

The case of the invisible vowels: Arabic speakers reading English words

Ann Ryan and Paul Meara

Centre for Applied Language Studies, University College Swansea

This paper investigates the hypothesis that Arabic-speaking learners of English, because of the lexical structure and orthography of their L1, will tend to rely heavily on consonants when attempting to recognise English words. A pilot experiment showed that Arabic speakers tended to confuse words with similar consonantal structures. In the main experiment, different groups were compared for their ability to notice missing vowels in word matching tests. Arabic speakers made more errors than either non-Arabic speaking learners of English, or native speakers. They were also much slower than the other groups in performing the tasks. The authors conclude that these results are compatible with their hypothesis, but that further experiments using words with missing consonants will be needed to confirm it fully.

INTRODUCTION

Most language teachers who have worked with Arabic speakers will have found themselves wondering whether Arabic speakers have a particular problem about learning to handle English words which is not shared by speakers of other languages. Speakers of Arabic, like other learners of English, have problems handling the segmental phonology of English, and experience difficulties with phonological distinctions that are not made in Arabic. Arabic speaking learners, however, seem to have other word-handling problems which cannot be simply explained in terms of contrasts in the phonologies of English and Arabic. Consider the following errors:

- . . . climb to the top of the moments (mountains)
- decimal, is that the word which means sad (dismal)
- what's the difference between pulls and plus?
- you spread the sheep from the goats (separate)

These errors, and others like them, which will be familiar to any teacher of Arabic-speaking students, seem to be more dramatic and outlandish than the errors ordinarily produced by Spanish speakers, say, or German speakers. They occur in large numbers among Arabic speakers, especially in low level learners.

Similar phenomena have been noticed by others. For instance, Alsulaimani (1990) simply displayed English words on a computer screen, and asked his subjects to read them aloud. A selection of the errors he recorded is reproduced in Table 1.

Dr Paul MEARA was head of the department of Applied Linguistics at Birkbeck College London; he is now Director of research in the Centre for Applied Language Studies, University College of Swansea. Ann RYAN is a senior tutor in the Centre for Applied Language Studies, University College of Swansea. She has a special interest in the reading skills of Arabic speakers. The authors may be contacted at CALS, University College, Swansea SA2 8PP, UK.

Table 1: Word reading errors made by Arabic speakers

TARGET	REALISATION	TARGET	REALISATION
biscuit	basket	blue	play
circuit	cricket	pint	painting
bowl	ball	capsule	capture
castle	custard	grill	girl
hair	higher	protein	Britain
splendid	spill	strewn	Citroen
stupid	stopped	sure	sir
trout	throat	plane	playing
subtle	stable	abroad	aboard
president	presented	difficult	different
reflection	perfection	thorough	throw
subtle	subtitle	spade	speed
blew	below	capsule	cable

Alsulaimani also presents some examples in which students were presented with single words and asked to construct sentences containing them:

build	I boiled an egg for tea.	
protein	we have to protein this prisoner	(detain)
trough	I think it means the truth	
bury	a kind of fruit	(berry)
broad	aboard a ship	
base	the sound of bees	
strewn	the car's steering wheel	
cough	he caught the ball	
borough	to borrow a cup	

The striking thing about errors of this type is that they almost always preserve the consonant structure of the target word. The vowels are often incorrect, but more importantly, they are often omitted, or turn up in the wrong place relative to the surrounding consonants. Thus, we have *pulls* for *plus* where the underlying *PLS* pattern is intact, but the vowel position varies; *spread* alternates with *separate*, with an underlying *SPRT* consonant structure (many Arabic dialects don't have a voicing distinction); *moments* alternates with *mountains*, with an underlying *MNTS* pattern; and so on.

Given that this type of error is relatively common among speakers of Arabic, and not, it seems, among speakers of other languages, it has occurred to us for some time to wonder whether the errors might arise because of the way words are organised in

the Arabic language – in other words, maybe these errors arise because of a specifically lexical process, rather than a simple phonological one. This paper reports an attempt to find some empirical evidence to support this suggestion.

