L1 Influence on Chinese Learners' Pronunciation of English /l/ and /r/: A Phonological Study

Ali Mohsin Ali AL-Hasani [1], **Nidham Sheet** [2]

Department of English, Dijlah University College, Iraq[1]
Department of English, Dijlah University College, Iraq[2]

ali.muhsen@duc.edu.iq[1]
nidham.sheet@duc.edu.iq[2]

Abstract

This study investigates how first language (L1) competence influences the phonological production of English liquid consonants /l/ and /r/ among Mandarin Chinese speakers. The research adopts an experimental acoustic-phonetic design supported by auditory analysis and perceptual judgment to examine pronunciation variation. Four Mandarin-speaking postgraduate learners of English participated in controlled minimal-pair production tasks in isolated and sentence-embedded forms. Guided by Flege's (1995) Speech Learning Model (SLM), the study analyzed the extent to which L1 phonetic categories affect the acquisition of L2 sound contrasts. Findings show that participants generally produced the /l/ sound accurately, while the /r/ sound exhibited persistent distortions and substitutions due to the absence of a distinct /r/ phoneme in Mandarin. These difficulties increased when sounds appeared in full sentence contexts, indicating heavier phonological processing demands. The results demonstrate a clear influence of L1 interference on segmental accuracy in English pronunciation. The study highlights the necessity of implementing targeted phonological instruction to support Mandarin learners in overcoming persistent difficulties with the /r/ sound.

Keywords: /l/ and /r/ contrast, English liquids, L1 interference, Mandarin speakers, minimal pairs, phonological acquisition, Speech Learning Model (SLM)

تأثير كفاءة اللغة الأم (L1) على متحدثي اللغة الإنجليزية من الصينيين: من منظور علم الاصوات للصوت /l/ و/r/

علي محسن علي الحساني¹ 🆔 **، نظام شيت²** 🆔

قسم اللغة الإنكليزية، كلية دجلة الجامعة، العراق¹
قسم اللغة الإنكليزية، كلية دجلة الجامعة، العراق²
¹ali.muhsen@duc.edu.iq
² nidham.sheet@duc.edu.iq

المستخلص:

تبحث هذه الدراسة في تأثير الكفاءة اللغوية في اللغة الأم (L1) على إنتاج المتحدثين الصينيين للأصوات السائلة الإنجليزية /l/ و /r/ من منظور صوتي-فونولوجي تجريبي. اعتمدت الدراسة تصميماً صوتياً تجريبياً مدعوماً بالتحليل السمعي والحكم الإدراكي لتحديد أنماط النطق لدى المشاركين. شارك في البحث أربعة طلاب دراسات عليا صينيون يتحدثون الإنجليزية كلغة ثانية، حيث قاموا بقراءة أزواج دنيا تحتوي على الأصوات المستهدفة ضمن كلمات معزولة وأخرى مدمجة في جمل. استند التحليل إلى نموذج تعلّم النطق (SLM) لفليج ١٩٩٥ لتفسير أثر الفروق الصوتية بين اللغتين على اكتساب المتعلمين للأصوات. أظهرت النتائج أن المشاركين نطقوا الصوت /l/ بدقة عالية، بينما واجهوا صعوبات كبيرة في نطق الصوت /r/ نتيجة غياب مقابل صوتي مباشر له في اللغة الصينية. وظهرت هذه الصعوبات بشكل أوضح عند قراءة الكلمات داخل الجمل. تؤكد النتائج وجود تأثير واضح للغة الأم على دقة النطق في اللغة الإنجليزية، مما يستدعي تضمين تدريبات صوتية-فونولوجية موجهة لتحسين نطق هذه الفئة من المتعلمين.

الكلمات المفتاحية: الكفاءة اللغوية في اللغة الأم، متحدثو الماندرين، الأصوات /l/ و/r/ ، التداخل الفونولوجي، نموذج تعلم النطق(SLM)

1. Introduction

A common topic in applied linguistics studying how first language (L1) phonological systems can affect the ability of learners to produce speech sounds accurately in a second language (L2) is that L1 linguistic competence influences the phonological skills necessary for correctly producing speech sounds that differ from the learners' default (or native) L1 sounds (such as the case with Mandarin speakers learning to produce both liquid /l/ and /r/ sound contrasts in English) (Flege, 1995; Lehmann, 2007).

The majority of Mandarin-speaking learners do not have access to the English liquid sound /r/ due to having only one acoustic approximation of the Mandarin liquid consonant that can be closely associated with the English liquid /l/ sound (i.e., /ai/ or /phai/) and therefore lack an /r/ category that distinguishes between the two liquids. Consequently, Mandarin-speaking learners commonly substitute and confuse the English /r/ for the sound that they would normally produce when speaking Mandarin. This substitution and confusion caused by either the phonemic gap in the learners' L1 or the difficulty they have in producing the phoneme causes a significant impact on how intelligibly the learners can produce English when trying to distinguish between minimal pairs (such as light/right and lock/rock) (Han, 2013; Zhang & Yin, 2009).

