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Vowel Epenthesis in the Pronunciation of English Consonant Clusters by Kuwaiti EFL Learners

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***Abstract*—This study investigated pronunciation errors made by Kuwaiti Arabic (KA) learners of English as a foreign language (EFL) in their production of English consonant clusters. The participants consisted of 25 Kuwaiti EFL learners who were asked to read English words embedded in short sentences. Target words constituted initial, medial, and final-consonant clusters. Data were transcribed by the researchers in addition to three phoneticians for reliability and were further verified through Praat software. Results indicated that pronunciation errors made by these learners of English were restricted to initial and medial consonant clusters that violated the syllable structure requirements of their native dialect. When a conflict occurred between the syllable structure of their first language (L1) and that of the English language, the participants adopted two phonological repair strategies to resolve the conflict: vowel epenthesis and re-syllabification. These phonological repair strategies appeared to be a process of phonological rule transfer from the L1 to the second language (L2) and served to bring the underlying forms of the English words into conformity with restrictions on possible surface syllable structures of the Kuwaiti dialect. These findings highlight the need to develop materials and reading exercises in the classroom to raise students' awareness of the differences between the syllable structure of their L1 and that of English and its role in successful communication.**

***Index Terms*—consonant clusters, phonological repair strategies, pronunciation errors, syllable structure constraints, vowel epenthesis**

I. Introduction

To improve good communication skills, learners of English as a foreign language (EFL) need to learn not only the individual speech sounds, that is, vowels and consonants, but also the rhythmic characteristics of English utterances, including the inventory of permitted syllable patterns (Tajima & Akahane-Yamada, 2004). The syllable is an important rhythmic linguistic unit representing a major component of the English sound system (Goldsmith, 2011). It has a significant role in successful communication in English as it enables EFL learners to produce comprehensible pronunciation (Gilakjani et al., 2020). However, due to the considerable cross-linguistic variation in syllable patterns, EFL learners often encounter difficulties acquiring and mastering the sound system of the English language. According to Shoji (2014), some English words constitute phonological patterns that do not fit the phonological constraints of the learners' native language. Previous studies (e.g., Bouchhioua, 2019; Broselow & Kang, 2013; Chan, 2023; Lam & Thi, 2022; Nguyen, 2020) have demonstrated that many EFL learners produce an epenthetic vowel when pronouncing complex English syllables constituting consonant clusters. Vowel epenthesis is one of the most common phonological strategies followed by EFL learners. While such a phonological process is considered an error in EFL learning, it serves as a repair strategy to make English words conform to the syllable structure restrictions of learners' native language, thereby simplifying their pronunciation of complex consonant clusters.

A. Research Aims and Questions

The main purpose of this study is to explore the production of English consonant clusters by Kuwaiti EFL learners. Specifically, it aims to investigate if Kuwaiti EFL learners make pronunciation errors when pronouncing English words constituting consonant clusters, whether they employ phonological repair strategies when pronouncing English consonant clusters, and the factors that may trigger these repair strategies. In pursuit of the aims of the study, the following research questions are proposed:

1. What pronunciation errors do Kuwaiti EFL learners make when producing English words constituting consonant clusters?
2. What phonological repair strategies do Kuwaiti EFL learners employ when producing English words constituting consonant clusters?
3. What factors trigger the phonological repair strategies involved in producing English consonant clusters by Kuwaiti EFL learners?

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Throughout this paper, epenthetic segments are italicised for visual clarity.

B. Significance of the Study

Studies on EFL learners' production of English consonant clusters have significantly contributed to the literature. They have provided insights into EFL learners' pronunciation difficulties and language-specific phonological rules and conditions governing syllable structure acquisition. They have also provided insights into phonological factors that contribute to the production of the epenthesized vowel. However, while a significant number of studies have investigated this phonological issue covering a wide range of EFL learners, including Arabic EFL learners (e.g., Al-Yami & Al-Athwary, 2021; Broselow, 1993; Khalifa, 2020; Mohamed, 2016), the context of Kuwaiti Arabic (KA) learners, to the best of our knowledge, has not been explored. The acquisition of English syllable structure is expected to be difficult for Kuwaiti EFL learners, given KA's relatively simple syllable structure compared to English. The syllable structure of English differs remarkably from that of KA. English syllables constitute a great variation in structure and can be quite complex, containing up to three or four consonant clusters. In contrast, KA phonotactics exhibit less variation and impose greater constraints that govern the structure of the syllables. This can be seen as a potential source of difficulties for Kuwaiti EFL learners who attempt to acquire more intelligible and native-like pronunciation. However, we do not know if they make phonological errors in their pronunciation of English consonant clusters and if they employ the same phonological repair strategy as other EFL learners from other languages and Arabic dialects. There is thus a need for more research to explore this phonological issue in the KA context, a country where English is learned as a foreign language and where learners' native language exhibits different syllable structures than that of English.

