

Vowel Epenthesis in English Loanwords by Iraqi Male and Female EFL Learners

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ABSTRACT:

This study investigate how Iraqi EFL learners modify English loanwords, with a particular emphasis on the phenomena of vowel epenthesis—the insertion of additional vowels to break up consonant clusters that violate Iraqi Arabic syllable structure limitations. The study seeks to establish whether there are gender variations in the frequency and length of epenthetic vowels among Iraqi learners. The research involved forty third-year Iraqi EFL students from the University of Anbar (20 males and 20 females). Controlled pronunciation exercises were used to gather data, and PRAAT software was used for acoustic analysis. The results show that both male and female learners regularly use vowel epenthesis, particularly in word-initial positions, to help them pronounce English loanwords. However, significant gender disparities emerged: females had somewhat greater rates of epenthesis in the start and medial places, whereas male had a higher incidence in the word-final position. The findings highlight the strong influence of native phonological patterns on English pronunciation and suggest that gender plays a role in adaptation strategies. These insights have implications for EFL pedagogy, emphasizing the need for targeted pronunciation instruction to address specific challenges faced by Arabic-speaking learners, with attention to sociolinguistic factors such as gender.

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Introduction

Borrowing occurs when words or phrases from one language are adopted and adapted into another, often to meet users' needs or convey prestige, resulting in mixed language systems and various types of borrowing such as loanwords, loan shifts, loan-blends, and calques. Borrowed words are modified to fit the grammatical and phonological rules of the new language, with processes like epenthesis used to make pronunciation easier, especially for sounds or clusters not present in the native language. In the context of Iraqi EFL learners, English loanwords are frequently adapted by inserting epenthetic vowels to break up consonant clusters that are challenging in Arabic.

The main reasons for borrowing are need and prestige. People borrow terms to name new concepts, especially in technology and science (Weinreich, 1953), or to adopt prestigious language traits. Euphemism also motivates borrowing, such as the Arabic term 'šaraṭaan' for cancer. Loanwords are adapted to fit in the phonological system of the borrowing language, as

shown by examples like the English word "Crystal," pronounced /kirista:l/ by EFL learners through epenthesis (Ohso, 1973; Chang, 2003; Crawford, 2009; Simonovic, 2009).

The process of adaptation often involves substantial alterations in the structure of the borrowed terms, including processes such as assimilation, dissimilation, metathesis, elision, and modifications involving the addition, deletion, or replacement of segments, as well as changes in stress patterns. Research indicates that these adaptations are essential for making the borrowed words usable within the recipient language's framework (Assayed, 2018; Abdulrazzaq & Al-Ubaidy, 2023). Consequently, understanding these adaptation mechanisms is crucial for analyzing how languages interact and evolve through borrowing processes.

Vowel epenthesis is a frequently seen phenomenon in loanword adaptation. This is specially regarding their acoustic properties such as duration and formant frequencies. Vowel epenthesis is utilized as a repair method to prevent consonant clusters, according to a number of researchers (Paradis, 1996; Miao, 2005; Abu Guba This insertion can significantly affect the acoustic characteristics of the vowels produced.

The study aims to identify whether there are gender differences among Iraqi EFL learners in the insertion of these epenthetic vowels. It focuses solely on the production of these vowels, not on how learners perceive them or the quality of the vowels, and seeks to fill a gap in previous research by providing an acoustic analysis of this adaptation process. Understanding these adaptations is important for linguists and educators, as it sheds light on language evolution and helps improve teaching strategies. In light of this, the following research question is being addressed

To what extent do Iraqi male and female EFL Learners differ in inserting vowels into English loanwords?

Vowel Epenthesis

Iraqi EFL learners adapt the pronunciation of English loanwords by inserting epenthetic vowels—extra vowels placed within words—to break up consonant clusters that do not conform to the syllable structure rules of Iraqi Arabic. This process, known as vowel epenthesis, helps learners pronounce English words more easily by making them fit the phonological patterns of their native language, often transforming monosyllabic English words with complex clusters into longer, more syllabically simple forms. For example, English words like "film" (/film/) and "stress" (/stres/) are pronounced as /fɪlm/ and /sɪtrɛs/ by Iraqi learners, with inserted vowels separating difficult consonant groupings.