Phonological interference manifests in speakers of Chinese who are learning English as a second language as difficulty accurately producing or perceiving the English sounds of /l/ and /r/. Due to the lack of a clearly defined /r/ sound in Mandarin, Chinese learners' ability to create new L2 phonetic distinctions may be inhibited. Therefore, this issue can adversely affect communicative effectiveness and intelligibility when communicating in English.

This study aims to:

1. Analyze the accuracy of Mandarin speakers' production of English /l/ and /r/ in isolated words and sentence-embedded contexts.

2. Examine the degree to which L1 phonological competence influences L2 pronunciation accuracy.

3. Interpret the findings based on the Speech Learning Model (SLM).

The Research Questions of this study as follows:

1. To what extent can Mandarin speakers accurately produce the English liquid consonants /l/ and /r/?

2. How does L1 phonological competence contribute to pronunciation variation in the production of these two consonants?

Ali Mohsin Ali AL-Hasani ✉ *Email:* *ali.muhsen@duc.edu.iq*
http://jcoeduw.uobaghdad.edu.iq/index.php/journal

The results of this study shed light on some of the difficulties involved in phonological learning by Mandarin-speaking learners of English. The results may help pronunciation instruction by indicating which specific error types require corrective instruction. Furthermore, this study provides additional evidence for SLM-based research examining segmental acquisition, which is an important aspect of L2 phonology.

2. Theoretical Framework
2.1 Speech Learning Model (SLM)

A theoretical basis for comprehending how second language (L2) learners perceive and produce sounds based on their first language (L1) phonetic system that is provided by James Fleges (1995) Speech Learning Model (SLM). According to the model, how closely L2 learners sounds resemble their L1 phonemes and affect learners' capacity to produce and differentiate between those sounds. The learner may have trouble differentiating between two sounds if they are similar in their L2 and L1, which could result in mispronounced words or fusions of the two sounds according to the SLM. On the other hand, if an L2 sound is thought to differ significantly from any L1 sound the learner is likely to categorize it in a new phonetic category, which will eventually result in more accurate production. The SLM holds significant relevance in the investigation of how Chinese speakers pronounce the sounds /l/ and /r/. The /l/ liquids in Mandarin Chinese is pronounced differently from the English /l/ sound and there is no distinct /r/ sound. On this basis, Chinese language learners of English tend to mix or confuse these two sounds. This behavior can be explained by the SLMs claim that L1 phonetic categories can obstruct the accurate acquisition of L2 sounds. The study's results which indicate that participants had more difficulty producing the /r/ sound than the /l/ sound lend credence to the SLMs assertion that sounds that are absent from the L1 are more challenging for learners to produce correctly.

2.2 Related Works

Chinese and English have nearly the same number of consonants according to Zhang and Yin (2009). However, there are English consonants that are absent from Chinese. Chinese language learners who are attempting to produce these consonants will find this difficult. Because of this one common tactic used by those learners is to create phonemes that do not exist in their L1 competence. In their English pronunciation of consonants Chinese learners frequently exhibit such replacements. For instance, because the two English consonants form a minimal pair and have only one similar consonant in Chinese, Chinese learners occasionally produce two English consonants interchangeably. Changes made to the consonant [v] do not affect the meaning of the word because in Chinese it only occurs as an

allophone of [w]. Chinese students frequently pronounce English words incorrectly such as village being pronounced as /ˈwɪlɪdʒ/ or window as /ˈvɪndəʊ/ (Han, 2013). However, Yemini (2024) mentioned that there are notable differences between the American and Chinese educational systems citing the Chinese teaching style, which emphasizes self-reliance and self-confidence while Chinese students are praised for participating in class by remaining silent and listening carefully. American teachers prefer it when their students interact with one another and present their unique ideas. In terms of the cultures of China and America Chinese, students ought to enroll in more interactive communication classes and offer lesson ideas for American educators to utilize.

In China, educators practice a very old-style instructing approach which is very dissimilar with other countries (Yin, 2023). "The current methodology employed is reliant on 'talk and chalk'" (Fetsi, 2023) Educators are the central talkers throughout the class. Students are not permitted to speak till they are asked and then get educators' approvals to answer questions. The objective of joining class is to listen to educators' lectures, write down the notes and memorize them. There is no discussion, teamwork, or speech that students need to provide throughout the class. The educators' job is standing at the front of the blackboard and repeating units from the text on the board, "Whereas the students sit silently and suck up the teacher's 'words of wisdom'".

The students' concern is to follow educator instruction and recall precisely whatever educators tell them that they should know. After the class, students need to deal with exercises and recall the content so that they can overcome the exam. "Little emphasis is placed on teaching students how to disapprovingly evaluate information and situations or to think creatively (outside the box)" (Niu & Wolff, 2004, p.6). Above all, students from China have little experience as sovereign, creative learners. This is the key reason why Chinese students feel less confident and more anxious when speaking in front of the class, especially speaking the second language.

However, group of studies has showed that the procedure of L2 acquisition is categorized via an initial universal topic comment stage, the other group has initiated that L2 learners transfer topic prominent features from L1 to L2 at an initial stage (Jin, 1994). As an example, for the influence of L1 on the L2, (Flege, Bohn, and Jang 1997) inspected the impact of L1 Mandarin on the L2 American English Vowel production to measure the consequence of English language experience on non-native English vowels production and perception which have not existence among the sound list of native Mandarin (/ɪ, æ, ɛ/).