Arabic words are very different from words in Indo-European languages, where words tend to be made up of a relatively stable root, and a system of affixes that are added on to this stem. Most Arabic words are based instead on a root that consists of three consonants, and these three consonants can be combined with different patterns of vowels to produce a whole family of words that share a common meaning.

For example, the root k-t-b combines with vowel patterns to produce: maktaba – library; Ketaab – book; Kataba – he wrote and so on. The root d-r-s combines with other vowel patterns to produce mudarris – teacher; madrasa – school; darrasa – to learn and so on. Readers may also be familiar with the j-h-d root, which underlies jihad – holy war; jahada – to fight; mujahideen – freedom fighters (a term familiar from its use by Afghan guerillas) and so on.

These differences are striking enough, but even more interesting is the fact that modern Arabic writing does not normally represent short vowels. Only the consonants are written down, and the reader is required to fill in the vowels which are appropriate to the context. In theory, this means that a sentence like “the scribe wrote the book at his desk in the library” could contain five identical k-t-b sequences. In practice, of course, it is more complicated than this. Nonetheless, it is clear that readers of Arabic are accustomed to a script which places great importance on consonant structures, and plays down the importance of vowels.

This, of course, does not apply to English, and we could argue that an Arabic speaker learning to read English is faced with what seems to be far too much information when he reads an English word. In English, words with similar consonant structures are **not** always semantically related, and vowel differences can be critical. This convention may seem strange to a speaker whose L1 operates in a different way.

Although this idea is not a new one, we are not aware of any empirical data which actually provides evidence supporting it. Indeed, what evidence there is seems to point in other directions. For instance, in an extensive series of pilot studies, we gave Arabic speakers multiple-choice vocabulary tests, where some of the distractors were phonologically related to the correct answer. We expected to find that Arabic speaking students would accept phonological distractors more often than a group of speakers of European languages at a similar level. In fact, all our subjects, both Arabic and non-Arabic speakers, were quite good at rejecting phonological distractors, and most of the errors they made fell into the category of semantic

distractors. This finding is comparable with that noted by Henning (1973) and may have more to do with proficiency than with the first language of the subjects. Haynes (1984) makes similar comments.

In our final pilot study, however, we did find differences between the Arabic speaking subjects and their controls. In this experiment, we gave the subjects a list of sixty 8- or 9-letter words with one letter deleted, alternately the fourth or fifth position in the middle of the word. The words were listed in their defaced form in two columns on one side of a sheet of A4 paper with a space beside each word for the answer. The task was to reproduce the whole word. Fifty subjects over a range of proficiency levels, from lower to middle intermediate took part, and any subject who scored more than 10% incorrect responses was included in the final tally. This included all the Arabic speakers (9) and gave a control group of 7 non-Arabic speakers from a variety of non-European countries.

There were three possible types of error: (A) no try (the subject left a blank); (B) a try but with mistakes in the spelling; and (C) a different word entirely. What interested us was that the Arabic speakers produced twice as many words in category C as the other subjects. *Presrve*, for example produced *pressure* rather than the expected target *preserve*; *contnual* produced *control* rather than *continual*; *provded* produced *proved* rather than *provided*; and *preence*, which might have produced *presence* or *pretence* produced *prince* instead.

We interpreted the data as showing something more than wild guesses by the subjects. In most cases the new word shared several initial and some final consonants with the target word, and this was in line with our idea that Arabic speakers confuse words with a similar consonantal structure. There was also some evidence that missing consonants produced more errors than missing vowels, and again this fits with our model.

