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Tone and Language Games in Chinese

Introduction

In African tone languages, tone can be considered part of the word, rather than part of some smaller constituent, such as the syllable or the segment. This analysis is well supported; for example, in Mende, there are only five tone patterns, regardless of word length: H, L, HL, LH, HLH. In this autosegmental analysis of tone, tone occupies a separate tier from the segments, and there is a mapping that associates the segments with the tones. Furthermore, in language games that switch syllables or parts of syllables, the tone is never switched with the syllable or the segment; it remains unchanged over the word. Hombert (1986) illustrates this with two word games:

WG1: $C_1X_1C_2X_2 \rightarrow C_1X_2C_2X_1$ switch the rimes
kʷélì (Bakwiri 'falling') -> kʷílè

WG2: $S_1S_2 \rightarrow S_2 S_1$ switch the syllables
kʷélì -> líkʷè

In most Asian tone languages, however, tone is not part of the word, but of some smaller unit (syllable or segment). For example, Cantonese has six tones, each of which can occur on any syllable. Following Yip (1995), we separate them into a high and low register:

1. H, h (55) high level   4. L, l (11) low level
2. H, lh (25) high rising   5. L, lh (23) low rising
3. H, l (33) mid level   6. L, h (22) mid-low level

When Hombert did the same word games with Mandarin, Cantonese,

Taiwanese, and Thai, he found that in WG2, the tone was almost always switched with the syllable. For WG1, results were variable, and the percentage of the cases in which the tones were switched varied depending on the language. Hombert concludes that "there is strong evidence that the word is the tone-bearing unit in the African tone languages but that, tentatively, tone may be a feature on a smaller unit in the Asian tone languages. Further investigations with more speakers are needed."

This paper is the result of further investigations with more speakers. In particular, the two language games above were performed by three Cantonese speakers and two Shanghainese speakers. These two languages are interesting because they are at opposite ends of the typological continuum: Cantonese is an syllable-tone language; Shanghainese is a word-tone language.

Shanghainese has three basic tonal patterns, which can be described as HL, H, LH.[1] According to Chen (1986), "The facts of Shanghai [tone sandhi] lend persuasive support to the notion that what is taking place is . . . a change in the status of the TBU from the syllable to the phonological word. . . . Shanghai has evolved from an s-tone language . . . to a w-tone language, similar in all relevant respects to Mende."

Thus, by comparing Cantonese with Shanghainese, this word-game experiment will test the hypothesis that in w-tone languages, application of the word games will not result in a change in the tonal pattern of the word, whereas in s-tone languages, the tones of the syllable will change (at least in WG2). The results show that this is indeed true, but in Chinese languages there is also interference from the fact that syllables and

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[1] This is, of course, an oversimplified picture. There are some differences for syllables that end with glottal stop (入聲 rusheng, the entering tone), so that one may actually count five citation tones, but we will consider these checked syllables to be the result of phonetic detail that is beyond the scope of this paper.

morphemes are virtually the same thing. The Cantonese results also support the idea that tone is not segmental but occupies a larger domain, possibly the syllable.

Methodology

Word lists were constructed for Cantonese and Shanghainese. The word list for Cantonese contained 23 words. The syllables in each word had different tones. 10 of these (items 1, 2, 3, 4, 11, 13, 16, 17, 20, 23) were words that could not be easily analyzed into its two constituent morphemes (several of these, such as 'cockroach,' are native Cantonese words which cannot be analyzed as separate morphemes at all). The word list was constructed from the experimenter's knowledge of Cantonese. In addition, 9 words were used as a training set. In these words, each syllable had the same tone.

The word list for Shanghainese contained 20 words. Because of the experimenter's lack of knowledge of Shanghainese, these words were taken from an introductory textbook on Shanghainese (Eccles 1993). Again, the syllables in each word had different underlying tones. The training set contained 20 words (more on this later); for each word, each syllable had the same underlying tone.

There were three subjects for Cantonese (we will call them C1, C2, and C3), and two for Shanghainese (S1, S2). C1 and C3 were female and grew up in Hong Kong. C2 was female and grew up in Sacramento, California. S1 and S2 were male and female, respectively. Both were born and raised in Shanghai. All subjects were undergraduate students at Stanford University.

Subjects were given instructions for each language game they were asked to perform. They were then given some examples from the training set, and then asked to perform the language game on the rest of the training set. Finally, they were asked to

perform the language game on the words from the word list.

There were some problems running the experiment, almost all of which happened for Cantonese (that's the one that was done first). First, there were not enough training examples for Cantonese—as it turned out, WG1 was an extremely difficult exercise. Second, syllables without onsets should have been excluded from this experiment completely (subjects struggled to find onsets that weren't there). Finally, the instructions given to the Cantonese subjects were not consistent. For C1, as was eventually done for S1 and S2, the subject was told that each syllable had an initial and a rime, and that WG1 consisted of switching the rimes. As C1 ended up switching the tone along with the rime for all but one of the words, it was decided that for C2 and C3, WG1 should be modeled, rather than explicitly described, so as to eliminate any effect from having subjects split up the onset from the rime. While this worked for C2, this proved disastrous for C3. Thus, the explicit instructions were given to S1 and S2.

