The Effect of English Songs on Chinese Students' Acquisition of Word Stress in a Rural Junior High School

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Manuscript received November 2, 2023; revised December 22, 2023; accepted January 30, 2024; published April 16, 2024

***Abstract*—Few studies have examined how teaching English songs to junior high school students in rural areas affects students' English pronunciation. To fill this gap, we taught English songs to 39 rural junior high school students and tested their perception and production of English words with different stress patterns before and after the session of learning English songs. Students were asked to identify the position of word stress for a list of disyllabic words, and they were asked to read the disyllabic words with different stress placements. Teachers evaluated the students' pre-test and post-test performance, and acoustic measures were taken to compare their pronunciation in two sessions. After two weeks, the production test revealed an improvement in the students' ability to produce English stress. In the post-test, students could more effectively use the *duration* cue to distinguish between stressed and unstressed syllables. However, students' perception improvement was not attested. The findings generally indicated that English songs have a beneficial impact on junior high school students in rural areas who are learning English word stress.**

***Keywords*—English songs, English pronunciation, rural junior high school, word stress**

I. Introduction

English is a kind of stress-timed language. Foreign language learners have to master the stress patterns of English when learning English pronunciation. However, being influenced by Mandarin Chinese, which is a typical syllable-timed language, Chinese learners of English often confront obstacles in English stress perception and production [1, 2].

In recent years, the effects of English songs on English stress acquisition among Chinese students have been extensively discussed, and teaching English songs has been proven to play a positive role in enhancing students' acquisition of English stress [2–5]. However, few relevant types of researches looked into rural junior high school students who have relatively limited English proficiency. Existing studies have focused more on adults and higher education students. What's more, the particular influences of songs on word stress acquisition are not yet fully understood. It is not clear whether English songs can be both effective in improving students' stress perception and stress pronunciation. To further our understanding about the effectiveness of employing English songs as a classroom activity in rural junior high schools, this study examines a class from grade seven in Jintan No.1 Junior High School in Jintan Town, Qingyuan City in Guangdong. The students in Jintan No. 1 Junior High School are mainly from primary schools in nearby villages and towns. The English proficiency of students in this school is subpar. To test the efficacy of English songs in improving students' pronunciation, the teacher assessed the students' mastery of the stress patterns in English words before and after the English song learning session. The research questions to be answered are: 1) Can students' ability to recognize the stress position in English words be improved by teaching them English songs? 2) Can English song instruction improve students' ability to pronounce English words with varied placements of stress?

A. English Word Stress

In an English word with more than one syllable, one syllable will be more prominent than the others. The prominent syllable is the stressed syllable, and the other syllables are unstressed. Stress plays an indispensable role in English phonology, affecting the way we perceive and process speech sounds. Ladefoged and Johnson indicated that a stressed syllable is usually produced by pushing more air out of the lungs in one syllable relative to others, so it has more respiratory energy than neighboring unstressed syllables [6]. Stressed syllables generally sound higher, longer, and louder than unstressed syllables. Acoustically, stress is manifested by increased fundamental frequency (F0), duration, and intensity.

Stress can distinguish lexical meaning and facilitate speech perception. The placement of stress usually indicates the syntactic category of the word. For instance, in the two phrases: *keep a* '*record* (n.) vs. *to re*'*cord* (v.), the noun has stress on the first syllable while the verb has stress on the second syllable. Stress also has a syntactic function in distinguishing between a compound noun and a phrase made up of adjective followed by noun. '*Blackboard* is a board used in a classroom, but *black* '*board* is a board that is black.

The rules of English word stress have been discussed extensively. Although researchers have proposed some general rules to predict word stress, there are some exceptions to those rules. One way to predict English word stress is to analyze the origin of the words. For instance, words of Germanic origin often place stress on the first syllable, such as *'water*. Words of Romance origin, often stress the penultimate syllable, such as *'govern*, *com'mission*. One well-known rule for word stress is Chomsky and Halle's principle of strong cluster and weak cluster [7]. They have pointed out that stress placement is sensitive to syllable weight. The word stress is usually assigned to the syllable made up of a strong cluster. The strong cluster refers to a series of sounds consisting of a long vowel or diphthong followed by an indefinite number of consonants, or a short

vowel followed by at least two consonants; the weak cluster means a speech sequence consisting of a short vowel followed by at most one consonant. There are other stress rules, but all these rules have certain exceptions.