There are a number of obvious technical problems with this pilot work, notably the difficulty of producing large numbers of errors in a pencil and paper test – but the results were sufficiently interesting to encourage us to develop a more sophisticated test using essentially the same technique. The methodology, which is described in more detail below, uses a computer program to present pairs of words to readers one at a time. The pairs of words are sometimes identical, sometimes slightly different, and the subject's task is to say whether the two presentations are identical or not. Our broad working hypothesis is that Arabic speaking subjects would find the task more difficult than non-Arabic speakers of a similar proficiency level.

METHOD

Materials

The experiment used 100 frequent 10-letter words in English in a slightly unusual variation of the familiar lexical decision task. The words were all highly frequent

items, from the Thorndike and Lorge AA to 20 per million categories. (Thorndike and Lorge 1944.) In our task each word appears on a computer screen for approximately 1 second; it is then blanked out for approximately 2 seconds. The word then reappears **either** spelled correctly **or** in an altered form. Altered forms consist of spellings in which one vowel is removed. Of the hundred stimuli, forty words appeared in their correct form and sixty appeared in mis-spelt form. Of these latter, 15 lost the vowel in the second position, 15 in the fourth position, 15 in the sixth position and 15 in the eighth position. See Table 2 for examples.

Table 2: Examples of altered stimuli

1st presentation	2nd presentation	vowel deleted from
department	dpartment	second position
distribute	dstribute	second position
experiment	expriment	fourth position
automobile	autmobile	fourth position
management	managment	sixth position
revolution	revoltion	sixth position
sufficient	sufficint	eighth position
photograph	photogrph	eighth position

Task

The subjects' task is to decide whether the two presentations are identical. The subjects respond by pressing either a YES key or a NO key on the keyboard. Between-trials time is controlled by the subject.

Subjects

Three groups of subjects were tested:

- A: 10 Arabic speaking subjects, students from University College of Swansea with a proficiency range from lower intermediate to intermediate. All these subjects were in their early twenties and came from the Middle East. All were males.
- B: a control group of 10 non-Arabic speakers, at a comparable level of proficiency to the Arabic speakers. This group consisted of seven men and three women.
- C: a second control group consisting of 10 adult native speakers, teachers in the Centre for Applied Language Studies at University College Swansea.

Scoring

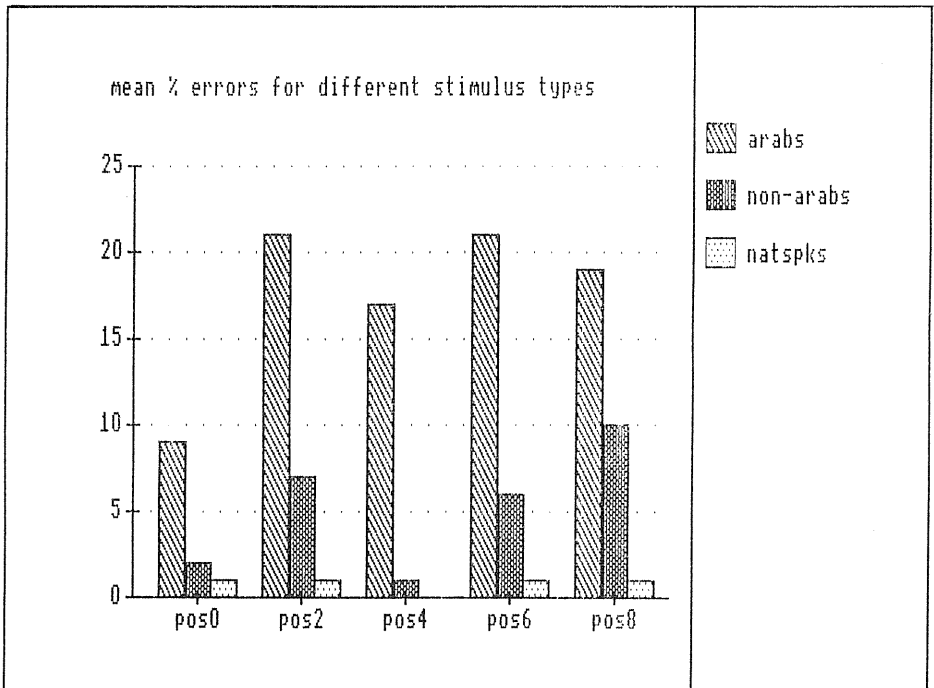
The computer program used to display the stimuli calculates decision time for each subject to each of the stimuli. For each of the five classes of stimuli the program calculates the mean reaction time for correct responses and records the number of incorrect responses. A correct response means YES when the two presentations are identical and NO when a vowel has been omitted from the second presentation.

