

Velar Fricatives in English-Persian Learner Language

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Dedication

This work is dedicated to my husband, Mohammad Ebtehaj, fellow traveler on the trails of scientific and romantic exploration, and delightful inspiration,

and

to my parents, Maryam Saffari and Eshagh Khanzadi, who gave me two wings to fly and have always encouraged me to look for four-leaf clovers.

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Abstract

Almost no previous research has described the learner language produced by English L1 learners of Persian L2. This study is a descriptive analysis of two phonemes, a voiced velar fricative /q/ and a voiceless velar fricative /x/, in the learner language produced in unrehearsed oral interaction by two adult English-speaking learners of Persian L2. The main focus of the study is to identify and predict possible instances of transfer from English L1 to Persian L2, and to see whether the position of /q/ and /x/ in the syllable affects the learners' accuracy in producing these phonemes. The general approach to analysis used in the present study was a combination of contrastive analysis, error analysis, and learner language analysis. Results showed that the absent phonemes in the English phonemic system caused difficulties for the English-speaking learners of Persian. Both /x/ and /q/ were variably replaced by the English voiceless velar stop /k/, which can in part be attributed to native language transfer since there is no such sound as /x/ or /q/ in English, but might also be attributed to conditioned variation in native speakers' production of /q/ (Windfuhr, 1979). The accuracy level and the phonemes substituted for the Persian target consonants varied in different contexts, as predicted by variationist SLA theory (e.g. Tarone, 1988; Major, 2001; Bayley & Tarone, 2012). The occurrence of /x/ and /q/ in an open or closed syllable did not affect their pronunciation; however, their occurrence in syllable initial or syllable final position did. Implications of these findings for second-language acquisition research and for Persian L2 pedagogy are explored.

Literature Review

The field of Second Language Acquisition (SLA) is based on data produced in a growing body of research on learner language (Ellis & Barkhuizen, 2005; Lightbown & Spada, 2006; Ellis, 2008). Selinker (1972) coined the term “interlanguage” to refer to the systematic knowledge that underlies the language of second language learners, which is different from both their first language and the target language. This learner language produced in unrehearsed interactions inside and outside the classroom reveals linguistic patterns that can be very different from those seen in controlled rehearsed activities with peers in the classroom. Corder (1967) claimed that interlanguage development follows its own “built-in syllabus” – one that is often different from the textbook’s or teacher’s syllabus. Careful description of the development of learner language is needed in order to understand the nature of that built-in syllabus for second-language acquisition.

Since Selinker (1972), many researchers have dedicated their careers to understanding the mechanisms and processes of second and foreign language learning that take place in learners’ minds. Many researchers have attempted to explore the steps that learners go through in acquiring a second language, particularly in unrehearsed oral interaction (Tarone & Swierzbin, 2009). The reasons are obvious: to design better methods and techniques of teaching and learning second languages, and to create better teaching and testing materials.

Most second language (L2) acquisition research has focused on learners of English as a second language, or of other European second languages (Major 2001, 2007). For example, Tarone (1981) investigated the English L2 syllable structures of three learner languages produced by speakers of Cantonese, Portuguese, and Korean, to

find influences on the syllable structure of their interlanguage phonology. Sato (1984)'s longitudinal study analyzed the phonological processes in English L2 acquisition, focusing on syllable structure in the interlanguage of two Vietnamese learners. Her data showed a preference for the open CV syllable in the modification of English syllable-final consonant clusters, more difficulty in producing syllable-final than syllable-initial clusters, and use of vowel epenthesis as a syllable modification strategy.

As part of research on second language acquisition, many researchers have dedicated their careers to exploration of the difficulties encountered by speakers of Persian as a first language (L1) who are learning English as a second language (L2). Many have produced contrastive analyses of Persian and English, since contrastive analysis (CA) is a one way to predict learners' transfer of linguistic patterns from L1 to L2. Contrastive analyses of Persian and English in theory could predict native language transfer in both directions (i.e. in Persian L1-English L2, and also English L1-Persian L2), but in fact all of these aim to predict difficulties and challenges of Persian speakers trying to acquire English L2, and not the other way around (Wilson & Martin, 2001; Ostadzadeh, 2005).

For example, Ostadzadeh (2005) is a contrastive analysis that focuses on sentence patterns in English and Persian. Her research reveals noteworthy similarities as well as differences between Persian and English. In both languages the basic functions of the clause are the same. One of her findings highlights the fact that Persian, unlike English, is very flexible in terms of word order of the clause. Unlike English where the indirect object may or may not be preceded by a preposition, depending on its position relative to the verb, in Persian the indirect object is always preceded by a preposition. On the basis of

this CA, Ostadzadeh predicts difficulties to be encountered by Persian learners of English L2.

In another example, Wilson and Martin (2001) is a chapter on Persian speakers in Swan & Smith (2001) that describes the features of the phonology, orthography and punctuation, grammar, and vocabulary of the Persian language in contrast with those of English. Wilson and Martin present Table 1 to contrast English phonemes with Persian phonemes, and use it to predict difficulty for learners of English L2. The shaded phonemes in Table 1 have an equivalent or near equivalent in Persian, and these would be predicted to be relatively easy for Persian learners of English. However, the articulation of un-shaded English phonemes, those with no equivalent Persian phonemes, may cause problem for such speakers of Persian.

Table 1: English phonemes with and without Persian equivalents
(from Wilson and Martin, 2001: 180)

p	b	f	v	θ	ð	t	d
s	z	ʃ	ʒ	tʃ	dʒ	k	g
m	n	ŋ	l	r	j	w	h

This table is useful for Persian learners of English L2, but not entirely accurate, in my opinion. For example, the authors say: “/ð/ and /θ/ tend to be confused or pronounced as /t/: *ten* for *then*; *tinker* for *thinker*” (p. 181). As a Persian learner of English, I believe this is generally accurate but I would also like to suggest a correction. Persian learners of English do not tend to substitute /t/ for /ð/ but rather /d/: *den* for *then* is more common than *ten* for *then*. Also, Wilson and Martin did not provide any Persian equivalent

phoneme for English /ʒ/ which in their opinion belongs to the un-shaded area. However, Table 5 on page 19 below, on Persian consonants, shows that English /ʒ/ has an exact equivalent in Persian /ʒ/ and as a result, the pronunciation of this English phoneme should not be difficult for Persian speakers. Examples of Persian words pronounced with /ʒ/ include: /ʒeleh/ “Jelly”, and /ʒakæt/ “sweater” (Farhang Moaser Kimia, Persian-English Dictionary).¹

It remains to be seen to what extent these same contrastive analyses can be used to predict transfer problems in English L1- Persian L2 (e.g. phonology, morphology, word order, and subject-verb agreement). These comparisons of English and Persian phonemes, as seen below, can be used to predict learning difficulty when English speakers learn Persian. For example, Persian phonemes that do not have equivalents or near equivalents in English may not be perceived and articulated by English speaking learners of Persian without difficulty. Of course, CA predictions are not enough. These differences need to be tested and verified by empirical research on learner language.

In addition to contrastive analyses used to predict difficulty for learners of English L2, a considerable number of empirical research studies have gathered data on the learner language of Persian L1 learners of English L2 (Karimi, 1987; Yarmohammadi, 1995; Jabbari, 1998; Hajizadeh, 2007, Ghavami & Mahmoodi, 2010; Jabbari & Samavarchi, 2011; Jalali & Shojaei, 2012). For example, Karimi (1987) and Yarmohammadi (1995) are research studies documenting difficulties of Persian speakers in producing initial consonant clusters in English. Persian prohibits /s/ + consonant clusters and Persian

¹ It is interesting that even though the /dʒ/ phoneme exists in Persian, and words like “jelly” and “jacket” are loan words from English, Persian speakers substitute /ʒ/ for /dʒ/ when they pronounce these words. Perhaps the way that Persians pronounce /ʒ/ is a transfer from French.

learners of English tend to cope with these clusters by inserting an epenthetic vowel (e-epenthesis) before the sC.

However, it is a little frustrating to find that almost no research studies have described the learner language produced by English L1 learners of Persian L2. For example, one reads,

The Persian-English data have shown that over time (hence with increased L2 proficiency) and in more formal situations, the amount of L1 transfer (i.e., e-epenthesis) decreases, while the proportion of L2 features (sC onset cluster production) increases.

(Boudaoud & Cardoso, 2009, p102).

Very interesting, but these authors solely focus on Persian speakers learning English and not vice versa. More empirical studies are needed that focus on English speakers learning Persian L2 to see how CA can help us predict and document the difficulties English speakers have when learning Persian.

I have been able to identify just three second-language acquisition (SLA) research publications that document the learner language produced by English L1 learners of Persian L2, only one of which focuses on phonology, the area of interest in the current study. The first is Tarallo & Myhill (1983) who reported findings of their research on English L1 speakers' acquisition of relative clauses in several L2s, which originally included Chinese, Japanese, Persian, German, and Portuguese. The main focus of their study was on the impact of L1 transfer on the learners' ability to recognize grammaticality in relative clauses in the target language. They were presented with twenty-four to thirty-two sentences containing relative clauses, which they had to mark as

being grammatical or not grammatical in the languages studied. Students were asked to give a value of 1 to the sentences that they considered to be grammatical, 0 to those rated ungrammatical, and .5 to those that they were not certain about. The researchers examined each test for the number of acceptances of unacceptable sentences that contained relative clauses across syntactic categories in the five languages.

The Persian learners who participated in their study were five students in Persian foreign language classes at the University of Pennsylvania. Persian was classified as a Subject Object Verb (SOV) language that has relativizers that may be deleted under some conditions. The authors note that indirect objects in Persian are marked with a preposition, as are possessives. To extract nouns with a preposition requires leaving behind a resumptive pronoun. Relativization of direct objects may optionally leave a resumptive pronoun but relativization of subjects may not. The authors state, “Structures tested for Persian include leaving a resumptive pronoun (correct except in subject position), stranding a preposition (always incorrect), deleting a preposition (always incorrect), and moving the preposition in front of the relativizer (also always incorrect)” (Tarallo & Myhill, 1983, p 60). The Persian L2 learners were asked to judge the grammaticality of the following sentences (p. 74):

1. *mardi keh (ou) az eeran amad pooldar ast*
man who he from Iran came rich is

The man who came from Iran is rich.

In Example 1, “*Ou*” (the RP) must obligatorily be left out.

2. *mardi keh man ou ra zadam eerani bood*
man who I him hit Iranian was

The man who I hit was Iranian.

In Example 2, *ra* is a definite direct object marker. *Ou* (the PR) may optionally be left in or out.

3. *mardi keh man ba ou sohbat kardam emrikayee bood*
 man who I with him speak did American was

The man whom I spoke with was American.

In Example 3, *ou* (the RP) may not be left out, nor may *ba* moved before the relativizer, as in: **Mardi ba keh man sohbat kardam emrikayee bood*.

In their description of the relevant grammatical structures in the languages they studied, Tarallo & Myhill (1983) state, “Persian grammarians have never been able to present a satisfactory account of this condition and this usage was clearly beyond the abilities of the students tested” (p 59). Because of their very low proficiency levels, in the end they did not include any data from the Persian L2 learners in their findings. However, the results they did report are possibly relevant for future research on Persian learner language. This possibility is particularly interesting because the researchers mentioned that the learner language produced by the L2 learners they did study differed from what a contrastive analysis would predict: they found a large number of acceptances of ungrammatical sentences involving resumptive pronoun (RPs). They conclude,

This of course cannot be attributed to interference from L1, as English does not normally allow RPs in relative clauses. Such unacceptable RPs were accepted statistically significantly more often in left-branching languages (Chinese and Japanese) than in right-branching languages (Portuguese and German). (Tarallo & Myhill, 1983, p. 63).

It would be interesting to replicate the Tarallo and Myhill study with learners of Persian L2 whose proficiency level is higher, to see if they too accept ungrammatical resumptive pronouns.

