

A Comparative Study on Tone Realization in Cantonese-Accented Mandarin and Standard Mandarin

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Abstract

The paper investigates tone realization in monosyllabic and disyllabic words in Cantonese, Cantonese-spoken Mandarin and Standard Mandarin, focusing on the deviations of tone realization in Cantonese-spoken Mandarin from standard Mandarin in monosyllabic and disyllabic words. The analysis on monosyllabic and disyllabic tone patterns shows that most of the tone deviations in Cantonese-accented Mandarin made by Guangdong Cantonese speakers resulted from negative transfers of their native language, Cantonese.

1. Introduction

Spoken Chinese comprises many regional varieties, called dialects. There are 9 dialectal areas in China: Guan, Jin, Wu, Hui, Xiang, Gan, Kejia, Yue and Min. People from different dialectal areas might not be able to communicate with each other simply because the differences among the dialects are so significant.

Standard Mandarin, or Putonghua, would be a good choice as a sharing basis. Most people in China are bilingual Chinese speakers, i.e. native dialect and Mandarin. Although lots of people CAN speak Mandarin, they speak it with different accents, depending on how well they grasp the language. The Mandarin they speak is always affected by their native dialects phonetically, lexically and syntactically.

Researchers for Chinese speech recognition have encountered huge problems because among the 1.3 billion Chinese, very few could speak Standard Mandarin. Most people speak Mandarin as a second language and the Mandarin they speak is unavoidably influenced by their first language, whatever dialect that is. Among the dialect areas, Mandarin with Cantonese accent is one of the most challenging cases.

Phonetic research of Cantonese-spoken Mandarin has to be done in parallel with Cantonese, Mandarin, and Cantonese-spoken Mandarin. Such research will benefit speech recognition and synthesis, pronunciation evaluation and language teaching as well.

We have been concentrating on comparative study of phonetic characteristics between regional Mandarin and standard Mandarin and have achieved good results on Wu Dialect [4] and MinNan dialect [5].

As one of the major Chinese dialect, also the most influential Chinese dialect after Mandarin, Cantonese has not received enough attention in the phonetics and linguistics societies [1][2].

Eric Zee and Wai-Sum Lee have done many researches on tone patterns of monosyllabic and disyllabic words in

Hong Kong Cantonese, as well as their duration patterns [8-10].

There are a lot more research activities for Mandarin [6][7], but little on Cantonese-accented Mandarin. In this article, we try to analyze tone realization in Cantonese, Cantonese-accented Mandarin and Standard Mandarin, find out what kind of errors in tone realization Cantonese speakers tend to make and why, based on extensive phonetic comparative experiments.

The paper first gives a brief description of database used in this study, and an introduction of Mandarin and Cantonese citation tone system, followed by various experimental results of tone patterns and realizations on monosyllabic and disyllabic words in three languages, with a detailed analysis of tone errors made by Cantonese speakers, and concludes with a summary.

2. Database Description

There are three databases used in this study, Cantonese, Cantonese-Accented Mandarin, and Mandarin respectively.

Nokia-CASS-CAN is a Cantonese database. Each speaker needs to record about 310 monosyllabic words, 110 phonetically rich disyllabic and 205 phonetically rich sentences.

Nokia-CASS-CAM is a Cantonese-Accented Mandarin database recorded by the same speakers in Nokia-CASS-CAN. Each speaker needs to record about 150 monosyllabic words, 320 disyllabic words, and 150 phonetically rich sentences.

2 male and 3 female native Cantonese speakers with medium accent when speaking Mandarin were selected from the above 2 databases, whose speech data were used in this study.

Nokia-CASS-MAN is a Standard Mandarin database [4][5], which has been used in our previous studies on regional Mandarin vs. Standard Mandarin. It consists of monosyllabic, disyllabic and tri-syllabic words, as well as phonetically rich sentences. We selected 5 male and 5 female speakers for this comparative study.

The databases were collected in a quiet office environment, using a laptop plus M-Audio MobilePre USB sound card, and a condenser microphone, by CASSRecorder software, with 16 K Hz sampling and 16 bit coding.

Manual annotation has been carried out for the databases, using C-TOBI system to annotate syllable, initial/final and prosodic boundaries in PRAAT. The acoustic features used are duration of initials and finals, and F0 contours of each syllable. The frequency range of each speaker is represented by a 5-letter tone system.

3. Citation tone system for Mandarin and Cantonese

3.1. Phonological tone system for Mandarin

There are four citation tones in Mandarin, i.e. Tone 1 or YinPing (55), Tone 2 or YangPing (35), Tone 3 or ShangSheng (214), and Tone 4 or QuSheng (51). In connected speech, the tone of a syllable changes according to its acoustic context, which is called Tone Sandhi. A good example of Tone Sandhi in Mandarin is when a ShangSheng tone (214) is followed by another ShangSheng, the first ShangSheng is realized as rising like YangPing (35); and a ShangSheng before the other tones will change from (214) to (211), which is not necessarily true as shown in section 4 based on speech corpus analysis.

