A Phonetic Study of Najdi Arabic Interference in L2 Acquisition of English

Wafaa Ammar*
Areej Alhumaid**

* Associate Professor, Dept. of English Language and Literature, Faculty of Languages and Translation. Imam Mohammad Bin Saud Islamic University, Kingdom of Saudi Arabia.

** Research Assistant, Dept. of English Language and Literature, Faculty of Languages and Translation, Imam Mohammad Bin Saud Islamic University, Kingdom of Saudi Arabia.

Abstract

The present study investigates L1 phonetic interference in the acquisition of English consonants and consonant cluster by Saudi female undergraduates. Based on the results, a speech improvement program is suggested and tested on a small group of students. The speech of thirty university students was recorded and analyzed. The results of this study have affirmed the previously reported influence of L1 interference on Arab L2 learners of English. This interference is inversely proportional to the level of proficiency of L2 learners. The nature of the interference is shown negatively in the consonants present in the American English inventory and missing from the Saudi Arabic inventory. The same can be said about consonant cluster as the clusters missing from the NA inventory were the most problematic. Error patterns are shown in consonants as consonant replacement or distortion and in cluster simplification as either inserting a vowel between the consonants or deleting one consonant. A speech development program was designed and applied to four students. The success of the suggested improvement program in reducing the participants' errors implies that traditional English skill programs are not effective for this specific purpose and that a specialized program should be introduced to tackle the specific phonetic interference problems between Arabic and English.

Introduction

It has been widely agreed that the major obstacle which seems to hinder the phonetic development of Arab and Saudi learners of English as a second language (henceforth L2) is the influence of their native language (henceforth L1) (Al-Jasser)[1], (Barros)[2], (Dabaan)[3], (Kharma and Hajjaj)[4], (Moosa)[5] and (Mousa)[6]. Saudi female undergraduates of English, for instance, encounter many pronunciation difficulties (Al-Deen)[7]. Their mispronunciations often resulted in failure of comprehensibility. Also, their pronunciation deficiency affects their performance in all the other language skills: listening, reading, and writing.

This study seeks to identify the particular sound patterns that are difficult for them to replicate. Second, it attempts to propose a remedial program that makes the learners aware of the differences between the phonetic systems of their native language and English, paying particular attention to the problematic areas.

Most researchers have examined pronunciation difficulties as experienced by school learners or beginners (Al-Jasser)[8], (Dabaan)[9], (Dulay and Burt)[10], (Mousa)[11], and (Moosa)[12]. A study by (Al-Deen)[13], however, dealt with female undergraduates studying English but who were speakers of the Hijazi dialect, a variety spoken in the Western Province of the Kingdom. To our knowledge, there are no studies to date that have investigated L1 interference problems encountered by Najdi female undergraduates studying English.

Scope and limitations of the Study

L1 interference has particularly been chosen for investigation relating to consonants and consonant clusters. Consonants were chosen for two reasons. First, it has been affirmed by (O'Connor)[14] that consonants are the backbone of English words and that they affect intelligibility more than vowels. Second, research has shown that interference errors committed by Saudi learners are more frequent and noticeable in their attempts to pronounce consonants rather than vowels (Al-Jasser)[15]. In addition, consonant clusters were chosen as a focus for this study for a number of reasons. First, they are very much related to consonants, and they have proved to be problematic for Saudi learners (Al-Jasser)[16]; (Dabaan)[17]and (Mousa)[18]. The ten consonants /p/, /v/, /ɲ/,/ʧ/, /ʤ/, /ʒ/, /l/, /r/, /θ/, and /ð/[19] were chosen because the literature shows that they are the most problematic for Saudi learners in general (Al-Jasser)[20]; (Dabaan)[21] and (Mousa)[22]. Word-initial and word-final three-con-

sonant clusters were also chosen because previous research shows that they constitute a major threat for Saudi speakers trying to learn English (Dabaan)[23] and (Mousa)[24].

It must be noted that this study seeks to examine and treat participants' pronunciation only when they are speaking formally, i.e., in Standard Arabic and not in colloquial.

The study is carried out in two phases. The first explores L1 interference detailing the problematic consonants and consonant clusters and their contexts and patterns of errors. The second phase involves a speech improvement program.

American English and Najdi Arabic Consonantal Inventory

Table 1 shows the full inventory of American English (henceforth AE) consonants as presented by the International Phonetic Association (2005). Table 2 shows Najdi Arabic (henceforth NA) consonantal inventory as presented by (Al-Feneekh)[25] and (Al-Sweel)[26]

Table 1: Phonemic Inventory of Consonants in AE

	Bilabial	Labio-dental	Dental	Alveolar	Postalveolar	Palatal	Velar	Glottal
Plosive	p b			t d			k g	
Affricate					ʧ ʤ			
Nasal	m			n	ʃ ʒ		ŋ	
Fricative		f v	θ ð	s z				h
Approximant				ɹ		j	w	
Lateral Approximant				l				

Table 2: Phonemic Inventory of Consonants in NA

	Bilabial	Labio-dental	Interdental	Dental - alveolar	Alveo-palatal	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	b			t d t̲			k g		□	
Fricative		f	θ ð̲	s z s̲	ʃ			χ ʁ	ħ ʕ	h □
Affricate						ʧ				
Nasal	m			n						
Liquid				l r						
Approximant	w				j					

AE and NA Rules of Clustering

An important aspect of restriction on syllable types involves consonant clusters and, specifically, the limited number of permitted combinations of consonants in initial and final clusters.

In English, syllables can consist of a vowel with up to three initial consonants, e.g., ‘‘pie’’ [py], ‘‘spy’’ [spy], and ‘‘spray’’ [spræy]); a vowel with up to three final consonants, e.g., ‘‘at’’ [æt], ‘‘ask’’ [æsk], and ‘‘asked’’ [æskt]); a vowel with one or more initial consonants and up to four final consonants, e.g., ‘‘ten’’ [tɛn], ‘‘tent’’ [tɛnt], ‘‘tempt’’ [tɛmpt], and ‘‘tempts’’ [tɛmpts]); or a vowel with almost the full range of possible initial and final clusters,e.g. ‘‘splints’’ [splɪnts]) (Celce-Murica et al.)[27].

