

Phonetic evidence for the three phonological pitch levels in Japanese dialects

In the currently standard theory of intonational phonology [1], it is claimed that any accentual f_0 patterns can be generated with High (H) and Low (L) tone targets and interpolation between them, plus f_0 range re-scaling mechanisms across prosodic words. The present study provides further evidence in line with this f_0 production model, but also shows that there are varieties of Japanese for which it is necessary to distinguish 3 phonological pitch levels (H, M and L) to fully capture both f_0 target values, and f_0 range rescaling effects. The data come from three Japanese dialects with different *shiki* systems: *shiki* are lexical contrasts manifested in word-sized f_0 contour patterns that coexist with pitch accent contrasts [2]. Twelve speakers produced 36 combinations of two nouns with all combinations of the *shiki* types in the frame sentence (1). The valley and peak f_0 values of the three constituents (V1, P1, V2, P2, V3 and P3) were sampled from a total of 2305 tokens (about 5 repetitions each).

(1) [N₁-GEN.] [N₂-NOM.] [VP]
 e.g., *kodomo-no namae-ga omoidasen* (I can't remember the name of the child.)

The results reveal that essentially the same f_0 range compression and expansion mechanisms are at work for the three dialect groups. In Central Kinki (Figure 1a), any HL tone sequence triggers *downstep* (!H), whether the L is part of an accent or the first tone in a rising *shiki* in N₂ [3]. In addition, a rising *shiki* (LH) in N₁ expands the pitch range of N₂. We call this effect *upstep* (^H; in a different sense from the f_0 range reset [4]). For Ibukijima (Figure 1b) and Mitoyo, HL triggers a larger downstep (!!H) and HM and ML trigger smaller (!H) downstep. V2 values reveal the distinction of H, M and L tone levels in word-sized units. Furthermore, the 3-way distinction is also manifested at V3 under the downstep and upstep effects that are carried over to V3 and P3. The findings suggest that the H-M-L tone distinction is necessary, independent of these pitch range rescaling mechanisms.

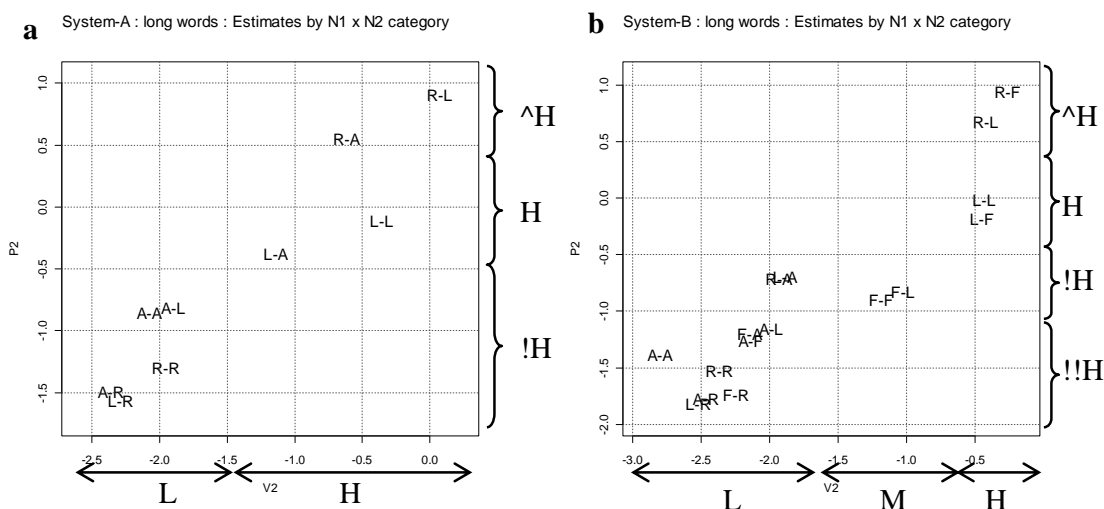


Figure 1: Bayesian estimates of the mean f_0 values at V2 (valley between N₁ and N₂) and P2 (peak of N₂) as a function of N₁-N₂ shiki-accent types (e.g., L-A: N₁=Level-shiki-unaccented/N₂=Accented; R-F: N₁=Rising-shiki-unaccented/N₂=Falling-shiki-unaccented).

References

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- [3] Pierrehumbert, J. and Beckman, M. (1988) *Japanese tone structure.* MIT Press.
- [4] Truckenbrodt, H. (2002). Upstep and embedded register levels. *Phonology*, 19, 77-120.