Perception in L2 and L3: The relationship between English and Norwegian vowel assimilation patterns and the Euclidean distances

This study examines L2 English and L3 Norwegian vowel assimilation to L1 Polish vowel categories and compares assimilation patterns to the acoustic distance between English/Norwegian and Polish vowels. It analyzes the differences between the perceptual assimilation of English vowels by multilingual learners and biligual learners, as well as examines Euclidean distance and lip rounding as explanatory factors in the observed patterns of cross-linguistic similarity.

So far studies concentrated on L2: perceptual assimilation (Best and Tyler 2007, Tyler et al. 2014), and the relationship between vowel perception and their acoustic parameters (Escudero, Simon, Mitterer 2012). In the present contribution we aim to explore the comparison of L2 and L3 perception and acoustic similarity operationalized as the Euclidean distance The hypothesis is that the smaller the Euclidean distance between two vowels, the higher the likelihood of assimilating a given English/Norwegian vowel to a Polish category and that lip rounding and duration differences may influence the assimilation patterns.

21 subjects withL1 Polish, L2 English and L3 Norwegian, 14 females, 7 males, (mean age 19.86), who learned English as L2 (mean of language learning duration: 12.23 years) and Norwegian as L3 for two months (initial stage) in an instructed setting participated in the study. They assimilated 10 English and 16 Norwegian monophthongs embedded in nonce words /dVd/ to six Polish vowel categories (orthographic labels, Polish vowel orthography is transparent) and rated their goodness of fit on a 7-point Likert scale. We examined the relationship between assimilation rates of English/Norwegian vowels to each Polish category, and the Euclidean distance between the reference vowels for Polish (Weckwerth and Balas 2019) and the English/Norwegian vowels presented in the perception experiment.

To analyze the data, we fitted a linear model to predict assimilation ratings of English vowels as a function of Euclidean distance. The effect of Euclidean Distance was statistically significant (beta = -0.03, $t(82) = -6.35$, $p < 0.001$). The same procedure was applied to goodness of fit results as a function of Euclidean distance. The effect of Euclidean Distance is again significant (beta = -0.002, $t(82) = -5.93$, $p < 0.001$). Similar results were obtained for Norwegian vowels. The English and Norwegian vowels were, as hypothesized and as it is attested in other non-native perception studies (cf. Tyler et al. 2014), assimilated to the nearest Polish categories as determined by the Euclidean distance, so the results confirm the relationship between acoustic and perceptual similarity. We observed more variation in the case of high front (English KIT, Norwegian FIN) and central/back rounded vowels (English FOOT, Norwegian BOK), the English rhotacized mid central NURSE and uncategorized assimilation types in the case of mid central rounded vowels (Norwegian LØP and LYS) with similar Euclidean distances to many Polish categories, but no single counterpart. These more varied assimilation patterns show that perceptual assimilation is not just a function of Euclidean distance but is sensitive to features such as lip rounding and rhotacization.

References:

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