition, three of these vowel qualities have a long vs. short distinction. Thus, Common Balochi has 8 vowel phonemes *i, i:, u, u:, e:, o: a, a:*. Common Balochi vowels system is also represented by Elfenbein (1989) for Balochi in general, by Barker and Mengal (1969) for Western dialect spoken around Noshki, by Rossi (1979) and Jahani (1989) for both Western and Eastern Balochi, by Buddruss (1988) and Rzehak (2003) for Balochi of Afghanistan, by Farrell (1990) for Balochi of Karachi, and by Axenov (2006) for Balochi of Turkmenistan.

Jahani and Korn (2009, p. 641) present the series *i, i:, u, u:, e:, o: a, a:* as the Common Balochi vowel system in their article, pointing out that most of the Balochi varieties have the same vowel system as Common Balochi, though "phonetically" the pronunciation of some vowels varies among the dialects. Jahani and Korn (*ibid:* 642) also provide two different inventories[6] for vowel systems occurring in the Balochi dialects in Iran *a, a:, e, e:, i:, o:, o, u:*; and *a, a:, e, i:, o, u:, ie, ue*. They do not mention which dialects in Iranian Balochistan have acquired which of these two systems. While Elfenbein (1989, p. 352) notes that "there exist no short *e*, *o*," in Balochi, Jahani and Korn see the change of *i/u* to *e/o* occurring in the vowel system of Iranian Balochi as due to the influence of the official language Persian.

Among the works in which there is somehow a reference to the existence of short /e/ and /o/, is Grierson (1921) studying Western and Eastern Balochi, Baranzehi (2003) studying the Saravani dialect and Persian influence on it, Yousefian (1383) describing the Iranian Balochi dialect of Lashari, Ahangar

[6] Based on the text in Jahani and Korn (2009, p. 642). Table 11: 3 in Jahani and Korn *(ibid)* gives *u* instead of *o*, which according to personal communication with Jahani is a *lapsus calami*.

(2007) describing the verbal system of Sarhaddi Balochi in Granchin, and Axenov (2006), who shows the allophonic form of the phoneme /i/ which becomes [e] in closed syllable and in unstressed word-final position, as e.g., in /dil/>[del] 'heart'. In some cases of these studies, such as Ahangar (2007), both forms of /i/, /e/ and /u/, /o/ are represented in the vowel systems or in the transcriptions.

Spooner (1967, p. 58), who also study Iranian Balochi, mainly the Saravani dialect, indicates that, because of variations in pronunciation, it is difficult to distinguish between the long /iː/ and /eː/, a long /uː/ and /oː/, and the long /aː/ and short /a/. Spooner's phoneme inventory, with distributional restrictions and phonetic features (presented in Rossi, 1979, pp. 192–193) is *a, aː, eː, i (e), iː, o, uː*. Spooner *(ibid)* adds "I have represented all long back rounded vowels as *u*, and short ones as *o*, since there seems to be no phonemic differentiation within each."

Rzehak (2009) deals with the phenomenon of language contact and its effects on the Balochi language spoken in Sistan. Rzehak mentions that the three traditional short vowels /a/, /i/ and /u/ in Balochi are pronounced as /a/, /e/, and /o/ in modern Persian, and that these days, some Balochi speakers follow the Persian model code, in some cases, by pronouncing /e/ and /o/ instead of /i/ and /u/, "although the opposition between /e/ and /i/ or between /o/ and /u/ has no phonemic relevance in Balochi" (ibid: 123).
The vowels found in Rzehak's work (2009), are *a, aː, e, eː, i, iː, o, oː, u, uː,*

1.2. Theoretical Consideration

Vowels, as one of the general categories for classifying speech sounds, can be defined phonologically, as the sounds with sonority, which can function as the nucleus, the center of a syllable. In phonetic terms, Ladefoged (2005, p. 26)

defines a vowel as a sound, which is produced without "any kind of obstruction of the outgoing breath". To classify vowels from a phonetic point of view, which is usually done by using "acoustic or auditory criteria" (Crystal, 2008, p. 517), it is necessary to make reference to different variables such as oral or nasal escape of the air, the position of the lips, and the part of the tongue as well as its height. All these factors determine the quality of vowels, the factor that distinguishes one vowel from another. The three features of vowel height (high, mid, or low position of the tongue), degree of backness (front, back, or central position of the tongue), and degree of lip rounding (rounded or unrounded) contribute to the different values of vowels (Ladefoged, 1975, p. 193).

To provide reference points of vowel quality to compare the vowel qualities of languages, the Cardinal Vowel[7] system was invented by the late Professor Daniel Jones (Chapman et al., 2000, p. 59). This system uses particular vowel percepts as reference points that define the most closed, the most open, the most front, and the most back points, which mark the limits of vocalic articulations. Ladefoged (1975, p. 195) defines cardinal vowels as evenly spaced vowels "around the outside of the possible vowel area" which show the extreme possible qualities.

Sound systems of languages tend to be fairly symmetrical, which means that the vowels are evenly spaced and quite peripheral in the vowel space; e.g., the

[7] The Cardinal Vowel system, a set of reference vowels invented by *Daniel Jones*, are used by phoneticians as a reference point in describing the sounds of languages. The cardinal vowels are divided into two sets of primary and secondary cardinal vowels and are represented by numbers and phonetic symbols. The primary cardinal vowels, numbers 1–8, are the front unrounded i, e, ɛ, a, and the back rounded ɔ, o, u and unrounded ɑ vowels, and the secondary cardinal vowels, numbers 9–16, are the front rounded y, ø, œ, ɶ, and the back unrounded ʌ, ɤ, ɯ and rounded ɒ vowels (Chapman et al., 2000, p. 60).

most common vowel system, i, e, a, o, u, is a symmetrical system (Burquest, 2006, pp. 4-5). The vowels arrange themselves more or less in a V-formation in a vowel chart. Regarding the typology of vowel systems, there are many languages which have the same basic vowel inventory. Ladefoged (2005, p. 36) points out that the five vowels *a, e, i, o, u*, are the most common vowels and are found in many languages. Schwartz et al. (1997, p. 251), which is a work on the major trends in vowel system inventories, refers to the picture one can derive from the Maddieson's (1984) UPSID (*UCLA*[8] *Phonological Segment Inventory Database*) inventory, in the sense that "[s]ymmetry is the rule" and "there is a strong trend for having the same number of front and back vowels in a peripheral system".

2. Vowel Quality Analysis

In this section, the findings about the qualities of the vowels in the Balochi dialects under study are presented and discussed in the form of scatterplots, spectrograms, and tables. A spectrogram is a visual representation of the spectral density of a signal over time. A spectrogram can be a useful in the determination of formants and acoustic characteristics of language sounds (Sepanta, 1377; Stevens, 2000). Ladefoged (2005, p. 34, 1975, p. 169) defines formants as the "resonances of the vocal tract", and states that formants are the "characteristic overtones" (pitches) two of which, the first and the second formants, serve to distinguish the vowels. Figure 1 shows spectrograms of the four primary cardinal vowels [i, e, o, u] (produced by Pétur Helgason 2007, recorded in laboratory condition) as samples to show the formants and their qualities in the speech of a male speaker.

