The case for examining perceptual similarity of L2 sounds to each other

Ryan Lidster & Danielle Daidone

(University of North Carolina Wilmington)

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Major models of L2 speech perception – SLM-r (Flege and Bohn 2021), PAM-L2 (Best and Tyler 2007), L2LP (van Leussen and Escudero 2015) – all focus on the similarity between L1 and L2 segments, and a perceptual assimilation task is frequently used to assess perceived similarity. However, use of this task largely limits researchers to investigating segmental phenomena that can be categorized through L1 labels. This focus makes it difficult to measure and model the acquisition of phenomena that are not found at the level of L1 individual segments, such as length. In this study, we use a method called free classification to model perceptual similarity of L2 stimuli to each other, specifically the perception of Japanese length contrasts by English-speaking learners. Thirty learners of Japanese completed a free classification task in which they dragged sound files into groups according to how similar they sounded to each other. They also completed an oddity discrimination task. The stimuli consisted of nonwords of the form *poko, posho*, and *pono* in six length templates (CVCV, CVVCV, CVCCV, CVCVV, CVVCVV, and CVCCVV). Grouping rates revealed that the stimuli that differed in initial vowel length versus consonant length (CVVCV-CVCCV and CVVCVV-CVCCVV) and in consonant length (CVCV-CVCCV and CVCVV-CVCCVV) were grouped together more often than ones from any other pairing. A multidimensional scaling (MDS) analysis of the results allowed for a visual representation of the perceptual similarity of stimuli, as well as provided dimension scores that could be correlated with acoustic properties of the stimuli. This analysis found that learners relied mainly on vowel length to determine the similarity of stimuli. Additionally, MDS distances significantly correlated with discrimination accuracy ($r = 0.91$). We argue that L1-L2 mappings at the level of individual segments are insufficient to explain our results, such as confusions between forms such as CVVCV and CVCCV or learners' reliance on vowel length over consonant length. We suggest that examining the perceptual similarity of L2 sounds to each other has high predictive power, captures the warping of perceptual space by the L1, and is not limited to phenomena that can be represented by distinct L1 labels.

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