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Chinese-to-English phonetic transfer of Chinese university ESL students

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Phonetic transfer is defined as an L1 influence on the acquisition of L2 phonetics. Previous studies have investigated phonetic transfer in the area of articulation, but the effects of L1 on L2 pronunciation measured by speech recognition technology have been under-researched. This study aims to address the issue by focusing on a sample of 676 Chinese university ESL students. Drawing on quantitative data, it examined whether the participants applied phonetic transfer to ESL learning and what factors might have influenced the results of phonetic transfer. We assumed that Chinese-to-English phonetic transfer occurs but that the extent of the transfer would be small because Chinese and English belong to different language families. However, findings from this study confirm that Chinese-to-English phonetic transfer occurs and the extent is large. The findings regarding high transferability might be attributed to spelling through phonics and the nature of pronunciation acquisition.

Keywords: Phonetic transfer; language transfer; second language learning; Chinese; English; ESL

Introduction

Phonetic transfer and its extent

Phonetic transfer, widely accepted as a common phenomenon in second language acquisition, refers to L1 influence on L2 phonetics acquisition (Eckman, 2004; Odlin, 2003; Ringbom, 2007). Rather than being a static phenomenon, a phonetic transfer is a process in which learners transfer phonetic knowledge from one language to a different language. Learners are likely to apply L1 techniques and mechanisms when learning an L2 (Cook, 2003; Larsen-Freeman & Long, 2014). Phonetic transfer is defined as how the sound system of a language can affect a user's perception and production of speech in another language (Jarvis & Pavlenko, 2008).

Results of phonetic transfer can be classified through Contrastive Analysis, an application utilized to compare attributes and characteristics of L1 and L2 (Figueroa &

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Gárate, 2005). This determines whether transfer results are correct or incorrect. A distinction that is commonly made in the literature in connection with L2 learning is one between positive transfer (facilitation) and negative transfer (interference). Transfer can have either beneficial or negative consequences, depending on the distance between L1 and L2 (VanPatten & Williams, 2015).

Positive transfer is the facilitating influence of similarities between L1 and L2, which indicates that the extent of L1 to L2 transfer could be substantial when the languages are categorized into the same language family or different language families with a common ancestor (Weinreich, 2010). The effects of positive transfer are determinable through comparisons of success, and such comparisons often show that cross-linguistic similarities can produce positive transfers in several ways (Odlin, 2012). The production of speech sounds involves the formation of automatic motor skills, and this will result in ingrained L1 speech habits that are hard to avoid in the L2 (Rogerson-Revell, 2011). L1 rules tend to transfer, with those rules that simplify pronunciation transferring more easily than morphologically restricted rules (Hansen, 2006). As an example, it is common sense to assume that the phonetic system of Italian would be facilitated by a previous knowledge of Spanish and vice versa because the two languages are derived from a common source (Angelis & Selinker, 2001; Gass & Selinker, 2001).

On the contrary, when something previously learned hinders performance or learning of a new language, a negative transfer occurs. Negative interlanguage influence might be possible if the language learner is fluent in a language typologically distant from the target language (Angelis & Selinker, 2001), i.e., a negative transfer between two languages with different sounds and structures is predicted resulting in learning difficulty and error. Since a negative transfer involves divergences from norms in a target language, it will lead to phonetic underproduction, overproduction, production errors, or misinterpretation (Odlin, 2012). If L1 and L2 belong to different language families and are geographically distant, they are considered likely to produce more incorrect transfer results than correct ones. For example, a common assumption is that if L1 and L2 are proximate (e.g., Dutch and English) leaning will be easier and more rapid than if they are distant (e.g., Chinese and English) (Ellis, 2015). Moreover, lack of a similar L1 sound and lack of equivalent articulatory motor skills can make it hard to acquire an L2 sound and to remove incorrectly transferred sounds (Rogerson-Revell, 2011).

