Perception of Consonants in Single Codas in English by Cantonese and Mandarin Speakers

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Abstract

One's native language (L1) would interfere with the perception of a foreign language because of the differences between the sound inventories and distributions in the two languages. Compared with English, the syllable structures of Cantonese and Mandarin are relatively simple. Mandarin has only two coda consonants /n/ and /ŋ/, while Cantonese has six: /p/,/t/,/k/,/m/,/n/,/ŋ/, both languages do not allow consonant clusters. However, English allows multiple consonants in syllable final position.

This study investigates Cantonese and Mandarin speakers' perception of English consonants in single codas, and found that Cantonese who were learning English as a Foreign Language (EFL) have advantages in the perception of English coda nasals and stops compared to the Mandarin speakers, but they have difficulty in identifying the voiced-voiceless contrasts in plosives. This is considered to be a result of negative transfer from their first language.

Key words: Syllable-final consonants; Codas; L2 speech learning, Perception; Interlanguage

1. INTRODUCTION

The acquisition of a foreign language is constantly affected by one's native language, which is defined as language transfer. Transfer occurs in all linguistic subsystems (Odlin, 1989). In the field of phonological acquisition, language transfer might be linked to many reasons, such as differences in the sound inventories between the native language and foreign language (both consonants and vowels), differences of segment distribution in the syllable between the two languages, and other factors such as stress, tone and rhythm.

This study mainly aims at investigating how the differences in segment inventory and distribution affect second language acquisition, more specifically, the perception of consonants in single codas (one-consonant-long coda) in English by Mandarin and Cantonese speaker. It consists of a perception task to examine the ability of English as a Foreign Language (EFL) learners to distinguish four types of different consonants, namely, nasals, plosives, fricatives and liquids. And we found that Cantonese EFL have advantages in the perception of English coda nasals compared to the Mandarin speakers, but they have difficulties in distinguishing syllable-final voiced plosives.

2. LITERATURE REVIEW

2.1 Single Codas of English, Cantonese and Mandarin

Although all three languages do not prohibit codas, the syllable structures of Cantonese and Mandarin are relatively simple compared with English. English allows at most 3 consonants as onset and 4-consonant-long coda, while Cantonese and Mandarin have a CV structure most commonly, and the CVC structure is relatively rare. Mandarin has only two coda consonants /n/ and /ŋ/, while Cantonese has six: /p/, /t/, /k/, /m/, /n/, /ŋ/, and both languages do not allow consonant clusters. In contrast, English allows multiple consonants in syllable final position.

Table 1
Single Codas in Three Languages

Mandarin	Cantonese	English
2 consonants	6 consonants	21 consonants
/n/, /ŋ/	/p/, /t/, /k/, /m/, /n/, /ŋ/	/p/, /b/, /t/, /d/, /k/, /g/, /m/,/n/, /ŋ/, /θ/, /ð/, /f/, /v/, /s/, /z/, /ʃ/, /ʒ/, /tʃ/, /dʒ/, /l/, /ɹ/

2.2 Related Theories

2.2.1 Language Transfer

A learner of a foreign language prone to resort his or her previous knowledge of mother tongue (L1) while processing the new language (L2). Usually, some structures in L2 are substituted by appropriate L1 forms during the process of both perception and production, resulting in non-native L2 acquisition. This phenomenon is defined as language transfer (Odlin, 1989), and it has a pivotal role in the field of second language acquisition (SLA).

Language transfer is directional. According to its influence on the results of acquisition, it can be divided into two categories: positive transfer and negative transfer. To make it blunt, if the pre-existing language knowledge helps the learner in acquiring the new language, the transfer is a positive one; if the learning process is interfered and errors related to L1 appear, it is a negative one. Different theories exist in the literature regarding language transfer.

2.2.2 Native Language Magnet Effect Model

The theory of Native Language Magnet Effect Model provides a useful account of how the transfer is realized. Proposed by Kuhl (1995), this model shows how infants categorize sound patterns into a "sound map". In early age, infants hear thousands of examples contains a particular sound, and then develop a map-like memory pattern in their brains, which not only includes the acoustic features, but also the distributions - in what environments will the sound appear - of this sound. This is a shift from a language-general to a language-specific pattern of perception, and this makes learning a second language more difficult. Because once a sound category exists in memory, "it functions like a magnet for other sounds". That is, the prototype attracts sounds that are similar in distribution and pronunciation, making them sound like the prototype itself (Kuhl, 1995).

