Tone Assignment in Second Language Prosodic Learning

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Abstract

In this study we observe the tone assignment patterns in Hong Kong Cantonese speakers' second languages. Based on an examination of new data and a review of previous studies, we verify some tone assignment regularities found in Cantonese speakers' second language pronunciations. We suggest that in the interlanguage phonological system of Cantonese speaker, the assignment of tones within a multi-syllabic word tend to follow the patterns /22-55/, /22-55-11/, /55-11/ or their variant forms, depending on the position of syllables with /55/ assigned. The generalization is also applicable to phrases, clauses and sentences.

In order to investigate whether these patterns are found when Cantonese speakers learn non-tonal languages in general, we examine three non-tonal languages, Japanese, Italian and Korean, pronounced by Hong Kong Cantonese native speakers who have no experience in learning these languages. The data support the generalization we propose.

1. Introduction

In Hong Kong Cantonese, there are nine lexical tones: four level tones (/55/,/33/,/22/,/11/) and two rising tones (/35/,/13/) for open syllables or syllables with nasal final consonants; as well as three short tones (/5/,/3/,/2/) for syllables with stop final consonants (fig. 1). The phonetic values of the tones are not consistent in descriptions of Cantonese tones. (See [2] p.5 for more details about variations in descriptions of Cantonese tone values). Since the actual tone values are not the major concern of this paper, for clarity, this paper will mainly base on transcriptions adopted from [9].
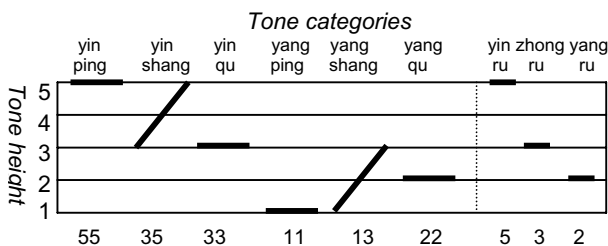

Figure 1: *Tone Categories and Relative Tone Height of Hong Kong Cantonese*

Tone language speakers use lexical tones to distinguish the meanings of different words in their native languages. They usually assign tones to each syllable of the words when speaking a second language [3],[8]. Earlier studies based on observations regarding English loanwords show that stressed and unstressed syllables are usually assigned high and low level tones respectively [4], [6], [10].

Loanwords in Cantonese covertly reflect the strategy of tone assignment. However their formation is largely affected by availability of existing written Chinese characters. For example, although syllable such as /fi/ is frequently pronounced, it is seldom used in loanwords as it cannot be represented by existing characters (see below example 'coffee'). Beside this, large number of existing loanwords use traditional written forms based on other Chinese dialects, making the trace of tonal transcription opaque (see 'cocaine'). Sometimes even the meanings of the words used for phonetic transcriptions are taken into consideration, for example the character used for /si/ for 'hippies' carries the meaning of 'an individual'.

English	Cantonese Speakers' English	Cantonese Loanword
'Wire'	/wai a/	/wɐi ja/
	/55-11/	/55-35/
'Coffee'	/kʰo fi/	/ka fe/
	/55-11/	/33-55/
'Hippies'	/hɪpʰis/	/hei pʰei si/
	/55-11/	/55-11-22/
'Cocaine'	/kʰou kʰen/	/ho kʰa jɐn/
	/22-55/	/35-55-55/

A Further problem is, in the first example 'Wire', assignment of the rising tone /35/ to the final syllable is commonly found in other loanwords. This assignment pattern does not seem to be a result of direct transformation from the foreign word, because the Chinese character used for /ja/ does not have this tone.

As seen above, tone assignment in loanwords is different from that in interlanguage. Therefore it is important to note that in this study we will observe speakers' interlanguage instead of loanwords.

2. Preliminary Observations

Our primary observations are based on Cantonese speakers' English, a language learned in every classroom since primary schooling in Hong Kong. We observed that high level tones are almost always used at primary stress in English, while the regularity of tone assigning pattern to secondary and tertiary stress is less prominent.

Cantonese Tone	/22-**55**/	/**55**-11/
English word	re'sult	'paper

From our observations it is very likely that when a multi-syllabic single word in foreign language is pronounced, only three tone categories, /55/, /22/ and /11/ are assigned. In a word with two consecutive syllables, /22-55/, /55-55/ and /55-11/ are almost always observed whenever the two syllables are assigned with different tones. /11-55/ or /55-22/ or other combinations are rare.