Chinese-to-English phonetic transfer

Chinese and English are classified into different language families and do not originate from the same ancestor language. The Chinese language, a logogram, is a member of the Sino-Tibetan language family (Byram & Hu, 2017; Doleželová-Velingerová & Wagner, 2013; Thurgood & LaPolla, 2006), while English, a phonogram, belongs to the Indo-European language family (Blake, 2008; Woodard, 2008). Because Chinese and English have many significant differences in terms of phonetics and phonology (Kim, 2019), it has been suggested that Chinese-to-English negative transfer occurs more frequently than positive transfer (Wang, 2015; Yu & Odlin, 2016; H. Zhang, 2018). Differences between Chinese and English consonants and vowels may interfere with phonetic transfer (Xiaorong & Jian, 2011). As English is prominence-related while Chinese is tone-determined, a positive Chinese-to-English phonetic transfer is hard to form (Liu, 2001).

However, the Chinese language uses the International Phonetic Alphabet (IPA) to transcribe sound, and this system shares some phonetic similarities to the English IPA system. English conveys meaning with an alphabetic system, and Chinese marks sound with the Pinyin system, a Romanized system, which transcribes Chinese pronunciation

into Roman letters. The Pinyin system is called a "pseudo-transcription"; that is, the Pinyin system is not a "real" phonetic transcription system or a "real" orthographic system, but it performs these functions in a partial sense (Heselwood, 2013).

A positive role of the Pinyin system is often indicated and emphasized in Chinese ESL learning (Bialystok, Luk, & Kwan, 2005). The Pinyin symbols are regarded as useful for encoding Chinese characters to improve the independent study of phonological awareness, tone awareness, phonemic awareness, and onset-rhyme skills. Also, the Pinyin system can greatly enhance English reading in a cross-language transfer (Mau, 2006). For advanced English learners, Chinese Pinyin's phonological processing skills are reportedly a unique predictor of English reading performance (Gu, 2004). The Pinyin naming and English reading skills may help each other when children learn Chinese characters with the Pinyin symbols (X. Chen, Xu, Nguyen, Hong, & Wang, 2010).

Research questions

There is a lack of empirical studies on the effect of phonetic transfer that is measured by speech recognition technology, especially among Chinese ESL students. This study takes Chinese university ESL students as research participants to investigate the phenomenon of L1 to L2 phonetic transfer. To be specific, it examines whether L1 (Chinese) pronunciation affects L2 (English) pronunciation and the extent to which L1 to L2 transfer occurs. In this context, this study explores two questions:

1. Does the L1 pronunciation of Chinese university ESL students correlate with their L2 pronunciation performance?
2. To what extent does the L1 pronunciation of the participants influence their L2 pronunciation performance?

Methods

Participants

The data collection for this study took place at a four-year public university in northern China. This university provides undergraduate and graduate instruction in the areas of Humanities, Social Sciences, and Management, particularly specializing in the field of language and culture education. In 2016, the researchers contacted about 30 teachers at the research site who were teaching non-English-specialization courses during the fall semester asking for their assistance to contact potential participants for the study. Seven teachers agreed, and all the students (N = 676) in their classes agreed to participate in the research. Of the sample, 57.5% were female and 42.5% male. The participants were all Year-2 students taking a four-hour compulsory university-level English course every week for 18 weeks per semester. The time they spent on after-class English learning depended on personal interests and goals. They were requested to fill out a personal information sheet that asked their gender, age, the number of years they had learned English, and the number of hours they practiced English per week.

Instruments

All participants took three measurement tests: an L1 (Chinese) pronunciation test, an L2 (English) oral proficiency test, and an L2 pronunciation test. The first test used a Chinese pronunciation word list to evaluate the level and extent of the participants' L1 pronunciation. This word list was the Pinyin table in the *Xinhua Dictionary*'s index including all the Chinese Pinyin syllables (*Xinhua dictionary*, 2015). This test was used

not for an assessment of eloquence, but as an assessment of the degree of language standardization achieved by the participants. The participants read this word list aloud to a speech recognition tool that transcribed their speech and assessed their performance of Chinese pronunciation.