Frameworks for defining consonants are provided by both phonology and phonetics. From a phonetic perspective, consonants are produced when the vocal tract is either completely closed or narrowed to the extent that the airflow is halted or sufficiently restricted to create audible friction. The articulation of consonants is typically straightforward to perceive, allowing for definitions based on where and how they are articulated. A comprehensive phonetic description of a consonant sound includes specifics on vocal fold vibration, sound duration, the airstream mechanism utilised, and whether the airflow is egressive (outward) or ingressive (inward). Alkalesi (2006, p. 1) states that IA (Iraqi Arabic) has thirty-one consonant sounds, of which around fifteen have English equivalents. In contrast, phonologically, consonants are units that occur at the margins of syllables, either alone or in clusters (Crystal, 2008, p. 103).

The consonants include: /ʔ/, /b/, /p/, /t/, /θ/, /j/, /tʃ/, /x/, /d/, /ð/, /r/, /z/, /s/, /ʃ/, /sʃ/, /dʃ/, /tʃ/, /zʃ/, /ʒ/, /g/, /ɣ/, /f/, /q/, /k/, /l/, /lʃ/, /m/, /n/, /h/, /w/, and /y/. Erwin (2004) notes that there are more consonant sounds in IA than in English; some of these sounds are quite distinct from those of English, while others bear some resemblance to certain English phonemes.

This rich consonantal inventory highlights the complexity of IA phonology and underscores the dialect's unique characteristics compared to both Modern Standard Arabic and other Arabic dialects. Understanding these phonemic distinctions is essential for linguists studying the phonological systems of Arabic languages and for learners aiming to grasp the nuances of Iraqi Arabic pronunciation.

Table (1): English consonants based on (Alhoody, 2019)

	Bilabial	Labio-dental	Inter-dental	Alveolar	alveopalatal	Palatal	Velar	Glottal
Voiceless stop	p			t			k	
Voiced stop	b			d			g	
Voiceless affricate					tʃ			
Voiced affricate					dʒ			
Voiceless fricative		f	θ	s	ʃ			h
Voiced fricative		v	ð	z	ʒ			
Nasal	m			n			ŋ	
Liquid				l j				
Glide	w					j		

“Vowels can be classified according to the height of the tongue, the part of the tongue that is raised, and the shape of the lips” (Roach, 2009, p. 14). In phonetic terms, vowels are further classified based on two main features: the shape of the lips (which can be rounded, spread, or neutral) and the position and height of the tongue during articulation. While describing lip shape is relatively simple, specifying exactly which part of the tongue is raised and to what extent is much more complex (Crystal, 2008, p. 517).

Erwin (1963) emphasizes that short vowels differ qualitatively from their long counterparts, not just in duration (p. 17). Recent studies further note that IA vowels exhibit greater phonetic variability than English vowels, with their articulation influenced by positional and environmental factors, such as neighboring consonants (Dawood, 1990; Fathi & Qassim, 2020). For instance, emphatic consonants (e.g., /tʃ/) trigger vowel lowering (Al-Ani, 1970), while short /a/ demonstrates fronting and raising in urban dialects (Fathi & Qassim, 2020).

