Enhancing L2 learners' perception and production of the Arabic emphatic sounds

ENHANCING L2 LEARNERS' PERCEPTION AND PRODUCTION OF THE ARABIC EMPHATIC SOUNDS

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ABSTRACT

This study examined the Arabic L2 learners' ability to perceive and produce the emphatic sounds /sˤ/, /ðˤ/, /dˤ/, and /tˤ/. Specifically, the study explored the effects of traditional-based and technology-based instruction in enhancing learners' perception and production of these sounds. Data were collected from forced-choice identification tasks and audio recordings taken during pre- and post-test conditions. The results revealed that the emphatic sounds posed a considerable amount of perception and production difficulties to L2 learners of Arabic. Additionally, there were significant improvements among all participants after the traditional and technological training courses and that the difference in the outcome between the two teaching methods was not significant.

Keywords: Pronunciation instruction, Arabic sounds, Emphatics, Praat.

1. INTRODUCTION

The Arabic language is distinguished by the existence of four emphatic sounds /sˤ/, /ðˤ/, /dˤ/, and /tˤ/ with a primary articulation in the interior vocal tract and a secondary articulation in the pharynx. Emphatics are considered to be a unique characteristic of Arabic, while the absence of these sounds in most world languages results in pronunciation difficulties among L2 learners of Arabic [11, 15, 18]. The primary reason for these challenges in pronunciation is because of the acoustic and auditory similarities to their plain counterparts /s/, /ð/, /d/, and /t/, which exist in most languages [2, 24]. What distinguishes the emphatics from the non-emphatics is the effect of the former sounds on the following and preceding vowels causing an 'emphasis or pharyngealization spread' and altering these vowels to allophones [22, 26].

A number of studies discussed the significant similarities between emphatic sounds and their counterparts and how these sounds share similar acoustic features [4, 11]. These studies provided detail about the way emphatics and non-emphatics are articulated by Arabic native speakers. To date, very few studies discussed Arabic pronunciation and singled out the features of the emphatic sounds and the adjacent pharyngealized vowels as particular issues in teaching L2 Arabic pronunciation. The lack of knowledge and understanding about the differences between emphatics and non-emphatics among L2 learners of Arabic can cause perception and production difficulties [3, 6].

Many studies that investigated the role of phonetic instruction in L2 pronunciation teaching found a positive relationship between explicit instruction and the performance of L2 learners [20, 21]. For example, reading aloud, minimal pairs, repetition, and explicit phonetic instruction techniques revealed significant and positive results [13, 25]. Similarly, speech analysis technology alone with or without verbal phonetic instruction was found to lead to significantly improved pronunciation [14, 16, 19, 20]. Particularly, speech analysis technology is one of the modern tools that has been repeatedly tested and applied in teaching English segmentals and suprasegmentals [19, 20].

Speech analysis programs are used to create graphic representations of speech, which are based on the visual display of the articulation. The work on speech analysis technology in teaching pronunciation started in the late 1970s with a software called Visi-Pitch [10]. The creation of this software allowed researchers to investigate the potential benefits of teaching pronunciation through visual analysis of native speakers' speech [1, 7, 8, 27]. Praat, used in the present study, is an open-source speech analysis tool that is developed with manifold functions to help researchers analyse, measure and understand acoustic features of sounds [9] and shows visual movements of speech through waveforms and spectrograms.

The present study looked at the differences in efficacy between the traditional and the modern teaching methods using speech analysis software (Praat) in enhancing the perception and production of emphatics in L2 learner of Arabic. The purpose of the study is to see whether using visual representations of the acoustic features of sounds rather than the usual traditional teaching approach could help L2 learners in understanding the features of the emphatic sounds and hence perceive and produce them more accurately.

2. METHODOLOGY

An experiment was conducted to investigate the effect of two different teaching approaches in enhancing the perception and production abilities of emphatic sounds in L2 learners of Arabic.

