A Sociophonetic Analysis of Lexical and Epenthetic Vowels in Iraqi Arabic

تحليل صوتي اجتماعي للحروف الصوتية اللغوية والحروف المتداخلة في اللهجة العراقية

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Abstract

In recent years, a considerable research has been conducted to examine epenthetic vowels (Alghamdi, 1998; Hall, 2006, 2013; Gouskova & Hall, 2007, 2013) This paper aims at investigating epenthetic vowel in word onset CC cluster in the Arabic dialect of Hit, Iraq (HIA) from an acoustic perspective. It provides an acoustic analysis of vowel epenthesis in this dialect and presents phonetic correlations between the lexical and epenthetic vowel /a/ in singleton contexts. This study builds on previous studies that investigated temporal and spectral i.e. vowel duration and formant frequencies F1 and F2 characteristics of epenthetic and lexical vowels in several Arabic dialects. It has been reported that in HIA the short vowel /a/ is elided in open unstressed syllables, resulting in onset two consonant clusters. For example, the word /bana:t/ 'girls' is pronounced as [bana:t] in Standard Arabic and Baghdadi Iraqi dialect, while in HIA it is pronounced as [bna:t]. It has been observed that this dialect began to insert an epenthetic

vowel within onset CC clusters. Despite this fact, no previous acoustic analyses of this type have been conducted on this dialects. The present paper presents an empirical evidence to the universal as well as language-specific acoustic features of lexical and epenthetic vowels and relates such evidence to social variables i.e. speakers' gender. Ten native HIA speakers were recorded (5 males/ 5females), their average age is 35. All participants were born and raised in Hit and were doing their postgraduate studies at the time of conducting the recordings. In total, the ten participants produced 480 tokens as included in a carrier sentence /aqu:l……. marte:n/ 'I say……twice'.

  Acoustic measurements have shown that there are considerable spectral and temporal differences among speakers; all speakers produced shorter, higher and baker epenthetic than lexical [a]. In terms of gender differences, male speakers produced higher and more retracted lexical and epenthetic /a/ than female peers There were significant gender variations across HIA speakers in the production of epenthetic and lexical vowels.

Keywords: lexical vowel, epenthetic vowel, vowel duration, HIA dialect.

Introduction

  Epenthesis (Crystal, 2008: 171p) is the addition of a vowel sound into a word to form the centre of a new syllable. On the other hand, vowel epenthesis represents the articulatory gestures processes accompanying with existent segments that are 'phased in a way that creates an acoustically vocalic period, but no phonological segment is inserted, and hence no new syllable is created' (Hall, 2006, p37). Epenthesis could be categorized into two forms: 1- anaptyxis, where a vowel in inserted between two consonants, and prosthesis, which involves. An example of this type is the pronunciation

of *film* as [filim] in some dialects of English (Crystal, 2008, p25).2- Prothesis, in which an additional segment is injected at the beginning of a word and this occurs in quick speech. Intrinsically, epenthetic vowels can be existent in isolated words as well as in sentence context (e.g. *left turn* pronounced as /*v*left t*v*pn/). Specific motivations stand behind epenthesis. Hartmann and Stork (1976) assert that insertion occurs so as to lead to ease of articulation (p. 118). Moreover, McMahon et al., (1994, p15) claim that 'Epenthetic vowels often break up 'difficult' consonant clusters'.   Hall (2006) suggests that one of the functions of vowel epenthesis is to amend an input that does not meet the required function of a language. It has been reported that in HIA, which in contrast to Baghdadi Iraqi dialect allows onset two consonant cluster (Al-Abdely, 2011), the short vowels /a/ and /i/ are inserted. For example, the word /bna:t/ 'girls' is pronounced as [bana:t] /smi:n/ 'fat m.' is realised as /simi:n/. However, very few attention has been given to this process. Therefore, this study builds on previous studies that investigated spectral and temporal characteristics of epenthetic and lexical vowels in many Arabic dialects (e.g. Elihay, 2004; Hall, 2006; Gouskova and Hall, 2007; Youssef, 2010).