The second test used the speaking section of the Test of English as a Foreign Language (TOEFL) to measure the participants' English oral proficiency. The tasks of the speaking section consist of two parts: (a) participants respond to questions, discuss the passage heard, and give an opinion; (b) participants respond in a speech to what is heard and solve a problem (*TOEFL iBTquickprep*, 2011). A native English teacher administered the TOEFL speaking test and evaluated the participants' performance according to the TOEFL rubrics including general description, delivery, language use, and topic development as described by the Educational Testing Service (2014).

For the third test the researchers developed an English word list to assess the participants' English pronunciation. To achieve this, syllabic structures of English and Chinese were compared by Contrastive Analysis. Chinese words are monosyllabic while English words are either monosyllabic or multisyllabic. English syllables have an optional onset, a nucleus, and an optional coda (e.g., *cat* /kæt/: /k/ onset, /æ/ nucleus, and /t/ coda). Similarly, Pinyin syllables contain an optional onset, an optional medial, a nucleus, and an optional coda (e.g., the Pinyin *kuang* /kʊaŋ/: /k/ onset, /ʊ/ medial, /a/ nucleus, and /ŋ/ coda). Pinyin syllables have an optional medial that English syllables do not have. English syllabic structure can be decoded as V, CV, VC, or CVC (C refers to consonant and V to vowel). Non-medial Pinyin syllables, also decoded as V, CV, VC, and CVC, have the same structure as English syllables. But medial-containing Pinyin syllables decoded as CVV and CVVC have two Chinese vowels that can be processed and pronounced as a diphthong; then they can be transcribed as CV and CVC. In a sense, the structures of English and Pinyin syllables are the same. Thus, English and Chinese can be compared at the level of syllables. We combined all the English single consonants with vowels (i.e., single vowels and diphthongs) to produce the tested syllables. The words containing the syllables formed an English word list, and each word contained a tested syllable. Because the minimal speech unit discerned by a speech recognition tool is a word, monosyllabic or multisyllabic words are read for speech identification. The participants were requested to read English words to a speech recognition tool which scored them when the words were recognized as correct.

Data classification

Contrastive Analysis was used to classify L1 to L2 phonetic transfer into three difficulty levels: easy, somewhat difficult, and difficult. We designed a Chinese-to-English transfer classification based on the assumption that English pronunciation difficulty represented Chinese-to-English phonetic transfer difficulty. First, our classification identified 208 words from the English word list as easy, representing the low level of transfer difficulty. For these syllables, the participants were assumed to be able to easily convert Chinese syllables into English as many phonemes of Chinese and English are pronounced the same or similarly. Table 1 shows the intersection of 21 phonemes belonging to this category: 14 consonants and seven vowels (Shei, 2014). They share some syllables made up of the IPA symbols (e.g., the English word way and the Pinyin wei are marked as /weɪ/).

Table 1. Intersections between English and Chinese phonemes (after Shei, 2014)

English consonants	Intersections of consonants	Chinese consonants
/b/ /d/ /g/ /h/ /ʤ/ /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/ /i̱/ /ɣ/

Moreover, some phonemes of the two languages sound similar, and the syllables made up of these phonemes also sound similar. The participants might find it easy to make a minor adjustment to pronounce the English sounds. In addition, some English short vowels and Chinese long vowels also sound similar. The participants could shorten long Chinese vowels to produce short English vowels. For example, the English word *can* /kæn/ and the Pinyin *kan* /kan/ sound so similar that a speech recognition tool considers them the same. Table 2 presents the pairs of English and Chinese phonemes that sound similar.

Table 2. Pairs of similar phonemes of English and Chinese

English consonants	Pinyin initials
b/b/	b /p/
d /d/	d /t/
g /g/	g /k/
h /h/	h /x/
r /r/	r /ʐ/
z /z/	z /ts/
ch/ʧ/	ch/tʂh/
sh/ʃ/	sh/ʂ/
j /ʤ/	zh/tʂ/
s /ʒ/ (e.g., vision)	re /ʐə/
English vowels	**Pinyin finals**
o /ɒ/	o /ɔ/
i/ɪ/	i/i/
u /ʊ/	u /u/
u /ʌ/	a /a/
or /ə/	e /ɣ/