Since there are exceptions to the general rules, second language (L2) learners of English often experienced challenges in acquiring correct English word stress. The inconsistencies in English stress rules add to the difficulty in predicting and applying them accurately. L2 learners may incorrectly apply learned stress patterns to other lexical items, resulting in incorrect stress placement. What's more, learners' first language (L1) may influence their perception and production of stress patterns, causing difficulties in identifying and producing the English stress patterns.

B. English Songs and Learners' English Pronunciation

Neurological research revealed that music and speech functions have numerous similarities and that several brain modules are engaged in both speech and music [8]. There is also evidence that music functions can benefit speech functions. There are many similarities between musical prosody and linguistic prosody. Linguistic and metrical rhythm tended to align in music. By analyzing rhythmic organization of a song, Palmer and Kelly found most of the time, the musical metrical accent accords with linguistic stress [9]. For example, the first syllable of a compound noun often carries linguistic stress, and in songs the metrical accent also falls on the first syllable in compound nouns. In English songs, the stressed syllable of a word is often placed in a strong beat and unstressed syllables in a weak beat.

Given these similarities, teaching songs to English learners can help them to understand stress/accent better. It has been indicated that the perception of English songs is perfectly matched with that of the English language [2]. Liu [5] showed that with the aid of English songs, students can distinguish stressed syllables from unstressed syllables in a word, by raising the pitch of stressed syllables, strengthening the intensity of stressed syllables, and prolonging the duration of stressed syllables.

There are some fewer positive concerns about music and songs in the language classroom. For example, some learners may get too excited and may forget about the discipline. Some learners just want to listen, not work. Many songs may be unintelligible for students since they contain many colloquial expressions. Therefore, when using songs to teach English pronunciation, teachers' selection of appropriate songs and scaffolding tasks are quite important. Besides, other factors like explicit instruction on word pronunciation, students' familiarity with the songs, and their English proficiency levels may also impact the learning outcomes.

In summary, the rhythm of English songs is very similar to the rhythm of English language, so using songs as a classroom activity may have a positive effect on students' English phonological ability, but the songs for teaching should be carefully selected.

II. Research Design

A. Participants

The participants were 39 Chinese EFL learners from the same class, 18 females and 21 males. Their average age was 13 years old. All the participants were native speakers of Cantonese and had no overseas learning experience. They started to learn English in grade three in primary school, at the age of about 9 years old. Most of the participants did not understand the phonetic transcriptions and spelling rules. The students' level of English proficiency is very limited.

B. English Songs Selected for Teaching

In the current study, English songs were selected on the following criteria. First, the musical metrical stress positions align with word stress positions. Second, the songs selected for teaching should accord with or be slightly higher than the students' current English proficiency level. The lyrics are not too long, and there are not too many difficult words. Third, some of the songs have Chinese versions that are available online, so the rhythms of songs are familiar to students. Based on these criteria, the five songs selected are: 1) Rain, rain, go away; 2) Row row row your boat; 3) Twinkle twinkle little star; 4) Do Re Mi; 5) Double Trouble.

We follow the paradigm in [2] to teach English songs. The teaching processes were as follows.

1) The teacher printed out the lyrics of songs and handed out them to each student before singing English songs.
2) Students were required to read the lyrics before listening to the song and they could ask the teacher about any words they did not know.
3) The teacher explained the lyrics, teaching new vocabularies and then played the video or audio of the song to students.
4) The teacher played the songs section by section and the student repeated them.
5) The students sang the songs together along with the music for several times.
6) The students discussed and practiced in groups. They were asked to talk about new words and practice singing.
7) The students had group singing competitions.
8) The students sang the songs together again.

The teacher used one week to teach the songs, and the students practiced the songs for one more week. The time interval between pre-test and post-test was about two weeks.

C. Word Stress Identification Test

To answer the first research question on whether students' ability to recognize the stress position in English words can be improved by teaching them English songs. A perception experiment was designed, consisting of a pre-test and a post-test. The testing materials are 25 disyllabic words with primary stress on the first or second syllable, as in Table1.

We adopted Whalley and Hansen's method [10] to test students' sensitivity to stress. Students listened to the recording of testing words and identified the placement of stress in each word. They were given three options like "TAta, TATA, taTA" uttered by the teacher to mimic initial stress, equal stress, and final stress, and they needed to choose one based on their identification of the word stress pattern. "TA" represents the stressed syllables in the disyllabic words, while "ta" represents the unstressed syllables. The "TAta" task was used to assess students' sensitivity to English stress. The same materials were used in the post-test, but the order of presenting the testing words was changed.

D. Word Stress Production Test 1: Teacher's Rating

To figure out whether students' production of English

word stress could be improved after learning English songs, we asked students to read the disyllable words with different stress placements.