Speech community under analysis

   HIA is an Iraqi dialect spoken in Hit, a town in Anbar province, in the western part of Iraq. This dialect belongs to the *qiltu* group mainly spoken Tikrit, Mosul, Hīt and Anah (Blanc, 1964). The other dialect family if Iraq is the *gilit* group, which is thought to be originally a Bedouin dialect similar to the dialects used in the Arabic Gulf countries and Syria (Abu-Haidar, 2006). It has been reported that, like other Iraqi dialects, HIA does not allow coda consonant clusters. However, it permits onset two consonant

clusters in five syllable types (Al-Abdely, 2011: 392). Take for example the following cases:

1. CCV, as in /ksa-ra/ [ksara] 'he broke it, fm.'.
2. CCVV, e.g. /braa-mil/ [bra:mi:l] 'barrels'.
3. CCVC, e.g. /tram-mal/ [trammal] 'he was widowed'.
4. CCVVC,e,g, /smi:n/ [smi:n] 'fat'.
5. CCVVCC, e.g. /zʁa:r/ 'little ones'.

Despite this fact, very little attention has been given to analyse this phenomenon in HIA. Although phonemic and phonetic criteria may both play a role in epenthetic vowels adaptation, it is the dialect-specific phonological aspect that are central to this process unique to the dialect under study (and believed to exist in other qiltu dialects in Iraq).

Methods

Speakers

Ten HIA speakers were recoded (5 males/ 5females); they were in average 35 years old. All participants were born and raised in Hit and were doing their undergraduate studies in the University of Anbar, Iraq at the time of conducting the recordings. Recordings took place at the participants' homes using a TASCAM DR-40 audio recorder. Audio files were recorded at 44.1 Khz 16 bit as wav files.

Data collection and sample size

For the analysis in the present study, 15 pairs of words were adopted, as in Table 1. The ten speakers read near-minimal pairs of words that had the underlying shape /CVCVC/ or /CCVC/, /CVCVCV/ or /CCVCV, and /CVCVCVC/ or /CCVCVC/ written in a carrier phrase /ʔaqu:l ……… marte:n/ 'I say…… twice'. The words were matched everything except for

the last syllable, e.g., /ʕadʒi:b/ 'marvellous' vs. /ʕdʒi:n/ 'dough'. Two groups of words represent words with epenthetic vowel compared to words with underlying vowel (lexical vowel). In total, 480 tokens were analysed using PRAAT 240 tokens for the lexical vowel and 240 tokens for the words with epenthetic vowel. The 480 tokens were calculated according to the following formula:

30 (15 words with epenthetic vowel+15 words with underlying vowel) x 2 (repetitions chosen as the best out of the five repetitions) = 60 x 8 (5M+ 5Fspeakers) = 480 tokens.

Table 1 shows the near minimal Pairs used for investigating epenthesis. The two groups of words represent words with epenthetic vowel compared to words with underlying vowel (lexical vowel).

Table 1. Near minimal Pairs used for investigating epenthesis

Clusters	words with epenthetic vowel	English gloss	words with underlying vowel	English gloss
Obstruent-sonorant				
s-n	/sana:bil/	Spikes	/sana:dʒib/	Squirrels
b-n	/bana:t/	Girls	/bana:diq/	Guns
q-w	/qawa:lib/	Moulds	/qawa:na/	Bullet case
m-n	/mana:ʃi:r/	Saws	/mana:ma/	Manama city
b-l	/bala:bil/	Birds	/bala:sim/	Balsam
f-w	/fawa:tiħ/	Death ceremonies	/fawa:riq/	Differences
ʕ-r	/ʕari:dˤ/	Wide	/ʕari:n/	Den