According to NLM model, the Cantonese, Mandarin and English speakers established their perceptual patterns at early age, therefore may have different perception of English codas. For example, Mandarin speakers may tend to interpret the /m/ sound at word-final place as /n/ or /ŋ/, because a /m/ never exist in a Mandarin coda, while Cantonese speakers may tend to perceive it correctly.

2.2.3 Equivalence Quantification Hypothesis

A more detailed analysis on how the sounds in L2 are acquired by "comparing and sorting" were conducted by Flege (1987), and he revealed that speakers perceive L2 speech sounds and classifies them as "similar" or "new" comparing with phonemes in L1. As noted by him, learners can label a new segment for the L2 if the sound is distinguishable, but if a L2 sound is too similar with L1, it may be perceived too quickly and put into the pre-existing category. By directly using the L1 sound pattern, the slight differences inside the two sounds will be ignored. In short, a new sound is easier to grasp than a very similar, but not identical, one.

The Cantonese plosive codas /p/ /t/ /k/ are worth discussing according to this theory. There is a slight difference between these plosive codas and those in English, because in Cantonese plosives are unreleased in the syllable-final place. An unreleased plosive is definitely unaspirated, but in English, a voiceless plosive is usually aspirated while a voiced one is not. Therefore, Cantonese speakers may be prone to perceive the aspirated plosive as unaspirated, in other words, the voiceless one as the voiced one.

2.3 Previous Studies

Previous studies on the factors effecting the acquisition of English syllable-final codas found that L1 transfer was the main constraint in both production and perception. Brazilians (Kluge, 2004), Koreans and Japanese (Aoyama, 2003) were all found to have difficulties in distinguishing different nasal codas due to various sound distributions and phonological rules in their L1. Atthaphonphiphat (2017) claimed that Thai can perceive English final consonants correctly but often fail to pronounce them perfectly, and the phonetic representations in their L1 have been partly taken into English. Chinese EFL usually make modifications when producing English codas, indicating that L1 transfer as well as markedness, and sonority jointly leaded to a non-native learning outcome (Hansen, 2001).

In addition to comparative studies of different languages, there is a growing body of literature that recognizes English coda acquisitions in Chinese dialect background. Hu and Ye (2019) conducted an acoustic experimental study on the production of voiceless plosive codas by Chaoshanese EFL, and found out the main error types are described as no audible releases and vowel epenthesis. Similar research on Cantonese (Jia, 2010), Miao (Tian, 2003), Sichuan dialect (Ma, 1997) and Jianghuai dialects provided an extensive analysis and summary of phonological errors in English consonants production in various regions, with suggestions for teaching strategies and methods.

The research to date are based on experiments in different language contexts, and they bring meaningful

insights to the present study in terms of experimental design and analytical methods.

3. METHODOLOGY

3.1 Research Questions and Hypothesis

This study addresses the following research questions:

• Do Cantonese and Mandarin speakers perceive English single coda differently?

• If so, are there any specific differences between the two groups in terms of different types of consonants?

• How to explain the differences?

According to the distributive differences, we assume that the Cantonese-speaking EFL have advantages in the perception of English coda nasals compared to the Mandarin speakers, while perform more poorly in distinguishing plosives. No significant difference would be found in terms of fricatives and liquids.

3.2 Participants

15 Mandarin and 15 Cantonese EFL learners reportedly at intermediate proficiency levels of English were recruited and divided into two groups according to their mother tongue. They were all university students from different majors, with an average age of 23. Within each group, half of the participants were male and the rest female. Cantonese speakers were all from Guangzhou or Hong Kong, making sure that they speak standard Cantonese. A 5-individual group of English native speaker from North American and Britain also took part in the experiment as control.

3.3 Experiment Design

The experiment included 24 questions, and each question was made up of minimal pairs only differentiated in the coda place. Single codas are divided into four groups according to manner of articulations of the consonants: nasals, plosives, fricatives and liquids. The grouping was only for statistical purposes, but the participants were not informed of it and presented with all the questions in random orders.

Table 2
Example Questions

	A	B	C	D
Nasals	clam	clan	clang	none
	hun	hung	hum	none
Plosives	wick	wit	wig	none
	tribe	tripe	try	none
	set	said	sag	none
Fricatives	course	cores	court	none
	lies	lice	like	none
Liquids	tell	tear	ted	none

The questions, along with a record of the target option, were dispensed through Qualtrics and the participants can take them online. All the recordings were the standard British English pronunciations in Oxford Learner's Dictionary (Online). Participants were required to play the recording and choose the answer based on what they've heard, for those who cannot choose one from the A, B or C options, they should choose D. All the records can be played once only.