The second research study with possible relevance for Persian L2 learning is Keshavarz (2007). This is a longitudinal study of a bilingual child's simultaneous acquisition of morphemes in English and Persian. The morphemes studied included determiners, plural marker, genitive, and copula. Keshavarz explored the question: if a language has more regular and less rich morphology than another language, for a given language category (such as copula), then will that category be acquired earlier in that language?

The data were collected from a Persian-English bilingual child, Arsham, who was born in Great Britain and lived there for the first 2 years of his life. Keshavarz tested two hypotheses regarding the development of inflections and other functional categories -- the Structure-Building Model and the Continuity Hypothesis, both constructed within generative theory. In the introduction, Keshavarz provides a literature review of the second language acquisition of bilingual children and frames his study this way:

One of the major issues dealt with in this field of study is the question of language differentiation by children acquiring two or more languages simultaneously, more specifically how and at what age these children succeed in differentiating the grammatical systems of the two languages they are exposed to (p. 257).

As part of this study, Keshavarz asked whether language categories like copula, determiners, and possessives were used first by Arsham in English or Persian. This

question has relevance for adult learners of Persian L2 as well. An ongoing theme has been whether people acquire a second language in the same way as a first. If the Persian second language learning stages are similar to those of Persian first language acquired by children, both groups are probably using the same learning process (Brown, 1973).

Answering this question about Persian and English acquisition by a bilingual child could help us predict which Persian grammatical features adult English speakers will acquire earlier.

Keshavarz (2007) begins with a contrastive analysis to demonstrate that Persian has richer verb morphology and verb syntax than English. For example, unlike English, all Persian verbs are inflected for number and person (except for the third person singular which shares the same form with the stem), and each person/number combination in Persian is uniquely identified by an inflected suffix. The author cites Hyams (1992) who claims that in the acquisition of languages with a richer verb morphology and verb syntax, children acquire certain inflectional elements at a very early age, from the beginning of their multiword utterances. Considering that Persian has richer verb morphology and verb syntax than English, the findings of this study can help us identify functional categories (e.g., copula, determiners, and possessive) that are also likely to be acquired in early or late stages by adult English speakers of Persian L2.

For example, Keshavarz (2007) describes definiteness/indefiniteness in Persian articles. He shows there are three ways in which indefiniteness can be shown in Persian, as shown in the following examples (p. 259):

- | | | |
|--|---|--|
| a. <i>ketab-I</i>
book-IM
'a book' | b. <i>yek ketab</i>
a book
'a book' | c. <i>yek ketab-i</i>
a book-IM
'a book' |
|--|---|--|

As can be seen in these examples, the definite/indefinite marker system in Persian is far more complicated than definite/ indefinite morphology in English. This difference would predict that an English speaker would have difficulty acquiring the definite/indefinite marker in Persian.

In another example, Keshavarz (2007) examined the order of adjectives and nouns in English and Persian. In English, adjectives precede nouns but in Persian nouns precede adjectives and are connected to adjectives by the *-e* morpheme, as in “*ʃæhr-e bozorg*, literally ‘city of big’ meaning ‘big city’” (p. 260). Since the order of adjectives and nouns is not the same in English and Persian one can predict that adult English speakers acquiring Persian L2 will encounter some difficulties producing such forms as this accurately: “*ʃæhr-e bozorg*.” They might be predicted to say “*bozorg ʃæhr*” instead. (In fact although the present paper does not focus on the order of adjectives and nouns in English-Persian learner language, I have observed my learners make exactly this error and produce “*bozorg ʃæhr*.”)

After providing the contrastive analysis of these and other features of English and Persian, Keshavarz (2007) restricted his study to the morphological analysis of two-word and early multiword utterances in English and Persian produced by Arsham from 16–23 months of age. Keshavarz calculated the mean length of Arsham’s utterances for that period using words as units rather than morphemes to avoid a bias against English which is not as morphologically rich as Persian. Utterances in this study were divided into three categories: Persian utterances, English utterances, and mixed utterances (those that contained elements from both languages). Here is a sample of these three categories of utterances:

Table 2: Arsham's Persian, English, and mixed utterances

Age	Language	Utterance	Gloss and contextual notes
16	P	<i>barun næ</i>	rain no = It stopped raining.
16	E	<i>at me[æmi]</i>	look at me.
18	E	<i>give me [gI mi]</i>	give me my soother.
18	M	<i>Mommy bebin</i>	mommy look.
22	E	<i>cheese cracker</i>	put some cheese on my cracker.
23	P	<i>inja lala</i>	here sleep=I want to sleep here.

E = English, P = Persian, M = mixed

In one part of the study, Keshavarz (2007) asked whether plural marking was acquired earlier in English or in Persian. He found that Arsham used plural marking in English much earlier than in Persian. Arsham did not show any sign of the development of plural morphemes in Persian until he was 21 months old when he used the plural deictic expression *in-a* 'these.' Even thereafter (until 23 months of age) his use of the plural morpheme in Persian was restricted to one word only *gol-a* 'flowers', produced twice. However Arsham's inventory of nouns used with plural morphemes in English reached 22 (eyes, boys, eggs, etc.) by 23 months of age. This earlier development of plural in English could have been due to a simpler plural marking system in English (though it also have been due to the fact that Arsham's exposure to English was greater than his exposure to Persian during that period). Plural nouns in Persian do not always show number agreement with numerals, as illustrated in the following examples:

4. *seta biskwit-Ø xord-æm.*

three biscuit ate-1st ps

‘I ate three biscuits.’

5. *diruz c ʔændta pærcænde- Ø did-æm.*

yesterday some bird- Ø saw-1st ps

‘I saw some birds yesterday.’

Using this fact to explain Arsham’s different rate of acquisition of plural in Persian and English, Keshavarz concluded, “language specificity in the development of certain morphemes, i.e. the structural properties of the language(s) involved will play an important role in bilingual acquisition (cf. Deuchar & Quay, 2001). In other words, since pluralness is always marked in English it is acquired earlier in this language compared to Persian” (p. 264). Based on Keshavarz’ findings, one could also hypothesize that when adult English speakers learn Persian L2, the development of plural markers in Persian may not happen at very early stages, due to the fact that plural nouns in Persian do not always show number agreement with numerals. Since pluralness is always marked in English, it may be acquired earlier in this language compared to Persian. One could consider this a kind of language transfer from English L1 to Persian L2.

Keshavarz (2007) also studied the acquisition of the copula in Arsham’s English and Persian. He found that Arsham was able to produce the short forms of the Persian copula earlier, at between 16 to 23 months of age, while he did not use the English copula or auxiliaries at all during the two-word stage. Keshavarz argued that this difference was due to the fact that the short forms of the Persian copula are more systematic than English copula form. In spoken Persian /æst/ (the equivalent of is) is reduced to the bound morpheme *-e*, which can be attached to other parts of speech: *(un) gol-e* “(that) flower-is: That is a flower.” Arsham began to produce this short form of the Persian copula at

between 16 to 23 months of age. As argued above, based on these findings for early acquisition of the Persian copula by a bilingual child, one might predict that adult American learners will also acquire the Persian copula during early stages.

Interestingly, Arsham sometimes applied the plural marker of Persian to English utterances, combining the Persian copula morpheme with English lexemes, as in *ball-e* “It’s a ball,” as early as 16 months of age. This is a case of code mixing at lexico-grammatical level. Such bilingual combinations consisting of lexemes from one of the two languages and grammatical morphemes from the other are very common in other studies (Burling, 1978; Klausen, Subritzky, & Hayashi, 1993; Lanza, 2004.)

The third research study on Persian L2 is most closely related to the focus of the present study, which will examine the acquisition of two phonemes in Persian L2. Ghadessy (1998) focuses on the acquisition of Persian L2 phonology by English speakers. Ghadessy asks whether or not the phonetic and phonemic characteristics of stop voicing produced by native speakers of Persian in reading a list of words (see Table 3) are markedly different from those produced by American English L1 students learning Persian L2.

Table 3: Test words in Tehran Persian Experiment (Ghadessy 1998, p. 81)

	Initial		Final	
/p/	<i>pær</i>	“feather”	<i>chæp</i>	“left”
/b/	<i>bær</i>	“side”	<i>cæb</i>	“nonsense”
/t/	<i>tær</i>	“wet”	<i>kæt</i>	“shoulder”
/d/	<i>dær</i>	“door”	<i>kæd</i>	“nonsense”
/k/	<i>kær</i>	“deaf”	<i>kæk</i>	“lice”
/g/	<i>gær</i>	“bald”	<i>kæg</i>	“nonsense”

Ghadessy provides a brief contrastive analysis of the Persian and English sound systems and how they differ in terms of some consonants, vowels and intonation. Of particular relevance to the present study, Ghadessy points out that stops that are common in both languages are /p, b/, /t, d/, and /k, g/ but that two additional Persian stops that do not exist in English are /ʔ/ and /q/. /q/ is fricative but in prevocalic initial position tends to be a voiced stop, often followed by a fricative release (Windfuhr, 1979). Voiced Tehran Persian stops /b/, /d/, /g/, and /q/ are not aspirated (nor are /b/, /d/, and /g/ in English); sometimes in specific environments Persian voiced stops are only partially voiced (Lazard, 1972). Tehran Persian stops, like English (and Spanish) stops, are classified as ‘long-lag’ VOT categories.

Following his CA, Ghadessy (1998) did an empirical research study on the value of the vowel /æ/ produced by both NSs and NNSs in various phonological environments in Persian, assuming with Tarone (1979, 1988) and Major (2001) that this value will vary in different phonological environments. He records the duration of /æ/ before and after the voiced and voiceless stops /b/, /p/, /d/, /t/, /g/, /k/, and then investigates whether voicing of these neighboring stops has a similar impact on the duration of /æ/ produced by native speakers of Tehran Persian, and by American learners of Persian L2.

Table 4: Participants in Ghadessy (1998)

Participants	Nationality	Education
Group 1	Iranian, 5 male students of Tehran dialect (NSs)	Graduate and undergraduate students at the University of Texas at Austin
Group 2	Iranian, 5 female students of Tehran dialect (NSs)	Graduate and undergraduate students at the University of Texas at Austin
Group 3	American, 5 male students (NNSs)	Had completed two years of Persian at University of Texas, Austin, and had resided in Iran from one to three years. During their stay in Iran they did not attend

		any special Persian classes, but were regularly engaged in oral communication with native speakers.
Group 4	American, 5 female students (NNSs)	Four undergraduates and one graduate students, none of whom had been to Iran but completed two years of Persian at University of Texas, Austin.

The spoken data from the Iranian groups were compared with that of the American groups. Ghadessy administered identical measures of the NSs and NNSs' production of the Persian word list in Table 3 and utilized a Sona-graph for acoustic analysis. Participants' production of the voiced and unvoiced stops /p, b, t, d, k, g/ was measured for voice onset time (VOT), initial position, vowel duration (/æ/), and initial vs. final position; then the results for the NSs and NNSs were compared.

A number of systematic differences between the phonological patterns used by native and non-native speakers was identified.

Initial position of C: Both place of articulation and speaker group had influence on the quality of consonant VOT; the VOT's for Persian initial position /p/, /t/, and /k/ produced by American students (L2) were shorter than those for the same initial position stops produced by Iranian students (L1).

Vowel duration: The duration of the vowel /æ/ in all four groups was longer whenever it was produced before and after voiced stops. But there was a difference in the duration of the vowel /æ/ in different phonological environments produced by the NSs of Tehran and American students. Overall, the vowel /æ/ produced by the American male group was about 13 msec. longer than the vowel produced by male Persian students, and there was a difference of 77 msec. between the American female students and the female NSs.