According to Flege (1995), the Chinese language lacks the lowest quantity of English experience demonstrated the least accuracy in production. The

supported outcomes that they predicted of the vowels not found in Mandarin L1 are closely produced inaccurately in the American English L2. by that time, they finalized that accuracy in production is connected to the perceived liaise between those of L1 sounds and the target L2 sounds, along with the extent of experience that speakers have with L2. Despite all, it was not possible for them to create tough decisions about how non-native speakers perceive the relatedness of L1 and L2 sounds and that because they did not contain vowels that are sharing sameness in both languages. Supportively, (Liao, 2006) studied acoustic characteristics of native Mandarin and English vowels likewise the non-native English vowel acoustic properties production by Mandarin speakers. The outcomes included some crossover impacts from Mandarin to English. Nevertheless, the vowels of the English language that have equivalents in the Mandarin, acoustic features did not vary considerably among languages. Related to the above investigation is the finding which non-native speakers identify L2 sounds with corresponding sounds in L2, these sounds are merely replaced with the equivalent sounds of L1(same as Flege's Speech Learning Model of L2 learning; Flege 1986, 1987, 1995) in the production of non-native speech. Additionally, Liao did not reject some other possibilities that the speakers of the Mandarin language recognize the dissimilarities between the L1 and the L2, but cannot even pronounce them differently, or that the vowels are truly matching in both Mandarin and English.

3. The Analytical Part

This section of the study tackles the following points: Research design, Participants, Research Instrument, Research Procedure and Data collection.

3.1 Methodology

3.1.1 Research Design

Experimental acoustic phonetic method is used to study the different pronunciations of both consonants' liquid /l/, /r/ English liquids by Chinese students. Informatively, the study deals with the minimal pairs in initial positions, Words Used with the Minimal Pairs as a Distraction and finally the minimal pairs in initial positions embedded in a sentence pattern. The worksheet consists of three different sequences and each sequence contains 20 words. Sequence 1 contains 10 minimal pairs (5, initial /r/) & (5, initial /l/) additional to (10, random distractive words). Correspondingly, the other two sequences (2 and 3) follow the same pattern except with a different arrangement. Likewise, the same arranged with the above-mentioned pattern word pairs sentences are created by embedding the word pairs in between (I say……., I say…….).

Ali Mohsin Ali AL-Hasani ✉ *Email: ali.muhsen@duc.edu.iq*
http://jcoeduw.uobaghdad.edu.iq/index.php/journal

3.1.2 Participants

The numbers of the participants included in this study are four (4) Chinese postgraduate students who conducted their study in University Utara Malaysia. The candidates' gender is of four (4) females. After attempting to register to study in UUM, you must have one of the certified English proficiency tests. therefore, the four participants had IELTS certification same as shown in table 1 below, However, the average of their age is in between of (26 - 39) the students sincerely followed the recommendation has been given to them by the researcher to record their voice while they read the worksheet. Correspondingly, each participant is given the worksheet in isolation to prevent any malfunctions and insufficient outcomes in the collected Data.

Table (1)
Participant Demographics and English Proficiency Levels

Participants	Age	Degree	Field of Study	Certificate	Grade
P1	38	Master	Business	IELTS	6.0
P2	28	Master	International accounting	IELTS	6.5
P3	39	Phd	SBM	IELTS	6.0
P4	26	Master	International commercials	IELTS	6.5

Justification: Although the sample size is small, it aligns with the scope of exploratory phonological studies where detailed segmental acoustic analysis is prioritized over large-scale generalization. The study aims to provide qualitative insight into error patterns rather than statistical generalization.

3.1.3 Research Instrument

The instruments used in this research is a worksheet that contain the minimal pairs, /r/ and /l/ and the instrument is a smartphone, HUAWEI nova 2 lite, recorder software is also used to capture students' voice while they read the minimal pairs in the worksheet. After all, the collected data is copied to the laptop to a better and clear environment for analyzing the recordings.

3.1.4 Research Procedure

As the worksheet is ready to be tested by participants, two native Chinese students were selected to be the respondents for the study. Each respondent asked to read the minimal pair in isolation and embedded in sentences too. They correspondingly take the task separately and individually. While the pronunciation is recorded for sake of observing their productive pattern of the minimal, pair in isolation and embedded in sentences. Whereas the number of the shown words and sentences are ten for each apropos /r/, /l/ English liquids. The content is divided into the different three sequences additional with initial minimal pairs. Moreover, the words and sentences take the random reading flow for three times in various locations of the

content. Finally, the process continues to the transcription and analysis of the minimal pair pronunciation.

3.1.5 Data Collection

In this respect, the collected data of the native Chinese participants are analyzed dependently on IPA consonant transcription for the general American English. This method is applied in a manual observation based on the hearing skills of a normal person after segmentation of the minimal pairs has been recorded. After that, the data are taken to be identified whether it contains any incorrect pronunciations of both minimal pairs /r/, /l/ liquids.

