The Production of English /r/ From a Foreign Language Learner Perspective

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Abstract

This paper presents a contrastive study of Arabic and English /r/ showing that the two forms of /r/ exhibit different articulatory and acoustic features. The ultimate goal is to account for problems facing Arab learners of English in their production of an English /r/.

The study analyzes data collected from 25 senior-level Arabic-speaking students. The production of /r/ in initial, medial, and final positions was tested at the level of single words, phrases, sentences, and a short text. The data which were analyzed by two judges, British and American, showed that English and Arabic /r/ exhibit more split and divergence than merger. Therefore, communication problems caused by L1 transfer arise. The study stresses the importance of these findings to language teachers, textbook writers, and test designers.

Introduction

In their attempt to acquire another language, speakers tend to substitute the sounds of their native language for the sounds of the language they are learning. According to Bialystok and Hakuta (1994: 11), "Second-language learning takes the first language as its starting point." Along the same lines, Williams (1980) shows that "learners begin by perceiving second-language speech according to their native-language categories, and then gradually shift their perceptual boundaries" (qtd. in Bialystok and Hakuta 1994: 16). And as the phonetic boundaries of bilingual and monolingual speakers are not the same, this results in a "foreign accent," "foreigner talk," interlanguage," approximative systems" (see Watson 1991, Scovel 1988, Wolfram

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The present study investigates one of the problems facing Arab learners of English in their production of English /r/. The problem is triggered by the different phonological patterns governing the articulation of the /r/ sound in both English and Arabic. Furthermore, English /r/ receives different treatment in British English (Received Pronunciation, RP) and American English.

Whereas Arabic /r/ is described phonetically as an alveolar trill or roll, RP /r/ is a voiced post-alveolar frictionless continuant as opposed to the voiced post-alveolar (American) retroflex. According to Lehn and Slager (1959), English and Arabic /r/ are entirely different. "Arabic /r/ represents an apical trill, in English a slightly retroflex resonant continuant (a vocoid") (in Robinett and Schachter 1983:35). Consequently, Arabic speakers fail to hear and produce a proper English /r/ since some of the phonetic details governing the production of this sound are not recognized in the Arabic sound system. Prominent examples such as those of Joseph Conrad, Henry Kissinger, and Roman Jakobson are often cited as cases of accomplished language learners whose spoken English is marked by a foreign accent (see Bialystok and Hakuta 1994: 75). And as Wolfram and Johnson (1982:4) put it "filtering sounds in terms of the native language rather than the second language is a natural tendency which must be overcome if a person is to acquire real fluency in a foreign language." The present study is particularly important on two levels:

(a) It provides, on purely theoretical grounds, an analysis of a problematic sound segment.

(b) It lends support to the idea of viewing speech errors within the larger context of the communicative network.

Production errors caused by lack of correspondence between the native and foreign language phonetic systems lead to the transfer of native language features. As a matter of fact, Arabic and English /r/ are different in their distribution and
variants (see section 8: 1-3 below). This discrepancy signals the advent of negative transfer evidenced in production distortions. On addressing the question of "transfer" and "interference", Lehn and Slager (1959) reported that "Arabic speakers have difficulty with /s/ in all environments and substitute /tr/, which is (probably) least acceptable to speakers of English in items such as bird, shirt, fur, her" (in Robinett and Schachter 1983: 35).

2. Hypotheses

Given that English and Arabic /tr/ exhibit different articulatory and acoustic features, the paper rests on the assumption that:

a) English /tr/ poses a maximum learning difficulty to Arab learners of English where the possibility of native language (L1) transfer arises (cf. section 3 below: Scope and Purpose).

b) Jordanian students, who have been schooled in a predominantly British English system, are expected to reflect a British English variety more than an American English one. This assumption will be tested through the production of English /tr/.

3. Scope and Purpose

The present study aims to investigate the linguistic performance of Arab learners of English in their attempt to produce an English /tr/, a sound segment which diverges significantly from its Arabic counterpart. The paper looks at the phonological production of this segment by Arab learners of English in relation to British and American varieties of English. The overall process is viewed as relevant to foreign accents, language teaching, learning and testing.