Final position: For all speakers, the VOT values of stop consonants in final position were consistently shorter than those of Cs in initial position. But, similar to the case for initial stops, the VOT values of /p/, /t/, /k/ for the American students were slightly shorter than the mean VOT values produced by Persian NSs. Ghadessy (1998) concludes that English L1 speakers pronounce Tehran Persian L2 stops /p/, /t/, and /k/ with shorter VOT than native speakers of Persian when these stops occur in both initial and final position, and produce a longer duration of the vowel /æ/ in Persian words than Persian native speakers do.

In summary, it can be seen that while considerable research has been done in second language acquisition, and there is a growing body of research on Persian L1 speakers' acquisition of English L2, there has been very little SLA research on English L1 speakers' acquisition of Persian L2. This area merits more attention in order to fill the need of both Persian teachers and Persian language learners. The present study will follow the lead of Ghadessy (1998) in examining English speakers' acquisition of two phonemes in Persian L2.

THE STUDY

The present study is a descriptive analysis of two phonemes in the learner language produced in unrehearsed oral interaction by two adult English-speaking learners of Persian L2. As such, it is one of the first studies on the acquisition of Persian as a second language that I am aware of that analyzes the learner language phonology produced by adult English-speaking learners of Persian.

This study examines the learners' production of two Persian consonants: "gh" (a voiced velar fricative /q/) and "kh" (a voiceless velar fricative /x/). A contrastive analysis of Persian and English phonology will show that these two consonants do not exist in the English phonemic inventory, and so one could predict that American learners of Persian will have a difficult time producing these two fricative phonemes. One might also predict that there may be transfer of the voiced and voiceless English stop consonants produced in the same articulatory position (i.e. /g/ or /k/) to replace /q/ and /x/ in Persian learner language.

As in previous studies of second-language phonology, it is good to start with a contrastive analysis of the phonemic inventories of the first and second languages, in this case, English L1 and Persian L2. The general approach to analysis used in the present study is a combination of contrastive analysis (CA), error analysis (EA) and learner language analysis to identify and predict possible instances of transfer from English L1 to Persian L2, and to see whether those predicted errors or patterns in fact occur. As it has been discussed, CA is the systematic study of two languages, here English and Persian, to identify their structural similarities and differences (Lado, 1957; Ellis, 1994; Connor, 1996). Where differences occur, it is usually predicted that errors will occur. Error analysis is the study of inaccuracies in learner language, as for example in pronunciation, and the source of these inaccuracies, whether in transfer from the native language or other sources. Learner language analysis goes beyond inaccuracies, and studies overall linguistic patterns in learner language; these too can often be traced to native language transfer.

CA, then, is a tool to predict and explain transfer from the native language to the target language in SLA. To identify possible areas of learner difficulty, the first step is to begin by contrasting Persian and English phonology. We will begin with a description of the Persian phonemic inventory. According to Windfuhr (1979) the Persian phonemic inventory contains thirty-two phonemes: twenty-three consonants and six vowels for a total of twenty-nine phonemes. Of the six vowels, there are three lax vowels /a/, /e/, /o/ and three tense vowels /æ/, /i/, /u/ as well as two diphthongs /ei/, /ou/ (Windfuhr, 1979, p.526; Samareh 2000, p.85). The classification of Persian consonants according to place of articulation (horizontal column) and manner of articulation (vertical column) is given in Table 5:

Table 5: Persian Consonants (International Phonetic Alphabet (IPA), 1999, p. 124)

	Bilabial	Labial	Dental	Postalv.	Palatal	Velar	Glottal
Plosive	p b		t d			k g	ʔ
Nasal		m		n			
Fricative		f v	s z	ʃ ʒ		x ɣ	h
Affricate				tʃ dʒ			
Trill				r			
Approximant					j		
Lateral Approximant				l			

As can be seen in Table 5, one major difference between the Persian and English consonant inventories is that Persian has two velar fricatives, one voiced and one voiceless, /ɣ/ (which we will refer to as /q/ for reasons we give below) and /x/, that do not occur in English. Because these two consonants are absent in English, this CA predicts

they will be difficult for English speaking learners of Persian L2, and the present study will focus on learners' production of those target phonemes. Positional variation in the production of these consonants is described by Hall (2007): "When /ɣ/ occurs at the beginning of a word and after nasals, it is realized as a voiced uvular plosive [q] as in 'ghabul' /qæbul/ meaning 'acceptance'; otherwise, it is postvelar [ɣ] as in 'maghbul' /mæɣbul/ meaning 'accepted'" (Hall, 2007, p. 8). In fact, in modern Persian, the two phonemes /q/ and /ɣ/ are increasingly merged into one phoneme transcribed as /q/ (Windfuhr, 1979). This is the case in my own Persian, where I use only /q/. Since I was the tutor of the participants in the present study, I assume in this paper that the two participants in this study had /q/ as their target but not /ɣ/². Windfuhr identifies this voiced velar fricative as a phoneme that is highly variable with regard to both speaker and phonological context:

The characteristic of /q/ remains the most problematic issue of the phonemic system of Iranian Persian. Experimental phonetic studies by Sokolova and Gaprindashvili and Guinashvili affirmed the impression of considerable conditioned variation, varying itself with the speaker. The first point to note is that the critical conditioning environments for /q/ are the same as those for the stops, but with divergent effects. 1) In prevocalic initial position, /q/ tends to be a voiced stop, often followed by a fricative release. 2) In final position, it is a devoiced stop, or fricative both with equal frequency. 3) In clusters, voicing is

² The letter "gheyn" represents the sound /ɣ/ which is a voiced uvular stop. There are many loan words in Persian from Arabic /ɣ/ such as "ɣoran" meaning Koran, and "ɣætær" meaning Qatar. However in modern Persian the Arabic /ɣ/ is being pronounced as a voiced velar fricative /q/ "ghaf". Arab scholars have noticed that Persians do not make a distinction between Arabic "gheyn" and "ghaf" (William Beeman, personal communication, 10/7/13).

neutralized. Most prominently, it tends to be devoiced before /t/; e.g., /væqt/ to /væxt/ “time.” In addition, in intervocalic position /q/ is a voiced fricative, which supports its systematic pairing with /x/.

(Windfuhr, 69)

Since the target Persian phonemes /q/ and /x/ do not exist in English, and since /q/ exhibits so much variation, we predict that English L1 learners of Persian L2 will have trouble with their pronunciation. Anecdotal observations support the view that English-speaking learners do sometimes replace /q/ and /x/ with the English phonemes /g/ and /k/ particularly syllable initially. Based on the CA, one would predict that the voiced /q/ would usually be replaced by voiced /g/ and voiceless /x/ by voiceless /k/. But some syllable positions favor accuracy of these phonemes more than others. In other words, accuracy varies depending on where these target consonants occur in the syllable (e.g., syllable-initial or syllable-final).

Some SLA researchers have questioned whether linguistic or social context variably influences learners’ accuracy of production of target L2 features. While Gregg (1990) argues that any such interlanguage variation is not the concern of second-language acquisition theorists, Major (2001) argues:

Variation exists at all levels of language: in the lexicon, phonology, morphology, syntax, semantic, pragmatics, and discourse. Furthermore all language data show variation both in NSs and NNSs, including introspective intuitive judgments about grammaticality. Therefore, any model, theory, or purported explanation that fails to account for variation is not accounting for the data, period. (p. 69)

In this study, we will explore whether the learners' transfer of English phonemes to replace the /q/ and /x/ phonemes will occur variably when the target sounds occur in different positions in the syllable.

In order to analyze such variation in the interlanguage phonology of Persian, a brief review of the syllable structure of Persian may be helpful here. The target phonemes /q/ and /x/ are consonants that occur in defined places in the syllable. According to Nye (1954) there are seven types of syllable structures for Persian words:

V	/U/	<i>he</i>	CV	/mu/	<i>hair</i>
VC	/ab/	<i>water</i>	CVC	/sal/	<i>year</i>
VCC	/æbr/	<i>cloud</i>	CVCC	/sæbk/	<i>method</i>
			CVCCC	/tæmbr/	<i>stamp</i>

According to Scott (1964, p 27-30) and Windfuhr (1979, p. 529) Nye's seven syllable types may be reduced to four by subsuming V, VC, and VCC under CV, CVC, and CVCC. They summarize the syllable structure of Persian as CV (C) (C) (C) where an initial C and V are obligatory, while 3 final C's are optional. They argue that *he* should not be classified as V. Rather, Persian syllables cannot be initiated with vowels; even words that start with a vowel include the glottal stop /ʔ / as the syllable onset: 'abru' /ʔæbru/ (eyebrow) (Hall, 2007). Hall states that syllable-initial consonant clusters are impossible in Persian, while syllable-final consonant clusters normally take no more than two consonants in their structure.

Using this framework, one can see that in Persian, /x/ occurs in three syllable positions:

1. Syllable-initial XV, XVC, and XVCC, as in /xæ.rið/ “bought” or “shopping”, /xun.dæm/ “I studied”, and /xord/ “ate”.
2. Syllable final CVX as in /sæx.teh/ “it’s difficult”.
3. Syllable final, consonant cluster CVXC, as in /de.ræxt/ “tree”.

The voiced consonant /q/ also occurs in the same three syllable positions:

1. Syllable-initial qV, qVC, and qVCC, as in /qæ.bul/ “pass”, or “OK” depending on the context, /qæt.reh/ “drop”, and /qæsɹ/ “castle”.
2. Syllable final CVq as in /tæq.ri.bæn/ “so-so”, “neither good nor bad”.
3. Syllable final, consonant cluster CVqC, as in /væqt/³ “time”.

One question of interest is whether and to what extent syllable position affects the accuracy of the target phonemes /q/ and /x/ in English L1-Persian L2 learner language.

Methods

In the present study, the following research questions were addressed.

Research Questions

1. In unrehearsed oral communication, do English L1- Persian L2 learners accurately pronounce two consonants: the voiceless velar fricative /x/ and the voiced velar fricative /q/? Do they replace these sounds with English phonemes, and if so, which ones?
2. How does the position of /q/ and /x/ in the syllable affect the learners’ accuracy in producing these phonemes?

³ The morphophonemic rules of English prohibit mixing of voiced and voiceless consonants in consonant clusters in English; therefore the pronunciation of the voiced velar fricative /q/ in consonant clusters like that in /væqt/ is likely to be very challenging for English-speaking learners of Persian L2 (William Beeman, personal communication, 10/7/13).

Participants

The participants in this study were two female English L1 speakers at different stages of acquisition of Persian as a second language; “Fereshteh” (a pseudonym) had studied Persian 1 year, and “Pari” (a pseudonym) had studied Persian for 2 years.

Background information about the participants is summarized in Table 6 (Information in the tables was gathered from videos and interviews with the researcher.)

Table 6. Background of the Participants

	Pari	Fereshteh
Age	39	31
Native language	English	English
Other language	Spanish, two semesters Hindi	Some Spanish
Studied Persian	Two years at the University of Minnesota, and in a summer immersion program at the University of Wisconsin, Madison. Participating in Persian conversation group every week for two hours.	Two semesters at the University of Minnesota. Participating in Persian conversation group for two hours two to three times a month.
Native Country	United States of America	United States of America
Education	Graduate student, Liberal Studies, University of Minnesota	Bachelor, Taking coursework, University of Minnesota
Relationship with conversational partner	Distant acquaintances	Distant acquaintances

“Pari” was educated in English, her native language, and was pursuing her masters’ degree in liberal studies. She is like many typical American graduate students in the Humanities who want to learn different languages. Along with taking Persian grammar-based language classes, Pari used Persian once a week outside of class with some native speakers at a Persian “conversation table”. In addition to studying Persian for more than two years, she had also started to learn Hindi. She was very relaxed and confident during the interview and wanted to share whatever she knew with the interviewer. She monitored her speech; she corrected her grammatical and lexical errors many times and usually when the interviewer corrected her she attempted to not make

that error again. The video of her interview is posted on the website

<http://www.carla.umn.edu/learnerlanguage/per/videos.html>.