ħ -m	/ħami:s/	'Iraqi dish'	/ħami:d/	Proper name m.
ħ -m	/ħama:ti/	My mother in law	/ħama:ma/	Dove
Obstruent-obstruent				
sˤ -f	/sˤafa:r/	Yolk	/sˤafa:r/	Yellowing
ʕ- dʒ	/ʕadʒi:n/	Dough	/ʕadʒi:b/	Wondrous
ʕ-z	/ʕazi:ma/	Feast	/ʕazi:za/	Proper name f.
tˤ- ħ	/tˤaħi:n/	Flour	/tˤaħa:lib/	Algae
ʕ-b	/ʕaba:ja/	Abaya	/ʕaba:li/	I thought
Sonorant- sonorant				
n-w	/nawa:ʕi:r/	Water wheels	/nawa:l/	Proper name f.

Acoustic measurements: Duration

For the purpose of temporal measurements, PRAAT (Boersma & Weenink, 2008) software was used to analyse vowel duration. For vowel duration, the start and end limits of each vowel were labelled manually depending on the waveform and spectrogram in PRAAT. As the focus is to measure the vowel duration, one tier interval was created (Figure 1).
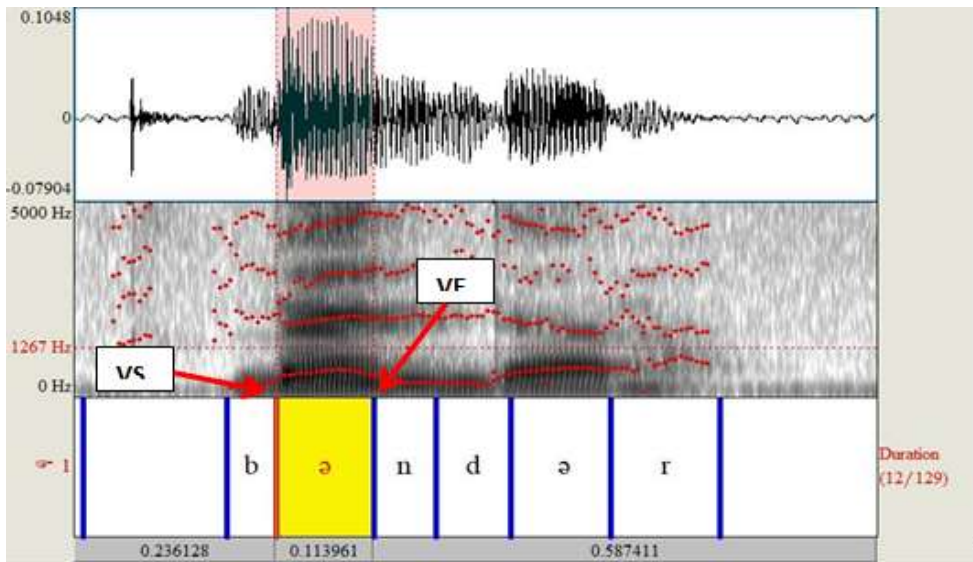
Figure 1. PRAAT image of a male speaker showing labelling procedure, ,
VS=vowel start, VE=vowel end

