



# The Effects of L2 Proficiency on Acquisition of English Lexical Stress by Chinese Learners—An Acoustic Study Based on L1 Interference Theory

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**Abstract.** English is an international language throughout the world and is widely learned as a foreign language by Chinese students. Compared with other skills, Chinese learners are less good at speaking, due to the first language (L1) interference in phonology. Lexical stress is a crucial constituent which determines the comprehension of speech. However, non-native speakers are less sensitive to the changes in English lexical and always produce inaccurate pronunciation. This paper studies the acquisition of English lexical stress by Chinese learners. A comparative experiment between two groups of learners with different proficiency and an acoustic analysis of the records support the research. The results indicate that the second language (L2) proficiency is a positive factor for the acquisition of lexical stress. But the L1 interference will not disappear, which is mainly manifested through a longer duration and a higher pitch, due to the different vowel systems in the two languages. The results also show that more practicing work should be combined with theory teaching to enhance both perception and production of English lexical stress by Chinese learners.

**Keywords:** English lexical stress · L1 interference · Vowel · Phonology system

## 1 Introduction

Chinese-accented English, as a variety deviated from the norm of English rhythm, is manifested in widespread neutralization of stressed syllables and unstressed ones [1]. Lexical stress is an important suprasegmental feature that distinguishes English from Chinese, giving the English language rhythms and tones. Lexical stress in English is acoustically manifested by combining cues such as frequency(0), intensity, vowel duration, and vowel quality [2]. Compared with English, Chinese has a unique phonology system with different syllabic structures and rhythms. In the process of learning English as L2, Chinese learners always have difficulty in the acquisition of English lexical stress pronunciation due to L1 interference, which refers to the negative transfer of their mother tongue. The L1 interference could also result from a learner's conscious or unconscious

knowledge that some segmental and suprasegmental features in L1 and L2 are similar, especially in phonology [3].

There are a substantial amount of research which studies the acoustic features of Chinese-accented English lexical stress pronunciation. However, little research looks into whether the improvement of L2 proficiency functions as a key factor in improving spoken English. Therefore, this paper investigates the relationship between L2 proficiency and the perception and production of English lexical stress by Chinese learners based on the L1 interference theory. An experiment is conducted to compare the perceptual and productional performances of Chinese learners with different English proficiency. The experimental results can give inspiration and instruction to L2 learning and teaching, especially in the acquisition of spoken English by Chinese non-native learners.

## **2 Background Information**

### **2.1 Comparing English Lexical Stress and Chinese Lexical Pronunciation**

#### **2.1.1 Acoustic Analysis of English Lexical Stress**

English lexical stresses are produced with a higher frequency, longer duration, and greater intensity [4]. Stress also implies the vowel quality. Vowels are reduced to schwa in unstressed syllables or syllables with a less stressed pronunciation. Previous research focuses on the acoustic features of English lexical stress, showing several changes of the vowel sound in pronunciation. The stressed syllable depends on both of the word classification and structure.

#### **2.1.2 Pattern of Syllable and Stress**

AS a suprasegmental element in lexical pronunciation, the syllable is the smallest unit of phonological organization. Syllables in English words consist of an onset and a rhyme. More specifically, a rhyme can be divided into a nucleus and a coda. Both the onset and coda are optional constituents. The nucleus is the most important and defining part of syllables, and it mostly contains a vowel. Therefore, one of the acoustic features of lexical stress is the analysis of vowel sound within the stressed syllable, which will be discussed later. The amount of the syllable can be identified by both native and non-native speakers, while native speakers have better tuition of stressed syllables.

Lexical stress refers to one syllable, in particular, that is more phonetically prominent than others in an English word. English is a mixture of the Germanic and Romance stress systems because of its historical development, which means the lexical stress is neither fixed nor entirely free. But there are some general rules that apply to lexical stress pronunciation. For example, in a noun, the penultimate syllable should be stressed when it is heavy; if not, the antepenult should be stressed instead. Another general rule for verbs is that the final syllable should be stressed if heavy; if not, the penultimate syllable should be stressed instead. An English word can contain more than two syllables sometimes, which is called multisyllabic words. In this case where the syllable pattern is generally more complicated, the vowel sound should be phonetically analyzed to determine which syllable is relatively prominently pronounced. Besides, the addition of

suffixes can change the lexical stress. Most suffixes are stress-neutral while some are stress-attracting, like *-ette* to *kitchen*, or *-ese* to *mother* [4].