Therefore, this study is conducted to explore the production of English consonant clusters by Kuwaiti EFL learners. It investigates if Kuwaiti EFL learners make phonological errors when pronouncing English words constituting consonant clusters (within and across syllable boundaries) and if they resort to vowel epenthesis as a phonological repair strategy when pronouncing such clusters. It also aims at exploring the possible factors that may trigger the epenthesis process, if any. By investigating the production of English consonant clusters in the context of Kuwaiti EFL learners, this study contributes to the field of EFL, thereby filling the gap in the literature and enriching it in this respect. Moreover, the study is considered significant as it provides phonological insights into phonotactic constraints of KA syllable structure and consonant cluster restrictions that could cause pronunciation difficulties for Kuwaiti EFL learners acquiring English as a foreign language. Furthermore, as this study highlights pronunciation difficulties encountered by Kuwaiti EFL learners, it also presents some pedagogical suggestions for EFL teachers to assist their Kuwaiti EFL students in improving their pronunciation.

II. Literature Review

A. Vowel Epenthesis

English has a complex syllable structure. It allows complex onsets and codas whereby a syllable could consist of up to three consonant clusters in the onset and up to four in the coda (e.g., *strengths* CCCVCCCC) (Cardoso, 2018). Consonant clusters also occur across syllable boundaries within one utterance (e.g., *children* CVC.CCVC) and could involve a longer and a different distribution of segments than that permitted in some other languages (Hashim, 2018). Therefore, acquiring English consonant clusters often poses significant challenges for EFL learners.

EFL learners' production of complex English consonant clusters has received tremendous attention in recent literature. Empirical studies (e.g., Al-Yami & Al-Athwary, 2021; Bouchhioua, 2019; Broselow & Kang, 2013; Castillo, 2022; Chan, 2023; Choi, 2016; Edwards, 2015; Lam & Thi, 2022; Nguyen, 2020; Zhang, 2009) have shown that EFL learners attempt to simplify their pronunciation of complex English words that constitute consonant clusters through vowel epenthesis. In fact, vowel epenthesis has been shown to be a prevalent phonological process among EFL learners[1]. In his investigation of pronunciation difficulties encountered by Chinese learners of English, Zhang (2009) found that Chinese speakers commonly have problems pronouncing English words like *prompt* and *thousandths*, which constitute initial and final-consonant clusters, and accordingly insert a vowel to ease their pronunciation of these words. Similarly, Adomako (2008), in his study of the production of English consonant clusters by Akan speakers, found that Akan speakers have problems producing English words constituting final-consonant clusters. A word like *film* was produced as /fɪl*ɱ*/ whereby a vowel was inserted to break up the syllable-final cluster. Japanese learners, as investigated by Tajima et al. (2002), have also been observed to insert a vowel into initial consonant clusters and after word-final consonants. Words like *sneezed* and *cross* were pronounced as /s*u*nɪz*u*do/ and /k*u*ros*u*/. Likewise, Tunisian speakers have also been reported breaking English consonant clusters that occur word-medially by means of vowel epenthesis to simplify their pronunciation. Bouchhioua (2019) argues that Tunisian students had problems identifying the syllables' boundaries in a word like *excuse*. The students inserted a vowel into the medial cluster, producing the word as /ɪks*ɪ*kju:z/. Such a phonological process of vowel epenthesis often causes English words to undergo re-syllabification.

[1] Research shows that vowel epenthesis and consonant deletion are the two most common phonological strategies used by EFL learners to simplify their pronunciation of English consonant clusters. However, empirical investigation shows that many languages prefer vowel epenthesis to consonant deletion (Shoji, 2014).

B. L1 Phonological Constraints

Researchers (e.g., Broselow & Kang, 2013; Edwards, 2015; Khalifa, 2018; Nguyen, 2021; Nguyen, 2020) point out that languages differ in the number of segments that are grouped into syllables and in restrictions on these segments that occur in certain positions within a syllable. Differences among languages are also identified in restrictions on sequences of segments that may occur across syllable boundaries. They further argue that native language restrictions often affect learners' production of L2 forms. Therefore, EFL learners, when producing consonant clusters that violate the phonological restrictions of their L1 or do not meet its structural requirements, tend to insert a vowel to 'fix' such impermissible inputs. Broselow and Kang (2013), for example, indicate that while vowel epenthesis is considered a phonological error in the production of L2 forms, it can be attributed to the phonological constraints of learners L1 used as a repair strategy to allow the surfacing of consonant clusters that underlyingly occur in 'illegal' contexts (see also Hansen, 2011). Tajima et al. (2002) also point out that vowel epenthesis stems from language-specific structural differences whereby each language differs in which features are specified in underlying representations and which features are not. EFL learners, therefore, follow such a strategy due to the effect of the phonotactic restrictions of their L1.

