Pertanika J. Soc. Sci. & Hum. 24 (S): 1 - 10 (2016)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

# The Interrelation between the Perception and Production of English Monophthongs by Speakers of Iraqi Arabic

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## ABSTRACT

The assumption that performance in second language (L2) speech perception and speech production is aligned has received much debate in L2 research. Theoretical models such as the Motor Theory (MT) and Speech Learning Model (SLM) have described the relation between these two processes based on the assumption that speech is perceived with reference to how it is produced and speech production is in turn influenced by how well speech contrast is perceptible to the second-language learner. The present study aims to investigate this relation with regard to Iraqi learners' perception and production of English vowels, focussing on the role of L1 interference and English proficiency level in shaping this relation. The results of the present study showed that accurate perception may not necessarily be a prerequisite for accurate production especially for EFL learners at the elementary level. Perception and production score means were significantly different, revealing an asymmetrical relation between the two processes. The results showed that speech production of L2 learners at the elementary level exceeded their ability in speech perception. However, for the other three proficiency levels, perception and production seemed to develop in synchrony. The level of difficulty encountered in the perception and production tasks could be attributed to L1 interference, since the vowels that were better produced than perceived are all found in the L1 vowel system, while the only vowel that was better perceived is not in the L1 vowel system.

*Keywords:* Speech perception, speech production, English vowels, Iraqi EFL learners, second language acquisition, pronunciation

ARTICLE INFO

*Article history:*
Received: 21 September 2015
Accepted: 15 January 2016

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## INTRODUCTION

The study of second language (L2) speech involves the examination of speech

ISSN: 0128-7702 © Universiti Putra Malaysia Press

perception and speech production. The relationship between these two speech processes in L2s has been investigated but results have been inconsistent; the perception-production relationship is described as direct in some studies and indirect in others. Both theoretical assumptions (Flege, 1995; Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967; Liberman & Mattingly, 1985) and empirical studies (e.g. Flege, Bohn & Jang. 1997; Flege, Mackay, & Meador, 1999; Baker & Trofimovich, 2006) have supported a close link between the two processes. However, the nature of the relationship is still under debate. Numerous studies that investigated bilinguals have reported a close link between the perception and the production of phonemic contrasts; however, this link might be weakened by factors such as L1 interference, proficiency level, age of learning and length of residence. Yet, to the best of the researchers' knowledge, this relation has not been explored in terms of Iraqi learners' perception and production of English vowels. Hence, the influence of the L1 vowel system and L2 proficiency in shaping this relation will be explored in this paper. The vowel space occupied by vowels in standard British English or Received Pronunciation (RP) is different from that occupied by Iraqi Arabic (IA) although the same phonemic symbols may be used to describe these vowels in the two systems. RP has 12 monophthongs while IA has only nine. Three RP English monophthongs, namely /æ/, /ʌ/ and /ə/, are not found in IA.

On the relationship between speech perception and speech production among L2 learners, Fox, Jacewicz, Eckman, Iverson, and Lee (2009) present four logical accounts. The first account describes L2 learners who can neither perceive nor produce an L2 contrast, while the second account describes L2 learners who successfully learn to perceive and produce L2 contrasts. There are abundant examples of L2 learners who fit these two accounts. The other two accounts are not that straightforward, and therefore necessitate consideration. Flege's (1995) Speech Learning Model (SLM) is based on the notion of "equivalence classification", in which an L2 learner sets up categories for L2 phonemes on the basis of the learner's perception of the segments in question. Results from a number of studies support the claim that accurate perception is a prerequisite for accurate production. L2 learners need to successfully perceive the L2 target contrasts before they can successfully produce them. The fourth logical possibility, elaborated by Fox et al. (2009), is that L2 learners' production of certain contrasts might exceed their ability to perceive these contrasts. This final account seems to challenge some observations in first language acquisition where children's perceptual ability is known to precede production (Smith, 1973; 2010). It is likely that this is where processes involved in first language acquisition differ substantially from second language acquisition processes. Baker and Trofimovich (2006) also offer three hypotheses about the relation between speech perception and speech production. The first assumes that perception is at least one of the essential components of accurate production. This entails a perception-first

relation where perception abilities often precede production abilities. The second hypothesis assumes that both perception abilities and production abilities develop in synchrony. Consequently, the development of these two processes are aligned. The third hypothesis assumes a production-first relation in which accurate production precedes accurate perception. According to Bialystok and Miller (1999) and Flege et al. (1999), both cited in Baker and Trofimovich (2006), the perception-production relation is particularly difficult to define in adult L2 acquisition because adult L2 acquisition is variable along several dimensions. Among these dimensions are L1 interference, which is expected to make certain vowels more or less difficult to perceive and/or produce, and L2 proficiency level, which is expected to improve speech perception and speech production skills.