3.1.6 Data Analysis

The analysis focused on:
1. Auditory discrimination using listening-based perceptual judgment
2. Manual segmental transcription based on the International Phonetic Alphabet (IPA) for General American English
3. Error classification according to substitution, distortion, or sound fusion

These steps directly support the research objective of determining how L1 phonology affects English liquid consonant production.

3.1.7 Ethical Considerations

Participation was voluntary, and informed consent was obtained prior to data collection. Participants were assured of confidentiality and anonymity, and no personal identifiers were used during analysis or reporting.

3.1.8 Limitations

The findings are limited by the small number of highly educated participants and the absence of acoustic software measurements (e.g., PRAAT). However, the results still provide meaningful insight into L1 interference patterns for Mandarin English learners.

Figure (1)

*IPA Consonant Transcription for the General American English*

3.2 Data Analysis and Findings

After collecting the needed data, this section deals with demonstrating the probabilities of the results, thus the results in this section will act as a support to our research questions of whether the L1 competence of the Chinese English speakers impact the L2 from a phonological perspective of pronouncing the /l/ and /r/ as a minimal pair in the English language. The following outcomes would exhibit and show the mere understanding of the proposed problem that takes place among the Chinese participants. The entire sequences that pronounced by the two subjects will be argued and put into a sharp analysis so that to show the exact and precise results of pronouncing the /l/ and /r/ as a minimal pair in the English language.

The end results of this paper will be established independently based on the /l/ and /r/ as a minimal pair and their sequence.

Figure (2)
The Overall Incorrect Pronunciation
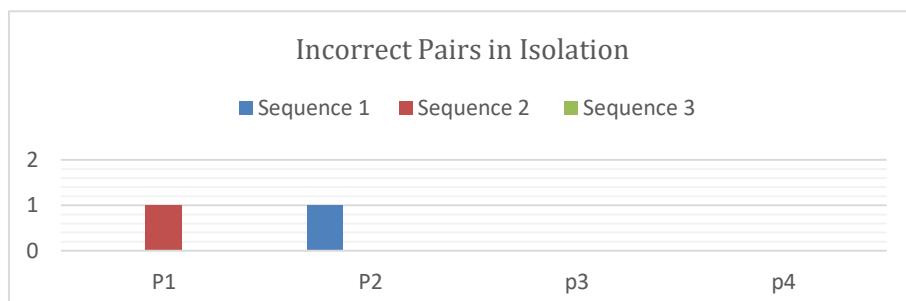
As it is shown above in figure 1, the four participants successfully pronounced the minimal pairs /l/, /r/ except a minimal number of mistakes occurred by P1 and P2 in different sequences but same average. Since the table exhibits the overall incorrect pronunciation of the four participants, it is only for the minimal pairs in isolation that are listed in the first page of the worksheet. Therefore, 90% of the content the participants showed is accurate dealing with the task.

Figure (3)
*The Overall Incorrect Pronunciation*
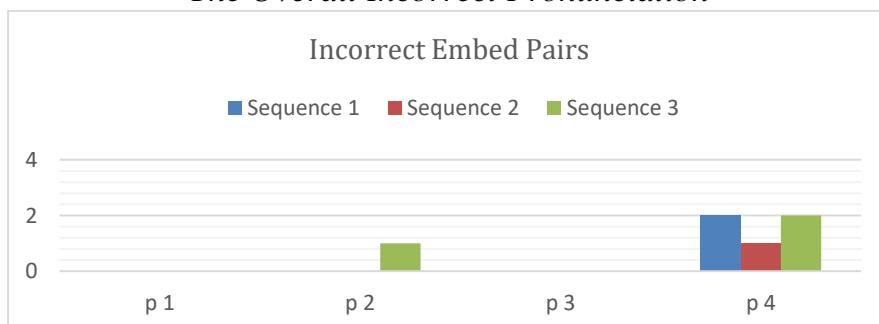
The above listed data, of the minimal pairs used in a sentence pattern, in figure 2 analytically demonstrates slight variations compared to Figure 1 of the overall incorrect pronunciation participants made. As it is noticed that the highest incorrect speaker is P4 with the sequence (1, 3) sharing the same mistakes point of (2) for each. However, the other participants have succeeded to overcome the given minimal pairs without any faults except P2 has scored one mistakes among the two subjects P1, P3. The data analyzed assumed that the embedded minimal pairs in a sentence have some effect on the pronunciations. Therefore, we can argue that P4 encountered difficulties of L1 competence over the second language. Since P4 did not notice to fail using word in isolation rather in embedded method.