3.2. Phonological tone system for Cantonese

According to Li Xinkui etc. [3], there are 11 tones in Cantonese, i.e. XiaYinPing (55), ShangYinPing (53), YinShang (35), YinQu (33), ShangYinRu (5), XiaYinRu (3), YangPing (21), YangShang (13), YangQu (22), YangRu (2) and XinRu (35), in which the entering tones are underscored. The high falling tone (53) has (55) as a free (stylistic) variant. , Tone (55) and (53) tend to be commixed in younger generation.

Compare to the Mandarin tonology system, the Cantonese tonology system is much more complicated with more tones and entering tones. And there is no neutralized tone in Cantonese. They both have (55) and (35), but there is no (214) in Cantonese.

4. Experimental Results

4.1. Monosyllabic tone realization

At first, we compared F0 contour for monosyllabic tones among standard Mandarin by Beijing speakers, Cantonese-accented Mandarin and Guangzhou Cantonese and analyzed the deviations of Cantonese-accented Mandarin from standard Mandarin tone realizations. The results are shown in Table 1, 2, and 3 respectively. Traditional definitions of tone contours were compared with metrical values obtained from the corpus in 5 letter tone system.

For all figures in this paper, the X-axis is normalized duration and Y-axis is normalized value in 5 letter system. For Cantonese, entering tones are denoted by underscored values like 33.

Table 1: Standard Mandarin mono-syllabic tones

Tone	1 YinPing	2 YangPing	3 ShangSheng	4 QuSheng
Traditional values	55	35	214	51
Metrical values	55	35	213	51

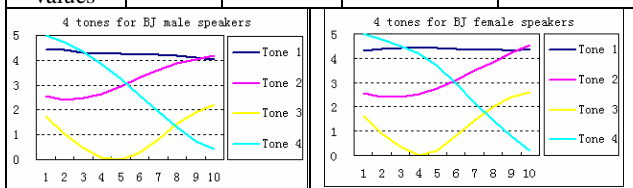


Figure 1: Standard Mandarin monosyllabic tone realization

Table 2: Monosyllabic tones of Cantonese-accented Mandarin

Traditional values	55	35	214	51
Metrical values	44	13	21	51

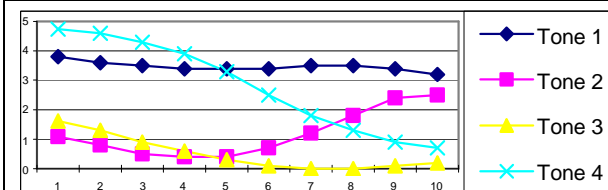


Figure 2: Cantonese-accented Mandarin mono-syllabic tone realization

Table 3: Mono-syllabic tones of Guangzhou Cantonese

Tone	1	1r	2	2r	3	3r	4	5	6	6r	9
Traditional values	55	5	35	35	33	33	21	13	22	2	53
Metrical values	44	44	24	34	33	33	21	13	22	32	42

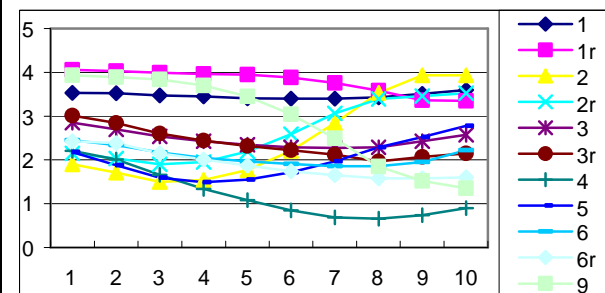


Figure 3: Guangzhou Cantonese monosyllabic tone realization

The above tables and figures explain many subjective observations known in Cantonese dialectology research community.

- ShangSheng tone (214) in Cantonese-accented Mandarin is realized as a (21) tone acoustically, because there is no flexural tone in Cantonese like (214) tone. Cantonese speakers tend to replace Mandarin tone (214) by (21) in Cantonese, which is primarily perceived as a “low” tone.
- Cantonese XiaYinPing Tone (55) tone is realized a bit lower as 44 than traditionally denoted 55. Not surprisingly, when Cantonese speakers speak Mandarin, their Mandarin YinPing tone (55) is also realized a bit lower, about 44, instead of 55.
- For Cantonese-Accented Mandarin Cantonese, ShangYinPing tone has a tone value 13, it is a copy of that for Yangshang tone in Cantonese as shown in Table 2 and table 3. This variety of Cantonese ShangYinPing tone might be a result of the fact that, much many Mandarin characters with Yangping tone are low rising tone in Cantonese.

