

ARE THERE SIX OR NINE TONES IN CANTONESE?

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ABSTRACT

Most contemporary linguists adopt a six- over nine-tone system in Cantonese. This study confirmed the psychological validity of the six-tone system through Cantonese speakers' knowledge of Mandarin tone pronunciations using a Mandarin *pinyin* transcription task. There are pronunciation relationships between Cantonese and Mandarin at the lexical level and previous studies have shown that Cantonese speakers were more accurate in giving the Mandarin pronunciation when the word followed the dominant correspondence than when it did not. Results from ANCOVA and regression analysis showed that the pronunciation correspondences using the six-tone system accounts better for the accuracy data than the nine-tone system, thus providing empirical support for the former.

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1. INTRODUCTION

Traditional Chinese linguists have classified Cantonese as a nine-tone system as shown in Table 1 [e.g., Cheung, 1]. However, most contemporary linguists mention that tones 7, 8 and 9 actually have the same pitch height and contour as the corresponding level tone categories 1, 3 and 6 respectively [e.g., Bauer & Benedict, 2; Matthews & Yip, 3]. The only difference between these two sets of tones is that the former must be realized on syllables with unreleased coda /p/, /t/ or /k/ and have shorter syllable durations than the latter. Therefore, the former have been treated as allotones of the latter, thus classifying Cantonese as having only six contrastive tones.

Table 1: Cantonese tone system (nine-tone version)

Tone	Description	Example
1	High level	詩 'poem' <i>si1</i>
2	High rising	史 'history' <i>si2</i>
3	Mid level	試 'try' <i>si3</i>
4	Mid-low falling	時 'time' <i>si4</i>
5	Mid-low rising	市 'city' <i>si5</i>
6	Mid-low level	是 'yes' <i>si6</i>
7	High stopped	一 'one' <i>jat7</i>
8	Mid stopped	八 'eight' <i>baat8</i>
9	Mid-low stopped	日 'day' <i>jat9</i>

These two views of Cantonese tone classification have not been tested empirically, but their psychological validity can be examined indirectly through research that shows that Cantonese speakers' phonological knowledge of Mandarin words is affected by the pronunciation relationships between Cantonese and Mandarin in different sublexical units (i.e., onsets, rimes and tones) [Chu & Taft, 4, 5]. For example, 89% of the words that are pronounced tone 2 in Cantonese are pronounced tone 3 in Mandarin (e.g., 找 'find', pronounced *zaau2* in Cantonese and *zhao3* in Mandarin) and Cantonese speakers were found to be more accurate in giving the Mandarin tone pronunciation in these words than in those that did not employ the dominant pronunciation correspondence (e.g., 搜 'search', pronounced *sau2* in Cantonese and *sou1* in Mandarin).

The tone pronunciation relationships between Cantonese and Mandarin are different in the six- and nine-tone system. As the documented tone pronunciation relationships were based on the nine-tone system [Tsang-Cheung, 6], the figures based on the six-tone system were recalculated and shown in Table 2. Words which are pronounced Cantonese tone 7 in the nine-tone system, for example, are treated as variants of Cantonese tone 1 in the

six-tone system. Hence, the 83% (845 words) shown in the six-tone system in Table 2 represents words which were classified as tone 1 (787 words) and tone 7 (58 words) in the nine-tone system that are pronounced tone 1 in Mandarin. As seen from the table, Cantonese tone 7 words correspond to Mandarin tone 4 words 40% of the time using the nine-tone system. However, if they are treated as a variant of Cantonese tone 1 words in the six-tone system, this corresponds to Mandarin tone 4 words only 9% of the time. Similarly, Cantonese tone 8 words correspond to Mandarin tone 1 words 32% of the time in the nine-tone system but this corresponds to Mandarin tone 4 words just 12% of the time if they are treated as a variant of Cantonese tone 3 words in the six-tone system.

