English and Arabic Vowels
A comparative study of vowel quality and duration

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Abstract:

This study is a comparison between English and Arabic vowels. First a description and classification of vowels in the two languages is given. Then the two sets of vowels are contrasted to find which vowels are similar and which are not. Finally, the set of similar sounds are analysed acoustically to find out to what extent they are similar. This is done by recording two sets of words containing these vowels and measuring their formants and duration. The findings show that although these sounds are similar in some aspects, Arab learners of English do not replace English vowels with their Arabic counterparts but, instead they try to reach the target sounds even though they are not completely successful in achieving their goal.

Introduction:

This work will be concerned with a comparison between English and Arabic vowels. The main focus will be on similar vowels in the two languages and the quality and quantity properties they have. The importance of this study lies in its implications for the learning of English vowels by Arab students.

The paper is divided into two main parts. The first will provide a description of the articulation of both English and Arabic vowels before classifying them into two sets: similar and dissimilar vowels. The second part will concentrate on similar sounds in order to find out to what extent these sounds are similar. This will be conducted through a scientific acoustic analysis using computer software of recorded material from native speakers of both languages. Finally, comments on the results of the study as well as the conclusion will be provided.

PART I: description of english and arabic vowels

Vowels are sounds that are produced without narrowing the air passage to a degree that prevents air from flowing freely. That is, no real hindrance or obstruction of the flow of air along the vocal tract is involved in the articulation of vowel sounds. Also, vowels are considered resonants since the vocal tract is used as a resonance chamber, and shaping this chamber in different ways results in different vowel types.

The quality of a vowel reflects the shape taken by the vocal tract when producing that vowel. Vowels, therefore, are usually classified according to whether the tongue is high, mid or low; whether the front, the centre or the back of the tongue is raised; and also whether the lips are round or not. The quantity of the vowel, on the other hand, means the duration of time involved in the production of the vowel. Thus, vowels are also classified according to whether they are long or short.
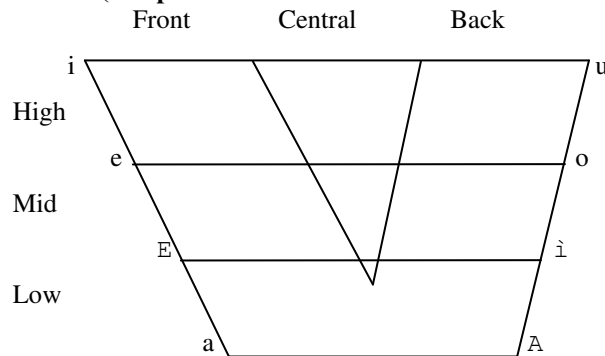
1.1. English vowels

The English sound system includes a large number of distinctive vowels, some of which are simple and others are

complex. Table1 below includes a list of the vowels occurring in English and their distribution (Gimson, 1994: p. 89).

(1) English vowels and their distribution (Adapted from Gimson, 1994, p.89)

Symbol	Initial	Medial	Final
[i:]	eat [i:t]	heat [hi:t]	see [si:]
[I]	it [I]	hit [hIt]	lady [leIdI]
[e]	ate [et]	head [hed]	
[Q]	angle [QNɡl]	bad [bQd]	
[A:]	aunt [A:nt]	hard [hA:d]	car [cA:(r)]
[ü]		hot [hüt]	
[ì:]	all [ì:l]	port [pì:t]	war [wì:(r)]
[U]		put [pUt]	
[u:]		food [fu:d]	b lue [blu:]
[├]		cut [k├t]	
[╫:]	earth [╫:T]	turn [t╫:n]	her [h╫:rn]
[½]	ago [½ɡ½U]	canal [k½nQl]	sister [sIst½(r)]
[eI]	ape [eIp]	veil [veIl]	day [deI]
[aI]	either	time [taIm]	lie [laI]
[ìI]	[aID½(r)]	voice [vìIs]	toy [tìI]
[½U]	oil [ìIl]	goat [ɡ½Ut]	hoe [h½U]
[aU]	old [½Uld]	town [taUn]	cow [kaU]
[I½]	out [aUt]	beard [bI½d]	here [hI½(r)]
[e½]		scarce [ske½s]	care [ke½(r)]
[U½]	air [e½(r)]		poor [pU½(r)]

(2) The cardinal vowels (Adapted from Stork and Widdowson 1974: p35)

The quality features of vowels are traditionally represented in terms of the cardinal values on a quadrilateral first suggested by Daniel Jones (Stork and Widdoson, 1974: p35) to work as a standard reference system for transcribing and classifying vowels. The quadrilateral represents the area of the mouth in which the tongue can move up and down and forward and backward to produce all speech vowels, and beyond which no vowel sound can be produced.

