



**An Acoustic Analysis of The English Vowels Produced by
Iraqi University EFL Learners Speaking Two Iraqi Dialects**

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Pronunciation is considered as one of important features of spoken language. It is crucially important as it is usually the first thing people notice about English language learners. The present study is a phonological one that tries to answer a nagging question asked by both Iraqi teachers and learners of English whether or not the colloquial Iraqi Arabic has an impact on the pronunciation of English and to find out the reasons behind the mispronunciation of Iraqi learners of English. To answer such a question an experiment is administered at the University of Anbar for twelve learners (six girls and six boys) at second stage who are at the same age ranged from 20 to 28 (mean 24). The experiment includes two parts: a test of English proficiency and a test which includes recording learners reading a Standard English text and a colloquial Iraqi one. In terms of vowel duration, HIA speakers produced slightly longer short vowels than RIA speakers did. There were more gender variation patterns among HIA than among RIA speakers. For short and long vowels, RIA speakers produced higher and more retracted vowels than HIA speakers

Introduction

Through the acquisition of any language, whether as a second or foreign language there should be more interest for pronunciation. Proper pronunciation of Iraqi learners for English sounds means either they have acquired them well enough or they have similar sounds in their language, while improper pronunciation indicates that interference or dissimilarity of sound system of two languages is the reason behind that contrastive linguistics and errors analysis in Second Language Acquisition are used to analyze the data. Gender, educational background and geographical area of the learners are some factors that play a great role in their production of English vowels. It has been claimed that (Ladefoged and Broadbent, 1957), when speakers produce a vowel, they convey three kinds of information: (1) phonemic information i.e. the phonemic feature of a vowel, (2) anatomical information related to the speaker's vocal tract physiological structure, and (3) sociolinguistic information, such as speakers' social and regional background. Of these information, the second and third sorts of information show differences in the formants values of vowels. Hence, a basic question in the present study is to examine whether or not speakers' native dialects affect their productions of the English vowels.

Proper pronunciation is considered an essential part of language fluency, but it is also very difficult for foreign language learners to control the pronunciation of the target language (Munro & Dewing, 2015: 32). In addition, modern methods of teaching languages give priority to speaking skills, which makes learning as much as correct pronunciation (Freeman & Anderson, 2011: 122).

In English language, there are several variations in the pronunciation of consonant and vowel sounds. In phonetics and phonology, variation is an alternative pronunciation of a word (or of a phoneme in a word) that does not affect the words meaning. One of the factors of this variation is the speaker's dialect. Moreover, phonetic variation can reflect the variety of social factors (Atchison, 2003: 119). Crystal (2003: 188-189) states that variation refers to the alternation of one sound for another in a given environment, with no consequent change in the words meaning. For example, whether the word *top* is pronounced with aspirated or non-aspirated /p/ does not affect its meaning. Phonetic variations receive more consideration in linguistics since the phonetic variations may reflect certain sociological backgrounds. Vowels are sounds in which the air stream is pushed out of the lungs passes through the vocal tract with much less obstruction of air (Al-Tamimi, 2007).

Method

Speakers

In this study, twelve speakers were recorded, six speakers from each dialect (3 males and 3 females) with no reported speech or hearing difficulties. They were second year students enrolled at the department of English, college of education for humanities, University of Anbar. For ease of investigating gender differences, equal numbers of male and female speakers for each dialect were included. All twelve speakers were born and grew up in the two speech communities under investigation and are therefore native speakers of their dialects.

Data collection and sample size

The data in this study was collected from parallel controlled read speech. The twelve speakers produced the twelve English pure vowels only in /hvd/ context embedded in a carrier sentence 'I say...twice'. 192 tokens were analysed; 12 speakers (3m+3f) x 8 vowels (2 repetitions per vowel). Recordings took place in a quiet

room at the phonetics lab using a battery-operated and AC adapter-powered TASCAM DR-40 audio recorder. Audio files were recorded at 44.1 KHz 16 bit as wav files and saved on an external hard drive.