The study also utilizes the acoustic aspect of phonetics to compare and contrast Arabic and English /tr/. The idea is to shed more light on the articulatory production of /tr/ by uncovering as many features of the two r's as possible.
**Theoretical background: Articulation of /t/**

4.1 English /t/: In the two varieties of English, British English and American English, the /t/ receives a different description in terms of place and manner of articulation. In American English, the tip of the tongue does not cause friction with the alveolar area. The body of the tongue is depressed with the tip raised and pointing towards the hard palate (i.e., retroflexed). In addition, the lips are slightly rounded (see Roach 1983: 49, O'Connor 1980: 60). According to Roach 1983: 49), "the curling-back process usually carries the tip of the tongue to a position slightly further back in the mouth than that for alveolar consonants such as /l/ and /dl/, that is why this approximant is called "post-alveolar". Concerning the manner of articulation, British English /t/ is classified as a frictionless post-alveolar approximant, which is characterized by a single flap of the tongue against the alveolar ridge.

4.2 Distribution of Arabic /t/: Arabic /t/ has a full-scale distribution occurring initially, medially, and finally. According to Anani (1985: 132), "the distribution of Arabic trill consonants shows that the quality of the open vowel in the environment is invariably back and that a trill consonantal articulation is always followed or preceded by a back open vowel" (see section 7.2 below for examples cited from Anani (1985:132)).

In view of these facts, we can capture the differences between English an Arabic /t/ through the notion of markedness, " which was developed first within the Prague school of linguistics and has recently been reintroduced by Chomsky and Halle " (Schane 1973: 112). According to this concept, Arabic /t/, which is described phonetically as an alveolar trill or roll is considered the norm or unmarked member for Arabic speakers. On the contrary, the English post-alveolar retroflexed /t/ is considered the marked one.

Another important contribution of the present study is using the acoustic component of phonetic description to support the articulatory and distributional facts of English and Arabic /t/. The two /t/ are examined acoustically according to their distribution, frequency, and the duration of each in seconds.
5. Methodology

5.1 Sample

The population of the study was 25 senior-level native Arabic-speaking students in the Department of English at the University of Jordan, Amman. The subjects were chosen randomly irrespective of sex, academic standing, social class, or any other non-linguistic variables and ranged from 21-22 years of age. All 25 students have completed a sequence of compulsory courses leading towards a B.A. degree in English and are, at the same time, relevant to this study. These courses are: Listening Comprehension, Phonetics, Oral Skills, and Pronunciation and Speech.

5.2 Corpus

The corpus of data consisted of four different categories: words, phrases, sentences, and a short text.

1. Words: A list of 15 words falling in three columns of five words each was prepared. The three columns represented the distribution of the /r/ phoneme: initially, medially, and finally, in the first, second, and third columns, respectively.

2. Phrases: A total of 9 phrases including nine occurrences of /r/ were prepared. The nine occurrences were representative of initial, medial, and final position /r/, with three examples of each.

3. Sentences: This category consisted of 5 sentences including 18 occurrences of /r/ as follows: 5 initial, 5 medial, and 8 final.

4. A short text: consisting of a 8-line paragraph of 100 words and including 35 occurrences of /r/: 5 initial, 20 medial, and 10 final. A summary of the corpus is given in Table 1 below:
Table (1)

<table>
<thead>
<tr>
<th>Category</th>
<th>Initial</th>
<th>Medial</th>
<th>Final</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Phrases</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>09</td>
</tr>
<tr>
<td>Sentences</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Paragraph</td>
<td>5</td>
<td>20</td>
<td>10</td>
<td>35</td>
</tr>
</tbody>
</table>

The idea behind diversifying the data is to test the students’ performance at all levels, from the single word to the full paragraph and in as many phonetic environments as possible. A full listing of the items representing the five categories stated above is given in an appendix.

5.3 Procedure

All 25 students were briefed about the method in which the experiment would proceed. Each student was required to record the entire data in the recording room of the language laboratory.