“Fereshteh” was taking graduate-level coursework as a non-degree student at the University of Minnesota at the time of the study. Along with taking Persian grammar-based language classes, Fereshteh used Persian outside of class with some friends, native speakers of Persian, and at a Persian conversation table. Overall, Fereshteh seemed less confident than Pari. Her Persian proficiency was lower than Pari’s, since she had only taken two semesters of Persian while Pari had studied Persian for more than two and a half years. However, she was a good risk-taker, and used communication strategies like clarification requests when she did not understand the researcher’s questions or words, asking for repetition, and checking her vocabulary with the researcher. The tasks required her to communicate, but her coursework focused on grammar had not prepared her to be a fluent communicator. She seemed to monitor her utterances considerably, speaking with long pauses. Watching her videos, one has the impression that she was thinking hard during those pauses; this would be consistent with her grammar-based educational background. Fereshteh told the researcher that she had public speaking anxiety and this was her first time speaking in any language in front of a video camera. Fereshteh’s Persian lexicon and syntax were not as complex as Pari’s, but she used a lot of words and phrases that native speakers of Persian would use in conversation. This may have resulted from her use of Persian with her many Iranian friends outside of class. The video of her interview is posted on the website

<http://www.carla.umn.edu/learnerlanguage/per/videos.html>.

Data Collection

The data for this analysis were gathered as part of a larger project funded by a Title VI International Research and Studies Program grant entitled “Asian Learner Language: Tools for Teachers (ALL-TT)⁴” which gathered samples of unrehearsed, task-based language produced by English-speaking learners of four less-commonly-taught languages in the US: Chinese, Japanese, Korean, and Persian. This study will focus only on the Persian learner language samples elicited in this grant-funded project.

The two learners of Persian were video recorded over a period of three and a half hours while engaging in six unrehearsed communication tasks. Because the learners were videorecorded in a studio with two cameras, some time was taken between each task to set up the recording equipment. In all videos, these learners of Persian were shown engaging in essentially the same six unrehearsed speaking tasks that Tarone and Swierzbinska (2009) used in eliciting English L2 learner language from adult native speakers of Spanish, French and Mandarin Chinese.

Instruments and Instructions

The six communication tasks used to gather Persian learner language for this study are described below:

Task 1: A one-to-one oral interview administered by the author of this paper about the learner’s language learning background (both had studied Spanish before Persian), goals, and experiences. The interviewer, a native speaker of Persian, Tehran dialect, asked the following questions in Persian:

⁴ U.S. Department of Education Office of Postsecondary Education Award # P017A090297, 9/1/2009-8/31/2012, Principal Investigator Elaine Tarone, University of Minnesota.

۱. پری/فرشته، شما به چه زبانها بی صحبت میکنی؟ چه زبان هایی بلدی؟
۲. زبان مادریت چیه؟
۳. چند سال اسپانیا بی خوندی؟
۴. میتونی برام به کلاس اسپانیای رو که در مدرسه داشتی تشریح کنی؟ توضیح بدی که کلاستون چه جور بود؟
۵. میتونی بهم بگی که دانش آموزها در کلاس هندی چی کار میکنن؟ چه طوری درس میخونن؟
۶. میتونی بهم بگی که چند ساله داری فارسی میخونی؟
۷. کجا زبان فارسی رو یاد گرفتی؟ میتونی با هم مقایسه کنی؟ کدوم رو بیشتر دوست داشتی؟
۸. خوب، حالا میتونی بهم بگی که آیا بیرون از کلاس با کسی فارسی صحبت میکنی؟
۹. چرا به زبان فارسی علاقه مند شدی؟
۱۰. دوست داری هیچ وقت به ایران مسافرت کنی؟
۱۱. چه شهر هایی رو دوست داری ببینی؟
۱۲. میتونی به فیلم ایرانی رو که بهش علاقه داری برام نام ببری؟
۱۳. خوب حالا بهم بگو که هنرپیشه ی ایرانی محبوب تو کیه؟
۱۴. میتونی برام به پلان از فیلم رو تعریف کنی؟

An English translation of the interview questions is:

1. What other languages do you speak?
2. What is your mother tongue?
3. How many years did you study Spanish?
4. Can you describe a typical Spanish class you've taken?
5. What did the students do in these classes?
6. Can you tell me how long have you been studying Persian?
7. Where did you learn Persian? Can you compare them? Which one did you like the most?
8. What do you do to learn this language outside of class?
9. Why did you become interested in Persian?
10. Would you like to travel to Iran?
11. Which cities would you like to visit?
12. Who is your favorite Iranian actor?
13. What is your favorite Persian movie?
14. Can you tell me the plot?

In the last question, the interviewer used a Persian vocabulary word *pelan* (plot) that she was reasonably sure neither of the learners knew, to see how they would react or what strategy they would use when they heard a word that they did not know but that was a key word needed to answer the question.

Task 2: A learner-interviewer question task in which learners had to ask the interviewer questions to understand the story depicted in a series of picture prompts. The picture prompts depicting the ‘Naughty girl’ story are shown in appendix A⁵. The interviewer gave these pictures to the learner and said,

"به عکسها نگاه کن و از من سؤال بپرس، من داستانشون رو برات میگم. بعدش من ازت میخوام که داستان رو برام تعریف کنی."

Then she repeated the instructions in English: “Ask me questions about what you see in the picture, and I’ll tell you the story. At the end, I will ask you to tell the story back to me.”

Task 3: A learner-interviewer retell task in which learners had to retell to the narrator the story depicted in the picture prompts in Figure 1. The retell task instructions were given when the learner had finished asking questions for the Task 2; the interviewer said, first in Persian and then in English:

"مرسی، حالا تو داستان رو برای من تعریف کن. میتونی به عکسها نگاه کنی."

“Thank you. Now tell the story back to me. You can look at the pictures.”

Task 4: A learner-interviewer oral narrative task with sequential prompts consisting of four line drawings. Each learner was shown a set of four line drawings. These drawings appear in photocopiable form in many second language acquisition research volumes

⁵ These pictures were drawn for this project by Nora Wildgen White, Minneapolis, Minnesota. They were based on a true story provided by Prof. Richard Young (University of Wisconsin-Madison).

(Tarone, 1989, p. 173; Yule, 1997, p. 68; Tarone & Swierzbin, 2009, p. 163). The interviewer said, first in Persian and then in English:

" این طراحی ها يك سری اتفاقاتی رو نشون میدن. به طراحی نگاه کن و به من بگو چه اتفاقاتی اینجا افتاده."

"This set of drawings shows a series of events. Look at the drawings and tell me what happened here."

Task 5: A learner-learner jigsaw task that required the learners to compare photos of two different houses (Figure 1) that each learner was holding without showing the photos to each other. The two learners sat facing each other. Each learner was given a photograph of a different house. The interviewer said, first in Persian and then in English,

" هر کدوم از شما عکس یه خونه در مینه سوتا داره. لطفاً عکساتونو با هم مقایسه کنین. از هم دیگه سؤال بپرسید یا در موردشون به هم اطلاعات بدین. عکساتونو به هم دیگه نشون ندین. مثلاً میتونین بگین! این خونه چهارتا پنجره داره! یا میتونین بپرسین 'خونه تو توی شهره؟' عکساتونو برای هم شرح بدین و تو اون ها سه تشابه و سه تفاوت پیدا کنین،"

"Each of you has a photograph of a house in Minnesota. Please compare the houses by giving each other information about your photograph or by asking questions. Do not show each other your photos. For example, you could say, 'This house has four windows', or you could ask 'Is your house in a city?' Describe the pictures to each other, and find three things that are the same and three things that are different."

Figure 1: Prompts with photographs of houses in two St. Paul neighborhoods.



Task 6: A learner-learner comparison task in which the two learners sat next to each other looking at the two photos of houses used in the jigsaw task, placed side by side on a table in front of them. The interviewer said, first in Persian and then in English,

"لطفا در مورد اینکه چه کسانی تو این خانه ها زندگی میکنند بحث کنید.
برای مثال، چند نفر تو هر کدام این خانه ها زندگی میکنند؟ مقعیت اجتماعیشون چیه؟
آیا این خانه ها خاص مینه سوتا ست؟ این جور خانه ها به شما در مورد فرهنگ آمریکا چی میگن؟"

"Please talk about who might live in each house. For example, how many people do you think live in each house? What do you think their social class is? Are these typical houses in Minnesota? What do these kinds of houses tell you about American culture?"

The researcher (who is also the writer of this paper) first administered Tasks 1 to 4 to each learner separately. Then both participants interacted with each other to complete the fifth and sixth tasks.

Data Analysis

To answer Research Question 1, I transcribed all the spoken language of Pari and Fereshteh, elicited as they completed Task 1 through Task 6. I identified obligatory contexts for use of the two phonemes, /x/ and /q/. To answer Research Question 2, I recorded the linguistic context for each obligatory context: what phonemes preceded and followed each obligatory context. In addition to the preceding and following vowels and

consonants that accompanied /x/ and /q/, syllable structures and boundaries in the context where /x/ and /q/ occurred were identified.

In each of these contexts thus delineated, I identified the sounds the learners produced. I noted systematic modifications of /q/ and /x/ that were made in each learner's speech, particularly the substitution of the wrong phoneme for each target phoneme. As it was a learner language analysis, I did not simply tabulate errors, but also all accurate productions of /x/ and /q/. Thus, I carried out a Target Language Use (TLU) analysis (Pica, 1983), which counts both the errors and the accurate uses of a form in learner language to identify possible patterns or interlanguage rules. Pica's equation for TLU is the number of correct uses in obligatory context divided by (the number of obligatory contexts) + (the number of incorrect contexts) (Tarone, 2009: 31). Therefore, all instances in which Pari and Fereshteh produced correct and incorrect versions of the target phonemes /x/ and /q/ were identified. The TLU rate of each phoneme in each of the three syllable positions was calculated.

Findings/Results:

The findings produced by this analysis show that while both learners often produced /x/ and /q/ accurately, in some cases, they were also inaccurate, replacing /x/ and /q/ with /k/. Here, the use of English consonant /k/ instead of Persian /x/ or /q/, can be attributed to native language transfer since there is no such sound as /x/ or /q/ in English. In a contrastive analysis of Persian and English phonemes, we predicted that L2 learners of Persian might use the English phoneme to replace voiced fricative /q/ but surprisingly, Pari and Fereshteh only replaced /q/ with voiceless /k/ in both syllable initial and final

position; they almost never used /g/ for /q/ (see p. 47 for the two instances in which they did).

Findings also showed that the learners' accuracy was variably affected by the syllabic context the phonemes occurred in. Below the discussion will first focus on the learners' production of /x/, and later /q/ in a wide range of syllable types, including information on where these syllables occurred in different positions in the word (e.g. first, second or third syllable in the word).

As mentioned above, /x/ can occur in syllable initial and syllable final position. The six tables below (Table 7-11) list all the Persian words where Pari and Fereshteh produced /x/ in syllable initial position (XV, XVC, and XVCC) in obligatory context. The following three tables, 12-14, present all the Persian words where Pari and Fereshteh produced obligatory /x/ in syllable final position both singly (CVX), and in a consonant cluster CVXC. Then six tables (Table 15-20) list all Persian words where Pari and Fereshteh produced /q/ in syllable initial and syllable final position (qV, qVC, CVq, and CVqC).