[8] University of California at Los Angeles (*UCLA*).

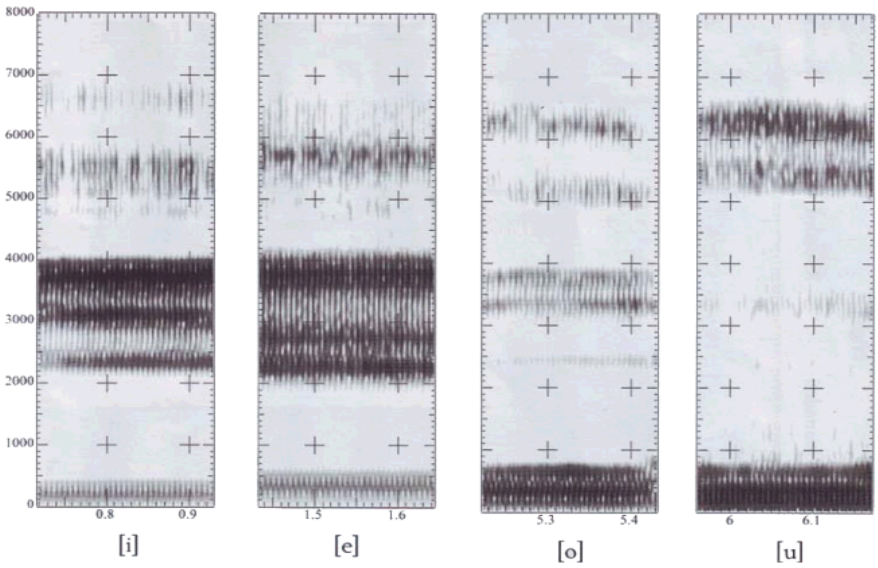

Figure 1. Spectrograms of the Cardinal Vowels /i/, /e/, /o/, /u/

According to the spectrograms in Figure 1, the placement of the formants (F) (dark bands) varies with the different vowels. For example, in [i], F1 (the first dark band from the bottom) is low, approximately 200 Hz, and F2 (the second dark band from the bottom) is high, approximately 2500 Hz (generally, the range of F1 for a male speaker is typically between 200–1000 Hz and F2 is 600–2500). With front vowels, the amount of energy (in the form of dark bands which are formants) above 1000 Hz is greater than in back ones. In the vowel [e], the positions of F1 and F2 are similar to those in [i], but slightly closer to each other; i.e., F1 is somewhat higher and F2 lower than in [i]. As for [u], both F1 and F2 are low, approximately 250 and 600 Hz respectively, so they tend to merge into one "fat" formant at the bottom of the spectrogram. F1 and F2 in [o] are both slightly higher than those in [u]; thus, in a spectrogram, F1 and F2 may seem to merge into one "fat" formant just like in [u]. For long vowels, everything is the same except for the duration which is longer than in short vowels.

The scatterplot figures in the following sections, presented for each dialect, plot the measured F1 vs. F2 values (in Hz) of the vowels /i/, /iː/ and /u/, /uː/ for female and male speakers separately (each circle or square in the scatterplots represents a token of a vowel). The number of tokens may not be the same for males and females or across the dialects, and that is because some tokens are excluded due to the different reasons, such as technical problems of recording or a synonym was uttered instead of the target word. The inclusion of the long forms /iː/ and /uː/ in the scatterplots are for the sake of comparison to show that lowering is just seen in the short forms of these vowels. In the scatterplots, the y-axis (vertical) shows the frequencies of the first formant (F1), and the x-axis (horizontal) shows the frequencies of the second formant (F2) of the target vowel. Also, the mean values and standard deviations (StDev) for each vowel are given in a table below each scatterplot, averaged separately for female and male speakers. The short and long forms of each vowel are represented on one panel related to each gender. Due to limitations in the data analysis software, the short and long forms of vowels are shown by lowercase and uppercase, respectively, in the legends of the figures (e.g., i, I) and by IPA symbols (e.g., i, iː) elsewhere. Table 1 presents a sample of words under analysis.

Table 1. A Sample of the Words under Analysis

/i, iː/		/u, uː/	
dil	'heart'	guṭ	'throat'
bil	'put!'	duz	'thief'
gipt	'he/she took'	buz	'goat'
diːst	'he/she saw'	zuːt	'soon'
duzziː	'theft'	buːt	'he/she became'
doːšiː	'last night'	kuǰē	'where is'
kučik	'dog'	buzeː	'it is a goat'
ǰigrit	'he/she fled'	ǰaːduː	'sorcery'
bikan	'do!'	abdul	'Abdul'
geːštir	'more'	kabuːl	'accepted'
diːwaːl	'wall'	daːnkuː	'wheat'

2.1. The Vowels /i/ and /u/ in SI

Figure 2 presents the formant values of the vowels /i/ and /iː/ in the SI dialect. The figure clearly shows that most of the long /iː/ tokens, both for male and female speakers, have lower F1 and higher F2 values than those of the short /i/. This means that the long /iː/ is closer to the value of [i] or [ɪ] than the short /i/, e.g., in the word *diːwaːl* 'wall', although there are some tokens that approach an [e] value. The short form of /i/, both for the female and male speakers, shows tendencies towards having higher F1 and lower F2, which indicates a lower position approximating [ɪ] or [e] vowel. For example, the words *dil* 'heart' and *bil* 'put!' are articulated as *d* [e]*l* and *b* [e]*l* respectively. There are examples of the same words being produced with these two vowel qualities in different repetitions, e.g., *gipt* as *g* [ɪ] *pt* and *g* [e] *pt* 'he/she got'. The mean formant values for /i/ and /iː/ are given in Table 2. They indicate a pronunciation approximating [ɪ] or [e] for the short /i/, but for the long /iː/ the formant values are closer to a cardinal [i] vowel, specifically for the female speakers.

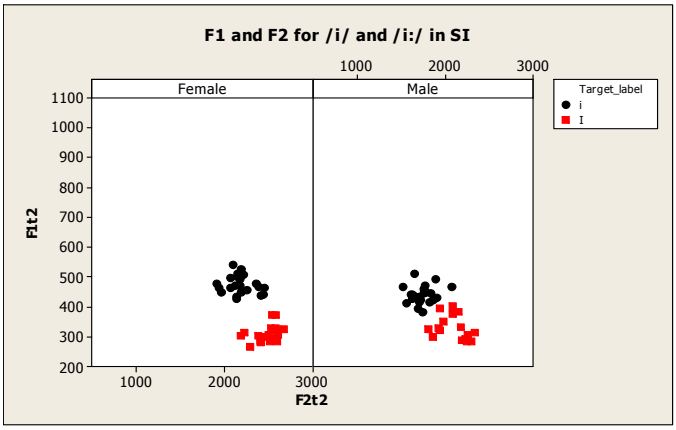

Figure 2. F1 and F2 for /i/, /iː/ in SI (/iː/ is indicated as I in the legend)