The data of the experiment was exported and recorded in *Excel*. *Jamovi* (Version 2.0.0.) was used to calculate the accuracy rates of different groups, and to analyze the correlation within and between groups. Histograms were made to show the performance of different groups, in order to verify the experimental hypothesis.

4. RESULTS AND DISCUSSION

4.1 Results

The average identification rate of single codas in native speaker group is 87.5%, while Cantonese-speaking and Mandarin-speaking groups show lower rates of 72.57% and 76.38% respectively. Although a significance is not reached in terms of the relationship between overall accuracy rate and speaker's native languages, the result reflects that native speakers show advantages in perceiving codas.

Table 3
Accurate Perception Rate of Each Type of Single Coda (%)

	English	Cantonese	Mandarin
Nasals	95	86.67	65.83*
Plosives	62.5	67.41	68.14
Fricatives	100	78.67	81.12
Liquids	100	93	88.34

Table 3 shows the perception rate of each type of coda consonants by English speakers, Cantonese speakers and Mandarin speakers. A Chi-square test were applied to test the results of each case between Cantonese and Mandarin group, and significant difference is marked with an asterisk ($p < 0.05$). What stands out in the table is the rate of nasals. In comparison with Cantonese speakers, Mandarin speakers are less sensitive to the differences between nasal codas, resulting in a lower accuracy rate in this category. However, for plosives, fricatives and liquids, no evidence is found for supporting that Cantonese and Mandarin speakers are prior to one another in distinguishing them.

There is a rather unexpected result that native speakers have an average of only 62.5% accuracy in plosives, even slightly lower than the non-native groups. A possible explanation for this, which also reveals a limitation to this study, is that the size of the native-speaking group is too small (only five participants in this group due to. When we examine the answers in detail, we found that the errors were all contributed by two of the five. With an inadequate sample like this, caution must be applied, as the findings might not be representative enough.

A more striking observation to emerge from the data comparison was that although the Chi-square test did not show any significant differences on plosives between two groups, the errors that they made when figuring out the plosives are actually diverse. Unlike Mandarin speakers, Cantonese find [+voicing, +plosive] feature much more difficult to identify. More specifically, they tend to interpret the voiced plosives as the voiceless ones, while voicing feature in fricatives is not a sticking point in perceiving. Note from Figure. 1 and Figure. 2, in the perception of voicing in coda plosives, Cantonese speakers made much more mistakes than Mandarin speakers.
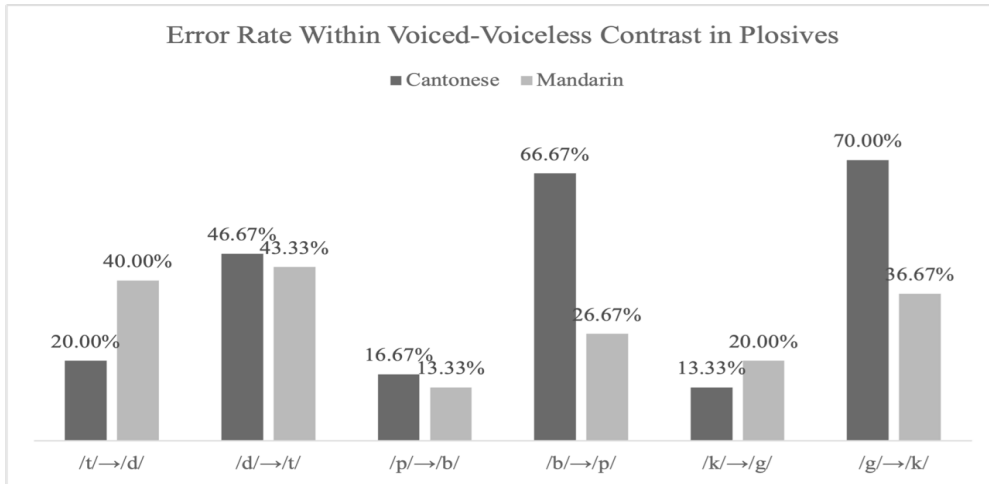