Classification and description of vowels

The English sound system as illustrated below includes simple and complex vowels. A simple vowel is one in the production of which the tongue takes one position, while in the production of a complex vowel, the tongue glides from one position to another. Simple vowels are, therefore, called monophthongs while complex vowels are known as diphthongs.

Simple vowels

Simple vowels are represented in a quadrilateral and described as follows:

(3) English simple vowels represented in a quadrilateral.
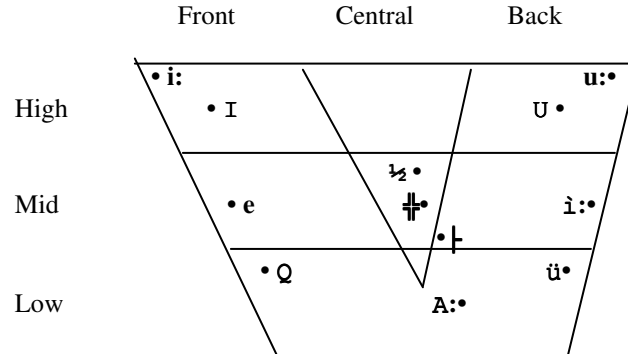
In what follows, a description of the articulation of each vowel is given.

-[i:] as in *been, lead, deep*. It is a long vowel articulated by raising the front of the tongue slightly below and behind the point where the cardinal vowel [i] is articulated. It is produced with spread lips and tensed tongue.

- [I] as in *sick, pin, hit*. In producing this short vowel, the front of the tongue is raised to a point near the middle of the high front area. The lips are slightly spread and the tongue is somewhat lax.

- [e] as in *led, fed, head*. The articulation of this short vowel involves raising the tongue front to a position which is exactly in the middle of the front side of the mid front area or between the cardinal vowels [e] and [E]. During its production, the tongue is tenser than in the case of [I] and the lips are spread.

-[Q] as in *hat, fat, rat*. It is a short vowel pronounced by raising the front of the tongue to a point which is slightly above the cardinal vowel [a]. The lips are neutral but the tongue is tenser than in the case of [e].

- [╟] as in *shut, but, cut*. The articulation of this short vowel demands raising the centre of the tongue to a position slightly below the mid central area. The lips are neutrally open.

- [ü] *shop, pot, hot*. It is a short vowel produced with slightly rounded lips and the tongue back is raised slightly above and in front of the cardinal vowel [A].

- [i:] as in *horse, port, court*. It is a long vowel articulated by raising the back of the tongue to a position which is nearly in the middle of the back of the mid back area. The lips are moderately rounded.

- [U] as in *put, foot, push*. This is a short vowel produced by raising the back of the tongue to a point nearly at the middle of the high back area. The lips are round and the tongue is held in a lax position.

- [u] as in *soon, moon, food*. Raising the back of the tongue to a point which is slightly below and in front of the cardinal

vowel [u] produces this long vowel. The lips are rounded and the tongue is tenser than in the case of [U].

- **[ɜː]** as in *girl, curly, her*. This is a long vowel produced by raising the centre of the tongue to almost the middle of the mid central area. The lips are neutrally open.

- **[ə]** as in *about, canal, sister*. It is a short vowel pronounced by raising the centre of the tongue to a position which is just above the position of [ɜː]. The tongue is lax and the lips are in a neutrally open position. The vowel [ə] is known in the literature as a schwa and is the most frequent vowel in English.

Diphthongs

Diphthongs are those vowels that are characterised by a movement of the tongue from one vocalic position to another during their articulation (Yole, 1996, 49); they start at one point of articulation and glide to another. Their quantity is similar to that of long vowels. It is also context dependent; a diphthong such as [ɔI], for instance, is usually longer when it is in a word such as in *boy* than when it is followed by a consonant as in *coin.*

Due to the glide direction, diphthongs can be classified into three sets: fronting, centring and backing diphthongs. Fronting diphthongs are those which glide in the direction of the high front vowel [I]. They are [eI, aI, ɔI]. Centring diphthongs are those which glide in the direction of the mind central vowel [ə]. They are [Iə, Uə, eə]. Backing diphthongs are those which glide in the direction of the high back vowel [U]. They are [əU, aU].
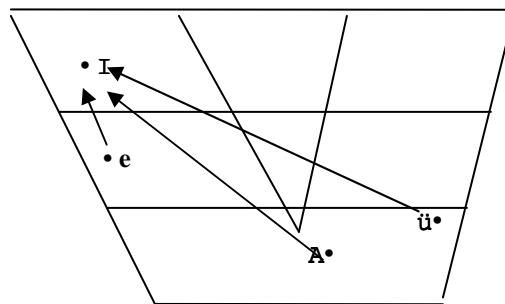
Fronting diphthongs

-[e] as in *eight, late, day*. This diphthong starts from the position of the vowel [e] and glides towards the vowel [I]. The lips are spread.