## MATERIAL AND METHODS

*Stimuli*

The list of words used in the present study included 48 words that presented the 12 English monophthongs four times each. This list was adapted from Nikolova (2010) and Almbark (2012), who both investigated vowel perception and production by Saudi and Syrian Arab learners of English, respectively. These words were piloted with 10 Iraqi learners of English who had done both tasks to make sure that the words were suitable in terms of familiarity. Since this study was interested in segmental perception and production, all words used were monosyllabic except for the words that include the schwa that were presented in disyllabic words. The words were recorded by a native speaker who is a tutor of English in the English Language Centre at a university in the UK and who was familiar with the variety of English commonly referred to as Received Pronunciation (RP).

*Participants*

Participants in this study were 85 Iraqi EFL learners who spoke Baghdadi Arabic. They were all males, ranging from 22 to 42 years old. The mean age of the participants was 32 years old. They were staying in Malaysia at the time of the study as they were either undergraduate or postgraduate students majoring in different fields including the English language. A demographic questionnaire was used to choose participants based on the limitations and purpose of the study. Learners who had stayed for a considerable period of time in an English-speaking country and those who had had learnt a third language extensively in addition to English and Arabic were excluded. The Oxford quick placement text (UCLES, 2001) was utilised to group the participants into four groups following the Common European Framework of Reference for languages where scores were used to place learners as basic users (Groups A1 and A2), independent users (Groups B1 and B2) and proficient users (Groups C1 and C2) (Council of Europe, 2001).

*Procedures*

After the demographic questionnaire and the quick placement test were analysed, 85 participants were selected to participate in the perception and production tasks. The systematic random technique was employed to select 25 participants only for groups A2 and B1 from among many learners who fell in these groups. Studies which used the same stimuli in their perception and production experiments have been criticised of being influenced by the learning effect. On the other hand, having the same stimuli is essential for a fair and accurate investigation of the perception-production relationship. To avoid possible learning effects, researchers of the present study used the same words for both tasks, but half of the participants started with the perception task while the other half started with the production task.

**Vowel identification task.** The perception task conducted in this study was a vowel identification task designed using Psychopy, created by Peirce (2007). The task was intended to examine learners' abilities to perceive English monophthongs as they hear them in 48 words pronounced by a native speaker of RP English. Each of the English monophthongs appeared in four different words presented randomly with four options given as possible answers for each word. Participants had to listen to the words, and then select one of the four options displayed on the computer screen to match the word they heard. Five practice trials were provided to familiarise the participants with the task before they started the actual trials. The suitable level of loudness was also adjusted during the practice phase. The experiment block began with instructions followed by the presentation of the words. Each trial began with the presentation of a word and the participants were required to select the best option that matched the word presented. Online feedback was not provided. Once the response for each trial was registered, the next word was presented. Results from the perception task were automatically extracted by Psychopy and stored in an Excel file. On average, each participant spent about five minutes on the perception task.

**Vowel production task.** The production task was intended to examine learners' production of the 12 English monophthongs. The task was also designed using Psychopy. Words were displayed on the computer screen one at a time and participants were required to pronounce these words aloud while Psychopy captured the word pronounced automatically and saved it in Waveform Audio File (WAV) format. The experiment began with an instruction window followed by the presentation of the words that were read by the participants. The words were randomly ordered and displayed on the screen with four-second intervals between them. On average, each participant spent about three and a half minutes on the production task.

*Data Analysis*

The results for the perception task were scored automatically by Psychopy.

However, for the production task, three independent raters were used to score the words produced. One of the raters was a British national who is an English native speaker and also an English teacher. He speaks RP English as he attended public schools in the UK. The second rater was a highly proficient Iraqi EFL teacher trained in phonetics and the third was one of the researchers of this study. Reliability among the three judges was very high with the Cronbach's Alpha at .80. However, when differences were found in the scoring of the three raters, the majority score was taken for the final analysis. Two analyses were conducted with the perception and production scores: a between-group subject analysis and a within-group item analysis. The independent t-test and paired-sample t-tests were conducted using SPSS.