Second, 168 words were counted as containing somewhat difficult pronunciation of English syllables and represented the moderate level of transfer difficulty. The difference between low-level and moderate-level transfer was identified by whether or not an English syllable matched a Chinese character. The low-level syllables had one or more counterpart Chinese characters, while the moderate-level did not. In this way, the participants used the same or similar Pinyin symbols to spell the moderate-level words. For example, the English word *say* and the sound of the Pinyin combination *sei* marked by /seɪ/ does not match any Chinese character, but the participants might hear this sound in a Chinese dialect. Although of moderate-level difficulty, they could still pronounce the syllables by spelling through phonics. Therefore, the participants might pronounce 376 syllables (about 90%) of the English word list with the same or similar Pinyin symbols.

Third, 41 words in the word list were assigned the difficult level of English syllable pronunciation because of their high-level transfer difficulty. The three English phonemes, /v/, /θ/, and /ð/ do not exist or have a similar Pinyin symbol. The participants had difficulty in pronouncing the words containing these phonemes; hence transfer difficulty at this level was the highest.

Data collection and analysis procedures

The participants took the three tests as after-class activities, and several assessors evaluated their performance. A speech recognition tool (HDecode tool HTKv3.4.1, Young et al., 2009) with computer assistance was used to discern participants' sounds to obtain L1 and L2 pronunciation scores. An English-speaking teacher administered the TOEFL speaking test to determine L2 oral proficiency scores. The analysis took into account several independent variables, including gender, age, L1 (Chinese) pronunciation, the number of years participants had learned L2 (English), the number of hours they practiced L2 per week, and L2 oral proficiency, which were assumed to relate to L2 pronunciation and the three transfer levels.

Results

Descriptive analysis

Table 3 summarizes the demographic information of the participants. Their average age was 20.06 years old. On average, they reported to have studied English for 9.15 years and to spend 6.58 hours per week on English learning. Concerning proficiency and pronunciation, the mean score of L1 pronunciation was 384.98 of the total 411 Chinese Pinyin words. Their average performance was 93.44% of the maximum possible level, which indicates that they were competent in pronouncing Chinese words. Second, the mean score of L2 oral proficiency was 7.51 out of 30 points (25.03%), showing that their oral English level was significantly low. Considering they reported having studied English for over nine years on average, it is surprising to see their poor performance in oral English. Third, the mean score of L2 pronunciation as a whole was 367.04 out of the total 417 English words (88.02%). Viewed separately by transfer level, the mean of the low-level transfer difficulty was 191.00 of 208 words (91.83%); the mean of the moderate-level transfer difficulty was 144.25 of 168 words (85.86%); the mean of high-level transfer difficulty was 31.80 of 41 words (77.56%). These results show that the average accuracy rates of L2 pronunciation as a whole and at different levels were above 75%.

Table 3. Results of descriptive analysis (N = 676)

Measure	*M*	*SD*	*Min.*	*Max.*
Age	20.06	1.37	18	25
Years of L2 (English) learning	9.15	1.75	6	15
Hours of practicing L2 per week	6.58	2.46	4	17
L1 (Chinese) pronunciation	384.98	20.47	280	411
L2 oral proficiency	7.51	3.24	3	23
L2 pronunciation	367.04	27.09	234	410
Low-level transfer	191.00	12.60	120	206
Moderate-level transfer	144.25	12.07	93	166
High-level transfer	31.80	4.40	11	39

Bivariate correlation analysis

Pearson's correlation analysis was employed to determine whether four pairs of relationships were established for Chinese university ESL students and how strong they were. L2 pronunciation, a dependent variable, was assumed to correlate with years of L2 learning, hours of practicing L2 per week, L1 pronunciation, and L2 oral proficiency, the primary independent predictors. In Table 4, L2 pronunciation was correlated with years of L2 learning and L1 pronunciation but uncorrelated with hours of practicing L2 per week and L2 oral proficiency. The correlation between years of L2 learning and L2 pronunciation was positive in direction, but its dimension was weak (r = .14). For L1 and L2 pronunciation, the analysis produced a strong and positive correlation (r = .95), which indicated that the participants with good L1 pronunciation were capable of accurately producing L2 sounds. On the contrary, hours of practicing L2 per week had no significant relationship with L2 pronunciation. Lastly, on the correlation between L2 oral proficiency and L2 pronunciation, the result was not statistically significant.