Evidence supporting this claim is presented in different empirical studies covering various EFL contexts, for example, Japanese, Chinese, Vietnamese, Brazilian, Spanish, Bengali, and Farsi speakers (Chan, 2023; Karim, 2010; Khanbeiki & Abdolmanafi-Rokni, 2015; Lam & Thi, 2022; Martinez-Garcia & Tremblay, 2013; Shoji, 2014; Silveira, 2002). Evidence is also presented from Arabic EFL learners, for example, Tunisian, Moroccan, Cairene, Iraqi, and Saudi speakers (Al-Yami & Al-Athwary, 2021; Bouchhioua, 2019; Broselow, 1993; Khalifa, 2020; Mohamed, 2016). These studies have clearly illustrated that English learners often carry over the phonological restrictions on consonant clusters of their native languages to the pronunciation of English words. For example, in Zhang's (2009) study of Chinese learners, vowel epenthesis takes place due to Chinese phonological rules whereby consonant clusters are not permitted in the language, and consonants are always followed by a vowel. Likewise, native Bengali words do not allow initial consonant clusters, and the maximum syllable structure is CVC. Speakers of this language, as investigated by Karim (2010), often carry over such constraints to English words, as in, for example, producing the word *gram* (CCVC) as /g*e*ram/ (CV.CVC) and *school* (CCVC) as /*ɪ*skul/ (VC.CVC). Japanese phonotactics also do not allow consonant clusters and word-final consonants. Therefore, when Japanese learners produce English words that constitute consonant clusters or word-final consonants, vowel epenthesis, as reported by Tajima et al. (2002), occurs to modify the clusters and avoid word-final consonants. Accordingly, English words like *dream* (CCVC) and *breakfast* (CCVC.CVCC) are often pronounced as /d*o*rɪm*u*/ (CV.CV.CV) and /b*u*rek*u*fas*uto*/ (CV.CV.CV.CV.CV.CV). Tajima et al. (2002) argue that such words are modified to conform to the primarily CV-based structure of Japanese.

Broselow (1993) has presented additional evidence that vowel epenthesis takes place due to EFL learners attempting to transform foreign language forms to fit the phonotactic restrictions of their native language patterns. Broselow's (1993) study investigating pronunciation errors in the production of English words containing medial three-consonant clusters by Egyptian and Iraqi Arabic speakers revealed differences in the treatment of such clusters. Both varieties of Arabic prohibit medial three-consonant clusters. Yet, speakers of each variety modify English medial clusters differently. Iraqi speakers pronounce the English word *children* as /ʧɪl*ɪ*dren/ whereas Egyptian speakers pronounce it as /ʧɪld*ɪ*ren/. While Iraqi speakers inserted a vowel after the first of three consonants, Egyptian speakers, on the other hand, inserted a vowel after the second of three consonants. Broselow (1993) argues that such a different pattern of vowel epenthesis can be attributed to the different rules of permitted syllable structures of the two Arabic dialects. The Iraqi rule of vowel epenthesis inserts a vowel to the left of a non-syllabified, or a 'left-over', consonant creating a closed syllable. The Egyptian rule, on the other hand, inserts a vowel to the right of a non-syllabified consonant forming an open syllable. Speakers of these dialects, according to Broselow (1993), often carry over such rules to the pronunciation of English words that constitute medial three-consonant clusters. In all cases, however, vowel epenthesis in the pronunciation of English consonant clusters by Iraqi and Egyptian English learners serves to produce a phonotactically acceptable output that adheres to the more restrictive syllable structure conditions of the learners' native Arabic dialects.

C. KA Syllable Structure

KA is commonly used to refer to the Arabic dialect spoken in Kuwait. Although Arabic dialects have a common origin in Standard Arabic, they vary linguistically, especially at the phonological level (AlOtaibi et al., 2022). As Humayun et al. (2023) state, each Arabic dialect has its own rules that differ from Standard Arabic and those of other dialects. This applies to the syllable structure, which varies across the Arabic dialects.

