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An Experimental Study of the Positive Transfer of Cantonese Rusheng Syllable Structures on Unreleased Stops in English

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Abstract

Accurate pronunciation is of great significance for all language learners. Syllables of Rusheng, a prominent feature of Cantonese tones, are ended by stops with no audible release /p̚/, /t̚/, and /k̚/, which is highly similar to the phenomenon of unreleased stops in English Consonant-Consonant linking. However, previous studies on stops in Cantonese and English focused on the onsets or codas stops in monosyllabic words or theoretically presumed the difficulties Cantonese EFL learners may encounter by analyzing the similarities and differences of vowels and consonants in Cantonese and English. Therefore, the author conducted an experiment among three language groups. The results identify that there is a positive transfer from Cantonese Rusheng on English unreleased stops in phrases or even sentences in natural speech.

Keywords: Cantonese, English, Rusheng syllable structures, unreleased stops, positive transfer

1. Introduction

1.1 Background and Significance

With the smooth progress of the Belt and Road Initiative, the ties between China and the rest of the world have been strengthened. The Guangdong-Hong Kong-Macao Greater

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Bay Area, an engine boosting trade, connectivity and dynamism between regions, is playing a more and more crucial role in the further reforming and opening-up blueprint of China.

Cantonese, a Chinese dialect widely spoken in both the Greater Bay Area and many overseas Chinese communities all over the world, has been spoken by 120 million people in China in 2013 (Chen, 2013). However, domestic studies concerning English and Cantonese mostly focus on English stress (Chen et al., 2021; Sui, 2020), pronunciation or intonation produced by Cantonese speakers (Shi, 2013; Zhang, 2016); some previous studies just generally summarized the similarities and differences of their vowels and consonants, then theoretically drew a conclusion about the difficulties Cantonese speakers may encounter when they learn English without solid proof (Chen, 2022; Mai & Quan, 2017).

Nowadays, English courses are required for Chinese students' compulsory education and higher education. However, due to the regional differences in dialects, educational resources and etc., students' English level, especially their pronunciation, varies. As Wang Chuming pointed out in his study Self-concept, English pronunciation and EFL learning, "although pronunciation is only part of the L2 learning task, performance on L2 pronunciation influences a learner's L2 achievement and judgement of his/her L2 learning ability" (Wang, 2004). Therefore, this study of language transfer between Chinese and English can contribute to the English teaching activities on phonetics, especially for Chinese English-as-a-Foreign-Language (EFL) learners. It could help improve their pronunciation so as to enhance their achievement and judgement of their English learning ability, and then improve learners' all-rounded abilities to listen, speak, read and write in English.

With China's increasingly stronger national power and rising international status, more

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and more expats choose to study and even settle in China. Meanwhile, according to the data on the official website, Confucius Institutes are spreading China's wisdom to 147 countries and regions throughout the world, carrying out colorful and fruitful teaching activities. The theories of language transfer and second language acquisition can also be applied to these expats' learning process of Chinese. Therefore, studying language transfer between Chinese and English can not only offer guidance to teachers' teaching but can also boost expats' enthusiasm and confidence in learning Chinese.

What's more, with its unique history and geographical advantages, the Guangdong-Hong Kong-Macao Greater Bay Area is playing an increasingly crucial role in China's blueprint for further reforming and opening up in the new era, while language is playing a vital part in both official visits, economic cooperation and people-to-people exchanges. As a native Cantonese majoring in English, I believe that studying the influence of Cantonese on learning English is of great significance for Cantonese EFL learners, helping them master English better, and carrying out more communication and cooperation with foreigners without language barriers and misunderstandings.

Moreover, official data indicate that over 40 million people in Guangdong province speak Cantonese, and many overseas Chinese in Southeast Asian countries also speak Cantonese as their mother tongue. But what is misaligned with such a population is that most domestic studies on English and Cantonese concentrate on stress, pronunciation or intonation. Previous research merely outlined the similarities and differences between their vowels and consonants and speculatively concluded the obstacles Cantonese speakers may face while learning English without concrete evidence.

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Under the previous studies of language transfer, this research aims to identify the positive transfer of the Cantonese Rusheng syllable structure on the unreleased stops in English by analyzing the production by Cantonese Chinese speakers, Mandarin Chinese speakers, and English native speakers through an experiment. The recordings of the participants will be edited and analyzed with the software Praat. After comparing the voice broad band spectrums of participants in these three language groups, conclusions will be drawn and suggestions will be made accordingly from several perspectives.

The findings of this paper can serve as a reference for Cantonese EFL learners, and also have certain theoretical values for second language acquisition research.

1.2 Literature Review

1.2.1 Cantonese tones Rusheng

Cantonese is a dialect widely spoken in Guangdong province. It preserves stops at the coda position in checked tones (as “入声”, “Rusheng” in Chinese) of ancient Chinese, which is considered as one of its most prominent features (Luo, 2016). The syllables of Rusheng characters are ended by unreleased stops /p̚/, /t̚/ and /k̚/ (Zhu, 2010).

There are four phases in the production of fully pronounced stops: The first phase is called the closure phase, in which the articulator or articulators move to form the stricture for the plosive. In the second phase, the hold phase, the air is compressed behind the stricture, which stops the air from escaping. We call the third phase the release phase, in which the articulators used to form the stricture are moved so as to allow air to escape. The fourth phase is what happens immediately after the third phase, so we will call it the post-release phase (Roach, 2008).