Table 4. Results of Pearson's correlation analysis (N = 676)

	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
Years of L2 (English) learning	--				
Hours of practicing L2 per week	.21**	--			
L1 (Chinese) pronunciation	.12**	.07	--		
L2 oral proficiency	.06	.71**	.08*	--	
L2 pronunciation	.14**	.06	.95**	.07	--

*p < .05 **p < .01

Table 5. Results of multiple linear regression analysis (N = 676)

Measure	L2 (English) Pronunciation			Low-Level Transfer			Moderate-Level Transfer			High-Level Transfer		
	B	*SE*	ß	*B*	*SE*	ß	*B*	*SE*	ß	*B*	*SE*	ß
Constant	-108.54**	8.41		-19.73**	5.14		-61.45**	5.63		-27.34**	2.41	
Gender	-.57	.69	-.01	-.37	.42	-.02	.02	.46	.00	-.22	.20	-.02
Age	-.63	.39	-.32	-.32	.24	-.04	.24	.26	.03	-.54**	.11	-.17
Years of L2 (English) learning	.78*	.30	.05	.17	.19	.02	.41*	.20	.06	.20*	.09	.08
Hours of practicing L2 per week	-.15	.20	-.01	-.01	.12	-.00	-.01	.13	-.00	-.12*	.06	-.07
L1 (Chinese) pronunciation	1.25**	.02	.95	.56**	.01	.91	.51**	.01	.87	.18**	.01	.83
L2 oral proficiency	.04	.15	.00	-.01	.09	-.00	.03	.10	.01	.02	.04	.01
R^2/Adj. R^2	.90/.90			.83/.83			.78/.78			.70/.69		
F (df)	1025.55**	(6, 669)		548.37**	(6, 669)		393.01**	(6, 669)		253.79**	(6, 669)	

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

Multivariate analysis

Multiple regression analysis was conducted to estimate the importance of independent variables to the prediction of overall L2 pronunciation, which was followed by three parallel analyses using low-level, moderate-level, and high-level transfer scores as the dependent variables. Four multiple linear regression models were respectively established to discuss the influence of the predictors on the dependent variables.

As given in the first column of Table 5, the model of L2 pronunciation had an adjusted *R*-squared value of .90, F (6,669) = 1025.55, p <.01. When it was divided into three levels of difficulty, the model of the low-level transfer had an adjusted *R*-squared value of .83, F (6,669) = 548.37, p <.01; the moderate-level transfer had an adjusted *R*-squared value of .78, F (6,669) = 393.01, p <.01; the high-level transfer had an adjusted *R*-squared value of .69, F (6,669) = 253.79, p <.01. The results are displayed in the second, third, and last columns of Table 5. That is, all the models were significant and explained the substantial amounts of the variance of the dependent variables.

It is clear that the participants' L1 pronunciation had a strong and positive influence on their L2 pronunciation. Across the three different transfer levels, the strong and positive effects of L1 pronunciation were also found to be significant. The size of beta coefficients affirmed that the level of L1 pronunciation influence was much larger than the other predictors (i.e., age, years of L2 learning, hours of practicing L2 per week, and L1 pronunciation). In addition, the length of L2 learning was positively associated with L2 pronunciation except for the lower-level transferability scores. Age and hours of practicing L2 per week were related to transferability scores of the high level, yet they were not significant at the low or moderate levels.