Acoustic measurements for duration

It has been widely accepted that a language's vowel system is best described when its characterization covers regional and social variations than when it comprises only a single criterial set of acoustic features (Clopper et al., 2005; Hagiwara, 1997).

For word duration, the start and end times of the 192 /hvd/ words were labelled manually using textgrids in PRAAT (Boersma and Weenink, 2012) at zero crossings at the start point of the word onset i.e. /h/ and the end point of its coda (i.e. /d/). For vowel duration, the start and endpoints of each of the vowels were labelled manually by looking at the waveform and spectrogram in PRAAT. Three tier intervals were created; one for phrase, one for word, and one for vowel. On the phrase tier, the whole carrying phrase was labelled, starting from /ai/ of 'I say' and ending with /s/ of the word 'twice'. On the words tier, the start and endpoints of the word containing the target vowel were labelled. The start and end of the target vowel were labelled on the vowels tier. The measurements were taken from the words and vowels tiers. Both word and vowel durations were extracted using a PRAAT script developed by Leendert Plug of the University of Leeds and available online at: http://www.personal.leeds.ac.uk/~lnlp/duration_measure.script.

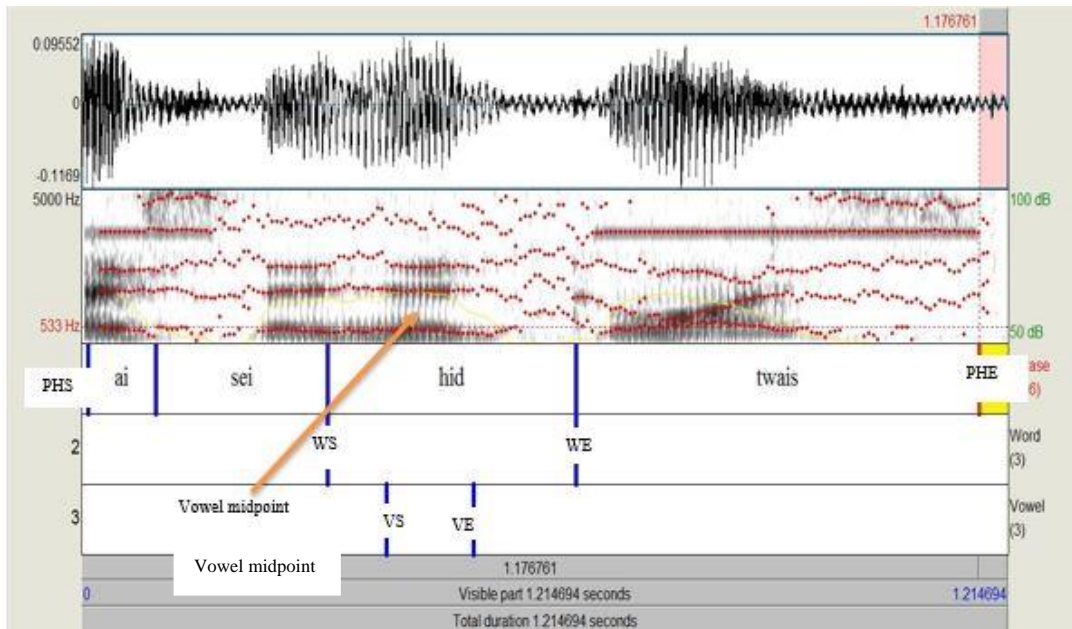


Figure 1. PRAAT photo illustrating labelling procedure, PHS=phrase start, PHE=phrase end, WS=word start, WE=word end, VS=vowel start, VE=vowel end.

Acoustic measurements for fundamental frequencies

In vowels, F₁ indicates the height of the vowel and is inversely related to it (Kent and Read, 1992). In other words, the lower in the oral cavity the vowel is produced, the higher its F₁ is, but the higher it is produced the lower F₁ it has. F₁ in vowels ranges between 300Hz and 1000Hz. F₂ refers to the frontness of vowels. Higher F₂ indicates that the vowel is produced close to the lips, while lower F₂ values mean that the vowel is articulated back in the mouth. F₂ ranges between 850Hz and 2500Hz. The frequencies of F₁ and F₂ were taken at midpoint of the target vowel to minimize the co-articulation effects of preceding and following consonants.

