Third Language Perception Predicted by Acoustic and Perceptual Similarity between L3 and L1/L2 Vowels

Xinran Ren (Sun Yat-sen University) & Peggy Mok (The Chinese University of Hong Kong)

A frequently asked question regarding L3 acquisition is which existing language system, L1, L2 or L1+L2, is transferred to L3. This study does not only aim at finding out the source of transfer to L3, but more importantly, it also tests the role of two factors, acoustic and perceptual similarity, in predicting the discrimination accuracy of L3 vowels. These two factors play an important role in several L2 perception models, such as PAM-L2 (Best and Tyler 2007) and L2LP (Escudero 2005), while not many studies extended the perceptual assimilation model to L3, and acoustic similarity has rarely been investigated in L3 studies.

22 college-aged L3 learners (8M, 15F) participated in a perceptual mapping task (with all possible vowels in Cantonese and English as choices), an identification task of target Korean vowels /u,o,ʌ/ and a reading task containing L1 and L2 vowels. To measure acoustic similarity between L3 and L1/L2 vowels, cross-language discriminant analyses (LDA) were conducted using F1, F2, F3 and duration normalized by Lobanov's z-score. For this aim, we compared the acoustic properties between the L3 learners' L1 and L2 vowel productions and the native Korean vowel tokens that were used as stimuli in the identification task. Perceptual similarity was measured through perceptual mapping percentages. Subsequently, Levy (2009)'s overlap scores were adopted to quantify acoustic and perceptual similarity. It represents the proportion of overlap between L3 target and L1 and L2 vowels, so a higher score means more overlap.

The acoustic and perceptual overlap scores were calculated according to the results of cross-linguistic acoustic comparisons and perceptual mappings. As is shown in the following table, the vowel contrasts /u-o/ and /o-ʌ/ have higher acoustic and perceptual scores than /u-ʌ/, which successfully predicted a more accurate discrimination of /u-ʌ/ than /u-o/ and /o-ʌ/. The comparisons between different vowel contrasts were confirmed by paired-samples t-tests. Therefore, in line with previous studies on L2 perception, the results in the current study also demonstrate that a larger acoustic or perceptual overlap between L3 and L1/L2 will lead to more difficulties in L3 vowel discrimination. The results will be further discussed from a perspective of L3 acquisition.

Overlap scores	NK Contrasts		
	/u-o/	**/o-ʌ/**	**/u-ʌ/**
Acoustic	34.8	31.2	8.0
Perceptual	64.8	48.6	31.5
Discrimination Accuracy: /u-o/ ≈ /o-ʌ/ < /u-ʌ/			

References:

Best, C. T. & Tyler. M. (2007). Non-native and second-language speech perception: Commonalities and complementarities. In *Language Experience in Second-Language Speech Learning: In Honor of James Emil Flege*. Edited by O. Bohn and M. J. Munro. Amsterdam: John Benjamins, pp. 13–34.

Escudero, P. (2005). *Linguistic perception and second language acquisition: Explaining the attainment of optimal phonological categorization*. Netherlands Graduate School of Linguistics.

Levy, E. S. (2009). On the assimilation-discrimination relationship in American English adults' French vowel learning. *The Journal of the Acoustical society of America, 126*(5), 2670-2682.