2.1 Participants

For this study, 38 females L2 learners of Arabic from Princess Nourah University in Saudi Arabia participated in the training courses. The participants' age was ranging from 20 to 26 years old (mean age 22.50), and they were from elementary, intermediate and advanced level of Arabic proficiency. 14 Urdu speakers, 13 Mandarin speakers, and 11 English speakers volunteered to participate. The time they spent studying Arabic ranged from three months to more than three years.

Participants were divided into two groups, 19 students in each group (see Table 1). They were divided equally based on their language backgrounds and proficiency levels in an attempt to control the effect of these variables on the results.

Table 1: Number of participants in each group (A= Traditional, B= Technology).

Speakers	Beginner		Intermediate		Advanced		Sum
	A	B	A	B	A	B	
Mandarin	2	2	2	1	3	3	13
Urdu	2	2	3	3	2	2	14
English	0	1	2	3	3	2	11

2.2 Materials

Two sets of materials were designed for each group, one using speech software and the other using traditional methods. The materials for both groups contained similar words that were taken from an Arabic language learning series [5]. Special DMDX written scripts were also designed for the computerized perception and production tests.

2.2.1 Traditional group

The materials for this group included handouts which contained information about the manner and place of articulation of each emphatic sound; pictures of the vocal tract; example sentences; small passages; and minimal pairs.

2.2.2 Technology group

An introductory presentation for this group was designed using computer slide presentation software. For the training course, slides were designed for each of the four days. Each slide contained three waveform and spectrogram pictures of three syllables that have the same emphatic sound but in three different environments (e.g. /asˁa/, /usˁu, /isˁi/). Four sound files were prepared for this group which contained words and isolated syllables that have the emphatic and non-emphatic sounds pronounced by an Arabic native speaker.

2.2.3 Perception and production testing materials

The perception and production tests were administered to both groups by means of the DMDX Display Software which employed scripts designed specifically for this study. It presents stimuli materials and record participants' responses via keyboard input [12]. Each test included thirty Arabic words placed in a carrier phrase presented in three phrases for each of the eight emphatics and non-emphatics, and six phrases which served as distractors. The words in the tests were minimal pairs to test participants' abilities to discriminate between sound contrasts. The stimuli for all perception and production tests were similar but they were in random orders and they were not part of the set of words that was included in the training.

2.3 Procedure

This study took place in the Arabic language institute at Princess Nourah University. On the first day of the experiment, the demographic information questionnaires and ethical consent forms were distributed to the participants. After filling out the questionnaires, participants took the perception pre-test. They individually entered a quiet room and sat facing a laptop. They were asked to wear headphones and follow the instructions on the screen. On the following day, they took the production test in the same way.

After taking the pre-tests, all participants received instructions about the time and the place of the training. While the traditional group took it in a regular classroom and the technology group took it in a computer lab.

2.3.1 Traditional group

The training started with the introduction of the emphatic sound, its place and manner of articulation. A picture of the vocal tract was provided to explain the place of articulation and to show the position of the tongue. After that, participants practiced reading minimal pairs from the board and discriminate between the emphatics and non-emphatics in pronunciation such as:

/ma:sˁah/ 'table' and /ma:sah/ 'diamond'.

/tˁa:biʕ/ 'stamp' and /ta:biʕ/ 'follow'.

This training focused on the emphatic sound itself rather than the adjacent vowels. Participants were asked to read aloud sentences and a short passage individually in turn, and feedback was provided by the tutor when necessary. They spent one and a half hours on each of four days reading passages and sentences aloud, discriminating minimal pairs, and receiving verbal pronunciation instruction and feedback.

