The Sonority Sequencing Principle in Consonant Cluster Perception Revisited

Results of non-native cluster perception have served as evidence that the Sonority Sequencing Principle (SSP) is synchronically active in the grammars of all speakers. Notably, Berent et al. (2007, *et seq.*) argue for it based on experimental evidence that speakers whose native languages do not have relevant clusters perceive universally preferred clusters with rising sonority more accurately than universally dispreferred clusters with level/falling sonority. However, recent research argues that phonetic details of the cluster affect non-native cluster perception (e.g., Wilson et al. 2014). This paper investigates the relative contribution of phonological factors like the SSP and phonetic factors in the perception of consonant clusters. We explore three hypotheses: (i) clusters with falling sonority are less accurately perceived than clusters with level sonority, which in turn are less accurately perceived than clusters with rising sonority (Berent et al. 2007); (ii) clusters involving an intensity rise are less accurately perceived than clusters with no intensity rise (Yun 2015a); and (iii) clusters beginning with a voiced consonant are less accurately perceived than clusters beginning with a voiceless consonant (Davidson 2006, Yun 2015b).

Methods: 28 English and 19 Korean speakers participated in an AX discrimination task of 58 nonce words with a consonant cluster (#CCát) paired with their epenthetic counterparts (#CəCát), recorded by Russian speakers. Stimuli involved the three sonority profiles, i.e., rise, plateau and fall, with two distinct phonetic realizations in certain cases. For example, pre-consonantal stops and nasals can be audibly released or not. Accordingly, our stimuli involved both released and unreleased variants (e.g., #m^{h}kat *vs.* #m'kat). For the other clusters, e.g., liquid-C, different types of liquids, trill and lateral, are included (e.g., #rkat *vs*. #lkat).

Results: No statistically significant differences in accuracy were found between sonority profiles (Figure 1). The phonetic factors had significant effects; clusters with an intensity rise were less accurately perceived than clusters with no intensity rise ($p<.05$), and clusters beginning with a voiced consonant were less accurately perceived than those with a voiceless consonant ($p<.001$).

Discussion: These results differ from those reported by Berent et al. (2007). This could be due to the fact that sonority profile was confounded in their experiments with different phonetic realizations. When analyzing a subset of the current stimuli that has a similar cluster distribution to Berent et al.'s, we see the expected SSP effect (Figure 2; $p<.05$ rise *vs*. fall). Also, when analyzing another subset involving rising-sonority clusters beginning with a voiced consonant only and falling-sonority clusters beginning with a lateral only, we see the opposite (Figure 3; $p<.001$). Across the subsets, however, there were consistently significant effects of intensity rise ($p<.05$) and C1 voicing ($p<.001$).

Summary: It is shown that accuracy of non-native cluster perception is affected by the auditory properties of the clusters, intensity rise and C1 voicing, and not by the SSP-related preferences in synchronic grammar.

Figure 1: % correct (overall)

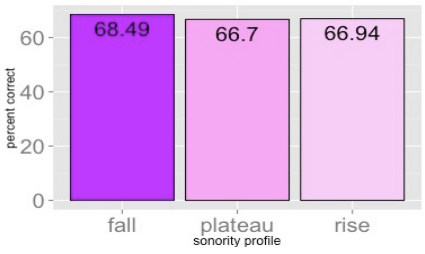

Figure 2: % correct (Berent subset)

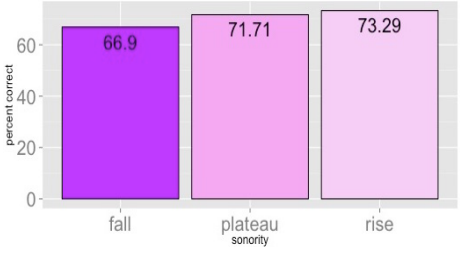

Figure 3: % correct (another subset)