English-to-Chinese Phonetic Transfer in Chinese Learning of US University Students

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Abstract: Phonetic transfer is defined that an individual's sound system can influence one's sound perception and production. The research of English-to-Chinese phonetic transfer aims at facilitating English-speaking learners of Chinese to acquire Chinese sounds from a transfer perspective. The current literature has few studies on phonetic transfer by speech recognition technology because this technology has not been widely applied in this area. This quantitative research focused on 151 US university students of Chinese learning as samples and measured results and extent of their English-to-Chinese phonetic transfer. The finding confirms that English-to-Chinese positive transfer is likely to occur when English and Chinese syllables are the same or similar in following the same pronunciation rules. However, the finding proves that English-to-Chinese negative transfer is likely to happen when English and Chinese phonemes are different or when Chinese words are inconsistent with English pronunciation rules.

1. Introduction

Chinese is considered one of the most difficult languages for native English speakers. Different from most of the world's languages, Chinese has two systems: a phonetic system and a character system. English-speaking learners of Chinese usually find Chinese phonetic system difficult to acquire. An explanation of learning difficulties might be phonetic differences between English and Chinese, including phonology and the use of tones and stress [1]. English is prominence-related while Chinese tone-determined, featuring with four pronounced tones and a neutral tone [2]. Those whose native language is non-tonal (e.g., English) have contributed to their lack of sensitivity to tonal categories in Chinese as they are unfamiliar with them [3].

Language transfer called cross-language transfer indicates that L1 can influence the acquisition of L2 [4]. The central assumption underlying the cross-linguistic approach was that L1 experience embedded habits of mind, a specific processing mechanism in L2 [5]. When certain features in two languages are similar to each other, one can expect to demonstrate positive transfer involving these structures; however, when structures are different from each other, studies strive to demonstrate negative transfer of interference because learners are likely to rely on what is familiar from their L1 and this will yield predictable errors [6].

In the study of English-to-Chinese phonetic transfer, the literature has focused on whether English pronunciation can help native English speakers of Chinese to acquire the Pinyin symbols, the Chinese phonetic system. English alphabet, somehow similar to the Pinyin system, might help native English speakers to master the Pinyin system. For beginners of Chinese as a second language, Pinyin is considered as an alternative writing system for Chinese characters and used as an aid to learn the Chinese sound system [7]. An integration of character and Pinyin could help English-speaking learners to read Chinese in a second language learning context [8]. However, many researchers hold opposite opinions that English-Chinese phonetic differences are considered great. Native English learners of Chinese applied English pronunciation rules to producing Chinese sounds; this misapplication interfered with Chinese learning [9]. Pinyin orthography negatively influenced Chinese pronunciation of native English learners [10].

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2. Methods

2.1 Research Question

This study proposed a quantitative method to measure whether English-to-Chinese phonetic transfer was true. Speech recognition technology (e.g., HDecode tool from HTKv3.4.1) was applied to collect data for this quantitative calculation. The hypothesis questions are whether the L1 (English) pronunciation of US university students of Chinese learning has an effect on their L2 (Chinese) pronunciation performance and how it influences their L2 pronunciation.

2.2 Participants

We conducted the study with 151 English-speaking students of Chinese as a foreign language in a university in California. These participants, including 65 female and 86 male, were involved in the study. The university arranged four-hour Chinese courses and two-hour language lab every week for them while they took the responsibility for after-class learning. They were requested to fill in a brief questionnaire and have three tests.

2.3 Instruments

In this study, the instruments included English pronunciation test, oral Chinese proficiency test, and Chinese pronunciation test. The aim of the measurements was to collect data of the scores for investigating the effect of English pronunciation on Chinese pronunciation. (1) A designed English pronunciation test used an English wordlist containing a syllable table to assess one's English pronunciation accuracy. All Chinese words are monosyllabic, while English words are monosyllabic or multisyllabic. The structure of English syllables is presented with an optional onset, a nucleus, and an optional coda (e.g., wood /wʊd/: /w/ onset, /ʊ/ nucleus, and /d/ coda). The structure of Pinyin syllables contains an optional onset, an optional medial, a nucleus, and an optional coda (e.g., the Pinyin luan /lʊan/: /l/ onset, /ʊ/ medial, /a/ nucleus, and /n/ coda). Pinyin syllables have an optional medial that English syllables do not have. English and Pinyin syllables are decoded with C for consonant and V for vowel, i.e., English syllables can be decoded as V, CV, VC, and CVC, while Pinyin syllables are V, CV, VC, CVC, CVV and CVVC. The structures of Pinyin syllables without a medial (i.e., V, CV, VC, and CVC) are as same as the structures of English syllables. Pinyin syllables containing a medial (i.e., CVV and CVVC) have two Pinyin vowels that can be processed and pronounced as a diphthong. Thus, Pinyin syllables with a medial can also be transcribed into CV and CVC like English. We combined all English single consonants and vowels (i.e., single vowels and diphthongs) to form an English syllable table. Because a speech recognition tool can discern a word as the minimum unit of a language, we found English words corresponding to all English syllables in the table and this wordlist was then used in our English pronunciation test. Participants were requested to read this English wordlist to a speech recognition tool and had their English pronunciation evaluated. (2) Oral Chinese proficiency test was a speaking test of Hanyu Shuiping Kaoshi, the HSK Speaking Test, which is a Chinese proficiency test to evaluate learners' oral Chinese proficiency as a second language. The HSK Speaking test was administered by Chinese native speakers to test one's Chinese proficiency and communication skills. (3) Chinese pronunciation test used the Pinyin table to evaluate one's Chinese pronunciation performance. The Pinyin table in Xinhua Dictionary was used as the Chinese pronunciation list. The Chinese language uses 411 Pinyin syllables to cover its whole vocabulary. Participants read the Pinyin table to a speech recognition tool and their reading was transcribed for the score of their pronunciation.