NA has its own syllable structure. (Al-Feneekh)[28] states:

> CVC^2 is the underlying form of the syllable in NA; vowel length is unpredictable. In the phonetic representation, there are many syllables of the form C^{2}VC^2 where consonant clusters within a syllable are only permissible at the beginning or the end of a phonological unit. (p. 12)

(Abboud)[29], who described syllabification rules in NA, has provided clarification:

> The onset of a syllable must have at least one consonant. A syllable must have a vowel for its peak and may be open (i.e. not followed by a consonant), closed (i.e. followed by a consonant), or doubly closed (i.e., followed by two consonants)... In word- initial position only, the onset of a syllable may have two consonants.... Three consonants may occur in word- initial position, but that is limited to a few sequences such as *str-* (p. 497).

Therefore, the fundamental difference between English and NA syllable structure is in the number of permitted combinations of consonants and positions. Since NA, with certain restrictions, allows very limited patterns of three-consonant clusters, it can be predicted that this pattern would be a problem for the participants of this study as discussed below.

Arabic and English Spelling Systems

(Barros)[30], (Dabaan)[31], (Kharma and Hajjaj)[32], and others have reported that L1 interference errors are enhanced not only by the phonemic differences between L1 and L2, but also by the difference between the spelling systems of the two languages. Thus, since this factor is related to the analysis of this study, it is dealt with here.

Given the well-known differences between the two systems: Arabic being more revealing with respect to the pronunciation than English (Avery and Ehrlich)[33], (Dabaan)[34] and (Kharma and Hajjaj)[35], and that the alphabet is a representation of the phonological system, it is expected that the phonological errors interact with the written ones and that Arabs will probably tend to expect the spelling to represent the pronunciation more consistently than it does (Barros)[36].

Methodology

Participants

I. Diagnostic Phase

Thirty Najdi female students were the participants in this phase. They were all enrolled in level six in the English Department at Al-Imam Muhammad Ibn Saud Islamic University. They had been studying English as a foreign language for about nine years. They had taken a course in English Theoretical Phonetics in level four for three hours a week. Their ages ranged from 20 to 23 years. None of them had lived in an English-speaking country. Four of them had studied in intermediate and secondary private schools for not more than two years. Thus, they had been exposed to English as a second language only after the age of puberty.

II. Speech Improvement Phase

Four Najdi female students were the participants in this phase. They were all enrolled in level two in the English Department at Al-Imam Muhammad Ibn Saud Islamic University. Their ages ranged from 19 to 23 years. They had not studied English phonetics or phonology, and they were deliberately chosen as participants for this phase in order to examine the effectiveness of the remedial program designed to shape their pronunciation. They had been studying English as a foreign language for about six years. None of them had lived in an English-speaking country. Three of them had studied in private schools but only at the secondary level. Thus, none had been exposed to English as a second language before the age of puberty. The participants were all highly motivated to improve their pronunciation. Most of them watched English television programs and read English books in their spare time as a way to improve their English.

Data Collection Procedure

I. Diagnostic Phase

In this phase, a questionnaire was distributed and 30 participants were recorded during a four-week period of time.

Questionnaire. A questionnaire was distributed to level six students of English at Al-Imam Muhammad Ibn Saud University. It aimed to explore their backgrounds and past experiences regarding their exposure to English as a second language. Based on the answers, a total of 30 students were selected to be recorded. They had to meet one basic requirement which is to be native speakers of NA.

Oral reading. Oral reading of two word lists and two sets of sentences was assigned as a formal task to examine the participants' performance at their careful style of speech. Thus, each of the 30 participants was recorded for 10 to 15 minutes, reading a total of 123 words and 20 sentences.

1 - *Word-list reading.* Two lists of target words were designed. The first list contained 84 words that incorporated 10 consonants that have proved to be problematic to Saudi learners of English as identified by (Al-Jasser)[37], (Dabaan)[38], and (Mousa)[39]. These consonants were /p/, /v/, /ŋ/, /ʧ/, /ʤ/, /ʒ/, /ð/, /θ/, and /l/. Each was distributed in all possible word -positions (initial, medial, and final) and presented in three different words for each position. Accordingly, sounds like [and [] that did not

occur initially in English, were presented only medially and finally. Considering the phoneme /l/, both its dark [ɫ] and clear [l] allophones were examined. Thus, the clear [l] was presented initially and medially while the dark [ɫ] was presented medially and finally. The reason for distributing the phonemes in different positions was to see whether their positions would have any effect on pronunciation.

The second word list was used to examine the difficulties faced in pronouncing English consonant clusters. It contained 39 words that incorporated the examined patterns of consonant clusters. Investigation was limited to word-initial and word-final three-consonant clusters that proved to be the most problematic for Saudi learners (Dabaan)[40]. Further, Dabaan affirmed that the initial sequences /spr/, /skr/, and /spl/ have proved to be the most problematic (as in ‘‘spree,’’ ‘‘splash,’’ and ‘‘scram’’), while the sequence /str/ seemed to be easier to pronounce. Hence, the list of words beginning with sequences of three consonants examined the difference. For each of the four cluster patterns (/spr/, /skr/, /spl/, and /str/), there were three example words.

2 - *Sentence reading.* In addition to the word-lists mentioned, problematic consonants and consonant clusters were also integrated into two sets of sentences designed to examine the participants' errors in connected speech. The first set was made up of 10 sentences. Each sentence examined one consonant sound in different word positions (initially, medially, finally). The second set contained 10 sentences and examined the pronunciation of word-initial and word-final clusters of three consonants. In most sentences, more than one cluster pattern was included.

