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INFLUENCE OF ENGLISH DONOR WORD STRESS ON TONAL ASSIGNMENT IN CANTONESE LOANWORDS – AN ACOUSTIC ACCOUNT

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ABSTRACT

This study aims to identify the relationship between tone and stress in Cantonese loanwords borrowed from English. Tonal patterns of 23 disyllabic and trisyllabic Cantonese loanwords corresponding to English donor words of 20 different stress patterns, and the tonal patterns of 23 unassimilated Cantonese loanwords exhausting the same set of 20 stress patterns were examined. Fundamental frequency characteristics of the vowels extracted from the loanwords produced by 15 native Cantonese speakers were analysed by using Praat. The average F0s were calculated in Matlab with the algorithm of autocorrelation, and the F0s of vowels corresponding to stressed and unstressed/epenthetic vowels were compared with Wilcoxon Signed Ranks Test. Acoustic results reveal that Cantonese loanword syllables corresponding to stressed syllables in the English donor words were assigned high-level tone whereas epenthetic syllables and those corresponding to unstressed syllables were usually assigned low-level or low-falling tone, and high-rising tone for word-final syllables. This is consistent with previous findings proving the explicit correlation between English lexical stress and high tone, and that between English lexical non-stress and mid or low tones in Cantonese loanwords.

Keywords: loanword phonology, tone, stress, acoustic analysis, Cantonese

1. INTRODUCTION

Cantonese is a tone language whereas English a stress language. A tone language manipulates pitch to contrast meaning. Cantonese exploits six tones. They can be represented with either tone letters as Tone 1 to Tone 6, or with pitch numbers as [55], [35], [33], [21], [13] and [22] respectively. For example, the syllable [si] has a different meaning

with each of the six Cantonese tones, with 詩 [si1 (55)] denoting “poem”, 史 [si2 (35)] “history”, 試 [si3 (33)] “attempt”, 時 [si4 (21)] “time”, 市 [si5 (13)] “market” and 是 [si6 (22)] “yes”. Though stress is used for emphasis beyond the word level, Cantonese does not use word stress to contrast meaning. Unlike Cantonese tones which are already specified in the lexicon and are learnt with the word, English word stress is predictable through stress placement rules. The different levels of word stress, namely the primary stress, secondary stress and the unstressed, generally demonstrate decreasing prominence.

Observations suggest a close relationship between English word stress and Cantonese tones in Cantonese loanwords: a stressed syllable in the English donor word is always assigned a high tone in its Cantonese loanword whereas an unstressed syllable is always assigned a relatively low tone.

Unlike most previous studies which examine tone-stress interaction in a single language, this study investigates how Hong Kong Cantonese native speakers represent word stress (present in English but absent in Cantonese) with tones (present in Cantonese but absent in English).

To facilitate systematic analysis, the scope of this study is limited to loanwords which meet all the following five criteria: (1) originated in English; (2) directly borrowed into Cantonese, not through another language; (3) conforming to Cantonese tonal and segmental inventories and syllable structure; (4) functioning as a noun; and (5) resulting solely from phonetic transliteration without semantic or orthographic influence.

1.1. Tone assignment in Cantonese loanwords

A number of studies have worked on the loanwords of English in Cantonese from the descriptive approach (c.f. [1, 3, 7, 14, 15]), and from the theoretical approach (c.f. [7, 11, 12]). Most focused on segmental changes, deletion and

insertion, but few focused on tones.

The most detailed study on the tonal patterns of loanwords, [15], finds that a 55 tone is assigned to loanword syllables that correspond to stressed syllables in the donor word, a 33 tone to loanword syllables that correspond to unstressed syllables, and a 22 tone to epenthetic loanword syllables. These patterns lead Zhang [15] to question whether Cantonese speakers perceive English stress as different pitch heights. This question, raised from a phonetics perspective, assumes that the phonetic cues for stress perception affect tone assignment.

Silverman [11] addresses the above question by assuming that stress is perceived as pitch heights at the Perceptual Level. Only syllables recognised at the Perceptual Level can gain H or M tone, with the former corresponding to a stressed syllable and the latter corresponding to an unstressed syllable in the donor word. Syllables not recognised at the Perceptual Level, for example, resulting from vowel insertion to a consonant cluster, must gain L tone at the Operative Level due to its least tonal prominence and best mimic of the input.

Though without addressing the tonal assignment in Cantonese loanwords, [12] has two important insights. First, repair strategies are viewed as being triggered by native Cantonese constraints. It is different from [11] which regards repair strategies as being applied specifically to Cantonese loanwords. While the approach in [12] is consistent with the principles of Optimality theory (OT), the approach in [11] is in line with that of the rule-based theory. [12] supports the homology of Cantonese loanword phonology and the native Cantonese phonology, but [11] opts for the separation of Cantonese loanword phonology from the native Cantonese phonology. Second, Yip [12] formalises well-formed syllables as OK- σ , which consists of OT constraints that govern the onset, nucleus and coda in a well-formed syllable. A “fully assimilated” loanword never violates OK- σ , and thus each of its syllables is “well-formed”.

