Perception and Production of American English Tense and Lax Vowels by Japanese Speakers

Michelle Minnick-Fox and
Kazuaki Maeda

University of Pennsylvania

Acquisition of a second language phonology is a formidable task that most (if not all) language learners never fully acquire. For example, second language learners often have difficulty perceiving phonemic contrasts in a second language (L2) that do not exist in their native language. They also often have difficulty in producing an intelligible or native-like phonetic realization of certain phonemes, especially of those phonemes that the learners have difficulty in perceiving. While experience with the L2 may improve perception and production, and may allow the learner to hear and produce distinctions, the criteria that he or she uses to distinguish the phonemes may not be the same as for native speakers of English. For example, Japanese speakers of American English (A.E.) may rely on durational cues to discriminate high front vowels in A.E. because Japanese /i/ and /i:/ differ primarily in duration. However, A.E. /i/ and /I/ differ in both vowel quality and duration, and Americans use vowel quality cues to discriminate the vowels.

The aim of the present study is to measure Japanese speakers' ability to perceive and produce the A.E. vowels /i/ and /I/. We are particularly concerned with the acoustic cues inexperienced and experienced Japanese speakers use in perception and with the acoustic characterization of their production of these two vowels.

The perception study consists of three sections:

1. a 2-option categorization test using natural tokens, in which the subject must choose which of the two categories each the vowel in the test word belongs to.

2. the same test using tokens which were durationally manipulated using the TD-PSOLA algorithm (a common method of modifying durations in speech tokens).

In each section of the test, a portion of the tokens are presented in isolation, and some are in the carrier phrase "Now say X again," where 'X' is the test word.

The production study consists of a detailed phonetic analysis of the vowels /i/ and /I/ spoken in 3 different conditions:

1. spoken in isolation
2. spoken in the carrier phrase, "Now X is the word I say."
3. spoken in a contrastive condition: i.e., "The word is X, not Y."

The phonetic analysis will include measuring the vowel quality and duration.

The third portion of the present study includes a perception study of the tokens recorded in the production study described above. Even if the tokens of /i/ and /I/ that are produced by the native Japanese speakers are statistically significantly different from each other in either vowel quality or (more probably in duration), the distinction produced is of minimal value if native A.E. listeners are not able to use the information.

The results in the perception and the production study are analyzed in detail to determine the phonetic characteristics of the vowel perception and production of the Japanese speakers of A.E. We hope the results address open questions in the second language acquisition, such as whether using wrong cues in perception is related to production of speech with a 'foreign accent.'