4.2. Disyllabic tone patterns

The F0 contour of disyllabic tone patterns in standard Mandarin, Cantonese and Cantonese spoken Mandarin were compared and visualized in figures 4, 5 and 6.

Since the entering tones are similar to their slack counterparts, with similar characteristics but different durations, we only compare 7 tones to simplify the problem.

This study proves the transitional theory in second language acquisition from prosody acquisition point of view: all the tone deviations of Cantonese-accented Mandarin from standard Mandarin, pitch height or contour deviations could be rooted in the Cantonese tone systems.

- Mandarin Yingping tone (55) was realized as (44) in Cantonese-accented Mandarin at word-final position of a disyllabic word. As shown in the mono-syllabic words already, Mandarin Yinping tone (55) is realized as (44) in position of left syllable in a disyllabic word, same as how YinPing is realized in Cantonese.
- As shown in mono-syllabic analysis, Cantonese speakers' application of YangShang (13) on Mandarin YangPing (35) resulted in a lower YangPing realization in Cantonese-accented Mandarin. When YangPing is at word-initial position of a disyllabic word, Cantonese-accented Mandarin has a lower pitch than that of standard Mandarin, in the same contour and value as Cantonese YangShang in word initial position.
- Mandarin ShangSheng tone (214) was realized as (21) in Cantonese-accented Mandarin at word-initial position. Because there is no flexural tone in Cantonese, when Cantonese speakers read disyllabic word ending with ShangSheng, they make it similar to Cantonese YangPing tone in word-final position.
- In standard Mandarin, when ShangSheng (214) is at word-initial position in a disyllabic word, followed by a YinPing, YangPing or QuSheng, the ShangSheng would change to 32 and the beginning is a bit higher, close to 4. In Figure 5, when the ShangSheng in word-initial position was realized as 31 in Cantonese-accented Mandarin when followed by other tones than another ShangSheng, similar to the pattern in an isolated Cantonese YangPing tone in the same position. Therefore, Cantonese speaker tends to realize Mandarin ShangSheng using Cantonese YangPing.
- In standard Mandarin disyllabic words, when QuSheng (51) is in word-final position, it was realized as 53, as shown in Figure 4. From Figure 6, Cantonese ShangYinPing (53) was realized as 52 in word-initial position. While in Cantonese-accented Mandarin, QuSheng was realized with lower pitch height in both beginning and ending of the tone, roughly as 42 in Figure 5, which takes the same ending of Cantonese ShangYinPing in same position, but not the beginning. That is to say, when Cantonese read disyllabic words with QuSheng in word-initial position, the ending part of tone seems similar to that of the words with Yangping tone as the initial position in Cantonese.

5. Conclusions

We investigated the tone pattern difference among standard Mandarin, Cantonese-accented Mandarin and Guangzhou Cantonese in monosyllabic and disyllabic words. As one

important part of tonal language acquisition, tone deviations of accented Mandarin mostly result from negative transfer of native language, i.e. Cantonese in this article, with some open issues to be further studied. More thorough analysis on duration and pitch range, as well as stress patterns are under investigation.

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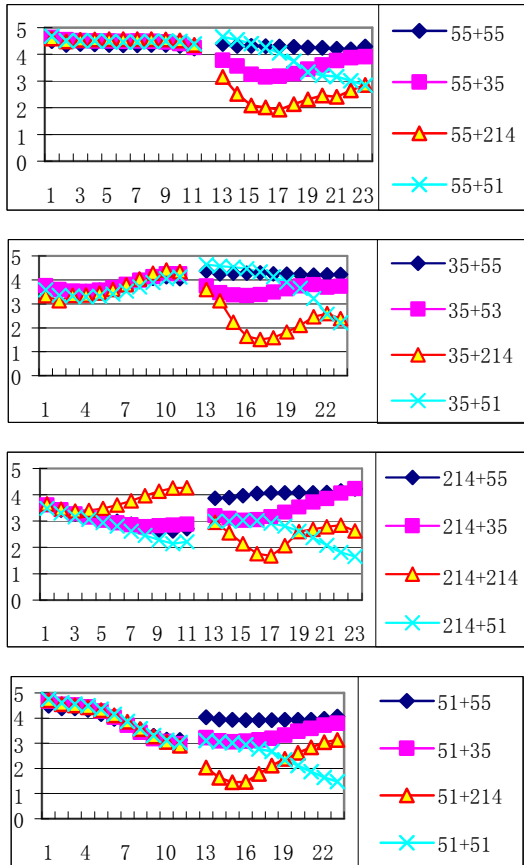


