An articulatory investigation of Mandarin speakers’ production of English /r/

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One important theme to existing L2 speech learning theories is whether the learning of the L2 sounds is influenced by phonetic or phonological similarity to the L1 equivalent. Given that Mandarin /r/ and English /r/ are perceptually similar and share similar phonological distribution [1], Chen & Mok [2] investigated whether Mandarin-English bilinguals (from the greater Beijing area) would produce a merged category or distinct phonetic realizations for the two /r/’s. They found that the proficient bilingual speakers realized the two /r/’s differently in both acoustics and articulation. That is, the L2 /r/ is represented as distinct from the L1 /r/.

To extend [2]’s work, this study investigates whether English /r/ in less proficient L2 learners is more likely to undergo equivalence classification with the Mandarin /r/ (i.e., L2 /r/ being assimilated into Mandarin /r/). In addition, given that /r/ in Taiwan Mandarin has four different realizations: [ɹ, z, ʐ, l] [3], it offers an opportunity to test whether a new phonetic category is more likely to be established when an L2 sound is phonetically different from the closest L1 sound. That is, whether Taiwan speakers with [z, ʐ, l] productions for Mandarin /r/ are more likely to produce a separate phonetic category for English /r/ than those with the [ɹ] realization. Both questions were formulated to test the hypotheses in Flege’s [4] Speech Learning Model.

To investigate the articulations of L1 Taiwan Mandarin /r/ in relation to L2 English /r/, we examined ultrasound tongue imaging (tongue shape), palatographic (place of articulation), and lip video (lip protrusion) data. The subjects were 6 Taiwan Mandarin speakers (3 males, 3 females) with intermediate-level proficiency in English (as measured by their TOEIC scores). The stimuli included Mandarin *rou, ru, rui* carrying Tone 4, English *row, rue, ray*, and non-/r/-initial syllables serving as distractors. All the stimuli were real words and were repeated 5 times.

All the Mandarin /r/ tokens were categorized into [ɹ, z, ʐ, l] based on two phonetically trained research assistants’ auditory impression. All the English /r/ tokens were correctly identified and rated 3 or above on a 5-point Likert scale by two native English speakers. The articulatory data showed three patterns. First, a merged L1-L2 category (3 subjects): for example, Subject 6 (see Figure 1) produced an apical post-alveolar retroflex /r/ for both Mandarin and English, with no lip protrusion difference. Second, distinct L1-L2 categories (1 subject): Subject 1 (see Figure 2) produced an upperapical pre-palatal retroflexed approximant for Mandarin /r/, but a laminal palatal bunched approximant for English /r/. The third pattern is emerging L1-L2 category dissimilation (2 subjects): While Subject 3 (see Figure 3) did not differentiate the two /r/’s in all of our articulatory measurements—both involved the blade of the tongue (with a bunched tongue shape) approximating the post-alveolar region, with no significant lip protrusion difference, she realized Mandarin /r/ as a fricative [z] and English an approximant /r/. Subject 4 had a [l] realization for Mandarin /r/, whereas his English /r/ was an approximant that shared the same articulatory configurations with its Mandarin counterpart—both were apicolaminal post-alveolars produced with a front-bunched tongue shape and with no lip protrusion difference.

In conclusion, while more advanced Mandarin speakers of English have developed separate phonetic categories for /r/ in L1 and L2 (as found in [2]), half of the less proficient L2 speakers in our study produced the L2 /r/ with reference to their L1 /r/. That is, L2 proficiency may be critical to L2 category assimilation vs. dissimilation. We also found that individuals with [z, ʐ, l] realizations for Mandarin /r/ produced an approximant /r/ for English that shared the same articulatory configurations as the Mandarin /r/. That is, L1-L2 phonetic dissimilarity is not necessarily more likely to result in a new L2 category.
Figure 1. Articulatory data of Subject 6’s Mandarin *rui* and English *ray*. From left to right: ultrasound tongue imaging (anterior on the right; palatal contour traced in red), palatographic, linguographic, and lip video data.

Figure 2: Articulatory data of Subject 1’s Mandarin *rou* and English *row*.

Figure 3: Articulatory data of Subject 3’s Mandarin *rou* and English *row*.

References