In surface structure, KA does not permit word or syllable-initial consonant clusters in accordance with a general rule of Arabic phonology (Hamdi et al., 2005; Hashim, 2018). Thus, in a word such as /warda/ 'a flower', the intervocalic consonants must belong to two different syllables, i.e., CVC.CV.

Different from English which allows several types of syllable structures, i.e., (C)(C)(C)V(C)(C)(C)(C), KA has five syllable patterns that occur in surface structure (Ayyad, 2011), as shown below:

CV	/fɪ/	'in'
CVC	/ʕʌd/	'count'
CVV	/maa/	'not'

CVVC /baab/ 'door'
CVCC /rɪħt/ 'I went'

The first four patterns have free distribution, whereas the fifth pattern, CVCC, rarely occurs initially but mostly occurs medially, finally, or in isolation (Abd al-Sattar, 2015), as in:

/bard.hom/ CVCC.CVC 'their cold weather'
/kɪ.tabt.la/ CV.CVCC.CV 'I wrote to him'
/ʕaz.zamt/ CV.CVCC 'I decided'
/ʤɪld/ CVCC 'skin'

As in Arabic, geminated (or doubled) consonants in KA are considered identical clusters (Mubarak & Jebur, 2018). Where the syllable boundary is concerned, the first member of the geminated cluster occurs as a coda of the first syllable and the second member always occurs as an onset of the second syllable, as in:

/raʃ.ʃaħ/ CVC.CVC 'elected'
/mat.tan/ CVC.CVC 'make fatter'

Long vowels[2], on the other hand, always stay within the syllable frame (Abd al-Sattar, 2015), i.e., the syllable cut does not divide them, as in the following examples:

/ʤɑɑ.hɪl/ CVV.CVC 'ignorant'
/maʃ.rʊ.baat/ CVC.CV.CVVC 'drinks'

Given KA's relatively simple syllable structure compared to English, one can presuppose that Kuwaiti EFL learners could have difficulties producing complex English consonant clusters.

III. Methodology

A. Participants

The participants consisted of 25 Kuwaiti EFL learners (males and females). They were selected to participate in this study because of their similar educational backgrounds: all have received twelve years of EFL education in Kuwaiti government schools. Also, all participants at the time of the current study were studying English for Specific Purposes (ESP) at the College of Business Studies (CBS) at the Public Authority for Applied Education and Training (PAAET) in Kuwait. To control language proficiency, the participants were also selected on the basis that all of them were at the time of recording in their second year at college enrolled in ESP English 154. In addition, all participants have not lived in an English-speaking country.

Upon agreeing to participate in this study and the recording procedure, the participants read the information sheet and signed the consent form. They were assured of the anonymity and confidentiality of their names and identities, and that they could withdraw from the study at any stage. They were also assured that the data would only be used for research purposes.

B. Data

A list consisting of 20 English words was compiled by the researchers. All test items were common English words the participants usually encountered in their high school and college English textbooks. The words contained initial, medial, and final-consonant clusters, as illustrated in Table 1. The number of consonants in the clusters ranged from two to three. The consonant clusters these words constitute are listed by Duanmu (2008) as the most frequently occurring consonant clusters in English.

[2] Throughout this paper, long vowels in (Kuwaiti) Arabic are indicated by doubling the symbol, for example, /aa/ for long /a/ (see Mubarak & Jebur, 2018, for the difference between Arabic and English long vowels).

TABLE 1
TEST ITEMS

Test items	Target clusters
brain	/breɪn/
cruel	/kruːl/
drop	/drɒp/
free	/friː/
grip	/grɪp/
proud	/praʊd/
step	/step/
trap	/træp/
spray	/spreɪ/
street	/striːt/
scream	/skriːm/
squeeze	/skwiːz/
splash	/splæʃ/
park	/pɑrk/
jump	/ʤʌmp/
resort	/rɪ.zɔrt/
modern	/mɒ.dərn/
conduct	/kən.dʌkt/
children	/ʧɪl.drən/
moisture	/mɔɪs.ʧər/

C. Data Collection Procedure

Rather than getting the participants to read a simple word list that included these target items, the participants were required to read short English sentences containing the target words such as *I spray my hair*, where the target word is *spray*. This method allows for natural pronunciation and avoids 'demand characteristics' without the participants necessarily knowing what words were under study. According to Leustek (2017), a demand characteristic involves the participants being aware of what the researcher is looking for and can cause 'participant bias'. The participants might change their responses, or their actual linguistic practices, based on what they think the study is about, thereby affecting the outcomes of the study.

