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Research Article

Perceptual category mapping between English and Korean obstruents in non-CV positions: Prosodic location effects in second language identification skills

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ABSTRACT

This study examines the degree to which mapping patterns between native language (L1) and second language (L2) categories for one prosodic context will generalize to other prosodic contexts, and how position-specific neutralization in the L1 influences the category mappings. Forty L1-Korean learners of English listened to English nonsense words consisting of /p b t d f v θ ð/ and /ɑ/, with the consonants appearing in pre-stressed intervocalic, post-stressed intervocalic, or coda context, and were asked to identify the consonant with both Korean and English labeling and to give gradient evaluations of the goodness of each label to the stimuli. Results show that the mapping patterns differ extensively from those found previously with the same subjects for consonants in initial, onset context. The mapping patterns for the intervocalic context also differed by position with respect to stress location. Coda consonants elicited poor goodness-of-fit and noisier mapping patterns for all segments, suggesting that an L1 coda neutralization process put all L2-English sounds in codas as "new" sounds under the Speech Learning Model (SLM) framework (Flege, 1995). Taken together, the results indicate that consonant learning needs to be evaluated in terms of position-by-position variants, rather than just being a general property of the overall consonant systems.

1. Introduction

A fundamental tenet of Flege's original Speech Learning Model (SLM: Flege, 1987; Flege, 1995, 2002) is that the degree of success a language learner will have in approximating the production of a non-native (L2) speech segment depends on the perceptual similarity/dissimilarity of that segment to segments in the native language (L1). To operationalize this observation, earlier versions of the SLM typologically classified L2 sounds into "similar" and "new" classes, where "similar" sounds are persistently functionally approximated by a previously existing L1 sound, and "new" L2 sounds require the learning of a category distinct from the previously existing L1 categories. The SLM predicts that the "new" segments are not the categories that constitute continual problems in more accomplished learners, but it is the "similar" ones that remain problematic for the learners trying to develop native-like production and perception skills. This is because novel category formation is blocked for the "similar" sounds, while such blocking does not occur for the "new" sounds.

Various findings in L2 category research over the last twenty years have shown that this classification of L2 sounds with respect to their similarity to ones in the L1 is not dichotomous, but rather is gradient. For example, Guion, Flege, Akahane-Yamada, and Pruitt (2000), studying the acquisition of English by Japanese speakers, noted that the difficulty of developing skills with regard to new segments varies widely; it is not the case that simply getting L1 categories out of the way will make the acquisition process easy for any segment. Both English /l/ and /ɹ/ are "new" segments to Japanese learners of English since neither English category was identified as one of Japanese categories with a high goodness rating. However, more experienced Japanese learners

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showed some evidence of learning only for English /ɹ/ but not for English /l/. The authors suggested that such a difference must be related to the fact that English /ɹ/ is less similar to a native category (i.e., Japanese /ɾ/) than English /l/ is, indicating a gradiency to L2 category classification. (Also see Strange et al. (1998), regarding Japanese listeners' perceptual assimilation of American English vowels for a similar conclusion.)

Park and de Jong (2008) also indicate that the distinction between "new" and "similar" is more graded than a typological labeling would suggest. Park and de Jong (2008) examined Korean EFL (English as a Foreign Language) learners' perceptual identifications of a set of anterior obstruents produced by American English talkers. Identification categories were of two types: Korean consonant categories in one task (Korean labeling task) and English consonant categories in the other task (Roman/IPA labeling task). The responses also included goodness-of-fit judgments for the Korean labeled responses. The results in the Korean labeling task showed that English voiceless stops /p/ and /t/ are perceptually very similar to Korean aspirated stops (i.e., they receive high goodness ratings) and non-sibilant fricatives /f/, /v/, /θ/, and /ð/ clearly are "new" (i.e., they receive low goodness ratings), and have no similar reflex in the Korean system. English voiced stops /b/ and /d/ are, however, somewhere in between, exhibiting a systematically greater degree of similarity with Korean fortis and lenis stops than do the non-sibilant fricatives, but also being a systematically poorer fit than are the English voiceless stops to the aspirated Korean stops. Schmidt (1996) and Cho and Lee (2007) also report similar results for English-to-Korean category mapping.