Unlike English, Mandarin Chinese words have a tonal pronunciation, similar to the intonation of English sentence pronunciation. There are 4 tones in Chinese lexical pronunciation: tone 1 (high-level), tone 2 (high-rising), tone 3 (dipping), and tone 4 (high-falling) [5]. Syllables in Mandarin Chinese are composed of an initial consonant and a compound vowel. This is the same as a combination of an onset and nucleus. But no coda can be found in Chinese words. Moreover, syllables in Chinese words are separated from each other, and each can be pronounced in a different tone. Thus, it is difficult to define the lexical stress in Chinese words.

## **2.2 L1 (Chinese) Interference on the Acquisition of L2 (English) Lexical Stress**

### **2.2.1 L1 Interference**

L1 interference refers to the transfer of the mother tongue to the target language, both positively and negatively. Cathy Benson pointed out that the positive transfer occurs when the two languages share some identical characteristics [6]. Bhela found that a negative transfer can unconsciously influence the perception and production of L2 learners whose L1 have some similarity in that they are assimilated and unaware of the difference [7]. For example, English has 14–19 vowel phonemes in the phonology system while Chinese contains only 5 vowel phonemes, thus Chinese learners of English generally simplify the vowel sound and substitute the English vowel with a vowel phoneme in Chinese.

### **2.2.2 Chinese-Accented Pronunciation of English Lexical Stress**

Previous researchers have found that L2 learners tend to unconsciously apply acoustic features of L1 in producing L2. Compared to English native speakers, Chinese learners produce the lexical stress by a higher pitch and a longer duration [8]. Mandarin Chinese has a clear sentence stress in speech, which is always improperly used to distinguish the word stress by Chinese learners when learning English. Chinese speakers use the a rising tone and pause to mark the stress, which is manifested in a higher pitch and a different rhythm. Because of the phonology system, especially the difference in vowel sounds, Chinese learners place the stress in a wrong way according to the word spelling rather than the sound. In the same phonetic environment, a low tongue position leads to a longer vowel while a high tongue position leads to a shorter vowel [1]. Besides, Chinese-accented English lexical stress shows a much greater intensity in that they mistake the vowels in weak form for those in strong form. However, Mandarin Chinese has a category of words that share a similar syllable pattern with English. There is an additional tone called light tone, which is used to express an appreciative feeling by speakers. When a word ends with a light tone, the last syllable will be reduced to a pretty short one. Another application is to add a voiceless syllable containing a vowel /e/ and a rhotic consonant /r/, which sounds like a “schwa” in English. It is always used by people living in northern China, as a distinguishable characteristic of the northern dialect. Therefore, Chinese learners unconsciously exert this rule, stressing the first syllable while reducing the last syllable into a “schwa” sound. This results in the omission of stressed syllables in

pronunciation, for example, /teɪn/ in “contain” is wrongly pronounced to an unstressed /tə/.

### 3 Experiment

#### 3.1 Research Goals

Based on the previous research, the present study fills the gap by conducting a comparative experiment and investigating the effect of L2 proficiency on the acquisition of English lexical stress by non-native learners. L2 proficiency refers to the acquisition of English reading and writing skills in particular. Based on the L1 interference theory mentioned before, it is expected to see a positive correlation between L2 proficiency and the accuracy of the perception and production of lexical stress. Besides, the predication will also look into the similarities and differences between high-proficiency and low-proficiency learners’ perceptual and productional performances, as well as other factors contributing better perception and production of lexical stress by non-native speakers.

#### 3.2 Research Participants

The present study concentrates on both the perceptual and productional accuracy of English lexical stress. The experiment will make comparisons according to different categories, revealing a general rule that L2 proficiency positively affects the L1 perception and production. Higher L2 proficiency generally leads to better L1 perception and production. To assure the reliability of the experiment, it is conducted in a quiet environment. Four Chinese university students with a same age period are invited, and they are divided into 2 groups (Group A and Group B) according to their English proficiency.

#### 3.3 Research Design

In this experiment, L2 proficiency mainly refers to academic performances in skills such as English writing and reading. Therefore, the standard of division is based on two standardized English exams in China. Chinese learners of English with high proficiency in Group A all get an excellent grade (over 80) in TEM4 while learners with low proficiency in Group B fail the CET4.

There are two steps in the process. The participants are given a word list which contains 30 bisyllabic and multisyllabic words. Firstly, they are required to give an answer in form of a number to tell which syllable is the stressed one. For example, “1” for word “package” means that the stress falls on the first syllable. Syllables in each word are marked out, but the phonetic alphabets are not given to the examinees. Secondly, the participants read the words on the list and their pronunciation is recorded respectively.

