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WITHIN-CATEGORY VARIATION IN L2 ENGLISH VOWEL LEARNING

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1. INTRODUCTION

Second language (L2) pronunciation research typically treats L2 phonological categories as monolithic wholes, without regard for potential within-category variation in learners' productions. Flege [1] argues that L1 transfer most easily occurs when an L2 phoneme has an L1 counterpart in a similar or identical phonetic environment. Some empirical evidence supports this claim (see [2] & [3]). Other factors may also contribute to within-category variation in L2 speech. In this study, we examine whether L2 learners are more apt to accurately produce English vowels 1) when vowels are in more familiar rather than less familiar words and 2) when the learners have access to orthographic representations of those words. We also examine the extent to which the learners' L1 plays a role.

2. METHOD

2.1 Speakers

19 Standard Mandarin (15 female, 4 male; *M* age = 40.1; range = 29-49) and 19 Slavic (12 female, 7 male; *M* age = 38.6; range = 29-49) speakers participated. The Slavic group comprised 13 Russian, three Serbian, two Ukrainian & one Polish speaker. The speakers' mean Length of Residence in Canada was 15.6 months (range = 4 - 40 months). All had been enrolled in intensive ESL classes for an average of 5.2 months (range 2 -16) and were assessed as beginners by the Canadian Language Benchmarks.

2.2 Stimuli

Stimuli comprised a list of 30 English progressive verbs containing 10 target Canadian English vowels. We chose words we thought would vary in terms of their degree of familiarity for beginner ESL learners (e.g., 'keep', 'feed' and 'beat' for the vowel /i/). Words were also chosen to include a range of onsets so as to mitigate any potential contextual biases in performance. The resulting word list was randomized and a male speaker of Canadian English was recorded producing each word, with a five second pause inserted between items. Stimuli were saved to CD.

2.2 Speaking task

L2 productions were elicited in two counter-balanced conditions: 1) after hearing the recorded CD prompts and 2) after hearing the recorded prompts accompanied by the written word list. In a third and final condition, all participants were asked to read the word list without any auditory prompt. Speaker productions were recorded in a quiet room using a high quality Marantz digital recorder.

2.3 Assessment of Word Familiarity

After the recording session, participants were asked to complete a 4-point familiarity judgment for each word where 0 = I don't know it; 1 = I might know it; 2 = I think I know it; and 3 = Yes, I know it.

2.4 Intelligibility Ratings for L2 Productions

Individual words were extracted from all recordings and saved as separate sound files for presentation to two phonetically trained native English speaker judges. Using *Praat* (*www.praat.org*), all recordings of a given word (e.g., "sitting") were randomly presented and the judges used a mouse click to indicate whether each production was perceived as containing the intended vowel or a different vowel. After one word set was evaluated, recordings of the next target word set were presented for assessment. Multiple sessions were needed to evaluate all 3420 items.

3. RESULTS

Mean familiarity scores for each word were used to assign words containing each vowel category to one of three groups: 1) most familiar, 2) second most familiar and 3) least familiar. For example, with mean familiarity scores shown in parentheses, "cool" (2.8), "fool" (2.4) and "boot" (1.3) were assigned to groups 1, 2 and 3 respectively. In one case, a tie in mean familiarity scores was broken through reference to word frequency in the British National Corpus.

The judges agreed on the identity of 81% of items. Chi-square analyses found no significant differences between judges' intelligibility scores across each of the three speech elicitation conditions, nor for intelligibility scores across each word familiarity group. Responses were pooled across judges to arrive at a mean intelligibility score for each item.

A two-way partially repeated measures ANOVA with Word Familiarity (3 levels) and Speech Elicitation Condition (3 levels) as within-subject factors, and L1 as a between subject factor, revealed a significant effect for Word Familiarity [$F(2,72) = 58.918$, $p = .000$, $\eta^2 = .621$] as well as Speech Elicitation Condition [$F(2,72) = 53.689$, $p = .000$, $\eta^2 = .599$]. No significant effect of L1 background on vowel intelligibility was found. Nor were there any significant interactions between factors.

Bonferroni adjusted *t*-tests found that vowels in the most familiar lexical context were significantly more intelligible than those in the least familiar lexical context [$t(37) = 8.493$, $p < .001$], but not significantly more intelligible than vowels in the second most familiar lexical context [$t(37) = 2.403$, $p = .0215$]. Vowels in the second most familiar lexical context

were significantly more intelligible than vowels in the least familiar lexical context [*t*(37) = 8.351, *p* < .001].

