

Natural Phonological Processes in Sistani Persian of Iran

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Abstract

This article provides an overview of natural phonological processes in the dialect of Sistani Persian spoken in Iranian Sistan, and reviews theoretical implications of these processes. A representative selection of processes in the language is examined in reference to conditioning by surrounding segments and conditioning in reference to syllable structure. While assimilation and dissimilation are tied to segmental context, deletion, epenthesis and metathesis are considered in light of syllable structure requirements. Synchronically, natural processes include those that are of an allophonic nature as well as those which involve morphophonological alternation. The description of these phenomena is corroborated by a discussion of the application of natural processes in diachronic changes. The authors show that, in some cases, the Sonority Sequencing Principle (SSP) is violated in Sistani Persian. This phenomenon is attributed not to language-internal factors, but rather to the generalization of marked structures as a result of interference from Standard Persian.

Keywords: Natural Phonological Processes, Sonority Hierarchy, Assimilation, Dissimilation, Epenthesis, Metathesis, Syllable Structure, Sistani Persian

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1. Introduction

The purpose of the present study is to provide an overview of natural phonological processes in the dialect of Sistani Persian spoken in Iranian Sistan and to review the theoretical implications of these processes. After providing theoretical background to natural phonological processes, the article presents the language under investigation and describes the implementation of field research, which is based on extensive data from a geographically representative sample. Particular attention is given to the relationship between Sistani Persian and Standard Persian, since the latter variety has a profound influence on the former. The inquiry then turns to a description of selected natural processes, first giving attention to the role of segmental context and then turning to the effects of syllable structure requirements. While assimilation and dissimilation are shown to be motivated by segmental context, deletion, epenthesis and metathesis are explained with reference to syllable structure requirements. The synchronic description of these processes includes both allophonic and morphophonemic alternation, and the diachronic application of the processes gives further clarification to their scope in the language. The study concludes with a review of theoretical implications of these natural processes, giving special attention to data where, because of interference from Standard Persian, the Sonority Sequencing Principle (SSP) is violated in Sistani Persian.

1.1. Theoretical Background

In this article, we account for phonological processes in terms of physiological as well as psychological causes, giving special attention to phonetic plausibility.

A central idea in the theory of Natural Phonology (Stampe 1979), later reworked in Optimality Theory (OT: McCarthy and Prince 1993, Prince and

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Smolensky 1993), is that phonological structure can be attributed to a set of universal phonological processes (or, as in OT, constraints) which interact with one another, and that each language specifies which of these processes are active and which ones are suppressed. Natural phonological processes, which act at the syllable or “sentence” (phonological phrase) level, are unordered with respect to each other and apply simultaneously, though the output of one level may be the input to another. These phonological processes are conditioned by surrounding segments or by syllable structures, and “may have their sources in one of the notions of articulation, acoustics, or cognition” (Burquest 2001: 115).

The most common set of phonological processes conditioned by surrounding segments is that of assimilation, which relates to the ideas of articulation and acoustics. Dissimilation, the converse of assimilation, is also conditioned by surrounding segments, but is motivated by cognitive factors.

Other phonological processes are conditioned by syllable structure: for example, elision (deletion), epenthesis (insertion), metathesis (reversal), coalescence (merging), and changes in syllabicity. Since the latter phonological processes relate to the structure of the syllable itself, in many cases they leave existing segments unchanged (Burquest 2001: 169).

Burquest, discussing segment ordering within syllables, states that stronger (i.e., less sonorous) segments tend to be distributed in stronger syllable positions, that is, those which are farthest from the nucleus (2001: 168). The strongest syllable position is the onset; codas, which more intimately linked with the nucleus, tend to host weaker consonants. The nucleus, of course, is prototypically represented by vowels, which are the weakest segments. Burquest’s sonority hierarchy is presented in Table 1.

Bijankhan (2005: 117) similarly states that phonemes take their positions in a syllable according to their sonority: the more sonorous (or weaker) the sound is, the closer it is to the nucleus, and the most sonorous sounds occupy the centre or the nucleus of a syllable. He cites Kenstowicz (1994: 254), who explains that sonority starts to rise in the onset and reaches the highest level in the nucleus, after which it falls towards the end of the syllable. This phonologically unmarked phenomenon is called the Sonority Sequencing Principle (SSP).

Table 1: Sonority hierarchy (Burquest 2001: 149)

Weakest consonantality (most sonorous)	low vowels
	mid vowels
	high vowels/glides
	flaps
	laterals
	trills
	nasals
	voiced fricatives
	voiceless fricatives
	voiced plosives
	voiceless plosives
Strongest consonantality (least sonorous)	complex plosives

1.2. Research Overview

Sistani is regarded as a dialect of New Persian, which in turn is classified within the Southwestern group of Iranian languages (Windfuhr 1989: 248). It takes its name from the historically important Sistan region (Grousset and Walford 1998: 7) that straddles southeastern Iran and southwestern Afghanistan: one portion of Sistan makes up the northern part of the Iranian province of Sistan and Baluchestan, and the other portion is a part of the Nimruz Province in

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Afghanistan. The Iranian dialect of Sistani is spoken by about 90% (authors' estimate) of a total of 350,000 inhabitants in the Sistan district of the province of Sistan and Baluchestan (www.sci.org.ir 2008). It is also spoken by Sistani emigrants to other parts of Iran such as Zahedan (the capital of Sistan and Baluchestan province), Sarakhs and Mashhad in the Khorasan-e Razavi province, and Golestan province. Sistan district, where we conducted field research for this study, comprises 6 towns and about 885 inhabited villages¹.