5.4 Data Analysis and Evaluation

The recorded data were analyzed by two judges: a native speaker of British English and a native speaker of American English. The need for two judges arose from the fact that two forms of English /r/ were represented in the elicited data, British pronunciation and American pronunciation. Therefore, it was necessary to analyse the data by two judges to ensure accurate and valid results.

The two judges who checked the data separately were asked to provide ratings for the "accentedness" of deviant forms in the production of English /r/. It is important to point out, however, that even within the same variety there is no strict adherence by speakers to one specific stylistic norm or fixed pattern. In fact, contextual styles reflect an array of stylistic variation or a "stylistic continuum", as evidenced in Labov's (1972:71) study of "Martha"s Vineyard and the five New York City variables, (r), (eh), (oh), (th), and (dh)."
6. Results

The two judges rendered different results. The discrepancy in the findings of the two judges was especially found regarding the pronunciation of English /h/ in medial and final positions. The British judge based his evaluation on the distributional peculiarity of /h/ in (RP) according to which the phoneme /h/ only occurs before vowels. At the end of words, RP retains the /h/ only if the immediately following word begins with a vowel. Any violation of this distributional norm was considered deviant by the British judge. The American judge, on the other hand, considered as correct the retention of /h/ before a consonant and in final position. A summary of the results is given in Table 2 below:

Table (2)

/h/ error frequency count by category, judge and distribution.

<table>
<thead>
<tr>
<th>Category</th>
<th>Judge</th>
<th>Initial</th>
<th>Medial</th>
<th>Final</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words</td>
<td>Br.</td>
<td>32</td>
<td>14</td>
<td>46</td>
<td>92</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>Am.</td>
<td>35</td>
<td>28</td>
<td>32</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>Phrases</td>
<td>Br.</td>
<td>22</td>
<td>28</td>
<td>34</td>
<td>77</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td>Am.</td>
<td>24</td>
<td>32</td>
<td>22</td>
<td>61</td>
<td>27.1</td>
</tr>
<tr>
<td>Sentences</td>
<td>Br.</td>
<td>16</td>
<td>28</td>
<td>23</td>
<td>67</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Am.</td>
<td>20</td>
<td>16</td>
<td>22</td>
<td>62</td>
<td>13.8</td>
</tr>
<tr>
<td>Paragraph</td>
<td>Br.</td>
<td>11</td>
<td>8</td>
<td>18</td>
<td>69</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>Am.</td>
<td>15</td>
<td>12</td>
<td>15</td>
<td>61</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>Br.</td>
<td>81</td>
<td>103</td>
<td>121</td>
<td>89</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>Am.</td>
<td>94</td>
<td>80</td>
<td>89</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results are given in two sets of figures: the upper set represents scores given by the British judge and the lower set represents those scored by the American judge. In addition, a calculation of the percentages of errors according to category, distribution, and judge is provided.
7. Discussion

By considering the results obtained from the analyzed corpus of data, we can easily realize that native speakers of Arabic face difficulties in producing a proper English /t/. Our discussion of the results will be carried out at two levels:

1. Correlation between the frequency of /t/ production errors and variety: British English vs American English.

2. Causes of /t/ production errors in the speech of Arab EFL learners.

7.1 Production errors according to variety

The results show that the two varieties of English: British and American were represented in the students' performance. And contrary to the commonly-held belief, the students' performance errors revealed that the total number of errors in all five categories was higher in the British English variety than in the American English. The figures showed 92:79 (= 24.5%: 21%) in words; 77:61 (= 34.2%: 27.1%) in phrases; 67:62 (= 14.9%: 13.8%) in sentences; and 69:61 (= 7.9%: 6.9%) in the paragraph. But in spite of these differences, the findings indicate that there are no strikingly significant differences which restrict students' errors to one variety of English but not to the other.

