

Local Context Effect on Downtrend Normalization in Cantonese

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1 Background

Downtrend has been used to account for any difference in f0 values of successive f0 peaks for two linguistically equivalent events. (Pierrehumbert 1979, Gussenhoven and Rietveld 1988, Leroy 1986, Terken 1991, Gussenhoven et al. 1997)

2. Research Questions

- Difference in f0 heights is used to distinguish Mid High from Mid Low tones in Cantonese. Difference in f0 heights also results from downtrend. How do listeners separate out these two effects when assigning a given f0 value to one of the two level tones in Cantonese?
- Do they normalize for downtrend? If they do, do they use a global or a local downtrend context as the frame of reference?

3 Experimental Design

- It comprised of two parts:
 - (a) testing for normalization of downtrend.
 - (b) testing for the effect of local context in downtrend normalization.
- 9 subjects participated in a lexical word identification task.
- Stimuli: the Mid High tone associated with /daɪ/ and /sau/ syllables was incremented and decremented at a step size of 0.125ERB to create a 12-step stimulus continuum, which was spliced into three test positions-in-utterance in a carrier utterance to create three test conditions — C1 (Early), C2 (Medial) and C3 (Late) for part (a) as in Fig.1.
- The same stimulus continuum in C3 was combined with two modified f0 contexts in the carrier sentence to create C4 and C5 for part (b) as in Fig.2 and Fig.3 respectively.



Fig.1

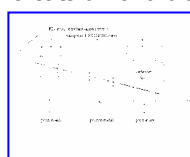


Fig.2.

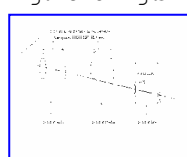


Fig.3.

- The carrier sentence was composed of the following tones: H H HR H X1 H H H LF H X2 H H H LF H X3 H H H.

4 Results

4.1. Normalization of Downtrend

- The categoric boundaries of H, MH and ML tones moved lower from C1 to C3 for the /daɪ/ syllable as in Fig.5, Fig.6 and Fig.7 respectively.

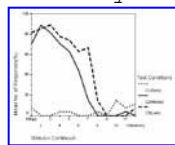


Fig.5.

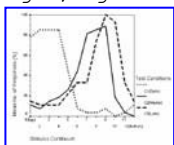


Fig.6.

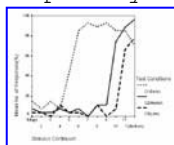


Fig.7.

4.2. Local versus Global Context on Downtrend Normalisation

- The categoric boundary of Mid Low tone shifted as a result of changes in the local context, but not in the global context (as in Fig.8 and Fig.9)

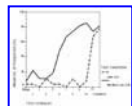


Fig.8.

C3 vs C4 (Fig.8)
Change in Local
Contexts

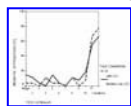


Fig.9.

C3 vs C5
Change in Global
Contexts

5 Conclusion

Downtrend was normalized to equate different phonetic f0 values to the same Cantonese tone. Local f0 context in immediately adjacent to the test tone exhibited a strong effect on how the test tone in question was normalized.