	Front	Central	Back unrounded	Back rounded
High (tense)	i:			u:
(lax)	ɪ			ʊ
Mid (high)	eɪ			oʊ
(central)		ə		
(low)	ɛ		ʌ	ɔ
Low	æ		ɑ	ɒ

Figure 1: English vowels based on Alhoody (2019)

According to Hassaan (1998, p. 73), syllable structure is a subset of phonological word division focusing on the distribution, division, and composition of pronounceable word segments, with phonotactics encompassing these structures as the laws governing sound patterns in a language. Roach (2009) explains that syllables can be defined both phonetically—as units with a central, sonorous nucleus (usually a vowel) flanked by less sonorous sounds—and phonologically, involving permissible combinations of phonemes. Minimal syllables may consist of a single vowel sound (e.g., 'are' /a:/), while others include an onset (consonants before the vowel, as in 'bar' /ba:/), a coda (consonants after the vowel, as in 'am' /a:m/), or both onset and coda (as in 'ran' /ræn/). Phonotactics, therefore, studies these possible phoneme combinations and restrictions within a language's syllable structure.

The search results provided are not focused on the Pronunciation of English Loanwords by Iraqi EFL Learners: The Case of Epenthetic Vowels. However, some related studies have investigated various aspects of Iraqi EFL learners pronunciation of English loanwords, such as in Arabic dialects. The present research focuses on Identifying gender differences among Iraqi EFL Learners in the degree of vowel epenthesis into English loanwords and finding out gender-related differences in the acoustic features, i.e., duration of epenthetic vowels.

Previous Studies

This section reviews the most relevant previous research conducted in similar areas to justify the need for the present study. Several recent studies are examined in chronological order to highlight the existing gaps that this research aims to address.

Abdullah and Daffar (2006) in a sociolinguistic study, investigated English loanwords in spoken Arabic in southern Iraq. Based on the data available for this study, they were able to deduce a number of sociolinguistic patterns of variation in the usage of English loanwords by Arabic speakers in southern Iraq.

According to Nogita & Fan (2008), the results revealed that when Mandarin and Japanese ESL learners with a short time of stay in Canada immediately repeated sound stimuli, they only occasionally inserted a short vowel in English consonant clusters. The distinction between the groups was that Mandarin speakers with correct phonological representations frequently attempted to produce consonant clusters without vowel epenthesis but occasionally failed in gestural coordination, resulting in a schwa-like vowel, whereas Japanese speakers primarily incorrectly stored English consonant clusters with extra vowel phonemes in their interlanguage mental lexicon. However, when copying the speech of native English speakers, they phonetically erased or softened such vowels.

Ali, Lahrouchi, & Ingleby's (2009) study examined evidence from exploratory timing study that challenges this widely accepted principle. They worked with minimal pairs of singleton consonants vs. geminates (e.g. /bka/ vs. /bəkka/) that reveals a presence of a vowel insertion between the clusters in word initial position in singleton cases. ... The epenthetic vowel is present in isolated words and in sentence context too. In this paper we also provide phonetic correlates in the minimal pairs - between epenthetic vowel and lexical vowel, between singleton and geminate consonants, and contrast these with other Arabic dialect phonetic timing studies.

Hall, N. (2011) mentioned that, the term "vowel epenthesis" refers to any procedure that involves adding a vowel to an utterance. Beyond this simple definition, vowel epenthesis processes vary greatly in their properties, and many parts of their typology remain unknown. For example, Lebanese Arabic epenthesis vowels in numerous CC codas to break up undesired coda clusters. A better understanding of vowel epenthesis will necessitate work in two dimensions. One approach is to conduct detailed case studies of individual languages, particularly those that combine the traditional, structural description of vowel epenthesis with an emphasis on the acoustics, articulation, and perception of the epenthetic vowels, as well as probe speaker intuitions about them.

As-Sammer (2015) explored the fundamental adaptation mechanisms that apply to English loanwords in Iraqi Arabic. Both integrated and online loans in IA are represented by the 150 loanwords that make up the study's basis. As a result of regular encounters, the author has accumulated them over a considerable amount of time. It concluded that the basic justification for adaptation is psycholinguistic, even if all of the modified forms are congruent with IA phonology. There were no default patterns as a result of these modifications. The constraint-based phonology (output orientated framework) theory, which our study supports, attributes the changes in loanwords to the limitations that are already present in the grammar of the borrowing language.