As for distribution according to category and variety, the British judge recorded a higher frequency of errors in all five categories in medial and final positions. The students' performance errors totaled 103 (= 5.3%) in medial position on the British English judge scale, against 80 (= 4.1%) for the American English judge. Also, 121 (= 6.3%) against 89 (= 4.6%) final position errors were recorded by each of the British and American judges respectively. In initial position, however, the results were reversed. The performance errors count revealed a total of 81 errors (= 4.1%) scored by the British judge against 94 (= 4.9%) by the American judge.

A valid interpretation of these findings is that British English and American English have a different distribution of the phoneme /t/. 
According to O'Connor (1980:61), in (RP), "/r/ only occurs before vowels, never before consonants, so words like learn, sort, farm do not contain /r/ (/lɜːn/, /sɔːt/, /faːm/). Other varieties of English (e.g., American, Irish, Scottish) pronounce /r/ in these words" (i.e., with a rhotic accent). In final position, "RP has /r/ only if the immediately following word begins with a vowel, as a linking /r/, e.g., never again" (representing non-rhotic accents) (ibid: 61: 61; see also Roach 1983:50).

It is worth noting that the error frequency count according to variety (i.e., British English vs. American English) yielded significant results. As Table 2 above showed, errors resulting from differences in the distributional patterning of British English and American English /r/ were not detected on a large scale in the error frequency count rendered by the two judges. For example, medial position occurrences were not markedly different from those of initial position. One would have expected sharp differences between the two judges especially with the presence vs. absence of /r/ in medial position in the two varieties. It is important to note the consistency in the ratings of the two judges with regard to the distributional patterning of initial and medial position /r/. The American judge has consistently reported more initial position errors while the British judge has always found more medial position errors.

The case for initial-position English /r/ (which is shared by the two varieties) reflected similar results by receiving almost similar ratings from the two judges. The frequency count and percentages showed: 32:35 (25%: 28%) in words; 22:24 (29%: 32%) in phrases; 16:20 (12%: 16%) in sentences; and 11:15 (8%: 12%) in the paragraph, with the first figure representing the British English variety systematically. In other words, the initial position /r/ scores reflected largely similar percentages to those of the medial and final positions, to which the two varieties of English exhibited different distributional patterns.

7.2 Causes of /r/ production errors

The data showed that the students have neither used a purely British English /r/ nor a purely American English /r/. The form of /r/ produced here is nothing but a distorted form of English /r/ which was caused by negative transfer from L1 (i.e.,
Arabic) and resulted in interference. It is basically an example of an "approximative system" (Nemser 1971), an "interlanguage" (Selinker 1972), or a "foreign accent" (Watson 1991, Ferguson 1975).

According to Anani (1985:133):
In contrast to RP /t/, Arabic /t/ is a lingual
roll and pronunciation errors arise from differences
of phonetic features between Arabic /t/ and
RP /t/ and from other associated features of
syllabification peculiar to Arabic word
structure. Hence, English sequences such
as /t/ + front half-open vowel are realized
by Arab speakers as /t/ + back open vowel,
parallel to the Arabic unitary complex
of /t/ + back open vowel, cf. JE
( Jordanian English ) RP.

JE       RP
/karat/   /karat/ carrot
/ratil/   /ratal/ rattle

Anani (1985) adds further that "the distribution of Arabic trill consonants exhibits
a similar pattern to that of "emphatic" consonants in that the quality of the open
vowel in the environment is invariably back, cf.

<table>
<thead>
<tr>
<th>Frontness</th>
<th>Backness</th>
</tr>
</thead>
</table>
| i         | /sama/ "sky"  
           | /rama/ "threw" |
| ii        | /balad/ "country"  
           | /barad/ "hail" |
| iii       | /kasal/ "laziness"  
           | /kasar/ "broke" (p.132). |

Anani (1985) concludes that "a trill consonantal articulation is always always
followed or preceded by a back open vowel, but all other consonants (except plosive
and uvular fricatives) are preceded and/or followed by a front open vowel" (P. 132).
If anything, the results suggest that the problems facing Arab learners of English in their production of English /tr/ hinge on a more important variable than that of distribution according to variety. In fact, Arabic has a phonetically different /r/ (in place and manner of articulation) from English /tr/ (cf. 4.1, 4.2 and 7.2 above).