Acoustic measurements: F1 and F2

The spectral i.e. formant values of F1 and F2 were taken at midpoint of the target vowel to minimize any co-articulation impacts of preceding and following consonants. This was achieved by putting the mouse curser at the middle of each target vowel after activating the frequency tool on PRAAT. When clicking at the point of the formant frequency, PRAAT displays a horizontal red line at the curser and the frequency value is marked.
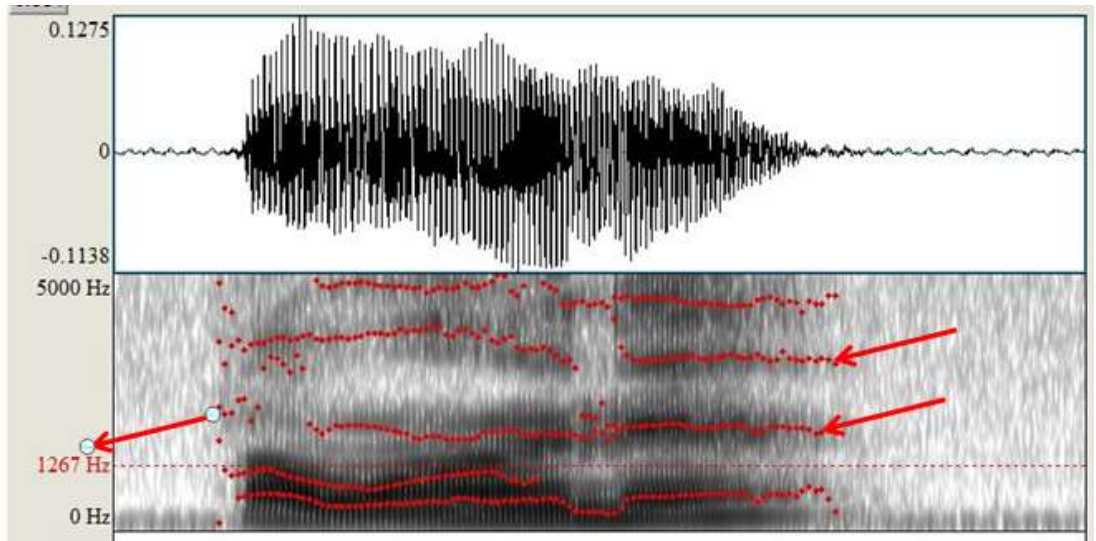
Figure 2. PRAAT image of a male speaker showing labelling procedure for measuring fundamental frequencies

Results and Discussion

Differences in vowel duration

The primary aim of this paper is to examine whether there is acoustic evidence of epenthetic vowels in initial CC cluster in HIA. Figure 2 is a spectrographic image of the word /sˤafa:r/ (yolk) with underlying initial two consonant cluster produced by a male speaker. As can be seen, there is a clear vowel material between the two consonants.
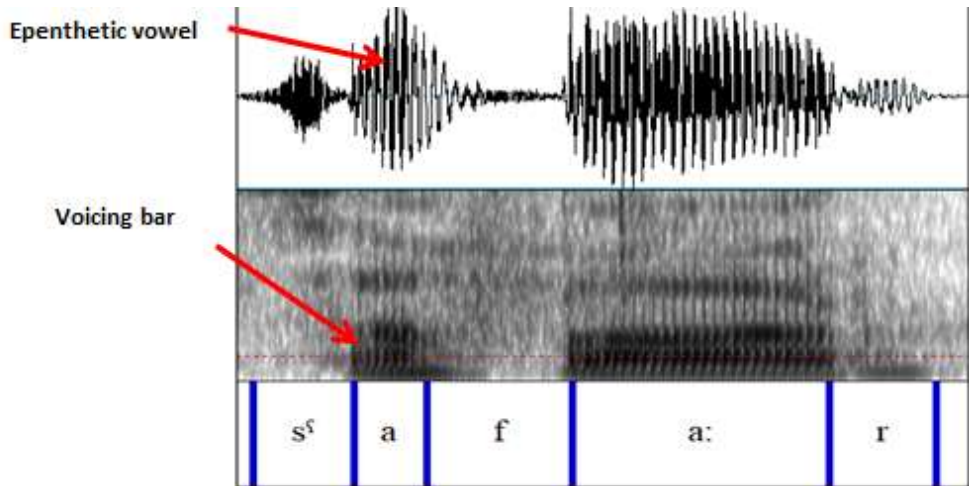
Figure 3: Presence of epenthetic vowel portion in onset CC cluster by a male HIA speaker