These patterns are also found in other multi-syllabic words. Listed below are some examples from our observations. They suggest that in each multi-syllabic single word, at least one of the syllables is very often assigned /55/. **The remaining syllables preceding the /55/ tone(s) are often assigned as /22/ and the remaining ones following it/them as /11/ tone(s).** The pattern remains consistent when number of syllables increased within the same word:

/22-55-11/   /55-11-11/   /55-5-55-11/
lo'cation   'photograph   disser'tation

/22-22-55/   /22-22-22-22-55-11/
repro'duce   capitali'zation

From these observations, the patterns can be generalized as (1).

$$22 -\ldots- 22 - 55 -\ldots- 55 - 11 -\ldots- 11$$

repeating   repeating   repeating
p times   q times   r times   (1)

We then try to list exhaustively the possibilities of (1) in trisyllabic and tetrasyllabic words, in order to verify this generalization.

Trisyllabic words:

p q r	Pattern	Example
0 1 2	55 11 11	photograph
2 1 0	22 22 55	reproduce
1 1 1	22 55 11	location
0 2 1	55 55 11	freelancer
1 2 0	22 55 55	fiancée
0 3 0	55 55 55	violin
0 0 3	11 11 11	NOT FOUND
3 0 0	22 22 22	NOT FOUND
1 0 2	22 11 11	NOT FOUND
2 0 1	22 22 11	NOT FOUND

Tetrasyllabic words:

p q r	Pattern	Example
0 1 3	55 11 11 11	category
1 1 2	22 55 11 11	analysis
2 1 1	22 22 55 11	universal
3 1 0	22 22 22 55	unrepresent(ed)
0 2 2	55 55 11 11	housewifery
1 2 1	22 55 55 11	Sukiyaki
2 2 0	22 22 55 55	unimportant (~issue)
0 3 1	55 55 55 11	preparation
1 3 0	22 55 55 55	original (~idea)
0 4 0	55 55 55 55	interviewee
4 0 0	22 22 22 22	NOT FOUND
0 0 4	11 11 11 11	NOT FOUND
3 0 1	22 22 22 11	NOT FOUND
1 0 3	22 11 11 11	NOT FOUND
2 0 2	22 22 11 11	NOT FOUND

From these data we modified (1) to (1'), by restricting the value of q as non-zero.

$$22 -\ldots- 22 - 55 -\ldots- 55 - 11 -\ldots- 11$$

repeating   repeating   repeating
p times   q times   r times   (1')

where p≥0, q>0 and r≥0.

Previous studies tend to generalize rules which based on direct mapping from the target words to the second language speakers' pronunciation of words (for example, see [3]). Our generalization does not intend to show the same kind of mapping because we cannot always guarantee their relationship. Let us illustrate it by the following example. It is not uncommon for a Cantonese speaker who learns the English verb "re'cord", and the noun "'record", but still pronounces both as "re'cord" frequently. Comparing the prescribed target form and the observed second language form of the noun such as 'record → 22-55 does not display a cause-effect relationship. Therefore, in our generalization, **we only describe the most frequently observed forms in second language, but not the mapping from the target words to the second language words.**

The generalization of tone assignment in (1') is very consistent if we consider single words. The generalized pattern can also be applied to describe tone assignments in larger syntactic domains such as compound words, phrases, clauses and sentences. We could find examples in the data adopted from [8] (notations of tone categories adapted).

22 55   55   55 11

I take four   subjects   (p.60)

However some violations to this generalization is inevitable at phrase or clause boundaries. (See arrows):

22 55 **22** 55 55   55 55   55 55   55 55   **22** 55 11 11

the use of English, Chinese history, Chinese and geography.