Table 1. Word list for stress identification test

ˈgently	reˈcite	ˈneedle	ˈpulling	ˈsomething
beˈtween	ˈtwinkle	unˈtil	forˈget	ˈfenny
ˈfollow	ˈbubble	ˈgolden	ˈtrouble	ˈdouble
aˈway	aˈbove	ˈhappen	ˈdragon	arˈrive
ˈwonder	ˈdiamond	beˈcause	aˈgain	ˈmummy

In the pre-test, 39 participants took part in the stress identification test. Then, based on the results of the stress identification test, students were divided into three performance levels: good, intermediate and poor. Three students from each level were selected to take part in the pre-test of this word stress production task. They are required to read the 25 words listed in Table 1 in front of two English teachers, and their pronunciation were rated by the teacher. After learning English songs, the students have to read the word list again and their pronunciation were rated by the same two teachers in the post-test.

E. Word Stress Production Test 2: Acoustic Measurement

Besides teachers' assessment of students' pronunciation, we conducted phonetic experiment to examine whether students' pronunciation was improved by learning songs. In this production test, five minimal pairs were designed. Each pair includes two disyllabic words, and the two words contrast with each other only in stress pattern, as shown in Table 2. Students are required to read the five minimal pairs and their pronunciations were recorded for acoustic measurements. After the session of English songs learning, we recorded and measured students' pronunciation again.

Table 2. Word list for production test & acoustic measurement

Pair 1	**Pair 2**	**Pair 3**	**Pair 4**	**Pair 5**
record (n.)	conduct (n.)	combine (n.)	refund (n.)	survey (n.)
record (v.)	conduct (v.)	combine (v.)	refund (v.)	survey (v.)

Six students were asked to read the five minimal pairs of words and repeated each word three times. These words were embedded in simple sentences. The experimenter recorded six students' pronunciation in a quiet room. Then, the recording was processed by Cool Edit Pro. Meaningless voice features and silent pauses were excluded from the original recording and the sound files were saved for further analysis. Praat [11] was then used to annotate the main vowels in each syllable and to extract the three acoustic parameters which are F0, duration, and intensity. Two repetitions of each word from each student were annotated and analyzed. In total 240 tokens were processed. 120 words were analyzed in the pre-test and another 120 words were analyzed in the post-test (i.e., 2 words×5 pairs×6 speakers×2 repetitions).

F. Methods of Data Analysis

For the perception tests, students' correct identifications of word stress patterns were recorded. We calculated each student's correct rate of stress identification both in the pre-test and post-test. The comparison of the correct rate and mean score in the pre- and post- tests can disclose whether there was an improvement after they learned English songs.

For the first production test, two teachers graded each word read by the students according to the following marking scheme. Three points were given to the word that was pronounced correctly, with proper placement of stress. Two points were given to the word with acceptable pronunciation. The placement of stress was correct, but the pronunciation of individual sounds had minor problems. One point was given when the word was read with wrongly placed stress. Zero was assigned when the word was read incorrectly, neither the stress position nor the pronunciation was correct. The final score for each student was calculated by averaging the two total scores awarded by two teachers.

Regarding the second production test, the current study adopted the method used in [12] to conduct acoustic measurements. Students' performance in producing different word stress patterns were compared. First, testing words were divided into two categories: words with initial stress and words with final stress. Second, we calculated the ratios of F0/duration/intensity of the major vowel(s) in the first syllable to those parameters of the major vowel(s) in the second syllable, as shown below:

$$\frac{\text{F0/duration/intensity extracted from the 1st syllable}}{\text{F0/duration/intensity extracted from the 2nd syllable}}$$

The ratios were first calculated in each initial-stressed or final-stressed word produced by individual student, then the mean ratios were calculated to represent all students' overall performance. Third, the ratios measured from initial-stressed words and final-stressed words were compared. Since the three acoustic parameters will have increased values in stressed syllables, the ratio got from initial-stressed words should be larger than the ratio calculated from final-stressed words if the students can pronounce the words correctly. By comparing the ratios calculated for words with different stress patterns in the pre-test and post-test, and by comparing the ratios measured from Chinese junior high students to the ratios from native English speakers, we can see whether and how students' ability to differentiate stressed and unstressed syllables have been improved after learning English songs.