2.3.2 Technology group

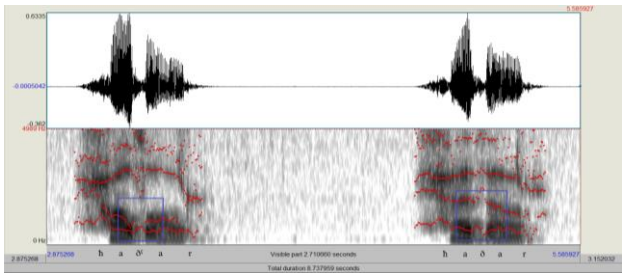
The training for the technology group started with an introductory session about analysing sounds through Praat. Participants were given instructions with pictures about downloading and installing the software along with creating, opening and understanding spectrograms.

This group took the training sessions on the same days as the traditional group. The participants started by examining the features of the emphatic and non-emphatic sounds through Praat. The purpose was to teach the learners how to examine spectrograms and distinguish emphatics from non-emphatics. They then followed three steps as recommended by Offerman and Olson [19, 20]: initial self-recording, guided visual analysis and practice and re-recording, as outlined below.

In the initial self-recording stage, three syllables in isolation and three words were given to this group in each of the four days (e.g. /sˤa/, /sˤu/, /sˤi/, /qasˤad/, /nusˤub/, /sˤi:n/). Participants were asked to record their voices through Praat then edit the recording to see the spectrogram and waveform.

In the guided visual analysis, the sound files of a native speaker pronouncing the same words and syllables were provided to participants (see Figure 1).

Figure 1: Praat screenshot showing differences in the vowel formants between the emphatics /ðˤ/ and non-emphatic /ð/ in a native speaker of Arabic.



The participants compared the shape of the emphatic consonants and the adjacent vowels in their spectrograms and those of the native speaker. The lowering of the second formant in the adjacent vowels was explained to participants at this stage. To enhance participants' understanding, pictures of the vocal tract were provided to explain the articulation of these sounds and to justify the lowering of the second formants (F2).

In the practice and re-recording stage the participants re-recorded the required words again to compare them with the native speakers' spectrograms. This allowed the participants to imitate the pronunciation of the native speaker many times, receive immediate feedback, and recognize the differences between the emphatic and non-emphatic sounds and adjacent vowels.

This group spent one and a half hours on each of the four days recording their voices, comparing them with native speakers' voices, receiving immediate feedback many times, and imitating native speakers' utterances.

2.4 Data collection

The perception data was taken from forced choice identification pre- and post-tests. Thirteen audio files of different phrases were played in random order to each participant. Two words appeared on the screen synchronizing with each audio file. Participants had unlimited time to think and decide which word they thought they heard.

The data taken from the production pre- and post-tests were audio recordings. 30 phrases appeared on the screen in random order and the participants were told to read them in a clear and loud voice. An Edirol R-09HR recorder was used to collect the data, the recordings sampled at a rate of 44100 Hz, 16 bit. The raters of these recordings were eleven Saudi Arabian language instructors who worked in different secondary schools in Saudi Arabia. Their task was to listen to the recordings and identify the incorrect sounds.

2.5 Data analysis

All data was analysed quantitatively using SPSS. A correct pronunciation for the production test and choice for the perception test were coded as (0, i.e., no error), and an incorrect pronunciation and choice were coded as (1).

Intraclass correlation coefficient (ICC) was conducted to calculate the inter-rater reliability of the production test raters. The results of the ICC showed a high degree of reliability between raters measurements. The average measure of ICC was rICC =.981 with a 95% confidence interval ($\alpha = 0.05$) from .971 to .989, F (570.1) = 37).

A one-way between subjects (ANOVA) was conducted to compare between the two groups. Furthermore, a paired samples *t*-test was carried out to reveal whether any group improved significantly after receiving the explicit phonetic instruction.