Variations in vowel duration

As predicted earlier, speakers' native tongues seem to change how they articulate the English vowels in terms of the acoustic features. This paper was set to look for differences in the production of the English primary cardinal vowels among Iraqi ELLs, who talk two mutually related Iraqi dialects.

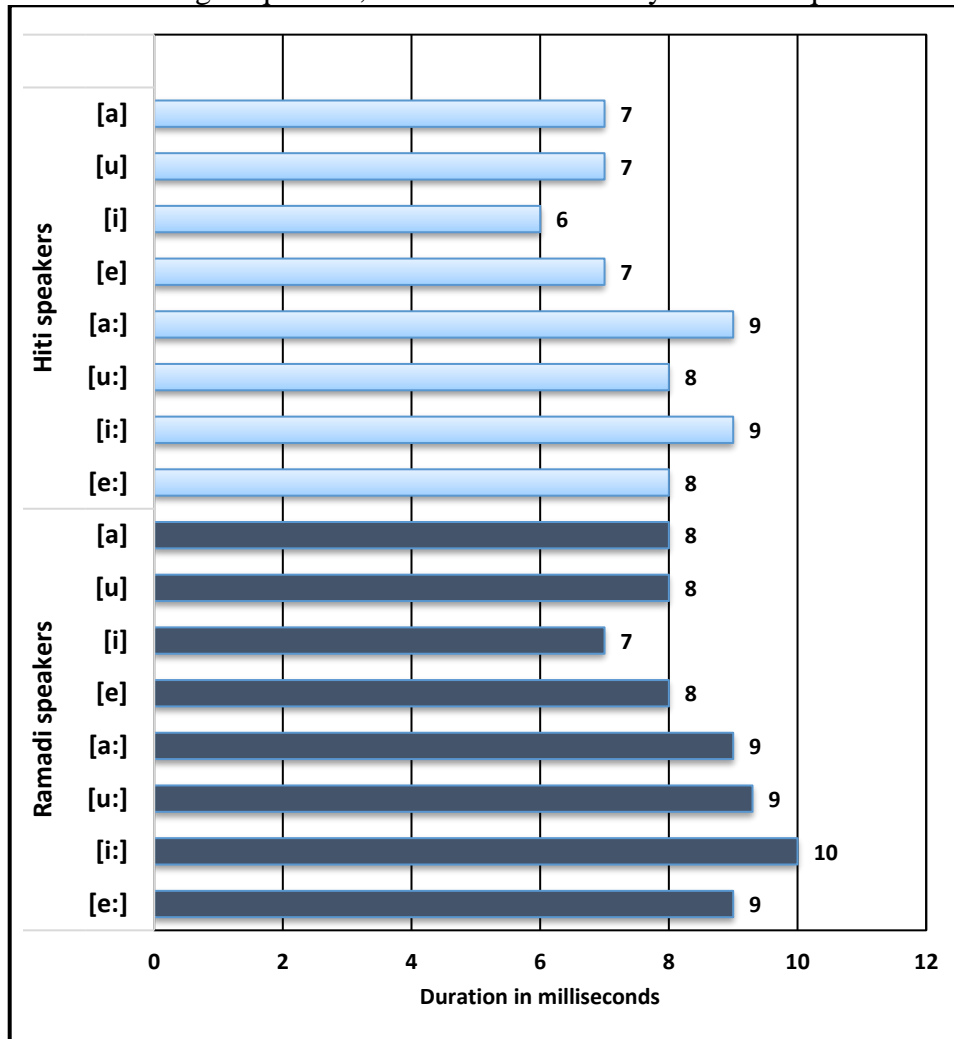


Figure 2 Normalized duration for English vowels by speakers' dialects

As can be seen, the average duration for the long vowels by speakers of both Iraqi dialects is above double that of their short versions. However, the short/long ratio by RIA speakers is slightly larger (1:2.4) than that produced by HIA speakers (1:2.2). HIA speakers produced slightly longer short vowels than RIA speakers did by 0.010 ms. However, the results of a T-test analysis showed no sufficient variation patterns between the two groups with no statistical significance ($p > 0.05$). With the exception of /u:/, the analyses for the long vowels indicated that the durations for long vowels were similar in both groups.

