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TONE AND MELODY IN CANTONESE  
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0. INTRODUCTION.

In the study of tonal phenomena, a curious linguist might wonder what happens to the tones in a language when the words are put to music and sung. For Chinese, modern songs in Mandarin and Cantonese exhibit very different behaviour with respect to the extent to which the melodies affect the lexical tones. In modern Mandarin songs, the melodies dominate, so that the original tones on the lyrics seem to be completely ignored. In Cantonese songs, however, the melodies typically take the lexical tones into consideration and attempt to preserve their pitch contours and relative pitch heights. In this study, I will focus on the Cantonese case to study the interaction of tone and melody in that dialect. Cantonese poses an interesting case, since it has level and contour tones that are intersected by a second dimension -- that of tonal register -- to yield a total of six contrastive tones. The interaction of tone and melody in Cantonese has not, to my knowledge, been studied. This, then, can be viewed as a preliminary investigation into the topic. [1]

There are two main tasks in this investigation. First, one should determine whether the songwriters had intended to compose with the lexical tones in mind. The claim here is that in tonal compositions -- that is, in compositions that pay attention to the lexical tones -- there would be a close correspondence between tone and melody.

The second task is to study the actual interaction between the tones in the lyrics, and the melody itself. The aim is to determine the degree of correspondence in the tone and melody interface, and more precisely, the extent to which the pitch contours and the relative pitch heights of the lexical tones are preserved in the melody.

The task at hand is then complicated by the need to take into consideration the various factors that might affect the tone-melody interface; for example, melodies imported from abroad, the intrusion of foreign phrases, and the tempo of the songs. These factors will all be considered.

For this study, six modern Cantonese songs were selected which are commercially available on cassette tapes from Hong Kong. The songs were sung by Cheung Kwok Wing, a popular, young, male Hong Kong singer. Four of the songs were recorded in 1984 and two in 1986. Further information on the six songs will be presented later. At this point, some background information on the tonal system of Cantonese is in order.

1. TONAL SYSTEM OF CANTONESE.

Cantonese is traditionally described as having nine tones, in which the tones on checked syllables -- those ending in -p, -t, or

-k -- are counted separately. As a result, there are, in fact, only six contrastive tones. Three of these are analyzed here as level, two as rising, and one as falling. The six phonemic tones are presented in (1), with the specific pitch assignment based on Yuan (1983). The pitch values are transcribed according to the convention of using ascending tone numbers, '1' to '5', with '1' representing the lowest pitch and '5' the highest. Checked syllables are short, and are assigned a single tone number (/5/, /3/, /2/). These syllables do not contrast with the non-checked, level-tone syllables. The checked/non-checked distinction is included for later reference. The aim is to determine whether the tone-melody interface agrees with the phonological analysis.

(1)	LEVEL TONES	
	<u>Non-checked Syllables</u>	<u>Checked Syllables</u>
High-level:	/55/ (with [53] variant)	/5/
Mid-level:	/33/	/3/
Low-level:	/22/	/2/
	FALLING TONE	RISING TONES
Low-falling:	/21/	Mid-rising:     /35/
		Low-rising:     /13/

It should be noted that the high tone on non-checked syllables is treated in (1) as basically level, /55/. The falling variant, [53], occurs prepausally and in tone sandhi environment, namely before a non-high tone. This is not the conventional analysis, wherein [53] is treated as basic. [55] is then treated as the sandhi form occurring before another high tone. There are at least two reasons for treating the tone as high level. First of all, in Hong Kong today, a number of young people simply have high level for this tone in all contexts. But more importantly for our study, the high tone behaves like a level tone in the interaction of tone and melody. It patterns similarly to the other level tones, /33/ and /22/. What is crucial in the pitch shape of the high tone is not that it falls, or that it is high-falling, but simply that it is high, which is captured by treating the tone as /55/. Evidence to support the treatment of the high tone as /55/ will be presented in the course of the analysis.

The six tones are exemplified in (2) below.

(2)	LEVEL AND FALLING TONES	
	<u>Non-checked Syllables</u>	<u>Checked Syllables</u>
soeng.55	'wound'	nuk.5     'cry'
soeng.33	'appearance'	hok.3     'shell'
soeng.22	'above'	hok.2     'study'
soeng.21	'often'	
	RISING TONES	
soeng.35	'think'	
soeng.13	'ascend'	

For typographical ease, a modified transcription system is adopted here. [2] In (2), a period marks the beginning of the tone numbers instead of superscripting them.