Figure (4)
The Accuracy of Overall Pronunciation
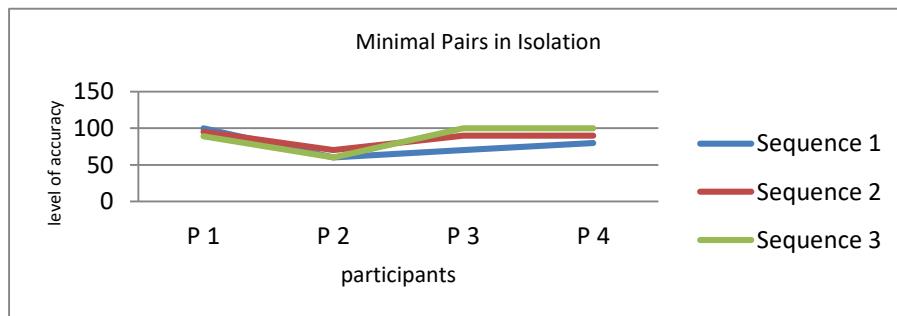
As noted, the results from figure 4 prove that most of the participants followed the same accuracy of the sequences, whereas, the lowest percentages stated with P2 to indicate fluctuation between duration of starting to speak and ending. As the three sequences contain the exactly same minimal pairs, but the results of the four participants did not show any similarities. Thus, this indicates that the accuracy of pronunciation with words in isolation do not shoe that L1 has an impact on L2.

Figure (5)
The Accuracy of Overall Pronunciation
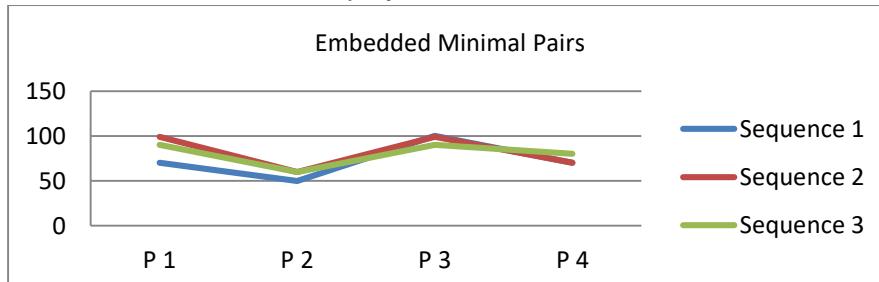
In contrast to the last Figure 4, the outcomes shown in Figure 5 approved that the participants have a mere variation in pronouncing minimal pairs embedded in a sentence. As we can see that P2 and P4 made somewhat the same accuracy, which means that, those two subjects are affected by the existence of their L1 competence over the existence of their English language learning process. Hence, it is obviously the L1 knowledge can have some effects on L2 based on the above given results.

Figure (6)

The Accuracy of /l/ Pronunciation
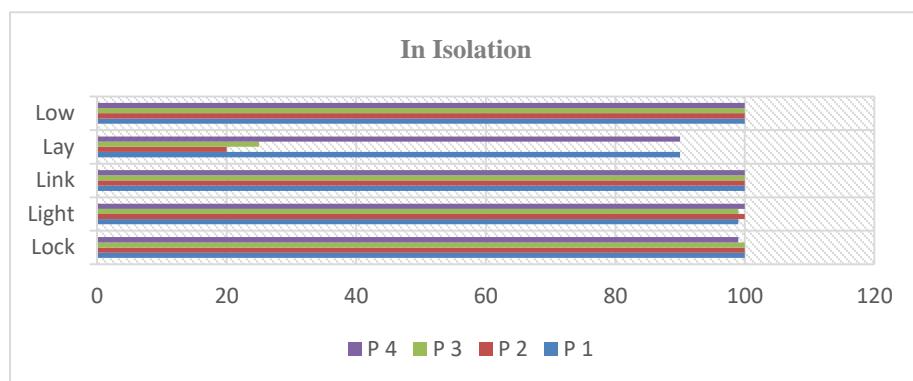
Figure 6, as stated above, showed that the majority of the participants pronounced the minimal pair /l/ correctly. While the only exception among of them is the term (lay) which is uttered incorrectly with both of (P2, P3) nearly to 20%. As a result, it is absolutely demonstrated that L1 competence to be having less impact on words initialized with /l/ sound. Since the main goal of this study is to analyze the acoustic properties of English liquid consonants /l/ and /r/ produced by native speakers of Mandarin Chinese, here we can claim that because of the high average participants pronounced the minimal pair /l/ it is investable that the Mandarin language sounds alike to the English language /l/ sound, and that because our subjects did not face difficulties to produce the same sound in isolation they have in their L1.

Figure (7)
The Accuracy of /l/ Pronunciation
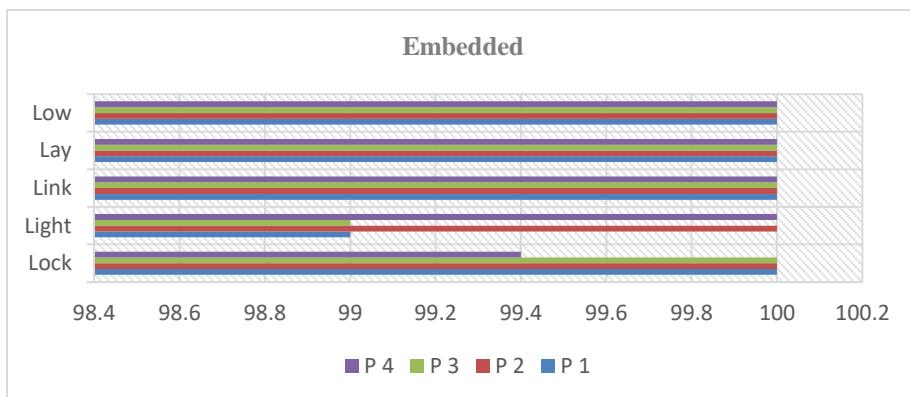
The results of the embedded minimal pair of /l/ sound in Figure 7 ratified that most of the Chinese English speakers do not have any problems with the /l/ sound in the English language. Despite the minor fluctuation of the term (Light) between (P1, P3) about 99% rather than 100%, figure 6 showed it evidently supportively with figure 5. However, the results can be stated that L1 competence.