The variety spoken in the Sistan district is representative of Iranian Sistani as a whole, since there is little variation within the larger dialect area. In order to ensure the reliability of the data and verify the scope of the results, a data corpus consisting of 10 hours of digital recordings was collected from a number of different areas of the district. In addition, a range of ages is represented in the corpus: data were gathered by interviewing 10 male and 6 female Sistani speakers aged between 40 and 102. The corpus primarily contains free conversation and life stories.

1.3. Analysis of Natural Processes and the Impact of Standard Persian

The data presented in this article bring to light a rich inventory of natural phonological processes in Sistani. However, in order to understand the phonological status of these processes- what the underlying forms are, and whether the processes are synchronic or diachronic- it is essential to come to terms with the relationship between Standard Persian and Sistani.

As is the case in most areas of Iran, Standard Persian exercises a profound impact on the character of the language spoken in Sistan. In Sistani, which is a

¹ www.sci.org.ir and en.wikipedia.org/wiki/Sistan, retrieved March 2008.

dialect of Persian, the influence of Standard Persian is of considerable time depth, and its influence has increased considerably in recent years as a result of increased penetration of schooling and media. Because of this, the use of Sistani is declining, and in many cases people who continue to speak it use an overlay of Standard Persian forms in free variation with Sistani forms. In the same way, when subjects in this study were requested to write down Sistani forms to corroborate the phonetic data collected by the researchers, they usually made use of Standard Persian spelling, since writing has always operated as an exclusive domain of the Standard dialect.

Like Standard Persian, Sistani has evolved from early New Persian, and there are many linguistic similarities between the two varieties. However, many of the natural processes exhibited by Sistani are lacking in Standard Persian, which resists phonological innovation because of its adherence to orthographic forms which date back about a thousand years to Early New Persian (Hashabeiky 2005: 59-61). Consequently, in cases where two or more forms have been collected in the data, we have identified authentic Sistani forms by their divergence from Standard Persian.² In sum, since the focus of the article is on natural phonological processes rather than lexical borrowing and other aspects of language shift, we have chosen to give particular attention to the Sistani base of the language.

² The reason for this comparison with Standard Persian (i.e. Modern Standard New Persian) instead of Early New Persian (often also called Classical New Persian) is that the pronunciation in Early New Persian is not fully known. It is thus, on the basis of written Early New Persian impossible to reconstruct the spoken language with certainty. Thus, Standard Persian forms are quoted to give an indication of the Early New Persian pronunciation. It may, however, be noted that the final vowel in Early New Persian was /a/ when Modern Standard New Persian has /e/.

2. Processes Conditioned by Surrounding Segments

Phonological processes conditioned by surrounding segments involve assimilation and dissimilation.

2.1. Assimilation

In assimilation, a sound is phonetically modified to become similar or even identical to another sound in its environment. Assimilation is physiologically motivated, since it facilitates the task of speaking (Katamba 1996: 80). It includes different types of processes in which segments condition other segments, as the following list shows:

- a) consonants condition consonants: e.g., nasal place and manner assimilation, voicing assimilation and occlusion assimilation
- b) vowels condition vowels: e.g., fronting, backing, raising or rounding
- c) consonants condition vowels: e.g., vowel nasalization and vowel fronting
- d) vowels condition consonants: e.g., labialization, palatalization, spirantization, voicing, fronting, backing

These represent phonological processes in many languages, whether allophonic or morphophonological (Burquest 2001: 117-129). They can apply progressively (to segments which follow a given segment) or regressively (to segments which precede a given segment), and to contacted (adjacent) or non-contacted (non-adjacent) segments. An example of noncontact assimilation is vowel harmony, which can be progressive or regressive (Lass 1988: 171-172). These concepts will be illustrated in the discussion of phonological processes that follows.

a. Consonants condition consonants

In Sistani, processes where a consonant affects a neighbouring consonant include nasal place and manner assimilation, voicing assimilation and occlusion assimilation.

1. Nasal place and manner assimilation

In Sistani -as in many languages- nasal consonants which directly precede other consonants match them in place of articulation. Specifically, [ŋ] is an allophone of /n/ before velars. The examples in (1) exhibit regressive contact assimilation.

- (1) a. /bɑ:n'ka/ → [bɑ:ŋ'k^ha] 'container'
b. /man'ya:l/ → [maŋ'ya:l] 'brazier'
c. /a:n'gær/ → [a:ŋ'gær] 'grape'

Progressive nasal manner assimilation has also taken place in the language: /b/ following /m/ has been rephonologized as /m/.