Table 2.Mean F-frequencies and Standard Deviations (Hz) of /i/, /iː/ in SI

SI	Variable	F1		F2	
	Target	i	iː	i	iː
Female	N	22	20	22	20
	Mean	474	309	2181	2487
	StDev	30.0	27.7	156.5	133.9
Male	N	24	16	24	16
	Mean	440	330	1730	2096
	StDev	28.7	39.8	124.2	165.0

The formant frequencies of the vowels /u/ and /uː/ in the SI dialect are presented in Figure 3. For the male speaker, the range of the formant values for /u/ and /uː/ overlap partly, while the female /uː/ tends to have slightly lower frequencies for both F1 and F2 than does /u/, indicating that it is produced higher and further back. The mean frequencies of /u/ and /uː/, given in Table 3 are consistent with these observations. In particular, the differences between the mean F1 frequencies for /u/ and /uː/ among males are fairly small, 426 and 364 Hz respectively, while the females show a greater difference, 463 and 327 Hz respectively. As indicated by Figure 3, the long /uː/ tokens that have the lowest F1 and F2 values approximate the percept of a cardinal [u], e.g., *kabuːl* 'accepted', and *zuːt* 'soon'. The figure also shows that, for all speakers, the F2 frequencies for the short /u/ are generally higher than one would expect for a cardinal [u]. This means that the short /u/ is articulated more as an [ʊ] or [o] sound than a cardinal [u]. Furthermore, in most of the data the higher F1, specifically with the female speakers, indicates a greater lowering of the /u/ towards an [o] sound, e.g., *buz* 'goat' as *b*[o]*z* (or *b*[oː]*z*).

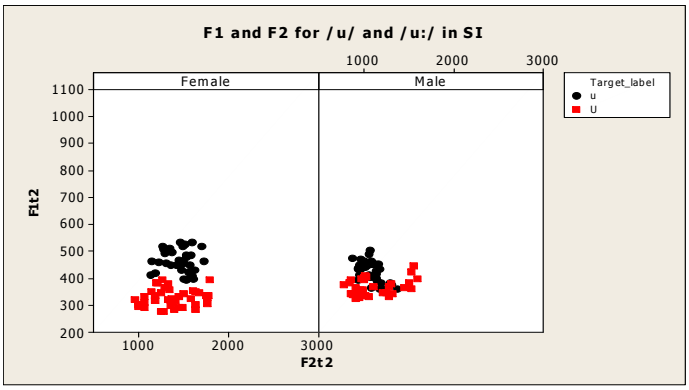

Figure 3. F1 and F2 for /u/, /uː/ in SI (/uː/ is indicated as U in the legend)

Table 3. Mean F-frequencies and Standard Deviations (Hz) of /u/, /uː/ in SI

SI	Variable	F1		F2	
	Target	u	uː	u	uː
Female	N	33	40	33	40
	Mean	463	327	1444	1365
	StDev	43.3	32.1	155.3	244.8
Male	N	36	40	36	40
	Mean	426	364	1075	1034
	StDev	37.6	30.2	115.6	183.2

Discussion: According to the figures 2 above, the vowels /i/ and /iː/ have slightly different formant values. Although females generally produce more peripheral vowel qualities than males, i.e., utilize more of the vowel space (Simpson, 2001, 2002), the long /iː/ tokens show more of the characteristics of a cardinal [i], both with the male and the female speakers. The short /i/ values are lower, closer to the vowels [ɪ] or [e] (there are, in fact, examples of the same word being produced with these two vowel qualities in different repetitions by the same speaker). Judging by the position and spread of the measurements in the figures, as well as by impressionistic analysis, the short /i/ approximates the quality of an [e] vowel. As the durational distinction between the long /iː/ and the short /i/ is fairly small in SI (see Okati, 2012, p. 49), it seems that the

speakers uphold the distinction between these two vowels partly through quality rather than just by quantity. Contact with Persian, especially the Sistani Persian dialect, may be a driving force for these changes because, there exist cognate words, such as *del* 'heart' (in Persian) and *bel* 'put!' (in Sistani Persian) which may directly influence the production of these words in the SI dialect and induce the production of, e.g., *del* and *bel*. Based on both the formant measurements and the impressionistic analysis, the vowel /i/ has primarily the quality of an [e] vowel, and so it seems justifiable to represent the /i/ as an /e/ in the SI dialect.

The vowels /u/ and /uː/, in general, are articulated more towards an [ʊ] sound, and even lower in many cases, towards the vowel [o]; e.g., *duz* 'thief' and *buz* 'goat' are uttered as *d* [o]*z* (or *d* [oː]*z*) and *b* [o]*z* (or *b* [oː]*z*), respectively, in many repetitions. One of the possible reasons for the lower quality of /u/ in these words, may be the instability of short vowels, in a sense that the unstable short vowels in a system show tendencies towards acquiring different durations or qualities of the stable long vowels (Lazard, 1992, pp. 17–22) (see more in Okati, 2012, p. 47). In many instances the long /uː/ shows the characteristics of a cardinal [u]. The scatterplot in the Figure 3 above, as well as the impressionistic analysis of the production of /uː/ and /u/, indicate that in SI, unlike in Common Balochi, the /u/ and /uː/ are qualitatively separate from each other because they are not overlapping in the scatterplot. The scatterplots indicate a near complete separation in F1-F2 values in the female data and the short /u/ shows a lower quality than /uː/, with a high degree of overlap with /oː/. Therefore it seems more reasonable to use a short /o/ rather than short /u/ to represent this vowel in the vowel system of the SI dialect. This distinction results in a symmetry in the vowel inventory of SI, as the short /i/ is also lowered and modified to the /e/ sound.

2.2. The Vowels /i/ and /u/ in SA

Figure 4 and Table 4 present the formant values and the mean formant frequencies for the vowels /i/ and /iː/ in the SA dialect. As in the SI dialect, the formant values in Figure 4 show that the /iː/ is more peripheral than /i/ for both male and female speakers. The short /i/, in both plots, generally has higher F1 and lower F2 frequencies than /iː/, which indicates a lower quality, approximately [e]. The formant values for the long /iː/ are closer to the qualities of [i] and [ɪ]. This is reflected in the mean formant durations given in Table 4, which show that /iː/ has lower F1 and higher F2 than /i/ for both males and females. The female formant values for /iː/ reflect a high front vowel [i], but the male F2 value is lower than one would expect for [i], indicating that the females have a more peripheral articulation in producing /iː/ than do the males. Impressionistic analysis supports the above analysis. For example, the long /iː/s in the words *duzziː* 'theft', and *diːwaːl* 'wall' are produced with an [i] or [ɪ] quality in impressionistic analysis. By contrast, the short /i/ in words such as *dil* 'heart', *bil* 'put!', and *gipt* 'he/she got' are generally produced with a slightly lower vowel, towards an [e] quality.

