

On the Perceptual Cue of Devoiced Vowels and Voicedness of Obstruents

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In Japanese, the high vowel between voiceless consonants often causes devoicing. Some previous studies (Maekawa 1989 and so on) have revealed that the acoustical reality of such a devoiced vowel is the extension of the noise in the preceding voiceless consonant, however Kawakami (1977) argued that [ɛ̥u] has the “devoiced vowel” actually. The purpose of this study is to clear Kawakami’s argument as follows: (1) the transition of pole frequency of [ɛ:] is important, (2) this transition motivates the phonological boundary of the following vowel.

Two perceptual experiments about (1) were conducted to assess the distinctive factors between [ɛ̥i] and [ɛ̥u]. In the first experiment, twenty-three subjects judged the “perceptual” vowel of fricatives with variable pole frequency bands that have no transition. The result of this experiment shows that the sound [ɛ:] with no transition does not occur the perception of the vowel /u/. On the other hand, in the second experiment using the stimuli [ɛ:] with pole frequency transition, the subjects could judge the vowel /u/ under the particular condition of pole frequency declining. These results show that the pole frequency transition of [ɛ:] is recognized as the property of the following vowel /u/ and that the phonetic form of /syu/ with a devoiced vowel in Japanese must be interpreted as [ɛ̥u] instead of [ɛ̥:].

If the pole frequency transition were the residual information of the following vowel, the phonological boundary should exist in this long consonant. This hypothesis is supported by the third experiment in regard to voicedness of fricatives and affricates. When the periodic vibrations occurred after the estimated boundary point in [ɛ:], the subjects recognized this fricative as a voiceless consonant regardless of the consonant with vocal fold vibration.

This result provides a suggestion for the “two peaks” distribution of VOT shown in Fig.1 (Takada 2011). This phenomenon may bear two explanations. One is a probability model based on the VOT distribution with an obstruct factor motivated by subglottic pressure as shown in Fig.2. Another plausible explanation is that the command of vocal fold vibration is controlled on two different reference points. This study suggests that one is based on the release timing of the closure, the other reference point is the phonological boundary which indicates both the end of the consonant and the starting timing of the following vowel (Fig.3).

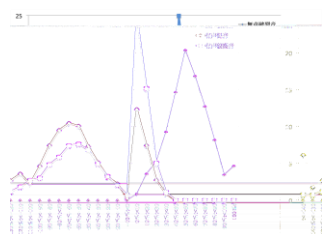


Fig.1 Distribution of VOT.

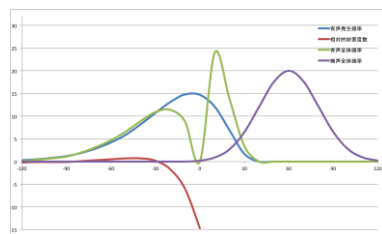


Fig.2 One reference-point model

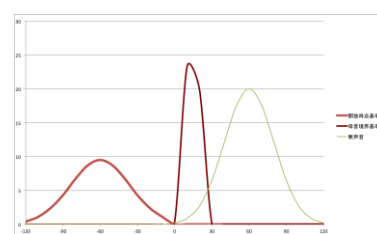


Fig.3 Two reference-point model

Selected References.

- Maekawa, Kikuo (1989). Vowel Devoicing. *Japanese and Japanese Education*, 135-153, Meiji-Shoin.
- Kawakami, Shin (1977). *An Introduction to Japanese Phonetics*. Oofuu-sha.
- Takada, Mieko (2011). *A Study of Initial Plosives in Japanese*. Kuroshio Publishers.