-[aI] as in *island, white, high*. The glide of this diphthong begins at a position near the lower side of the low central area and then moves in the direction of the high front vowel [I]. The lips are spread.

-[ìI] as in *oil, coin, boy*. The starting position of this diphthong is that of the vowel [ü] and then the tongue glides towards the vowel [I]. The lips are round for the first part of the diphthong and then become neutral for the second part.

(4) Fronting English diphthongs

Centring diphthongs

-[I½] as in *here, dear, year*. The point of articulation of this centring diphthong starts from the position of the high front vowel [I] and moves towards the position of the mid central vowel [½]. The lips take a neutral position.

-[U½] as in *tour, poor, moor*. Its starting point is a position near that of the high back vowel [U] and then the glide is towards the mid central vowel [½]. The lips are round for the first element and then change to a neutral position for the second element of the diphthong.

(5) Centring English diphthongs
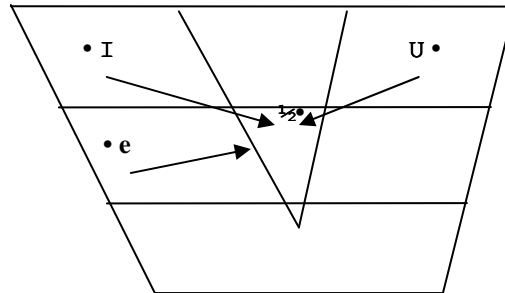
Backing diphthongs

-[½ʊ] as in *old, road, know*. The tongue starts from the position of [½] and moves in the

direction of the high back vowel [ʊ]. The lips are neutral during the articulation of the first part and then change to round for the second part.

-[aʊ] as in *out, sound, cow*. The tongue begins slightly in front of the position of the vowel [ɑ:] and then glides towards the [ʊ] sound.

(6) Backing English diphthongs
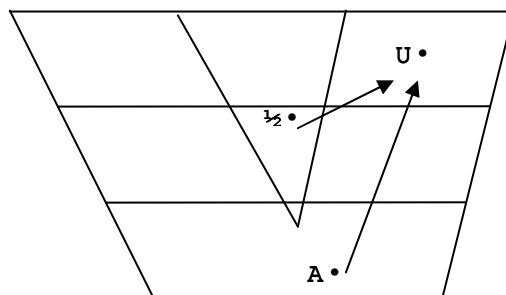
1.2. Arabic vowels

Compared with English, Arabic has a small number of vowels. Only three main vowel qualities can be distinguished. However, these vowel qualities are realized into two forms each; a short and a long form. In addition to these vowels which are found in both the standard variety of Arabic and the dialects, there are some vowels which are unique to some regional dialects. Those dialectal vocalic sounds which are relevant to learning English by Arab students will also be referred to when necessary in the following sections.

Description and classification

Using the same Criteria in describing English vowels, Arabic vowels can be represented on a quadrilateral to show their quality values and described as follows:

(7) Arabic simple vowels
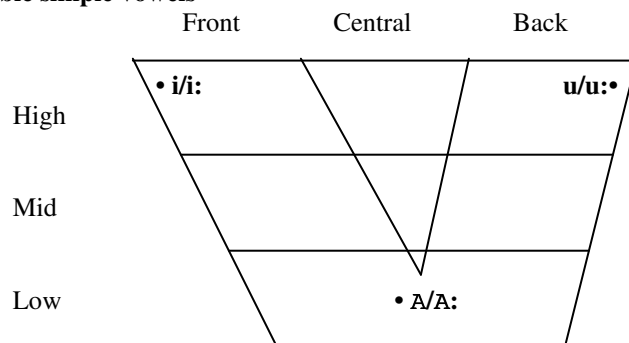
-[i]/[i:] as in *[sir] secret, [mil] bend* imp*., [qi:l] was said, [li:n] softness*. It is a high front vowel produced by raising the tongue to a position slightly retracted from and below the cardinal vowel number one (see section 1.1). When articulating it, the lips are spread and the tongue is lax in its short form but tense in its long form.

-[ʉ]/[u:] as in *[qul] say* imp., *[˩ud] come back* imp., *[tu:l] lengh*, *[su:f] wool*. This is produced by raising the tongue to a point slightly below and in front of the cardinal vowel [u]. The lips are round and the tongue is tense in its long form but remains lax when producing the short form of the vowel.

-[ʌ]/[ʌ:] as in *[ʔʌn] about, [mʌn] who, [qʌ:l], [mʌ:l] money*. It is a low vowel produced by maintaining the tongue in a fully open position. The lips are neutrally open and the tongue is a little bit tense during its long form, lax during its short form.