### 4 Experimental Results

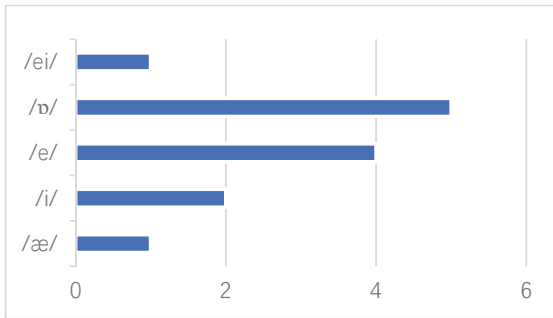
As Table 1 indicates, students in Group A have a better acquisition of English lexical stress than students in Group B. Their performances in recognizing the correct stress are

**Table 1.** The results of the correct rate.

	Words	Incorrect answers
A1	object, contribute, legislate	2.1.2
A2	legislate	2
B1	periodical, merit, symbolic	3.2.1
B2	veneer, panel, illustration, periodical, symbolic, legislate	1.2.1.1.1.2

**Table 2.** Errors in Vowel Sounds.

Participants	A1	A2	B1	B2
Rate of recognizing the right stressed syllable	27/30	29/30	27/30	24/30
	90%	96.67%	90%	80%
Rate of pronouncing correctly	25/30	28/30	20/30	15/30
	83%	93%	66%	50%



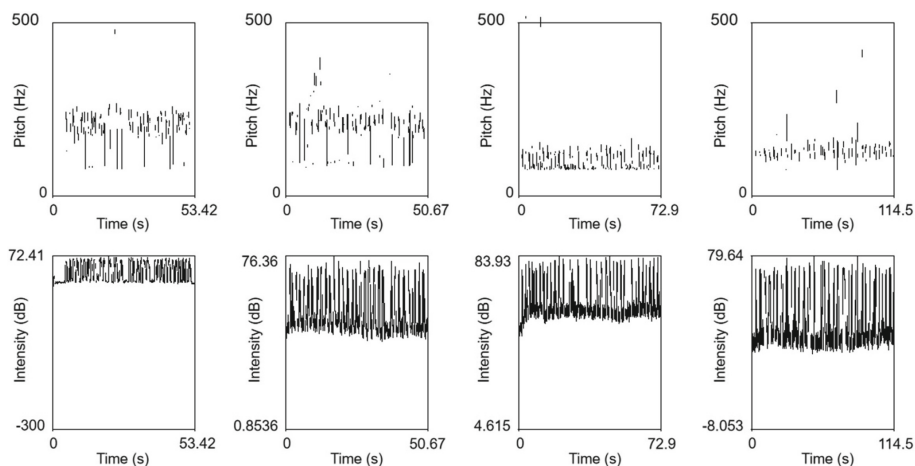
**Fig. 1.** Errors of placing stressed vowel in words by Chinese learners in experiment.

similar, but a gap shows up in their production. When it comes to production, Group A has a much higher rate of pronouncing the stress in the proper syllable than Group B. However, there is a common phenomenon that participants in both groups cannot necessarily pronounce the stress that they recognize. Even if they point out the right syllable, they are likely to stress another one in pronunciation. The errors generally happen in stresses with a monophthong, which indicates that Chinese learners have a better understanding of the diphthong. As shown in Table 2 and Fig. 1, the most common stressed vowel sound that has been omitted is /ɒ/, followed by /e/, /i/, /æ/, and /ei/. Compared with bisyllabic words, multisyllabic words are more frequently mispronounced.

The acoustic features of participants’ pronunciation are illustrated in Table 3 and Fig. 2. It is clear that Chinese learners with high English proficiency pronounce in

**Table 3.** Total duration in production of the English words by participants.

	A1	A2	B1	B2
Total duration	53.419s	50.667s	72.896s	114.496s

**Fig. 2.** Pitch and intensity in production of the English words by participants.

a shorter duration more like the native-speaker, while those with low English proficiency have a longer duration. The most obvious difference lies in the pitch of their pronunciation, while the intensity shares an identical fluctuation in all records.

## 5 Analysis and Discussion

Based on the experimental data, the general rule of how L2 proficiency affects the acquisition of English lexical stress by Chinese non-native speakers can be concluded. There is a positive correlation between L2 proficiency and the accuracy of perception and production of lexical stress. As the data indicates, when the L2 proficiency is low, L1 will have a strong interference to the L2 output. If the L2 proficiency is raised to a high level, the interference of L1 will be reduced, but it cannot completely disappear. This is the reason why both of the learners with high L2 proficiency and low L2 proficiency have an approximate grade in recognizing the stressed vowel, but learners with high L2 proficiency speak them out better. Briefly speaking, the pronunciation of the participants in Group A has fewer features of Chinese-accented English, which is mainly manifested in the pitch and duration. The results are in line with the previous findings by other researchers.