The shapes and pitch levels of the tones in (2) are displayed in Figure 1, based on narrowband tracings of single tokens from one speaker. (All figures are placed at the end of the paper.) In Figure 1, the upper portion of the figure displays the level and falling tones. Studying first the non-checked syllables, the three level tones are /55/, /33/ and /22/. They are contrastive for the speaker despite very slight differences in pitch height. The Low-falling /21/ is also distinct. Beginning at roughly the same pitch height as tone /22/, the Low-falling tone is characterized by an initial fall accompanied by low amplitude. Moreover, for some speakers, the tone is regularly accompanied by creakiness. Observe that the High-level tone is indeed level here.

The lower portion of Figure 1 contains the two rising tones. In anticipation of the analysis on the tone-melody interface, these two tones are compared with their corresponding level tones with respect to the end-point, or target. The Mid-rising tone, /35/, is paired with the High-level tone, /55/, while the Low-rising tone, /13/, is paired with the Mid-level tone. In the analysis of the tone-melody interaction, what is crucial in the comparison is the target of the rising tones: for the Mid-rising tone, the target is [5]; for the Low-rising tone, the target is [3]. The significance of these observations will soon be clear.

## 2. THE DATA: SIX MODERN CANTONESE SONGS

We proceed now to the data, which consists of the following six modern Cantonese songs:

- (3) a. Ts'i tsung wui hang wan. (Eventually (I'll) be lucky)
- b. Monica.
- c. Nung pun to ts'ing. (My desires)
- d. Yat tsaan siu ming tang. (A small bright lantern)
- e. Stand Up.
- f. Haak sik ng ye. (Black midnight)

The six songs were selected, varying in tempo, presence or absence of English phrases in the songs, and whether the melodies were locally-produced or foreign-imported. The information is summarized in (4) overleaf, arranged according to tempo. The sub-categorization of the songs into four tempos is based on the "average length per syllable", obtained as follows. The length of the first line of each song is calculated from the beginning to the end of the vocal portion. That length is then divided by the number of syllables in the line, including any potential pauses between syllables. As a result, four distinct tempos emerge, identified in (4) as Slow, Medium, Quick, and Fast. The year that the songs were recorded, 1984 or 1986, is indicated after the title of the song. The 1984 tape is simply entitled "Leslie" (the singer's English name), and the newer tape is entitled "Stand Up".

## (4) Summary of information on the six songs.

Tempo	Average Length		Song Title	Foreign	
	Per Syllable			Phrases	Melody
Slow	.84 sec.		Nung-pun to ts'ing ('84)	No	No
Medium	.46 sec.		Ts'i-tsung wui hang wan ('84)	No	No
	.41 sec.		Yat-tsaan siu ming tang ('84)	No	No
Quick	.31 sec.		Stand Up ('86)	Yes	Yes
	.31 sec.		Haak sik ng ye ('86)	Yes	Yes
Fast	.22 sec.		Monica ('84)	Yes	No

## 3. TONAL STRUCTURE OF THE LYRICS.

Having provided the necessary background information on the tones and the data, we proceed to the first task -- that of determining whether or not the lexical tones were taken into consideration in the composition of the lyrics. This task is accomplished by focussing on stanzas in the lyric that are sung to the same basic melody. [3] For the six songs, there are either two or three stanzas which have repeating melodies. Thus, it is possible to juxtapose the first line of the first stanza with the first line of the second stanza, and with that in the third stanza if there is one. The step is then repeated for the second line of each stanza, and so forth. An example is presented in (5) from "Ts'i tsung wui hang wan" (Eventually I'll be lucky), where three of the stanzas share the same melody. Only the first line of each stanza is given. For the sake of greater clarity, the tone numbers are placed on a separate line. ('L.' = Line, 'S.' = Stanza)

- (5) a. Tsoi ts'ing tsoi lei?      Ta sam ngo sam?      (L.1, S.1)  
       22    21    22 13            55 55 13 55  
       (in love in reason? his heart my heart)
- b. Soen yyn soen yi,            hi-ha            pun-sang,      (L.1, S.2)  
       22 21 22 33            55 55            33 55  
       (obey fate obey desire, (laugh) half-of-lifetime)
- c. Hap-ts'ing hap-lei,          hoi-sam          ts'ing-sam,      (L.1, S.3)  
       2    21    2 13            55 55            33 55  
       (fair (and) reasonable, happy (and) satisfied)

A quick glance at (5) already reveals that there are definite tonal correspondences among the lines. The songwriter clearly had the lexical tones in mind in composing the lyrics. For a more systematic study, the tones are isolated in (6), with each column of tones identified with an uppercase letter for easy reference.