RESULTS

Table 3: mean % errors for three groups

	pos 0	pos 2	pos 4	pos 6	pos 8	overall
Arabic speakers (n=10)	9.75	20.7	17.3	20.7	18.7	17.23
non-Arabic speakers (n=10)	1.51	7.3	1.3	6.0	10.0	5.26
Native speakers (n=10)	1.25	1.3	0.0	0.7	0.7	0.8

Figure 1:



a. errors

The pattern of errors produced by the three groups is summarised in Table 3 and Figure 1.

This data was subjected to an analysis of variance in which the main effects were group and stimulus type. The analysis showed that there was a highly significant group effect ($F(2,27)=10.3$, $p<.001$) – basically the Arabic speakers performed very badly overall, the native speakers performed very well overall and the non-Arabic speakers performed at intermediate levels. The analysis also showed a significant position effect ($F(4,108)=3.25$, $p=.017$) – basically, errors were fewest in Post 0, where the two items were identical.

Finally, the analysis failed to show a significant interaction between group and stimulus type. However, this data is rather difficult to interpret, as the errors made by native speakers were almost negligible, and we therefore reanalysed the data for the two learner groups alone. This analysis showed essentially the same patterns in the data. The Arabic speakers perform worse than the control group overall ($F(1,18)=6.95$, $p=.017$), and both groups are affected by the position of the omitted vowel ($F(4,72)=3.28$, $p=.016$). Again there is no interaction between the group and position effects.

b. reaction time data

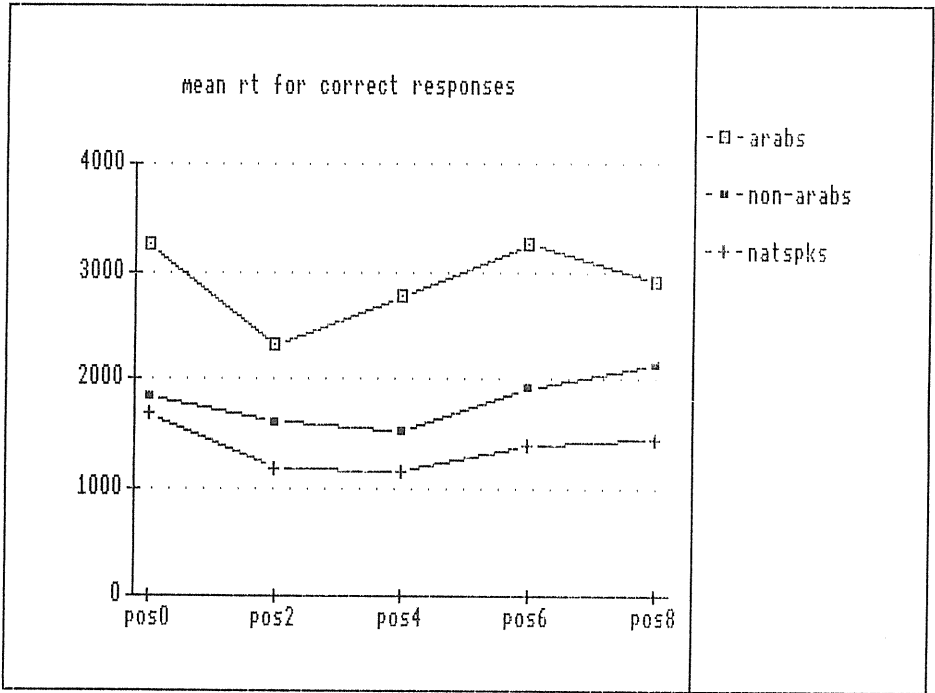
The reaction time data is summarised in Table 4 which shows the mean reaction time for correct responses for each of the stimulus types. The same data will also be found displayed in Figure 2.