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The final stop consonants in Rusheng characters are pronounced half-way, which means they only have the closure phase and the hold one, but not the release and post-release phases.

1.2.2 Unreleased stops in English

When native speakers speak English, they arrange words into groups and join together the stressed and unstressed words within the group. This group is called sense-group, which consists of a few words in close grammatical connection (Raoch, 1962). Speakers can move smoothly from one word to the next without making any sudden pauses if the words belong to a same sense group. And this phenomenon of joining words together is called linking (Wang, 2002).

Liang sorted English linking into three types, Consonant-Vowel linking (C+V), Vowel-Vowel linking (V+V), and Consonant-Consonant linking (C+C). He pointed out that there are four types of Consonant-Consonant linking in English, i.e. incomplete plosions, nasal plosions, lateral plosions, and consonant clusters with same places of articulation (Liang, 2011). The current study will focus on the former three types which are in close connection with stops, because the fourth type only occurs when fricatives, nasals or semivowels are linked together.

If two words are linked together in one sense group, when the former one ends with a stop and the latter one begins with a stop or an affricate, to make smooth transitions in speech, the former final stop will become an unreleased stop, which means it has the closure phase and the hold phase, but not the release burst. The air compressed behind the stricture will be then released at the articulation place of the latter stop or affricate. And this is how speakers

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produce incomplete plosions.

When a word with a stop at the coda position is followed by a word with a nasal /n/ or /m/ as an onset in the same sense group, the stop will be unreleased and the air compressed behind the stricture will be then released through the nasal cavity. And this is what we called nasal plosions.

As for the lateral plosions, when a word ended with a stop is followed by a word beginning with a lateral /l/, instead of releasing the air at the articulation place of the stop, the air pressure during the stop will be released through the sides of the tongue (Liang, 2011).

1.2.3 Second language acquisition

In the 1960s and early 1970s, Contrastive Analysis (CA) Hypothesis put forward by Lado was extensively applied in the field of second language acquisition (SLA). He compared L1 and L2 in the aspects of grammar, pronunciation, etc. in his research, and claimed “those elements which are similar to native language will be simple for him, and those elements that are different will be difficult” (Lado, 1957). He pointed out that learners’ mother tongue may have both positive and negative effects on the language they are learning, the positive one is called positive transfer, while the negative one is negative transfer. And if a sound in L2 is similar to one in L1, learners may substitute the target sound with the sound from their source language.

Later, Selinker coined the terms “interlanguage” and “fossilization” and noted in 1972 that in a given situation, the utterances of a learner differ from those of a native speaker to convey an identical meaning. An interlanguage is what L2 learners may write or speak, which preserves some features of their mother tongue and expresses in L2 with its grammar, words,

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pronunciation, etc. of L2. L1 transfer, previous learning strategies, strategies of L2 acquisition, L2 communication strategies, and the overgeneralization of L2 language patterns are claimed to be several factors that shape the rules of interlanguage. An interlanguage can be used to examine a learner's knowledge of the pronunciation, grammar, vocabulary, and linguistic norms of L2 (Selinker, 1972).

Flege conducted an experiment, in which he compared the French /y/ and /u/ with the English /u/ produced by English speakers and French native speakers, and developed the hypothesis of Equivalence Classification and a theory that new sounds are easy to learn while the similar ones are hard (Flege, 1987).

In the current study, although Cantonese Rusheng codas function as phonemic, tone-bearing properties (Zhu, 2010), and English unreleased stops serve as non-phonemic, context-dependent allophones (Liang, 2011), they are considered to share identical articulatory gestures, both involving the closure and hold phases of the vocal tract while lacking the final release burst (Roach, 2008). Therefore, this study aims to investigate whether there is a transfer of the Cantonese speakers' physiological and psychological patterns from Cantonese coda stops to the production of English unreleased stops. According to Flege's theoretical framework, these structures would be categorized as similar sounds, which may cause difficulties to learners because of equivalence classification. However, due to the highly similar articulatory gestures and patterns mentioned above in these two languages, Cantonese English learners may benefit from their L1 habits when producing English unreleased stops in Consonant-Consonant linking rather than experience the interference predicted by SLM.

1.2.4 Studies on stops produced by Cantonese speakers

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As for domestic phonetics and phonological studies, Wang and Heuven have been exploring the intelligibility among speakers with different language backgrounds across borders, and identified several acoustic features of English vowels and obstruents produced by Chinese, Dutch, and American speakers (Wang, 2007; Wang & Heuven, 2015; Wang & Heuven, 2018; Wang & Heuven, 2019).

Some studies on English stops produced by Cantonese speakers discussed Cantonese negative transfer on English by error analysis, while others summarized the similarities and differences between Cantonese and English and concluded the positive and negative transfer of Cantonese Rusheng.

Jia conducted a series of experiments to analyze the errors of English monosyllabic voiceless plosive endings produced by Cantonese students and find them always too weak to be audible, which is claimed to be affected by the negative transfer of Cantonese (Jia, 2010).

With the software Praat, Zhou and Chen carried out an experiment on the stops at the onset position produced by Cantonese speakers. The result showed that participants tended to pronounce all the English stops in voiceless stops, which means they mistook the voiceless aspirated stops in Cantonese for English voiced stops (Zhou & Chen, 2015).