Figure (8)
The Accuracy of /r/ Pronunciation
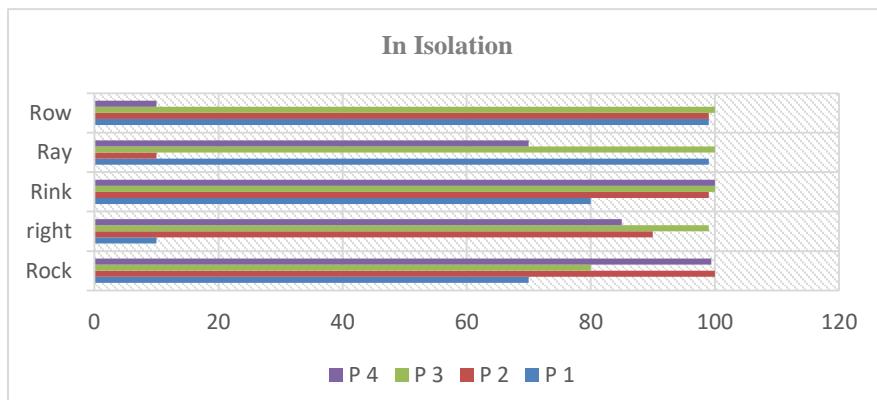
Figure (9)
The Accuracy of /r/ Pronunciation
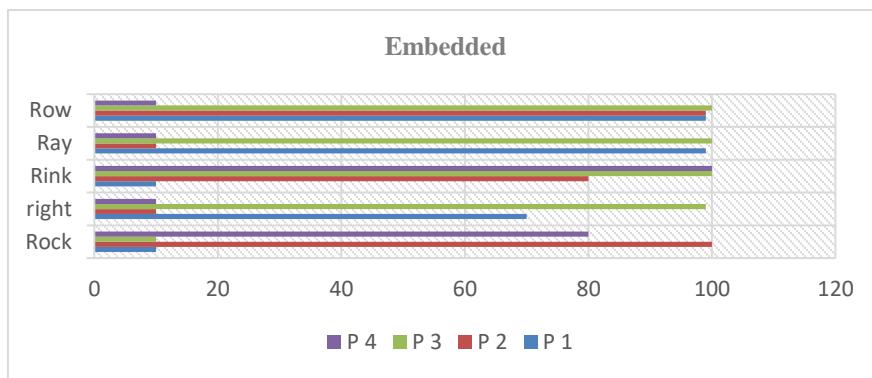
As it is obvious, both of Figures are about the accuracy of /r/ sound in the initials of the English words which are Embedded in a sentence, they showed a hug and clear oscillation and variations, most of the participants in figure 8 achieved some progress between each other, while the results in figure 9 showed that the majority encounters the same hardships and confusion of pronouncing correctly. Therefore, we can assert that Chinese English speakers encounter a lot of problems with /r/, whereas, they do not have that severe hindrance and impact with the words in isolation. As it can notice, Figure 9 as final results which provide a good agreement for the question "Will the L1 competence of the Chinese English speakers affect English language?"

Table (2)
Minimal Pair of the /l/ Sound

Participants	Isolation	Fusion	Embedded	Fusion
P1	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	Zero	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	Zero
P2	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	Zero	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	Zero
P3	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	Zero	lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ]	rock [rɑk]

Ali Mohsin Ali AL-Hasani ✉ *Email:* *ali.muhsen@duc.edu.iq*
http://jcoeduw.uobaghdad.edu.iq/index.php/journal

| P4 | lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ] | Zero | lock [lɑk] light [laɪt] link [lɪŋk] lay [leɪ] low [ləʊ] | Zero |

As we can notice that table 2, the minimal pair of the /l/ sound in the English language, strongly support and backing the idea, that /l/ sound has no any effects on the English flow of the Chinese English speakers. However, as vividly shown above, the four participants did not fuse between the minimal pairs /r/ and /l/ in the English language, which in turn gave us absolute results. For instance, the table contain only words initialized by /l/ and all the five terms, except one, sustain 50% of the answer in which question one question about "Will the students be able to pronounce /l/ and /r/ sounds correctly?" While the other 50% of the question needs to have deep analytical investigations over all the results of /r/ sound. Additionally, the word "lock [lɑk] - rock [rɑk]" in the column of P3 is appeared to be fused into the other minimal pair /r/ and this exception does not refute the positive outcomes of /l/. From this point, we can say that /l/ sound does not recognize as the foremost effect of Chinese English speakers' hindrance.