Chu and Taft [4, 5] argues that beginning Cantonese learners use the sublexical route in producing Mandarin words through Cantonese-Mandarin pronunciation relationships, while advanced learners gradually shift to the use of the lexical route which retrieves the stored correct Mandarin pronunciation. Therefore, beginning Cantonese learners of Mandarin may think the word ‘test’ 測 (pronounced *caak7* in Cantonese and *ce4* in Mandarin) is pronounced

Mandarin tone 4 or tone 1 equally often if Cantonese words are represented using nine tones, as these are the equally dominant correspondences (40% and 35% respectively). On the other hand, if Cantonese has an underlying six-tone system, they may think the word is pronounced Mandarin tone 1 instead of tone 4 as the former has a far more dominant relationship (83% correspondence) than the latter (9%). If beginning Cantonese learners of Mandarin do not have any lexical knowledge about the Mandarin pronunciation of the word, their pronunciation accuracy is hypothesized to be related to the pronunciation correspondence percentage between Cantonese and Mandarin. Hence, words with high and low Cantonese-Mandarin tone correspondence percentages will be reflected by high and low accuracy rates respectively.

Whether Cantonese is mentally represented as a six- or nine-tone system can, therefore, be determined by comparing accuracy rates among different categories and establishing through a regression analysis whether the Cantonese-Mandarin correspondences of the six- or nine-tone system are more consistent with the errors made by the Cantonese speakers in a Mandarin *pinyin* transcription task. If Cantonese is

Table 2: Pronunciation relationships between Cantonese tones 7 to 9 and Mandarin words.

Cantonese tone	Mandarin tone	Correspondence percentage		Examples	Pronunciation	
		9-tone system	6-tone system		Cantonese	Mandarin
7	1	35% (58)	83% (845)	吸 ‘suck’	<i>kap7</i>	<i>xi1</i>
	2	16% (26)	5% (49)	級 ‘level’	<i>kap7</i>	<i>ji2</i>
	3	8% (14)	2% (25)	筆 ‘pen’	<i>bat7</i>	<i>bi3</i>
	4	40% (67)	9% (88)	測 ‘test’	<i>caak7</i>	<i>ce4</i>
	neutral	1% (1)	0% (5)	的 ‘adverbial particle’	<i>dik7</i>	<i>de0</i>
8	1	32% (69)	12% (88)	吃 ‘eat’	<i>hek8</i>	<i>chi1</i>
	2	23% (50)	7% (51)	國 ‘country’	<i>gwok8</i>	<i>guo2</i>
	3	12% (25)	7% (48)	百 ‘hundred’	<i>baak8</i>	<i>bai3</i>
	4	33% (70)	74% (540)	闊 ‘wide’	<i>fut8</i>	<i>kuo4</i>
9	1	6% (16)	3% (21)	滴 ‘drop’	<i>dik9</i>	<i>di1</i>
	2	42% (115)	15% (123)	核 ‘nuclear’	<i>hat9</i>	<i>he2</i>
	3	2% (5)	3% (22)	乙 ‘second’	<i>jyt6</i>	<i>yi3</i>
	4	50% (139)	79% (638)	入 ‘enter’	<i>jap6</i>	<i>ru4</i>
	neutral	0% (1)	0% (2)	着 ‘adverbial particle’	<i>zoek9</i>	<i>zhe0</i>

Remarks: The number of words using a particular pronunciation correspondence is shown in brackets.

represented as six tones, we hypothesize that Mandarin tone 1 words will be the most accurate for Cantonese tone 7 words while Mandarin tone 4 words will be the most accurate for Cantonese tone 8 words (see Table 2). If Cantonese is represented as nine tones instead, Mandarin tone 1 and 4 words should be most accurate and have similar scores, while Mandarin tone 3 words will be the least accurate for words pronounced in Cantonese with tones 7 or 8. In the regression analysis, the pronunciation correspondences using the six-tone system should account for a larger amount of variance of accuracy rate than those using the nine-tone system. The participants were also asked to indicate their confidence in each of their Mandarin pronunciations, so that prior lexical knowledge about the Mandarin pronunciation could be controlled for.

2. METHOD

2.1. Participants

Forty native Cantonese speakers from the Chinese University of Hong Kong participated in this study. They all received formal education in Mandarin for at least three years.

2.2. Materials

Sixty-four monosyllabic Mandarin words were selected in this study. Half were pronounced with tone 7 and the other half with tone 8 in Cantonese according to the nine-tone system. Equal numbers of these words were pronounced with each of the four tones in Mandarin. Words pronounced with Cantonese tone 9 were not included due to the insufficient number of words which can be used to balance the four tones in Mandarin. The words pronounced with the four Mandarin tones were matched on the number of strokes and word frequency. All words were presented in a pseudo-randomized order. Two versions of the list were created with the order of the words reversed, with an equal number of participants responding to each.