II. Speech Improvement Phase

This phase was limited to treating the speech sounds and consonant clusters that proved to be most problematic and had the greatest impact on intelligibility. Thus, the phoneme /p/ and the clusters /spr-/ and /spl-/ were chosen for treatment. To accomplish this, a three week speech improvement program was implemented.

Questionnaire. A questionnaire was distributed to the participants of the second phase before implementing the improvement program. This questionnaire was similar to the one distributed in Phase I with the addition of two

questions. The additional questions aimed at exploring the students' motivation to improve themselves (Avery and Ehrlich)[41].

Pre-test / post-test tasks. The tasks for the pre-test and the post-tests were to pronounce the same set of words and sentences used in the first phase of this study containing the problematic target /p/ and clusters /spl-/ and /spr-/. The pre-test was administered before starting the speech improvement sessions. The post-test was administered twice to trace the participants' improvement, once after two weeks of training and again after three weeks.

Program length of time. Following (Gordon)'s[42] advice, the remedial program in this study consisted of nine meetings, each about 30-40 minutes long, during a period of three weeks. The researchers and the students met three times a week.

Program pronunciation manual. The manual used in the speech improvement program was designed to focus on the following:

1 - Showing the learners the difference between Arabic and English concerning the problem area, e.g., that the phoneme /p/ does not exist in Arabic and that the Arabic orthographic letter "ب" is representative of the phoneme /b/, which in English contrasts with /p/.

2 - Presenting brief basic information about the relationship between the pronunciation of the target sound at hand and English spelling because, as (Gordon)[43] asserted, understanding the types of spelling involved will help the student learn the target sound more efficiently since the English spelling deceives most learners. For instance, if the sound [ʒ] was introduced, it should be noted that the orthographic letter ''s,'' as in ''measure,'' [meʒɚ] and ''vision'' [vɪʒən], and the letter ''g,'' as in ''massage'' [məsɑːʒ], are all representative of that sound.

3 - Providing aural exercises that made the learners discriminate between the correct target sound and the replacement they used; e.g., minimal pairs were used to make them discriminate between /p/ and /b/ as in ''pear'' and ''bear''.

4 - Involving students in activities that showed them how inappropriate transfer of L1 system features hindered communication, such as, illustrating that breaking consonant clusters by inserting vowels radically changes the meaning of a word like ''sport'' to ''support'' or a word like ''state'' to ''estate''.

5 - Providing oral drills through which they practised pronouncing the target sound in isolation and then in connected speech.

The material used for instruction was organized according to the framework suggested by (Gordon)[44], who stated that a speech improvement learning process for non-natives should ideally consist of two stages: 1. learning to listen, done in three steps: error recognition, ear training and replacement, and 2. oral drills of sounds in isolation and in context.

Data Analysis

I. Diagnostic Phase

A diagnostic profile was set up for each of the 30 participants based on the recordings made. Accordingly, the recorded data were phonetically transcribed by the researchers, and the patterns of errors were traced. An American English native speaker was consulted to listen to the recordings to reduce the possibility of errors the researchers might have overlooked. Then, the incorrect responses for each of the participants were registered and presented as percentages that designated the rate of mispronunciation in the participant's speech production. Consequently, if a participant consistently mispronounced pronounced a particular problematic consonant or consonant cluster, her percentage would be 100%. If, on the other hand, she consistently pronounced the phonemes correctly, the percentage would be 0%. Then an average of mispronunciation was calculated for all the participants in the pronunciation of each problematic consonant and consonant cluster in the different word positions and in the different speech styles (i.e., word-list reading and sentence reading).

II. Speech Improvement Phase

The data produced by the four participants in this phase were also phonetically transcribed. Incorrect responses were converted into percentages, and an average of the participants' interference errors was calculated. The average percentages of interference errors in the pre-test were then compared to those obtained in the post-tests to affirm the facilitating role of the implemented improvement program. Consequently, an average percentage of error reduction was calculated.

Results and Discussion

I. Diagnostic Phase

L1 Interference in Participants' Production

Figure 1 presents the rate of L1 interference experienced by each participant in the production of all the problematic consonants and consonant clusters. The highest percentages were 53.1%, 49.9%, and 49.2%. The percentages 17.5% and 18% were the lowest. Other percentages varied from 21%, attained by Participant 29, to 42.4%. The fact that such a variance in rates was exhibited proves that teaching them English Theoretical Phonetics was not enough to help them overcome interference problems.

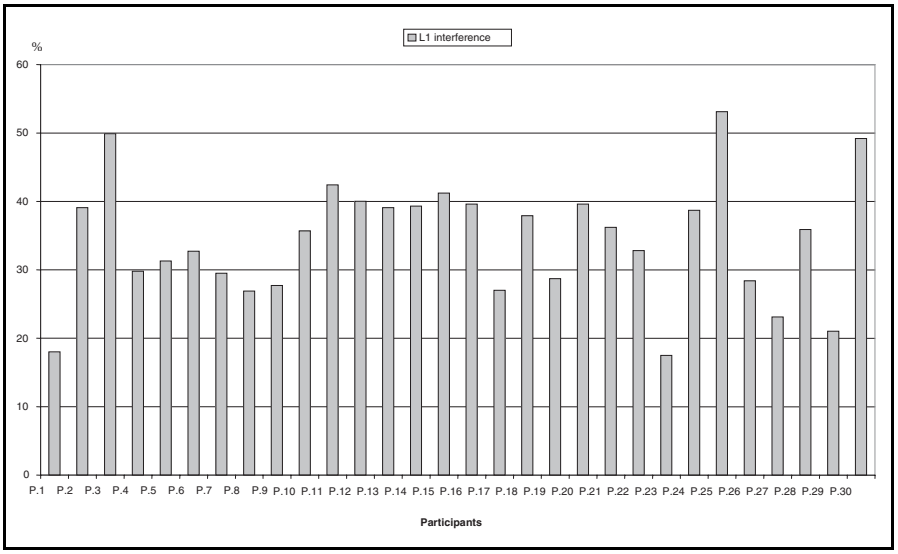

Figure 1: The Rate of L1 Interference Experienced by Each Participant in Production of all the Consonants and Consonant Clusters

L1 Interference in Production of Consonants

Rates of L1 interference. Table 3 shows that the four consonants [ɳ], [ʒ], [p], and [r] proved to be the most problematic for the participants in this study. Their average percentages of mispronunciation ranged between 46.7% and 91.7%. The consonants [ʧ], [ð], [l], and [ʤ] were less problematic. Their average percentages of mispronunciation ranged between 18.3% and 24.3%. The two sounds [v], and [θ] were the least problematic.