8. **Phonotactic Differences and Contrastive Phonology**

The phonotactic differences regarding one aspect of two contrasting phonemic systems, English and Arabic /r/, lead to problems for Arab learners of English as a foreign language. This was shown in the distributional patterns of the /r/ in the two systems. In fact, the comparison of language systems (i.e., contrastive analysis) has been designed to predict and account for foreign language learning problems (see Kharma and Hajjaj 1989: 187). According to Lado (1975: 1), "many linguistic distortions heard among bilinguals correspond to discrete differences in the languages involved."

Pronunciation distortions emerge when the foreign language learner hears the foreign language sound segment in terms of his own. In other words, a transfer of native sound systems (i.e., the phonemes and their variants) occurs. Bialystok and Hakuta (1994: 11) reiterate the same idea when they say that "second language learning takes the first language as its starting point."

In their production of English /tr/, the student sample represented in the study reflected pronunciation distortions. The phonetic differences between English and Arabic /r/ were missed by a good number of the study sample. Among the reasons for the transfer of native language features are:

1. Arabic does not have a phonetically identical /tr/ to that of either the British or American variety of English.

2. The variants of the /r/ in the two language are not similar. For instance, English /tr/ equates with two units in Arabic: plain /r/ and emphatic or geminate /r/ as in /mar-ra/ "passed", /dar-raba/ "trained", in which case the /r/ is pronounced twice and not only once, as is the case in English.
3. Arabic and English /r/ are not similarly distributed, as was shown in 4.1 and 4.2) above.

The case for the production of English /r/ by the fourth-year English majors making our student sample may be best identified as a case of a "fossilizable" error. Selinker (1972: 16) points out that such structures remain as potential performance problems which "reemerge in the productive performance of an interlanguage (IL) even when seemingly eradicated." Nemser (1971: 115) refers to the same phenomenon as "approximative system" or "La"

9. An acoustic Description of /r/ in Arabic and English

The articulation of the /r/ sound, as pronounced by a native English speaker and a native Arabic speaker respectively, was examined from an acoustic point of view. For this experiment, the three English words rope, zero, more were chosen to exemplify the /r/ sound in word-initial, word-medial, and word-final positions. For each word, a wide-band spectrogram and a power spectrogram were made using a kay DSP sonograph (Model 5500). The following acoustic features were recorded:

1. duration of /r/ in sec.
2. general pattern of power spectrum.
3. locus of F2 and F3 transitions.

The acoustic parameters of the /r/ sound, as produced by a native English speaker and by a native Arabic speaker, respectively, were compared. Any differences in values are likely to explain the issue of a "non-native English accent" where the pronunciation of the /r/ sound is concerned.

9.1 Results

a). Duration in seconds of /r/ sound
Table (3)

<table>
<thead>
<tr>
<th></th>
<th>Word initial</th>
<th>word medial</th>
<th>word final</th>
</tr>
</thead>
<tbody>
<tr>
<td>native English speaker</td>
<td>0.12</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>native Arabic speaker</td>
<td>0.05</td>
<td>0.03</td>
<td>0.08</td>
</tr>
</tbody>
</table>

In general, the duration of the native English /r/ is longer than the same sound produced by a native Arabic speaker. There is however a marked difference in duration when the sound occurs in word initial position. It should be pointed out that word final English /r/ in Table 3 above is representative of the American English variety and not British English (RP).

The power spectrum for the /r/ sound produced in the three word positions has a falling pattern when said by the two speakers. Energy appears to be concentrated in the lower frequencies between 0 and 1000 Hz. Variations however may be noted in the intensity and frequency range of energy spread. When the native English speaker pronounces the /r/ sound, energy is concentrated in the first 1000 Hz at an intensity of 50 dB approximately. Beyond 1000 Hz, energy decreases very sharply. When a native Arabic speaker pronounces the /r/ sound in English words, energy is concentrated in the first 3000 Hz at an average intensity of 25 dB. Decrease in energy is more gradual, dying out in the next 3000 Hz.