Further, it aims to find out whether there is any temporal and/or spectral differences between epenthetic and lexical vowels within the same phonological context. Figure 4 shows the mean durations for HIA lexical and epenthetic /a/ vowel produced by male and female speakers.
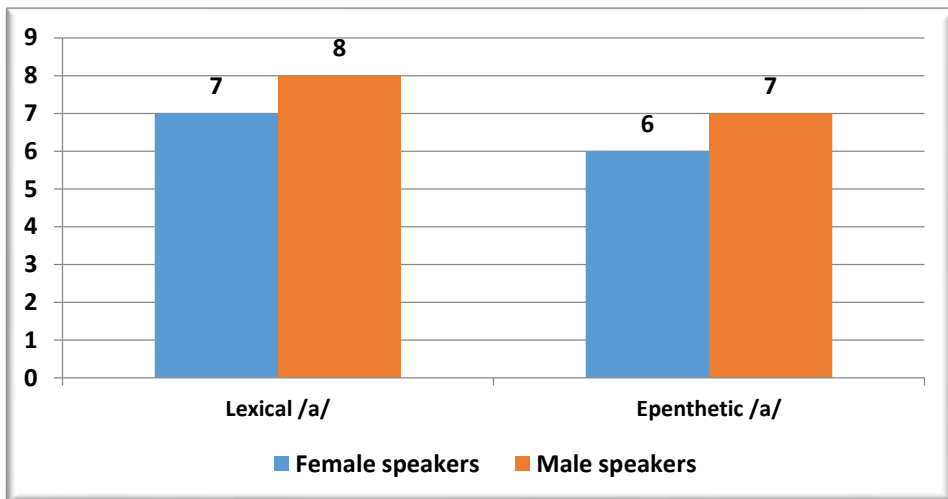

Figure 4. Duration (in milliseconds) of lexical and epenthetic /a/ by gender

It can be noticed from the data in Figure 4 that in general, male and female speakers produced longer lexical than epenthetic /a/ vowel. On the other hand, men epenthesized more often than women. Results of a T-test have shown no statistically significant value for this gender differences, 0.2 and 0.1 for lexical and epenthetic vowel, respectively. Male Hitis produced longer lexical and epenthetic /a/ vowel than female ones. The lexical to epenthetic vowel duration ratio was 1:1.2 for male and female speakers. This difference proved statistically significant for female speakers (0.01), but no statistical significance between lexical and epenthetic vowel among male speakers was found (0.1).

There have been within-group variations in vowel duration for the lexical and epenthetic /a/ vowel. The difference between lexical and epenthetic vowel among male and female speakers varied by 1millisecond. In average, the duration values recorded by male HIA speakers have been 8 and 7 milliseconds for lexical and epenthetic vowel, respectively. For female speakers, these values have been lower by 1 millisecond with 7 and 6 milliseconds for the lexical and epenthetic /a/ vowel, respectively. Despite the same variation range, differences among male speakers proved statistically significant (p: 0.01), but no significance has been recorded among female (p: 0.1).