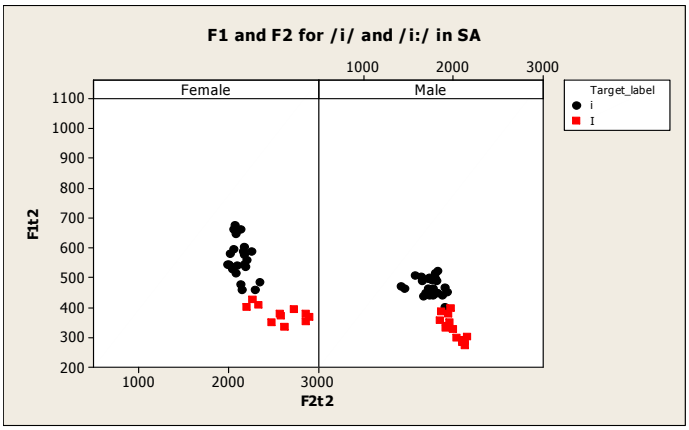

Figure 4. F1 and F2 for /i/, /iː/ in SA (/iː/ is indicated as I in the legend)

Table 4. Mean F-frequencies and Standard Deviations (Hz) of /i/, /iː/ in SA

SA	Variable	F1		F2	
	Target	i	iː	i	iː
Female	N	23	11	23	11
	Mean	561	381	2126	2532
	StDev	62.1	28.7	95.1	333.0
Male	N	23	15	23	15
	Mean	472	327	1735	2012
	StDev	30.4	40.7	131.3	101.9

Table 5 gives the mean formant values of /u/ and /uː/ in SA. The frequencies of /u/ are largely consistent with an [o]-like vowel, while the /uː/ shows more [ʊ]-like values. For the female speakers, the mean F2 values of /u/ and /uː/ are 1551 and 1441 Hz, respectively, while the corresponding values for the males are 1195 Hz and 1063 Hz. The higher female F2 values indicate a less peripheral or even central articulation of these vowels, which is not consistent with the general observation that females tend to have more peripheral articulations than males (cf. Simpson, 2002, 2003). The higher F2 frequencies in the females can thus be seen as a result of centralization or fronting. As seen in Figure 5, the short /u/ tokens show a greater tendency for fronting than the long /uː/s. The words *kabuːl* 'accepted', *daːnkuː* 'wheat', and *buːt* 'he/she became' are observed to have both low F1 and low F2, which impressionistically resulted in a quality resembling cardinal [u]. In the female data, a subset of words, such as *buz* 'goat', *duz* 'thief', and *abdul* 'Abdul' is observed to mostly have a markedly higher F1 than the remaining /u/ data. Contact with the dominant language, Persian, can be a reason for the appearance of these lower articulations for /u/ in SA, considering that the same words, *dozd*, *boz*, and *Abdol,* exist in Persian where they are generally produced with a mid-high back rounded vowel.

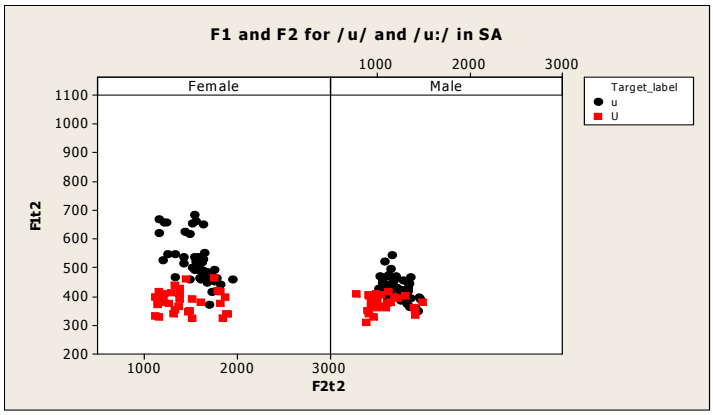

Figure 5. F1 and F2 for /u/, /uː/ in SA (/uː/ is indicated as U in the legend)

Table 5. Mean F-frequencies and Standard Deviations (Hz) of /u/, /uː/ in SA

SA	Variable	F1		F2	
	Target	u	uː	u	uː
Female	N	49	32	49	32
	Mean	522	383	1551	1441
	StDev	74.5	38.4	176.5	262.9
Male	N	55	32	55	32
	Mean	430	376	1195	1063
	StDev	36.6	26.3	120.5	178.2

Discussion: The vowel /i/ is observed to be lower than /iː/, having slightly lower F2 values and higher F1 values both for the male and female speakers. The short /i/ is thus, by and large, produced with an [e]-like quality. The observation of the durations of /i/ and /iː/ in the SA dialect (see Okati, 2012, p. 57) revealed a small durational distinction between /i/ and /iː/. By producing the short /i/ with an [e]-like quality, it seems that the SA speakers distinguish between /i/ and /iː/ primarily through quality (i.e., [e] vs. [iː]) and not through quantity. A similar observation is made in the SI data discussed earlier. Contact with numerous Persian speakers in the Saravan region may be a contributing factor in the tendency for /i/ to be lowered towards an [e] sound. Spooner (1967, p. 58), who worked on the Balochi varieties spoken in Saravan, points

out that because of variations in pronunciation, the distinction between the /iː/ and /eː/ is difficult to perceive. He (*ibid:* 59–69) also uses both short *e* and *i* in his word-list, but it is not clear if they are used as two different phonemes. In the present discussion, however, the vowels /i/ and /iː/ might better be represented as /e/ and /iː/.

As in SI, the vowels /u/ and /uː/ in SA do not show exactly the same range of qualities. As seen in Figure 5 above, the short /u/s do not overlap much with the long /uː/s, which indicates a quality difference. The short /u/ tokens are not only more centralized but also seem more lowered, towards an [o] sound. The long /uː/ tokens show a range of frequencies that center around an [ʊ] vowel. In some cases /uː/ is produced with a quality approximating a cardinal [u], especially in bilabial and velar environments. The female data show a wider range of frequencies than the male data, which is caused partly by the process of fronting in coronal contexts, and partly by the process of lowering towards [o], both of which occur more frequently among the female speakers. Contact with the dominant language Persian may be a reason for the lowering process. The lowering process in this dialect, as well as in the other dialects under investigation, may originate in cognate words which exist in both Persian and the SA dialect. A word with /u/ in SA may thus be affected by a cognate word with /o/ in Persian, e.g., *buz* 'goat' and *duz* 'thief' in SA but *boz* and *dozd* in Persian. However, allophonic alternations conditioned by syllable structure (again borrowed from Persian) may also be a source for the observed lowering (see Okati, 2012, p.166). Finally, although a short [ʊ] is seen among the phonetic variants of /u/, it is suggested here, based on the findings in the SA data, that the vowels /u/ and /uː/ are most aptly represented phonemically as /o/ and /uː/ in SA.

2.3. The Vowels /i/ and /u/ in KH

Some variation in height is observed in the pronunciation of /iː/ and /i/ in KH. The /iː/ is produced mainly as a high, front vowel [i] or [ɪ], although an [e]-like quality is occasionally observed. For example, a quite peripheral vowel, close to a cardinal [i], is observed in the production *diːwaːl* 'wall' and *duzziː* 'theft', but slightly lower variants are also observed and speakers are not consistent with regard to the height of the /iː/ vowel. Impressionistically, the /i/ vowel has the characteristics of [e] or [ɪ], for example in the words *bil* 'put!', produced variably as *b* [ɪ]*l* and *b* [e]*l*, and *bikan* 'do!', produced as *b* [ɪ]*kan* or *b* [e]*kan*. The difference between /iː/ and /i/ is reflected in Table 6 and in the F1-F2 plot in Figure 6, in that /iː/ generally has lower F1 and higher F2 values than does /i/. The different phonetic variants are seemingly in free variation within and across speakers, as one speaker may variably use [e] and [ɪ] for a particular word.

