Stabilizing determinants in the transmission of phonotactic systems: on the emergence of the Afrikaans consonant-cluster inventory

The diachronic development of Afrikaans phonotactics is characterized by a considerable number of processes that affect consonant clusters, i.e. sequences of two or more consonants, especially when occurring in the word-final coda position (cf. Watermeyer 1996; Roberge 2002). For example, clusters were reduced in *direk* /dɪrək/ (‘direct’, Dutch *direct*) or *nag* /nɑx/ (‘night’, Dutch *nacht*). Nevertheless, consonant clusters still surface word finally in numerous lexical items (e.g. /rk/ in *kerk*, ‘church’ or /ns/ in *mens*, ‘man’).

Several linguistic, cognitive and social factors have been considered to be involved in such phonotactic repair processes. In particular, it has been hypothesized that generally, clusters are more likely to get stably transmitted the greater the phonological difference between the respective consonants involved is. That is, clusters are expected to get reduced if their building blocks share the same place and manner of articulation or if they agree in voicing (Dziubalska-Kołaczyk 2014). Which of these factors has the largest impact on consonant clusters, is, however, not *a priori* evident, although research on sonority (Berent et al. 2007) and the neuro-cognitive organization of phonemes (Mesgarani et al. 2014) seems to imply that manner-of-articulation differences are particularly important for the stability of clusters.

The present study seeks to determine the relative importance of (i) *manner-of-articulation differences* (ΔMoA), (ii) *place-of-articulation differences* (ΔPoA) and (iii) *differences in consonant voicing* (ΔVoice) for the establishment of the Afrikaans inventory of word-final morpheme-internal biconsonantal coda clusters, by comparing Afrikaans to its sibling Dutch.

This is done in two steps. First, a preliminary study will assess the impact of the three phonological factors on the learnability of consonant clusters. In order to do so, the respective *age of acquisition* (AoA) is estimated for each cluster type based on age-of-acquisition ratings of Dutch core vocabulary lexemes ending in a cluster (Brysbaert et al. 2014). The variable ΔMoA is operationalized by calculating pairwise differences between sonority scores (cf. Dziubalska-Kołaczyk 2014). In a similar way, ΔPoA values are calculated as the pairwise differences of ordinal scores reflecting the place of articulation, while ΔVoice is operationalized as a binary categorical variable.

The (Box-Cox) transformed estimated AoA is then implemented as an outcome variable into a generalized linear model (GLM) in which ΔMoA, ΔPoA, and ΔVoice serve as predictors, additionally controlling for potentially intervening factors such as token frequency and word length. A top-down model-optimization procedure reveals that depending on the interacting control variable, ΔPoA and ΔVoice both have positive and negative effects on AoA, while ΔMoA has either no effect or significant positive effects on cluster learnability.

If high ΔMoA values promote the acquisition of clusters, does this then have consequences for the clusters’ susceptibility to diachronic changes? This question is going to be tackled in the second part of this study. Here, the differential effects of ΔMoA, ΔPoA, and ΔVoice on the *productivity* of a cluster (AfrProd), i.e. the number of Afrikaans word types a cluster type occurs in, are investigated. For this, cluster specific type frequencies (AfrProd) were first extracted from the NCHLT corpus (Eiselen & Puttkammer 2014). Since the Afrikaans frequencies are expected to correlate with the analogue type frequencies in Dutch, the corresponding Dutch frequencies (DutProd) were determined based on the CELEX database (Baayen et al. 1995) and included into the analysis, again only considering the core vocabulary. Under the assumption that Afrikaans underwent more diachronic phonological changes than Dutch, the following question suggests itself: did the distribution of word-final clusters among

word types change significantly in the diachrony of Afrikaans, and if so, did ΔMoA, ΔPoA, or ΔVoice play a crucial role in these changes?