(2) Standard Persian	Sistani	
a. /ʃam'be/	/ʃem'me/	'Saturday'
b. /pam'be/	/pem'ma/	'cotton wool'
c. /dom'be/	/dem'ma/	'fat in sheep's coccyx'

Currently, due to pressure from Standard Persian, the phonological forms of the Sistani examples are in free variation with Standard Persian forms /ʃam'be/ 'Saturday', /pam'be/ 'cotton wool' and /dom'be/ 'fat in sheep's coccyx'. This indicates that the natural phonological process of nasal manner assimilation which has applied diachronically in Sistani is being undermined; and not for phonological reasons, but for sociolinguistic reasons.

2. Voicing assimilation

Voicing assimilation, a second well-attested phenomenon in the world's languages, is also attested in Sistani. Here, adjacent consonants are involved: that is, a consonant takes on the voicing specification (voiced or voiceless) of an adjacent obstruent (stop or fricative). Cases where morphophonological alternation is driven by voicing assimilation are found in examples (3) and (4), where two prefixes with the form /b-/, namely imperative and past prefixes, become voiceless adjacent to voiceless obstruents:

- | | | | | | |
|-----|----|-----------|---------------------|--------------|------------------|
| (3) | a. | /b-/ + | /kɑ:r/ → | /pkɑ:r/ | 'plant (impv.)' |
| | | '(impv.)' | 'plant (v.)' | | |
| | b. | /b-/ + | /xɑ:r/ → | /'pxɑ:r/ | 'eat (impv.)' |
| | | '(impv.)' | 'eat' | | |
| cf. | c. | /b-/ + | /dɑ:v/ → | /'bda:v/ | 'run (impv.)' |
| | | '(impv.)' | 'run' | | |
| | d. | /b-/ + | /ro/ → | /'bro/ | 'go (impv.)' |
| | | '(impv.)' | 'go' | | |
| | e. | /b-/ + | /ɑ:r/ → | /'bjɑ:r/ | 'bring (impv.)' |
| | | '(impv.)' | 'bring' | | |
| (4) | a. | /b-/ + | /kɑ:ft/ → | /'pkɑ:ft/ | 'he/she planted' |
| | | '(past)' | 'plant (past stem)' | | |
| | b. | /b-/ + | /xɑ:rd/ → | /'pxɑ:rd/ | 'he/she ate' |
| | | '(past)' | 'eat (past stem)' | | |
| cf. | c. | /b-/ + | /dɑ:vid/ → | /'bda:vidak/ | 'he/she ran' |
| | | '(past)' | 'run (past stem)' | | |
| | d. | /b-/ + | /ra:ft/ → | /'bra:ftak/ | 'he/she went' |
| | | '(past)' | 'go (past stem)' | | |
| | e. | /b-/ + | /ɑ:rd/ → | /'bjɑ:rdak/ | 'he/she brought' |
| | | '(past)' | 'bring (past stem)' | | |

Another example of voicing assimilation between two obstruents at a morpheme boundary is shown in (5):

- (5) /iʃ-/ + /ɖɑ/ → /iɖɖɑ/ 'nowhere'
'none, any' 'place'

Voicing assimilation has also taken place diachronically. Examples (6a) and (6b) show the historical devoicing of /ɣ/ and /b/ following a voiceless consonant:

- | | | | |
|-----|-------------------------|----------------|------------------|
| (6) | Standard Persian | Sistani | |
| | a. /boʃ'ɣɑb/ | /boʃ'xɑ:b/ | 'plate' |
| | b. /sa'bok/ | /spok/ | 'light (weight)' |

In examples (7a) and (7b) the opposite process, voicing, has in some cases applied in a similar environment (i.e., between two obstruents which have historically differed in voicing): here, the voiceless consonant is voiced by the following voiced consonant.

- | | | | |
|-----|-------------------------|-----------------|--------------------|
| (7) | Standard Persian | Sistani | |
| | a. /as'ɣar/ | /az'ɣa:r/ | 'proper name' |
| | b. /ak'bar/ | /ag'va:r/ | 'proper name' |
| | c. /lafz/ | /lavz/ ~ /labz/ | 'language, accent' |

3. Occlusion assimilation

In occlusion assimilation, a segment assimilates to the closure of another segment (Burquest 2001:119). There are few synchronic occurrences of this process in Sistani, but two examples of occlusion assimilation, both of which also exhibit voicing and place assimilation, are given below. Example (8) shows this process causing morphophonological alternation, and example (9) shows how the process has applied diachronically.

- (8) /xod/ 'self' + /fo/ 'enclitic pronoun 3 plural' → /xoffo/ 'themselves'

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(9) Standard Persian	Sistani	
/mas'ʒed/	/maʒ'ʒed/	'mosque'

b. Vowels condition vowels

Here, a vowel assimilates to one or more features a neighboring vowel. Some examples of assimilation processes in Sistani are fronting, backing, raising and rounding. Interestingly, most of the examples in the data involve vowel harmony, a type of noncontact assimilation (see introduction to 2.1 above).