Table 3: Average Percentages of Mispronunciations (MP) of Problematic Consonants

Problematic consonants	MP% in word-list reading				MP% in sen-tence reading	MP to-tal %
	Initially	Medial-ly	Finally	All po-sitions		
/ŋ/	-	92.2	93.3	93.5	94	91.7
/ʒ/	-	51.1	86.7	69.6	54.4	65.9
/p/	47.8	66.7	25.6	50.8	57.9	51.8
[r]	50	52.2	31.1	44.5	51.7	46.7
/ʧ/	14.4	31.1	10	19.6	25.7	24.3
/ð/	0	14.4	87.8	36.6	4	23.1
/l/	46.7	25.5	7.8	26.7	14.7	20.7
/ʤ/	16.7	37.8	10	21.5	12.7	18.3
/v/	20	6.7	4.4	11.8	14.2	12.2
/θ/	7.8	4.4	10	7.0	9.9	7.8

Figure 2 represents the rate of interference errors that were committed in the production of each speech sound. It displays the hierarchy of difficulty experienced in the production of the consonant sounds.

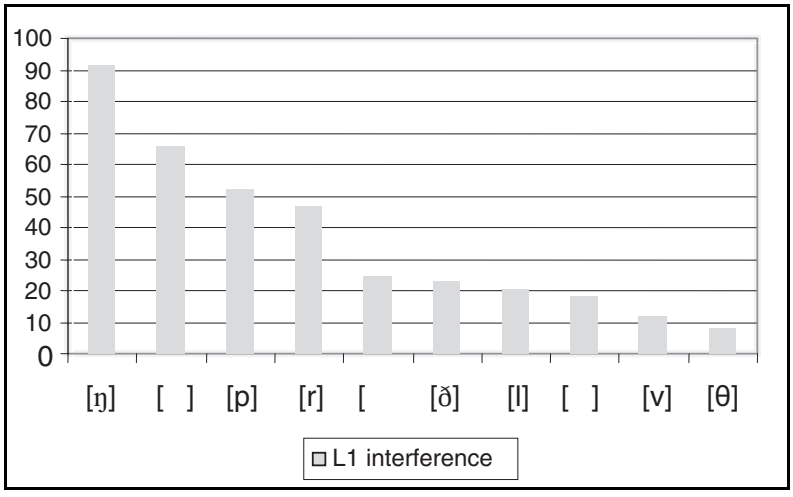

Figure 2: The Rate of L1 Interference Experienced in Production of Each Consonant

Analysis of error patterns. In this section, the examined consonants are analyzed according to their order of difficulty. The participants' error patterns are appointed and discussed with reference to the phonemic inventory of AE and NA consonants as represented in Tables 1 and 2.

/ŋ/: This is a distinct phoneme in AE (see Table 1), but in NA, it occurs as an allophone of the phoneme /n/ (Al-Sweel)[45]; (Dabaan)[46], (Al-Jasser)[47] and (Moosa)[48]. This explains why all the participants in this study pronounced it [ŋg] -as in the word ''sing'' [spronounced [sɪŋg]- 91.7% of the times it occurred (see Figure 2). Another reason that may have caused such a high rate of mispronunciation was the misleading spelling of the words the participants were asked to read. For instance, since the sound [ŋ] in the words ''hanger'' [hæŋɚ] and ''hanging'' [hæŋɪŋ] was orthographically represented by the two letters ''n'' and ''g'', it was pronounced by the participants as two phonemes [ŋg]. Such an error is justified once the participants' L1 and L2 are compared. Arabic has a one-to-one correspondence between sounds and spelling (Barros)[49] and (Dabaan)[50]. The sound was the most problematic with an average mispronunciation that reached 93.3%. Despite this high percentage of error occurrence, mispronouncing it did not affect the intelligibility of the words and sentences.

/ʒ/: This phoneme exists in AE but not in NA as seen in Tables 1 and 2 and it was in second place in order of difficulty. Its total average percentage of mispronunciation reached 65.9% (see Figure 2). The highest percentage of mispronunciation appeared when /ʒ/ occurred word finally and the mispronunciation rate was 69.6% (see Table 3). Most of the participants substituted [ʒ] with its nearest affricate equivalent in NA, which is [ʤ] (see Table 2). Others were deceived by the spelling of the words in which the sound was represented since in Arabic each orthographic letter has only one pronunciation. Thus, [ʒ] was pronounced [g] in words like ''beige'' [beɪʒ] where [ʒ] was orthographically represented by the letter ''g.'' Others were confused when choosing the particular phonetic representation of the phoneme /ʒ/ in words like ''invasion'' [ɪnveɪʒˤn]. Thus, it was pronounced either as [s], [ʃ], or [z], becoming [ɪnveɪsˤn], [ɪnveɪʃˤn], or [ɪnveɪzˤn]. One participant pronounced it as [ʧ] in the word ''measure'' [meʒɚ], which became [meʧɚ]. Such mispronunciations caused noise to the ear and sometimes rendered the word unintelligible.