In 2017, Mai and Quan summarized Cantonese positive and negative transfer on English according to the features of these two languages. Speaking of the influence on English stops, they indicated that because of Cantonese Rusheng, Cantonese speakers can learn the stops with higher accuracy than Mandarin speakers from Northern China, but they may also ignore the final stops in English words due to the same reason (Mai & Quan, 2017).

In general, previous studies on stops produced by Cantonese-accented English

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speakers centered around stop onsets or endings in monosyllabic words but none of them studied stops in phrases or even sentences. And many studies on Cantonese transfer on English were inferred based on the characteristics of the two languages, instead of being confirmed with scientific experiments, so they are of neither universality nor objectivity.

1.3 Research Questions

Due to the high similarity of Cantonese Rusheng and English unreleased stops, the writer aims to identify if there is a positive transfer from Cantonese tones Rusheng on unreleased stops in English and to address the following questions in this research:

1. Is it true that Cantonese-accented speakers can produce unreleased stops in natural speech like English native speakers?
2. Is it true that Cantonese-accented speakers can produce unreleased stops in natural speech better than Mandarin ones?
3. If both yes, is it Cantonese Rusheng that causes this positive transfer on English unreleased stops?

What are the accurate frequencies of these unreleased stops /p̄/, / t̄/ and /k̄/ produced by Cantonese speakers? Which one can they pronounce with the highest accuracy and which one is the lowest?

To answer these questions, the writer will collect recordings from five Cantonese speakers, five Mandarin speakers from Northern China and two English native speakers for the sake of comparison, edit and analyze the voice broad band spectrums of these participants, and find out whether Cantonese Rusheng has positive transfer on English unreleased stops produced by Cantonese speakers.

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1.4 Hypothesis

According to the language transfer theory, the author assumes that syllables of Cantonese Rusheng syllable structures have positive transfer on English unreleased stops in linking. That is to say, when Cantonese speakers speak English in natural speech, they can link a word ended with a stop and a word began by another consonant with unreleased stops more naturally and accurately than Mandarin Chinese speakers, because of Cantonese Rusheng's feature, which is ended with unreleased stops /p̚/, / t̚/ and /k̚/.

2. Method

2.1 Subjects

To identify the influence of Cantonese tones on English unreleased stops, five Cantonese-accented English speakers from Guangdong province were recruited, with five other Mandarin Chinese speakers from Mandarin-speaking regions in China as a control group, who speak Mandarin varieties without the feature of Rusheng. In order to provide samples for evaluation, one English native speaker from the United States of America was also recorded. All speakers age from 18 to 55, in order to control the variables in the experiment. Non-native English speakers are students from a university in Shenzhen who have not majored in English and have not spent time in an English-speaking environment. Each group consisted of three speakers who had passed the CET-6 (College English Test Band 6) and two had passed the CET-4, which ensures comparable English proficiency between groups and the following observed performance in the current experiment could be attributed to L1 transfer effects.

2.1.1 Cantonese speakers

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Since the experiment is designed for identifying Cantonese impacts on Cantonese speakers' English pronunciation, Cantonese EFL learners are the subjects of this research. And three females and two males from the cities of Guangzhou and Foshan in the Greater Bay Area were recruited, aging from 18 to 23. According to their questionnaires, Cantonese is their native language and they have learned English for more than 12 years since primary school. These speakers are students of Shenzhen University majoring in History, Control Engineering, Network and New Media, Civil Engineering, and Spanish, who neither have no regular contact with English native speakers nor have no experience living in English-speaking countries. Mandarin is the language they usually speak when they are at school or talking with friends, while Cantonese is used at home.

2.1.2 Mandarin speakers

For comparison, there are two females and three males in the Mandarin group participating in this experiment, who age from 18 to 23. Four of them are from Beijing, Jilin province, Liaoning province and Shanxi province, the northern cities and provinces in China, where native people speak Mandarin or dialects without unreleased stops /p̄/, /t̄/ and /k̄/. Only one female comes from Kunming, Yunnan province, who speaks the Kunming dialect without unreleased codas /p̄/, /t̄/ and /k̄. These speakers are also students from Shenzhen University, majoring in Japanese, Electronic and Information Engineering, Communication Engineering, Journalism and Communication, Optoelectronic Information Science and Engineering, and Engineering Management. None of the Mandarin speakers have regular contact with English native speakers or spend time in an English-speaking environment. All of them speak Mandarin when having conversations with friends, at school and at home, but only some of

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them also speak dialects with their families.

2.1.3 English native speaker

Native English speaker can provide authentic samples of the pronunciations of the material in natural speech for the current study. Therefore, one male was invited to produce samples for this experiment. He is a teacher at the College of International Studies in Shenzhen University, who is 52 years old and comes from Michigan, USA. He has lived in China for 19 years but has little knowledge of Cantonese, which means his Cantonese proficiency would not have an impact on his English pronunciation.

2.2 Materials

The materials of this experiment can be divided into two groups, one is the Consonant-Vowel (CV) group, and the other is the Consonant-Consonant (CC) group. All the materials are meaningful phrases that make sense in grammar, and also be widely used in our daily life, so speakers can produce them fluently in natural speech. It is worth noting that coda stops are typically released in English, when followed by a vowel in linking contexts. Therefore, the CV group is designed as a control condition to test whether Cantonese unreleased coda stops in Rusheng syllable structures are blindly applied to inappropriate phonetic contexts. If Cantonese speakers achieve high accuracy in CV groups (i.e., releasing the stops in CV contexts), it may suggest that their production of unreleased stops in CC contexts is a selective move according to corresponding phonetic contexts and a positive transfer from their L1 feature.