Allophonic variation

The three main qualities of Arabic vowels whether in their short or long forms are phonetically realized in two allophones each; a plain allophone and an emphatic allophone as can be seen in the following quadrilateral.

(8) Emphatic variations of vowels in Arabic
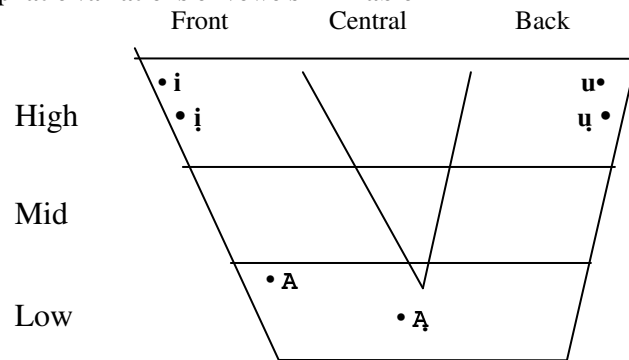
It is clear from the quadrilateral that the emphatic vowels are more retracted and lower than their plain counterparts. Because it is difficult to pronounce a plain vowel immediately after (or before) an emphatic consonant, the tongue is maintained (or dragged back) near the position required by the emphatic consonant and, thus, the vowel itself becomes emphatic.

Also, it is clear from the quadrilateral that the qualitative difference between these allophonic variation is greater in the case of [ʌ, ɑ] than that of [i, i] and [u, u] and therefore, some native speakers cannot audibly make a distinction between the two elements of each of the two pairs [i, i] and [u, u]. This can be illustrated further through the following examples:

(9) Plain and Emphatic vowels in Arabic

Plain	Examples	Emphatic	Examples
[ʌ]	[sʌb] abuse (v.)	[ɑ]	[s|ɑb] pour (v.)
	[dʌb] walk slowly (v)		[d|ɑb] (a kind of) lizard
[i]	[ɒil] humble (v.)	[i]	[ɒ|il] shadow (n.)
	[sir] secret (n.)		[s|ir] severe cold
[u]	[sum] poison (n.)	[u]	[s|um] fast (v. imp.)
	[sul] tuberculosis		[s|ul] (a kind of) snake

Vowel length

Any of the six allophones of Arabic vowels can have a long or a short form with little change in its quality except for the fact that the tongue is tenser in the production of long vowels than in short vowels. The distribution of long forms is the same as that of their short counterparts, as the following examples show:

(10) Distribution of long and short vowels in Arabic

	Short vowels	Examples	Long vowels	Examples
Plain Emphatic	[i] [i]	[zir] button [t│ib] medicine	[i:] [i:]	[zi:r] large jar [t│i:b] scent
Plain Emphatic	[u] [u]	[suq] drive (imp.) [q│u̦bil] was accepted	[u:] [u:]	[su:q] market [q│u̦:bil] was met
Plain Emphatic	[ʌ] [ʌ]	[fʌhim] he understood [s│ʌ̦˪id] he rose (v.)	[ʌ:] [ʌ:]	[fʌhim] knowing (adj.) [s│ʌ̦:˪id] rising (adj.)

The examples above indicate that length is phonemic in Arabic vowels. Length is the only feature that makes these minimal pairs significantly different.

Diphthongs

The Arabic sound system contains only two diphthongs. They are [ʌi] and [ʌu]. In addition to these two diphthongs there is the diphthong [ui] which is found in Libyan Arabic besides the first two which are also available in the Libyan variety of Arabic.

(11) Arabic diphthongs
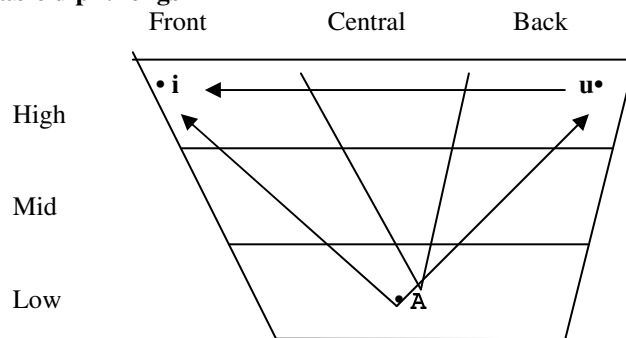
-[ʌi] as in *[kʌif] how, [˪ʌin] eye, [bʌit] home*. In its articulation, the fronting diphthong starts from the low front

vowel [ɑ] and then glides towards the high front vowel [i]. The lips are neutrally open and the tongue is lax during the first part of the diphthong but the lips become slightly spread and the tongue is tenser during the second part.