The results from Park and de Jong (2008), nevertheless, support the more basic contention of the SLM that segments in an L2 need to be evaluated in terms of their 'newness'. In their study, the Korean learners' perceptual identifications in the Korean labeling task were used to generate a mapping of the English to Korean categories, and to then estimate a matched Korean-to-English category mapping. The paths through the mappings were then modulated by the goodness-of-fit judgments to make quantitative predictions of the Korean listeners' accuracy and error patterns. These predictions were tested by examining the listeners' English identification responses to the same stimuli in the Roman/IPA labeling task. With appropriate use of the goodness-of-fit data to weight the probability of particular English responses associated with each Korean category, the model was very successful in quantitatively predicting the accuracy of the Korean responses to the English stops. Predicted accuracies deviated from actual accuracy by less than 6% for most stops with the exception of English /p/. Accuracies for the non-sibilant fricatives, however, were grossly under-predicted; the Korean learners were systematically much better with the fricative consonants than would be predicted on the basis of the English-to-Korean mappings. This pattern of results was interpreted as indicating that the learners' L1 categories could be said to explain the pattern of English identifications and their accuracy with the English stops, while their pattern of identification of the English fricatives suggested the development of new categories that were effectively separating the fricatives from the stops.

One other attribute of these new fricative categories was also noted; error rates involved with fricatives were higher than those between stops, suggesting that, while the new categories have the advantage of being built around the English productions, they are also less well developed, and so are more noisy. They are subject to more confusion with other categories than the similar stops are.

The current research seeks to replicate the findings of Park and de Jong (2008) with another Korean EFL data set, and to apply the same methodology in answering two somewhat different questions. All of the segmental identifications in the previous work were for consonants in prevocalic word-initial (henceforth, *onset*) position. The first question, then, to be asked, is the degree to which mappings for one prosodic context (i.e., onset position) will generalize to other contexts, and if they do not, whether the mapping patterns found in these other prosodic contexts conform to the "newness" mapping predictions found in Park and de Jong (2008). A second, more specific question is also pursued in the context of the particular L1 being tested, and concerns the effect of having systematic neutralization rules in the L1 on mapping between the L1 (Korean) and L2 (English), and on perceptual identification performance in the L2.

Concerning the first question, de Jong, Silbert, and Park (2009) investigated the generalization of perceptual identification abilities across prosodic contexts among Korean learners of English and found that perceptual identification skills related to voicing in onset do not generalize to voicing perception in intervocalic and post-vocalic word-final (henceforth, *coda*) contexts. Listeners who were exceptionally accurate with voicing in onset were not necessarily exceptionally accurate with voicing in other contexts, and listeners who were less accurate in onset consonants were not necessarily less accurate in other prosodic contexts. This pattern of results was interpreted as indicating that the particular perceptual skills necessary for initial position are different from those for voicing in other prosodic contexts. The results from Cho and Lee's (2007) and Jang's (2014) studies also suggest that perceptual identifications for one prosodic context are not likely to generalize into other contexts. Cho and Lee (2007) examined the category mapping patterns between English and Korean consonants across prosodic contexts among Korean learners of English. They reported that the mapping patterns differed in different prosodic contexts; more diverse patterns were observed in prosodically weak position (e.g., coda) than in prosodically strong position (e.g., onset). Jang (2014) compared identification accuracies for English consonants in onset and coda positions among Korean learners of English, finding large differences in accuracy for the two positions; the accuracy was higher in the syllable initial than in the syllable-final position. These findings fit with previous work in the SLM line, which generally treats position-specific allophones as the targets of analysis (Flege, 1995). If this conclusion is appropriate to the current data, and thus mapping patterns differ by position, then these consonants in other contexts provide additional test cases for examining the general contention of Park and de Jong (2008) that similarity classification ("newness") determines identification performance for the segments.

Concerning the second question, the current research specifically investigates the effect of Coda Neutralization in