(6)	A	B	C	-----   D   -----	E	F	-----   G   -----	H
a.	22	21	22	13	55	55	13	55 (L.1, S.1)
b.	22	21	22	33	55	55	33	55 (L.1, S.2)
c.	2	21	2	13	55	55	33	55 (L.1, S.3)

Let us now study the matching of the members within each set, identified in (6) by column. For the sets in B, E, F, and H, the tones in each set are identical: in Column B, all the syllables are Low-falling; in Column E, all the syllables are High-level, and so forth. The match in those sets are perfect.

In Columns A and C, the tones in both sets are Low-level. The third member of each set, found in Stanza 3, differs from the others only in that the syllable bearing the tone is checked, and hence shorter. The pairing of /2/ with /22/ is consistent in the data. Parallel cases hold for the pairing of /3/ with /33/, and for the pairing of /5/ with /55/. The matching of the tones in song composition, thus, coincides with the phonological treatment of these tones as phonemically non-distinct from the level-tone counterparts in non-checked syllables.

We turn now to the final cases in Columns D and G. At first glance, they appear to contain tonal mismatches, in which the Low-rising tone, /13/, is paired with the Mid-level tone, /33/. However, observe that both /13/ and /33/ end in a mid pitch level. It would seem that it is the end-point, the target, that is relevant, and not the beginning point. The pairing of /13/ with /33/ is not haphazard, but occurs systematically throughout the six songs. Similarly, the other rising tone, /35/, is systematically paired with its corresponding level tone, /55/. Again, it is the target that is relevant in determining the tonal pairings. It is this pairing of /35/ with /55/ that provides arguments for treating the high tone as level, /55/, rather than falling, /53/.

There are further theoretical implications concerning the behaviour and treatment of the rising tones. Digressing briefly, what is crucial in these tonal compositions is not the direction of pitch change (rising or falling), but the end-point, or target, of the tone, mid or high. The end-points of these contour tones are then paired with the level tones in the dialect. As a result, it would be more appropriate to refer to tone /13/ as "rising-to-mid", and tone /35/ as "rising-to-high". With regard to the beginning point of the contour tones, although they do not play a crucial role in tonal compositions, they are nonetheless necessary for distinguishing rising (and falling) tones from level ones in the phonology. Of paramount importance for linguistic theory is that these tonal compositions can provide a primary source of evidence, hitherto overlooked, to argue in favour of treating the lexical tones in Chinese as sequences of level tones.

Returning to the systematic pairing of /13/ with /33/ and that of /35/ with /55/, if they are considered tonal mismatches,

then about a third of the sets in the data contain mismatches (that is, 77 out of 248 sets). However, excluding these pairs leads to a dramatic drop in tonal violations to less than one-tenth (23 out of 248 sets). Indisputably, the songwriters intended these pairings as permissible rather than aberrant. The permissible tonal pairings are summarized in (7).

- (7) a. High: /5/, /55/, /35/  
 b. Mid: /3/, /33/, /13/  
 c. Low: /2/, /22/

Observe that only the Low-falling tone, /21/, is not included in (7). It is systematically excluded from the tonal pairings in the six songs.[4] This would not be expected if the beginning point of a tone is also relevant in determining tonal pairings. As seen earlier in Figure 1, the Low-falling tone, /21/, and the Low-level tone, /22/, both begin at the same pitch. Tone /21/, however, has an initial fall to an extra low pitch, hence resulting in creakiness for some speakers. Tone /22/, on the other hand, is phonologically level even though it may have a slight, gradual pitch drop prepausally. Thus, the crucial difference between the two tones is their phonological shape: one is falling and the other level.[5]

Sets that conform to the permissible tonal pairings in (7) constitute 90.7 percent of the total sets, or 225 out of a total of 248 sets. Only 9.3 percent of the data contains genuine tonal mismatches. A study of the tonal violations reveal that such factors as the tempo of the song, and whether a given song has a foreign melody or contains foreign phrases are not relevant.