-[ɑu] as in *[hɑul] terribleness, [mɑut] death, [lɑun] color*. The staring point of this backing diphthong is the same as that of [ɑi], the low front vowel [ɑ] and the glide ends at the high back vowel [u]. The lips are neutrally open and the tongue is lax when articulating the first part of the diphthong but the lips move to a round position and the tongue becomes tense during the second part.

-[ui] as in *[bui] my father, [xui] my brother*. The starting point of this fronting diphthong is the high back vowel [u] and it glides to the high front vowel [i] the lips take a rounded position during the articulation of the first element of th diphthong but they become slightly spread in the production of the second part. The tongue is tense when the diphthong is pronounced.

As is the case with simple vowels, complex vocalic units are realized in two allophones each: plain and emphatic. The emphatic allophones of diphthongs, like those of simple vowels, are found in the environment of emphatic consonants.

(12) Plain and Emphatic diphthongs in Arabic

Plain	[sɑif] sword	[sɑuwɑr] to fence in
Emphatic	[sɑif] summer	[sɑuwɑr] to photograph

1.3. The Two Systems in Contrast

Now we have analyzed the vowels of English and Arabic, we move on to compare and contrast the two systems in order to specify the similarities and the differences between them. But before we go into details of comparison, it would be useful to provide a list of both English and Arabic vowels in order to make such a comparison more obvious.

(13) English and Arabic vowels

English vowels	Examples	Arabic vowels	Arabic allophones	Examples
i:	Eat [i:t]	i:	i:	[zi:r] large jar
I	Hit [hIt]		i:	[si:t] reputation
e	Head [hed]	i	i	[zir] button
Q	Bad [bQd]		i	[tir] fly (imp.)
A:	Art [A:t]	u:	u:	[tu:t] mulberry
ü	Got [ɡüt]		u:	[tu:l] length
ì:	Sort [sì:t]	u	u	[ᴸum] swim (imp.)
U	Put [pUt]		u	[sum] fast (imp.)
u:	Blue [blu:]	A:	A:	[kA:n] was
⊢	Cut [k⊢t]		A:	[dA:r] harmful
╫:	Term [t╫:m]	A	A	[ᴸAlA:] on
½	About [½baUt]		A	[DAfir] won
eI	Make [meIk]	Ai	Ai	[bAin] between
aI	Tide [taId]		Ai	[tAir] bird
ìI	Noise [nìIz]	Au	Au	[ᴸAun] help
½U	Coat [k½Ut]		Au	[qAul] saying
aU	Cow [kaU]			
I½	Here [hI½]			
e½	Air [e½]			
U½	Sure [SU½]			

A closer look into these vowels shows that we can group the vowels of the two systems in two categories: similar and different vowels.

Similar vowels

They are those vowels that have similar distinctive features with respect to the
position of the tongue and lips. They are the high front vowels [i:, i:] and [I, i], the high back vowels [u:, u:] and [U, u], the low front vowels [Q,A:], the low central vowel [A:, A:], the

fronting diphthong [aɪ, ʌi] and finally the backing diphthong [aʊ, ʌu]. (Note that the first vowel of each pair is English while the second is Arabic).

(14) Similar vowels in English and Arabic

English vowels	Examples	Arabic vowels	examples
[i]	lean [i:n] feel [fi:l]	[i:]	[li:n] softness [fi:l] elephant
[ɪ]	sin [sɪn] bill [kɪ]	[i]	[sin] tooth [bil] make wet (dialectal)
[u:]	fool [fu:l] toot [tu:t]	[u:]	[fu:l] beans [tu:t] mulberry
[ʊ]	pud (pudding) [pʊd] full [fʊl]	[u]	[bud] escape [ful] jasmine
[ɒ]	lamb [lɒm] sad [sɒd]	[ʌ:]	[lʌ:m] blamed [sʌ:d] enough (dialectal)
[ʌ:]	tar [tʌ: (r)] far [fʌ:(r)]	[ʌ:]	[t∣ʌ:r] flew [fʌ:r] mouse (dialectal)
[aɪ]	side [saɪd] sigh [saɪ]	[ʌi]	[s∣ʌid] hunting [s∣ʌif] summer
[aʊ]	mouse [maʊs] lousy [laʊzɪ]	[ʌu]	[mʌuz] banana, [lʌuzi] my almonds
[ì:]	horse [hì:s] gorse [gì:s]	[ì:] dialectal	[≡ì:ꜱ] house, [gì:ꜱ] bow

In addition to these vowels, which are available in both the dialectal and the standard varieties of Arabic and which have similar counterparts in English, there is the specifically dialectal Libyan Arabic vowel [ì:] which is similar to the English vowel [ì:]. The similarity of these vowels can be illustrated through examples such as those presented in table14 above.

