

Conditional realisation of post-focus compression in Japanese

The realization of focus in Japanese has been extensively studied (e.g. [1]–[4]). It is generally agreed that focus is marked by raising the F0 of the focused item, and by post-focus compression (PFC) of F0 range. Where PFC is measured on the initial rise that marks the beginning of the post-focus word [3], it is consistently observed regardless of the accent condition of the utterance; where PFC is measured as maximum F0 *less* minimum F0 in the post-focus domain, it is found only after an accented word [1], [4]. How PFC should be classified in the PFC typology [5], [6] thus depends on how the measurement is taken.

However, confining PFC to initial rise would be inconsistent with the previously observed trizone pattern of focus [7] because the beginning of initial rise is also the end of the preceding word, in which case initial rise would be looking across both on-focus and post-focus domains. Here we argue that PFC in Japanese should be measured across a wider domain (e.g. a prosodic word), like in other languages (e.g. English and Mandarin). In this approach, the realization of PFC would be accent-dependent, and is absent in an unaccented utterance [1], [4].

We conducted a production experiment and compiled a 6251-sentence corpus that controls for accent condition (initial accent vs. unaccented), sentence type (yes/no question vs. statement), focus condition (initial/media/final/neutral), and sentence length (8 vs. 11 morae). Our goal is to examine the interaction among accent, sentence type, and focus and its effect on the course of F0 trajectory in Japanese.

Panels 222S (8-mora) and 442S (11-mora) below show averaged F0 contours of unaccented declarative sentences under different focus conditions (neutral focus as solid black curve). X-axis shows normalized time, with word boundaries marked as dashed vertical lines. For both panels, the green curve (initial focus) sees a shrunken initial rise in the second word (i.e. post-focus), thus arguably PFC. However, this could equally be interpreted as a phonetic carryover effect from the preceding on-focus raising. That is, the post-focus word starts at a high F0 level inherited from the preceding word, and remains higher than neutral focus throughout the post-focus domain. The unaccented post-focus contour converges with the neutral focus contour only at the end of 222S and near the end of 442S. The sluggish convergence of the post-focus and the neutral focus contours suggests that F0 targets are realized at a weak strength after focus, reminiscent of neutral tone in Mandarin [8]. This weak strength analysis is further supported by the differential timing of the convergence point in 222S (short utterance) and 442S (long utterance).

The realization of PFC also depends on sentence type. Panel 331S shows PFC in a statement under initial focus (green curve vs. black curve), but the same effect is much smaller in yes/no questions (Panel 331Q). In fact, with considerable individual variability, repeated measures ANOVA revealed that focus condition does not have a significant main effect on post-focus F0 in yes/no questions.

This study shows that the realization of PFC in Japanese depends on at least accent condition and sentence type. The surface realization of these communicative functions is therefore not just an amalgamation of their respective prosodic markers, but involves a more complex and context-dependent encoding scheme.

References

- [1] A. Lee and Y. Xu, "Revisiting focus prosody in Japanese," in *Proceedings of the 6th International Conference on Speech Prosody (SP2012)*, 2012, pp. 274–277.
- [2] J. B. Pierrehumbert and M. E. Beckman, *Japanese Tone Structure*. Cambridge, MA: Massachusetts Institute of Technology, 1988.
- [3] M. Sugahara, "Downtrends and post-focus intonation in Tokyo Japanese," University of Massachusetts, Amherst, Amherst, MA, 2003.
- [4] S. Ishihara, "Focus prosody in Tokyo Japanese wh-questions with lexically unaccented wh-phrases," in *Proceedings of the 17th International Congress of Phonetic Sciences (ICPhS 2011)*, 2011, pp. 946–949.
- [5] Y. Xu, "Post-focus compression: Cross-linguistic distribution and historical origin," in *Proceedings of the 17th International Congress of Phonetic Sciences (ICPhS 2011)*, 2011, pp. 152–155.
- [6] Y. Xu, S.-W. Chen, and B. Wang, "Prosodic focus with and without post-focus compression: A typological divide within the same language family?," *Linguist. Rev.*, vol. 29, no. 1, pp. 131–147, Jan. 2012.
- [7] Y. Xu, C. X. Xu, and X. Sun, "On the temporal domain of focus," in *Proceedings of the 2nd International Conference on Speech Prosody (SP2004)*, 2004, pp. 81–84.
- [8] S. Prom-on, F. Liu, and Y. Xu, "Post-low bouncing in Mandarin Chinese: Acoustic analysis and computational modeling," *J. Acoust. Soc. Am.*, vol. 132, no. 1, pp. 421–432, Jul. 2012.