Table (3)
Minimal Pair of the /r/ Sound

Participants	Isolation	Fusion	Embedded	Fusion
P1	rock [rɑk]	Lock [lɑk]	rock [rɑk] right [raɪt] rink [rɪŋk] ray [reɪ] row [rəʊ]	Zero
	right [raɪt]			
	rink [rɪŋk]	Link [lɪŋk]		
	ray [reɪ] row [rəʊ]			
P2	rock [rɑk]		rock [rɑk] right [raɪt] rink [rɪŋk]	Lock [lɑk]
	right [raɪt]	White [hwaɪt /w-]		
	rink [rɪŋk]			
			ray [reɪ]	Loy [lɔɪ]
	ray [reɪ]	Line [laɪn]	row [rəʊ]	
	row [rəʊ]			
P3	rock [rɑk] right [raɪt] rink [ʳrɪŋk] ray [reɪ] row [rəʊ]	Lock [lɑk]	rock [rɑk] right [raɪt] rink [rɪŋk] ray [reɪ] row [rəʊ]	Zero

P4	rock [rɑk]	Lock [lɑk]	rock [rɑk]	
	right [raɪt]	Light [laɪt]	right [raɪt]	
	rink [rɪŋk]	ʒ rink [ʒ rɪŋk]	rink [rɪŋk]	Zero
	ray [reɪ]	Ree [ʒ ˈri:]	ray [reɪ]	
	row [rəʊ]	ʒ Row [ʒ rəʊ]	row [rəʊ]	

In contrast to the previous table 2, in this table 3 we can clearly see the differences of how many fusions had been made by the participants themselves. The incorrect pronunciation of the five minimal pairs of the sound /r/, highly observed in isolation pattern, is recognized to be the central effect of how participants dealt with. Let's take, for example, p1, p3 and p4 faced the same fusion with the minimal pairs of "rock [rɑk]- Lock [lɑk]" in isolation pattern. Despite the fact that P2 met the same problem but in different condition "embedded pattern".

Separately, the highest fusions took place with P4 in which all the five words of the /r/ sound "in isolation" was not correctly pronounced. Moreover, most of the words contained the sound /ʒ/ preceded the /r/ sound same as in "rink [rɪŋk]- ʒ rink [ʒ rɪŋk]"," row [rəʊ]- ʒ Row [ʒ rəʊ]". As a result, we can say that Chinese English speakers face a severe problem with /r/ rather than /l/ while they speak English. However, this approves and answers the rest 50% of question one that says "Will the students be able to pronounce /l/ and /r/sounds correctly?" As noticed that participants could not pronounce /r/ sound correctly. Furthermore, the second question "Will the L1 competence of the Chinese English speakers affect English language?" in this case I can claim that L1, Chinese language, competence affects the English language flow of the Chinese English speakers due to the findings of the /r/ sound and its impact on their pronunciation.

Table (4)
The minimal pairs /l/ and /r/

	/l/	/r/
1.	Lock	Rock
2.	Light	Right
3.	Link	Rink
4.	Lay	Ray
5.	Low	Row

The table 4 above shows the list of words that consist with the /l/ and /r/ minimal pairs sounds.

4. Discussion

Based on the findings, the findings vividly reflected that all participants did not face difficulties in pronouncing the /l/ sound in a minimal pair sequence of both conditions, isolation and embedded (in a sentence). However, the

major issue participants especially encountered was dealing with the /r/ sound in minimal pair sequence of both conditions, as we can notice in table 3 that the entire subjects have at least one fusion in the isolation condition, whereas in embedded condition we can see that only one of the four participants had difficulties to pronounce the sound. In the /r/ sound, we observed that some additions combined with the words such as in table 3, p4 when a word like [Row ʒrəʊ] is pronounced as [Row [ʒrəʊ] this is inspected to be a kind of invention from the L1 competence of the Chinese English speakers. Supportively, (Herman, 2016) indicated that the manner we speak in a different language is affected by our mother tongue. Therefore, we can say that the Chinese language can be a great reason behind the mistakes mandarin English speakers do usually.

If we observed the way participants pronounce in isolated words and in the sentences, we can conclude that the majority made fewer mistakes in sentences rather than in isolation, while in /r/ sound, they all constantly made mistakes in isolation and sentences. Before we run the test on them, we assumed that all of them would make mistakes in embedded compare to in isolation due to our assumption that repeating the sentences for 3 sequences would make them pronounce the sounds correctly. However, the data showed inconsistency in pronouncing both sounds in words as well as in sentences except with the /l/ sound.

The results demonstrate high accuracy for /l/ across participants, while /r/ productions show significantly greater variation. Table 1 summarizes total correct productions across tasks.

Sound	Total Items Tested	Correct	Accuracy Rate
/l/ isolated + embedded	40	38	95%
/r/ isolated + embedded	40	27	67.5%

This contrast supports the assumption that English /l/ more closely matches a Mandarin L1 category, whereas English /r/ lacks an equivalent category — consistent with SLM's equivalence classification prediction (Flege, 1995).