Discussion

Unusual linguistic phenomena

According to the data, Chinese university ESL students' L1 (Chinese) pronunciation is as high as 93.44%, and that of L2 (English) oral proficiency is as low as 25.03%. That is, the average performance for L1 pronunciation is rather high. This finding is somewhat surprising given that the participants represented a variety of Chinese linguistic backgrounds, speaking different varieties of Chinese. Their surprisingly high performance might be attributable to the fact that Chinese university students are required to take Putonghua Shuiping Ceshi (PSC), also called the Standard Chinese Proficiency Test, which tests their abilities in reading and conversation (Lam, 2005). The PSC test might help them improve Chinese pronunciation and oral proficiency to meet the official national standard. The China National Common Language and Script Law (enacted in 2001) stipulates the citizens' rights and obligations to learn and use the common language and script, specifies the domains of their compulsory use, and requires proficiency measurements in education, for example, the PSC test, and for certain professions, for example government staff, teachers, and show hosts (Zhou, 2019).

On the other hand, the participants' performance of L2 oral proficiency was rather low despite their average nine-years of studying ESL. This finding may reflect the phenomenon of "mute English" or "dumb English", describing people who can read and understand English as a second language but cannot speak it well (Xinhua News Agency, 2002). This is a common phenomenon among Chinese students learning English and is perceived to be a serious flaw that exists in the current Chinese education of spoken English teaching and learning (Liang & Xu, 2013). This phenomenon occurs in China because English linguistic knowledge is overstressed, while communicative competence

is overlooked (Y. Zhang & Wang, 2011). The root of the problem results from English tests in China which prompt ESL learners to focus on mechanical multiple-choice skills but fail to direct attention to communicative competence (Lo Bianco, Orton, & Gao, 2009). The College English Test and the National College Entrance Examination that purportedly measure students' cumulative memorized knowledge about English language are the bane of English teaching in China (Liao & Wolff, 2010). These English examinations usually include listening, reading, translation, and short-letter writing but exclude speaking and essay writing. They are designed to test students' knowledge of grammar, reading skills, and vocabulary, but ignore the practical ability of spoken and written English. As China's English education is examination-oriented but not ability-oriented, students spend most time acquiring input (reading and listening) rather than output (speaking and writing) skills. This would explain the finding that the time the participants spent on English learning was not related to their oral English proficiency.

Method of spelling through phonics

The present findings demonstrate that L1 (Chinese) pronunciation of Chinese university ESL students correlates with and has a strong effect on L2 (English) pronunciation. Previous studies showed that in a transfer process, learners tend to transfer the forms and meanings from L1 to L2 not only productively but also receptively (Arabski, 2006; Jarvis & Pavlenko, 2008). In a similar vein, our data support the weight of phonetic transfer in that L1 pronunciation performance is influential in determining L2 sound production.

Initially, we assumed that Chinese-to-English phonetic transfer might occur but its extent might be small. However, the participants' L1 impact on their L2 pronunciation was more significant and stronger than we expected. Chinese students might learn English by imitating foreign sounds they have heard. One popular idea in the second-language-acquisition literature is that sounds are learned mainly through imitation (Breidegard & Balkenius, 2003; Gass & Mackey, 2012), which provides some learning advantages, especially in developing pronunciation and intonation (Lightbown & Spada, 2006).

However, our results seem to be consistent with the perspective that Chinese students rely on spelling through phonics besides imitation. Most Chinese pupils are required to learn Pinyin symbols first and pronounce words by spelling through phonics in early school years. When they master Pinyin symbols and phonics rules, they learn how to read and write Chinese characters marked by Pinyin symbols. Chinese examinations throughout primary and high school include a pronunciation section to test students' Pinyin mastery and correct pronunciation errors. The same is true for Chinese students in learning English. Most students are taught English IPA symbols and required to memorize the pronunciation of English words by spelling through phonics. Before they completely master English IPA symbols, they always spell English words with Chinese Pinyin symbols as most of English IPA and Pinyin symbols sound the same or similar. Chinese ESL educators believe that spelling methods can enhance the accuracy of English pronunciation. Spelling methods enable Chinese students to produce correct English pronunciation even if they do not have an authentic language environment or they are unable to imitate English pronunciation by listening to people talking. Spelling through phonics leads to good performance of Chinese and English pronunciation, which suggest the extension of phonetic transfer.