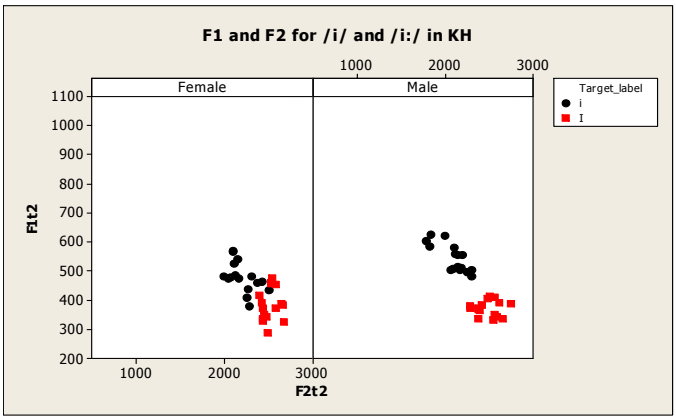

Figure 6. F1 and F2 for /i/, /iː/ in KH (/iː/ is indicated as I in the legend)

Table 6. Mean F-frequencies and Standard Deviations (Hz) of /i/, /iː/ in KH

KH	Variable	F1		F2	
	Target	i	iː	i	iː
Female	N	16	16	16	16
	Mean	479	384	2204	2524
	StDev	52.1	55.7	148.3	91.6
Male	N	16	16	16	16
	Mean	544	372	2090	2488
	StDev	47.2	26.4	161.1	133.1

Table 7 gives the mean F1 and F2 values for /u/ and /uː/ in KH. The formant values for both vowels are quite similar and consistent with an [ʊ]-like quality. The F1-F2 scatterplot in Figure 7 reveals considerable variation in height and frontness for both /u/ and /uː/, and both vowels show substantially the same range of qualities. The clusters of tokens with higher F2 values in both plots are fronted variants that occur in coronal contexts, e.g., in the words *zuːt* 'soon' and *kuǰẽ* 'where is'. The tokens, that have higher F1 frequencies, suggest that /u/ in these words is lowered towards [ʊ] or a mid-high [o] quality, e.g., in *duz* 'thief' uttered as *d*[o]*z*, *buz* 'goat' as *b*[o]*z*, and *zuːt* 'soon' as z[ʊ̟ː]*t*. This lowering may be an allophonic variation attributed to the syllable structure, or they may just be the free phonetic variations. Tokens with a quality closer to a cardinal [u] also occur and are found in words such as *buːt* 'became', *buzeː* 'it is a goat', *ǰaːduː* 'sorcery', and *kabuːl* 'accepted'.

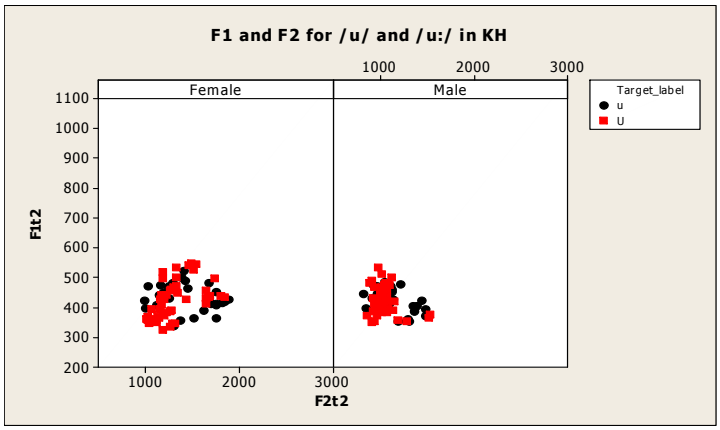

Figure 7. F1 and F2 for /u/, /uː/ in KH (/uː/ is indicated as U in the legend)

Table 7. Mean F-frequencies and Standard Deviations (Hz) of /u/, /uː/ in KH

KH	Variable	F1		F2	
	Target	u	uː	u	uː
Female	N	31	48	31	48
	Mean	434	423	1418	1304
	StDev	4.5	62.6	277.8	222.5
Male	N	34	48	34	48
	Mean	428	423	1113	1037
	StDev	37.3	45.3	180.2	130.2

Discussion: Usually, short /i/ is produced with the quality of [e] or [ɪ] and it is generally produced lower than /iː/ as indicated by the mean formant frequencies shown in Table 6. The scatterplot of F1-F2 frequencies in Figure 6 reveals that while the majority of long /iː/ tokens are produced with an [i]-like quality, some of the data show tendencies towards [ɪ] and [e]. The durational distinction between short /i/ and long /iː/ is greater in KH (see Okati, 2012, p. 65) than it is in the SI dialect, for example, and thus, it seems that the speakers use both quantity (different durations for /i/ and /iː/) and quality (i.e., a lower position for the /i/ vowel) to maintain a distinction between /iː/ and /i/. Although many of the long /iː/ tokens have the quality of a more peripheral [i]

vowel, such a peripheral vowel is not observed with all speakers or even in the same word in different repetitions. The production of [ɪ] and [e]-like qualities for the long /iː/ in some tokens caused some overlap between /iː/ and /i/ (which is modified to /e/) in this dialect. Despite this partial overlap, the durational difference observed between /iː/ and /i/ coupled with the differences in mean F1 and F2 frequencies, shows that the two should be regarded as separate vowel phonemes. In addition, the lower position of the short vowel justifies representing these vowels as /e/ and /iː/ in the KH dialect, rather than /i/ and /iː/.

The range of frequencies seen for the vowels /u/ and /uː/ in the KH dialect show that there is considerable variation in the production of these vowels. The vowel qualities observed are mostly [u]- and [ʊ]-like vowels, but tokens of fronted /u/ and /uː/ in coronal contexts are also observed in this dialect. A lowering towards [o] vowel is also seen for both /u/ and /uː/ in this dialect. Contact with the dominant language Persian can be a reason for this lowering, because there are cognate words in Persian and the KH dialect which differ only in the vowels; i.e., the KH word has an /u/ vowel where Persian has an /o/, e.g., *buz* and *boz* 'goat', respectively. However, the tendency of the back high vowels towards showing lower qualities (i.e., towards an [o] sound), is not consistent in KH, as it is for the short /u/ in the SI and SA dialects. Therefore, it seems more reasonable to keep these vowels phonemically as /u/ and /uː/ in the vowel inventory of KH.

