UPWARD F0 TRANSITION IN FALLING-FALLING TONES AND RISING F0 PART IN FALLING-CONVEX TONES

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ABSTRACT

The results of acoustic analysis and perceptual experiment indicated that the information of tones is mainly carried by the syllabic vowel and its adjacent transition. The upward F0 transition in VCV and VV with falling-falling tones of Standard Chinese is not perceived, because the durations of the upward F0 transition only have 89ms and 60ms in average and it occurs durning the non-voiceless initial and its adjacent transition. The durations of the rising F0 part of F0 in VCV and VV with falling-convex tones of the Chinese dialect of Fuzhou have 167ms and 140ms and it occurs durning the syllabic vowel and its adjacent transition, therefore, it can be perceived.

I. INTRODUCTION

The F0 transition in the intersyllable that the second syllable is with non-voiceless initial was discussed in our paper [1]. Acoustic data from two tone languages were presented to demonstrated that the perceived segmental structure is an important factor in the interpretation of F0 as pitch [2].

In this paper, acoustic analysis and perceptual experiment were done on falling-falling tones in VCV(c=/m, n, l/) and VV of Standard Chinese and falling-convex tones in VCV and VV of the Chinses dialect of Fuzhou to discover why the upward F0 transition is not perceived and the rising F0 part in convex tone is perceived.

II. FALLING-FALLING TONES IN VCV AND VV OF S.C.

In disyllabic utterances with falling-falling tones and a voiced intervocalic segment, the F0 must change from low-ending on the first syllable to high(falling) on the second syllable, the upward F0 transition in the intersyllable being formed.

2.1 F0 and amplitude(Am)

15 disyllabic utterances with falling-falling tones in VCV and VV were uttered by a native male speaker of Beijing Mandarin. A formant transition are formed in the intersyllable. The perceptual boundary of the first syllable and the second syllable with non-voiceless initial was determined with the trancation method[2]. In the Fig. 1.1, the perceptual boundaries were indicated with "a-b". The second syllable, therefore, started with "6".

It can be seen in Fig. 1.1 that the starting-point of the upward F0 transition occurred within "a-b". The duration of the upward F0 transition in the second syllable, However, was counted from the point "b". The magnitude of F0 in the upward transition was about 25Hz. The duration of the upward transition of F0 was 89ms and 60ms in average in VCV and VV, amounting to 38% and 30% of the whole duration of the second syllable, respectively. A Am curve in the second syllable being with flat-topped.

2.2 Carrier of the information of tones in S.C.

In this experiment, the duration of 120ms in each stimulus was selected, because a vowel duration greater than 100ms was required to optimize movement feature perception[3].

It can be seen in Fig. 1.2.1 that the highest sensitivity to falling pitch in the first syllable was stimulus 8(140-260ms), and the stimulus was made from the syllabic vowel and its adjacent transition; the highest sensitivity to the falling-pitch in the second syllable was stimulus 25(480-600), and the stimulus was made from the syllabic vowel and its adjacent transition. However, the sensitivity of the stimulus covering the vocalic-ending in"调"[tiao ||] and the nasal coda in "任"[n ||] were lower than that covering the syllabic vowel; the stimulus covering the vocied fricative initial didn't be identified as falling pitch.

It can be seen in Fig. 1.2.2. that the highest sensitivity to falling pitch in the first syllable was stimulus 4(60-180 ms), and the stimulus was made from the syllabic vowel and its adjacent transition; the highest sensitivity to falling pitch in the second syllable was stimulus 17(320-440ms), and the stimulus was mainly made from the syllabic vowel and its adjacent transition. However, the sensitivities of the stimuli covering the vocalic-ending in "概"[kai ||] and"要"[iao ||]were lower than that covering the syllabic vowel, and the stimulus covering the zero-initial didn't be identified as falling pitch.

III. FALLING-CONVEX TONES IN VCV AND VV OF THE CHINESE DIALEXT OF FUZHOU

3.1 F0 and Am

13 disyllabic utterances with falling-convex tones in VCV and VV were uttered by a native speaker of the Chinese dialect of Fuzhou. It can be seen in Fig. 2.1 that in falling-convex tones in VCV and VV, the starting-point of the rising F0 part in convex tone was synchronized with the second syllable. A Am curve in the second syllable being with pinnacl. The magnitude of the F0 rise in convex tone was about 15Hz, and the durations of the F0 rise in VCV and VV were 167ms and 140ms, amounting to 52% and 49% of the whole duration of the second

syllable, respectively.

3.2 Carrier of the information of tones in the Chinese dialect of Fuzhou

Here, the duration of 140ms in each stimulus was selected. It can be seen in Fig. 2. 2. 1 that the highest sensitivity to falling pitch in the first syllable was stimulus 3(40-180 ms), and the stimulus was mainly made from the syllabic vowel and its adjacent transition; Those that was identified as level pitch covering the turning-point in convex tone was timulus 17(320-460ms), and the stimulus was made from the syllabic vowel and its adjacent transition, too. However, sensitivities of the stimuli covering the vocalic-ending in the first and second syllables were lower, and the stimulus covering the nasal consonant initial didn't be identifed as rising pitch.