Table 4: mean reaction time in milliseconds

	pos 0	pos 2	pos 4	pos 6	pos 8
Arabic speakers	3306	2336	2775	3257	2908
non-Arabic speakers	1860	1607	1533	1924	2152
Native speakers	1684	1189	1169	1401	1462

This data was also submitted to an analysis of variance with main effects group and stimulus type. The analysis revealed a hugely significant group effect ($F(2,27)=16.61$, $p<.001$) – (Arabic speakers were massively slower than the other groups) and a significant position effect ($F(4,108)=7.10$, $p<.001$).

Figure 2:



This position effect is relatively easy to interpret; subjects take longest to identify items that are unchanged ("pos 0"). Missing vowels in pos 2 and pos 4 are easily spotted and produce equally fast reaction times. Vowels missing from pos 6 and pos 8 are harder to handle, and produce slower reaction times. Positions 2 and 4 produce significantly faster reaction times than the other three positions. The slow reaction times for positions 6 and 8 are in line with earlier findings on word recognition in English, e.g. Aitchison (1987). There was no significant interaction between the two main effects.

DISCUSSION

The data reported in the previous section provides very strong support for the view that Arabic speakers have great difficulty in processing English words. The task we used here is extremely simple. All the subjects have to do is to read the first presentation of the item, store it in the short term memory and match this stored representation against the second presentation two seconds later. In fact, since the deformed stimuli are all shorter than the original presentations all the subjects really

need to do is to count the number of letters. But even this simple solution seems to be beyond the Arabic speakers. Despite the fact that our Arabic speakers are close to the non-Arabic speakers in terms of overall proficiency, they nonetheless produce a significantly higher number of errors and significantly slower reaction times.

How can we explain this discrepancy? In the introduction to this paper we argued that vowels might be expected to cause particular difficulty for Arabic speakers and we suggested that Arabic speakers might be using mental representations of English words which ignore vowels and rely very heavily on consonantal segments. The data reported here is obviously compatible with this speculation. The data does not force this interpretation, however. What we really need is a further experiment in which consonants are systematically deleted instead of vowels. We would expect Arabic speakers to perform much better on this task than they do in the present experiment and data of this sort would confirm that they are indeed relying on consonantal representations of English words. Work of this type is currently underway in Swansea.

It is perhaps surprising that none of the interactions between group and position were significant. The data in figures 1 and 2 certainly suggest that the Arabic speakers are performing differently from the other two groups, who both look remarkably similar to each other. Bearing in mind that Arabic writing goes from right to left, rather than from left to right, it would not have been surprising to find that the Arabic speaking group scanned the words rather differently from the two other groups. There is, in fact, a general trend from left to right in the data, but this is less apparent in the Arabic speakers, who appear to locate errors at the extreme right (position 8) more quickly than we would have expected. They also appear to be very much slower than we might expect at accepting identical pairs of items (pos 0). The general trends are slightly misleading, however, in that there is a huge amount of variation in the scores of the Arabic speakers. The standard deviations of this group are very high – typically 3 to 4 times higher than the native speaker group for the reaction time data, and even larger for errors, and this suggests that it might be worth looking in more detail at individual subjects in further work of this type.

In the meantime, this data clearly shows that Arabic speaking learners of English may be faced with word processing problems that are rather different from those faced by other learners of English, and that these difficulties may be related to the lexical structure and orthography of Arabic. It remains an open question whether other L1 orthographies produce similar psycholinguistic difficulties.

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