The effect of lexical pitch accent and downstep on listeners' word identification in Japanese

Yukiko Sugiyama[1], C. T. Justine Hui[2], Takayuki Arai[2]
[1]Keio University, [2]Sophia University

We examined how Tokyo Japanese listeners perceived lexical pitch accent and how their perception was affected by the presence or absence of downstep in the following word. sIn creating the stimuli, first, a native speaker of Tokyo Japanese produced five minimal pairs of pitch accent consisting of two syllables (e.g. /haná/ 'flower' vs /hana/ 'nose,' in which " ´ " indicates accent) in the carrier phrase /watasi wa [target] ga sukí/ meaning "I like [target]." Then, the utterances were divided insto two parts: the accentual phrase and the carrier phrase. The former consisted of the target words and the particle /ga/, and latter consisted of the remaining parts, i.e. /watasi wa/ and /sukí/. Next, for each accentual phrase, two seven-step continua were created from the accented words and the unaccented words with only f0 manipulated. In order to determine the effect of downstep where the pitch range is compressed after an accent word [1], we created two sets of stimuli using both the carrier phrases taken from the utterance with the accented word and utterance with the unaccented word. Each accentual phrase created was embedded in both carrier phrases, resulting in 28 stimuli per word pair (7 continual stimuli for each word (accented and unaccented) × 2 carrier phrases). We carried out a perception experiment where 14 native speakers of Tokyo Japanese (age: 19-24) were asked to identify whether they heard an accented word or its unaccented counterpart by choosing from two alternatives (e.g. flower or nose for /hana/). Each stimulus was presented 10 times to each listener. The results obtained so far indicate that listeners' identifications were generally consistent with the f0 contours in the accentual phrase, as shown in the ascending and descending slopes in Figure 1. In addition, when the accentual phrase was identical as indicated by the same stimulus number in the same color, listeners were more likely to respond that they heard an accented word when the carrier phrase was taken from the utterance in which the accented word was produced, and vice versa. Furthermore, the figure also illustrates some variations among pairs. While pairs such as *hana* and *hati* show relatively steep slopes, pairs such as *hasi* and *osu* show flatter slopes. For the pair *osu*, the carrier phrase seems to have affected the listeners' judgments more strongly than it did for the other pairs. Taken together, the results suggest that listeners integrate the f0 information in the target phrase and that in the following phrase in judging accentual properties of words.

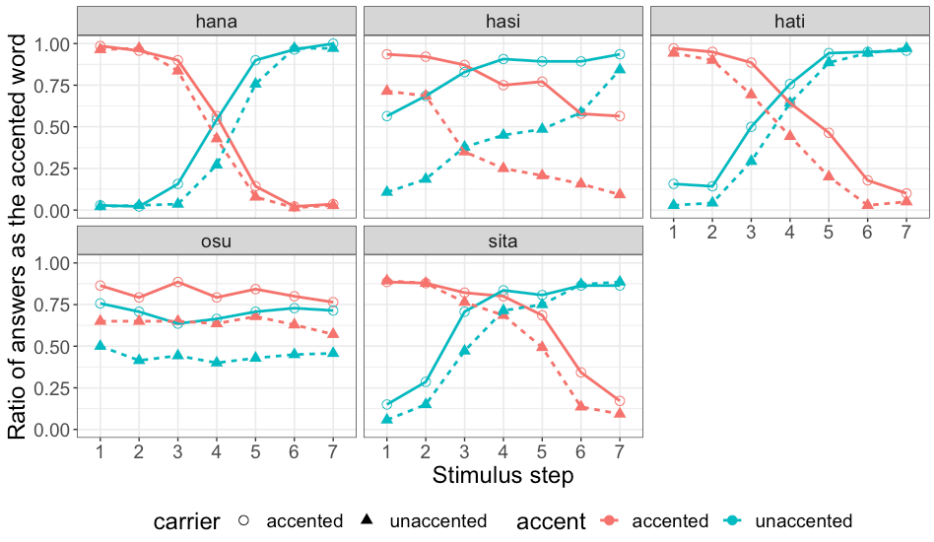

Figure 1. Word identification of each pair as functions of stimulus step and carrier phrase

[1] Pierrehumbert, J. B., Beckman, M. E. 1988. Japanese Tone Structure. Cambridge, MA: MIT Press.