/p/: This phoneme exists in AE but not in NA (see Tables 1 and 2). Its average percentage of mispronunciation reached 51.8% (see Figure 2). Most participants substituted it with the phoneme /b/, as in ''park''

[pɑ:rk] pronounced [bɑ:rk], or articulated it more like a fricative [Φ] giving a friction-like quality to the sound. The fact that /p/ and /b/ are two contrastive phonemes in English caused a significant change in the meaning of such words. The highest rate of mispronunciation appeared when /p/ occurred word medially, reaching 66.7% (see Table 3). Most participants substituted the sound [p] in words like ''depend'' [dɪpend] and ''stu:pɪd'' [stu:pd] with the sound [b]. In addition to the influence of L1, such an error was also likely caused by assimilation. The fact that [p] was preceded and followed by voiced phonemes caused an overlap of voicing. The lowest average percentage of mispronunciation was obtained when the phoneme /p/ occurred at word-final positions, reaching only 25.6% (see Table 3). That was true because, in this position only, the devoiced [b] was considered correct since in English a final oral stop may be unreleased as another variant of the released stop (Aronoff & Rees-Miller)[51]. Consequently, a word like ''lip'' could alternatively be transcribed as [lɪp^{h}] with a released [p^{h}] or as [lɪp□] with an unrealesed [p□]. Thus, words like ''lip'' [lɪp], ''trap'' [træp], and ''hop'' [hop] were considered correct when they were respectively pronounced as [lɪp□], [træp□], and [hop□].

/r/: This phoneme, which was the fourth most mispronounced consonant, has different phonetic realizations in NA and AE. In AE, it is retroflex with some rounding of the lips and transcribed [ɹ] (see Table 1). In Standard Arabic, it is either tapped as in [bæɾæ] ''he sharpened'' in which the tongue rapidly taps once against the alveolar ridge, or trilled as in [bɑr:ɑ] ''outside'' in which the tongue makes several quick taps against the alveolar ridge (Anani)[52]. Further, Table 2 shows that in NA it is produced as a trill [r]. This justifies the fact that it was pronounced by the participants as either a tap [ɾ] or a trill [r]. The participants simply replaced the sound [ɹ] with the sounds represented by the letter ''r'' in their own L1. A third attempt to resemble the target sound resulted in producing a flap [ɽ] that neither existed in their L1 nor their L2. This, again, might be attributed to the fact that their speech organs or mouth musculatures have not been trained enough to produce the English version of the [r] sound, since the participants did not learn English until after the age of puberty. The highest percentage of mispronunciation occurred when the sound appeared medially in words like ''card'' [kɑ:ɹd]. It was mispronounced 66.7% of the times it occurred (see Table 3). It was noted that the phonetic alterations used by the participants did not critically affect comprehending their speech.

/ʧ/: This phoneme exists in AE but not in NA as shown in Tables 1 and 2. It

was mispronounced 24.3% of the time (see Table 3). It was substituted with either /ʃ/, as in ‘‘watch’’ [wɑ:ʧ], pronounced [wɑ:ʃ], making the words ‘‘watch’’ and ‘‘wash’’ sound identical, or by /ʤ/, as in ‘‘church’’ [ʧɝ:ʧ], pronounced [ʧɝ:ʤ]. It was also substituted with other phonemes due to the deceptive spelling of the words. For example, the word ‘‘pasture’’ [pæsʧɚ] was consistently pronounced [pæstɚ], substituting the phoneme /ʧ/ with /t/. The highest percentage of mispronunciation reached 31.1% when the sound occurred word medially (see Table 3).

/ð/: This phoneme exists in both AE and NA (see Tables 1 and 2), but caused some errors (see Table 3). In all the errors that occurred, the phoneme /ð/ was substituted with /θ/. The familiarity of words to the participants had an effect on their pronunciation. Since the words that began with /ð/ were familiar to them, such as, ‘‘those’’ and ‘‘there,’’ the participants scored 0% as the average percentage of mispronunciation when it appeared in a word initially. However, the phoneme’s average percentage of mispronunciation when it appeared in a word finally reached 87.8% (see Table 3). That was true because the words in the cases where the phoneme /ð/ occurred at word-final position were less familiar, such as ‘‘bathe’’ [beɪð] and ‘‘loath’’ [loʊð], which were pronounced [beɪθ] and [loʊθ], respectively. Such words that were less familiar were deceptive to the participants in terms of their orthographic form. In English, the letters ‘‘th’’ could be phonetically realized as /ð/ or /θ/, whereas in Arabic, where each orthographic letter has only one realization, the letter ‘‘ث’’ is realized as / θ / and the letter ‘‘ذ’’ is realized as /ð/ (Dabaan)[53]. This caused confusion to the participants when the letters ‘‘th’’ occurred in a word. Such mispronunciations sometimes rendered their speech unclear.

/l/: This phoneme has two allophones in AE; the clear alveolar [l] and the dark or velarized [ɫ] (Celce-Murcia et al)[54], (O’Connor)[55] and (Avery and Erlich)[56]. These two allophones also exist in Standard Arabic (Barros)[57], (Dabaan)[58] and (O’Connor)[59]. Concerning NA, no source with a clear description of the /l/ allophones was available to the researchers. However, based on observation and mingling with Najdi speakers, the researchers have noticed that they use both allophones; the velarized [ɫ], as in [wɑɫɫɑ:h] ‘‘by the name of God’’ and the clear [l] as in [læ□]‘‘no.’’. In this study, both the velarized [ɫ] and the clear [l] were examined. The highest percentage, 46.7%, of mispronunciation occurred when the clear [l] appeared word initially (see Table 3). The clear [l] produced by the participants in words like ‘‘leap’’ [li:p] and ‘‘lose’’ [lu:z] resembled the Arabic clear [l]. However, the velarized [ɫ], which occurred word finally,

was not as problematic. The average percentage of mispronunciation in this position reached only 7.8%. The discussed mispronunciations did not affect the intelligibility of their speech.