III. Results and Discussions

A. Word Stress Identification Test

39 students participated in the perception experiment and 35 valid answer sheets were collected both in pre-test and post-test. Table 3 shows the overall performance of the students. Since the data did not show normal distribution, a non-parametric test, Wilcoxon signed-rank test in two related samples test, was employed to examine the difference between the pre-test and post-test of the English word stress identification test. There was no significant difference (p = 0.39>0.05) between students' performance in word stress identification in the pre-test and post-test. The average score of the pre-test was even slightly higher than the average score of the post-test, and the correct rate of the pre-test was 2% higher than the correct rate of the post-test. Neither the pre-test nor the post-test shows a high correct rate of word stress identification, but both correct rates are higher than the chance level (0.33). This result failed to prove that English

song teaching would improve rural junior high school students' ability of word stress recognition.

Table 3. Results of stress identification in pre-test and post-test

Tests	No.	Mean score (SD)	Correct rate	Sig(2-tailed)
Pre-test	35	10.54 (3.17)	0.42	0.39
Post-test	35	10.06 (4.00)	0.40	

B. Word Stress Production Test 1: Teacher's Rating

Although the stress identification test did not demonstrate the positive impact of English songs, the stress production test showed that students' ability to pronounce words with diverse stress patterns improved. A significant difference was seen in students' production performance in the pre-test and post-test. The mean score of students' pronunciation in the post-test was 70.38 (SD=1.85) and that score in the pre-test was 66.25 (SD=3.42). The total score of the post-test was significantly higher than that of the pre-test (p=0.02<0.05). According to this result of teachers' evaluation, students' performance in English word stress production was improved after learning the English songs.

Stress shift is a common mistake made by students when reading those disyllabic words. Students tended to wrongly place the stress on the final positions of some disyllabic words with initial stress. For instance, they wrongly stressed the second syllable of the following words: "trouble", "dragon", "wonder", "something" (see Table 1). In the pre-test, there were on average 6.5 times when students shifted the stress to the final position. However, in the post-test, on average students wrongly placed the stress on the final positions twice. After learning songs, students made fewer mistakes on stress placement in reading disyllabic words.

C. Word Stress Production Test 2: Acoustic Measurement

The result of the first production test showed that students' performance was generally improved by learning songs. The results of the second production test may reveal more about the specific influences of English songs on students' stress learning.

Figs. 1–3 display the results of acoustic measurements. Students' performances in the pre- and post-tests were compared. Furthermore, Chinese students' ratios were compared to native English speakers' ratios. The native English speakers' data were cited from [12].

Fig. 1 shows the change of duration ratios before and after the session of teaching English songs. In the pre-test, participants had larger duration ratios in the initial-syllable stressed word (1.2) compared to the final-syllable stressed word (0.76). In the post-test, the duration ratio in the initial-stressed word increased (1.35>1.2), while the duration ratio in the final-stressed word decreased (0.73<0.76). For words with initial stress, the statistical analysis shows a near significant difference (p = 0.06) between Chinese students' duration ratio in the pre-test and that in the post-test. However, for words with final stress, there is no significant difference (p = 0.72>0.05) of duration ratios between the pre-test and post-test.

These results indicate that students did much better at lengthening the duration of the first syllable and shortening the second syllable when reading a word with initial stress. Students showed increased use of duration cues. They performed better in contrasting the duration of stressed and unstressed syllables after learning English songs. Compared with native speaker, Chinese students in the present study demonstrated near-native performance in pronouncing the words with initial stress in the post-test. However, for those words with final stress, Chinese students did not reduce the initial syllable as much as native speakers. Students' sensitivity to duration is probably influenced by their native language. All participants in this study are native speakers of Cantonese, and longer duration is one of the major acoustic correlates of focus prosody in Cantonese [13].

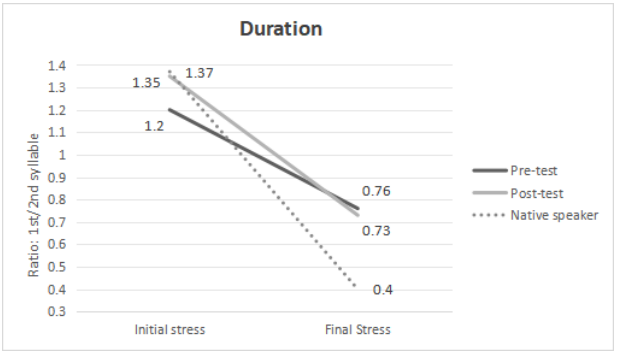

Fig. 1. Duration ratios for words with initial/final stress.