1. Fronting

Examples (10a) and (10b) show examples of vowel harmony where /o/ is fronted to /ʌ/ and /ʌ/ is fronted to /i/ when /i/ is present in the environment -even when there is an intervening consonant.³ Here, the assimilation is morphophonological, occurring across a morpheme boundary; in the first example, it is regressive, and in the second example, it is progressive.

- (10) a. /a:'ros/ 'bride' + /i/ 'nominalizing suffix' → /arʌ:'si/~ /ari:'si/ 'wedding'
b. /i:-/ 'proximal demonstrative' + /sʌ/ 'side' → /i:si/ 'this side'

2. Backing

Examples of backing in the data show that this process is both synchronically and diachronically relevant. In (11), the vowel /e/ is backed to /ə/ when it

³ In Sistani, vowel harmony is found in a limited number of words. This is also the case in Standard Persian (e.g. the imperative morpheme /be-/ - /bo/ in /be-riz/ 'pour' vs. /bo-ro/ 'go'), but the /ʌ(:)/ - /i(:)/ alternation is particular to Sistani, and merits further investigation. Each of the alternating forms is in free variation with a non-assimilating form. This raises the question of whether variation has arisen within the language itself or, more plausibly, that interference from Standard Persian has generated the variation, as for other cases of variation in Sistani.

follows a back vowel. In (12), the vowel /i:/ has been historically backed to /ɨ/ in the presence of /u/; the outcome is the reverse of the synchronic morphophonemic fronting process immediately above.

- (11) a. /mlɑ:'em/ → [mlɑ:'əm] 'mild'
b. /ɣɑ:'em/ → [ɣɑ:'əm] 'hidden'
- (12) **Standard Persian** **Sistani**
/bi'run/ /bɨ:'rɨ/ 'outside, out'

3. Height

In one case, a mid vowel /e:/ is raised to the high vowel /i:/ when it precedes /i:/ across a morpheme boundary. Like the fronting process above, this is a case of vowel harmony: more specifically, it is a regressive, non-contact morphophonemic alternation.

- (13) /'ble:/ + /gi/ → /'bli:gi/ 'hold up'
'up' 'hold'

There are some other relevant examples of regressive vowel harmony as well:

- (14) **Standard Persian** **Sistani**
/mel'li/ /mil'li/ 'national'
/bes'jar/ /bis'jar/ 'many' (assimilation of /e/ to the semivowel /j/)
/ferdo:'si/ /ferdɨ:'si/ ~ /ferdo:'si/ 'Ferdowsi'

4. Rounding

In the examples in the paragraphs on fronting and backing immediately above, assimilation of rounding specification is also involved in each case of /ɨ(:)/ - /i(:)/ alternation.

c. Consonants condition vowels

Two instances of consonants conditioning vowels in Sistani involve vowel nasalization and vowel fronting.

1. Vowel nasalization

In this cross-linguistically well-attested process, a vowel adjacent to a nasal consonant becomes nasalized by a process in which the soft palate is lowered to open the velum, allowing air to pass through both the nasal and oral cavities simultaneously. Raja (2006:3) points out that when nasal consonants occur after a vowel “the vowel is usually nasalized for at least part of its duration”. In Sistani, this process is operative when the vowel is surrounded by two nasal consonants, regardless of the whether or not the vowel is in the same syllable as the following nasal consonant:

- (15) a. /ma:ng/ → [mã:ŋg] ‘yawn (n.)’
b. /no:m/ → [nõ:m] ‘name’
c. /me:na/ → [mē:na] ‘he/she does’

2. Vowel fronting

In this type of assimilation, vowels are affected by surrounding consonants. The process is manifested in Sistani, where coronal consonants cause the vowel [ɯ] to be fronted from its central position to [ɤ] (see also Okati *et al.* 2009):

- (16) a. /tɯt/ → [t^hɤt] ‘berry’
b. /ʃɯl/ → [ʃɤl] ‘basket’
cf. c. /pɯl/ → [p^hɤl] ‘money’ (since /p/ is not coronal)

From a comparative perspective, this assimilatory process is interesting since it is an allophonic echo of the phonemic /u/ → /i/ shift that has taken place beside coronals in many Iranian varieties, in particular Luri (Anonby 2003a: 186-197) and Northwestern Iranian varieties (Skjærvø 2010). Another Sistani

example of vowel fronting due to the presence of coronal consonant, but which has taken place historically, is shown in (17):

- (17) **Standard Persian** **Sistani**
/don'ja/ → /din'ja/ 'world'

Likely because of interference from Standard Persian, the form /din'ja/ is in free variation with its Standard Persian reflex /don'ja/ (see section 1.3. above).

d. Vowels condition consonants

There are several types of assimilatory processes in which vowels condition consonants. In Sistani, vowels are responsible for the labialization, spirantization and fronting of consonants.