Al-Athwary (2017) examined how English loanwords are phonologically altered in Modern Standard Arabic (MSA). After examining over 300 English loanwords, he found that segment adaptation, or MSA, occurs when familiar English phonemes are substituted for new ones. Furthermore, the study found that the most common syllable-level adaptations include declustering, syllabic consonant conversion, consonant lengthening, and vocalic glide insertion. The MSA's phonological system governs these processes. The study also found that MSA speakers incorrectly geminate certain English consonants due to the effect of MSA spelling-to-pronunciation correspondence and the English orthographic system.

Habib & Khan (2019) looked at how Punjabi speakers employ vowel epenthesis to integrate the English consonant cluster at the commencement of the syllable. The findings imply that Punjabi speakers use vowels to alter English consonant clusters based on their phonological context. As a result, they add another vowel node and resyllabify the consonant clusters. The mid centre /ə/ vowel is the default epenthetic vowel, while /e/ is sometimes used before consonant clusters.

Mahmood (2022) aimed to investigate the phonological aspects of the English loaned words in the Iraqi Samawian Arabic vernacular from the point of view of the students of the department of English since they are introduced with these words in both languages. These loanwords have been subject to modification or adaptation to match the morphological -

phonological system of Iraqi Samawian Arabic vernacular. Consequently, such loanwords are used as if they were Arabic ones. ... The study supports several hypotheses regarding the borrowing and adaptation of English loanwords into Arabic, particularly within the context of the International School of Arabic and Vocational Studies (ISAV). ... Furthermore, the study affirms that English loanwords undergo morphological changes when integrated into Arabic; specifically, their pronunciation aligns with Arabic phonological rules rather than English ones.

Al-Abdullah & Almutairi (2024) looked at the pronunciation errors caused by Kuwaiti Arabic (KA) EFL learners when producing English consonant clusters. When a conflict arose between the syllable structure of their first language (L1) and that of English, the participants used two phonological repair procedures to resolve it: vowel epenthesis and re-syllabification. These phonological repair procedures appeared to be a process of phonological rule transfer from the first to the second language (L2), with the goal of bringing the underlying forms of English words into line with the Kuwaiti dialect's constraints on permissible surface syllable patterns.

Few studies specifically address the effect of social factors, such as gender on variance in loanwords adaptation. An acoustic analysis of epenthetic vowels has not received much attention in research.

Methodology

The current study follows a quantitative research design as it employs statistical procedures to handle data both statistically and numerically. Quantitative research is a systematic investigation method that focuses on collecting and analyzing numerical data to describe, predict, or control variables of interest. This method emphasizes objective measurements and statistical analysis of data collected through various methods such as surveys, questionnaires, and experiments (Creswell, 2014).

Gender

According to Creswell (2009), independent variables are "those that (probably) cause, influence, or affect outcomes". In the current study, the independent variable is gender. The intersection of gender and language use, particularly in the context of loanword pronunciation, has been a subject of extensive phonetic and sociolinguistic research globally. Gender is an important social characteristic that influences the frequency, context, and adaptation techniques of loanword usage, according to several studies. For example, research on Saudi Colloquial Arabic shows that female speakers use English loanwords more frequently than male, and they are more likely to break native phonological and morphological constraints, and occasionally employ loanwords exclusively in certain themes like fashion and technology. Similar studies in Taif Arabic reveal that females use English loanwords more frequently for prestige, with both genders sharing many adaptation mechanisms but exhibiting significant disparities in frequency and usage patterns.

Gender plays an important role in linguistic diversity and loanword adoption, often resulting in changes in vowel and consonant patterns, grammatical gender, and pluralisation (Meyerhoff, 2015; Philips et al., 1987; Talbot, 2010; Trudgill, 2000). These studies have revealed that gender is a significant factor influencing accuracy in speaking skills, especially in the production of English loanwords. The term gender denotes the social status of being

male or female. Gender is often seen as one of the most essential attributes of individuals as well as groups. Moreover, it distinguishes itself from several other culturally and linguistically significant qualities by presenting, or seemingly presenting, a binary opposition. It is seen as a binary system with just two options: a person might only be a woman or a male, not both or neither. (Eckert & McConnell-Ginet, 2003).