In order to address this question, DutProd was transformed and adjusted based on the arguably more representative historical 'De Gids' corpus (see van de Velde 2009; only data before 1900 considered). AfrProd was integrated as a transformed outcome variable into a GLM as well as three separate generalized additive models (GAM, Wood 2006), in which ΔMoA, ΔPoA, as well as ΔVoice – each of them together with DutProd as an interacting variable – figure as predictor variables. The resulting models show that only ΔMoA (and to a lesser extent ΔVoice) has a positive effect on cluster productivity in Afrikaans. That is, productive clusters with low ΔMoA scores tend to be less frequent in Afrikaans than expected according to the Dutch data, while clusters featuring high ΔMoA scores did not get repaired. In contrast, ΔPoA shows a more complicated behavior (Figure 1).

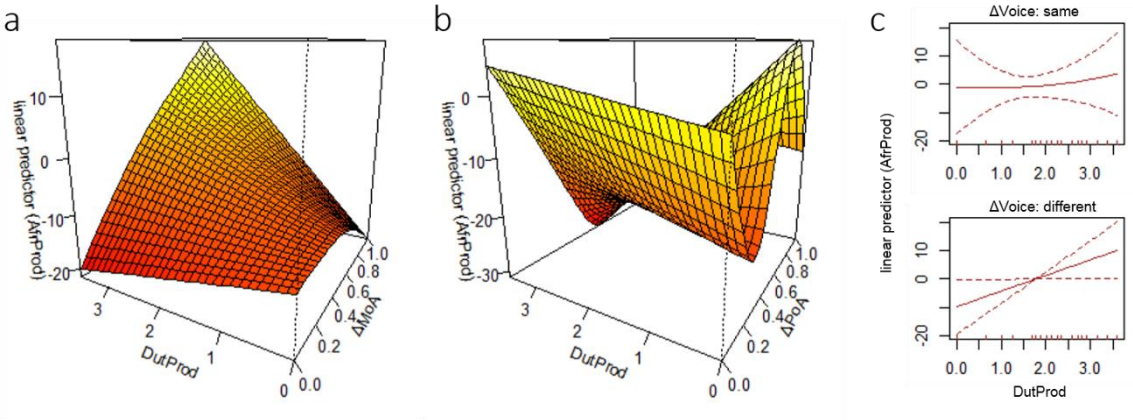

Figure 1. GAMs of the effects of (a) ΔMoA, (b) ΔPoA and (c) ΔVoice on cluster productivity in Afrikaans.

The present study thus demonstrates that, very much in line with recent neuro-cognitive research, sufficiently large manner-of-articulation differences in consonant clusters clearly play an important role in the acquisition and transmission of phonotactic systems and that the development of Afrikaans serves as an excellent example illustrating these pressures.

References:

Baayen, R., Piepenbrock, R., Gulikers, L. 1995. CELEX2 LDC96L14. Web Download. Philadelphia: Linguistic Data Consortium.

Berent, I., Steriade, D., Lennertz, T., Vaknin V. 2007. What we know about what we have never heard: evidence from perceptual illusions. Cognition 104: 591-630.

Brysbaert, M., Stevens, M., De Deyne, S., Voorspoels, W., Storms, G. 2014. Norms of age of acquisition and concreteness for 30,000 Dutch words. Acta Psychologica 150: 80-84.

Dziubalska-Kołaczyk, K. 2014. Explaining phonotactics using NAD. Lang. Sciences 46: 6-17.

Eiselen, E. R., Puttkammer, M. J. 2014. Developing text resources for ten South African languages. Proc. of the 9th International Conference on Language Resources and Evaluation, Reykjavik, Iceland: 3698-3703.

Mesgarani, N., Cheung, C., Johnson, K., Chang, E. 2014. Phonetic feature encoding in human superior temporal gyrus. Science 348: 1007-1010.

Roberge, P. 2002. Afrikaans: considering origins. In R. Mesthrie (ed.), Language in South Africa. Cambridge: CUP. 79-103.

Van de Velde, F. 2009. De nominale constituent: structuur en geschiedenis. Leuven: LUP.

Watermeyer, S. 1996. Afrikaans English. In V. de Klerk (ed.), Focus on South Africa. Amsterdam: JB. 99-124.

Wood, S. 2006. Generalized additive models: an introduction with R. Boca Raton: CRC Press.