All recordings were made using a high-quality recorder in a sound-attenuated room. The participants were instructed to read the sentences at a normal rate and to correct themselves if they thought they made a mistake by repeating the entire sentence without any interference from the side of the researchers. The sentences were presented to the participants one at a time. Each participant was recorded apart from the other participants.

D. Data Analysis

This study is based on analysing recorded and transcribed data. Data transcription aimed to answer research question 1, which is proposed to explore any pronunciation errors made by the participants in their production of the consonant clusters that the English words constitute. Data transcription also aimed to answer research question 2, which looks at any repair strategies, including vowel epenthesis, which the participants may have employed in their production of the English consonant clusters. Data analysis aimed at answering research question 3, which is proposed to investigate the factors that could possibly trigger the phonological repair strategies involved in the participants' production of the English consonant clusters.

The researchers transcribed the target words using the International Phonetic Alphabet (IPA). Data transcription consisted of listening carefully to the recordings to identify pronunciation errors and diagnose the insertion of a vowel or any modification to the consonant clusters. All cases of hesitation were excluded as participants were encouraged to repeat and read without hesitation. Transcription of the English words under investigation was re-checked against the recordings and re-transcribed by three phoneticians for reliability. Two were native English speakers, and one was bilingual in English and KA. The inter-transcriber agreement was 98%. In addition, the transcription of target words was further verified through Praat software 6.3.0.9 (Boersma & Weenink, 2001) for verification of data analysis.

Data were then classified into three categories: the first category included initial two-consonant clusters as in *brain* and *step*; the second category included initial three-consonant clusters as in *spray* and *scream*; and the third category included medial and final consonant clusters as in *park* and *children*. The data consisted of 20 words with each word pronounced by the 25 participants with a total of 500 test items. The pronunciation of each word was compared across the 25 participants to identify any similarities and individual differences.

IV. FINDINGS AND DISCUSSION

Table 2 outlines the participants' pronunciation of the English words constituting consonant clusters. As indicated in the previous section, the consonant clusters in these words are classified into three categories. Category I consists of initial two-consonant clusters, category II consists of initial three-consonant clusters, and category III includes medial and final consonant clusters:

TABLE 2
PRONUNCIATION OF ENGLISH CONSONANT CLUSTERS

Category	Test Items	Production
I. Initial two-consonant cluster	brain	/ʔɪb.reɪn/
	cruel	/ʔɪk.ruːl/
	drop	/ʔɪd.rɔb/
	free	/ʔɪf.riː/
	grip	/ʔɪg.ɪb/
	proud	/ʔɪb.raʊd/
	step	/ʔɪs.teb/
	trap	/ʔɪt.rab/
II. Initial three-consonant cluster	spray	/sɪb.reɪ/
	street	/sɪt.riːt/
	scream	/sɪk.riːm/
	squeeze	/sɪk.wiːz/
	splash	/sɪb.laʃ/
III. Medial & final consonant cluster	park	/bark/
	jump	/ʤʌmb/
	resort	/rɪ.zɔrt/
	modern	/mɔ.dərn/
	conduct	/kɔn.dʌkt
	children	/ʧɪld.ren/
	moisture	/mɔɪs.ʧʌr/

As shown in Table 2, the participants inserted an /ɪ/ and a glottal stop before the initial two-consonant clusters in category I. In category II, they also inserted an /ɪ/ after the first consonant of the initial three-consonant clusters. However, vowel epenthesis did not occur in category III, which involves medial and final consonant clusters. Nevertheless, participants' pronunciation of some of the medial consonant clusters in category III, specifically the word *children*, shows a different phonological process, namely, re-syllabification. The following sections deal with data analysis in detail.

It is worth mentioning that KA does not have the phoneme /p/; therefore, this sound was pronounced by the participants as /b/ as in the case of, for example, *trap* in category I and *park* in category III.

A. Initial Two-Consonant Clusters

This section deals with the pronunciation of English words in category I, which includes initial two-consonant clusters, such as *brain*, *drop*, and *step*. Data analysis revealed that the participants inserted an /ɪ/ before the initial two-consonant clusters. A glottal stop was also pronounced before the epenthetic vowel. Such mispronunciation is however expected. As mentioned earlier, consonant clusters in KA are not permitted word or syllable-initially. KA, therefore, has a rule for inserting a vowel before an initial two-consonant cluster. Consider the pronunciation of the following KA words:

(1) /mal.la.ħɪl.la.ħam/ 'he salted the meat'
/mal.laħ.lal.la.ħam/ 'he salted the meat for him'
/mal.laħt.lal.la.ħam/ 'I salted the meat for him'
/ʔɪt.mal.lɪ.ħɪl.la.ħam/ 'you salt the meat'
/ʔɪt.mal.lɪħ.lal.la.ħam/ 'you salt the meat for him'