Different sounds

Different sounds are expected to consist of two sets: those which are found in English and not in Arabic and those

which are found in Arabic and not in English. However, all Arabic vowels, irrespective of the minor differences, have similar counterparts in the English sound system. On the other hand, the set of vowels which are found in English but not in Arabic contains a relatively large number of both simple and complex vowels. They are [e, ü, ├, ╫:, ½, eɪ, ìɪ, ½U, ɪ½,e½,U½].

PART II: acoustic characteristics of the vowels of the two systems

2.1. The importance of acoustic analysis

So far vowels have been dealt with from an articulatory point of view. That is, how sounds are made and produced using the vocal tract. It is also possible, however, to describe these vowels acoustically. That is, how sounds move in the air from a speaker to a hearer. Analysing sounds and particularly vowels acoustically has some advantages (Ladefoged, 2001: 161). First, it helps in explaining the confusion that some sounds may make. It might not be enough to show the difference between similar sounds, for example, by only describing how these sounds are articulated. Another advantage of acoustic analysis is that it provides a better understanding of the structure of sounds. Again, describing the movements of the organs of speech may not give a complete picture of the factors involved in producing these sounds. Finally, although it is possible to listen to a sound or a sequence of sounds several times by recording them, this will not give the kind of information given by analysing these sounds acoustically: "the best way of describing vowels [therefore] is not in terms of the articulations involved, but in terms of their acoustic properties" (Ladefoged, 2003: p104).

What follows is a discussion of these acoustic characteristics that will be given through the analysis of some English and Arabic vowels. In other words, what has been

concluded from our articulatory discussion in the previous part to be similar. We will try to ascertain if they are really similar and if they are so, to what extent they are similar.

2.2. Vowel Production and the Source Filter Theory

Air coming up from the lungs makes the vocal folds vibrate and this is the source of sound in vowels. Then air goes through the vocal tract which works as a filter for these sounds and modifies them according to the shape it takes. This is known as 'the source-filter theory of vowel production' (Fant, 1960 cited in Johnson, 2003: p79). To make it simple, we can think of the vocal tract, from the vocal folds to the lips, as a tube that consists of two main parts (i.e. the throat and the mouth) and takes different shapes to produce different sounds. These different shapes of the vocal tract produce resonance which results from the vibration of the air in that vocal tract. The resonance resulting from the vibration of the air in the back of the vocal tract (i.e. the throat) is called the first formant (F1) and the resonance made in front of the vocal tract (i.e. the mouth) is called the second formant (F2)(Ladefoged, 2005: p34-35). In fact, there are more than two formants involved in the production of vowels but it is usually satisfactory to describe vowels in terms of the first two formants. The unit of measurement for formants is Hertz, abbreviated as Hz, which refers to the number of frequency cycles per second.

2.3. The experiment

In the previous part of this work, the researcher tried to determine which vowels are similar and which vowels are different in both English and Arabic. In this part, the similar sounds are investigated acoustically to determine scientifically to what extent these sounds are similar. To do this, the

following two sets of words illustrating these vowels were chosen from the two languages.

(15) Words used for acoustic analysis from both Arabic and English

ENGLISH		ARABIC	
Lean	[li:n]	لين	[li:n]
sin	[sɪn]	سن	[sɪn]
Fool	[fu:l]	فول	[fu:l]
Full	[fʊl]	فُل	[ful]
Lamb	[lɒm]	لام	[lɑ:m]
Tar	[tɑ: (r)]	طار	[tˤɑ: r]
Side	[saɪd]	صَيد	[sˤüid]
Mouse	[maus]	مَوز	[mʌuz]
Gorse	[gɔ̀:s]	قوس	[gɔ̀:s]
Feel	[fi:l]	فيل	[fi:l]
Kill	[kɪl]	زن	[kil]
Toot	[tu:t]	تُوت	[tu:t]
Pud	[pʊd]	بُد	[bud]
Sad	[sɒd]	سَاد	[sɑ:d]
Bar	[bɑ:(r)]	بار	[bɑ:r]
Sigh	[saɪ]	صَيف	[sˤʌif]
Lousy	[lauzɪ]	لوْزي	[lʌuzi]
Horse	[hɔ̀:s]	حوش	[ḥɔ̀:ʃ]

As can be seen from the words above, an effort has been made to minimise the differences between these similar sounds in the two languages by choosing words that sound similar. It is not only the case that the sounds are similar but also the pronunciation of the words in both languages, although the meaning is completely different. This is done in order to keep affecting variables to the minimum although it was not always possible to do so.