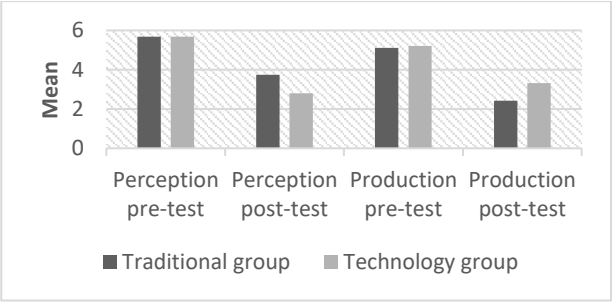
3. RESULTS AND DISCUSSION

The results of the pre-tests revealed that L2 learners or Arabic faced great difficulties in the perception and production of the emphatic sounds, especially with the sounds /tˤ/ and /ðˤ/. Many participants from all the three proficiency levels produced errors in perceiving and producing the emphatics.

Based on the results of a paired samples *t*-test, significant improvements were found in the traditional group; $t(18)=5.62$, $p < 0.001$ and the technology group; $t(18)=7.91$, $p < 0.001$ after the training in the perception of the target sounds. However, the comparison between the two groups showed that there were no significant differences between the technology group (M=2.79, SD=2.2) and the traditional group (M=3.74, SD=2.6) at the $p<.05$ level in the perception of the emphatic sounds; [$F(1, 36) = 1.513$, $p = 0.227$].

Concerning production, significant improvements were found in the traditional group; $t(18)=7.56$, $p < 0.001$ and the technology group; $t(18)=8.95$, $p < 0.001$ after the training course in producing the target sounds. However, there were also no significant differences between the technology teaching group (M=2.42, SD=1.98) and the traditional teaching group (M=3.32, SD=2.3) in the production of the emphatic sounds; [$F(1, 36) = 1.71$, $p = 0.200$] (see Figure 2).

Figure 2: Participants' perception and production errors before and after receiving the two teaching methods.



The statistical results showed that the technology group made fewer errors in perceiving and pronouncing the emphatics than the traditional group, but the difference between groups was not significant.

Both teaching approaches contributed significantly in developing L2 learners' pronunciation of sounds. The results of this study supported many previous studies that attributed their positive results to using speech analysis technology as a main tool in phonetic teaching [14, 16, 19, 20]. However, the difference between previous studies and this study is that this study found no significant difference between the traditional and the modern teaching approaches, as both groups improved significantly after taking one of the training courses.

The improvement in participants' pronunciation might due to the explicit information components and feedback. The role of speech visual displays alone might not have contributed to accurate production of sounds as the feedback from the instructor and Praat and repeating the sounds many times helped the participants improve as well. The results of this study provided support for literature in both traditional [13, 25] and modern teaching approaches [19, 20].

The two groups received the training conditions for four days (90 minutes/day), when each day was dedicated to one emphatic sound. Indeed, this amount of time spent in receiving explicit instruction was brief, but on par with the amount of time devoted to teaching phonetics explicitly in some previous research, which yielded significant and positive results [17, 23, 28].

4. CONCLUSION

This study has shed light on the possibilities of integrating technology, specifically speech analysis technique into Arabic pronunciation curriculum to enhance learners' pronunciation of difficult L2 sounds. The contribution of the current study is to show that explicit instruction is a strong candidate for leading to pronunciation improvement, and that Arabic emphatics can be explained by presenting their visual representation forms.

The explicit information component, used in this study, need to be controlled in order to see better if using speech analysis in learning Arabic sounds would be significantly better than the traditional method. It appeared that explicit information and feedback were possible confounding variables that were not taken into consideration, eliminating the possibility to conclusively determine if the use of Praat actually helped Arabic learners or whether the explicit instruction and feedback improved learners' perception and production. Future research could eliminate this limitation and control these variables.

It is hoped that this paper will benefit Arabic language instructors and researchers in embedding this modern tool in Arabic sounds teaching to enhance learners understanding which can be used inside or outside of classroom settings. Further research will include looking at the effect of using Praat with L2 learners of Arabic from different proficiency levels and from different language backgrounds to investigate the variations of perception and production abilities and to identify whether this tool is more beneficial to specific proficiency level or language group.

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