Voiceless fricative /x/**Voiceless fricative /x/ in syllable initial position****Table 7:** Pari, /x/ in syllable initial position (in open CV syllables)

	First Syllable	Second Syllable	Tokens	English translation
1	<i>/xei.li/</i>		36	Very
2	<i>/xu.be(h)/</i>		4	It's good
3	<i>/xu.bæn/</i>		1	They're good
4	<i>/xu.band/?</i>		1	Are they good?
5	<i>/xæ.rið/</i>		1	Bought
6	<i>/xu.ne(h)/</i>		14	House
7	<i>/xu.ne(h).æm</i>		7	My house
8	<i>/xu.ne(h).æt/</i>		4	Your house
9	<i>/xu.ne(h).ha/</i>		2	Houses
10	<i>/xu.ne.va.deh/</i>		1	family
11		<i>/mi.xa.nim/</i>	1	We study
12		<i>/mi.xa.nænd/</i>	1	They study
13		<i>/mi.xu.næm/</i>	1	I study
14		<i>/mi.xo.rim/</i>	1	We eat
15		<i>/mi.xæ.re(h)/</i>	1	s/he buys
16		<i>/mi.xa.ne(h)/</i>	1	s/he studies
17		<i>/'a.xæ.reʃ/</i>	1	At the end
18		<i>/be.xo.re(h)</i>	1	To eat (s/he)
19		<i>/bo.xo.ri/</i>	1	To eat (you)

Examples presented in Table 7 reveal that Pari pronounced the voiceless fricative /x/ phoneme accurately when it was in initial position in an open CV syllable. Whether /x/ was in the first or the second syllable, and no matter what the preceding vowel was, Pari produced /x/ with 100% accuracy, not replacing it with any other phonemes. Pari produced 19 different words with syllable-initial /x/ (XV) in obligatory context for a total of 77 times. Since she always produced /x/ correctly in syllable initial position, one can

say that none of the following situational and linguistic contexts influenced her pronunciation of syllable initial /x/: the interlocutor (researcher or Fereshteh), task (task design or task sequence), the phonological environment, etc.

As mentioned earlier Pica's equation for TLU equals the number of correct uses in obligatory context divided by (the number of obligatory contexts) + (the number of incorrect contexts). This equation is a quantitative measure that enables us to compare learners in terms of how target-like their use of /x/ and /q/ was. Pari produced 80 tokens that contained /x/ in initial position in an open CV syllable through out the six tasks with 100% accuracy. Therefore her TLU in this context equals 1.

Table 8: Fereshteh, /x/ in syllable initial position (in open CV syllables)

	First Syllable	Second Syllable	Tokens	English
1	/xei.li/		66	Very
2	/xu.be(h)/		1	It's good
3	/xu.be(h)/?		2	How are you
4	/xu.bi/?		1	How are you?
5	/xu.bæn/		2	They are good.
6	/xu,bænd/		1	They are good
7	/xa.ne(h)/		7	House
8	/xu.ne(h)/		24	House
9	/xa.ne(h).ha/		1	Houses
10	/xu.ne.va.deh/		1	Family
11	/xa.ba.lu/		1	Sleepy
12	/xo.da/		4	God
13	/xæ.bcær/		1	What's up?
14		/mi.xu.ne(h)/	1	S/he studies
15		/mi.xu.næm/	4	I study
16		/mi.xæ.ræm/	1	I buy
17		/mi.xo.ri/	1	you eat
18		/mi.xæ.ri.de(h)/	1	s/he was buying

As can be seen in Table 8, Fereshteh like Pari, did not have any problem pronouncing this voiceless fricative /x/ phoneme in open CV syllables. Once more, it can be observed that no matter whether /x/ initiated the first or the second syllable in the word, or what the preceding vowel was, Fereshteh was able to produce /x/ with 100% accuracy and not to replace it with any other phonemes. Fereshteh produced 120 tokens of 18 different words (types) that had /x/ in syllable initial XV in obligatory context.

In most of the verbs where Fereshteh and Pari produced this XV context the /x/ phoneme was preceded by a front high vowel /i/ in the preceding syllable. In Table 8, all the verbs that Fereshteh produced, from #14 to #18, and in Table 7, all the verbs that Pari produced from #11 to #16, *mi-* was used as a prefix that can be added to the stem of the verb to produce present tense. In Table 8, number 14, /*mi.xu.neh*/ for example, “*khandan*” is the infinitive and “*khun*” /*xun*/ is the stem of the verb. *mi-* is the first syllable, *-xu-* is one syllable, and *-neh* is the last syllable. When the first syllable in these words ended with a vowel and /x/ initiated the second syllable, followed by another vowel, learners pronounced /x/ with no difficulty.

Fereshteh’s TLU in this context equals 1. She produced 120 tokens that contained /x/ in XV obligatory context with 100% accuracy. It appears that English L1 learners find that mastering pronunciation of the phoneme /x/ in syllable initial position XV in Persian L2 is not very challenging.

Table 9: Pari, /x/ in syllable initial position (in closed XVC syllables)

	First Syllable	Second Syllable/	Tokens	English translation
1	/xub/		14	Good
2	/xob/		34	Well, OK
3	/xun.dæm/		4	I studied
4	/xun.dim/		2	We studied
5	/xun.deh/		1	S/he studied
6	/xof.tip/		1	Handsome
7	/xof.ha.le(h)/		1	S/he is happy
8		/mi.xam/	2	I want
9		/ne.mi.xam/	1	I don't want
10		/bo.xor/	1	Eat (imperative)

Table 9 shows closed CVC syllables that /x/ happens to initiate. Pari produced 47 tokens of /x/ with 100% accuracy in 10 diverse words (types) including, verbs, nouns, compound nouns and phrases.

Table 10: Fereshteh, /x/ in syllable initial position (in closed XVC syllables)

	First Syllable	Second Syllable	Tokens	English translation
1	/xub/		7	Good
2	/xob/		3	Well, OK
3	/xof.ha.le(h)/		1	S/he is happy
4	/xof.ha.le(h)?		1	Is s/he happy?
5	/xor.di/		1	You ate
6	/xor.dæm/		2	I ate
7	/xun.de(h)?		2	What did she study?
8		/næ.xor.dæm/	3	I did not eat
9		/mi.xam/	2	I want
10		/a.xey/	1	You poor thing

Fereshteh produced 47 tokens of /x/ in XVC closed syllable context with 100% accuracy in 10 diverse words (types) including, verbs in negative and questions, nouns,

compound nouns and phrases. As can be seen in Table 10, her pronunciation was not affected by whether the XVC syllable occurred in first or second position in the word.

In XVC context, initial position, Pari and Fereshteh produced 61 and 23 tokens respectively that contained /x/ with 100% accuracy. Therefore, the TLU in this obligatory context is equal to 1. The data presented in Table 9 and 10 shows that when /x/ happens in syllable initial, both learners can produce it accurately, no matter if it is an open or closed syllable.

Table 11: Pari and Fereshteh, syllable initial /x/ (in closed XVCC syllables)

	Persian Word	Tokens	English translation
Pari	<i>/xord/ as in /keyk xord/</i>	5	S/he ate She ate the cake
Fereshteh	<i>/xord/ as in /bætʒeh ziad keyk xord/</i>	1	S/he ate The kid ate a lot of cake

Table 11 shows the pronunciation of /x/ when it initiated a closed syllable with a final consonant cluster. Neither Pari nor Fereshteh had difficulty pronouncing /x/ when it initiated such syllables. */xord/* is a past tense verb that means, “ate”. Pari produced this word 5 times, always correctly, during the Question and the Retell Task while she was talking about the little girl who ate the birthday cake, and Fereshteh produced this verb once, correctly. In XVCC obligatory context in initial position, Pari and Fereshteh produced /x/ in 5 and 1 tokens respectively with 100% accuracy and their TLU equals 1.

Voiceless fricative /x/ in syllable-final position**Table 12:** Pari, /x/ in syllable final position (CVX syllables)

	First Syllable	Second Syllable	Tokens	English translation
1	<i>/mox.tæ.lef/</i>		4	Different
2	<i>/mox.tæ.le.fe/</i>		1	It's different
3	<i>/sax.te.man/</i>		1	Building
4	<i>/dox.tær/</i>		14	Girl
5	<i>/dox.tæ.ræf/</i>		3	Her daughter
6	<i>/dox.tæ.ræm/</i>		1	My daughter
7	<i>/dox.tæ.ran/</i>		2	Girls
8		<i>/bæd.bæx.ta.neh/</i>	2	Unfortunately
9		<i>/be.bæx.fid/</i>	5	Sorry
10		<i>*/be.bæk.fid/</i>	4	Sorry

Table 12 shows that for /x/ in syllable-final position, or CVX context, Pari had a little more difficulty. She produced 10 different words containing such syllables; these included verbs, nouns in both singular and plural forms, compound nouns, and adverbs, in which CVX occurred in both the first and second syllables in the word. Pari's pronunciation was 100% accurate when /x/ was at the end of the one syllable and the next syllable began with a voiceless stop /t/ as in examples 1 to 8, Notice that /x/ and /t/ do not form a consonant cluster internal to the syllable; there is a preceding vowel that the final C /x/ attaches to, and a following vowel that the initial C /t/ attaches to. Notice also that both phonemes in question, /x/ and /t/, are voiceless.

Pari had more difficulty when syllable-final /x/ was followed by syllable-initial voiceless /f/. In examples 9 and 10 */be.bæx.fid/* and **/be.bæk.fid/* represent two ways that Pari produced the word that means "sorry", which has three syllables: *be.bæx.fid*. The C /x/ follows a vowel at the end of the second syllable and precedes a voiceless fricative /f/

that begins the third syllable. In producing this word Pari correctly produced /x/ 5 times, but incorrectly substituted /k/ 4 times, producing **/bebækfid/*. Her variable performance shows that she knew the right way to say this word, but sometimes transferred English /k/ to replace it. In other words, the place and manner of articulation of the initial consonant in the next syllable appeared to variably affect her pronunciation of the phoneme /x/. Pari produced 37 tokens that contained syllable final /x/ in CVX obligatory context. She had 4 errors out of 37 tokens, with a TLU of $33/(37+4) = 0.8$.

Table 13: Fereshteh, /x/ in syllable final position (CVX syllables)

	First Syllable	Second Syllable	Tokens	English translation
1	/sæx.te(h)/		1	It's difficult
2	/dox.tæx/		10	Girl
3	<i>*/dok.tæx/</i>		7	Girl
4		/be.bæx.fid/	1	Sorry
5		<i>*/be.bæk.fid/</i>	9	Sorry

Like Pari, Fereshteh's pronunciation of the /x/ phoneme in final position in CVX context was less accurate than her pronunciation of the same phoneme in syllable initial position. Across all 6 tasks she produced 28 tokens of 5 words in which CVX occurred in either the first and second syllable. When voiceless /x/ ended the first syllable and preceded a voiceless stop /t/ initiating the next syllable, as in example 2, /dox.tæx/ "the girl", Fereshteh pronounced /x/ with only 59% accuracy. She was accurate 10 times, and inaccurate 7 times, replacing the target phoneme with /k/ and producing **/dok.tæx/* (example 3). In this particular example, this error could be a case of phonological transfer from English. Again, like Pari, when syllable-final /x/ occurred before a syllable-initial /ʃ/, as in **/bebæxʃid/*, her accuracy rate fell, for Fereshteh, to 11%. She produced

final /x/ correctly before /f/ only once (in example 4) in 9 attempts. In the eight inaccurate productions she replaced /x/ with voiceless stop /k/ and produced */bebækfid/.