#### 4. TONE AND MELODY INTERACTION.

As might be expected from the overwhelming number of cases with appropriately matched tones in the data, there is a close correspondence between lexical tone and melody, otherwise the painstaking efforts of the songwriters would have been in vain. To be precise, there is a strong tendency for the melody to respect the three relative pitch levels, high, mid, and low, and to keep the Low-falling /21/ tone distinct from the other tones. Representative examples are given in Figures 2 and 3. Figure 2 is the tracing of narrowband spectrograms, and Figure 3 the transcription of musical notes showing relative (and not absolute) pitch.[6] Observe in Figure 2 that, in addition to the preservation of relative pitch levels, the rising contours in both the faster tempo and slower tempos are also preserved. The shortening of the syllables in the faster tempo, however, renders the rising contours less perceptible.

In some songs, it is not possible to obtain narrowband tracings due to the strong overlay of music on the tones. This is particularly true for the faster-paced songs with strong beat and loud melody. Recording of musical notes is not sufficiently precise, however, especially for quick pitch changes that are

subtle, but linguistically significant. As a result, a statistical account of the degree to which the melodies preserve the pitch shape and relative pitch height in the six songs must await a follow-up study. Nonetheless, although statistical figures cannot be obtained at this time, some generalizations can still be made. First of all, the tempo of the song, and whether it contains foreign phrases, or has an imported melody, do not interfere in any significant way with the maintenance of relative pitch levels. This is expected, given the minimal degree of tonal mismatches.

While relative pitch levels are, by and large, preserved in the songs, the same is not true of the tonal contours. The crucial factor involves tempo. In faster-paced songs, the tendency is for the tonal contours to be levelled out. This is accomplished by sacrificing the initial pitch rise when time is short. Thus, tone /13/ would be sung as simply mid, [33], and tone /35/ as simply high, [55].

It is important to note that, despite the tendency toward the levelling of tonal contours in faster tempo, the permissible tonal pairings are still preserved, because the target pitch is preserved. From the general observations made here, it can be seen that the constraint in modern Cantonese songs is against the mixing of pitch levels. The loss of pitch contours is not critical, as long as the target pitch level is attained.

## 5. CONCLUSION.

The impressionistic observation that modern Cantonese songs tend to preserve the relative pitch levels and pitch contours of lexical tones is borne out. Furthermore, the effect of foreign melodies and foreign phrases is negligible. Tempo is the only important factor in affecting the tone-melody interface. A loss, or partial loss, of pitch contours occurs on rising tones in faster-paced songs. Nevertheless, crucially, the loss does not result in tonal mismatches.

The same results do not hold for modern Mandarin songs, where neither relative pitch height nor pitch contours are sacred. This can be demonstrated with a simple example. Figure 4 shows the narrowband spectrographic tracings of the first line of the Happy Birthday song read in (a). In (b), the words are sung to the well-known English tune, "Happy birthday to you". The lexical tones are completely obliterated in (b). Corresponding lyrics do not exist for Cantonese, precisely because the words not only need to convey the desired message simply and naturally, but they must also form a sequence of tones that harmonizes with the melody.

To conclude, this study on tone-melody interaction has several important ramifications. It shows that tonal compositions can provide evidence for choosing the underlying tones in the dialect. It also yielded our first concrete evidence for treating the lexical tones in Chinese as sequences of level tones. Moreover, the results predict that the pitch height dimension would be more critical than the tone contour dimension for Cantonese speakers in tone perception studies. The isolation of the Low-

falling tone from permissible tone pairings suggests that the tone would be similarly distinguished in perception studies. And finally, the findings of this study suggest that a parallel case would hold in the interaction of tone and intonation in Cantonese, in that a faster rate of speech could destroy the initial pitch shape on the rising tones, while greater constraints would exist to minimize the loss of relative pitch height.[7]

#### Notes

1. Research for this study is supported in part by the Social Sciences and Humanities Research Council of Canada Post-doctoral Fellowship. I thank the many individuals at UCLA for their helpful suggestions and comments. In particular, I thank Peter Ladefoged, Ian Maddieson, Hongmo Ren, Russell Shuh, Shoichi Iwasaki, Rongrong Liao, Ulrica Lau, David Leong, Brian McHugh, and Peter Li, who have helped in different ways to bring about the successful completion of the project. I have also benefited from Arnold Zwicky's helpful comments on the different musical scales used in Chinese versus Western music.

2. The phonetic value for some of the vowels are: aa = [A] (low central vowel), a = [a], y = [y], and oe = [œ]. For the consonants, ng = [ŋ], and y = [j] in syllable-initial position before [y], and [j] elsewhere in syllable-initial position.

3. There are also some stanzas that have their own melodies, such as one finds in refrains in English songs. Within these stanzas, one sometimes find adjacent lines sung to the same tune. These lines are also included in the study.