To create a natural context for reading, materials in both groups are phrases with targeted stops /t/, /k/, or /p/, and speakers will produce them in the middle part of a fixed

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carrier sentence “I say ... again.” All the materials are written on a paper sheet and shown to participants before recording.

In the CV group, each material is a verb phrase that begins with a verb ended with targeted stops /t/, /k/, or /p/, and ends with a preposition begun by a vowel (see Table 1).

Table 1 Word list of the CV group.

	/t/	/k/	/p/
/ʌ/	shut up	pack up	wrap up
/ɒ/	shout on	check on	step on
/æ/	shoot at	work at	keep at
/ɪ/	consist in	stick in	drop in

As for the CC group, materials are divided into three units according to the different types of plosions. As we mentioned above, Liang sorted Consonant-Consonant linking into four types, i.e. incomplete plosions, nasal plosions, lateral plosions, and consonant clusters with the same places of articulation. The current study focuses on the former three types which are in close connection with stops, because the fourth type only occurs when fricatives, nasals or semivowels are linked together.

In the unit of incomplete plosions, phrases are begun with the same word with one targeted sound /t/, /k/ or /p/ at the coda position respectively, and ended with a word with one targeted stop /t/, /k/ or /p/ at the onset position (see Table 2).

Table 2 Word list of incomplete plosions in the CC group.

Number	Phrase	Target	Number	Phrase	Target
T1	sport time	/t/	K2	drink coffee	/k/
T2	sport car	/t/	K3	drink please	/k/
T3	short pants	/t/	P1	keep talking	/p/
K1	drink tea	/k/	P2	keep calm	/p/

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	P3	keep promise	/p/

As for the unit of nasal plosions, phrases consist of a same word with one targeted sound /t/, /k/ or /p/ at the coda positions respectively, and a word with one targeted nasal /m/ or /n/ at the onset positions (see Table 3).

Lastly, phrases in the unit of lateral plosions start with a word with one targeted coda /t/, /k/ or /p/ respectively, and end with the word “light”, which contains a lateral /l/ as its onset (see Table 4).

Table 3 Word list of nasal plosions in the CC group.

Number	Phrase	Target	Number	Phrase	Target
T4	hot milk	/t/	K5	dark night	/k/
T5	hot news	/t/	P4	stop me	/p/
K4	dark mood	/k/	P5	stop now	/p/

Table 4 Word list of lateral plosions in the CC group.

Number	Phrase	Target
T6	spot light	/t/
K6	dark light	/k/
P6	lamp light	/p/

2.3 Procedure

The experiment was conducted in the following procedures: (1) recruiting speakers, recording, filling out questionnaires; (2) processing recordings; (3) transcribing the recorded materials; (4) analyzing experimental data.

Firstly, Cantonese, Mandarin and English speakers that meet the requirement of the experiment were recruited with payment. Before recording, the reading list and its

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instruction[1] were shown to the participants for three to five minutes so that they could get enough knowledge of this experiment and the following procedures. Speakers were required to read each sentence only one time, or repeat the whole sentence if they need to correct what they've read. The whole process of sound recordings was carried out in a small and quiet room in the library in Shenzhen University, lasting for about three minutes each time. By using a Uniscom T3 recorder, the productions of participants were recorded and saved in wav. format. After recording, while the researcher checked the quality of the recordings, participants were required to fill out a questionnaire designed for collecting their personal information[2], i.e. gender, age, language background, birthplace, previous experience of English learning and etc. Lastly, speakers were allowed to leave after the recorded materials were saved and the questionnaires were fully filled.

Secondly, the sound files were transferred onto the computer and edited with the software Praat. The targeted phrases were cut out from each sentence and saved independently as another sound file, renamed in the format of "Language Participant Number_Targeted Phrase.wav" (eg., C1_sport time.wav means the recording of the phrase "sport time" produced by the first Cantonese speaker). There are 11 participants in this experiment, and each of them produced 30 sentences. Therefore, there are 330 sound files carrying target phrases in total.

Later on, the sound files with targeted phrases were analyzed with the software Praat. The voice broad band spectrums of the sounds can be viewed in Praat. Spike in the

[1] Please contact writers for the detailed reading list and its instruction applied in this experiment.
[2] Please contact writers for the questionnaire employed in this research.

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spectrograms is one of the acoustic properties of stops, meaning the release burst of the air. On this premise, the writer listened to the sound files and viewed their spectrograms to see if there are spikes in the targeted places. Then, each piece of materials was transcribed into phonetic transcriptions and their spectrums were saved together in a table with the software Excel.

Lastly, results were analyzed according to different language groups and different types of plosions. The researcher calculated the accurate frequency of each targeted sound and had them shown in graphs. Furthermore, the results will be discussed in the following chapter.

3. Result Analyses

3.1 Production of English Coda Stops

The results are broken down by different groups of materials and different language groups so as to compare the production performances in different aspects among Cantonese, Mandarin, and English speakers. We collected 330 recorded materials, while 321 of them are valid. The overall accurate frequencies and accurate rates of the CV and CC group produced by participants in three language groups are shown in Table 5 and Table 6.

Table 5 The percentage of accuracy of English coda stops in the CV group produced by different language groups.

	Cantonese	Mandarin	English	Total
Frequency	50	51	11	112
Percentage	84.75	86.44	91.67	86.15

Table 6 The percentage of accuracy of English coda stops in the CC group produced by

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different language groups.