1. Labialization

Labialization, a process in which consonants adopt a secondary labial articulation, is cross-linguistically well-attested on consonants preceding round vowels. In Sistani, this is also the case:

- (18) a. /kʊt/ → [k^{wh}ʊt] 'deaf'
 b. /ko:r/ → [k^{wh}o:r] 'blind'

2. Spirantization

Spirantization refers to a process in which plosives become fricatives, and this often occurs in environments containing vowels. In particular, it is common for consonants between two vowels, and consonants in the presence of high vowels (Burquest 2001:126). Examples of this process, which has applied diachronically in Sistani, are shown in (19):

- (19) **Standard Persian** **Sistani**
a. /tarki'de/ → /traxi'da/ 'it has burst'
b. /ro'ba/ → /ro'va/ 'attraction', in: /ɑ:enro'va/ 'magnet'

3. Fronting

Fronting is a process in which a front vowel causes a consonant to be fronted in the oral cavity. For Standard Persian, Jahani and Paul (2008) have described the fronting of velar stops before /i:/ to post-palatal or pre-velar position. In Sistani, this allophonic process takes place with all front vowels and applies not only to velar stops, but also to velar fricatives (20).

- (20)
- | | | |
|--------------|------------------------|------------------|
| a. /kil/ | → [k ^h il] | ‘slanted’ |
| b. /ke:l/ | → [k ^h e:l] | ‘measure, scale’ |
| c. /gar'da:/ | → [gar'da:] | ‘neck’ |
| d. /xi:ra/ | → [xi:ra] | ‘stubborn’ |
| e. /ya'za/ | → [ya'za] | ‘food’ |

2.2. Dissimilation

Dissimilation refers to processes in which sounds become more auditorily distinct from other sounds in their environment. This allows for easier speech perception (Katamba 1996: 94). For example, if r → l happens in a form containing another r, this is a dissimilation, e.g. arbor → arbol (Lass 1988: 171). Some examples of dissimilation in Sistani are given in (21).

- (21) **Standard Persian** **Sistani**
- | | | |
|------------------|-----------------|--|
| a. /ɖgahan'nam/ | /ɖgaan'dam/ | ‘hell’ (/n/ → /d/ near another /n/) |
| b. /ɖgenn opari/ | /ɖgend o pari/ | ‘jinn and fairy’ (/n/ → /d/ near another /n/) |
| c. /ha'lal/ | /a:lɑ:r/ | ‘halal (ritually approved)’ (/l/ → /r/ near another /l/) |
| d. /lafz/ | /labz/ (~lavz/) | ‘language, accent’ |
| e. /zabt/ | /zaft/ | ‘tape-recorder’ |

3. Processes Conditioned by Syllable Structure

In addition to being conditioned by segments, natural phonological processes may be conditioned by syllable structure. In Sistani, these processes include elision (deletion), epenthesis (insertion) and metathesis (reversal). Since the processes relate to the structure of the syllable itself, in some cases they leave the resulting segments for the most part unchanged (Burquest 2001: 169).

3.1. Elision (segment deletion)

Elision refers to phonological processes in which a segment sound is omitted in a word. Generally, the motivation behind deletion of segments is to preserve or restore a syllable pattern which is acceptable within the phonotactics of the language (Burquest 2001: 169). In Sistani, deletion takes place synchronically, but has also impacted the language diachronically. For consonants, whereas final /d/ and /n/ and /g/ deletion are synchronic, final /t/ deletion is historical.

For vowels, deletion occurs synchronically when two vowels come together at morpheme boundaries.

1. Final /d/ deletion

The stop /d/ is deleted in utterance-final position. The fact that it is present in the underlying form of some words is revealed by its maintenance utterance-internally (22).

(22)	UF	utterance-final	utterance-internal
	a. /sfe:d/	/sfe:/ 'white'	/sfe:da/ 'it is white'
	b. /kli:d/	/kli:/ 'key'	/kli:de/ 'a key'

2. Final /n/ deletion

The same thing happens with the nasal alveolar /n/. The example in (23) undergoes both /n/ and /d/ deletion.

(23)	UF	utterance-final	utterance-internal
	a. /dʒvo:n/	/dʒvo:/ ‘young’	/dʒvo:na/ ‘he/she is young’
	b. /no:n/	/no:/ ‘bread’	/no:ne/ ‘a [loaf of] bread’
	c. /dʒo:n/	/dʒo:/ ‘body’	/dʒo:ne me/ ‘my body’
	d. /blend/	/ble:/ ‘high’	/blendə/ ‘it is high’

/n/ deletion is encountered also in various Balochi dialects, such as Sistani (pers. comm. Behrooz Barjasteh Delforooz), Sarhaddi (Ahangar 2007: 5-24) and KarachiBalochi (Farrell 2003: 174-178).

3. Final /g/ deletion

There are some words with a final /g/ in Middle Persian (Mackenzie 1990) which have lost it in the New Persian as well as utterance-finally in Sistani:

(24)	Middle Persian	Standard Persian	Sistani (utterance-finally)
	a. /gurbag/ →	/gor'be/	/gor'ba/ ‘cat’
	b. /mɑ:dag/ →	/mɑ'de/	/mɑ'da/ ‘female’
	c. /daxmag/ →	/dax'me/	/dax'ma/ ‘tomb’

Nevertheless, this historical change did not take place in certain phonological conditions, notably when /g/ was the second consonant of a final cluster after a long vowel. There could be other phonological conditions for this diachronic change; this requires further investigation.