4. Only three cases can be found from a total of 248 sets. They all involve the pairing of /21/ with the Mid-level tone.

5. Vance (1977) treats these two tones as differing only in pitch level (mid-low versus low-low). Very low pitch, however, is not the primary acoustic cue for distinguishing tone /21/ from tone /22/, as his perceptual study reveals. (See Vance 1977 for details.) The proposal here is that the primary perceptual cue is the initial pitch drop in tone /21/.

6. Special thanks go to Brian McHugh for his assistance. The main observation to be made concerning Figure 3 is the maintenance of the relative pitch levels.

7. Some of the predictions made here are in fact borne out in the instrumental studies by Vance (1976, 1977) and Gandour (1981, 1984). The readers are referred to these articles and the works cited therein for further details.

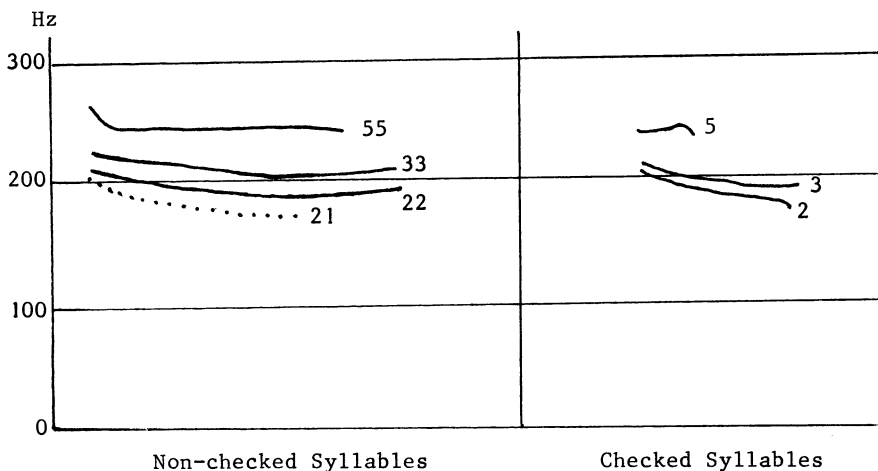
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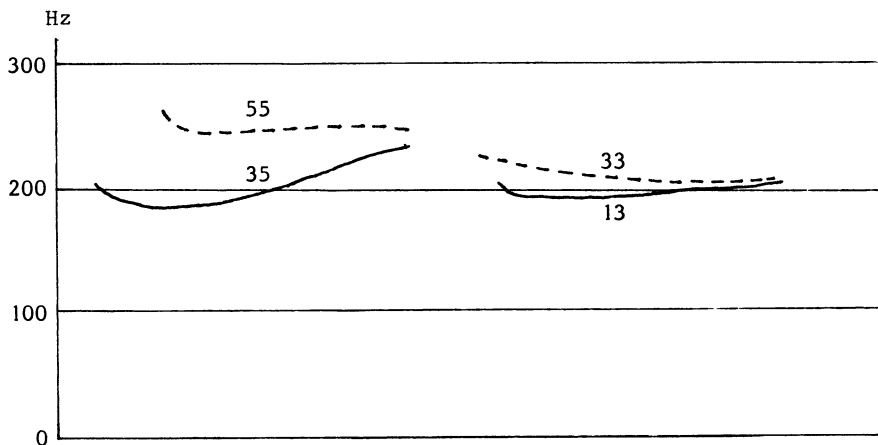
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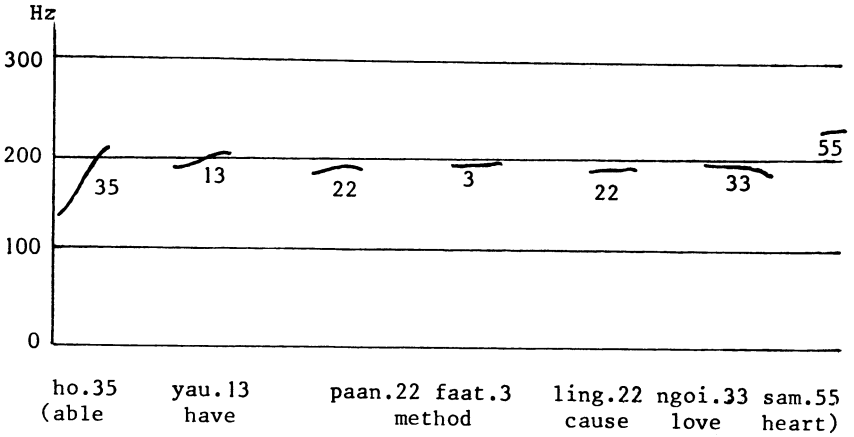


a) Level and Falling Tones. (Level: —, Falling:.....)