	Cantonese	Mandarin	English	Total
Frequency	48	38	15	101
Percentage	57.83	42.7	83.33	53.16

Note. The statistics (X2 = 3.935, df = 1, p = 0.047) were calculated for the non-native English speaker groups to evaluate the influence caused by their L1.

From the tables above, we find that the general accurate rate of Consonant-Vowel linking, with a percentage of 86.15%, almost 33% higher than the Consonant-Consonant group.

In the CV group, the Cantonese and Mandarin groups contain 60 tokens respectively (5 speakers × 12 stimuli), while the English one contains 12. However, speaker C1 mispronounced the phrase “keep at” (/ki:p æt/) as [khi:p̄ k æt̄], while speaker M4 added a [t] after [drɒp] in the phrase “drop in”, which made these two pieces of recordings invalid. As for the accurate rates sorted by language groups, the English native speakers had the best performance, with an accurate rate of 91.67%, while the Cantonese and Mandarin ones were approximately 7% and 5% lower. Since the gap between the accuracy of Cantonese and Mandarin speakers produced in the CV group is only around 1.7%, the impacts of Cantonese Rusheng features on English Consonant-Vowel linking are not prominent, suggesting that Cantonese speakers do not overgeneralize the unreleased stops habit to the English CV phonetic contexts where a release is required. Consequently, this may indicate that their production of unreleased coda stops in English appears to be a context-sensitive positive transfer from L1 articulatory habits.

As for the CC group, there are 180 tokens in the Cantonese and Mandarin groups (2

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groups × 5 speakers × 18 stimuli) and 18 in the English group, but only 190 of them are valid. In the Cantonese group, speaker C2 mispronounced the coda /k/ in “drink please” as [t] and the onset /l/ as [n] in phrases “spot light” and “dark light”, and added a [t] after “keep” in the phrase “keep calm”. Speaker C4 also pronounced /l/ as [n] in the three materials in the unit of lateral plosions. And the third speaker of the Mandarin group read the phrase “stop me” as “stop you”. Speaking of the accuracy broken down by speaker group, the English native speakers also crowned the best performance with an accurate rate of 83.33%, followed by the Cantonese speakers, 57.83%, while the Mandarin group is the lowest one, with only 42.7%, around 41% lower than the English one. To objectively evaluate the influence of L1 transfer for Mandarin and Cantonese speakers, a weighted Chi-square test was performed. The results yielded $X2 = 3.935$, $df = 1$, $p = 0.047$, indicating a statistically significant difference between these non-native English speaker groups ($p < .05$).

3.2 Production of English Coda Unreleased Stops

3.2.1 Production of the English coda unreleased stop / t̚/

The results of the pronunciation of English coda unreleased stop /t̚/ by three language groups were calculated and presented in Figure 1.

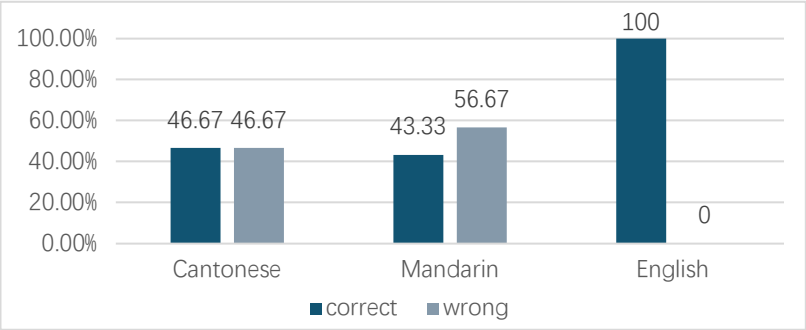

Fig. 1 The percentage of accuracy and errors of /t̚/ among Cantonese, Mandarin, and English speakers.

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From the data of the production of the English coda unreleased stop / t̄/, the English native speaker performed the best with no error, while the accurate rates of Cantonese and Mandarin speakers are lower than 50%. But the Cantonese group performed slightly better than the Mandarin one with a 3% higher accurate rate and a 10% lower error rate.

The material with the highest accuracy in this group is the phrase “sport time”, with the accurate rates of 80% in Cantonese speakers and 60% in Mandarin ones. The accurate samples produced by speaker C2 is as follow (see Fig. 2).

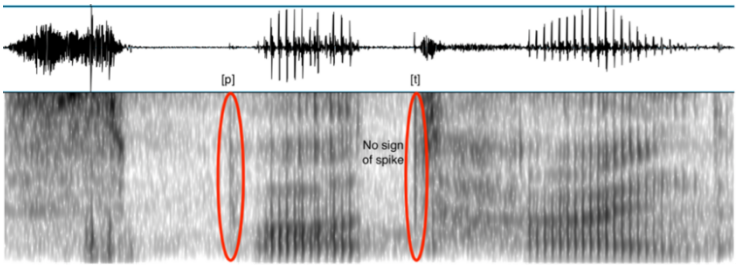

Fig. 2 The phrase “sport time” produced by speaker C2

And the phrase with the lowest accuracy is “spot light”, with only 20% in the Cantonese group and 40% in the Mandarin one. With the unreleased stop / t̄/ at the coda position within the first word /spɒt̄ /, no spikes should be observed in this position. The wrongly articulated sample by speaker C3 is as follow (see Fig. 3).