Fereshteh's production of /x/ in syllable-final position was variably affected by the place and manner of articulation of the adjacent consonant in the following syllable. Fereshteh produced 28 tokens in total in this context in which she made 16 errors, for a TLU of:

$$12/(28+16) = 0.27.$$

Voiceless fricative /x/ in a syllable-final consonant cluster

Table 14: Pari and Fereshteh, /x/ in syllable final consonant clusters (CVXC syllables)

	Second Syllable	Tokens	English translation
Fereshteh	/de.ræxt/	1	Tree
Fereshteh	*/de.rækt/	2	Tree
Pari	/de.ræxt/	1	Tree
Pari	*/de.rækt/	1	Tree

The learners only produced one word in which /x/ occurred in a syllable final consonant cluster: /deræxt/, meaning “tree.” In the word /deræxt/, two voiceless consonants /x/ and /t/ form a consonant cluster at the end of the second syllable, in which position both Pari and Fereshteh had difficulty pronouncing /x/. Although Fereshteh produced just 3 tokens of this word, and Pari produced 2, Table 13 shows that both of them produced /x/ variably. It is interesting to see how this variability was manifested in the context of their discourse. All 5 tokens occurred during just two conversational turns in the Jigsaw Task:

Excerpt 1: Jigsaw Task

- 18 F ...*xuneh--ye mæn*, *kenar* *do* **derækt daræm*, **derækt dari?*
 ... my house, beside two I have tree Do you have a tree?
 (I have two trees beside my house. Do you have a tree? Do you have a tree?)
- 19 F *deræxt dari?*
 (Do you have a tree?)
- 20 P *areh, um*, *xuneh--æm* *do ta* **derækt dareh*, *deræxt dareh. xob.*
 Yes, um, my house two tree has tree has. OK.
 (Yes, um, my house has two trees, has two trees. OK.)

As can be seen in line 18, in trying to produce the word /*deræxt*/ “tree” Fereshteh at first replaced /x/ with /k/ and said /*derækt*/ twice, but then corrected herself in line 19 and said /*deræxt*/ with stress on /*ræxt*/, presumably to demonstrate that she knew the correct pronunciation. In other words, her production of /x/ in this context was variable because she was self-correcting an initial incorrect pronunciation. In the next turn, in line 20 Pari follows the same pattern, first erroneously replacing /x/ with /k/ and then pronouncing the word correctly with extra emphasis on /*ræxt*/ -- at which point, both participants laughed. Their laughter presumably indicates their amusement at their shared difficulty with the pronunciation of /x/ in this word. The TLU for Pari and Fereshteh’s pronunciation of /x/ in this syllable final consonant cluster is 1 for Pari (1/(1+0)) and 0.2 for Fereshteh (1/(3+2)).

Voiced fricative /q/**Voiced fricative /q/ in syllable-initial position****Table 15:** Pari, /q/ syllable-initial position (in open CV syllables)

	First Syllable	Second Syllable/	Tokens	English translation
1	<i>/qæ.za/</i>		2	Food
2	<i>/qæ.fæn.ge(h)/</i>		1	Beautiful, pretty
3		<i>/mæ.qa.zeh/</i>	3	Store
4		<i>*/mæ.ka.zeh/</i>	2	Store
5		<i>/ʔæ.la.qeh/</i>	2	Interest
6		<i>/tæ.bæ.qeh/</i>	1	Floor

The voiced fricative /q/ in syllable-initial position in open CV syllables was more challenging for Pari than /x/ in the same position. In total, Pari produced 11 tokens of 6 words that contained /q/ in qV in initial position across all tasks. As it can be seen in Examples 1, 2, 5 and 6, when /q/ initiated the first syllable or the last syllable, Pari produced /q/ accurately. I might add a note about examples 5 and 6 where the last syllable in both words is */qeh/*. In Persian, final [h] can be silent or consonantal (not silent). The silent /h/ is simply an orthographic feature and it is used for the specific writing system, which represents a terminal [-e] sound as in the words */batfe/* “child”, or */baq.tfe/* “garden”. However, after long vowels final [h] is a consonantal /h/ that is not silent, and is pronounced strongly as in */fah/* *king*. However, in these two examples /h/ should remain silent, and in this case it seems that Pari was able to easily pronounce /q/ in this qV syllable. In examples 3 and 4, syllable-initial /q/ occurs in the middle syllable of a three syllable word: */mæ.qa.zeh/* or **/mæ.ka.zeh/* which means “store” or “market” in English. Pari produced this word in a story about an old lady at the food market, where her main focus was on fluency and not accuracy. In this task she said **/mæ.ka.zeh/* twice

at the very beginning of her story replacing the voiced fricative /q/ with voiceless stop /k/.

At the end of the story she said the same word with an accurate /q/ phoneme:

/mæ.qa.zeh/. One possible cause of this error is native language transfer at the phonological level, replacing /q/ with /k/. Another possible cause is lexical transfer from English, which has an equivalent word ‘market’, produced with a /k/ rather than a /q/ beginning the second syllable. It is also possible that there was a practice effect, where she was better able to monitor and self-correct this word at the end of the story than at the beginning.

Table 16: Fereshteh, /q/ in syllable initial position (in open CV syllables)

	First Syllable	Second Syllable/	Tokens	English translation
1	<i>*/xæ.fæn.ge(h)/</i>		2	It’s beautiful
2		<i>/'a.qa/</i>	1	Man
3		<i>/fo.lu.qe(h)/ as in</i>	1	Crowded, busy

Fereshteh only produced 4 tokens of three words that contained syllable-initial /q/ in qV syllables. Initial /q/ was pronounced accurately in two words: */'a.qa/* “man” in Question Task line 79: *so, xob, 'aqa be polis zæng mizæneh?* (“so, OK, is the man calling the police?”) and */fo.lu.qe(h)/* “busy”, in Comparison Task line 40 *særef foluqeh*. Table 16 shows that */'a.qa/* has two syllables with /q/ initiating the second syllable, qV. The /q/ in */fo.lu.qe(h)/* initiates the third syllable which is a qV because [h] is silent. Like Pari, Fereshteh did not have any problem pronouncing /q/ in this context. The TLU of /q/ phonemes in initial position in qV obligatory context for Pari was $9/(11+2) = 0.7$; and for Fereshteh $2/(4+2) = 0.3$.

Table 17: Pari, /q/ syllable-initial (in closed qVC syllables)

	Persian Word	Syllable	Tokens	English translation
1	*/kæm.gi.ne(h)/	First	1	Is sad
2	/fæ.qæt/	Second syllable	3	Just
3	*/fæ.kæt/	Second syllable	2	Just
4	/af.qal/	Second syllable	1	Garbage, waste
5	/o.ta.qeʃ/	Third syllable	3	Her room
6	/o.ta.qet/	Third syllable	1	Your room
7	/tæ.bæ.qeh/	Third syllable	4	Floor
8	*/mo.la.kat/	Third syllable	1	Meet
9	/mo.va.fe.qæm/	Fourth syllable	1	I agree
10	*/mo.va.fe.kæm/	Fourth syllable	1	I agree

The voiced fricative /q/ sometimes was the initial C in a closed CVC syllable. As we see in Table 17, Pari produced only one word with a qVC syllable in first position in the word: /qæm.gi.ne(h)/ “she is sad.” In this word, she replaced /q/ with /k/, */kæm.gi.ne(h)/. All the other words that Pari produced containing qVC syllables had these in second, third, or fourth syllable position in the word. In second syllable position, she has 5 tokens of /fæ.qæt/ “just,” with two syllables and /q/ in initial position of the second syllable, followed by /æ/ and a final /t/. Pari’s production of the /q/ phoneme in this word was 60% accurate, with accurate /q/ three times and inaccurate /k/ two times. Pari had just one other word with qVC in second position in the word, /af.qal/ “garbage”, where she produced /q/ correctly. Pari produced four words with qVC in third syllable position in the word: /o.ta.qeʃ/ “her room”, /tæ.bæ.qeh/ “floor”, and /o.ta.qet/ “your room”. By comparing these two words */fæ.kæt/ and /o.ta.qet/ one can observe that they both contain a syllable /qVt/ -- almost the same syllabic context. Why does she produce the /q/ phoneme correctly in the one word and incorrectly in the other? There are two differences between these words: whether the syllable occurs in second or third position

in the word, and the vowel that follows /q/: /æ/ or /e/. /æ/ is a tense vowel and /e/ is a lax vowel. Either aspect of linguistic context could play a role in influencing Pari's production of the correct /q/ variant as opposed to incorrect /k/. We do not have enough examples of this context to decide. The fourth word with qVC in third syllable position is */mo.la.kat/ where Pari replaced /q/ with /k/.

In words where qVC occurred as the fourth syllable in the word, Pari said the word /mo.va.fe.qæm/ "I agree" once accurately and once inaccurately, replacing /q/ with /k/ to produce */mo.va.fe.kæm/. She used this word during the Comparison Task when she and Fereshteh were comparing the two houses. It is hard to interpret any pattern in the impact of these different linguistic contexts on Pari's production of /q/ to initiate CVC syllables. To sum up, Pari produced 18 tokens that contained /q/ in qVC context from which she had 5 pronunciation errors, for a TLU of $13/(18+5) = 0.6$.

Table 18: Fereshteh, /q/ in syllable-initial position (in closed qVC syllables)

	Persian Word	Syllable	Tokens	English translation
1	*/ges.mæt/ as in /gesmæt nemidunæm/	First syllable	1	Section, part, plot (I don't understand what "gesmæt" means)
2	*/gæm.gin/	First syllable	1	Sad
3	*/gæm.gi.ne(h)/	First syllable	1	Is sad
4	/fæ.qæt/	Second syllable	6	Just
5	/tæ.bæ.qeh/	Third syllable	1	Floor
6	*/mo.la.kat/	Third syllable	1	Meet
7	*/qor.beh/	First syllable	2	cat

In using /q/ to initiate closed CVC syllables, Fereshteh did not have any problem with the following words: /fæ.qæt/ "just" (6 times), and /tæ.bæ.qeh/ "floor" (one time).

Although Fereshteh's proficiency was lower than Pari's, she uttered the word /fæ.qæt/

“just” accurately 6 times, whereas Pari replaced /q/ with /k/ while uttering the same word. The following two words **/gesmæt/* “section, plot,” and **/gæm.gin/* “sad” (2 times) provide the only instances where one of our learners, Fereshteh, replaced /q/ with /g/ as the contrastive analysis of Persian and English predicted. In **/mo.la.kat/* Fereshteh replaced the /q/ with /k/ just as Pari did in example 7 Table 17. The next example is an interesting case; in Persian the word */gorbeh/* means “cat” and it has two syllables */gor.beh/*. It is very interesting to see that in example 6, Fereshteh replaced the voiced stop /g/ with /q/ once during the Question Task and later in the Retell Task for the second time. She produced **/qor.beh/* instead of */gorbeh/*. This interesting error shows how learners may overgeneralize their target language phonological features, using a target language phoneme where it is not correct to do so. This is not a transfer from L1 to L2, but a transfer of one interlanguage feature to another interlanguage feature. Overall, Fereshteh produced 13 tokens of /q/ in qVC syllables, of which 3 were incorrect; the TLU in this case is $10/(13+3) = 0.6$.

/q/ syllable-initial position in closed syllables with final consonant clusters (qVCC syllables)

Neither Pari nor Fereshteh produced any words with /q/ in initial position in CVCC syllables.

Table 19: Pari, /q/ in syllable final position (in closed CVC syllables)

	First Syllable	Second Syllable	Tokens	English translation
1	/tæq.ri.bæ̃n/		2	Almost
2	*/væk.ti/		8	When
3	*/tæk.sir/		7	Fault
4	/baq.tʃeh/		1	Garden
5		*/o.tak/	1	Room
6	/tæ.laq/		2	Divorce

When /q/ is required as the final C in a closed CVC syllable, the data presented in Table 19 show that Pari had difficulty pronouncing it. Nonetheless, She was able to produce /q/ in such syllables accurately some of the time, as in /tæq.ri.bæ̃n/ “almost” example 1, /baq.tʃeh/ “garden” example 4, and /tæ.laq/ “divorce” example 6. In the first example, syllable-final /q/ is followed by voiced trill /r/ that initiates the next syllable; in example 4, syllable-final /q/ is followed by a syllable-initial voiceless affricate /tʃ/; and in example 6 syllable-final /q/ is the last consonant of a two-syllable word.