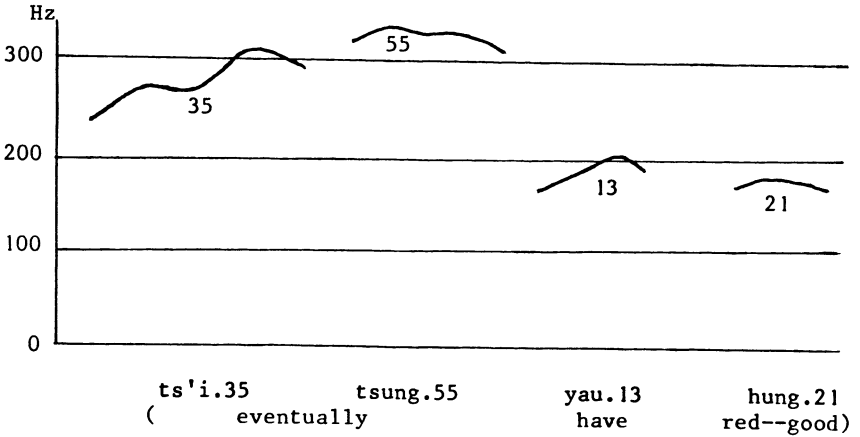


b) Rising Tones (contrasted with corresponding level tones).  
(Rising: —, Level:----)

Figure 1. The tones in Cantonese. (Spoken by UL)



a) Part of a line from "Yat tsaan siu ming tang."



b) Part of a line from "Ts'i tsung wui hang wan!"

Figure 2. Preservation of relative pitch levels.

21 35 5 13 5 33 55 33 35

yu paai tik nei pat yiu taam tang tsai  
 ( sway PRT you NEG need carry small-stool)

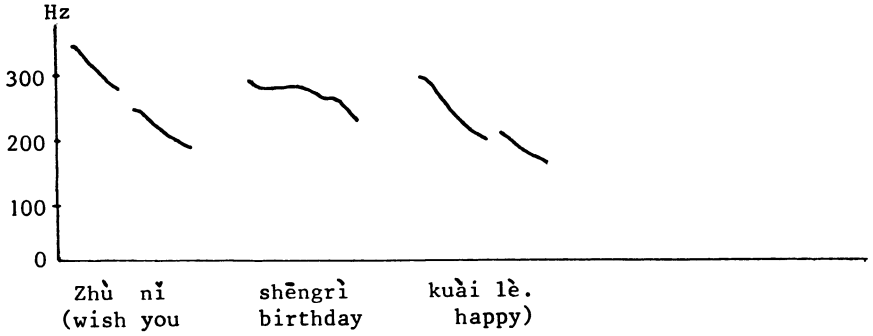
a) A line from "Haak sik ng ye" (Black midnight).

2 33 22 33 33

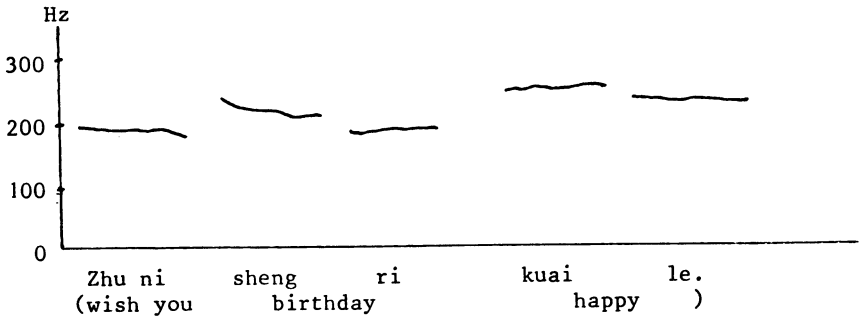
pit p'ing ming hung tsai  
 (don't risk-life control)

b) A line from "Haak sik ng ye" (Black midnight).

Figure 3. Preservation of relative pitch levels.



a) 'Happy birthday to you.' (Spoken by RL)



b) 'Happy birthday to you.' (Sung by RL)

Figure 4. Tone-melody interaction in Mandarin.