The KA examples in (1) illustrate that when an utterance begins with a two-consonant cluster, it is pronounced by native Kuwaiti speakers with the vowel /ɪ/ inserted before the first consonant. A glottal stop is also pronounced before the epenthesized vowel in accordance with a general rule of Arabic phonology where a glottal stop is inserted before a syllable or word-initial vowel (Broselow, 2018). According to Haddad (2023), if a word starts with a vowel, it is preceded by a glottal stop which is considered a real consonant in Arabic.

The following KA examples further illustrate that word-initial vowels are preceded by a glottal stop:

(2) /ʔɪm.tiin / 'fat' /ʔɪn.sˤiid / 'we catch' /ʔɪt.dar.siin/ 'you teach'
/ʔɪz.ɣiir / 'small' /ʔɪn.fuus / 'souls' /ʔɪʃ.rʊ.bat/ 'she drank'
/ʔɪt.law.wɪn / 'you color' /ʔɪd.dɪz / 'you push' /ʔɪt.gɑɑ.bɑl.na/ 'we met'

Thus, two rules in process in KA apply to initial two-consonant clusters: vowel epenthesis and glottal stop insertions. These rules can be represented as follows:

Rule # 1 Vowel epenthesis
ø → ɪ / # _ CC
Rule # 2 Glottal stop insertion
ø → ʔ / # _ ɪ

Rule # 1 states that the vowel /ɪ/ is inserted before an initial two-consonant cluster. Rule # 2 states that a glottal stop is inserted before the /ɪ/ when it occurs word-initially. Rule # 2 is triggered by rule # 1. These phonological rules serve to modify initial two-consonant clusters thereby creating syllable structures that are permissible in the dialect. To derive

the surface forms from the underlying forms for the KA words in (2), the two rules are required. The vowel epenthesis rule crucially precedes and feeds the glottal stop insertion rule:

Underlying representation	mtiin	zɣiir	ʃrʊbat	tdarsiin
Vowel Epenthesis Rule # 1	ɪmtiin	ɪzɣiir	ɪʃrʊbat	ɪtdarsiin
Glottal Stop Insertion Rule # 2	ʔɪmtiin	ʔɪzɣiir	ʔɪʃrʊbat	ʔɪtdarsiin
Output	ʔɪm.tiin	ʔɪz.ɣiir	ʔɪʃ.rʊ.bat	ʔɪt.dar.siin
Gloss	'fat'	'small'	'she drank'	'you teach'

These rules explain participants' mispronunciation of the English words in category I. The following presents the derivation process of some of the data in category I:

Underlying representation	breɪn	fri:	drɒp	step
Vowel Epenthesis Rule # 1	ɪbreɪn	ɪfri:	ɪdrɒb	ɪsteb
Glottal Stop Insertion Rule # 2	ʔɪbreɪn	ʔɪfri:	ʔɪdrɒb	ʔɪsteb
Output	ʔɪb.reɪn	ʔɪf.ri:	ʔɪd.rɒb	ʔɪs.teb

Notably, these rules turned the monosyllabic English words with impermissible structures, i.e., CCVVC, CCVV, and CCVC, into permissible disyllabic ones with the structures CVC.CVVC/CVC.CVV/CVC.CVC.

Hence, since their L1 does not permit initial two-consonant clusters, it can be argued that the participants modify these clusters to bring the English words into conformity with their L1 syllable structure constraints that define possible syllables (Broselow, 1993). The initial two-consonant clusters in the English words cannot be analysed by the participants as belonging to acceptable syllable structures and thus are modified through the insertion of a vowel and a glottal stop pronounced before the clusters. While such insertion is considered a phonological error in the pronunciation of English words, it can be seen as a phonological repair strategy triggered by the participants' L1 restrictions on possible syllable structures.