Although statistical analyses indicated that male speakers in both groups produced longer vowels than female speakers did, they appear to have different gender-related variation patterns in vowel duration. Gender seems to be an influential factor among HIA speakers than that among RIA speakers in terms of such variations. The duration measurements per each vowel served as the dependent variable, and the gender served as the independent variable. The analyses showed that the gender differences were only significant for the low vowel /a/ (F: 6.787, $p < 0.05$), and its long version /a:/ (F: 6.632, $p < 0.05$). Gender differences among HIA speakers were very significant for short as well as long vowels at $p < 0.00$. In contrast, despite the noticeable differences between RIA males and females, they were only significant for /i/ $p < 0.05$.

There were gender variations across as well as within groups. With regard to variations across dialects, HIA male speakers produced shorter vowels than their RIA male speakers did. However, these differences did not hold any statistical significance for all short and long vowels at $p > 0.05$.

In addition, HIA female speakers produced slightly longer vowels than their RIA peers. A T-test analysis carried out to establish whether these differences reflect any gender-related variation patterns across dialects showed that the duration differences are statistically significant only for short vowels. An extra T-test was

performed to find out in which English vowels HIA and RIA females differ the most. The statistical analysis showed that the differences are very significant only for /i/ and /a/, but not for the rest vowels.

As for gender variations within dialects, there were more gender variation patterns among HIA than among RIA speakers. While gender differences among HIA speakers were more significant for /a/ and /u/, the differences between RIA male and female speakers were only statistically significant for /i/. For long vowels, gender-related differences were not significant, except for /a/, which proved very significant among HIA speakers ($p = 0.000$).

Variations in vowel quality

The first research question in this study is to access whether the quantitative differences between short and long vowels are accompanied by qualitative differences. Figures 3 and 4 show the distribution of short and long vowels for HIA and RIA speakers according to mean normalized F1 and F2 values.