1.2. Relationship between tone and stress

The above finding that stress matches a high tone and non-stress matches a low or mid tone in Cantonese loanwords suggests further discussion of (1) the similarities and differences between tone and stress, and (2) tone-stress interaction.

1.2.1. Comparison of tone and stress

The similarities between tone and stress can be compared in both phonetic and phonological terms. Phonetically, both tone and stress are perceived with pitch, but stress is also perceived with intensity and duration. Phonologically, the two most significant similarities are their autosegmental status and the analogy of tone bearing unit (TBU) and weight bearing unit (WBU) despite stress metricality. Tone is mapped to TBU while syllable weight affecting stress in some languages is mapped to WBU.

However, tone and stress are independent of each other in terms of phonological status. Tone placement is specified in the lexicon whereas stress placement is also sensitive to position. Another difference is that two successive tonal autosegments occupy two consecutive tone bearing slots, but two successive stress autosegments may not occupy two consecutive stress bearing slots.

1.2.2. Tone-stress interaction

Tone-stress interaction can be seen as two-way, with tone affecting stress and vice versa. In the former case, high tone attracts stress. In the latter, stress may attract an H tone or affect tone sandhi.

The general agreement that syllables originally stressed in the donor word are assigned high tone in Cantonese loanwords supports the formalisation of the attraction between high tone and stress in [5] and [6]. However, with no clear consensus on whether syllables originally not stressed in the donor word get low or mid tone in Cantonese loanwords, the question concerning the attraction between lower tones and the absence of stress is raised based on [6].

1.3. Research questions

The gaps in previous studies and the question raised above help refine the objectives of this study to the following research questions: (1) *What are the present tonal patterns of Cantonese loanwords?* (2) *Is there an interaction between tone and stress in these loanwords?* (3) *If so, how is English stress represented in loanwords of a tonal language?*

2. METHODOLOGY

The current study is largely based on [7]. Lai [7] investigates the tonal patterns of 283 Cantonese loanwords collected from previous literature and Lai's own observation. Two tasks were carried out, one for 38 native Cantonese speakers to verify

through a questionnaire the inconsistent phonetic transcriptions of 18 loanwords in the literature, the other for 13 native Cantonese speakers to create loanwords with written transcriptions for 17 English words never borrowed into Cantonese.

2.1. Participants

In the current study, 15 native Hong Kong Cantonese speakers (11 female and 4 male; aged 18-24) were recruited to perform two tasks, both of which were recorded.

2.2. Task procedures

After a briefing on the purpose of the current study and task procedures, participants signed the written consent forms and completed a questionnaire on their background information.

To ensure the production of loanwords but not code switches, a standard recording of the instructions and the demonstrations of both tasks, each with five examples not used in the real tasks, was played to the participants. They were then allowed 15-30 minutes to prepare for both tasks.

In each task, 23 loanwords were elicited from contextualised sentences containing the corresponding English donor words as typical examples of 20 different stress patterns as classified in [7] (see Table 1 and 2) (with three patterns each exemplified with two loanwords). For example, in the first task (also known as Loanword Verification Task), *你間房個 number 幾號呀?* (= *What's your room number?*) elicited the existing loanword [lɛm.pa:] (*秣把*) for the donor word *number*; in the second task (also known as Loanword Creation Task), *你件 blouse 好靚喎!* (= *Your blouse is very pretty!*) elicited the loanword for the English word *blouse* never borrowed into Cantonese.

Table 1: Possible syllable combinations in a disyllabic loanword.

Originally Disyllabic	Pattern	One Epenthetic Syllable	Pattern	Truncation of subsequent syllables	Pattern
'σ,σ or ,σ'σ	1	'σ□	4	'σ,σ... or ,σ'σ...	N/A
'σσ	2	□'σ	5	'σσ... or ,σσ...	6
σ'σ	3	σ□	N/A	σ'σ...	7
σσ	N/A	□σ	N/A	σσ...	N/A
				'σ□...	8
				□'σ...	N/A
				σ□...	N/A
				□σ...	N/A
				□□...	N/A

Table 2: Possible syllable combinations in a trisyllabic loanword.

