Sensitivity and Transfer in Perceptual Learning of Nonnative Phonological Contrasts

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Perception of a nonnative language (L2) is known to be affected by TRANSFER from the native language (L1), but the relative importance of transfer vis-a-vis INDIVIDUAL DIFFERENCES remains unclear. For example, L2 learners who speak an L1 in which [±voice] is not used or consonant clusters are not allowed tend to have difficulties perceiving L2 contrasts related to voicing or clusters, which can be explained in terms of transfer of L1 phonological constraints to L2 perception (Hallé et al. 1998; Brown 2000; Dupoux et al. 2008). However, there is more to L2 perception than L1 transfer, as learners from the same L1 background can show marked variability, both *ab initio* as well as over the course of L2 development; such individual differences may arise due to variation in perceptual and cognitive dimensions undergirding phonological learning (Díaz et al. 2008; Perrachione et al. 2011; Darcy et al. 2015; Schertz et al. 2015; Bowles et al. 2016). The current study explored how phonetic sensitivity and transfer interact in L2 phonological learning through an experimental study of L2 learners of Korean. In particular, we tested the hypothesis that the nature of transfer changes as learners gain experience with the L2, such that preexisting differences in phonetic sensitivity are more influential at earlier stages of learning and L1 transfer is more influential at later stages.

To test this hypothesis, novice adult L2 learners of Korean from diverse L1 backgrounds ($N = 57$; $M_{age} = 21.5$ yr) were examined longitudinally in a pretest-posttest design with respect to their perceptual acquisition of novel L2 consonant contrasts (namely, the three-way Korean laryngeal contrast among lax, tense, and aspirated voiceless plosives, which differ in terms of [±spread glottis] and [±tense] but not in terms of [±voice]). The participant sample included L1 speakers of English, Finnish, French, Malay, Mandarin Chinese, Portuguese, Slovenian, Spanish, Swedish, and Turkish. At the time of study, participants were enrolled in an elementary Korean course at a university in Seoul, which lasted five weeks and consisted of a total of 54 class contact hours. The pretest (conducted before the Korean course) used an oddity discrimination task to measure the degree to which participants, with no prior exposure to the L2, could already perceive the target L2 phonemes, while the posttest (conducted after the Korean course) used a forced-choice identification task to measure participants' level of acquisition of the target phonemes after extensive exposure to the L2.

Results showed a significant disparity between the pretest and posttest in the effect of L1 background. Consistent with our hypothesis, accuracy on the pretest showed large individual differences (range of 25–100%); however, mixed-effects regression modeling with random effects for Participant and Item and a fixed effect for L1 Laryngeal Type ([±voice] contrasts only, e.g. Spanish; [±spread glottis] contrasts only, e.g. Mandarin; both [±voice] and [±spread glottis] contrasts, e.g. English) showed no effect of L1 Laryngeal Type [$\chi^2(2) = 5.523, p > .05$]. In contrast, accuracy on the posttest showed a significant effect of L1 Laryngeal Type [$\chi^2(2) = 9.982, p < .01$], with learners whose L1 makes use of [±spread glottis] showing a sizable advantage over those whose L1 does not (mean 66% vs. 49%). Furthermore, pretest accuracy did not predict posttest accuracy [Pearson's $r(56) = .097, p > .05$] (Figure 1), suggesting that posttest performance was not closely related to individual differences in phonetic sensitivity.

Taken together, these results support the view that the L1 phonology influences L2 perception dynamically according to the amount of L2 knowledge available to learners (cf. Major 2001). As learning proceeds, acquiring a phonological framework for the L2 provides a phonological basis for mapping L2 speech to the L1; this leads to the L1 phonology playing a primary role in L2 perception, thereby reducing the role of individual differences. For *ab initio* learners, however, no phonological framework yet exists, allowing individual differences to shine through instead. In short, our findings suggest that phonetic sensitivity and L1 phonology both play a role in L2 perception, but to different degrees over the course of L2 development.

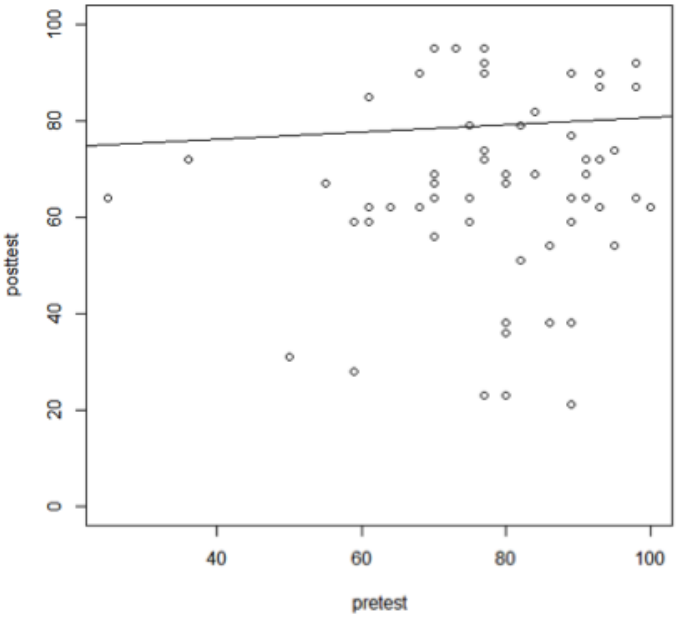

Figure 1: Scatterplot of posttest accuracy (%) by pretest accuracy (%), with best-fit regression line. Each point represents one participant.

References

Bowles, A. R., Chang, C. B., & Karuzis, V. P. (2016). Pitch ability as an aptitude for tone learning. *Language Learning*, *66*(4), 774–808.

Brown, C. (2000). The interrelation between speech perception and phonological acquisition from infant to adult. In J. Archibald (Ed.), *Second Language Acquisition and Linguistic Theory* (pp. 4–63). Malden, MA: Blackwell Publishers.

Darcy, I., Park, H., & Yang, C.-L. (2015). Individual differences in L2 acquisition of English phonology: The relation between cognitive abilities and phonological processing. *Learning and Individual Differences*, *40*, 63–72.

Díaz, B., Baus, C., Escera, C., Costa, A., & Sebastián-Gallés, N. (2008). Brain potentials to native phoneme discrimination reveal the origin of individual differences in learning the sounds of a second language. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(42), 16083–16088.

Dupoux, E., Sebastián-Gallés, N., Navarrete, E., & Peperkamp, S. (2008). Persistent stress 'deafness': The case of French learners of Spanish. *Cognition*, *106*(2), 682–706.

Hallé, P. A., Segui, J., Frauenfelder, U., & Meunier, C. (1998). Processing of illegal consonant clusters: A case of perceptual assimilation? *Journal of Experimental Psychology: Human Perception and Performance*, *24*(2), 592–608.

Major, R. C. (2001). *Foreign Accent: The Ontogeny and Phylogeny of Second Language Phonology*. Mahwah, NJ: Lawrence Erlbaum Associates.

Perrachione, T. K., Lee, J., Ha, L. Y. Y., & Wong, P. C. M. (2011). Learning a novel phonological contrast depends on interactions between individual differences and training paradigm design. *Journal of the Acoustical Society of America*, *130*(1), 461–472.

Schertz, J., Cho, T., Lotto, A., & Warner, N. (2015). Individual differences in phonetic cue use in production and perception of a non-native sound contrast. *Journal of Phonetics*, *52*, 183–204.