Gender has proven to have a considerable influence on linguistic behavior, as evidenced by gender-related patterns in sociolinguistic variables across speech groups. This might disclose information about the functions of diversity that is of public interest. According to Labov (2001, p. 262), gender-related variance challenges the premise that linguistic inequalities across groups are greatest when there is less contact. Men and women have regular and occasionally close interaction in the same community, yet their linguistic behavior remains varied in quantifiable ways (Aarts and McMahon, 2006).

Data Collection Instrument

Data for this study were collected through individual interviews, beginning with a demographic questionnaire to screen participants based on age, name, and gender, ensuring alignment with research criteria (Creswell, 2009; Aldridge & Levine, 2001). Participants were then asked to pronounce a list of 21 English loanwords—seven for each target position—each embedded in the carrier sentence “I say (...) twice” and repeated twice. Recordings took place in the phonetics laboratory at the University of Anbar using a TASCAM audio recorder, and the clearest pronunciation of each word was analyzed. This approach ensured relevant, high-quality data and maintained the integrity of the research design.

Sampling Method and Sample Size

The current study used stratified random sampling, which seeks to give a generally similar number of EFL learners in order to achieve balanced population proportions (Luborsky and Rubinstein, 1995). This approach might involve stratifying learners based on factors such as proficiency level, native language background, or learning context (e.g., academic vs. professional English). This method separates EFL learners into several sub-groups (strata) that share traits, such as age, gender, native language, proficiency level, or learning context. A random sample is then selected from each stratum.

The participants of the current study are 40 Iraqi EFL learners at the Department of English Language, College of Education for Humanities, University of Anbar. All of them are third-year students enrolled in the academic year (2024- 2025) divided equally into 20 males and 20 females. Third-year students were selected because they had previously experienced pronouncing English vowels in their first and second classes of phonetics and phonology coursework. As the study aims to examine gender differences, participants were stratified into male and female.

Vowel Duration Measurements

For each sound file, one annotation tier was created. For vowel duration, the start and endpoints of each of the vowels were labelled manually by looking at the waveform and spectrogram in PRAAT. The acoustic measurements went through the following steps:

1. After the recordings were obtained, they were converted as WAV sound files using a software called Audacity and saved to a laptop in preparation for conducting the acoustic analysis.
2. The analysis starts by opening PRAAT, inserting the sound files, creating a TextGrid file, and then building the required tier for each recording as in Figure 2 below:

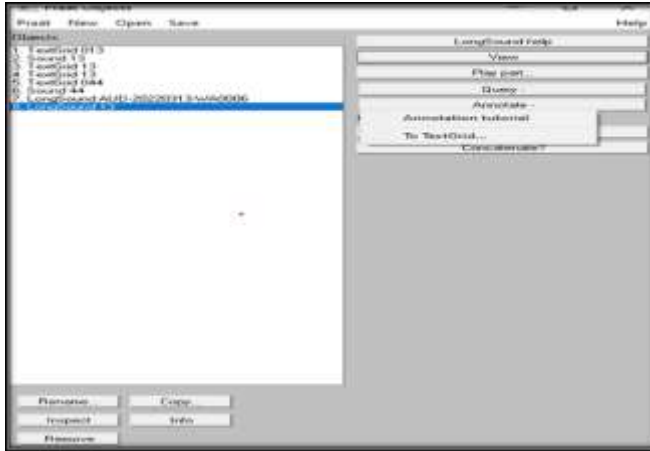


Figure 2: forming Textgrids for creating tiers

3. As shown in Figure 3 below, two layer intervals were constructed: the first tier interval was designed for words (e.g. spray), while the second tier interval was made for epenthetic vowels (e.g. /i/).