Differences in fundamental frequencies

Measurements show considerable gender differences in the temporal features of lexical and epenthetic /a/ vowel.
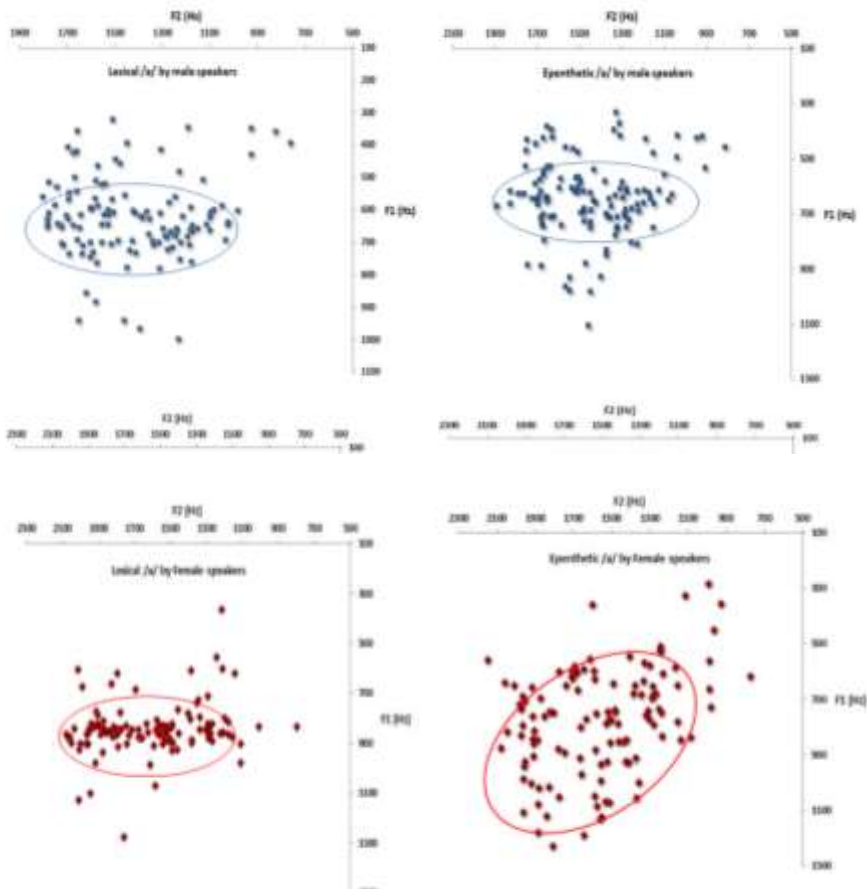
Figure 5. F1 and F2 values for lexical and epenthetic vowels by gender

Figure 5 clearly shows that male speakers produced higher and more retracted lexical and epenthetic /a/ than female peers. On the other hand, female speakers produced lower and more advanced lexical vowel than men. For the lexical vowel, men speakers produced lower F1 (by 152Hz) and F2 values (by 137Hz) than women. Differences in the formant frequencies for the epenthetic /a/ vowel showed less gender variations with 119Hz and 101Hz difference for F1 and F2, respectively. However, spectral differences between Hiti men and women speakers were more significant for the

epenthetic than its lexical version. Results of a 2 tail t-test revealed statistically significant gender differences in fundamental frequencies for the epenthetic /a/ vowel (p=0.03) for F1 and F2. With regard to the gender variations in F1 and F2 for the lexical vowel, they proved less statistically significant than those found in epenthetic vowel. To verify this, a 2 tail t-test has been performed and showed that the p value was 0.04 for F1 and 0.05 for F2.

It has been noticed that there are within-group variations in the quality of lexical as well as epenthetic /a/. Differences in the formants frequencies among female speakers have been bigger than those recorded among male ones. F1 values varied by 18Hz and 15Hz for female and male speakers, respectively. Relatively smaller differences have been recorded in F2 with 22Hz for women and only 18Hz for men. In contrast to variations between groups, within-group differences did not reflect any statistical significance.

Conclusions

Previous studies with several Arabic dialects (Haddad, 1983; Ali, et al., 2008; Gouskova & Hall, 2013) have proved the existence of a vowel material within onset CC clusters. In the present acoustic analysis, a vowel in word- initial position has also been found. Our results go in line with previous studies conducted on other Arabic dialects that on average, the lexical vowel is longer, more specifically about double the duration of the epenthetic version (1:1.2). With regard to the quality of the epenthetic /a/ vowel in HIA, Results of the present study have shown that epenthetic and lexical vowels in HIA, which are often perceived and/or transcribed as identical, are acoustically distinct. Our results, therefore, contradicted previous acoustic analyses of epenthetic vowels in other Arabic dialects (Gouskova, 2013). In certain contexts, there were significant quantity, but

not quality differences between the lexical and epenthetic vowels that were examined in this study for male and female speakers.

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