(25)	Middle Persian	Standard Persian	Sistani
	a. /kaf'ta:rg/	/kaf'tar/	/ka:f'ta:rg/ ‘hyena’
	b. /gu'ra:zg/	/go'raz/	/ɣo'ra:zg/ ‘boar’

Synchronically, one could still view the examples in (24) as /g/ deletion, since it reappears in specific morphologically conditioned context, such as before the animate plural morpheme /-o/ (but not the plural morpheme /-a/, used both for animate and inanimate nouns) (26).

(26)	UF	most contexts (e.g., with copula)	with specific suffixes (e.g., with plural morpheme /-o/)
		‘it is a...’	‘__ (pl.)’
	a. /gurbag/ ‘cat’ →	/gor'bija/	/gorba:'go/
	b. /mɑ:dag/ ‘female’ →	/mɑ:'dija/	/mada:'go/
	c. /daxmag/ ‘tomb’ →	/dax'mija/	cf./daxma:'ɑ/

4. Final /t/ deletion

Historically, most /st/ codas in Sistani have been simplified by the deletion of /t/, as the shown in (27):

(27)	Standard Persian	Sistani	
	a. /mast/	/mɑ:s/	‘yogurt’
	b. /dast/	/da:s/	‘hand’

The fact that no /t/ remains in the underlying Sistani form is supported by the fact that, unlike the examples in the previous paragraphs, /t/ does not reappear when the word is found utterance-internally:

c. /'mɑ:sa/	‘it is yogurt’
d. /'dasme/ ⁴	‘my hand’

⁴ Note the deletion of length before the enclitic pronoun.

5. Vowel deletion at a morpheme boundary

In some cases, when two vowels come together at a morpheme boundary in the following words, the first vowel is deleted and the second vowel is lengthened to compensate.

- (28) a. /ba:'bo/ + /-e/ + /to/ → /ba:'be: to/ 'your father'
 'father' 'of' 'you'
 b. /dafta:'ra/ + /-e/ + /ma/ → /dafta:'re:ma/ 'our notebooks'
 'notebooks' 'of' 'we'

However, when the first vowel is /a/ in this context, the second vowel is not lengthened.

- (29) /ken'dʒa/ + /-e/ + /me/ → /ken'dʒe me/ 'my daughter'
 'daughter' 'of' 'I'

3.2. Epenthesis (segment insertion)

Epenthesis refers to a process in which a segment is inserted into a string of other segments. It usually takes place to allow a simpler word pattern or easier articulation. In Sistani, we look at vowel insertion and consonant insertion, the latter of which is most frequent.

1. Vowel epenthesis

Burquest (2001: 173) claims that “epenthesis is most common with vowels, where a vowel is inserted to break up a consonant cluster”. This process has taken place between Middle Persian, in which initial consonant clusters are permitted, and New Persian, which has rid itself of these clusters. For example, in the New Persian (NP) reflex of the Middle Persian word /draxt/ ‘tree’, an /e/ has been inserted, hence NP /deraxt/ ‘tree’ (Sadeghi 2001: 11). By resyllabifying

initial consonant clusters, NP has reduced the number of syllable patterns, as shown in (30):

- (30) /draxt/ → /de.'raxt/ 'tree'
 CCVCC CV.CVCC

Vowel epenthesis is weakly attested in our Sistani data. However, it is found with negative verb forms. Negative verb forms are shown in (31):

- (31) a. /n-/ 'not' + /mja:.'fna/ 'she/he hears' → /'nmi.ja:.'fna/ 'she/he does not hear'
 C + CCV.CCV CCV.CV.CCV
 b. /n-/ 'not' + /mxɑ:.'ro/ 'I eat' → /'nme.xɑ.ro/ 'I do not eat'
 C + CCV.CV CCV.CV.CV

In (31a), the vowel /e⁵/ is inserted in the negative verb form to maintain the acceptable syllable pattern; otherwise, it would generate a CCCVC syllable pattern, which is not permitted in Sistani. The same reasoning holds for the insertion of /e/ in (31b).

2. Consonant epenthesis

Consonant epenthesis has taken place in a few Sistani words. Specifically, it appears that /d/ has been inserted historically in places where alveolar sonorants were found between vowels.

- (32) **Standard Persian** **Sistani**
 a. /ʃabɑneru'zi/ /ʃabɑ:ndarɑ'zi/ 'for a 24-hour period, all night and day'
 b. /dɒbɑ're/ /dɒbɑ:r'dɑ/ 'again'

⁵ The epenthetic vowel /e/ becomes [i] before /j/; compare the example of raising in section 2.1, b, 3 above.