⇧   ⇧
                                              (p.60)

Cantonese speakers who study Japanese produce similar patterns. Japanese uses 'high'(H)-'low'(L) to contrast word meaning. Examples are as follow:

Cantonese Tone	/22-55/	/55-11/
Japanese Pitch	L H	H L
Japanese	hashi	hashi
meaning	'chopsticks'	'bridge'

/22-55-11/	/55-11-11/
L H L	H L L
anata	kinoko
'you'	'mushroom'

/22-55-55-11/ /22-55-55-55-11/
L H H L L H H H L
mizuumi atarashii
'lake' 'new'

We must mention the fact that Cantonese speakers' Japanese has a wide range of variation in tone assignment compared to English. For example, speakers very often fail to distinguish between H-L and L-H for both meanings of 'hashi'; similarly, 'anata' can have variants such as L-H-H and L-H-L. However, even in these cases the assigned tone patterns still follow (1').

Since the same pattern is found consistently in both Cantonese speakers' English and Japanese, which have different phonological structure, we suppose that Cantonese speakers tend to follow (1') when they imitate non-tonal languages in general. To support our hypothesis above, we simulated a "classroom learning" situation for beginners where learners learn their first words by imitating "teacher's" pronunciations.

3. Methodology

The imitation test is conducted with two subjects. One male and one female, in their twentieths age, were asked to listen to three groups of words in three different foreign languages respectively, and imitate each word right after it is being heard. Both subjects had never studied any one of these languages and they were not told what languages they were going to listen. Using languages unintelligible to the subjects in this test rejects the possibility that the subjects pronounce the words by recalling from what they have learnt before. 20 dissyllabic and trisyllabic words in Korean, Italian and Japanese were selected randomly from language learning audio materials for elementary level learners [1],[5],[7]. The distributions in terms of number of syllables are listed below:

Table 1: *Number of words used in the imitation test*

	Total	**disyllabic**	**trisyllabic**
Korean	20	17	2
Italian	20	16	4
Japanese	20	15	5

Data are listened and transcribed into tone categories independently by the two authors, who are native speakers of Cantonese. To assist our explanation after transcription, we need from each subject their relative tone frequency of the four level tones, with which we can use to identify more objectively the tones assigned in their second language. To achieve those data, subjects were asked to read a four-digit sequence in Cantonese before reading out each target word. The four digits are: 0, 2, 4, 1, pronounced [lɪŋ], [ji], [sei], [jɐt] with tones /11,22,33,55/ respectively. For example:

Word played Speaker pronounced Tones assigned
colore [lɪŋ ji sei jɐt **kolole**] /11-22-33-55-**22-55-11**/
　　　　　　　　imitated　　　　　　imitated
　　　　　　　　word　　　　　　　　word

It is shown in figure 2, where we can compare the fundamental frequencies (F_0) of each token and confirm it with what we transcribed.
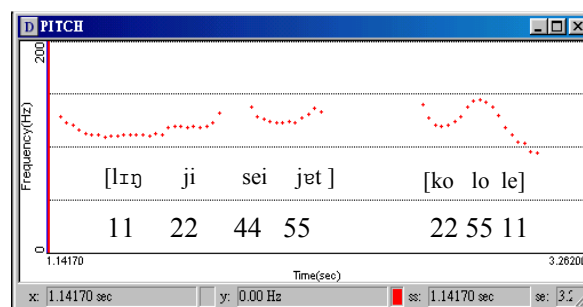

Figure 2: *F0 of Italian /colore/ 'color' by subject 1.*

4. Results

Speech sounds recorded were analyzed with CSL software. The transcribed patterns are sorted. Totally three disyllabic and four trisyllabic patterns that follow our generalization are found. They are /55-55/,/55-11/,/22-55/and /22-55-11/, /55-11-11/, /22-55-55/, /55-55-55/, as shown in table 2. Almost all patterns fall into (1'), except one Korean word pronounced by subject 1:

	Subject 1			Subject 2		
Tone pattern	**Kor**	**Ita**	**Jap**	**Kor**	**Ita**	**Jap**
55-55	15	0	0	8	0	0
55-11	1	15	3	3	15	3
22-55	1	1	12	7	1	12
35-11 (violation)	1	0	0	0	0	0
Total	18	16	15	18	16	15

Table 2a: *Number of assigned patterns of the two subjects: disyllabic syllables*

	Subject 1			Subject 2		
Tone pattern	**Kor**	**Ita**	**Jap**	**Kor**	**Ita**	**Jap**
22-55-11	1	2	2	0	2	2
55-11-11	0	2	0	1	2	0
22-55-55	0	0	3	0	0	3
55-55-55	1	0	0	1	0	0
Total	2	4	5	2	4	5

Table 2b: *Number of assigned patterns of the two subjects: trisyllabic syllables*

Results for both subjects are identical in Italian and Japanese data. However in the Korean data we found some differences in two subjects (see next section). Table 2a shows that subject 1 prefers /55-55/ more while subject 2 prefers /22-55/ for the same words.