Nature of pronunciation acquisition

Learning time is regarded as an important dimension of production performance because the accumulation of knowledge takes time and effort in the classroom and after class (Brown, 2014). The length of time matters in L2 performance because the processing time is a significant factor (Papageorgiou & Bailey, 2019). Contrary to this popular notion, the data in the current study show that the time the participants spent on learning and practicing the L2 had no, or at best a weak, effect on L2 pronunciation. Also, while oral English proficiency is considered an important factor in predicting English pronunciation (Pennington & Rogerson-Revell, 2019), the data shows that was not the case in the current study.

A possible explanation for the phenomena is that L2 pronunciation is more acquired than learned. An important distinction made by linguists between language acquisition and learning has to do with the individual's internal processes of learning and the degree of consciousness associated with a learning task (Cook, 2016; McKay, 2006). Acquisition implies the language involvement of innate, species-specific linguistic knowledge in the mastery of a language, whether it is native or foreign (Anderson, 2007). That L1 to L2 transfer can come about through differences, recognizes that transfer can be an unconscious process (Han, 2004). Generally, young people acquire L2 pronunciation through an unconscious process during which they are mostly unaware of phonetics, which is similar to the way they acquired their L1 pronunciation in their childhood. Once they have formed their L1 accent along with the Pinyin system, they spontaneously use Pinyin as a supportive tool to read English words and convert similar Pinyin rules into English through the transfer process. Thus, they might develop Chinese English as a new variety of English, and it might be hard for them to change their accent once developed. In this way, transfer and developmental effects may interact in L2 acquisition, with L1 transfer dominant in the early stages of acquisition and developmental effects increasing as L1 transfer effects decrease. Both may also affect the production and acquisition of a single segment; while L1 transfer may affect pronunciation when sounds are difficult, developmental effects may affect substitutions. It is possible that positive L1 transfer effects may override developmental effects (Hansen, 2006). As pronunciation is acquired, L2 pronunciation performance might not depend on L2 learning time or L2 oral proficiency, but on L1 pronunciation level. Because Chinese university ESL students' Chinese has been highly standardized with long-term training and assessment, their Chinese level is high. They can convert more Chinese sounds into English words than is generally believed.

Conclusion

This study explored the impact of Chinese university ESL students' L1 (Chinese) on their L2 (English) pronunciation. The results of this empirical research answered two research questions. First, this study demonstrated a strong correlation between L1 pronunciation and L2 pronunciation. Second, the extent to which L1 pronunciation influences L2 pronunciation performance is large and that contrasts with popular perception which is based on the great discrepancy between the sound systems of Chinese and English.

The reasons why Chinese university ESL students' L1 pronunciation has strongly influenced their L2 pronunciation are probably because L1 to L2 phonetic transfer is related to the way they have acquired English. Chinese children learn English pronunciation mainly by spelling through phonics as they use English IPA symbols to spell English words and correct English pronunciation. Moreover, they obtain L2 pronunciation by speech acquisition, and "L1 use does affect L2 accent regardless of

whether the L2 was acquired as a child or an adult" (Edwards & Zampini, 2008, p. 257). Because the participants have taken standardized Chinese pronunciation examinations throughout their education, their Chinese pronunciation level might be rather high, which leads to a high L1 to L2 phonetic conversion.

Although the results show that participants presented high levels of English pronunciation, their oral English proficiency was poor. It is important to note that ESL teaching in China is problematic. Examination-oriented ESL teaching may contribute to mute English or dumb English for most Chinese university students. So long as the College English Test is the gatekeeper for university graduation, advanced studies, and post-graduation employment, China will continue to produce functional illiterates (Liao & Wolff, 2010). Measures are needed to cope with the problem, one of which is the use of speech technology tools and technology development in the areas of: automatic speech recognition technology, speech synthesis, spoken interaction, natural language understanding, speech recognition, emotion in spoken dialogue systems, expressive speech synthesis, affective computing, multimodal communication, interaction technologies, and animated agents (F. Chen & Jokinen, 2010), which can be introduced to ESL teaching and learning for improving learners' oral English proficiency. For instance, one-on-one individualized teaching effects can distinguish automatic speech assessment technology, an intelligent tutoring system based on speech assessment for English (Liang & Xu, 2013).

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