However, the rates of recognizing the correct stressed syllable do not match the performances in production. In terms of production, Chinese learners tend to make more mistakes though they have known the stressed syllable. Notably, this tendency is more

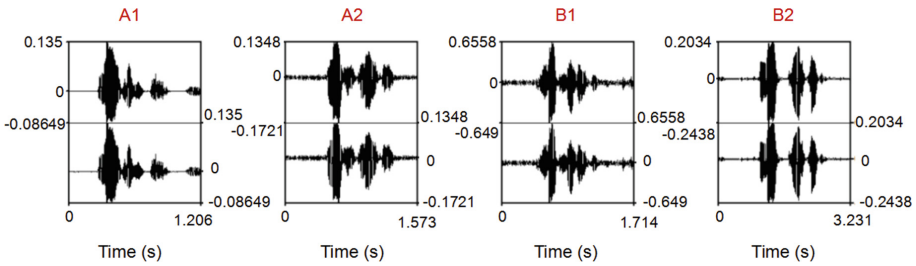


Fig. 3. The phonetic drawings of “legislate” pronunciation.

common in the performances of learners with low L2 proficiency. For one thing, it further verifies the positive influence which results from the improvement in L2 proficiency. For another, it reveals that the gap between perception and production is hard for non-native learners to entirely eliminate. It also gives an instruction that teachers should lay emphasis on the problem and give targeted methods, like raising the oral practices in class.

Some similarities and differences are found in the current study. As for similarities, both groups fail to recognize the lexical stress in multisyllabic words in that the less stressed one misleads their judgment. This implies that they unconsciously exert the rule of the Chinese vowel system that every syllable is separated and should be pronounced with a commensurate intensity. Besides, the errors in vowel sounds are identical, and the most frequent errors are found in monophthong /ɒ/ and /e/, both mid-high vowels. In Mandarin Chinese, most vowel phonemes are high vowels, which makes Chinese learners less sensitive to the relatively low tongue position when speaking English, and thus Chinese learners tend to neglect the mid and low vowels in judging the English lexical stress. The differences in the acquisition of the English lexical stress by Chinese learners with different English proficiency occur in productional performances. Firstly, the accuracy of the vowel pronunciation in lexical stress for learners with high proficiency is higher. Learners with low proficiency always have an obvious accent, which is characterized by a longer duration and higher pitch. Secondly, the L2 proficiency of non-native learners differentiates the inequality between perception and production. High proficiency learners may misplace the position of stressed vowels, while low proficiency learners tend to replace stressed vowels with a similar sound in Chinese, even if they recognized the position. This indicates that L2 proficiency makes for a better understanding of the phonetic and phonology knowledge, contributing to a native-like pronunciation and production of word stress. For example, they use /i:/ to pronounce /ai/ in “binder”, and /əu/ for /ɒ/ in “symbolic”. Moreover, there is an interesting phenomenon in the current study. When both groups fail in recognizing the stressed syllable, learners with high L2 proficiency can surprisingly produce the right pronunciation while the other group can not. Take the word “legislate” as an example.

As shown in Table 2, three out of four participants give a wrong number(2) and they believe that the stress falls on the second syllable/gis/. But there is a discord in their records that they actually lay the stress on the first syllable/le/. To be more specific, the pronunciation of high-proficiency learners is close to that of native speakers while the pronunciation of the rest does not. Here two kinds of errors show up. Firstly, B1

mistakes /e/ in the first stressed syllable for /ei/. It is a misunderstanding of vowel sound which has been discussed in the last paragraph. Secondly, the other error is related to the rhythm, in drawing of B2 (seen in Fig. 3), the duration of the first syllable is obviously longer, but the intensity and pitch are similar to that of the second syllable, making the pronunciation sound strange.

## 6 Conclusion

TO sum up, L2 proficiency plays an essential role in the acquisition of English lexical stress, as the raise in L2 proficiency leads to a better performance, especially in the production of English lexical stress. However, the L1 interference cannot be ignored, which results in some common errors in Chinese learners of English. When recognizing the stressed syllable, they tend to omit those vowels which are not included in the vowel system of Mandarin Chinese /ɔ/, /æ/, /e/, /ə/, /ɛ/; when producing the lexical stress, they tend to substitute stress with a similar sound in Chinese, which can causes misunderstandings to the listeners. Improving L2 proficiency helps to fill the gap in phonetic and phonological knowledge and reduce the accent that is based on the L1 phonology system. The current study hopes to take an insight into language teaching as well. From the results, it is assumed that the time of speaking English in practice can also influence the acquisition of lexical stress. However, due to the limited amount of data, other factors that influence the acquisition of English lexical stress cannot be defined. The experiment will be completed if more controlling factors are added. Considering the physical differences between individuals and their learning ability, it is hard to give an absolute conclusion. Chinese learners of English should take notice of the L1 interference and avoid its negative effects. There is a long way for them to go in improving English pronunciation.

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