3. Results

3.1 Descriptive Analysis

A descriptive analysis was applied to describe the demographic features of US university students of Chinese. In Table 1, their average age was 20.26 years old (SD = 2.40). Because their Chinese learning experience mattered for data collection, years and hours of Chinese learning were

involved in the data analysis. The participants had learned Chinese for 1.74 years (SD = .76) and spent 8.23 hours per week (SD = 2.51) practicing Chinese on average. This table presents the descriptive results of three instrument tests. (1) The mean value of their oral Chinese proficiency test was 2.08 (SD = .85) of ten-point scale. Their oral Chinese level was low probably because they had learned Chinese for just over one year on average. (2) The mean value of their English pronunciation test was 376.21 (SD = 18.53) of the total 417 English syllables and the correction rate was 90.22%. (3) The mean value of their Chinese pronunciation test was 343.31 (SD = 29.29) of the total 411 Pinyin syllables and the correction rate was 83.53%. Comparing their Chinese pronunciation score with their oral Chinese proficiency score, we found that they were not consistent with each other. Their Chinese pronunciation was above the moderate level while their oral Chinese proficiency was at the low level.

Table 1 Results of descriptive analysis.

Variable	*M*	*SD*	*Min.*	*Max.*
Age	20.26	2.40	18	35
Years of L2 (Chinese) Learning	1.74	.76	1	5
Hours of Practicing L2 per Week	8.23	2.51	6	17
L1 (English) Pronunciation	376.21	18.53	329	404
L2 Oral Proficiency	2.08	.85	1.01	5.56
L2 Pronunciation	344.03	27.38	284	404
Note. N = 151				

3.2 Curve Estimation

Curve estimation was applied to determine whether English and Chinese pronunciation could form a line or a curve. Table 2 shows the results of curve estimation of English pronunciation's effects on Chinese pronunciation. (1) The change from linear value (R2 = .835) to quadratic value (R2 = .872) was .037, 3.7% increase. The increase between linear and quadratic values was so substantial (> 3%) that English and Chinese pronunciation formed a quadratic relationship in this model. (2) The change from quadratic value (R2 = .872) to cubic value (R2 = .873) was .001, 0.1% increase. The gap between quadratic and cubic values was too little and English and Chinese pronunciation did not form a cubic function.

Table 2 Results of Curve Estimation.

	Chinese Pronunciation	
	R Square	*F*
Linear	.835**	755.16
Quadratic	.872**	503.90
Cubic	.873**	506.77
Note. $N = 151$. $^{**}p < .01$.		

3.3 Polynomial Regression Analysis for the Quadratic Model

Polynomial regression analysis was applied to confirm the model's pattern formed by English and Chinese pronunciation. English pronunciation and its square value were analyzed to evaluate the pattern of the relationship between English and Chinese pronunciation. The model would be quadratic when both English pronunciation and its square value presented a significant value or when only its square value proved statistically significant. Table 3 displays that English pronunciation (B =-6.70, p < .01) presented a significant value as well as its square value (B =.01, p < .01). Because both English pronunciation and its square value were significant, the model did form a quadratic pattern.

Table 3 Results of Polynomial Regression Analysis.

Variable	Chinese Pronunciation		
	B	*SE*	*ß*
Constant	1328.78**	306.10	

Gender	-.56	1.66	-.01
Age	-.31	.32	-.03
Years of L2 (Chinese) Learning	.53	1.05	.02
Hours of Practicing L2 per Week	.19	.50	.02
L1 (English) Pronunciation	-6.70**	1.66	-4.54
L1 Pronunciation Square	.01**	.00	5.41
L2 Oral Proficiency	3.64*	1.46	.11
R^2/Adj. R^2	.89/.88		
F (df)	160.31** (7, 143)		

Note. N = 151. Gender (0 female+, 1 male). *p < .05. **p < .01.