Originally Trisyllabic	Pattern	One Epenthetic Syllable	Pattern	Two Epenthetic Syllables	Pattern
'σ'σ'σ	N/A	'σ,σ□ or ,σ'σ□	4	'σ□□	11
'σ,σσ or ,σ'σσ	N/A	'σ□,σ or ,σ□'σ	5	□σ□	12
'σ,σσ or ,σσ'σ	1	□'σ,σσ□ or □,σ'σ	N/A	□□'σ	N/A
σ'σ,σ or σ,σσ'	N/A	'σσ□	6	σ□□	N/A
'σσσ	2	σ'σ□	7	□σ□	N/A
σ'σσ	3	'σ□σ	8	□□σ	N/A
σσ'σ	N/A	σ□'σ	9		
σσσ	N/A	□'σσ	10		
		□σ'σ	N/A		
		σσ□	N/A		
		σ□σ	N/A		
		□σσ	N/A		

'σ and ,σ here refer to an originally primarily stressed syllable and an originally secondarily stressed syllable respectively.

σ here refers to an originally unstressed syllable.

□ here refers to an epenthetic syllable.

... here refers to any number of truncated syllables.

N/A means that such pattern is not found in the collected loanwords while the numbers indicate the types of patterns found in the collected loanwords which are referred to in the below main text.

Shaded patterns are not possible in loanwords because there are no corresponding patterns in English.

2.3. Method of analyses

The recording of each subject was first processed with Praat [2]. Each vowel in the pronounced loanword and the six isolated vowels carrying the six Cantonese tones were extracted and saved to individual files. The segmentation of vowels was done manually by one of the authors. Each subject's data were segmented twice in order to test the intra-judge reliability. The Spearman's correlation coefficient between the duration of segmented vowels is 0.96 (p=0.000), which is regarded satisfactory. The average F0 of the vowels was then calculated in Matlab (version R2009b) with the algorithm of autocorrelation [8]. Then, the average F0 of the isolated vowels with the high-level tone (Tone 1, 55 tone) was used as a reference to normalise each subject's F0 range.

The extracted loanword vowels were then classified into two types, (1) those corresponding to stressed vowels in the English donor words, and (2) epenthetic vowels or those corresponding to unstressed vowels in the English donor words, for later comparisons of the mean values of F0s with the Wilcoxon Signed Ranks Test.

3. RESULTS

The Wilcoxon Signed Ranks Test reveals significantly higher mean F0 in loanword vowels corresponding to stressed vowels in the English donor words than epenthetic vowels or those corresponding to unstressed vowels in all participants (Z= -3.408; p=0.001). According to fundamental frequency analysis, the tonal patterns

of Cantonese loanwords identified in both the Loanword Verification Task and the Loanword Creation Task are generalised as follows: 1) Every syllable in a loanword corresponding to a perceived stressed syllable in the donor word is assigned a high-level tone (Tone 1, a 55 tone). 2) In a loanword, an epenthetic syllable or a syllable corresponding to an unstressed syllable in the donor word is assigned a low-level tone (Tone 6, a 22 tone) or a low-falling tone (Tone 4, a 21 tone) and sometimes a high-rising tone (Tone 6, a 35 tone) if it is also word-final in the loanword.

4. DISCUSSION

The above generalisations confirmed with the acoustic analyses have provided further support for the following hypotheses in [7]: 1) Stress attracts an H tone. 2) Non-stress attracts an M tone. Both suggest that the tone-stress interaction in Cantonese loanwords is one-way with English word stress affecting the Cantonese tone assignment. Loanword syllables corresponding to stressed syllables are assigned H (55); epenthetic syllables or those corresponding to unstressed syllables are assigned M (22).

This finding also supports Prominence Attraction in [5] stipulating that more prominent stress and more prominent tone attract each other. Further, it confirms Tone-Stress Hierarchies (*HDft /M >> *HDft/L; *-HDft/H >> *-HDft /L) formalised in [7] under the framework of Optimality Theory. These hierarchies state that M tone avoidance is preferred over L tone avoidance in the head syllable of a foot, i.e. the stressed syllable, and H tone avoidance is preferred over L tone avoidance in the non-head syllable of a foot, i.e. the unstressed or epenthetic syllable. The latter part, which also explains why M tone rather than L tone is attracted to loanword syllables either epenthetic or corresponding to unstressed syllables in the English donor words, has been formalised by assuming that M tone is the least marked (c.f. [4, 9, 10, 13]). According to Pulleyblank [10]'s underspecification of tones, the lower mid-tone which is not specified with tonal features is the unmarked. Yip [13] also points out that M tone, assigned to phonologically toneless syllables in the surface phonetic form, is generally regarded as the unmarked, while H and L tone, produced with extra efforts, are more marked, with H more marked than L.

5. CONCLUSION

Through an acoustic analysis of the recordings in the Loanword Verification Task and the Loanword Creation Task, an explicit correspondence between English lexical stress and Cantonese H (55) tone and that between English lexical non-stress and Cantonese M (22) tone were identified, which supports the formalisation of constraints on tone-stress interaction in Optimality Theory.

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