B. Initial Three-Consonant Clusters

This section deals with the pronunciation of English words in category II, which includes initial three-consonant clusters, such as *spray*, *scream*, and *street*. Data analysis revealed that the participants inserted a vowel after the first of the three-consonant clusters in the English words. This is expected since the dialect does not permit initial consonant clusters. As with the rule of inserting a vowel before an initial two-consonant cluster, KA also has a rule for inserting a vowel into an initial three-consonant cluster. The vowel, in this case, is inserted after the first of three consonants, as the pronunciation of the following KA utterances illustrates:

(3)				
	/ʃe.ɣəl/	'work'	/ðˤarb/	'hit'
	/tɪʃ.te.ɣəl/	'she works'	/tɪðˤ.rəb/	'she hits'
	/jɪʃ.te.ɣəl/	'he works'	/jɪðˤ.rəb/	'he hits'

The examples in (3) illustrate that when an utterance begins with a three-consonant cluster, native Kuwaiti speakers break up the cluster in the KA utterances by inserting the vowel /ɪ/ after the first consonant. The vowel epenthesis rule can be represented as follows:

Rule # 3 Vowel epenthesis

ø → ɪ / # C _ CC

The rule states that a vowel is inserted after the first consonant of an initial three-consonant cluster. As is the case with rules # 1 and 2, rule # 3 serves to modify initial three-consonant clusters thus creating syllable structures that are permitted in the dialect. To derive the surface form from the underlying form for the KA examples in (3), the rule applies as follows:

Underlying representation	tʃteɣəl	jðˤrəb
Vowel epenthesis Rule # 3	tɪʃteɣəl	jɪðˤrəb
Output	tɪʃ.te.ɣəl	jɪðˤ.rəb
Gloss	'she works'	'he hits'

This rule accounts for the mispronunciation of the English words in category II whereby the participants pronounced the English words with a vowel inserted after the first of the three consonants. The following presents the derivation process of some of the data in category II:

Underlying representation	spreɪ	skwi:z	stri:t	splaʃ
Vowel epenthesis Rule # 3	sɪbreɪ	sɪkwi:z	sɪtri:t	sɪblaʃ
Output	sɪb.reɪ	sɪk.wi:z	sɪt.ri:t	sɪb.laʃ

As with rules # 1 and 2 which deal with initial two-consonant clusters, rule # 3 turned the monosyllabic English words with impermissible structures, i.e., CCCVV/CCCVVC/CCCVC, into permissible disyllabic ones with the structures CVC.CVV/CVC.CVVC/CVC.CVC.

Accordingly, it can be argued that the errors in producing the English words in category II occur when such consonant clusters are word-initial. The participants do not analyse the syllables containing these clusters as possible KA syllable structures. Therefore, they are modified to bring these foreign forms into conformity with their L1 restrictions defining possible syllables. When a foreign form includes consonant clusters that cannot be grouped into acceptable syllables, the participants insert a vowel to break up the cluster to create permitted syllables. Thus, as with

initial two-consonant clusters, vowel epenthesis in the pronunciation of English words constituting initial three-consonant clusters is triggered by the participants' L1 constraints on possible syllable structures.

C. Medial and Final Consonant Clusters

This section deals with the pronunciation of English words in category III, which includes medial and final consonant clusters such as *park*, *conduct*, and *children*. Contrary to expectations, data analysis revealed that although the English words in this category constitute consonant clusters, the participants did not attempt to insert a vowel to break up the clusters. The participants seemed to have less difficulty in pronouncing English utterances constituting medial and final consonant clusters than with initial clusters. To illustrate, consider the pronunciation of the following KA utterances:

(4)

/tˤabx/	'cooking'	/ʕa.raf/	'he knew'
/tˤɪ.baxt/	'I cooked'	/ʕa.raft/	'I knew'
/tˤɪ.baxt.la/	'I cooked for him'	/ʕa.raf.ta/	'I knew him'
/tˤɪ.baxt.la.ha/	'I cooked for her'	/ʕa.raft.la/	'I knew how to do it'

These KA examples clearly illustrate that consonant clusters are permitted in the dialect in medial and final positions. This explains why the English words in category III were pronounced by the participants without inserting a vowel between the consonant clusters since such clusters occur medially and finally. Moreover, except for *children*, all the English words in category III constitute syllable patterns that do not violate those of KA which is also the case with the KA examples in (4). Therefore, it can be argued that medial and final consonant clusters in English words remain intact if the syllable patterns of the English utterances adhere to the syllable structure requirements of the participants' L1.

However, with regard to *children*, the word was not correctly pronounced. Interestingly, the word was pronounced with some modification to the boundaries of the syllables that the word constitutes. Nevertheless, such mispronunciation is expected. The English word *children* consists of CVC.CCVC in which the second syllable is not permitted in the dialect. KA allows syllable onsets consisting of only one consonant. Yet, the participants did not attempt to insert a vowel to break up the undesirable onset consonant cluster of the second syllable in the English word. They, however, employed a different phonological process to repair the syllable.