3.3. Metathesis (reversal)

Metathesis refers to a process in which the ordering of two proximate (and usually adjacent) segments is reversed. Usually, the change is motivated by an attempt to preserve more acceptable phonotactics. Blevins and Garrett (2004:128) refer to four different types of metathesis occurring in different languages:

- 1) *Perceptual metathesis* occurs for easier perception; e.g., in the prehistory of Classical Armenian, the linear order of stop (or affricate) + r clusters was regularly inverted, as in /subr/ → /surb/ ‘holy’.
- 2) *Compensatory metathesis* is used for sound changes where a vowel at the edge of the phonological domain undergoes phonetic weakening in quality and duration; the metathesis compensates for this weakening; e.g., Rotuman, an Oceanic language shows metathesis at the right-edge of the word: /tíko/ → [tíok] ‘flesh’.
- 3) *Coarticulatory metathesis* has an articulatory origin related to sequences of stops which involve closure of distinct articulators but whose gestural overlap results in nearly simultaneous closure, e.g., in one Micronesian language all /pk/ sequences are optionally realized as [kp]: /apkas/ → [apkas], [akpas] ‘now’.
- 4) Finally, *auditory metathesis* is related to auditory-stream decoupling such as that involving sibilant-stop and stop-sibilant; e.g., this is found in the late West Saxon dialect of Old English: /frosk/ → /froks/ (late West Saxon) ‘frog’.

In many cases, the Sonority Sequencing Principle (SSP; see REF above) is respected when metathesis takes place in Sistani (32).

(33)	Standard Persian	Sistani	
	a. /yofl/	/yolf/	‘lock’
	b. /aks/	/ask/	‘photo’
	c. /pirɒ'hɒn/	/pe:'nɑ:r/	‘shirt’ (/pe:'rɑ:n/ before metathesis)
	d. /mayz/	/mɑ:zy/	‘brain’
	e. /'bebɒxʃ/	/'bebɑ:fʃe/ ~ /'bobɑ:fʃe/	‘excuse (me)’
	f. /noʃ'xɑ:r/	/nɑʃ'ʃɑ:l/ ~ /noʃ'ʃɑ:r/	‘chewing the cud’
	h. /hɑm'le/	/el'mɑ/	‘attack (n.)’ (/em'la/ before metathesis)

Some of the examples in (33) fall more clearly into one or other of the four types of metathesis than others. For instance, (33a) (/yofl/ → /yolf/) resembles the example of perceptual metathesis provided by Blevins and Garrett (2004: 128). Example (33c) (/pe:'rɑ:n/ → /pe:'nɑ:r/), for its part, bears the marks of compensatory metathesis, since it pre-empts the utterance-final /n/ deletion (3.1 above) that would affect the word if /n/ remained in word-final position.

Examples (33d-33f) might be appropriately classed as instances of coarticulatory metathesis, since in the phonetic data, we observed partial overlap between the two fricatives⁶; the same situation is true for the nonmetathesized reflexes of the words in other Persian dialects. Still, it could be argued that auditory metathesis is active in most or all of the changes, since contrastive reversal in the order of segments is dependent on auditory decoupling at some cognitive level.

More relevant to the argumentation in this article as a whole, it should be noted that the examples of metathesis above respect the SSP (33a, 33b) or, in any case, do not violate it (33c-33h). However, other data in the language

⁶ Simultaneous articulation of coronal and velar fricatives is attested elsewhere; a specific IPA symbol [ɟ] is dedicated to this.

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violate the SSP, and disrupt the sonority wave within syllables by moving the less sonorous unit in a cluster toward the nucleus, as in (34).

(34)	Standard Persian	Sistani	
	a. /disk/	/diks/	‘furrower’
	b. /nerx/	/nexr/	‘price’
	c. /rezɣ/ ⁷	/reyz/	‘portion, ration’

In Arabic, syllable structures which do not conform to the SSP have been explained by positing an external foot at the end of a syllable, essentially designating the segment in violation of the SSP as extra syllabic (outside the syllable). While Standard Persian has to some degree accommodated these marked Arabic coda structures, Sistani has typically remained faithful to historical Persian syllable structure, where codas respect the SSP: in fact, as (33a) and (33b) demonstrate, metathesis has taken place in order to ensure conformity to the SSP in Sistani. So what factors could be behind the SSP-violating cases of metathesis in Sistani shown in (34)?

Because Standard Persian forms coexist with Sistani forms (1.3), and have done so for centuries, we would suggest that Sistani speakers have internalized the SSP-violating structures that they associate with Standard Persian. In situations where Standard Persian forms are likely to be used by Sistani speakers (for example, in formal contexts, or among younger speakers), Sistani speakers whose bilingualism in Standard Persian is minimal would apply SSP-violating forms. In some cases, the resulting words are “standardized” in the dialect. This reasoning echoes the conclusions of Anonby (2003a: 20-1)

⁷ It is highly likely that the /ɣ/ in Standard Persian was pronounced /q/ (i.e. a voiceless uvular plosive) in Early New Persian. In any case, the sonority rule is here broken.

regarding a parallel situation in Southern Luri: as in Sistani, Persian clusters that violate the SSP are typically altered to conform to the SSP; but similarly, there are some contexts where speakers apply SSP-violating rules (e.g., /asp/ → /aps/ ‘horse’) in an effort to reproduce Standard Persian structures, even for items in which the SSP is not violated in Standard Persian (as the two examples above show). In both cases, this overcompensation is part of an intermediate stage in language shift, since it is motivated by contact-induced generalizations about the dominant language but does not conform to the particular structures of the dominant language.