Results/Discussion

For Shanghainese, the results of WG1 were consistent. Both subjects left the tonal pattern for the word unchanged, while switching the rimes of the syllables. The only exceptions were for S2, for items 18 HL[i ɦyœ]'hospital' and 19 HL[iŋ ɦyœʔ]'music'. The tones were switched to LH: [ɦyœ i] and [ɦyœʔ iŋ]. This is probably due to that fact that in these words, the first syllable has no onset, and S2 effectively performed WG2 instead of WG1 for these words.

For WG2, the morphemes were switched, along with their underlying tones, so that the output of the word game had the underlying tone of the second syllable/morpheme of the input word:

HL[tʰi tsʰi] 'weather' -> H[tsʰi tʰi]

The only exceptions were item 7 LH[di tsz̩] 'address' -> LH[tsz̩ di] for S1, and item 3 H[kɔʔ tsja] 'country' -> H[tsja kɔʔ] for S2. In both of these cases, the tone pattern did not change. It may be that in these cases, the subjects did not apply the underlying tone of the second syllable, and left the tone unchanged. It may also be the case that they did not know the underlying tone of the second syllable, but this seems unlikely, since those morphemes are not particularly obscure.

For Cantonese, the results of WG1 varied by speaker. C1 consistently switched the tone with the rime. The only exception was item 3, laap6 saap3 'trash'. The responses of C2 were variable. 15 words (items 1, 2, 3, 4, 6, 8, 9, 10, 14, 15, 17, 18, 19, 22, 23) did not change tone; the other 8 did. There does not seem to be any morphological effect, i.e., there does not seem be any difference between the words not easily split up into morphemes and the obviously compound words. C3 had extreme difficulty with WG1. C3 would often change a high rising tone to a high level tone, and some syllables would somehow acquire a tone that was not originally in the input. Nevertheless, it is possible to see that for 6 of the words (items 3, 4, 7, 10, 12, 20), the tones did not switch, but for the rest of the words, the tones did switch with the rimes, although other additional things happened to the tones. Again, there does not seem to be any morphological effect. Also, a cursory look at the data does not suggest that ill-formed syllables in the output (such as item 2, wu4 dip2 'butterfly' -> wip du) does not affect whether the tone is switched or not, since there are ill-formed syllables in both cases. It is interesting to note that all of the subjects did not switch the tones for item 3, where the finals differed only in tone. It seems that they eyeballed the word in their head, so to

speak, noticed that the segments were the same, concluded that there was nothing more to be done, and therefore left the output the same as the input. These results from WG1 in Cantonese suggest that the tone is not a feature of the segment. Assuming that it was, we would expect the tone to *always* move with the vowel in the word game; as it turns out, this is not the case, for any of the speakers.

The results of WG2 were much more consistent: the tones all switched with the syllables. The exceptions were item 2

wu4 dip2 -> dip6 wu4, for C3

and item 23

gaat6 zaat2 -> zaat6 gaat6, for C3

gaat6 zaat2 -> zaat6 gaat2, for C2

Clearly, this is not simply a case of a word tone that remained the same. In Cantonese, many words end with a high rising tone which originally (historically) had a different tone. This morphological tone change (Chen 1986, p. 116) is similar to the -r suffix in Mandarin, and is highly lexicalized. However, speakers of Cantonese are cognizant of this tone change, partly because some morphemes which are affected by this tone change also appear in other, non tone-changing contexts, and partly because sometimes reading pronunciations of words will not have this tone change. This tone change is especially obvious in checked (入聲) syllables, which normally can only have tone 1, 3, or 6. Hence, what appears to be happening is that C2 and C3 are "undoing" this tone change, and then switching the syllables. C2 additionally puts a high rising tone on "gaat2", recognizing that this changed tone can only occur at the end of a word. Interestingly, C2 does not do this with wu4 dip2.

Conclusion

Through rime-switching word game, we can immediately see the difference between Shanghainese and Cantonese: in Shanghainese, a word-tone language, switching the rimes does not affect the tonal pattern of the word; in Cantonese, a syllable-tone language, the tone often, but not always, moves with the rime. The results also indicate that tone might not be a feature of segments in Cantonese.

The syllable-switching word game highlights a difficulty in performing such word games in Chinese, where practically every syllable is a morpheme. Thus, for a Chinese speaker, asking them to "switch the syllables" is the same as asking them to "switch the characters."[2] In spite of this—or perhaps because of this—a carefully constructed language game experiment can tell us quite interesting things about how tone is represented.

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[2] This observation may begin to explain the results that Hombert got for WG2 in Taiwanese, where interaction with tone sandhi rules yielded three patterns for WG2: (1) switch the surface forms of the tones, (2) switch the surface forms of the tones and apply tone sandhi again, and (3) switch the underlying forms, and then apply tone sandhi. We can view (3) as a case where the two syllables are easily analyzed morphemes, and (1) and (2) as cases where they are not. For these cases, a better understanding of the tone alternations in Taiwanese would help greatly.