It can be seen in Fig.2.2. 2 that the highest sensitivity to falling pitch in the first syllable was stimulus 4(60-200 ms), and the stimulus was made from the syllabic vowel and its adjacent transition; Those that was identified as level pitch covering the turning-point in convex tone was stimu-lus 19(360- 500ms), and the stimulus was made from the syllabic vowel and its adjacent transition, too; However, sensitivity of the stimuli covering the last part of the final in the first syllable and the nasal code in the second syllable were lower, sensitivity of the stimulus covering the zero-initial was lower, too.

IV. Conclusion and discusion

1. The information of tones is carried by the syllabic vowel and its adjacent transition, but the formants in the area of the syllabic vowel and its adjacent transition in[|], [iao |], [mau |] and [i |] rapidly change. The Am curves in the area of the syllabic vowel and its adjacent transition in the second syllable rapidly change, too.

2. In VCV with falling-falling tones, the duration of the upward F0 transition in the second syllable was 89ms in average in which the duration of the initial /m, n, l/ was about 60ms. The upward F0 transition in VCV that is not perceived can be interpreted by D. House' theory[3] . The upward F0 transition in VV, However, can't be interpreted by D. House' theory, This is because the duration of the upward F0 transition was about 60ms and the complexty of the spectrogram in the area of the upward F0 transition is not more than that in the area of the syllabic vowel and its adjacent transition.

3. The upward F0 transitions in VCV and VV with falling-falling tones of S.C. are not perceived, because they don't occur durning the syllabic vowel and its adjacent transition, and their durations just have 89ms and 60ms amounting to 38% and 30% of the whole

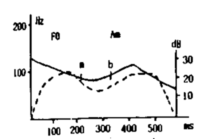

Fig 1.1 Mean F0 curve and Am curve of falling -falling tones in VV of Standard Chinese.

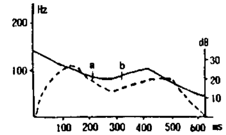

Fig 1.2 Mean F0 curve and Am curve of falling -falling tones in VCV of Standard Chinese.

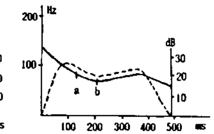

Fig. 2.1 Mean F0 curve and Am curve of falling -convex tones in VV of the Chinese dialect of Fuzhou.

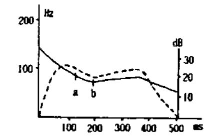

Fig. 2.2 Mean F0 curve and Am curve of falling -convex tones in VCV of the Chinese dialect of Fuzhou.

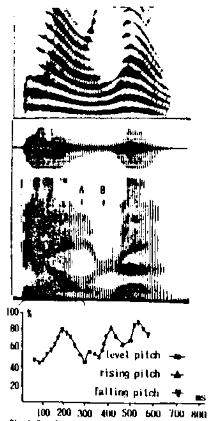

Fig 1.2.1 The percentage of identifica -tion for the different kinds of pitch in stimuli that were sliced from "调任" [tiao [illegible] ian [illegible]] judged by 8 listeners.

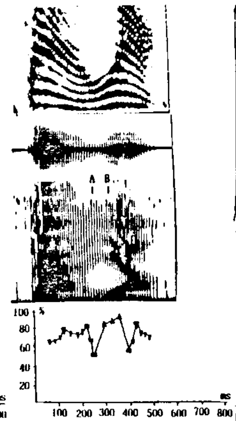

Fig. 1.2.2 The percentage of identifica -tion for the different kinds of pitch in stimuli that were sliced from "概要" [kai [illegible] iao [illegible]] judged by 8 listeners.

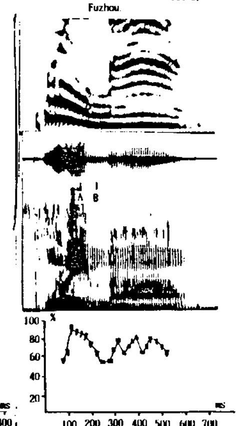

Fig. 2.2.1 The percentage of identifica -tion for the different kinds of pitch in stimuli that were sliced from "外贸" [buai [illegible] mau [illegible]] judged by 8 listeners.

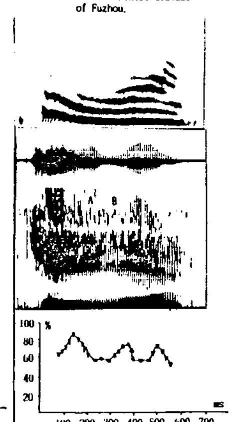

Fig. 2.2.2 The percentage of identifica tion for the different kinds of pitch in stimuli that were sliced from "住院" [tsy [illegible] iɛŋ [illegible]] judged by 8 listeners.

duration of the second syllable, respectively, but the rising F0 parts in VCV and VV with falling-convex tones of the Chinese dialect of Fuzhou occur durning not only the non-voiceless initial, but also the syllabic vowel and its adjacent transition, and their durations have 167ms and 140ms amounting 52% and 49% of the whole duration of the syllable, respectively. In VCV, the dura-tion of the rising F0 part minus that of the voiced con-sonant initial is about 100ms, the remaining rising F0 part occuring durning the syllabic vowel and its adjacent transi-tion; In VV, the most part of the rising F0 occur during the syllabic vowel and its adja-cent transition. Therefore, the rising F0 part in convex tone in VCV and VV is perceived.

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