Then two subjects from each language were chosen to say the words with two tokens of the above 18 words representing 9 vowels in each language (two words for each vowel). The speakers from both languages are males who are

in a similar age (11-12 years). The choice of two words for each vowel enabled us to check the reliability of the measurements of the formants. In addition, words of each language were recorded twice by the same speaker which made it possible to put the measurements of the two utterances of the same word against each other and see if they differ or whether any errors have been made. This experiment aims at investigating both quality and quantity in similar vowels of English and Arabic.

2.3.1. Vowel Quality in English and Arabic

The quality of a vowel refers to the shape taken by the vocal tract when producing that vowel. This relates directly to the formants since F2 drops as the tongue retracts and F1 rises as the mouth opens. This means that the English High front vowel [i:], for example, has a higher F2 than the high back vowel [u:]. By contrast, the vowel [ɑ:] has a higher F1 than [ü], for instance, because the former is more open than the latter.

English vowels

The following is a table showing average F1 and F2 of the vowels in question produced by two English native speakers.

(16) English Vowel formant values in Hertz (Hz)

Vowels	i:	I	u:	U	ì:	ɒ	ʌ	aI	aU
F1	443	604	476	640	561	887	846	689 577	795 505
F2	2103	1778	1369	1396	1044	1495	1204	1769 2071	1552 1232

As previously mentioned, F1 is expected to rise as the mouth opens and this is exactly what can be seen from the above table. For example, F1 for [i] is lower than that for [I] (443 vs. 604) since the latter is more open than the former. By

contrast, F2 is expected to drop as the tongue retracts and this can by seen from F2 for [ɒ] as compared to that of [ɑ:] in the production of which the tongue is more retracted (1495 vs. 1204). Also, diphthongs are represented by two values each for each formant since they consist of two elements each and every element should be measured separately (Ladefoged, 2003: p104-5).

Arabic vowels:

Following the same procedure applied in measuring English vowel formants, Arabic vowel formants can be shown as in the following table.

(17) Arabic Vowel formant values in Hz

Vowels	i:	i	u:	u	ɨ:	ʌ:	ʌ:	ʌi	ʌu
F1	474	488	516	521	634	703	743	633 443	651 465
F2	1992	1738	1634	1561	1257	1852	1437	1773 2493	1525 1508

With regard to F1, it is clear that the two vowels [i:] and [i] do not differ much (474 vs. 488) because they have the same place of articulation. The two vowels only differ in duration. That is the former is long whereas the latter is short. The same thing can be said about the other two vowels [u:] and [u] (516 vs. 521]. On the other hand, the two vowels [ʌ:] and [ʌ:] show a little difference in F1 (703 vs. 743) because the latter is more open than the former. However, the same two vowels show a great difference with regard to F2 (1852 vs. 1437) because the latter, which is an emphatic vowel, is more retracted in its pronunciation than its plain counterpart [ʌ:] (see section 1.2.2).

The two systems in contrast

To make the comparison clear, the two tables of the formants of vowels of both languages have been integrated in a single table as shown below.

(18) English and Arabic Vowel formant values

English Vowels	i:	I	u:	U	ì:	Q	A	aI	aU
F1	443	604	476	640	561	887	846	689 577	795 505
F2	2103	1778	1369	1396	1044	1495	1204	1769 2071	1552 1232
Arabic Vowels	i:	i	u:	u	ì:	A:	A:	Ai	Au
F1	474	488	516	521	634	703	743	633 443	651 465
F2	1992	1738	1634	1561	1257	1852	1437	1773 2493	1525 1508

Having examined the table above, we can make the following general remarks:

1. The English vowel [i:] and its Arabic counterpart [i:] do not differ much with regard to their formants: F1 and F2 (443 vs. 474).

2. The English sound [I] has a higher F1 than its Arabic counterpart [i] (604 vs. 488) because the former is more open than the latter. However, they do not differ much with regard to F2 (1778 vs. 1737) and this is an indication that they both have a similar position with regard to tongue retraction. The same thing can be said about the English vowel [U] and its Arabic counterpart [u]. The English vowel [u:] and the Arabic vowel [u:] have a similar F1, but they differ with regard to F2 (1369 vs 1634) because the former is more retracted than the latter.

3. The English vowel [ì:] and its Arabic counterpart [ì:] show some difference in that the latter is a little more open than the former (F1: 561 vs 634) and the former is more retracted than the latter (F2:1044 vs 1257).

4. The English vowel [Q] is more open and retracted than its Arabic counterpart (F1: 887 vs 703 and F2: 1495 vs1852). That is also true of the English vowel [A:] and its Arabic counterpart [A:], that is, the former is more retracted and open than the latter.