2.3. Procedure

Participants were seated in a quiet room and asked to write down in *pinyin* the Mandarin pronunciation (including tone) of a list of Chinese characters. Guessing was encouraged if they were uncertain about the correct Mandarin pronunciation. They were also asked to rate their confidence on the pronunciation they had given on a 5-point scale, with 1 being the least confident.

3. RESULTS

The mean accuracy rates and confidence ratings for each category are shown in Table 3. Separate one-way ANCOVAs, with confidence rating as a covariate, showed a main effect of Mandarin tone category on accuracy rate for words pronounced with Cantonese tones 7 [$F(3,27) = 12.76, p < .001$] and tone 8 [$F(3,27) = 4.30, p = .001$] respectively. Post-hoc comparisons with Bonferroni adjustments were computed separately for Cantonese tone 7 and 8 words and only significant results were reported. For words pronounced with Cantonese tone 7, those pronounced with Mandarin tone 1 were more accurate than those pronounced with Mandarin tone 2 ($p = .005$), tone 3 ($p = .002$) and tone 4 ($p < .001$). For words pronounced with Cantonese tone 8, those pronounced with Mandarin tone 4 were more accurate than those pronounced with Mandarin tone 3 ($p = .011$).

Separate fixed order hierarchical regression analyses were carried out for words pronounced

Table 3: Mean accuracy rates and confidence ratings for different word types

Cantonese tone	Mandarin tone	Accuracy rate	Confidence rating
7	1	78.3%	3.46
	2	53.5%	3.52
	3	51.2%	3.46
	4	38.6%	3.50
8	1	59.7%	3.58
	2	67.5%	3.46
	3	51.0%	3.45
	4	77.1%	3.31

Remarks: The accuracy rates shown are the adjusted value using confidence rating as a covariate.

with Cantonese tones 7 and 8 with accuracy rate as the dependent variable. Confidence rating and percentage correspondence between Cantonese and Mandarin pronunciation (six- vs. nine-tone system correspondences) were entered in the first and second step as the independent variables respectively.

For Cantonese tone 7 words, confidence rating accounted for 25.5% of the variance [$\Delta F = 10.24$, $p = .003$]. The percentage of correspondence between Cantonese and Mandarin tones using the six-tone system explained an additional 34.8% of the variance significantly [$\Delta F = 25.43$, $p < .001$]. However, that using the nine-tone system instead, explained only an additional non-significant 0.3% of the variance ($\Delta F < 1$). For Cantonese tone 8 words, confidence rating accounted for 20.7% of the variance [$\Delta F = 7.85$, $p = .009$]. Using the six-tone system, the percentage of correspondence between Cantonese and Mandarin tones explained an additional 16.0% of the variance significantly [$\Delta F = 7.63$, $p = .011$]. Using the nine-tone system instead, the percentage of correspondence between Cantonese and Mandarin tones explained a significantly additional 13.7% of the variance [$\Delta F = 6.08$, $p = .020$].

4. DISCUSSION

The results from the regression analyses indicated that after controlling prior Mandarin pronunciation knowledge of the Mandarin words as determined from confidence ratings, pronunciation correspondences using the six-tone system accounted for a larger amount of variance of the accuracy rate for both Cantonese tone 7 and 8 words than did the nine-tone system (though the latter did account for a significant amount of variance for Cantonese tone 8 words). This result provides processing evidence to support the six-tone over the nine-tone system.

The results from ANCOVA revealed similar findings. For Cantonese tone 7 words, those pronounced with Mandarin tone 1 were significantly more accurate than those

pronounced with all other Mandarin tones, thus supporting the six-tone over nine-tone system. For Cantonese tone 8 words, although those pronounced with Mandarin tone 4 were more accurate than those pronounced with all other Mandarin tones, only the difference between Mandarin tones 3 and 4 was significant. Such a pattern seems to be partially compatible with both the six- and nine-tone system.

The partial support for Cantonese tone 8 words using the nine-tone system may be due to the fact that the correspondence percentages were computed on the basis of type rather than token frequency and, the latter may be more appropriate. Nonetheless, the current study using correspondence percentages based on word types provides more support for the six-over the nine-tone system.

5. REFERENCES

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