## RESULTS

### *Descriptive and Statistical Analysis*

Generally, as expected, learners at the higher proficiency levels performed better than the learners from the lower proficiency levels for both perception and production tasks as shown in Table 1. What was surprising was that learners from all groups had higher mean scores in the production task [A2: 62.5%; B1: 76.75%; B2: 81.94% and C1: 82.19%] compared to the perception mean scores [A2: 54.66%; B1: 70.75%; B2: 78.12% and C1: 81.06%]. However, the paired sample t-test conducted found a significant difference between the overall perception and production mean scores only for group A2, the group with the lowest level of proficiency in English. Learners in this group performed better in the speech production task.

Table 1

*Mean Scores of Speech Perception and Speech Production Tasks*

| Group | No | Perception | | Production | | |
|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | |
| A2 | 25 | 26.24 | 5.380 | 30.00 | 4.992 | .005* |
| B1 | 25 | 33.96 | 5.256 | 36.84 | 5.669 | .086 |
| B2 | 24 | 37.50 | 4.969 | 39.33 | 4.806 | .287 |
| C1 | 11 | 38.91 | 3.360 | 39.45 | 2.979 | .663 |
| Overall | 85 | 33.33 | 6.956 | 35.87 | 6.279 | .001* |

* $p < 0.05$

An item analysis was also conducted across all groups to compare performance in the two tasks. A series of 12 paired sample *t*-tests were conducted to identify any significant differences in the mean scores of the perception and production of each vowel. These tests indicated significant differences in the perception and production means of the vowels /ɪ/, /æ/, /ʊ/, /ɔ/, /a:/ and /o:/ with p values below 0.05. The results showed that the production scores were significantly higher than the perception scores with the exception of /æ/ where the reverse was observed as shown in Table

2. The results of the comparison suggest possible L1 effect as the vowels that were better produced than perceived were all found in the L1 vowel system, while the only vowel that was better perceived is not in the L1 vowel system. A more detailed explanation of these effects are presented in the discussion.

Table 2
*Results of Paired-Sample t-test*

| Vowel | Perception (MEAN) | Production (Mean) | p |
|---|---|---|---|
| /ɪ/ | 2.40 | 3.14 | .000** |
| /æ/ | 2.88 | 2.46 | .007** |
| /ʌ/ | 2.39 | 2.51 | .487 |
| /ʊ/ | 2.79 | 3.16 | .008** |
| /ɔ/ | 1.21 | 2.01 | .000** |
| /a:/ | 3.14 | 3.53 | .000** |
| /ɛ/ | 2.88 | 3.11 | .164 |
| /i:/ | 3.11 | 3.47 | 1.000 |
| /e:/ | 2.94 | 2.85 | .563 |
| /o:/ | 2.54 | 2.69 | .280 |
| /u:/ | 2.94 | 3.36 | .002** |
| /ə/ | 3.74 | 3.69 | .608 |

** $p < 0.05$

## DISCUSSION

### *Production-Perception Relation and English Proficiency Level*

It can be concluded that at the earlier stage of learning, Iraqi learners are better producers than perceivers, as the production scores were significantly higher than the perception scores. This seems to be uncommon, as theories of speech perception and production such as SLM and several previous studies such as Smith (2010), Nikolova (2010) and Baker and Trofimovich (2006) all assumed that the ability to perceive is a prerequisite for the ability to produce specific speech sounds. The results of the present study however could be in line with the Motor Theory of perception (Liberman *et al*., 1967; Liberman & Mattingly, 1985), which assumes that speech is perceived with reference to how it is produced. A production-first argument as supported by the data in the present study is also found in several studies such as Catford and Pisoni (1970) and Weiss (1992), cited in Ho (2009). Baker and Trofimovich (2006) also state that production may precede perception at a particular stage in L2 learning when some internal elements underlying production might be developed at a later stage into perceptual ability. It is worth noting that error count differences between the higher three groups also considerably decreased in accordance to advances in proficiency level. The conclusion offered in the present study can also be accounted for by Fox et al. (2009), who refer to a logical possibility that is documented in studies such as Sheldon and Strange (1982), where L2 learners' production might exceed their ability to perceive.

### *L1 Influence on Vowel Perception and Production*

Five vowels were statistically better produced than perceived, while /æ/, a vowel not found in the inventory of IA, was the only vowel which was statistically better perceived. Ho (2009) argues that its salient acoustic features make it easier to perceive while the motor patterns for producing this new vowel accurately will take time

and practice to develop. A bi-directional relation between /æ/ and /ʌ/ that caused them to be most frequently misproduced for one another was also noticed in this study. This refers to the inability of learners to distinctively produce these open vowels, where IA has two open vowels only, while RP English has four.

