

Testing phonological models: the role of alternation in phonological relationships

The concept of phoneme/allophone has always been central in phonology (Jaeger 1980; Marslen-Wilson & Warren 1994; Norris et al. 2003). This study uses a previously established method of testing speakers' perception, *similarity rating*, to investigate what factors cause speakers to assign two sounds of their language to a single phoneme category: complementary distribution, morphological alternation, or a combination of the two.

I investigate the processing of *s* and *sh* in three languages in which these sounds participate in different types of phonological relationships. In English *s* and *sh* are contrastive. In Korean *s* and *sh* are in complementary distribution and participate in morphological alternation. In Mandarin *s* and *sh* are in complementary distribution *without* morphological alternations. The results help us test the predictions of different phonological models. The traditional structuralist definition of contrast/allophony, in which two (phonetically similar) sounds in complementary distribution are analyzed as allophones of the same phoneme (Bloch 1950; Harris 1951; Hualde 2004), predicts that *s* and *sh* should be analyzed as allophones by speakers of both Mandarin and Korean, despite the absence of morphological alternation. However, frameworks that assume a close match between underlying and surface representation except where allomorphic alternation requires two surface forms to derive from a single underlying representation (as in the Lexicon Optimization principle of Optimality Theory) predict that in Mandarin, *s* and *sh* should derive from separate underlying representations, with constraints determining possible surface distributions, so that Mandarin speakers will assign these sounds to different categories, while Korean speakers will assign them to the same category. Finally, an exemplar approach in which all heard tokens are assumed to be stored, the distribution of sounds in complementary distribution should emerge as generalizations over these stored utterances, though morphological alternations should be expected to reinforce the connections among sounds. This model therefore predicts that Mandarin speakers should associate *s* and *sh* but the connections between the two sounds should not be as strong as in Korean.

Following previous work (Boomershine et al. 2008; Johnson & Babel 2010) demonstrating that speakers tend to rate sounds that are in allophonic variation in their language as more similar than sounds that are assigned to discrete phoneme categories, I tested similarity ratings of *s* and *sh* for 20 Mandarin, 20 English, and 20 Korean speakers. *S* and *sh*, along with two other fricatives (*f*, *h*), were embedded in three vowel contexts [a_a], [i_i], and [u_u] to serve as stimuli. If distribution alone determines whether speakers analyze two sounds as members of the same category, we expect Mandarin listeners' judgments to be similar to those of Korean listeners, since the two sounds are in complementary distribution in both languages. If alternation is a necessary condition for mapping two sounds to a single category, we expect the ratings of Mandarin listeners to be similar to those of speakers of English, for whom the two sounds are in contrast. We expect a higher difference rating between *s* and *sh* for English listeners due to their phonemic status, and a more similar rating between *s* and *sh* for Korean listeners due to their allophonic status.

The results showed that Mandarin listeners rated *s* and *sh* (both [s-ç] and [s-ʃ]) as significantly more different than did Korean listeners. This suggests that Mandarin listeners, like English listeners, perceive *s* and *sh* as different categories. The results suggest that alternation plays an important role in phonological relationships, contrary to approaches that rely solely on distribution. Instead, alternation appears to be necessary for language learners to assign two sounds to a single category.

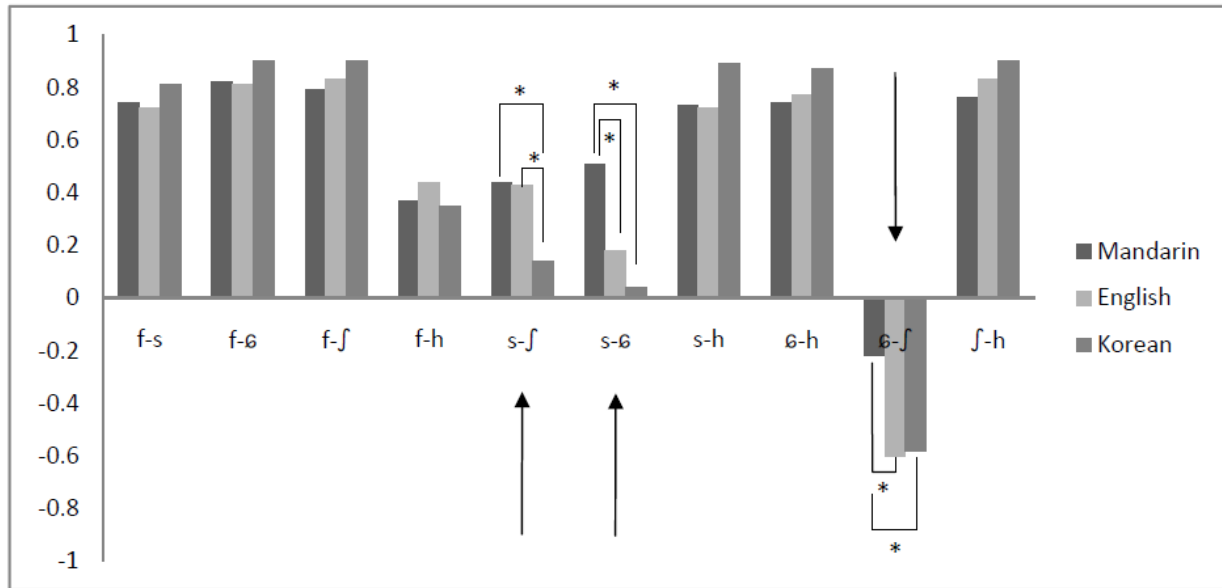


Figure 1 A standardize z-score transformation was used to avoid variability of participants using endpoints, or mid points from the 1-5 scale. The standardized scores were centered around 1, with scores above zero indicating ‘more different’ and scores below zero indicating ‘more similar.’

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