/ʤ/: This phoneme exists in AE and NA (see Tables 1 and 2). Yet, it was still mispronounced 18.3% of the times it occurred (see Table 3). Most of the errors occurred word-medially with an average percentage that reached 37.8%. Most errors committed were out of confusion, since English letters, as mentioned previously, do not correspond to particular phonetic or phonemic counterparts like Arabic letters. Thus, in words like "gym" [ʤɪm] and "ledger" [leʤɚ], the [ʤ] sound was pronounced [g]. Such mispronunciations made those words unintelligible.

/v/: This phoneme occurs in AE but is absent in NA as seen in Tables 1 and 2. However, it was not problematic for the participants in this study, at this level of proficiency, since 12.2% was the total average percentage of mispronunciation (see Table 3). Most errors occurred word-initially where the sound /v/ was often substituted with its voiceless counterpart /f/, which exists in NA, as in "vast" [væ:st], pronounced [fæ:st]. Such alteration affected the meaning drastically since /f/ and /v/ are two contrastive phonemes in English.

/θ/: This phoneme is the voiceless counterpart of the voiced /ð/. It exists in AE and NA as seen the Tables 1 and 2. Very few errors were committed since the words incorporating the sound were familiar to them (e.g. "thin" [θɪn] and "nothing" [nʌθɪŋ]. The total average percentage of mispronunciation reached only 7.8% (see Table 3). Most errors appeared word-finally with an average percentage that reached 10%. The words "therapy" [θerəpi] "earthy" [ɝ:rθi], and "breath" [breθ] were mispronounced by replacing [θ] with [ð], which caused unintelligibility. Again, such confusion is attributed to the difference between the Arabic and English orthographic systems, as mentioned in the previous analysis of /ð/.

In general, the average percentages of mispronunciations of all the examined consonants in sentence reading were usually higher than those in word-list reading, as can be seen in Table 3. Out of ten examined target sounds, six manifested higher average percentages of mispronunciation in sentence reading, namely /p/, /v/, /ŋ/, /ʃ/, /r/, and /θ/. Thus, it seemed that the participants' pronunciation in sentence reading was affected in the connected speech by the preceding and following phonological environments, resulting in the sounds not being linked correctly. On the contrary, there were a few cases where the situation was reversed. Perhaps the most apparent was the sound /ð/, which scored 36.6% in word-list reading but only 4% in sentence reading.

L1 Interference in Production of Consonant Clusters

Rate of interference. Table 4 shows that the total average percentage of mispronouncing the word-initial and word-final consonant clusters reached 24.1%. It reached 34.7% in sentence reading and 21.9% in word-list reading. Thus, the participants committed more pronunciation errors in sentence reading.

Table 4: Average Percentages of Mispronunciations (MP) of Word- initial and Word-final Consonant Clusters

	MP % in word- list reading							MP% in sentence reading	MP total %
	Initial clusters					Final clusters	Initial & final clusters		
	/spr-/	/spl-/	/str-/	/skr-/	All types				
% of MP	27.5	26	2	20.7	19	22.6	21.9	34.7	24.1

As for word-initial consonant clusters, four types were examined: /spr-/ as in ‘‘spray’’ [spreɪ], /spl-/ as in ‘‘splash’’ [splæʃ], /str-/ as in ‘‘street’’ [stri:t], and /skr-/ as in ‘‘scram’’ [skræm]. The average percentages of mispronunciation in order of difficulty were: 27.5% for /spr-/, 26% for /spl-/, and 20.7% for /skr-/. The least mispronounced type was the initial /str-/ which produced an average percentage of mispronunciations of only 2%. This was not surprising, since NA does allow this pattern (Abboud)[60]. This supports what (Dabaan)[61] concluded concerning this type of cluster.

Figure 3 is a further display of the rate of interference experienced in pronunciation of word-initial and word-final consonant clusters.

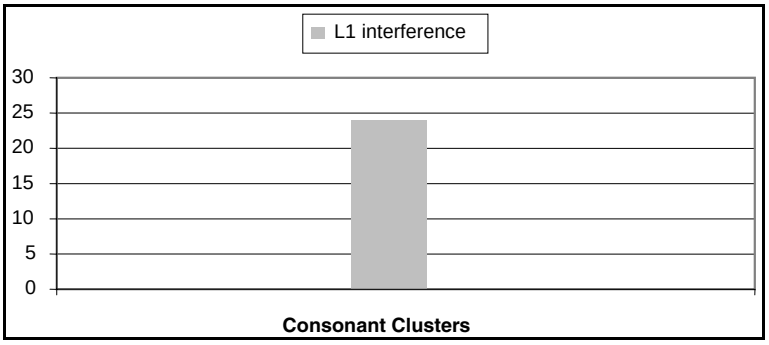

Figure 3
The Rate of L1 Interference Experienced in Production of Consonant Clusters

Analysis of error patterns. The error patterns applied by the participants manifested the evident influence of L1 in different ways. Since NA rarely allows three consonant clusters (Abboud)[62], the participants tended to employ two strategies in dealing with the problematic clusters. Both of these strategies served to simplify the syllable structure of the English word by making it conform to the pattern of the participants' L1. Both, however, affected intelligibility of speech.

The first strategy was to insert epenthetic vowels at different word positions. Consequently, a word like ''spray'' [spreɪ] was sometimes pronounced as [sɪpreɪ] by inserting a vowel medially, and other times as [ɪspreɪ] by adding the vowel initially.

In word-list reading, where the clusters were incorporated in isolated words, the dominant tendency was to add the epenthetic vowel word medially. However, in sentence reading, where the words with consonant clusters were presented in context (i.e., in longer sequences of consonants), the tendency to break the clusters moved to the beginning of the word. For example, the word ''spread'' [spred] was mostly pronounced [sɪpred] when read alone, but pronounced [ɪspred] when read in connected speech as in ''diseases spread'' [dɪzi:zɪz spred].