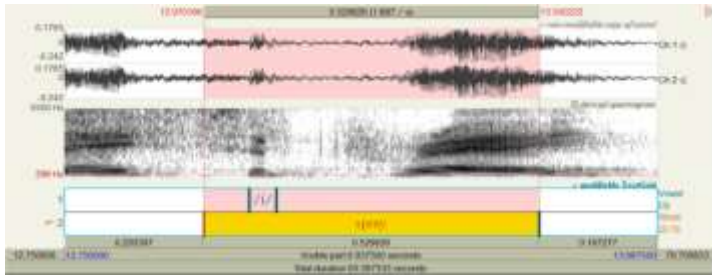


Figure 3: Creating word and vowel tiers in PRAAT

4. As shown in Figure 4, duration values were manually retrieved by marking the vowel part.

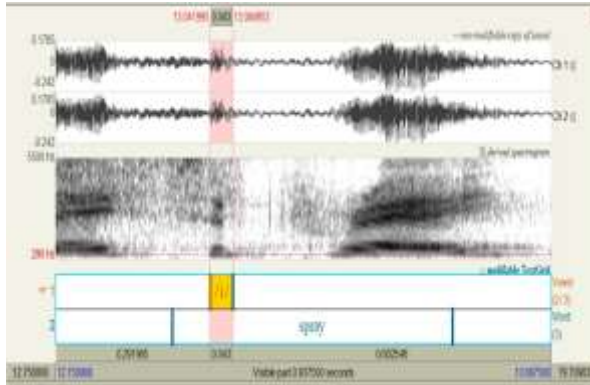


Figure 4: Measuring vowel duration in PRAAT

- To get the average duration values, the data that was taken out of PRAAT was moved to Excel files.

Statistical Data Analysis

"All statistical analyses in this study were performed using IBM SPSS Statistics Version 25 to examine if the difference of group means was significantly different to accept or reject the null hypothesis.

The null hypothesis, according to which the means of two population samples are not different, is fundamental to inferential statistics (Rose and Sullivan, 1996: 168). In order to accept or reject the null hypothesis, statisticians are primarily concerned with determining if the mean differences are statistically significant. The null hypothesis is what we aim to test against in statistical testing in order to ascertain whether there is sufficient evidence to support a different explanation. A claim that suggests the existence of an effect, difference, or relationship is known as the alternative hypothesis. Through data analysis, the researcher hopes to support this claim. The alternative hypothesis might be accepted if the evidence points to the null hypothesis as impossible.

Results and Discussion

Figure 5 illustrates male female participants' vowel epenthesis in initial, medial, and final positions within English loanwords to fit the phonological structure of Iraqi Arabic (IA). Among female participants, epenthesis occurred most frequently in the word initial position (82.86%), followed by the medial (43.57%) and, while it occurred the least in final positions (7.14%). Male participants showed a similar tendency, with initial epenthesis at 80.71%, medial at 39.29%, and a slightly higher rate epenthesis in word final position than their female peers 12.14%. These results highlight that both male and female Iraqi EFL learners systematically adapt English loanwords by inserting vowels, particularly at the beginnings of words.