Post-hoc Bonferroni adjusted *t*-tests found that vowels in the Auditory + Reading condition were significantly more intelligible than vowels in the Auditory only [*t*(37) = 3.22, *p* = .003] and the Reading only conditions [*t*(37) = 8.59, *p* < .001]. In addition, the vowels in the Auditory only condition were significantly more intelligible than those in the Reading only condition [*t*(37) = 7.20, *p* <.001].
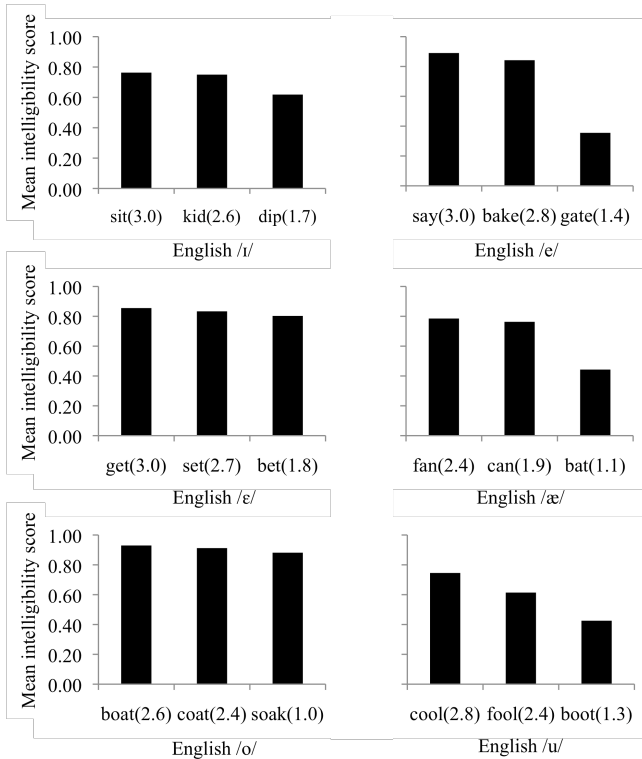

Figure 1. Mean intelligibility scores for English vowels in words that followed the rank order predicted by mean familiarity scores (indicated in parentheses). Results are pooled across Mandarin and Slavic speakers.
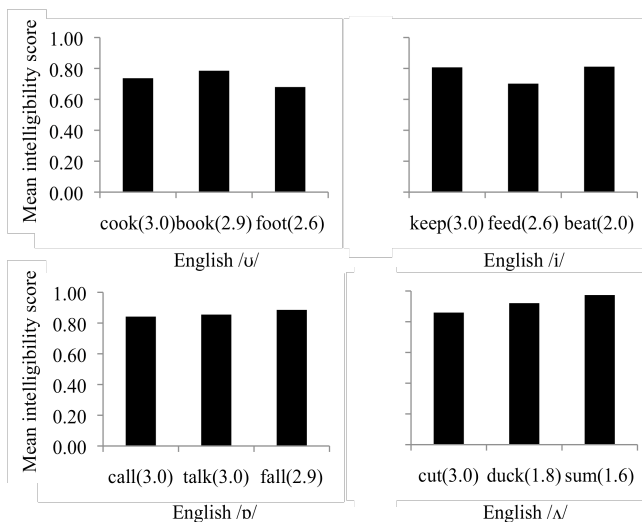

Figure 2. Mean intelligibility scores for English vowels in words that did not follow the rank order predicted by mean familiarity scores (indicated in parentheses). Results are pooled across Mandarin and Slavic speakers.

Mean intelligibility scores for individual words (see Figure 1) provide more specific evidence for the role of lexical familiarity. For six of ten English vowels, the mean intelligibility score decreases as lexical familiarity decreases. In the remaining four cases (see Figure 2), individual items do not follow the predicted pattern. However, if the Mandarin productions of "cook", "book" and "foot" are examined in isolation, rather then pooled with Slavic productions, intelligibility scores do follow the predicted pattern. Conversely, the Slavic productions of "feed", "keep" and "beat" examined in isolation also follow the predicted pattern with respect to lexical familiarity.

4. DISCUSSION

The results of this study provide strong evidence that lexical familiarity predicts the intelligibility of L2 phonemes, regardless of the learners' L1. In the majority of cases, vowels from a single English category were produced less intelligibly when they occurred in less familiar words. Although there was no significant L1 effect, differences between L1 groups in two cases suggest there may be differences with respect to specific English vowel categories, providing some evidence for Flege's [1] claims regarding L1 transfer being context-specific. The results of this study also indicate that the provision of orthographic information can have a facilitative effect on the intelligibility of L2 speech. Taken together, these findings suggest that L2 speech emerges at the level of lexically conditioned allophones, not as entire categories. Rapid access of semantic and/or lexical information in more familiar words may facilitate greater attention to phonetic form. Reference to orthographic representations, assuming they are relatively transparent as was the case in this study, may also allow for more rapid access of semantic and/or lexical information, and also facilitate attention to form.

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