2.4. The Vowels /i/ and /u/ in IR

The mean formant values of /i/ and /iː/ in IR given in Table 8 indicate a difference in quality between the two vowels, although this difference is not very large. As shown in Figure 8, in IR /i/ and /iː/ have a degree of overlap with regard to F1-F2, which is more considerable in the male plot. Both are quite

variable in height, ranging from a high front [i] position to mid-high [e] or [ɪ]. The tokens with the higher F1 values are articulated with an [e] sound rather than [i] in most of the repetitions, e.g., *dil* 'heart' produced as *d* [e]*l*, *gipt* 'he/she got' as *g* [e] *pt*, and *gir* 'take!' as *g*[ɪː]*r* and *g* [eː]*r* (the word *gir* was mostly uttered long, and in some cases, it was even diphthongized as *gier*). There are also examples of words produced variably with [ɪ] or [e], e.g., *kučik* 'dog' produced as *kuč* [ɪ]*k* and *kuč* [e]*k*. The tokens with low F1 and high F2 in Figure 8 have a quality closer to an [i] and [ɪ] vowels and occurred in words such as *diːwaːl* 'wall', *duzziː* 'theft', *dil* 'heart', and *ǰihiː* 'he flees'.

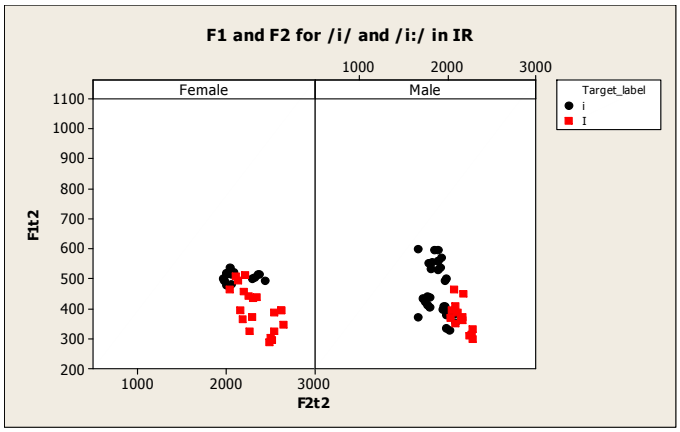

Figure 8. F1 and F2 for /i/, /iː/ in IR (/iː/ is indicated as I in the legend)

Table 8. Mean F-frequencies and Standard Deviations (Hz) of /i/, /iː/ in IR

IR	Variable	F1		F2	
	Target	i	iː	i	iː
Female	N	14	20	14	20
	Mean	506	406	2140	2344
	StDev	16.3	83.7	173.6	203.3
Male	N	30	14	30	14
	Mean	457	370	1892	2156
	StDev	85.4	48.7	120.4	90.0

Figure 9 presents the formant frequencies for the vowels /u/ and /uː/ in the IR dialect. These two vowels have a similar quality in impressionistic analysis and show considerable overlap in the scatterplots. As can be seen in the figure, the F1-F2 frequencies indicate a great deal of variation in both vowel height and frontness. This spread of the frequencies is caused in part by fronting towards the center in coronal contexts, but also by a seemingly unconditioned variability in height yielding both high back [u] variants as well as lower [ʊ] and even [o]-like articulations. The mean formant values for /u/ and /uː/ given in Table 9 are affected by this variability, causing mean F1 and mean F2 to have higher values than one would associate with [u]-like articulations. Variability in height could not be associated with phonetic context, and so the phonetic variants [u], [ʊ], and [o] are observed to occur in the same words. For example *buːt* 'he/she became' is produced as *b* [uː]*t* and *b* [ʊː]*t*, *zuːt* 'soon' as *z* [uː]*t* and *z* [ʊː]*t*, *kabuːl* 'accepted' as *kab* [uː]*l* and *kab* [ʊː]*l* 'accepted', *daːnkuː* 'wheat' as *daːnk[uː]* and *daːnk* [ʊː]. The [u] variant is not observed in *guṭ* 'throat', which is produced as *g* [ʊ]*ṭ* and *g* [o]*ṭ*, *buz* 'goat' produced as *b* [ʊ]*z* and *b* [o]*z* and *kuǰē* 'where is' produced as *k*[ʊ] *ǰē*. Unlike the dialects discussed so far, the lower articulations are not specifically associated with words that have cognates in Persian.

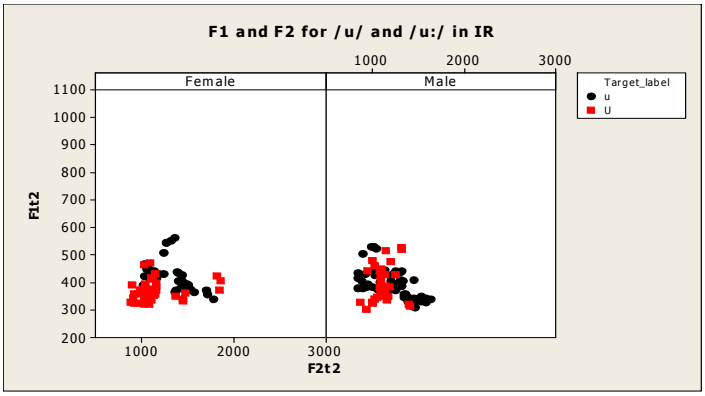

Figure 9. F1 and F2 for /u/, /uː/ in IR (/uː/ is indicated as U in the legend)

Table 9. Mean F-frequencies and Standard Deviations (Hz) of /u/, /uː/ in IR

IR	Variable	F1		F2	
	Target	u	uː	u	uː
Female	N	42	44	42	44
	Mean	420	369	1291	1137
	StDev	50.3	36.0	210.4	234.6
Male	N	57	32	57	32
	Mean	390	397	1229	1119
	StDev	52.2	64.2	222.7	124.9

Discussion: The vowels /i/ and /iː/ in IR have a similar range of variation and are not as sharply separated in quality, especially in the case of female speakers, as they are in, e.g., the SA and SI dialects. Impressionistically both /i/ and /iː/ are produced variably as [i], [ɪ], and [e]. It should be noted that production of the different phonetic forms, [i], [ɪ], and [e], cannot be associated with specific contexts, but are in free variation both within and across speakers. As in the other dialects considered, contact with the dominant language Persian, may be a reason for the appearance of the lower [e]-like articulations in this dialect, which has many Persian speakers surrounding it. There are word cognates in Persian and Balochi which differ only with regard to the vowel, with Persian having an [e]-like quality and Balochi an [i]-like quality, e.g., *del* 'heart' in Persian and *dil* 'heart' in Balochi. In the four Balochi dialects considered so far, the production of an [e] quality for /i/ has been particularly noticeable in these cognates. Perhaps under the influence of Persian and/or for intrinsic reasons, a process of change through lexical diffusion is underway in these dialects. Because the durational distinction between /i/ and /iː/ is almost on par with the durational distinction between /a/ vs. /aː/ and /u/ vs. /uː/ (see Okati, 2012, p. 73), it can be argued that the speakers use both the quantity (i.e., length) and the quality to maintain the distinction between the vowels /i/ and

/iː/. At the present time, it can be suggested that the vowels /i/, /iː/ should be categorized phonemically as /e/, /iː/ in the IR dialect with the different phonetic forms as free variations.