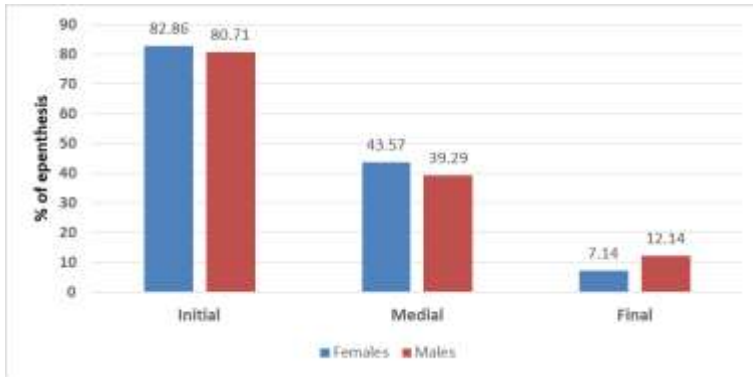


Figure 5: Vowel epenthesis by gender and position

Vowel epenthesis in word initial position

Figure 6 compares male and female participants' vowel epenthesis into word-initial position. It can be seen both groups have slightly identical rates of epenthesis with females scoring (82.86%) and males (80.71%). Provided that both genders struggle with English word-initial consonant clusters, this slight variance suggests that vowel insertion is a commonly used repair method. The substantial numbers for both groups demonstrate how challenging it is for EFL learners to adjust to English loanwords to comply with the phonotactic rules of their mother tongue, in particular with regard to the beginning position.

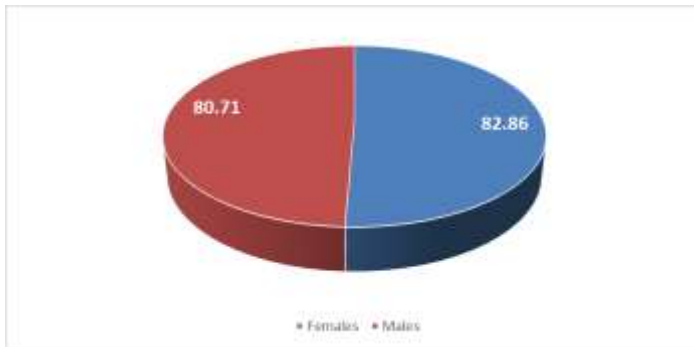


Figure 6: Vowel epenthetic in word initial position by gender

The present study's findings corroborate those of earlier research. For instance, Zuraw (2007), who studied "Tagalog" speakers, discovered that because Tagalog lacks a complicated onset in its native grammar, male native speakers of the language break apart clusters of Spanish and English loanwords.

Vowel epenthesis in word-medial position

In medial position, female participants demonstrate a moderately higher tendency to insert vowels in word-medial position with 43.57%, compared to their male counterparts, who scored 39.29% out of the total number of tokens. This 4.28% difference suggests considerable gender variation in phonological adaptation strategies when encountering consonant clusters within

English loanwords. The data reveals a considerable, but not overwhelming frequency of epenthesis for both genders, indicating that while medial consonant sequences present significant challenges, they appear more manageable than initial clusters (which typically show higher epenthesis rates). This gender disparity may reflect different phonological awareness levels or potentially divergent attitudes toward pronunciation accuracy, with females possibly demonstrating more attention to syllable-by-syllable articulation when processing unfamiliar phonotactic structures in the middle of English loanwords (see Figure 7).

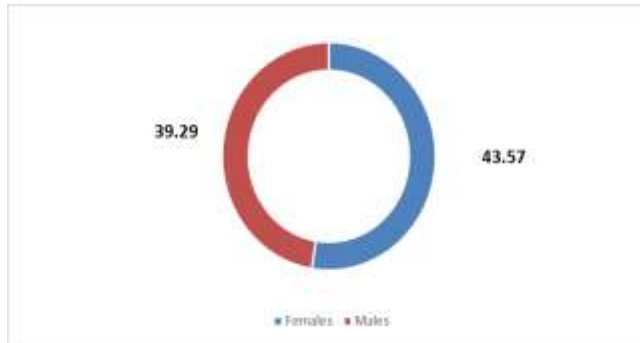


Figure 7: Vowel epenthesis in word-medial position by gender



Figure 8: Vowel epenthesis in word-final position by gender

Vowel epenthesis in word-final position

Figure 8 illustrates the mean values of epenthetic vowel by EFL learners into English loanwords with final consonant clusters. The data reveal a significant gender difference in this context. Male learners demonstrate a substantially higher rate of vowel epenthesis in word-final position at 12.14%, nearly double that observed in female learners at 7.14%. This notable disparity suggests that males more frequently add vowels to word-final consonant clusters or singleton consonants that may be phonotactically restricted in their native language. The overall lower percentages that female presented by breaking up a word-final consonant clusters (compared to initial or medial positions) indicate that word-final consonants or clusters generally pose fewer pronunciation challenges for EFL learners regardless of gender. However, the marked gender difference aligns with sociolinguistic Labov, W. (1972) research suggesting that females often adopt more standard or prestigious-like pronunciation forms, potentially explaining their lower rate of word-final epenthesis as they may be more attentive to maintaining target language syllable structures in this position.