To illustrate, if the word *children* is divided into syllable types that are permitted in the dialect, we will end up having a stray consonant:

ʧɪl.dren
(ʧɪl) d (ren)
(CVC) C (CVC)

If we consider the maximal onset principle which states that consonants are assigned to the right-hand syllable, not to the left, in conformity with universal and language-specific constraints (Treiman et al., 2023), *children* would thus be pronounced by the participants as /tʃɪl.dren/. However, given the language-specific conditions of the dialect that govern the syllable onsets and codas, the stray consonant cannot be assigned to the right syllable because of its impossible onset cluster. As mentioned earlier, KA does not permit syllable-initial consonant clusters. Accordingly, /tʃɪl.dren/ must be rejected. In this case, the preferable solution is to assign the stray consonant to the left syllable which seems more satisfying, given that the dialect allows syllable codas consisting of two consonants. Thus, rather than the undesirable CCVC syllable that violates the syllable structure requirements of the dialect, the participants created a CVCC syllable. Apparently, when a word includes medial consonant clusters that cannot be grouped into acceptable syllables, a process of re-syllabification occurs to create permitted syllables. Here, the first 'illegal' consonant of the onset cluster of the second syllable, i.e., the stray consonant, is moved to the preceding syllable where it fits. This re-syllabification process of *children* yields two syllables that are permitted in the dialect:

tʃɪl.dren
(tʃɪl) d (ren)
(tʃɪld) (ren)
CVCC.CVC

Thus, to account for the mispronunciation of this word without the participants resorting to vowel epenthesis, it can be argued that a process of re-syllabification took place. As in the case of vowel epenthesis, the re-syllabification process of medial consonant clusters takes place to produce an acceptable output. Here, the participants, when pronouncing English words with medial consonant clusters that violate the syllable structures of their dialect, attempted to re-structure the syllables of these words to meet their L1 syllable structural requirements. Thus, it can be argued that re-syllabification is also triggered by constraints on possible syllable structures of the dialect.

To sum up, the findings reveal that Kuwaiti EFL learners make pronunciation errors when pronouncing English consonant clusters. These errors are restricted to initial and medial consonant clusters that violate the syllable structure requirements of the participants' L1. Where a conflict occurs between the syllable structure of their Arabic dialect and the English language, the participants employ two phonological repair strategies to resolve the conflict: vowel epenthesis and re-syllabification. These phonological repair strategies seem to be triggered by their dialect's syllable structure constraints and function to bring the underlying forms of the English words into conformity with restrictions on possible surface syllable structure of the participants' L1. Accordingly, it can be argued that pronunciation errors in the production of English initial and medial-consonant clusters made by Kuwaiti EFL learners in this study are due to the participants transferring the phonological rules and constraints of their L1 to their pronunciation of L2 forms.

V. Conclusion

This study has investigated phonological errors Kuwaiti EFL learners make in their pronunciation of English consonant clusters. The results reveal that pronunciation errors are restricted to initial and medial consonant clusters that violate the syllable structure requirements of the learners' L1. The analysis suggests that the phonological repair strategies adopted by Kuwaiti EFL learners appear to be a process of phonological rule transfer from the L1 to the L2.

This study has contributed to the field of EFL by providing phonological insights into phonotactic constraints of KA syllable structure and consonant cluster restrictions that cause pronunciation difficulties for Kuwaiti EFL learners acquiring English as a foreign language. The study may be beneficial for EFL teachers as it demonstrated areas of pronunciation difficulties encountered by Kuwait EFL learners. It may also benefit other studies exploring other Arabic dialects with possible similar phonotactic constraints.

The results of this study have some pedagogical implications. Kuwaiti EFL teachers should give more attention to pronunciation difficulties encountered by Kuwaiti EFL learners. First, teaching materials need to consider comparing the syllable structure of KA with English, highlighting the differences to students, and raising their awareness of the importance of producing English syllables and their role in successful communication. Learning the different types of English syllables will improve students' ability to read and speak accurately. Second, teaching materials should frequently include audio recordings of English material (e.g., texts and conversations) read by native English speakers, so students are exposed to the correct pronunciation of English words that constitute complex syllables. Frequent listening to authentic materials will enhance students' pronunciation skills (Uchihara et al., 2022).

This study has some limitations that need to be indicated. These include the sample size and the level of education of the participants. First, the study was based on a relatively small sample of participants, limiting the generalizability of the results. Second, the study focused on Kuwaiti EFL learners at the college level. However, more Kuwaiti EFL learners from different educational levels, such as high school students, should also be investigated to have a clearer picture of the pronunciation problems of Kuwaiti EFL learners. Nevertheless, such an investigation can be a point of departure for further research.

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