The formant frequencies observed for the vowels /u/ and /uː/ in the IR dialect are slightly higher than those associated with a cardinal [u] vowel. The data for both /u/ and /uː/ reveal the occurrence of fronting in coronal contexts as well as a tendency to produce lower [ʊ]- and [o]-like variants. The occurrence of these processes serves to increase the mean formant values for both /u/ and /uː/ in this dialect. The phonetic variants observed, [u], [ʊ], and [o], do not seem to be conditioned by context or word, and speakers also vary their production. There exist some cognate words that have an [o] vowel in Persian, but an /u/ vowel in IR (as well as the other Balochi dialects), which may increase the likelihood of contact effects. Alternatively, the occurrence lowered variants may be conditioned by syllable structure, which also can be traced to Persian influence (see Okati, 2012, p. 166). Despite the variation observed, /u/ and /uː/, however, show a great degree of overlap, indicating the same qualities, and are best represented phonemically as /u/ and /uː/ in the vowel system of the IR dialect.

2.5. The Vowels /i/ and /u/ in CH

The formant values of the vowels /i/ and /iː/ in CH are presented in Figure 10. The figure shows that almost all short /i/ tokens for both female and male speakers have higher F1 values and lower F2 values than those for /iː/. This implies that /i/ is consistently lower than /iː/ and has the quality of [e], and in few tokens, the quality of [ɪ], in impressionistic analysis. In fact, almost all the male tokens of /i/ are produced as [e] impressionistically. Examples of these variants include *bil* 'put!', produced as both *b* [ɪ]*l* and *b* [e]*l,* and *ǰigrit* 'he/she

fled', produced as *ǰ*[ɪ]*grit* and *ǰ*[e]*grit,* both of which are observed in the speech of the same female speaker. The mean formant values for /i/ and /iː/ given in Table 10 are consistent with a mid to mid-high quality for /i/ and a higher quality, closer to cardinal [i], for /iː/. Examples of /iː/ with a quality close to a cardinal [i] include *ziːt* 'soon', *biːt* 'he/she becomes', and *diːwaːl* 'wall'. However, instances of these words with a lower [ɪ]- and [e]-like quality are also attested in the words *biːt* 'he/she becomes' and *ziːt* 'soon', observed in one speaker, yielding *b*[ɪː]*t* and *b*[eː]*t*, and *z*[ɪː]*t* and *z*[eː]*t*.

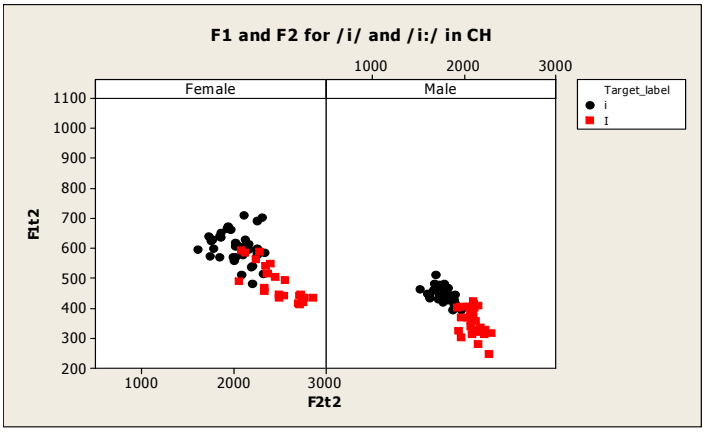

Figure 10. F1 and F2 for /i/, /iː/ in CH (/iː/ is indicated as I in the legend)

Table 10. Mean F-frequencies and Standard Deviations (Hz) of /i/, /iː/ in CH

CH	Variable	F1		F2	
	Target	i	iː	i	iː
Female	N	38	25	38	25
	Mean	604	483	2036	2490
	StDev	51.8	59.5	192.6	235.9
Male	N	34	29	34	29
	Mean	441	360	1798	2095
	StDev	27.1	46.1	126.0	92.1

Figure 11 shows the formant values measured for /u/ and /uː/ in the CH dialect. The F1-F2 values for the male /u/ and /uː/ have less spread than the females, and they generally, especially for the long /uː/, have a quality fairly close to a cardinal [u] in impressionistic analysis. The female values are more spread, especially with regard to F1, which primarily reflects variability in vowel height. Factoring in a 20% larger vocal tract size for males, the mean frequencies for /u/ and /uː/ in Table 11 indicate that the female values reflect a lower quality of /u/ and /uː/ than do the male values. Similarly, the female F2 values for /u/ are also slightly higher than the male values, but for /uː/ the male and female F2 values are approximately equal. As the F1 frequencies get higher, which is seen particularly in the females, the auditory impression is that vowel height lowers. This means that, particularly for the females, /u/ and /uː/ are sometimes produced as [ʊ] or [o], as well as with a concomitant fronting to [ɵ]. The usage of [ʊ] or [o] does not seem to be conditioned by phonetic contexts and appears to be in free variation, as one speaker may use both forms for one word in different repetitions of a word. There are also examples which are uttered with a more back [u]-like quality as well. Examples with these different variants include *kabuːl* 'accepted' produced as *kab* [uː]*l*, *buz* 'goat' as both *b* [ʊ]*z* and *b* [o]*z*, *daːnkuː* 'wheat' as both *daːnk* [uː] and *daːnk*[ʊː], and *guṭ* 'throat' as *g*[o]*ṭ*. The tokens with the highest F2, observed more frequently for /u/ than /uː/, are due to fronting with concomitant lowering, in words such as *duz* 'thief' and *kučik* 'dog', which occurs much more frequently among the females than the males.

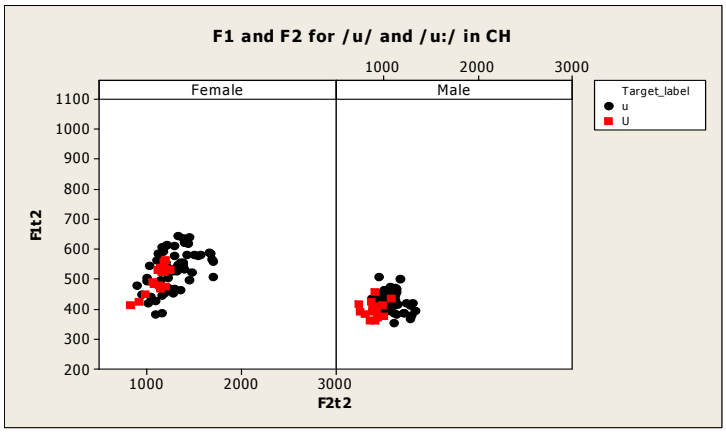

Figure 11. F1 and F2 for /u/, /uː/ in CH (/uː/ is indicated as U in the legend)

Table 11. Mean F-frequencies and Standard Deviations (Hz) of /u/, /uː/in CH

CH	Variable	F1		F2	
	Target	u	uː	u	uː
Female	N	58	16	58	16
	Mean	536	499	1287	1104
	StDev	64.4	45.7	194.7	114.2
Male	N	64	16	64	16
	Mean	427	399	1060	896
	StDev	31.0	26.2	105.4	87.6

Discussion: The vowels /i/ and /iː/ are almost entirely separated in F1-F2 space, which in impressionistic analysis leads to different vowel qualities. The durational difference between /i/ and /iː/ is very small (as /iː/ is, on average, only 1.14 times longer than /i/, see Okati, 2012, p. 81). It can therefore be stated that the primary phonetic correlate of the /i/ vs. /iː/ distinction in CH is quality rather than quantity. Thus, in accordance with the present data, the vowels /i/ and /iː/ can be represented phonemically as /e/ and /iː/ in the inventory of the CH dialect. The /iː/ tokens are chiefly produced with a quality close to a cardinal [i] both by male and female speakers while the /i/ tokens generally

have an [e]- or [ɪ]-like quality. The vowel in the word *ziːt* 'soon' sometimes shows a tendency for a lower quality, and at the same time, it tends to have a short duration, similar to other /iː/ vowels in CH. This lowering and shortening of /iː/ may indicate a categorical change underway from /iː/ to /e/ in this word. Similar lowering of /i/ is seen to occur more actively in the other four dialects, where specific words, for example *dil* 'heart' (in KH) and *ǰist* 'fled', have apparently changed to *deːl* (only in KH) and *ǰeːst*, respectively, in the speech of all speakers of those dialects.