Example error patterns:
- *rock* → [lɑk]
- *ray* → [ʒeɪ]
- *row* → [ʒrəʊ]

These patterns show that participants either mapped /r/ onto /l/ or replaced it with an L1-based fricative gesture, indicating incomplete category formation. Further, accuracy for /r/decreased in sentence contexts, suggesting higher cognitive load causes more reliance on L1 articulatory habits — another SLM prediction.

Interpretation through SLM:

- When L2 sounds are similar to L1 → easy category formation (/l/)
- When L2 sounds are new / absent in L1 → difficulty and substitution (/r/)

Overall, findings strongly reinforce SLM's claim that L1 categories constrain L2 perception and production.

5. Conclusion

The results of the study indicate that the participants had no problems producing the English /l/ and /r/ sounds distinctively from one another. The results showed that when producing the sound /l/, the participants had a relatively high level of accuracy in producing this sound. This may be due to the perception that the Mandarin language has similarities with this sound, which has allowed for the correct mapping of the phonemes in the acquisition of L2 English. In contrast, the participants had a much lower level of accuracy when producing the sound /r/. This finding supports the idea that Mandarin speakers struggle to develop a distinct phonological category for this sound because there is no equivalent in the Mandarin language. The participants' production errors in producing minimal pairs also provide additional support for Flege's Speech Learning Model. It is assumed in Flege's Speech Learning Model that when learning a second language (L2), learners often need to create new phonological categories for sounds that are significantly different from the categories established by their first language (L1). The creation of a new phonological category typically takes time and is not always consistent. Additionally, the reduced accuracy of the participants in performing sentence-embedded tasks shows that as the demands of the task increase, the learner has a greater reliance on L1 habits. This study confirms that even for intermediate speakers of the English language, the phonology of the L1 constrains their ability to produce accurate L2 phonological representations.

6. Recommendations of the Study

It is advised that specific pronunciation exercises be included in language teaching curricula to help Chinese language learners who struggle to recognize and produce the /l/ and /r/ sounds. These exercises ought to concentrate especially on production methods and phonological differences. The use of theoretical frameworks such as Fleges Speech Learning Model (SLM) can also assist in customizing pronunciation instruction to match learners L1 phonetic systems thereby addressing particular problem areas.

Swapping out traditional lecture-based teaching methods for more interactive and communicative ones is also crucial. Pronunciation skills can be greatly improved in language learning sessions by promoting peer engagement and active participation. By giving students the ability to see

and adjust their pronunciation in real time technological tools like phonetic analysis software can help them even more. Finally structured programs that introduce children to English phonology early on may help lessen the long-term effects of L1 interference by encouraging improved pronunciation habits at an early age.

7. Suggestions of the Study

Male learners and people with different levels of English proficiency should be included in future studies participant demographics. It would be easier to ascertain whether the trends seen are consistent across various learner profiles with this wider scope. To give a more thorough understanding of L1 interference on English pronunciation it would also be helpful to look into other difficult English sounds like /v/ and /w/. It is also advised to conduct longitudinal studies to see if phonetic interference is lessened by repeated exposure and practice. The quality of English phonological instruction can be further improved by investigating how well various teaching approaches address these issues. To keep up with contemporary educational advancements a thorough examination of the role that cutting-edge technological tools—like AI-driven applications—play in enhancing phonological learning and pronunciation is also necessary.

Appendices
Worksheet

Initial Position: Words in Isolation

SEQUENCE 1	SEQUENCE 2	SEQUENCE 3
Lock	Rink	Much
Much	Link	Rock
Think	Close	With
Right	Down	Low
Low	Mother	Think
Rink	Ray	Lock
Bad	Bad	Ray
Lay	Lock	Link
Close	Low	No
Rock	Think	Mother
Mash	With	Bad
Link	Lay	Lay
No	Yellow	Close
With	Row	Right
Yellow	Mash	Rink
Row	Right	Down
Down	Rock	Light
Ray	No	Yellow
Light	Light	Row
Mother	Much	Mash

Ali Mohsin Ali AL-Hasani ✉ *Email:* *ali.muhsen@duc.edu.iq*
http://jcoeduw.uobaghdad.edu.iq/index.php/journal

Initial Position: Words in a Sentence

SEQUENCE 1	SEQUENCE 2	SEQUENCE 3
1. I say lock	1. I say rink	1. I say much
2. I say much	2. I say link	2. I say rock
3. I say think	3. I say close	3. I say with
4. I say right	4. I say down	4. I say low
5. I say low	5. I say mother	5. I say think
6. I say rink	6. I say ray	6. I say lock
7. I say bad	7. I say bad	7. I say ray
8. I say lay	8. I say lock	8. I say link
9. I say close	9. I say low	9. I say no
10. I say rock	10. I say think	10. I say mother
11. I say mash	11. I say with	11. I say bad
12. I say link	12. I say lay	12. I say lay
13. I say no	13. I say yellow	13. I say close
14. I say with	14. I say row	14. I say right
15. I say yellow	15. I say mash	15. I say rink
16. I say row	16. I say right	16. I say down
17. I say down	17. I say rock	17. I say light
18. I say ray	18. I say no	18. I say yellow
19. I say light	19. I say light	19. I say row
20. I say mother	20. I say much	20. I say mash

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