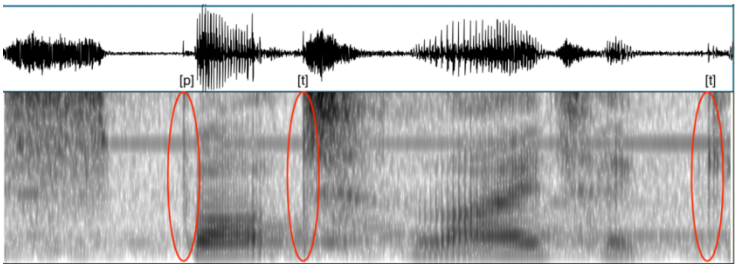

Fig. 3 The phrase “spot light” wrongly produced by speaker C3.

3.2.2 Production of the English coda unreleased stop /p̄/

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Among the three language groups, the English group still has the best performance on producing the unreleased stop /p̄/ at the coda position. Cantonese speakers are 20% lower while the Mandarin group is the lowest with an accuracy of 26.67%. And 73.33% of the materials with an unreleased stop coda /p̄/ were mispronounced by the Mandarin speakers, which is much higher than the other two groups.

Among the phrases with /p̄/, “keep promise” has the highest accuracy. All the Cantonese speakers could accurately produce it, while 80% of Mandarin speakers have it right too. Fig. 5 shows the correct sample by speakers E1, in which only the spikes for the two onset stops can be observed.

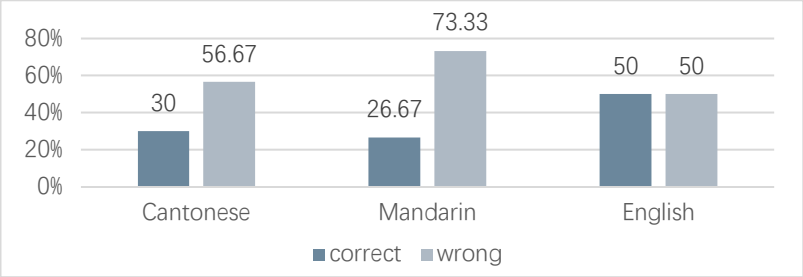

Fig. 4 The percentage of accuracy and errors of /p̄/ among Cantonese, Mandarin, and English speakers.

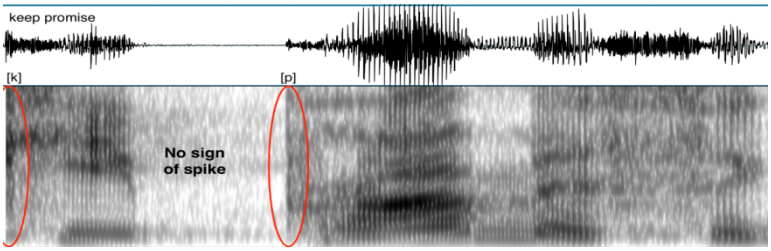

Fig. 5 The phrase “keep promise” produced by speaker E1.

The phrase “lamp light” has the relatively lowest accuracy among the phrases with / p̄/, with 60% accuracy in the Cantonese group and 0% accuracy in the Mandarin one. The

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spectrogram of the incorrect sample produced by M4 can be seen in Fig. 6.

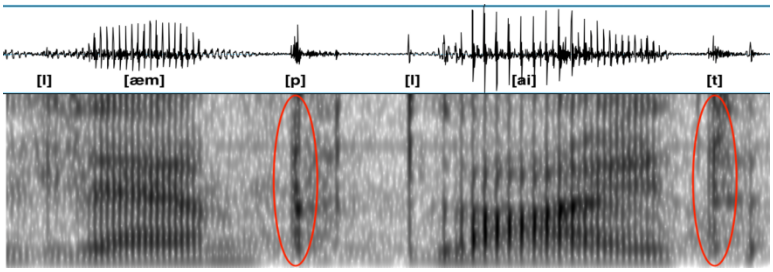

Fig. 6 The phrase “lamp light” was wrongly pronounced by speaker M4.

3.2.3 Production of the English coda unreleased stop /k̚/

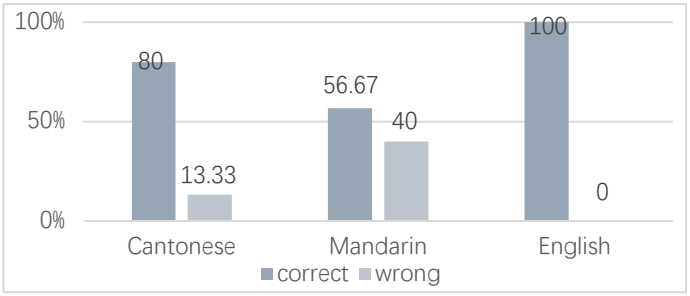

Fig. 7 The percentage of accuracy and errors of /k̚/ among Cantonese, Mandarin, and English speakers.

The English group is seen with the highest accurate rate with no error in this section, followed by the Cantonese group with an accuracy of 80% and an error rate of 13.33%. And the accurate rate of the Mandarin speakers, with only 56.67% is almost half lower than the English group.

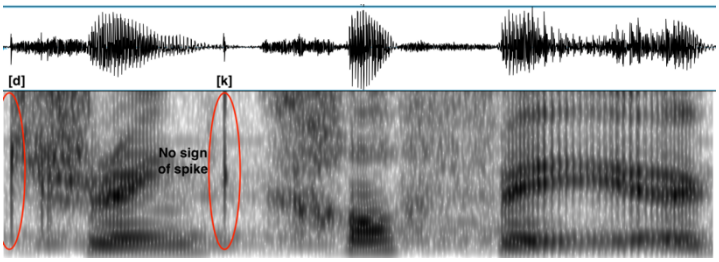

Fig. 8 The correct sample of “drink coffee” produced by C4.