Both /u/ and /uː/ in CH are generally produced as an [ʊ]-like vowel, although many cases of lower [o]-like vowels are also attested, as well as a few cases of [u]-like vowels. Fronting with concomitant lowering is also observed, more often for /u/ than /uː/. Figure 11 above shows that the range of F1-F2 values for the vowels /u/ and /uː/ in CH overlap to a great extent the values of an [o] vowel (see Section 2 for the cardinal [o] qualities). As the durational distinction between the long /uː/ and short /u/ is quite small (the long /uː/ is, on average, 1.15 times longer than the short /u/, see Okati, 2012, p. 81), which means that the only phonetic correlate that distinguishes long /uː/ and short /u/ is a quite weak durational distinction. In any case, it is at present unclear how listeners can differentiate between /u/, /uː/, and /oː/ in perception. Possibly, there are aspects in the production of these vowels that are not revealed by the data analysis at hand. For example, /oː/ might have inherently different vowel dynamics than /uː/, which a formant measurement that samples the central vowel formant frequencies cannot capture. However, an analysis of the formant transitions in CH vowels is outside the scope of this study. An alternative suggestion might be made for /u/, vs. /uː/ in CH, namely that /u/ and /uː/ are merging into /o/, leading to a contrast between short /o/ and long /oː/ with a small durational distinction. Yet another alternative is that the merger of /u/

and /uː/ has not yet been completed, and that CH speakers still distinguish short /u/ and long /uː/ phonemically. The small phonetic separation between the two would then indicate a case of near-merger (Labov et al., 1972). However, although a short /o/ might be better to be represented instead of a short /u/ for CH, the case of /u/, /uː/, and /oː/ in this dialect is a complicated one and requires further investigation.

3. Conclusion

In this paper, the status of the short vowels /i/ and /u/ in five selected Balochi dialects of Sistan (SI), Saravan (SA), Khash (KH), Iranshahr (IR), and Chabahar (CH) have been studied. These dialects are spoken in the province of Sistan and Baluchestan located in the southeast of Iran. The investigation has examined the qualities of these vowels to see how similar they are to the /i/ and /u/ in the Common Balochi inventory, *i, iː, a, aː, u, uː, eː, oː* (first proposed by Morgenstierne 1948 as a general vowel system for the Balochi language, see Rossi, 1979, p. 176). The phonetic analysis presented in this study makes it clear that all the dialects considered make a qualitative distinction between the traditional long and short *i* vowel; consequently, with the Common Balochi vowel inventory as the point of departure, the traditional short vowel /i/ is here modified into a short /e/ in the phonemic analysis of all dialects investigated. Thus, in the Iranian Balochi dialects considered here, the vowel corresponding to a Common Balochi long /iː/ can best be phonemically represented as /iː/, while short /i/ can best be represented as /e/.

The study has also revealed the possibility for the short /u/ to be characterized phonemically as a short /o/ in these dialects, especially in SI, SA, and CH, given the overlap in formant values of the short /u/ and /oː/ in these dialects. It should be noted that in these dialects, in addition to the tendencies

for /u/ to be produced as mid-low back vowel, it is, in some cases, articulated more towards [ʊ], which has formant qualities very close to [o]. Short vowels in general show more centralized formant values than their long counterparts (Walker, 2011, p. 16). This can be seen in the short /u/ tokens in SI, SA, and CH, and especially clearly with the female speakers of SI. Due to strong tendencies towards the lowering of /u/ to /o/ in SI, SA, and CH, a short /o/ instead of the short /u/ is suggested for these dialects, but not for KH and IR. This creates a symmetrical vowel inventory for SI, SA, and CH. The suggestions made in this survey have been proposed in earlier studies on the Iranian Balochi dialects done by scholars such as Spooner (1967), who uses the short forms /e/ and /o/ in his transcriptions, or Jahani and Korn (2009, p. 642), who mention these short vowels in the vowel systems of the Iranian Balochi dialects in general and not for specific dialect(s).

The occurrence of the observed changes in these dialects might generally be attributed to language inherent factors. Apart from inherent reasons, the effects of language contact can also account for changes and variability in languages in general. The lowering of /i/ to /e/, and tendencies for /u/ to shift toward /o/ may be ascribed to the influence of the Persian, the dominant language surrounding these dialects, which seems to have been gradually affecting the vowel systems of the Balochi dialects spoken in Iran.

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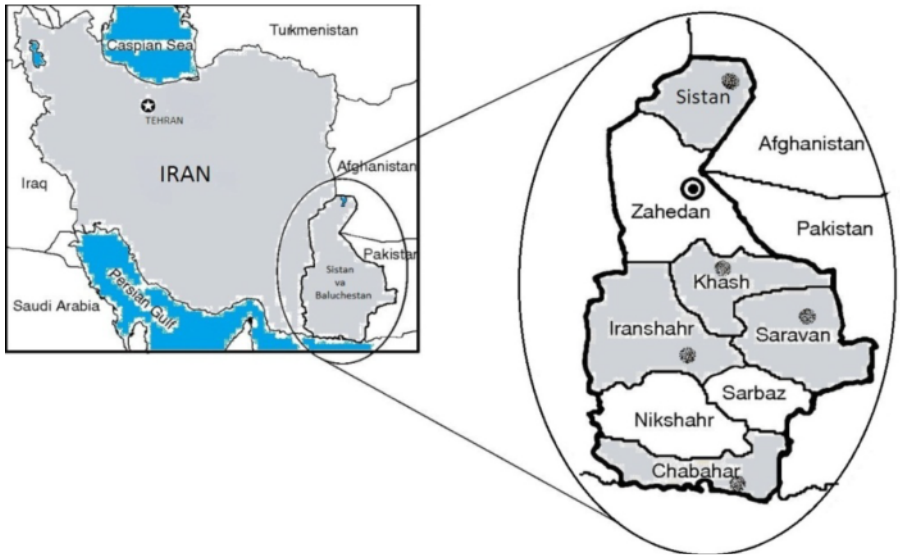
Map of Iran,[9] With the Selected Regions in the Sistan and Baluchestan Province Highlighted



[9] Adapted from http://bjo.bmj.com/content/91/5/579/F1.large.jpg, retrieved May 2012.