On the other hand, five vowels were significantly better produced by learners. These are the four back vowels /ɔ/, /ʊ/, /u:/ and /a:/, and the front vowel /ɪ/. All these vowels are found in IA in almost similar positions in the vowel spaces of the two languages. Learners might have the necessary practice to produce these vowels as they are found in their L1; however, their perception still lags behind due to the learners' inability to distinguish these vowels from adjacent vowels in the vowel space of the L2. Fabra and Romero (2012) further argue that in foreign language speech learning contexts, learners lack exposure to the target language in a naturalistic setting; therefore, they argued that it would be unlikely for the perceptual abilities of EFL learners to improve much. Their experience of different instantiations of the same phonemic category would be limited to instances found in the classroom and possibly limited to what their teachers and peers produced. Hence, the vowel space of the phonemic category, if the category already exists, could be limited by their experience with the language in natural contexts.

The acoustic features of these vowels differ between the two languages; hence, their ability to discriminate these vowels could be more difficult than their production which, in our study, could be rated as correct even if it is not perfectly produced. However, in the perception task they had to deal with distractions from the three other possible options for each word.

*Task Difficulty*

The two tasks used in the perception and production studies were definitely different in terms of difficulty. According to, Jia, Strange, Wu, Collado, and Guan (2006), learners found the discrimination task quite difficult, in the sense that it required a high level of auditory attention. In contrast, the production task was cognitively less demanding, so they could do it with comparative ease. Moreover, learners from the low proficient group (A2) might have been confused by the four options given simultaneously to them as they may not have known all the words presented in the option, and this could have increased the level of difficulty of the perception task for this group whereas in the production task, participants had only one word to focus on in each trial.

Spelling could also have been another influencing factor. The inconsistency between spelling and pronunciation in English is usually confusing to Arab learners because there is a close correspondence between orthography and pronunciation in Arabic. Learners have to consider four words with a rather similar spelling. This could be more challenging for learners with a lower proficiency level in English

who possibly have a smaller repertoire of English vocabulary and who may have had fewer encounters with the options presented in the task.

## CONCLUSION

The assumption postulated by theories such as SLM, PAM and DRT that inaccurate perception should result in inaccurate production is not well supported in this study, especially among learners who are most likely at an early stage of L2 acquisition. The results showed that speech perception and production were significantly different from one another, indicating an asymmetrical relationship between them, where speech production can be better developed than speech perception (Fox et al., 2009).

More specifically, possibly due to L1 interference, some vowels were either positively or negatively influenced. When the vowel positions of English vowels were shared with vowels in IA, as in /ɔ/, /ʊ/, /u:/, /a:/, and /I/, the participants seemed to perform better in the production task compared to the perception task. However, the reverse was found with /æ/ as this vowel stands out as distinctively different from other vowels, reducing its confusability with other options given in the perception task.

However, because the results obtained could have been influenced by the design adopted for the perception task, the study should be replicated with other speech perception designs. For example, the same-different discrimination task, which reduces the effect of word familiarity, would be a likely option. Furthermore, this study was exploratory in nature as no specific hypotheses were made about specific vowel pairs in English that could represent the same vowel in IA. Subsequent studies could focus on an instrumental analysis of the vowels in Iraqi Arabic and compare them with those in RP and the English vowel produced by Iraqi EFL learners to test this relation again with the various proficiency groups.

Nevertheless, the results of this study provides for some recommendations for pedagogical applications. This study suggests that vowel perception might lag behind at an early stage of L2 learning; therefore, teachers dealing with this group of learners should devote more time towards developing their perceptual ability. Teaching and learning strategies that can help students guard against misperception should be adopted in class. Special attention could be drawn to frequently confused words to help students pay attention to the vowel pairs and words that may be confusing for Iraqi EFL learners. With students at the intermediate and advanced levels, however, both perception and production tasks can be taught side by side as they seem to develop in synchrony. Vowels with salient acoustic features can be easier to perceive and attention should be directed to those with less salient features. Perception training should focus on vowels that are also found in IA, while production training should focus on those that are not found in the IA vowel inventory, as they have been identified as more difficult to produce than those that are found in the vowel inventory of IA.

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