Conclusions:

This study has explored how Iraqi EFL learners adapt English loanwords, focusing on the phenomenon of vowel epenthesis—the insertion of vowels to break up consonant clusters that do not conform to Iraqi Arabic syllable structure. The findings demonstrate that both male and female learners frequently employ vowel epenthesis, especially in word-initial positions, as a strategy to facilitate pronunciation.

Significant gender-based differences were observed; female learners exhibited greater epenthesis in word-initial and medial positions, while male learners demonstrated increased epenthesis in word-final positions.

These findings show the important influence of local phonological norms on the adaption of English loanwords and underscore the involvement of gender in shaping these adaptation strategies. The acoustic analysis of the study shows that not only the frequency but also the duration of epenthetic vowels changes by gender, implying that sociolinguistic elements have to be taken into account in both linguistic study and language instruction. These realisations have general relevance for EFL instruction. With particular emphasis to gender-related issues, they highlight the need of focused pronunciation teaching addressing the particular difficulties encountered by Arabic-speaking students. Understanding the trends and causes of vowel epenthesis can enable teachers to create more successful teaching plans to assist students get higher English proficiency and overcomes of pronunciation problems.

إدخال حروف العلة في الكلمات المستعارة الإنجليزية لدى المتعلمين العراقيين للغة الإنجليزية كلغة أجنبية من الذكور والإناث

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المستخلص:

ي تناول هذه الدراسة كيفية قيام متعلمي اللغة الإنجليزية كلغة أجنبية في العراق بتعديل الكلمات المستعارة من الإنجليزية، مع تركيز خاص على ظاهرة إدخال حروف العلة - إدخال حروف علة إضافية لتفكيك تجمعات الحروف الساكنة التي تنتهك قيود بنية المقاطع في العربية العراقية. تسعى الدراسة إلى تحديد ما إذا كانت هناك اختلافات بين الجنسين في تكرار وطول الحروف المتحركة الإضافية بين المتعلمين العراقيين. شمل البحث أربعين طالباً وطالبة في السنة الثالثة من تعلم اللغة الإنجليزية كلغة أجنبية من جامعة الأنبار (20 ذكوراً و20 إناثاً). تم استخدام تمارين النطق المنضبطة لجمع البيانات، وتم استخدام برنامج PRAAT للتحليل الصوتي.

أظهرت النتائج أن كلا الجنسين يستخدمان إدخال حروف العلة بشكل متكرر، خاصة في المواضع المبدئية للكلمات، لتسهيل نطق الكلمات الدخيلة الإنجليزية. ومع ذلك، وُجدت اختلافات جوهرية بين الجنسين: إذ سجلت الإناث معدلات أعلى في المواضع الابتدائية والوسطى، بينما أظهر الذكور معدلات أعلى في المواضع الابتدائية للكلمات. تبرز هذه النتائج التأثير القوي للأنماط الصوتية الأصلية (العربية) على نطق الإنجليزية، كما تشير إلى دور الجنس في استراتيجيات التكيف الصوتي. تلك الرؤى لها تداعيات تربوية مهمة، حيث تؤكد الحاجة إلى تعليم نطقٍ موجهٍ يعالج التحديات الخاصة التي يواجهها المتعلمون الناطقون بالعربية، مع مراعاة العوامل الاجتماعية اللغوية مثل الجنس. يُوصى بتصميم أنشطة تعليمية تراعي هذه الاختلافات لتعزيز الفهم الصوتي وتحسين التواصل الفعال باللغة الإنجليزية.