However, Pari also had difficulty producing syllable-final /q/ accurately in syllabic contexts where the next syllable began with a voiceless plosive /t/ or with a fricative /s/, and where it was the last consonant of a two-syllable word. (In the last context, she produced /q/ accurately once, and inaccurately once.) Pari produced two tokens of */væk.ti/ “when” during the interview and six tokens during the Retell Task. She replaced the voiced fricative /q/ with a voiceless plosive /k/ as in /væk/ instead of /væq/ when /q/

was followed by voiceless plosive /t/. This regressive assimilation of voicelessness is seen when sound segments assimilate, or adopt a feature of a following sound (here, adopting the features of voicelessness and stop from the following /t/); the process makes the pronunciation of a word easier for L2 learners. Throughout the Retell Task, as Pari was telling the story back to the researcher she produced 7 tokens of */tæk.sir/ “fault”, (example 3) as in */tæk.si.re mæn nist/ “it’s not my fault,” */tæk.si.re gorbæst/ “it’s the cat’s fault”. In these tokens, Pari replaced the voiced fricative /q/ with /k/, in a context where it was followed by a voiceless fricative /s/. She never used this word accurately. Her word */tæk.sir/ cannot be entirely explained in terms of regressive assimilation; the feature of voicelessness does seem to be assimilated from the following /s/, but where does the stop feature of this /k/ come from? Both /q/ and /s/ are fricatives. Finally, in example 5, */o.tak/ “room”, Pari replaced syllable-final /q/ with /k/ in CVq when this syllable occurred at the end of a word that was not followed by a syllable-initial C. In all, Pari produced 21 tokens of this syllable type, in which 16 tokens of /q/ were incorrect, with a TLU of $5/(21+16) = 0.13$. This low TLU demonstrates how challenging it was for Pari to produce syllable-final /q/ in CVq context. Fereshteh did not produce any words containing CVq.

Voiced fricative /q/ in syllable-final consonant clusters

Table 20: Pari, /q/ in syllable-final position (CVqC syllables)

	First Syllable	Tokens	English translation
1	/væqt/ as in /hit/væqt hærf nemizænim/	1	Time (We never talk to each other)

Fereshteh did not produce any words containing /q/ in a final consonant cluster (CVqC), and Pari produced just one such word: /væqt/ (time), during the interview when she told the researcher that her classmates and Pari never talk to each other “*hitʃ væqt hærf nemizænim.*” It is very interesting to see that Pari was able to pronounce this consonant combination accurately when /q/ and /t/ occurred in a final consonant cluster within a single syllable, but did not produce the same combination of consonants accurately when they occurred across a syllable boundary, in two separate syllables in */væk.ti/ as was mentioned earlier in example 2 in Table 19. Because Pari produced just one token of /q/ used in a final consonant cluster, and that one token was correct; the TLU is 1.

Discussion

A contrastive analysis of Persian and English phonology predicted that Pari and Fereshteh would have a difficult time producing the voiceless and voiced velar fricatives, /x/ and /q/ because neither /x/ and /q/ is part of the English phonemic inventory. The CA predicted the likely transfer of the English voiceless and voiced velar stop consonants /k/ and /g/ to replace the missing voiceless and voiced velar fricatives.

The data offered in this paper in response to Research Question 1 provide support for the prediction that the two learners would have difficulty pronouncing the voiceless and voiced fricatives /x/ and /q/ but their difficulty did not materialize exactly in the way we predicted. We predicted that there would be likely transfer of the English voiceless and voiced velar stop consonants /k/ and /g/ to replace the missing voiceless and voiced velar fricatives. The data show that both Pari and Fereshteh replaced the voiceless

fricative /x/ with English voiceless velar stop /k/ as we predicted. However, both participants tended to replace /q/ with English voiceless /k/. Pari never replaced the voiced fricative /q/ with English voiced /g/ and Fereshteh replaced /q/ with /g/ only in two words */gesmæt/ “section, plot,” */gæm.gin/ “sad”. This is a very interesting pattern of NL transfer that differs from what we predicted. More empirical research is needed to investigate and inspect whether, and why, such English speakers may perceive the Persian voiced fricative /q/ as voiceless, resulting in their preference for the voiceless stop /k/ as an equivalent. Is there aspiration in /q/ production by native speakers? Or are there some other phonetic features of /q/ that cause English L1 learners to perceive it as voiceless?

To answer Research Question 2 we examined data showing that the position of /x/ and /q/ within the structure of Persian syllables appeared to affect whether the two learners produced those sounds accurately, or transferred other NL phonemes to take their place. The accuracy level and the phonemes substituted for the Persian target consonants varied in different contexts, as predicted by variationist SLA theory (e.g. Tarone, 1988; Major, 2001; Bayley & Tarone, 2012)

Although I studied whether their occurrence in an open or closed syllable would affect the pronunciation of /x/ and /q/ phonemes, the results suggest that this was not an important factor. However, occurrence of /x/ and /q/ in syllable initial or syllable final position did affect the learners’ pronunciation of these two phonemes. Overall, both learners were most accurate when producing /x/ in syllable-initial position, whether that syllable was open or closed. Both Pari and Fereshteh produced /x/ with 100% accuracy (TLU rate – 1) in syllable-initial position in CV, CVC, and CVCC syllables while they

were communicating either with the researcher or each other. It appears that mastering the voiceless velar fricative /x/ in syllable-initial position before a vowel is not challenging for English-speaking learners of Persian. In comparison, the accuracy rate was much lower for initial /q/ in the same types of syllables; we saw that Pari & Fereshteh's TLU rates for syllable-initial /q/ in CV syllables was .7 and .3, and it was .6 for syllable-initial /q/ in CVC syllables.

Neither Pari nor Fereshteh were able to produce /x/ as accurately when it occurred in final position in CVC, or CVCC syllables. Syllable-final /x/ was always, for both learners, followed by a syllable-initial voiceless fricative /f/ or /t/. In such contexts, both learners sometimes produced /x/ correctly, but sometimes variably replaced /x/ with voiceless stop /k/. An example is **/bebækfid/* instead of */bebæxfid/* yet each learner also produced */bebæxfid/* accurately at least once. In other words, their production of syllable-final /x/ in these contexts was variable; the place and manner of articulation of the following consonant in the next syllable appears to have affected the pronunciation of the phoneme /x/.

The voiced velar fricative /q/ phoneme was much more challenging for both learners than the voiceless velar fricative /x/. This is not surprising, given its highly variable status in Persian phonology (Windfuhr, 1979). Whether it was followed by a vowel or a consonant, or was in initial or a final syllable position, /q/ seemed to be more difficult than /x/. It was particularly difficult when it was followed by a voiceless alveolar like /t/ or /s/, or when it occurred at the end of the word. We noted above that most of the time, Pari and Fereshteh replaced the voiced velar fricative /q/ with the voiceless velar stop /k/, which was also most frequently used to replace /x/, the voiceless velar fricative.

In certain syllable positions, other phonemes replaced /q/. Fereshteh replaced /q/ with /x/ in syllable-initial position in an open syllable, saying twice **/xæfæŋgeh/* “is beautiful” instead of */qæfæŋgeh/*. This could be viewed as transfer of one interlanguage feature to another; it could also be called overgeneralization. Either way, she never pronounced syllable-final /q/ accurately. In a very interesting instance, we saw that she replaced syllable-initial /g/ in */gorbeh/* “cat”, with /q/ producing **/qorbeh/* in a close CVC syllable. This variability is an outstanding feature of this data that supports cognitive processes outlined in Selinker’s “Interlanguage” paper (1972).

Surprisingly, in a final consonant cluster (CVqC), Pari was able to produce one word: */væqt/* (time) even though a CA predicted that CVqC might be very difficult for English-speaking learners of Persian. It is not very clear how Pari was able to pronounce this word accurately. Maybe it was an accident, since she produced it only once, or maybe she had used this word very often before. We need more research to be able to answer such questions.

Side Observations

Persian *khob* */xob/* is one of the 100 most commonly used Persian words; it is a one syllable word which means “OK” in English. After analyzing the data I noticed variation in Fereshteh’s pronunciation of this word. She dropped the syllable-final bilabial voiced stop /b/ from */xob/* and said */xo/* eleven times through out the study, pronouncing the /o/ vowel as a long vowel /o:/. However, she did not drop the final /b/ phoneme in another 5 instances. Such final consonant deletion is similar to what native speakers of Persian do in deleting the final consonant in a consonant cluster to simplify the cluster. It is also similar to what native speakers of Persian do when they do not

pronounce final consonants strongly. Interestingly, in Old Persian there was also a tendency to drop final consonants (*Universal Cyclopedia and Atlas*, Volume 9, p. 224). It is possible that in this context, which was not a consonant cluster, Fereshteh just dropped the last consonant in imitation of Persian native speaker patterns to sound more proficient.

Implications and Future Research

There is a need for more empirical second-language acquisition studies to test predictions of likely learner language patterns for English-speaking adult learners of Persian L2 such as those made in CA, or in child bilingual studies. Such studies are needed to help prepare teachers of Persian to better predict and resolve difficulties their English-speaking students may have in learning Persian L2. Enrollment in Persian programs in the U.S. almost doubled between 2002 and 2009 according to the MLA report (2009) of *Enrollments in languages other than English in the United States Institutions of Higher Education*. Given this increased interest among American students in learning Persian, I believe that pronunciation of this language merits more attention in Persian curriculum design and teacher training programs. This study has focused on just two Persian phonemes in SLA, but there are many more aspects of English-Persian interlanguage phonology to explore. For example, a valuable next step for the study of Persian interlanguage phonology could be a quantitative analysis of the acquisition of Persian phonemes that do not have an equivalent or near equivalent in English, such as /x/ and /q/, over a longer period of time. Such a longitudinal study can provide valuable insights into the mechanisms involved in the development of the interlanguage system.

Teaching Suggestions

Teachers of the Persian language can benefit from these findings in teaching the pronunciation of /x/ and /q/ in their classrooms. These findings are valuable since they can be used as a guideline or a road map to indicate where to start, how to start, and in what order the phonemes /x/ and /q/ should be taught to English-speaking learners of Persian.

The best way is to start with /x/ and /q/ phonemes in initial position in CV, CVC, and CVCC syllables and only later move on to their occurrence in syllable final position in CVC, or CVCC syllables. It would be better to start with /x/ in syllable-final position first and introduce syllable-final /q/ later. Syllable-final /x/ and /q/ were consistently challenging for both learners, particularly when it was followed by a syllable-initial voiceless fricative /f/, /t/, or /s/. Therefore, one can conclude that learners need more scaffolding in these contexts. Teaching these phonemes in order moving from easier to harder contexts as outlined below can provide more time and opportunity for learners to practice and master the pronunciation of /x/ and /q/ phonemes: first in initial position, in both open and closed syllables, and then gradually expanding to harder phonological contexts (in syllable-final position).

Diagnostic materials that are informed by research are needed to evaluate students' pronunciation at the very beginning of each class to help teachers design appropriate tasks based on their students' needs. For less advanced and beginning learners, these problematic sounds can first be described using a combination of visual supports, drawings, and word and sentence drills. Although consonant sounds can be presented individually, they are often taught in contrast with other consonants. For

example, based on the current research study, teachers can choose to teach /x/ and /q/ in contrast with /k/. Students need practice in distinguishing the sound contrast between /x/, /q/, and /k/. Based on the findings of this study, the best way to teach these voiced fricative /x/ and /q/ phonemes is to start with their occurrence in initial position in CV, CVC syllables, and later move on to the more challenging contexts. It is probably also a good idea to start with /x/, and leave /q/ for a little later. As a teacher, based on the findings, I would teach /x/ and /q/ phonemes in the following sequence, beginning first with perception and then moving to production:

1. /x/ phoneme in initial position in CV, CVC, and CVCC syllables
2. /x/ v.s. /k/ in initial position
3. /q/ phoneme in initial position in CV, CVC, and CVCC syllables
4. /q/ v.s. /k/ in initial position
5. /x/ phoneme in final position in CVC, or CVCC syllables
6. /x/ v.s. /k/ in final position
7. /q/ phoneme in final position in CVC, or CVCC syllables
8. /q/ v.s. /k/ in final position

Contextualized discrimination exercises with minimal pairs can work well as a diagnostic tool as well as in listening-speaking activities. I would teach /x/ and /q/ in conjunction with /k/ and not in conjunction with /g/ since /g/ was not a factor in our findings. As this study has shown it is possible that there are features of /q/ that lead the learners to think it is voiceless; this could be aspiration or some other factor, but learners need to be able to distinguish between /x/ and /q/ and /k/. Learners need to perceive these

phonemes accurately in order to produce them accurately. Therefore teachers can start with a perception task.