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Among all the materials with /k̄/, 60% of Cantonese speakers and 80% of Mandarin speakers pronounced “drink coffee” correctly, which makes it become the sample with the highest accurate rate (see Fig. 8 for the accurate sample of “drink coffee”); “dark light” is the lowest one, with only one Cantonese speaker articulated it with no mistakes in the two language groups (see Fig. 9 for its incorrect sample).

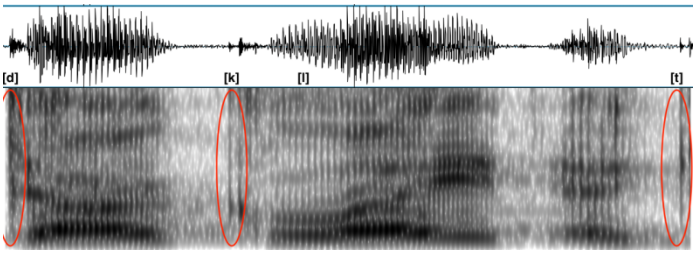

Fig. 9 The incorrect sample of “dark light” produced by E1.

3.3 Summary and Discussion

From the comparison between Tables 7 and 8, the overall accuracy of Consonant-Vowel linking is about 33% higher than the Consonant-Consonant group. Compared with the relatively narrow gaps in their performance among the three language groups in the Consonant-Vowel group, the accuracy gaps are quite large in the Consonant-Consonant group, that is, the Cantonese group is 25.5% lower than the English one, while the Mandarin one is even 40.63% lower. All of these indicate that Chinese EFL learners may have more difficulties in linking coda stops with another onset consonants in phrases in natural speech.

What’s more, Table 7 has shown that the accurate frequency gap between Cantonese and Mandarin speakers in pronouncing coda stops followed by a vowel is quite slight, which denotes Cantonese Rusheng’s influence on pronouncing coda stops is not prominent.

Plus, according to the collected data, the comparison of three unreleased stops /t̄, p̄, k̄/

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is presented in Figure 21. In the production of these three stops, the English native speaker always had the best performance with the highest accurate rate and the lowest error rate. And the Cantonese group takes second place in every type, respectively 3.34%, 3.33%, and 23.33% higher than the Mandarin group.

Speaking of the accurate rate of different stops, the accuracy of /p̄/ is generally the highest among these three types, while the accuracy of /k̄/ is the lowest.

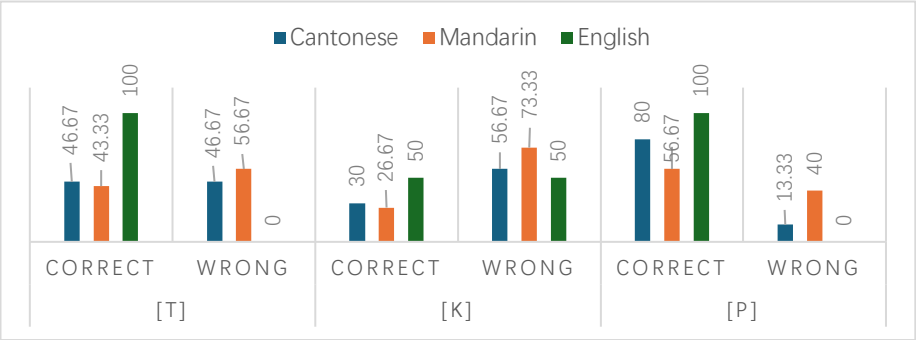

Fig. 10 The percentage of accuracy and errors of three unreleased stops produced by three language groups

Figure 11 presents the comparison of three plosive types, that is incomplete plosions, nasal plosions, and lateral plosions. All the language groups performed best in the unit of incomplete plosions and worst in the unit of lateral plosions. In the production of these three types, the performances of Cantonese speakers are all better than the Mandarin ones, which may result from the positive transfer of Cantonese Rusheng's feature at the coda position.

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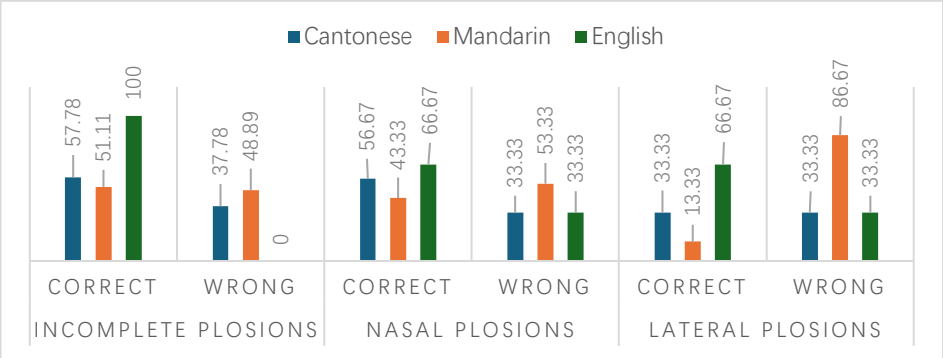

Fig. 11 The percentage of accuracy and errors of three plosive types produced by three language groups

However, from the invalid materials, we could find that both Cantonese and Mandarin speakers tend to add an additional consonant after words ended with consonants, and the Cantonese speakers may mispronounce /l/ as /n/. These are the issues that need to be paid attention in English phonetics teaching activities. Since the issues above are beyond the scope of the current study, the author will not elaborate on them any further.

