

Imitation of non-native clusters: the role of timing patterns

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Clusters of consonants are produced with a degree of overlap that differs between languages. Such timing pattern differences can have repercussions for second language acquisition: Zsiga (2003) found that Russian speakers transfer their native pattern of low overlap to English, but also that English speakers produce Russian ones with the Russian pattern of low overlap, i.e. departing from the English high overlap pattern. Acoustic counterparts of (sufficiently) low overlap are audible release of first consonants and a schwa-like sound (ə) between consonants. Davidson (2005) showed that a transitional schwa in fact differs phonetically from a lexical one. Therefore, a low overlap pattern should not be attributed to an attempt to produce a schwa to perceptually ‘repair’ a non-native cluster (categorical misperception). However, unfamiliarity with a cluster might entail a lack of the motor skills to produce it with higher overlap.

Method We used articulography (EMA) to study the imitation of consonant clusters with different timing patterns, comparing the timing pattern of imitations of native and non-native clusters and familiar and unfamiliar timing patterns. Two languages were compared: German with relatively large overlap and Georgian with less (Chitoran, Goldstein, & Byrd, 2002). Participants in our study repeated clusters produced by an audio model. The models were a native speaker of Georgian and one of German. Eight German and ten Georgian speakers participated in the study. German participants did not speak Georgian; Georgian speakers had acquired German as a second language. The present study presents data on imitations of /bg/, /gb/, /dg/ and /gd/ (non-native to Germans; produced by the Georgian model), as well as /bl/ (occurring in both languages and produced by both models). Clusters were embedded in a non-word syllable (cluster + /a/). Consonant overlap is calculated as the percentage of the constriction of the first consonant that is ‘free’ of the second gesture, i.e. the percentage of time of the first constriction that passes before the onset of the second gesture. Hence, lower values mean more overlap and values above 100% indicate no overlap at all.

The Georgian model produced the Georgian-only clusters, as expected, with low overlap (grey bars in Figure 1). Overall, values for the German speakers (black) were in fact quite similar to the model (around 100%, i.e. no overlap). On the other hand, the model makes fine-grained differences between the clusters (e.g., /dg/ has higher overlap, /gd/ lower). The Germans do not show these differences and therefore differ significantly from the model for /bg/ and /dg/ ($B = 27.5$, $t(301) = 3.2$, $p = 0.002^{**}$). Georgian speakers imitate those clusters with more overlap than the Germans ($B = -61.3$, $t(301) = -5.1$, $p < 0.001^{***}$). Georgians also produce more overlap than the model ($B = -46.30$, $t(17) = -3.51$, $p = 0.002^{**}$). Nevertheless, Georgians show the same fine-grained differences between clusters as the audio model. For all comparisons reported, linear models were constructed with a random effect for participant, after which insignificant ($p > 0.1$) factors were removed. Figure 2 shows overlap (higher values mean lower overlap). There was no significant main or interaction effect of practice (number of repetitions).

As German participants show the expected lower overlap pattern, sometimes even lower than the model, the question is whether overlap decreased because of unfamiliarity with the clusters or because the participants tried to copy the audio model’s timing pattern. Hence, imitations of /bl/ produced by the Georgian and German model were compared. The cluster is familiar to

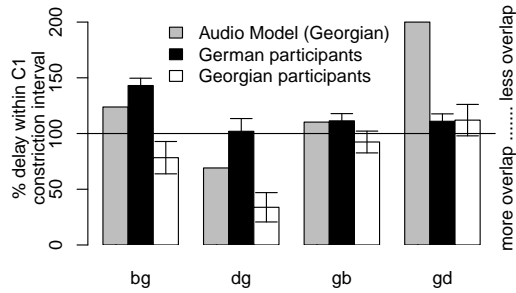


Figure 1: Georgian cluster production.

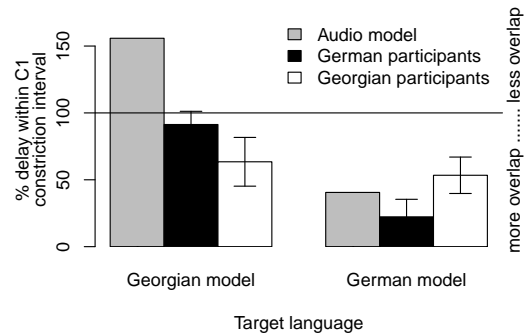


Figure 2: /bl/ production.

both Germans and Georgians, allowing to isolate the influence of the timing pattern of the model: the Georgian model produced less overlap than the German one, corresponding to the general known difference in timing patterns between the two languages. Participants imitated /bl/ from both audio models. German participants showed a difference in their imitations, aligned with the difference between the models (i.e., lower overlap when imitating the Georgian model, $B = -69.1$, $t(185) = -3.663$, $p < 0.001$ ***). In comparison to the Germans, Georgian participants showed significantly less difference ($B = 57.9$, $t(185) = 2.232$, $p = 0.027$ *), suggesting again that they do not copy the timing pattern of the model but retain a native-like timing. Figure 2 shows the overlap values for imitations of the Georgian model (left) and German model (right); the grey bars show the value of the audio model and the other bars the German (black) and Georgian (white) imitation. Practice with repetitions again had no significant influence.

Discussion Georgian participants do not approach the audio models' timing pattern, in spite of their knowledge of both languages. They imitate Georgian clusters with higher overlap than the model, possibly indicating they imitate at a phonological level and discard the model's possibly exaggerated low overlap: fine-grained relative differences between Georgian clusters are still retained in the Georgian imitations. In contrast, the German participants approach the audio model's overlap values, but do not show the same fine-grained differences as the Georgians participants (and the Georgian audio model). Unfamiliarity with the Georgian phoneme combinations is not the only factor conditioning the German's lower overlap, as the lower overlap of the Georgian production of the familiar cluster /bl/ is also approached. Nevertheless, Germans imitate all clusters with a relatively similar overlap level (around 100%). The value suggests that the Germans have zoomed in on a transitional schwa in the audio model's production and copied this feature but not more subtle differences. Lack of motor skills does not seem to be an issue, as Germans are able to produce /bl/ with high overlap but do not do so when imitating Georgian /bl/. By comparing articulatory data between audio models and imitators with different native timing patterns, the present study reveals that imitation of non-native clusters with lower overlap might be more driven by the perception of the audio model's timing than by phonotactic misperception or lack of motor skills due to unfamiliarity with such clusters.

References

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