5. Discussions

Generally, speakers tend to impose the above mentioned tone patterns on neighboring syllables, for example /22-55/ for 'low-high' assignment (figure 3). In some cases target language syllables with small pitch differences could still fall into these patterns.

In Japanese language the primary determination of accent is 'High' and 'Low' in pitch. Both subjects can easily detect high pitch from a set of syllable and assign the tone patterns to it.
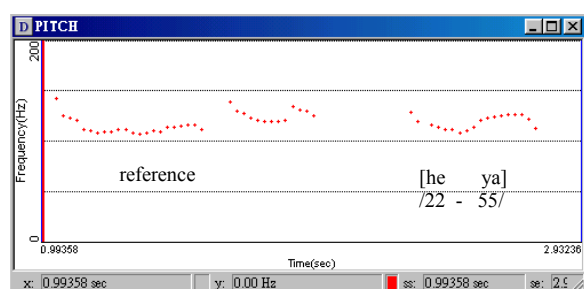

Figure 3: F0 of Japanese /heya/ 'room' by subject 1.

However according to many evidences in our data it is clear that this assignment of tones is highly subjective regardless of the subtle pitch difference in the target language. Figure 4 illustrates that although the pitch height of the two Korean syllables show very little difference and is not clear that which syllable is higher, the subject still put them into tones /55-11/.
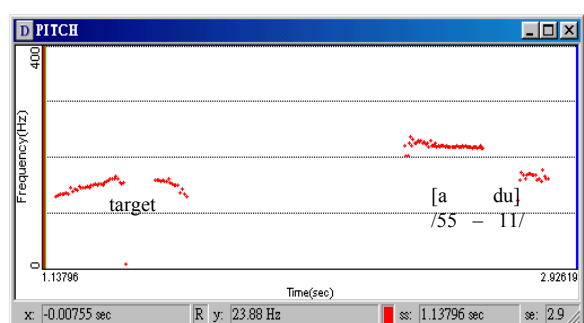

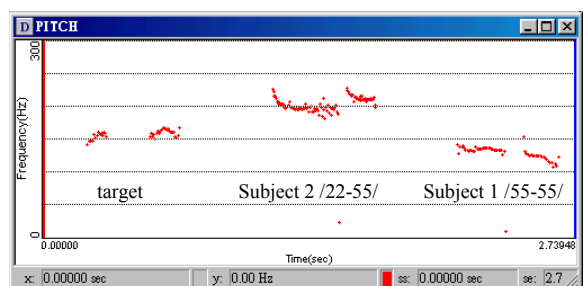Figure 4: *Comparison of F0 of target word and productions of subject 2. Korean, /adur/ 'son'*

Figure 5: *F0 of target word and productions showing differences between two subjects. Korean, /kəmdo/ 'swordmanship'*

As mentioned, there is diversity in the Korean data between the two subjects. An example is shown in figure 5, the difference of F_0 of the syllables in the target word is not obvious. This further implies that tone assignment might not be relying solely on pitch height, but also the individual perception of the native speakers.

6. Conclusion

Tone assignment in second language prosody seems to be a common strategy used by tone language speakers when learning foreign languages. We propose a generalization upon the observed patterns in Cantonese speakers' second languages.

We have also observed three non-tonal languages, Japanese, Italian and Korean, pronounced by Hong Kong Cantonese native speakers. Randomly selected words in these three languages in general trigger similar tone patterns assigned by our Cantonese speaking subjects. We thus conclude that Cantonese speakers tend to follow this generalization when they imitate an unintelligible foreign non-tonal language.

The question remains is how these patterns emerge: 1. why only three tone categories are used in most cases? 2. why /55/ must be preceded by /22/ but followed by /11/? Inconsistency in tone assignments when our two subjects imitating Korean language may suggest that the emergence of tone assigning patterns we observed may have multiple causes. Further data collection is necessary to find out these causes.

7. Acknowledgement

8. References

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