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Effects of Exposure to a Language on Perception of Non-Native Phonologically Contrastive Duration

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Abstract : It remains unclear how language speakers are able to perceive phonological contrasts that do not exist on their own. This experiment uses the vowel-length distinction in Japanese, which is phonologically contrastive and co-occurs with tonal change in some cases. For speakers whose first language does not distinguish vowel length, contrastive duration is usually misperceived, e.g., Mandarin speakers. Two alternative hypotheses for how Mandarin speakers would perceive a phonological contrast that does not exist in their language make different predictions. The stress parameter model does not have a clear prediction about the impact of tonal type. Mandarin speakers will likely be not able to perceive vowel length as well as Japanese native speakers do, but the performance might not correlate to tonal type because the prosody of their language is distinctive, which requires users to encode lexical prosody and notice subtle differences in word prosody. By contrast, cue-based phonetic models predict that Mandarin speakers may rely on pitch differences, a secondary cue, to perceive vowel length. Two groups of Mandarin speakers, including naive non-Japanese speakers and beginner learners, were recruited to participate in an AX discrimination task involving two Japanese sound stimuli that contain a phonologically contrastive environment. Participants were asked to indicate whether the two stimuli containing a vowel-length contrast (e.g., maapero vs. mapero) sound the same. The experiment was bifactorial. The first factor contrasted three syllabic positions (syllable position; initial/medial/final), as it would be likely to affect the perceptual difficulty, as seen in previous studies, and the second factor contrasted two pitch types (accent type): one with accentual change that could be distinguished with the lexical tones in Mandarin (the different condition), with the other group having no tonal distinction but only differing in vowel length (the same condition). The overall results showed that a significant main effect of accent type by applying a linear mixed-effects model ($\beta = 1.48$, $SE = 0.35$, $p < 0.05$), which implies that Mandarin speakers tend to more successfully recognize vowel-length differences when the long vowel counterpart takes on a tone that exists in Mandarin. The interaction between the accent type and the syllabic position is also significant ($\beta = 2.30$, $SE = 0.91$, $p < 0.05$), showing that vowel lengths in the different conditions are more difficult to recognize in the word-final case relative to the initial condition. The second statistical model, which compares naive speakers to beginners, was conducted with logistic regression to test the effects of the participant group. A significant difference was found between the two groups ($\beta = 1.06$, 95% CI = [0.36, 2.03], $p < 0.05$). This study shows that: (1) Mandarin speakers are likely to use pitch cues to perceive vowel length in a non-native language, which is consistent with the cue-based approaches; (2) an exposure effect was observed: the beginner group achieved a higher accuracy for long vowel perception, which implied the exposure effect despite the short period of language learning experience.

Keywords : cue-based perception, exposure effect, prosodic perception, vowel duration
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