The second strategy employed by the participants was to reduce the cluster by eliminating one of its successive consonants, also at different word positions. Thus, elimination was sometimes finally as in ''lists'' [lɪsts] pronounced [lɪst], ''asked'' [æskt] pronounced [æsk], and ''against'' [əgenst] pronounced [əgens]. Other times a medial sound was eliminated as in ''sixth'' [sɪksθ] pronounced [sɪkθ] and ''scratch'' [/skræʧ/] pronounced [sræʧ].

II. Speech Improvement Phase

The treatment was limited to the consonant and consonant clusters that proved to be the most problematic and the most detrimental to the intelligibility of speech. From the consonants, /p/ was chosen because although it was in third place as the most problematic sound, it had the greatest effect on the intelligibility of speech. For instance, changing ''park'' [pɑ:rk] to [bɑ:rk], was far more critical than changing ''invasion'' [ɪnveɪʒ^{ə}n] to [ɪnveɪʃ^{ə}n]. As for the consonant clusters, they all equally affected intelligibility. Thus, /spl-/ and /spr-/ were the chosen clusters since they were two of the specified patterns that yielded high mispronunciation percentages (see Table 4).

Rates of Error Reduction in Post-tests

The participants made significant improvement in the pronunciation of the consonant /p/ and the clusters /spr-/ and /spl-/ in two weeks of training and

eradicated their problems in the third week. Three main factors led to such progress. The first was acquainting the students with a phonetic description of their exact error patterns, which was very effective in drawing their attention to such unconscious habits. The benefits of this step were obvious when it was time for them to orally produce the speech sounds. The second concentrated on discriminating drills that highlighted the difference between the correct target sound and the replacement they used. The third was their high motivation to improve their pronunciation as inferred from their answers to the questionnaire that was distributed before starting the treatment and was obvious in their commitment.

The consonant /p/. Table 5 displays the average percentages of interference errors obtained in the pre-test and the two post-tests in the production of /p/. It shows that the participants significantly improved their pronunciation of /p/ in all word positions and in all speech styles.

Table 5
Pre-test and Post-test Average Percentages of Interference Errors in Pronunciation of /p/

	% in word list reading				% in sentence reading	total %
	Initially	Medially	Finally	All positions		
Pre-test	50	66.7	41.7	52.8	67.5	60.4
Post-test: after two weeks of training	16.7	8.3	0	8.3	9.4	8.8
Post-test: after three weeks of training	0	0	0	0	0	0

The total average percentage of interference, which reached 60.4% in the pre-test, decreased to 8.8% in the post-test taken after two weeks of training and then reached 0% in the post-test taken after three weeks. The percentage of interference of /p/ in word-list reading and sentence reading respectively decreased in two weeks from 52.8% to 8.3% and from 67.5% to 9.4% and then reached 0% in the third week. This means that the participants reduced 85.4% of their total errors in two weeks and all their errors in three weeks. Table 6 shows the rates of error reduction as experienced throughout the weeks of training.

Table 6
Rates of Error Reduction in /p/ Pronunciation

Length of training time	% in word list reading				% in sentence reading	total %
	Initially	Medially	Finally	All positions		
Post-test: after two weeks of training	66.6	87.6	100	84.3	86.1	85.4
Post-test: after three weeks of training	100	100	100	100	100	100

Tables 5 and 6 also show that the lowest percentage of errors in the pre-test occurred word-finally at 41.7%, and the participants were able to overcome those mispronunciations in two weeks, obtaining 0% error occurrence (see Table 5) and thus reducing their errors 100% (see Table 6). It was easier for them to obtain a correct pronunciation of /p/ in this position because /p/ is generally unreleased word-finally in English.

Further, the pre-test results showed that /p/ word-medially was more problematic than /p/ word-initially. However, the post-test results showed that after two weeks of training, the percentage of interference decreased more in the medial position than in the initial position. The percentage of errors decreased word-medially from 66.7% to 8.3% whereas it decreased word-initially from 50% to 16.7%, making the rate of reduction reach 87.6% and 66.6% of their errors, respectively. That was because when /p/ came initially, the participants who were very anxious to produce the correct pronunciation focused all their attention on this first letter and exaggerated in restricting then releasing the puff of air and thus ended up pronouncing it wrong.

The consonant clusters /spr-/and /spl-/. The participants also made significant progress in the production of the examined clusters as seen in Table 7. After two weeks of training, the percentage of interference decreased from 35% to 4.9% and then reached 0% in the third week. The clusters /spl-/ and /spr-/ in word-list reading both decreased in the first two weeks from 30% to 5% and then to 0% in the third week. In sentence reading, the percentage decreased from 40% to 5% and then to 0%.

Table 7
Pre-test and Post-test Average Percentages of Interference Errors in Pronunciation of /spl-/ and /spr- /

	% in word list reading			% in sentence reading	total %
	/spr-/	/spl-/	All types		
Pre-test	30	30	30	40	35
Post-test: after two weeks of training	5	5	5	5	4.9
Post-test: after three weeks of training	0	0	0	0	0

The participants' improvement can be further analyzed in terms of the rate of error reduction they experienced. Table 8 displays these percentages.

Table 8
Rates of Error Reduction in /spr-/and /spl-/ Pronunciation

	% in word list reading			% in sentence reading	total %
	/spr-/	/spl-/	All types		
Length of training time	83.3	83.3	83.3	87.5	86
Post-test: after three weeks of training	100	100	100	100	100

The percentages of error reduction in both types of clusters and in both speech styles were very close. In the first two weeks of training, the participants reduced 86% of their total errors, 87.5% of their errors in sentence reading and 83.3% of their errors in word-list reading. In the third week, they reduced all their errors by 100%.