In Sistani, then, the application of SSP in the language has been compromised by the internalization of SSP-violating structures from a dominant neighbouring language. Whatever the motivation for this violation, it raises questions regarding claims of the SSP’s universality (by Kenstowicz, cited in Bijankhan 2005: 123).

4. Conclusion

In this study, we have provided an overview of natural phonological processes in Sistani Persian spoken in Iranian Sistan. Using both synchronic and diachronic data, we have shown that natural phonological processes are motivated by segmental context as well as syllable structure requirements. As has been shown in other studies, assimilation and dissimilation are motivated by segmental context, and processes such as deletion, epenthesis and metathesis are motivated by syllable structure requirements. The application of metathesis is particularly interesting in Sistani, since it suggests that the application of the Sonority Sequencing Principle (SSP) in the language has been compromised by the internalization and generalization of SSP-violating structures in a dominant neighbouring language, Standard Persian.

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THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC) © 2005 IPA

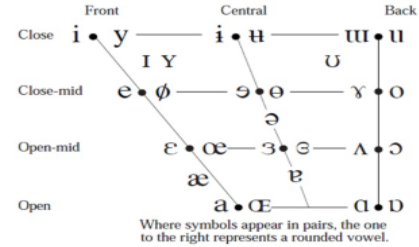
	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			ʀ					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	Examples:
ǀ Dental	ɗ Dental/alveolar	ɓ' Bilabial
ǃ (Post)alveolar	ɟ Palatal	ɗ' Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	k' Velar
ǁ Alveolar lateral	ɠ Uvular	s' Alveolar fricative

VOWELS



OTHER SYMBOLS

ɱ Voiceless labial-velar fricative	ɕ ʑ Alveolo-palatal fricatives
ɰ Voiced labial-velar approximant	ɭ Voiced alveolar lateral flap
ɥ Voiced labial-palatal approximant	ɧ Simultaneous ʃ and x
ħ Voiceless epiglottal fricative	
ʕ Voiced epiglottal fricative	Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary.
ʡ Epiglottal plosive	

k̟p̟ ts̟

SUPRASEGMENTALS

- ˈ Primary stress
- ˌ Secondary stress
- ː Long eː
- ˑ Half-long eˑ
- ˑˑ Extra-short eˑˑ
- ˌ Minor (foot) group
- ˌˌ Major (intonation) group
- ˑˑˑ Syllable break ii.ækt
- ˑˑˑˑ Linking (absence of a break)

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. ɲ̥̊

◌̥ Voiceless	◌̤	◌̥̥ Breathy voiced	◌̤̤	◌̥̥̥ Dental	◌̤̤̤
◌̦ Voiced	◌̧	◌̦̦ Creaky voiced	◌̧̧	◌̦̦̦ Apical	◌̧̧̧
◌̨ Aspirated	◌̩	◌̨̨ Linguolabial	◌̩̩	◌̨̨̨ Laminar	◌̩̩̩
◌̪ More rounded	◌̫	◌̪̪ Labialized	◌̫̫	◌̪̪̪ Nasalized	◌̫̫̫
◌̬ Less rounded	◌̭	◌̬̬ Palatalized	◌̭̭	◌̬̬̬ Nasal release	◌̭̭̭
◌̮ Advanced	◌̯	◌̮̮ Velarized	◌̯̯	◌̮̮̮ Lateral release	◌̯̯̯
◌̰ Retracted	◌̱	◌̰̰ Pharyngealized	◌̱̱	◌̰̰̰ No audible release	◌̱̱̱
◌̲ Centralized	◌̳	◌̲̲ Velarized or pharyngealized	◌̳̳		
◌̴ Mid-centralized	◌̵	◌̴̴ Raised	◌̵̵ (ɹ̵ = voiced alveolar fricative)		
◌̶ Syllabic	◌̷	◌̶̶ Lowered	◌̷̷ (β̷ = voiced bilabial approximant)		
◌̸ Non-syllabic	◌̹	◌̸̸ Advanced Tongue Root	◌̹̹		
◌̺ Rhoticity	◌̻	◌̺̺ Retracted Tongue Root	◌̻̻		

- TONES AND WORD ACCENTS LEVEL
- ◌̥ or ◌̦ Extra high
 - ◌̧ or ◌̨ High
 - ◌̩ or ◌̪ Mid
 - ◌̫ or ◌̬ Low
 - ◌̭ or ◌̮ Extra low
 - ◌̯ Downstep
 - ◌̰ or ◌̱ Upstep
- CONTOUR
- ◌̥ or ◌̦ Rising
 - ◌̧ or ◌̨ Falling
 - ◌̩ or ◌̪ High rising
 - ◌̫ or ◌̬ Low rising
 - ◌̭ or ◌̮ Extra rising
 - ◌̯ Global rise
 - ◌̰ or ◌̱ Global fall

Chart 1: The International Phonetic Alphabet (revised to 2005)⁸

⁸<http://weston.ruter.net/projects/ipa-chart/view/keyboard>



Map 1: Map of Iran with Sistan enlarged⁹

⁹ Adapted from: http://english.freemap.jp/asia_e/iran.html and <http://www.weather-forecast.com/locations/Zabol>