5. Diphthongs are more complex with regard to the analysis of their formants since each diphthong consists of two elements with different formants. As for the English diphthong [aI] and its Arabic counterpart [Ai], they generally show a little difference with regard to F1 of both elements (689 vs 633 and 577 vs 443). However, although F2 is similar in the first element (1769 vs 1773), it shows a considerable difference in the second element (2071 vs 2493) which means that this element is more retracted in the English vowel than that of the Arabic one. The same thing applies to the English diphthong [aU] and its Arabic counterpart [Au].

The above-mentioned differences between these vowels which are initially supposed to be similar are reflected in the pronunciation of the same previously analysed English words produced by Arab speakers. The table in (20) shows how English vowels are produced by Arab speakers. Also, tables in (19) and (21) showing English and Arabic vowels produced by native speakers of the two languages are reproduced here to facilitate the comparison.

(19) English vowels produced by native speakers

Vowels	i:	I	u:	U	ì:	Q	A	aI	aU
F1	443	604	476	640	561	887	846	689	795

								577	505
F2	2103	1778	1369	1396	1044	1495	1204	1769 2071	1552 1232

(20) English vowels produced by Arab speakers

Vowels	i:	I	u:	U	ì:	Q	A	aI	aU
F1	465	556	512	542	651	785	788	772 532	696 612
F2	1929	1949	1381	1477	1457	1539	1252	1739 2351	1476 1376

(21) Arabic vowels produced by native speakers

Vowels	i:	i	u:	u	ì:	A:	A:	Ai	Au
F1	474	488	516	521	634	703	743	633 443	651 465
F2	1992	1738	1634	1561	1257	1852	1437	1773 2493	1525 1508

In a close investigation of these formant values we can clearly find that most values of the English formants of vowels produced by Arab speakers occur between those of the target language and those of the mother tongue. This is a good indication that learners are not replacing target sounds with similar ones from their mother tongue but are trying to reach their target although it is not always possible to do so. This is so, since those Arab speakers have spent more than three years in the UK and they are at a suitable age for acquiring English as a foreign language (11 and 12 year old).

2.4. Vowel Duration in English and Arabic
English vowels

The following table shows the average duration of the English vowels spoken by native speakers.

(22) Duration of English vowels in seconds

Vowels	i:	I	u:	U	ì:	Q	A:	aI	aU
Duration	0.146	0.089	0.126	0.100	0.179	0.162	0.193	0.212	0.191

It is clear from the table that the English vowels [ɪ] and [ʊ] are short whereas [i:], [u:], [ɜ:] and [ʌ:] are long. However, the vowel [ɒ] seems to be longer than the other short vowels yet shorter than long vowels. Diphthongs are also considered long vowels and this is clear from their duration values.

Arabic vowels

In the same procedure followed in dealing with English vowels, the following table shows the average duration of Arabic vowels.

(23) Duration of Arabic vowels in seconds

Vowels	i:	i	u:	u	ɜ:	ʌ:	ʌ:	ʌi	ʌu
Duration	0.174	0.087	0.147	0.079	0.184	0.179	0.179	0.184	198

The above table shows that the two vowels [i] and [u] are short while all other vowels are long including the two diphthongs [ʌi] and [ʌu]. It should also be emphasised that length of vowels is context dependent. Therefore differences in duration between long vowels, for example, can be explained by referring to the context in which they occur, as mentioned in the first part of this paper.

The two systems in contrast

As can be seen from the table in (24) that there is a big similarity between the English vowels and their Arabic counterparts with regard to their duration apart from a few exceptions which, as said earlier, can be explained by referring to the context in which these vowels have been produced. For example, a vowel is often longer word-finally than before a consonant and it is often longer before a voiced consonant than before a voiceless one. The vowel [u], for instance is longer in the word *too* than that in the word *fool* which is longer than the one in *toot*.

(24) Duration of English and Arabic vowels

English Vowel	i:	I	u:	U	ì:	Q	A:	aI	aU
Duration	0.146	0.089	0.126	0.100	0.179	0.162	0.193	0.212	0.191
Arabic Vowel	i:	i	u:	u	ì:	A:	A:	Ai	Au
Duration	0.174	0.087	0.147	0.079	0.184	0.179	0.179	0.184	198

Conclusion:

This research work was concerned with a comparison between similar vowels in both English and Arabic, auditorily as well as acoustically. Two major characteristics were studied: quality and quantity. The aim of this study was to find out to what extent these sounds are similar and the effect of their similarity on learning English vowels by native speakers of Arabic.

The results showed that Arabic vocalic sounds are similar in some aspects to their English counterparts. However, Arab learners of English do not substitute English vowels for their Arabic counterparts but, instead they try to reach the target sounds although they are not totally successful in accomplishing their goal.

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