Figure 1
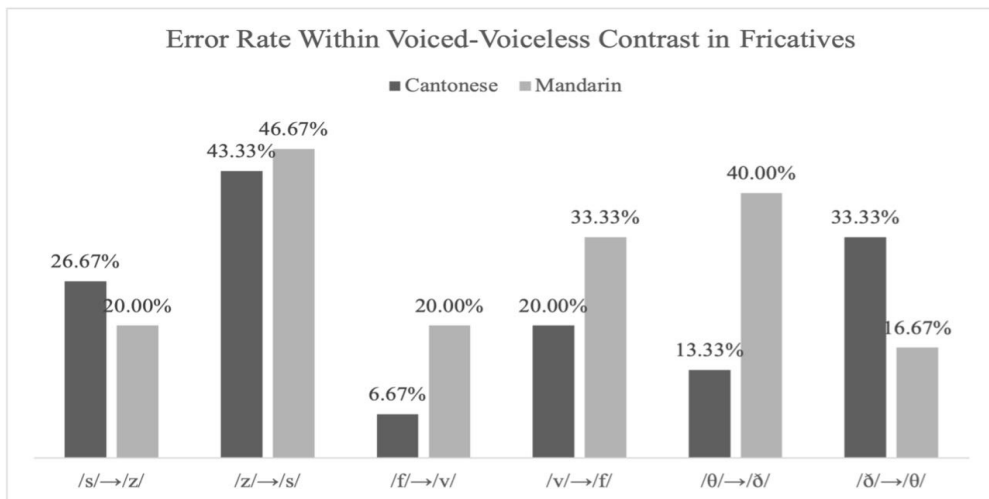**Error Rate Within Voiced-Voiceless Contrast in Plosives**

Figure 2
Error Rate Within Voiced-Voiceless Contrast in Fricatives

4.2. Discussion

This study found that L1 transfer constrain the development of an L2 phonology, and the following discussion examines how and to what extent it affected the participants' perception of single codas.

Comparatively, native-speaking participants had the best perception of codas, which broadly supports the work of other research in the field of language transfer. The fact that Cantonese speakers' similarly good performance in distinguishing nasals like native speakers reflects a positive L1 transfer: if the phonemes distribution in one's mother tongue is exactly the same as that in the target language, it will help the learner in creating the "sound map" in L2. Contrary, Mandarin participants had difficulties in perceiving the /m/ due to the loss of the bilabial nasal coda in their mother tongue.

Turning now to the perception of voiced-voiceless contrast by the two groups, it seems possible that these results are due to Equivalence Classification. In English, voiceless plosives are aspirated in some condition but voiced plosive codas are always unaspirated. However, in Cantonese and Mandarin, there are no voiced plosives, while aspirated voiceless plosives are phonemic, and /pʰ/ and /p/ are represented with "p" and "b" respectively. This usually cause confusion when Cantonese and Mandarin speakers learn English plosives. The distinction between

Cantonese unreleased stops [p̚] [t̚] [k̚] and English [b] [d] [g] is too small to be distinguished, making Cantonese speakers classify them all into a certain category. They have only one distinctive feature [-voiced], which is not contrastive in Cantonese, so it is fair to make speculation that this factor contributes to the high error rate in Cantonese group. The reason why Mandarin speakers have fewer negative interferences by L1 can supposedly be that the distribution of plosives is not the same with English.

Some constraints beyond pure phonological theories still exist, making EFL learners perceive English single codas unsatisfactorily. One possible factor is that some English teachers in China have weak awareness of voicing qualities in plosives, and many of themselves cannot pronounce them accurately, which stem from their limited educational resource when they were students. Even then, some teachers would turn to Chinese Pinyin during teaching process, and this erase the differences between the two languages. Another contributing factor is the limited testing method in China. Listening tests only account for a small part in this country with exam-oriented education, resulting in a neglect in phonetic perception and production.

5. CONCLUSION

In this study, a perception task was conducted to investigates Cantonese and Mandarin speakers' perception of English consonants in single codas. The result shows that English native speakers have highest accuracy rate in perceiving them, and Mandarin speakers performed less well than Cantonese speakers in the perception of nasal codas. Cantonese find the voiced-voiceless contrasts in plosives most difficult, and they show a tendency to identify the voiced plosives as the voiceless one. This is considered to be a negative transfer from their first language, and the education that ESL learners have received may also contribute to their non-native acquisition of single codas in English.

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