Figure 1 displays a quadratic relationship between the participants' English and Chinese pronunciation. The scatter plots indicated that the bottom of the quadratic was roughly -1.4, a standardized value. For about 85% of the participants whose standardized value of English pronunciation was above -1.4, their English and Chinese pronunciation had a linear and positive relation. It indicated that the participants with good English performance would produce Chinese sounds better than low achievers. However, for about 15% of the participants those whose English pronunciation fell below -1.4, their English and Chinese pronunciation was much below the average. Their English pronunciation had a negative effect on predicting Chinese pronunciation and it caused a negative transfer. A possible explanation might be that Pinyin syllables are too difficult to pronounce and it makes phonetic transfer hard

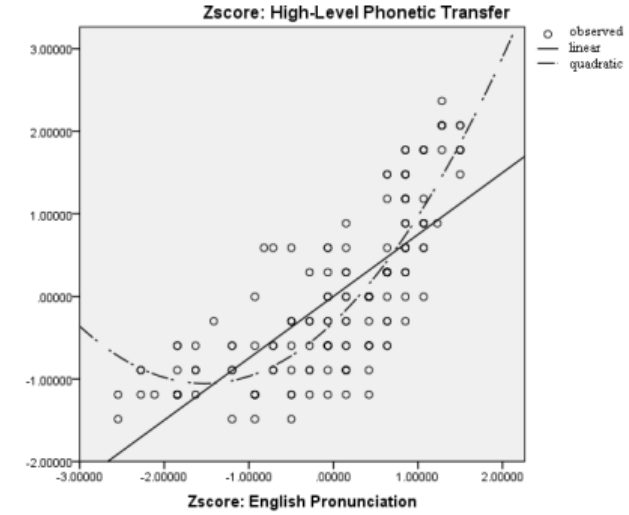

Figure 1 Chinese Pronunciation by English Pronunciation.

4. Discussion

According to the research result, we classify English-to-Chinese transfer into two modes: positive and negative transfer. Positive transfer will happen when: (1) English and Pinyin syllables sound the same (e.g., both the English word may and the Pinyin mei are transcribed as /meɪ/); (2) English and Pinyin syllables sound similar and follow the same pronunciation rules (e.g., the English word none /nʌn/ and the Pinyin nan /nan/ sound similar). As many English and Pinyin phonemes sound the same or similarly, native English learners of Chinese could easily convert English syllables into Pinyin syllables [11]. Table 4 illustrates that English and Pinyin have the intersection of 21 phonemes, including14 consonants and 7 vowels [12].

Table 4 Intersections between English and Chinese Phonemes.

English Consonants	Intersections of Consonants	Chinese Consonants
/b/ /d/ /g/ /h/ /dʒ/ /r/ /z/ /ʒ/ /ʃ/ /ʧ/ /v/ /θ/ /ð/	/p/ /t/ /f/ /k/ /l/ /m/ /n/ /ŋ/ /s/ /w/ /j/ (/kh/ /ph/ /th/)	/tsh/ /ts/ /tʂh/ /tʂ/ /x/ /ʐ/ /ʂ/ /tɕ/ /tɕh/ /ɕ/ /ɥ/
English Vowels	Intersections of Vowels	Chinese Vowels
/ɪ/ /ʌ/ /æ/ /ɒ/ /ɜ/	/i/ /u/ /ʊ/ /ɛ/ /ə/ /ɔ/ /a/	/y/ /ɨ/ /ɣ/

However, English-to-Chinese negative transfer is likely to occur when: (1) Though English and

Pinyin phonemes sound the same and similar, they have different pronunciation rules. Participants had difficulty in transferring English pronunciation rules into Pinyin phonemes' combination. For example, the Pinyin ca transcribed with the IPA /tsʰa/ and the English grapheme tsa sound similar. The English phoneme ts in cats is always placed as a coda. When a coda was used as an onset in a syllable, participants probably would fail in producing the sound. (2) Pinyin phonemes are new to native English speakers and they have difficulty to pronounce (e.g., /y/ or /ɥ/). The Pinyin vowel /y/ and consonant /ɥ/ pronounce the same but function in different places in a Pinyin word. Learners can start /i/ and end with /u/ to produce them. Its position is a nucleus as a vowel (e.g., the Pinyin xu /ɕy/) or a medial as a consonant (e.g., the Pinyin xuan /ɕɥan/). Hence, some Pinyin syllables are difficult to pronounce and their syllable transferability is low.

5. Conclusion

This research investigated the impact of US university students' English pronunciation on Chinese pronunciation. Curve estimation and polynomial regression analysis showed a quadratic relationship between English and Chinese pronunciation. For about 85% of the participants, their English and Chinese pronunciation formed a linear and positive position, while for the rest 15% of the participants, their English and Chinese pronunciation formed negative transfer and presented little relationship. The possible explanation of negative transfer was that some Pinyin words were too difficult for the participants to pronounce. Therefore, native English speakers of Chinese will feel easy to learn a majority of Pinyin words through positive transfer. They will feel difficulty in learning some Pinyin words of negative transfer because they cannot transfer English phonemes and pronunciation rules into Chinese sounds correctly.

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