

Third language phonetic and phonological acquisition: perceptual discrimination of consonants in Chongqing Mandarin, Standard Mandarin, and English

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In this paper we consider L3 perception in the context of south-west China. Specifically, our work investigates listeners whose L1 is Chongqing Mandarin, L2 Standard Mandarin, and L3 English. In this context, a merger is ongoing in Chongqing Mandarin between [l] and [n] ([l], [2]), but these sounds are phonemic in speakers' L2, Standard Mandarin, and L3, English. We address the following research questions: 1) To what extent can L1 Chongqing Mandarin speakers perceive /l/ and /n/ in L2 Standard Mandarin and L3 English? 2) What is the directionality of perception in L2 Standard Mandarin and L3 English? 3) Is there a correlation between the /l~/n/ perception in L2 Standard Mandarin and L3 English? 4) How do social and linguistic factors modulate the perception and directionality in L2 Standard Mandarin and L3 English?

We present perception data from 97 L1 Chongqing Mandarin listeners (38M, 59F) with different proficiency levels in L2 Standard Mandarin and L3 English. Audio data used for perception tasks were recorded from female speakers as follows: two L1 speakers of English, and two speakers of Standard Mandarin whose proficiency fulfills the requirement for Chinese-language teachers in China. Listeners carried out an AX discrimination task aiming to examine the extent of their knowledge of /l~/n/ contrasts in L2 and L3, and a 2AFC task aiming to examine the directionality of potential /l~/n/ merger in L2 and L3 perception. Stimuli contained minimal /l~/n/ pairs from four vowel contexts (e.g. [a], [an], [i], [u]) and two tones in Standard Mandarin (35 and 51), and five vowel contexts (e.g. [a], [an], [ʌ], [i], [u]) in English. Target consonants are in the word-initial position (e.g. [ni35], [ni51] and neat). Participants also completed a language background and proficiency questionnaire. Each listener heard 84 trials in each AX task, and 42 trials in each 2AFC task.

Statistical testing was carried out via mixed-effects regression modelling. Specifically, we fit a logistic model to the likelihood of responding correctly in the AX task, and a logistic model to the likelihood of perceiving [l] in L2 and L3 in the 2AFC task. We also tested for the potential impact of linguistic and social factors via model comparison. To assess correlations, we calculated perceptual sensitivity (d-prime) in L2 and L3 to give each speaker one value capturing their performance across different linguistic contexts. We then calculated Pearson's correlation coefficient on d-prime scores for L2 and L3 in each task.

Results indicate that listeners can perceive a difference between /l/ and /n/ in both L2 and L3 AX tasks with better performance in L3. In the 2AFC task, they cannot perceive better than chance levels in L3, but do so in L2. Such a result suggests that their L3 perception is likely to be influenced by their L1, where [l] and [n] are merging. Their perception performance in L2 and L3 varies according to gender, with male listeners less likely to be able to perceive the difference in the AX task. The directionality of perception in L2 and L3 is not biased towards [l] or [n] overall. Listeners with longer residence in Chongqing are more likely to perceive [n] in L2 but no significant differences are found in L3. The correlation between accuracy in L2 and L3 is strongly positive ($R = 0.75$ $p < .001$ AX task; $R = 0.59$ $p < .001$ 2AFC task), indicating that the better listeners are at perceiving in L2, the better they are in L3 (see Figures 1 and 2).

Cross linguistic influence from both L1 and L2 onto L3 perception are found in line with predictions made by the SLM and PAM-L2 for L2 phonological acquisition ([3], [4]), demonstrating that the SLM and PAM-L2 can be extended to L3 phonological acquisition ([5], [6], [7]). Such a hybrid transfer is in contrast with results in [2] that L2 Standard Mandarin did not have any transfer to L3 English, but L1 Southwestern Mandarin did.

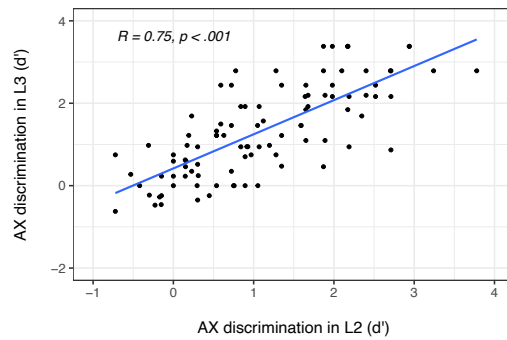


Figure 1 Correlation of L2 and L3 for AX task

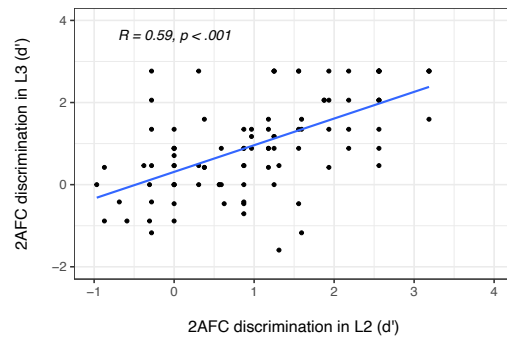


Figure 2 Correlation of L2 and L3 for 2AFC task

- [1] Zhang, W. (2007). Alternation of [n] and [l] in Sichuan dialect, Standard Mandarin and English: A single-case study. *Leeds Working in Linguistics and Phonetics*, 12, 156-173.
- [2] Zhang, W., & Levis, J. M. (2021). The Southwestern Mandarin /n/-/l/ Merger: Effects on Production in Standard Mandarin and English. *Frontiers in Communication*, 6, 1-22.
<https://doi.org/https://doi.org/10.3389/fcomm.2021.639390>
- [3] Best, C. T., & Tyler, M. D. (2007). Nonnative and Second-Language Speech Perception: Commonalities and Complementarities. In M. M. a. O.-S. Bohn (Ed.), *Second Language Speech Learning: The Role of Language Experience in Speech Perception and Production* (pp. 13-34). John Benjamins Publishing Company.
- [4] Flege, J. E. (1995). Second Language Speech Learning: Theory, Findings, and Problems. In W. Strange (Ed.), *Speech Perception and Linguistic Experience: Issues in Cross-Language Research* (pp. 233-277). York Press.
- [5] Liu, J., & Lin, J. (2021). A Cross-Linguistic Study of L3 Phonological Acquisition of Stop Contrasts. *SAGE Open*, 11(1).
- [6] Onishi, H. (2016). The Effects of L2 Experience on L3 Perception. *International Journal of Multilingualism*, 13(4), 459-475.
- [7] Wrembel, M., Marecka, M., & Kopečková, R. (2019). Extending Perceptual Assimilation Model to L3 Phonological Acquisition. *International Journal of Multilingualism*, 16(4), 513-533.