A distinctive acoustic characteristic of the English /r/ sound is a sharp F3 pattern. This sharpness is blunted when the /r/ sound is produced by a native Arabic speaker.

b). Frequency of F3 locus and steady state.

Table (3)

<table>
<thead>
<tr>
<th></th>
<th>word initial</th>
<th>word medial</th>
<th>word final</th>
</tr>
</thead>
<tbody>
<tr>
<td>native English speaker</td>
<td>2000 Hz to</td>
<td>3250 Hz to</td>
<td>3890 Hz to</td>
</tr>
<tr>
<td>native Arabic speaker</td>
<td>4000 Hz</td>
<td>3770 Hz</td>
<td>3070 Hz</td>
</tr>
<tr>
<td>2500 Hz to</td>
<td>2240 Hz to</td>
<td>3690 Hz to</td>
<td></td>
</tr>
<tr>
<td>3100 Hz</td>
<td>2450 Hz</td>
<td>2425 Hz</td>
<td></td>
</tr>
</tbody>
</table>
10. Conclusion

Results of the present study done on fourth-year English majors at the University of Jordan have demonstrated that Arabic /t/ and English /t/ are different. The two phonemes differ in their place and manner of articulation, their distribution and their acoustic properties.

As for hypotheses testing outlined in (2.a,b) above, the study has shown that the problems are triggered by a difficulty in the production of English /t/ by Arab learners of English as a foreign language. The students' performance was characterized as deviant from the British and American standards of correct pronunciation. Such performance errors were found to exist in the students' latent" psychological structure and a state of "fossilization" was identified (see Selinker 1972). The pronunciation distortions resulted in a "foreign accent" in which case learners produced second-language speech according to their native language categories (cf. Watson 1991, Ferguson 1975)).

With the merits accrued to hypothesis (2.a above), the present study will have far-reaching theoretical and practical insights into the Arabic-English language contact situation manifested in second language acquisition and foreign language learning. It is therefore important for language teachers, textbook writers, and test-designers to place extra emphasis on the structurally divergent linguistic forms. By so doing, they can predict the problems that will emerge in the event of teaching English /t/ to native speakers of Arabic and consequently find practical solutions for them. On the other hand, a contrastive analysis of the /t/ phoneme in English and Arabic sheds light on what will pose a problem for language learners.

It has been illustrated that English and Arabic /t/ show, both on articulatory and acoustic grounds, more split and divergence than merger. This suggests that English /t/ will pose communication problems between Arabic and English speakers. Consequently, communication channels are most likely to be blocked, and mutual intelligibility will naturally be minimized. In view of the above, the case for Arabic /t/ and English /t/ calls for a systematic comparison of languages.
Appendix

This appendix includes the corpus of data representing the four categories: words, phrases, sentences and a short text, which students were asked to record.

1. Words

1. rule 6. grudge 11. sincere
2. risk 7. court 12. care
3. raise 8. arrange 13. keeper
4. road 9. person 14. center
5. roast 10. press 15. her

2. Phrases

1. pay raise 4. after a while 7. serving spoon
2. roast 5. stock market 8. a best seller
3. pretty good 6. wild rabbit 9. full of fear

3. Sentences

1. The woman who drew water brought two buckets
2. Robert is washing the dishes and Mary is ironing the clothes.
3. People always remember the good old days.
4. His theory proved entirely wrong.
5. More and more men under thirty are giving up smoking.

4. Short Text

The term "renaissance" means "reawakening". Thus, as personal dangers gradually become less acute, as commerce and trade once again began to compete with agriculture in Europe's economy, and as the feudal lords' hold over the local inhabitants consequently diminished, families began to move from the rural communities to the cities. And as people's fortunes improved, their attention could once more be turned to other matters. Gradually, interest in scholarship and in things cultural was renewed. It soon became possible for men of leisure to focus their attention once again on the work of earlier Greek and Roman scholars for enlightenment.
References


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