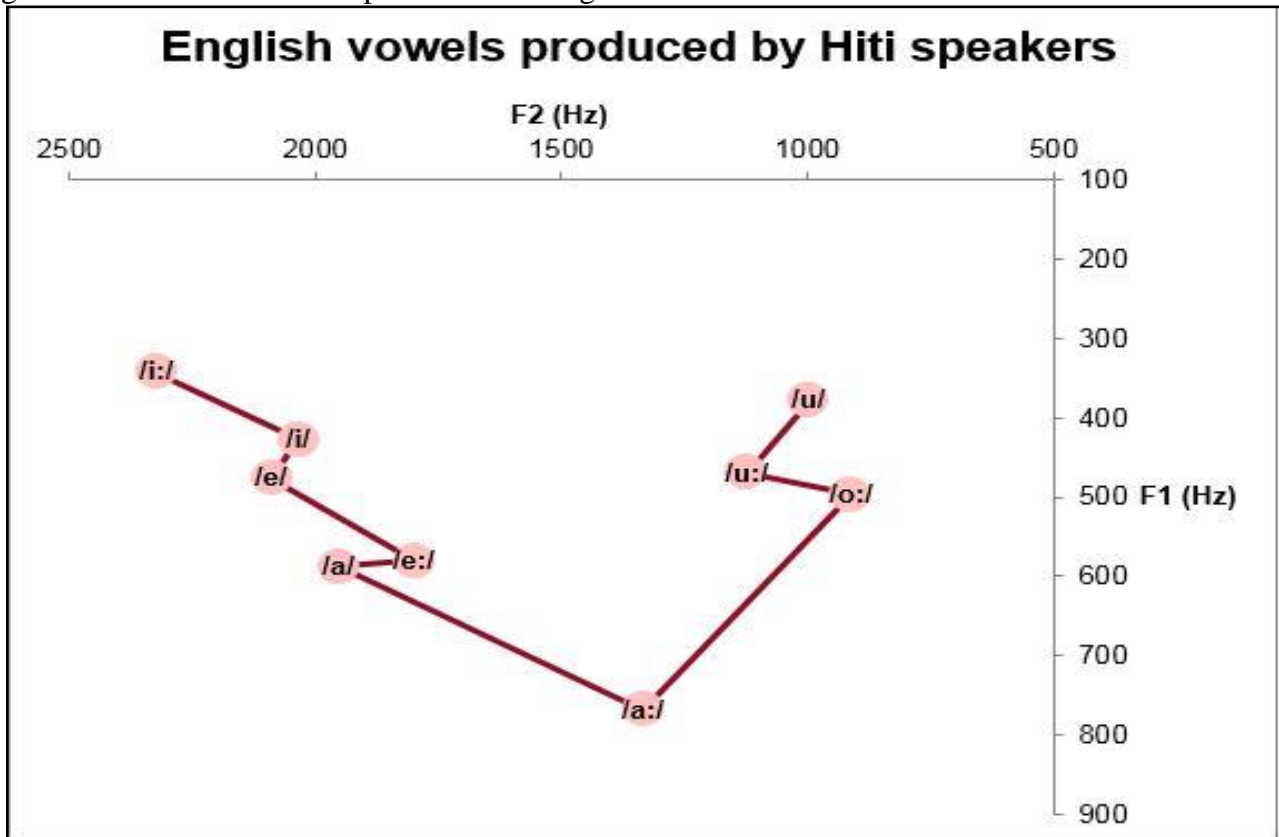


Figure 3 English vowels produced by HIA speakers by formants values

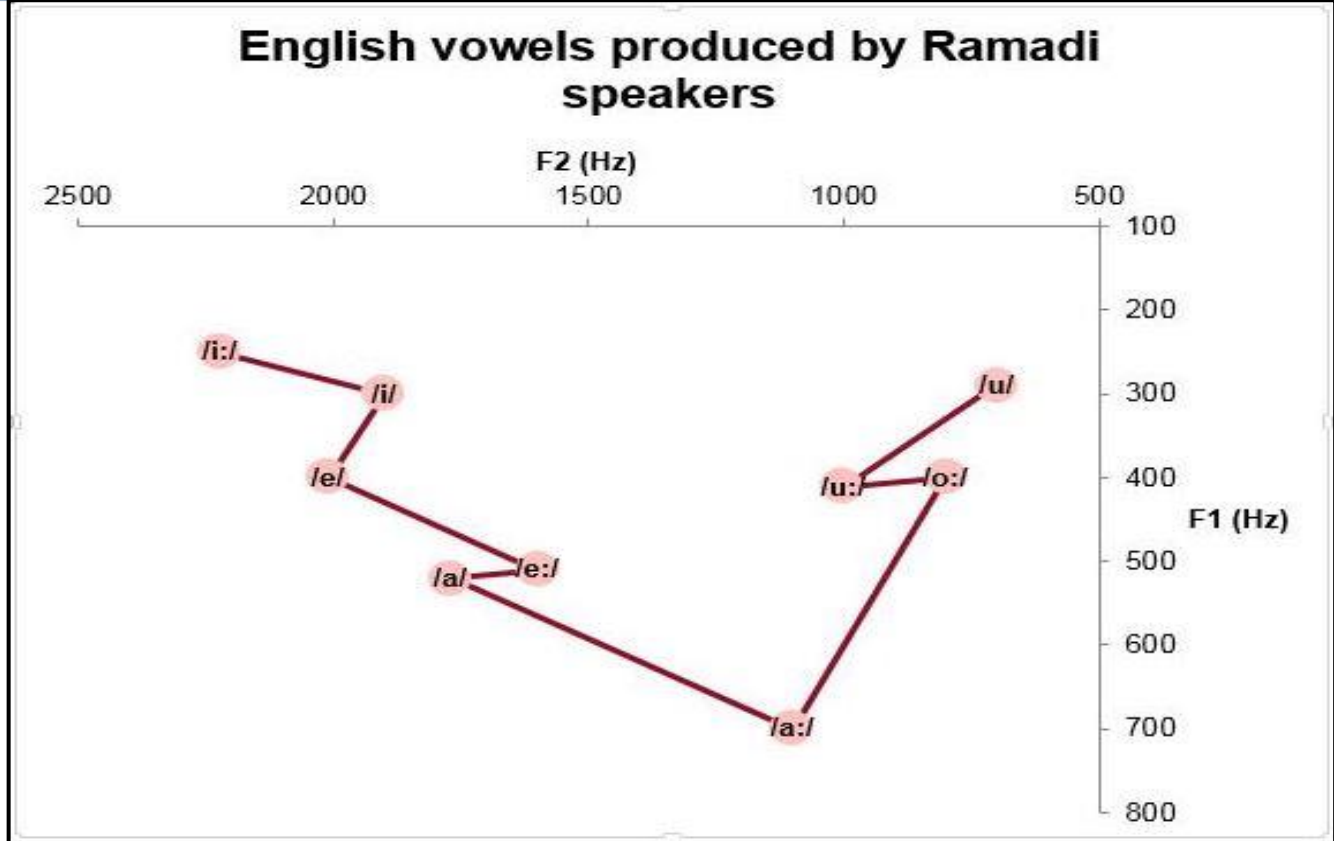


Figure 4 English vowels produced by RIA speakers by formants values

As can be seen, RIA speakers produced higher and more retracted short and long vowels than HIA speakers. For short vowels, male speakers in both speech communities varied more in F2 with high statistical significance at $p < 0.05$ for /a/ and /u/, but not for /i/. Furthermore, both short vowels also varied in their F1 values with a similar degree of significance. Greater differences in F1 between HIA and RIA speakers were noticed in long vowels, namely in /i:/ and /a:/, which proved significant for /i:/ and /a:/ at $p < 0.05$, but not for /i:/. Female speakers varied in F2 more than in F1 for short and long vowels. For short vowels, only the variations in /u/ proved significant for short vowels and in /i:/ and /u:/ for long vowels. In contrast, there were significant differences between HIA and MIA women in F1 for /a:/ at $p < 0.05$.

Conclusions

This study examined acoustic characteristics of the English vowels as produced by Iraqi learners of English speaking two Iraqi dialects; HIA and RIA dialects. It attempted to find out a correlation between vowels quality and quantity, i.e. in vowel duration and F1 and F2. The average duration for the long vowels by speakers of both Iraqi dialects is above double that of their short versions. However, RIA speakers slightly larger short/long ratio (1:2.4) than HIA speakers (1:2.2). The two groups of students showed qualitative and quantitative contrasts in the English vowels they produced. The duration measurements per each vowel served as the dependent variable, and students' dialect served as the independent variable. HIA speakers showed slightly greater duration ratio than RIA speakers. It was found that speakers of the two mutually-related Iraqi dialects vary in the production of English vowels. HIA speakers produced slightly longer short vowels than RIA speakers did by 0.010 ms. However, this does not prove statistically significant variation patterns between the two groups ($p > 0.05$). In addition to the dialectal differences, there have been gender-related differences within and between groups. For between-groups analysis, gender differences only proved significant for the low vowel /a/ ($F: 6.787, p < 0.05$), and its long version /a:/ ($F: 6.632, p < 0.05$). Gender differences among HIA speakers were very significant for short as well as long vowels at $p < 0.00$. In contrast, despite the noticeable differences between RIA males and females, they were only significant for /i/ $p < 0.05$. As for variations across dialects, HIA male speakers produced shorter vowels than their RIA male peers did. However, these differences did not hold any statistical significance for all short and long vowels at $p > 0.05$.

Furthermore, HIA female speakers produced slightly longer vowels than their RIA peers. A T-test analysis showed that the duration differences are statistically significant only for short vowels. An extra test showed that the differences are very significant only for /i/ and /a/, but not for the rest vowels.

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