In moving later to production of these phonemes, controlled or guided practice tasks with feedback can provide an easy-to-use and effective way of practicing the /x/ versus /k/ and /q/ versus /k/ distinction, even with beginning-level students. A clear articulation of consonants is very important.

In either perception or production communicative practice, lists of minimal pairs can be used in this context. As can be seen in the following minimal pair lists in Table 21 and 22, the substitution of /k/ for /x/ and /q/ totally changes the meaning of the words:

Table 21: Minimal Pairs: /x/ and /k/

<i>/xær/</i> donkey	<i>/kær/</i> deaf
<i>/xar/</i> torn	<i>/kar/</i> work/ job
<i>/xol/</i> crazy	<i>/kol/</i> total
<i>/xæm/</i> bend, curve	<i>/kæm/</i> a little
<i>/xun/</i> blood	<i>/kun/</i> butt
<i>/xi.se/</i> it's wet	<i>/ki.se/</i> bag
<i>/xæn.de/</i> laughter	<i>/kæn.de/</i> torn up

Table 22: Minimal Pairs: /q/ and /k/

<i>/qar/</i> cave	<i>/kar/</i> work/ job
<i>/qul/</i> giant	<i>/kul/</i> shoulder
<i>/qol/</i>	<i>/kol/</i> total
<i>/qæm/</i> sorrow	<i>/kæm/</i> a little
<i>/qænd/</i> sugar cube	<i>/kænd/</i> picked

The first set of minimal pairs contains /x/ and /q/ in syllable initial position because they are easier to produce in this position. Later, as in Table 23, one can create similar minimal pair activities with the target phonemes in syllable final position and then in syllable final consonant cluster position.

Table 23: Minimal Pairs: /q/, /x/, and /k/ in syllable final position

<i>/tæq.sir/</i> fault	<i>/tæk.sir/</i> proliferation
<i>/tox.meh/</i> seeds	<i>/tok.meh/</i> button
<i>/es.teq.bal/</i> welcome	<i>/es.tek.bar/</i> arrogance

Later, using the minimal pairs, as in Table 24, the distinction between voiceless /x/ and voiced /q/ can be made.

Table 24: Minimal Pairs: /q/ vs /x/ in syllable final position

<i>/tæq.rib/</i> approximation	<i>/tæx.rib/</i> destruction
<i>/væqt/</i> time	<i>/raxt/</i> cloths

There are many ways that one can use these minimal pair lists in teaching /x/ and /q/; however, the most effective way would be to start with the teacher pronouncing some words with /x/ and /q/ and having students decide whether they heard /x/, /q/ or /k/. For example:

Perception Task

Table 25: Listening discrimination exercise with minimal-pair sentences

Task: Circle the word you hear.

1. Sara ye *qæm/ kæm* pool dareh?

(Sara has a sad/little money)

2. *Amir **xar/ kar** peyda kærdeh.*
(Amir has found a torn/job)
3. *dastante **khændeh/kændeh** dari bud.*
(It was a funny/torn up story.)

If learners can hear these phonemes and differentiate between /x/, /q/ and /k/, then they will be ready to try to produce them. As stated above, the results of this study show that it is better to start with open syllables. Then maybe the teacher might move to nonce words, sing songs and do rhythmic practices with syllables (e.g., /xar/, /kar/; /xar/, /qar/). This type of listening discrimination practice can be followed by a controlled production exercise in which students can produce these minimal pairs together and monitor each other's production.

Production Tasks

Students can record their voice as a speaking activity reading the words presented in Table 21 and 22 to do a self- or peer-evaluation. Still later students should be able to put these words in sentence frames, and ultimately take the final step: the goal of these activities is to prepare students for unrehearsed oral communications.

Jigsaw activities, information gap tasks, are an excellent way to integrate the oral skills, as learners ask and answer questions in pairs to exchange information with each other to complete the task. In the following example, there are four similar and two different objects on Student A and B's handouts (see Appendix B for Jigsaw task handouts). The teacher can have the students ask and answer questions to find the four similar and two different objects they have in their handouts. All the objects in these two sheets starts with /q/ or /x/. Here is the list of words referring to objects in Student A's

handout: 1. /qomqomeh/ “water bottle”, 2. /quri/ “tea pot”, 3. /xorma/ “dates”, 4. /qelyun/ “hookah”, 5. /xormalu/ “persimmon”, and 6. /xaneh/ “house”. And on Student B’s handout one can find: 1. /qomqomeh/ “water bottle”, 2. /quri/ “tea pot”, 3. /xiar/ “cucumber”, 4. /qelyun/ “hookah”, 5. /xormalu/ “persimmon”, and 6. /qælb/ “heart”.

After giving the instructions, teacher can model the activity first, and then have students work in their pairs. For example, they might say:

Student A: *mæn ye qomqomeh to aksæm daram, to hæm qomqome dari?*

“I have a water bottle in my picture, do you have a water bottle?”

Student B: *bæleh, mæn ham qomqomeh daram. mæn ye qælb daram, to chetor?*

“Yes, I have a water bottle too. I have a heart, how about you?”

While students are doing the activity, teacher can walk around the room and monitor students’ production of /x/ and /q/ phonemes to provide feedback later when debriefing the activity.

Conclusion

In summary, this study was a descriptive analysis of two phonemes, a voiced velar fricative /q/ and a voiceless velar fricative /x/, in the learner language produced in unrehearsed oral interaction by two adult English-speaking learners of Persian L2. The major concern of this study has been to investigate the learners’ production of these two phonemes in their acquisition of Persian. Since these two consonants do not exist in the English phonemic inventory we predicted that American learners of Persian might encounter difficulties producing these two fricative phonemes. The general approach to analysis used in the present study was a combination of CA, EA, and learner language analysis. The primary focus of the study was to identify and predict possible instances of

transfer from English L1 to Persian L2, and to see whether those predicted errors or patterns in fact occurred.

The analysis of findings revealed that the absent phonemes in the English phonemic system did cause difficulties for English-speaking learners of Persian. Possibly due to its conditioned variation in Persian (Windfuhr 1979), the phoneme /q/ was more difficult than /x/. Interestingly the data showed that both the voiceless fricative /x/ and voiced fricative /q/ were replaced by English voiceless velar stop /k/. The use of English consonant /k/ instead of Persian /x/ or /q/, can in part be attributed to native language transfer since there is no such sound as /x/ or /q/ in English, but cannot be entirely explained in terms of L1 transfer. Rather, an unknown reason, such as the highly variable realization of /q/ in Persian, might be a contributor, and need more research in the process of language acquisition. Finally, the study revealed that the accuracy level and the phonemes substituted for the Persian target consonants varied in different contexts, as predicted by variationist SLA theory (e.g. Tarone, 1988; Major, 2001; Bayley & Tarone, 2012). The occurrence of /x/ and /q/ in an open or closed syllable did not affect the pronunciation of /x/ and /q/ phonemes; however, their occurrence in syllable initial or syllable final position did.

It is hoped that the information presented in this paper may contribute to our knowledge, as just the first of many steps to be taken in the study of English-Persian learner language. Also, it is hoped that it will better provide Persian teachers with explanations and examples needed to foster learners' continuing development of proficiency in Persian as a second language.

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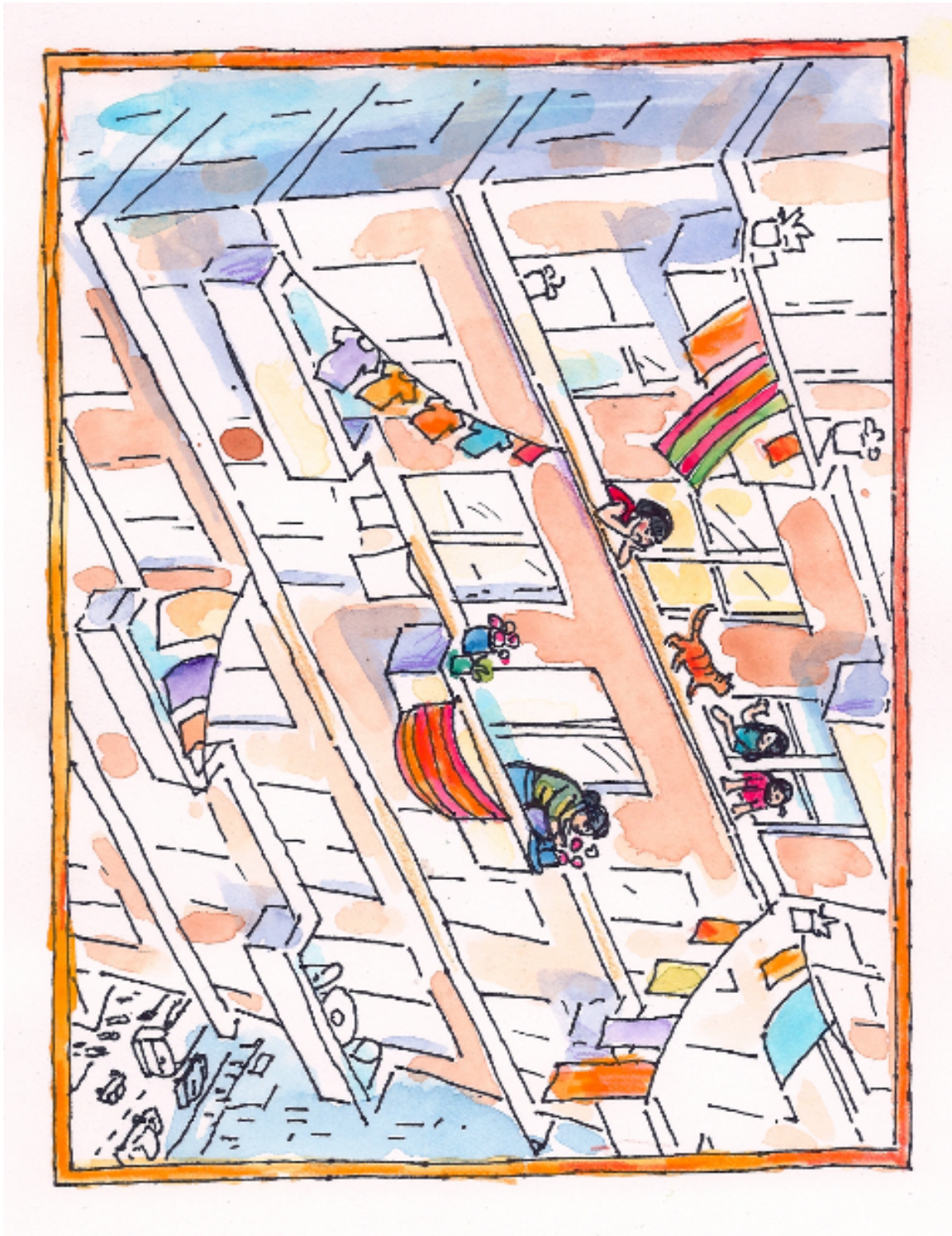
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Appendix A. Six Picture Prompts for the 'Naughty girl' story















Appendix B: Two Handouts for Jigsaw Task Focused on /x/ and /q/

Student A:

1. _____



2. _____



3. _____



4. _____



5. _____



6. _____



Student B:

1. _____



2. _____



3. _____



4. _____



5. _____



6. _____