Figure 4: Disyllabic tone patterns of standard Mandarin

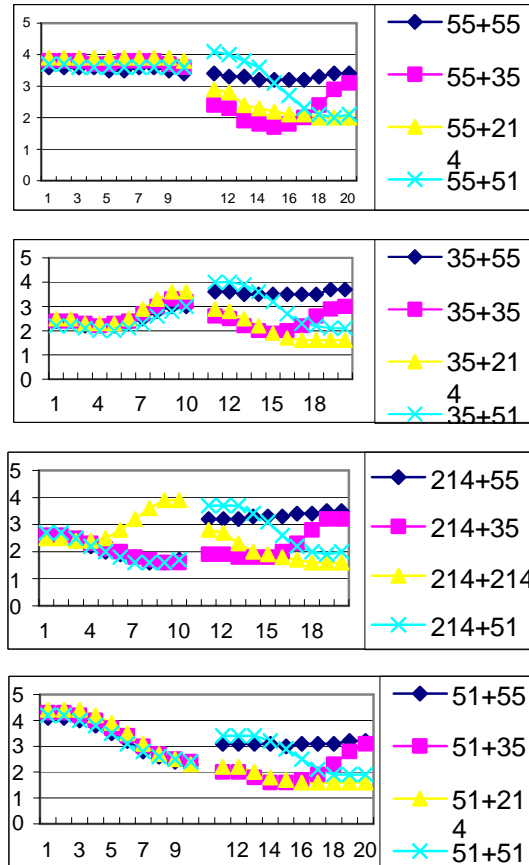


Figure 5: Disyllabic tone patterns of Cantonese-accented Mandarin

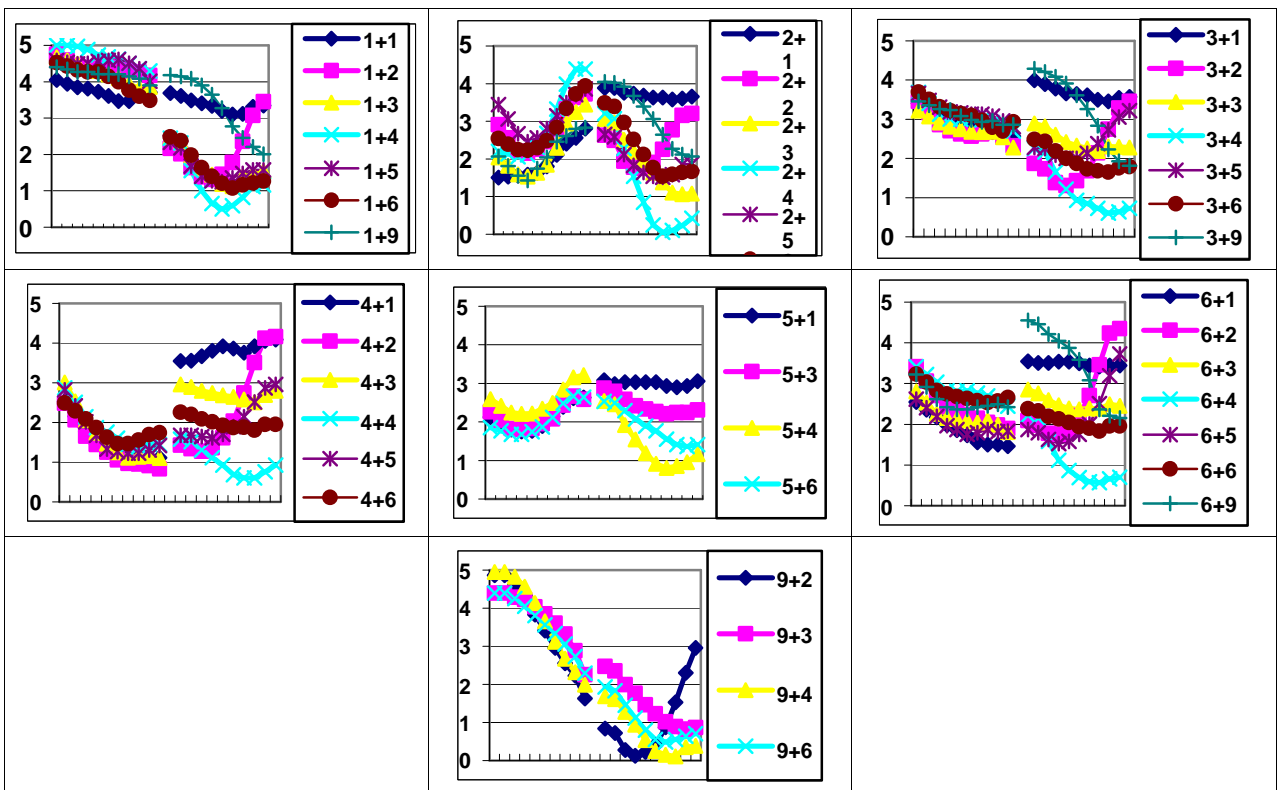


Figure 6: Disyllabic tone patterns of Cantonese