4. Conclusions and Suggestions

4.1 Major Findings

Spike in the spectrograms is one of the acoustic properties of stops, indicating the release burst of the air. Syllables of Cantonese tones Rusheng are ended by stops /t/, /k/ and /p/ with no audible release, which means no spike could be seen at the coda positions in the spectrograms when pronouncing Cantonese Rusheng syllables. This feature is highly similar to the unreleased stops in English Consonant-Consonant linking in natural speech. In light of this similarity between Cantonese and English, the author designed an experiment and identify that there is a positive transfer of Cantonese Rusheng on English unreleased stops produced by Cantonese speakers.

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According to the data collected from analyzing the recordings produced by three language groups, answers to the research questions and major findings of the current study are listed as follows:

1. The gaps in accurate frequency and accurate rate between Cantonese and Mandarin speakers in pronouncing coda stops followed by a vowel in the Consonant-Vowel linking is quite small, which indicates Cantonese Rusheng features are not blindly applied to the English CV contexts, further demonstrating that their production of unreleased coda stops in English is a context-sensitive positive transfer from L1 articulatory habits.

2. As data shown in the last chapter, the Cantonese speakers take up higher accuracy in the production of unreleased stops among all the three types of plosions and three sounds / t̄/, / p̄/, and / k̄/ than the Mandarin ones, but there is still room for Cantonese speakers to improve compared to the English native speaker.

3. All the non-native speakers involved in the current study have previous experience learning English for more than ten years and obtained English proficiency certificates above CET-4, and none of them have received professional pronunciation lessons, had regular contact with English native speakers, or lived in English-speaking countries. Therefore, the higher accuracy of English unreleased stops by Cantonese speakers may not result from school education or an immersive environment of English, but from the equivalence classification and the positive transfer from Cantonese Rusheng syllables ended by stops with no audible release.

4. Broken down by types of plosions, incomplete plosions were the easiest to accurately produce, while lateral plosions were the most difficult among all the language

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groups. In terms of the accuracy of different stop sounds, / p̄/ had the highest accuracy rate among the three unreleased stops, while / - k̄/ had the lowest.

5. The accurate rates of three unreleased stops /p̄/, / t̄/ and /k̄/produced by Cantonese speakers are 80%, 46.67%, and 30%, respectively. Speaking of the accuracy sorted by different types of plosions, Cantonese participants had the best performance in incomplete plosions (57.78%) and the worst in lateral plosions (33.33%). The data above indicate that Cantonese EFL learners may have more trouble in linking words ended by /k̄/ with other words beginning with a consonant, especially the lateral /l/.

4.2 Limitations

There are several limitations in the current study that need to be improved in future work.

Firstly, non-native speakers in this experiment are students in Shenzhen University, aged 18-23, so the result may not be universally applicable to people of all ages.

What's more, due to time constraints, the sample size was limited to five participants in non-native English speaker groups respectively and only one native speaker as baseline. And the participants voluntarily signed up for this experiment, who might have more confidence in their English pronunciations. Therefore, the result may not be applied to English learners of all proficiency. And only one English native speaker qualified for the requirements was involved in this experiment. Therefore, the results presented above are part of the research, and the author will recruit more participants and improve the experiment in the future.

Lastly, the materials produced by all the speakers were all transcribed and analyzed

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solely by the author, a Cantonese student majoring in English, which means the lack of inter-rater reliability checks and acoustic measurements may introduce potential bias. In the future, the perceptional experiment will be designed and more participants from three language backgrounds will be invited to become the perception group, which may contribute to more findings in this field.

4.3 Suggestions

Primarily, although students need to learn English from a young age and English is one of the compulsory disciplines in China's nine-year compulsory education, many districts did not pay much attention to students' English pronunciations back then. Nowadays, with more and more cities and provinces launching English-speaking tests for entrance examinations for both secondary school and college, teachers need to adapt to the new changes and add more phonics courses to their original teaching routines according to the different stages of students' development, so that students would place more weight on learning English phonics from an early age.

Secondly, the teaching activities of second-language phonetics should be integrated with native-language ones. Except for teaching linking, rhythm and stress of English speech, strong forms and weak forms, teachers in the Cantonese-speaking regions should pay more attention to teaching the similarities and differences between the Cantonese Rusheng codas and the voiceless stops in English, especially their articulators, places of articulation and the rules. With the guidance of teachers, Cantonese students might make good use of this strength and overcome the negative transfer of the Cantonese Rusheng.

In addition, a variety of tools can assist offline phonics teaching activities in

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classrooms. For example, the figure of the human vocal tract can be used to improve students' understanding of the places and organs of articulation, thus increasing the accuracy of their pronunciations. And the software Praat can also be used in high schools or universities to guide students in imitating the pronunciation of English native speakers, and allow them to view the spectrograms and find out the differences in sounds between their native language and English.

Last but not least, EFL learners should also take the initiative to explore more effective methods to learn English. They can try to communicate with native English speakers, create a relatively immersive environment for learning English, acquire and imitate native English speakers' pronunciations by listening to English songs, watching TV series in English, listening to English news or interviews, etc.

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