Conclusions

The results of this study have affirmed the previously reported influence of L1 interference on Arab L2 learners of English. This interference is inversely proportional to the level of proficiency of L2 learners. Some of the previously reported problematic consonants proved to be otherwise as the participants of this study are assumed to have attained a high level of proficiency. The nature of the interference is shown negatively in the consonants present in the AE inventory but missing from the NA inventory. The same can be said about consonant clusters as the clusters missing from the

NA inventory were the most problematic ones. The effects of error patterns on comprehensibility are variable resulting in speech that can be described as slightly or highly distorted. Error patterns are shown in consonants as consonant replacement or distortion and in cluster simplification as either inserting a vowel between the consonants or deleting one consonant.

Word position is not significant with respect to its effect on the difficulty of the problematic consonants.

The success of the suggested remedial program in reducing the participants' errors implies that traditional English skill programs are not effective for this specific purpose and that a specialized program should be introduced to tackle the specific phonetic interference problems between Arabic and English. This program should be based on the phonetics and phonology of both Arabic and English, raise the awareness of the students about their own pronunciations, primarily target consonants and consonant clusters, consider regional and social dialectal variations, and include objective methods for assessment of pre- and post course phonetic skills.

REFERENCE:

1 - Al-Jasser, J. Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter. Kansas, USA: Unpublished Master's dissertation, University of Kansas, 1978.

2 - Barros, A. Pronunciation difficulties in the consonant system experienced by Arabic speakers when learning English after the age of puberty. West Virginia, USA: Unpublished Master's dissertation, University of West Virginia, 2003.

3 - Dabaan, I. Implications of Error Analysis for the Teaching of English Phonology to Saudi Students. Kansas, USA: Unpublished Ph.D. dissertation, University of Kansas, 1983.

4 - Kharma, N. and A. Hajjaji. Errors in English among Arabic speakers: analysis and remedy. Beirut: Libraire Du Liban Publishers, 1997.

5 - Moosa, M. Difficulties of learning the pronunciation and structural differences between Arabic and English. Kansas, USA: Unpublished Master's dissertation, University of Kansas, 1979.

6 - Mousa, A. The interphonology of Saudi Learners of English. Essex, UK: Unpublished Ph.D. dissertation, University of Essex, 1994.

7 - Al-Deen, S. Phonological difficulties encountered by Saudi undergraduates enrolled in the english program at women's colleges. Jeddah, KSA: Unpublished Mater's dissertation, college of Education, 1982.

8 - (Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter.)

9 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

10 - Dulay, H. and M. Burt. "Errors and Strtegies in child second language acquisition." TESOL Quarterly (1974): 129-136.

11 - (The interphonology of Saudi Learners of English.)

12 - (Difficulties of learning the pronunciation and structural differences between Arabic and English.)

13 - (Phonological difficulties encountered by Saudi undergraduates enrolled in the english program at women's colleges.)

14 - O'Connor, J. Better English Pronunciation. Cambridge: Cambridge University Press, 1985.

15 - (Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter.)

16 - Op. Cit.

17 - Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.

18 - (The interphonology of Saudi Learners of English.)

19 - Phonetic symbols used in this article follow the International Phonetic Alphabet (http://www.arts.gla.ac.uk/IPA/IPA_chart_(C)2005.pdf)

20 - (Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter.)

21 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

22 - (The interphonology of Saudi Learners of English.)

23 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

24 - (The interphonology of Saudi Learners of English.)

25 - Al-Feneekh, A. Non-phonetic prerequisites to phonological rules. Washington: Unpublished Master's dissertation, University of Washington, 1983.

26 - Al-Sweel, A. The verbal system of Najdi Arabic: a morphological and phonological study. Washington, USA: Unpublished Master's dissertation, University of Washington, 1981.

27 - Celce-Murcia, M., D. Brinton and J. Goodwin. Teaching Pronunciation. Cambridge: Cambridge University Press, 1996.

28 - (Non-phonetic prerequisites to phonological rules.)

29 - Abboud, P. "The verb in northern Najdi Arabic." Bulletin of the school of Oriental and African studies (1979): 468-499.

30 - (Pronunciation difficulties in the consonant system experienced by Arabic speakers when learning English after the age of puberty.)

31 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

32 - (Errors in English among Arabic speakers: analysis and remedy.)

33 - Avery, P. and S. Erlich. Teaching AE pronunciation. Oxford: Oxford University Press, 1992.

34 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

35 - (Errors in English among Arabic speakers: analysis and remedy.)

36 - (Pronunciation difficulties in the consonant system experienced by Arabic speakers when learning English after the age of puberty.)

37 - (Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter.)

38 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

39 - (The interphonology of Saudi Learners of English.)

40 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

41 - (Teaching AE pronunciation.)

42 - Gordon, M. Speech Improvement. New Jersey: Prentice Hall, Inc., Englewood Cliffs, 1974.

43 - (Speech Improvement.)

44 - Op. Cit.

45 - (The verbal system of Najdi Arabic: a morphological and phonological study.)

46 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

47 - (Interlingual errors and the Phonological difficulties that Saudi Arabian Learners of English Encounter.)

48 - (Difficulties of learning the pronunciation and structural differences between Arabic and English.)

49 - (Pronunciation difficulties in the consonant system experienced by Arabic speakers when learning English after the age of puberty.)

50 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

51 - Aronoff, M. and J. Rees-Miller. The Handbook of Linguistics. Oxford: Blackwell Publishing, 2003.

52 - Anani, M. "Differences in the distribution between Arabic /l/, /r/, and English /l/, /r/." Papers and Studies in Contrastive Linguistics (1985): 129-133.

53 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

54 - (Teaching Pronunciation.)

55 - (Better English Pronunciation.)

56 - (Teaching AE pronunciation.)

57 - (Pronunciation difficulties in the consonant system experienced by Arabic speakers when learning English after the age of puberty.)

58 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

59 - (Better English Pronunciation.)

60 - "The verb in northern Najdi Arabic."

61 - (Implications of Error Analysis for the Teaching of English Phonology to Saudi Students.)

62 - "The verb in northern Najdi Arabic."

❊ ❊ ❊