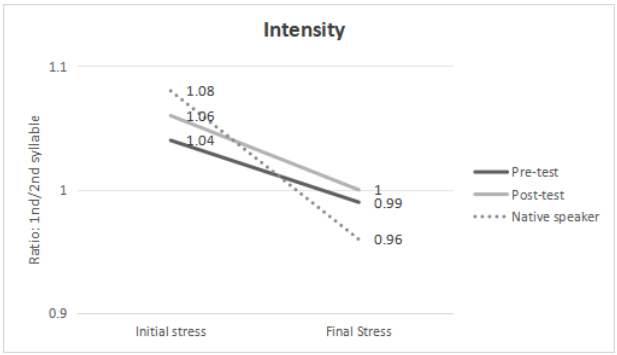

Fig. 2. Intensity ratios for words with initial/final stress.

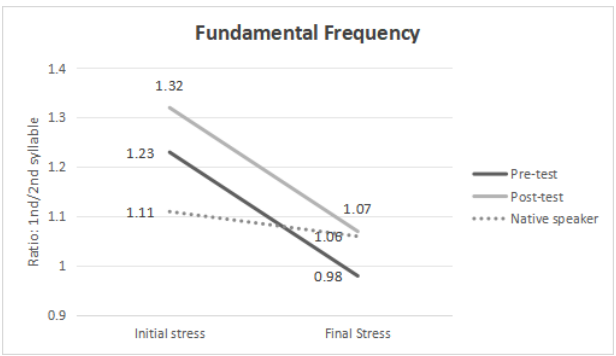

Fig. 3. F0 ratios for words with initial/final stress.

Fig. 2 shows the results of intensity ratios. The ratios did not change significantly before and after the English songs training session. In both pre- and post-tests, the ratios for the initial-stressed words are larger than the ratios of final-stressed words (1.04>0.99; 1.06>1). These numbers indicated that students knew how to increase the intensity in stressed syllable and decrease the intensity in unstressed syllables. However, compared with native English speakers, the intensity contrast is not enough. Native speakers showed higher ratio in initial-stressed words and lower ratio in

final-stressed words. Therefore, students should learn to somewhat lessen the intensity in unstressed syllables and to pronounce stressed syllables louder and stronger.

Fig. 3 shows the results of F0 ratios. In the pre-test, students showed a greater F0 ratio for the initial-stressed word (1.23) compared to the final-stressed word (0.98). In the post-test, they showed a greater F0 ratio for the initial-stressed word (1.32) compared to the final-stressed word (1.07). The numbers also indicated that students understood how to raise pitch in stressed syllable and lower pitch in unstressed syllables. In addition, there was no significant difference (p = 0.21>0.05) of F0 ratio between the pre- and post-tests in the initial-stressed word, and no significant (p = 0.58>0.05) difference of F0 ratio between pre- and post-tests in the final-stressed word. Compared with English native speakers, Chinese students excessively raised the initial syllable's pitch, thus they seemed to overuse pitch feature to some extent. This is probably because that pitch is the most important acoustic cue of lexical tone, and all students are native speakers of a tonal language.

To sum up, the acoustic data showed that students could better use the *duration* feature in distinguishing between stressed and unstressed syllables after their exposure to English songs. Besides, it was observed that students' performances were better in uttering the words with initial stress. When it comes to words with final stress, students did not reduce the first syllable as much as native speakers.

IV. Conclusions

The purpose of this study was to investigate the effects of English song teaching on rural junior high school students' word stress acquisition. Based on the data obtained from the experiment, findings were summarized. First, the perception test did not indicate that English song teaching improved the word stress identification of rural junior high school students. There was no significant difference between the pre-test and post-test results. A possible explanation for this result is the way how English songs were taught. During the process of teaching English songs, the teacher prioritized cultivating students' singing and pronunciation abilities while relatively neglecting the development of their listening skills.

Second, it has been demonstrated that incorporating English songs in classroom improves students' ability to produce word stress in English. On the one hand, teachers' evaluations revealed a considerable improvement in students' stress production following the English song learning session. On the other hand, acoustic analyses showed students could better use *duration* cues after practicing songs. Students could better differentiate between the stressed and unstressed syllables by lengthening and shortening the relevant syllables, especially for words with initial stress. The results above generally imply that English songs have a beneficial effect on rural students' acquisition of stress.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Xiuqi Deng conducted the experiment, collected the data, analyzed the data and wrote the first draft. Aishu Chen designed the experiment, supervised data gathering and data analysis, revised the paper; Zhangxin Wu formatted and proofread the paper. Authors all approved the final version.

Funding

This research was funded by Guangdong University of Foreign Studies, grant number 19QN23.

Acknowledgment

Xiuqi Deng would like to express her gratitude to the teachers and participants of Jintan No.1 Junior High School for their invaluable assistance, which greatly facilitated the smooth implementation of this research. She also thanks Aishu Chen for her valuable guidance throughout the course of this study.

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