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A phonetic study of *l*-deletion in Hungarian

The aim of this talk is to discuss a phonetic study of coda-*l* deletion in Hungarian and clarify some of the issues that *l*-deletion raises. Although *l*-deletion has long been acknowledged as a part of Hungarian phonology (see e.g. Kiefer 1994; Siptár & Törkenczy 2000), most existing treatments limit themselves to brief descriptions of the phenomenon based on introspective judgments. The absence of descriptions drawing on actual phonetic data may be a consequence of the difficulty of identifying the phonetic cues of *l* in preconsonantal and prepausal position: coda *l* in Hungarian appears to have a highly glide-like quality and is therefore mainly cued by dynamic patterns in formant transitions, with no clear boundaries or static cues. The pilot study described in this abstract develops a novel methodology for tackling the challenges inherent in investigating the phonetics of coda *l* and applies it to data obtained in a small experiment to shed light on certain aspects of *l*-deletion in Hungarian.

The data that serve as the basis of the study were collected and processed as follows. We elicited sentences containing potential [ɒl] and [ɛl] sequences in preconsonantal and prepausal position (the *lateral* group) along with corresponding control-sentences containing only the vowels [ɒ] and [ɛ] (the *non-lateral* group) from three male speakers of Standard Educated Hungarian. The quality of the consonants following the target sequences was recorded as an independent variable. The 308 target sequences were extracted manually in Praat, and an automated script took 50 measurements of F1, F2, F3 and intensity values at even intervals from the beginning of the ɒ/ɛ(l) sequence to the beginning of the following segment, yielding numeric sequences representing the formant and intensity trajectories; the duration of the sequences was also recorded.

We used two further methods to construct more easily interpretable representations of the trajectories. First, a Discrete Cosine Transform (DCT; Rao & Yip 1990) was performed on the sequences, returning three coefficients correlated with the *mean*, the *slope* and the *curvature* of the trajectories. The values obtained through DCT can be subjected to standard statistical tests such as ANOVA or multiple regression when evaluating differences between groups. Second, graphic representations were produced using Smoothing Spline ANOVA (SS ANOVA; Gu 2002), which maps a group of curves to a single smoothed curve. When several groups are compared, the test provides a confidence interval for each of the groups of curves; the curves can be considered significantly different in places where the intervals do not overlap.

The DCT and SS ANOVA representations were first used to establish which phonetic parameters serve as reliable cues to the presence of coda *l*. Since we had no information about *l*-fulness in individual tokens, all of the results below are derived from the trivial assumption that the lateral group contains more *l*-ful forms than the non-lateral group. This assumption has the following corollary: if a given trajectory contains cues to *l*, it will be different across the lateral and non-lateral groups. This was first investigated by performing multiple regressions and ANOVA's with the DCT representations for F1, F2, F3 and intensity as independent variables. Significant effects of group membership were found for the mean and the curvature of F1, and the mean of F2. The effects on F1 can also be seen in the SS ANOVA representations in Figure 1, which show smoothed curves for several environments in the lateral and non-lateral groups. The robustness of the curvature of F1 receives further support from the fact that the distribution of lateral tokens along the dimension of F1 curvature subsumes that of the non-lateral tokens (Figure 2). This indicates that the lateral group contains both *l*-ful and *l*-less tokens, which are spread out along the dimension of F1 curvature, as opposed to the non-lateral group, which only contains *l*-less tokens. To sum up, F1 mean, F2 mean and especially F1 curvature appear to be reliable cues to *l*.

After establishing the cues to *l*, we investigated a number of potential hypotheses about *l*-deletion. We first looked at the claim that *l*-deletion entails compensatory lengthening of the preceding vowel. A multiple regression with the duration of the sequence as the independent variable showed that duration is significantly different between the lateral and non-lateral groups, and an inspection of the distributions for the two groups also revealed that there is little overlap between them, suggesting that even *l*-less tokens within the lateral group are longer than corresponding tokens within the non-lateral groups. The second hypothesis concerns the gradience of *l*-deletion. An inspection of the distributions in Figure 2 shows that the tokens in the lateral group form a unimodal normal distribution along the dimension of F1 curvature, suggesting that the lateral tokens show varying degrees of *l*-fulness without any categorical effects. Finally, we looked at the effect of the following consonant on *l*-deletion. This is illustrated in Figure 3, which compares kernel estimates for the distributions of F1 curvature values in the lateral and non-lateral groups before [r], [s], [t] and a pause (indicated by *w*). The two groups are almost identically distributed before [t], slightly different before [r] and [s] and rather far apart prepausally, which suggests that *l*-deletion is most likely before [t], followed by [r] and [s] and least likely before a pause.

In conclusion, the pilot study presented here introduces novel methods for investigating the behaviour of coda *l*, establishes F1 curvature, F1 mean and F2 mean as reliable cues to *l*, and confirms the hypotheses that (i) *l*-deletion causes compensatory lengthening of the previous vowel, (ii) *l*-deletion is gradient and (iii) the extent of *l*-deletion is influenced by the phonetic environment. We intend to pursue this line of research further and use the same methodology in a larger-scale experiment, which will make it possible to test additional hypotheses about *l*-deletion (e.g. claims about *l*-vocalisation and frequency effects) and refine the results of the pilot study.

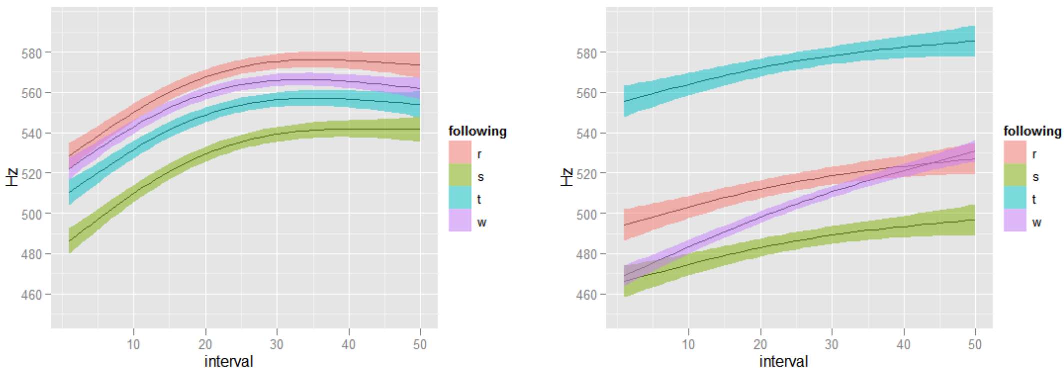

Figure 1: *left*: lateral F1 curves; *right* non-lateral F1 curves

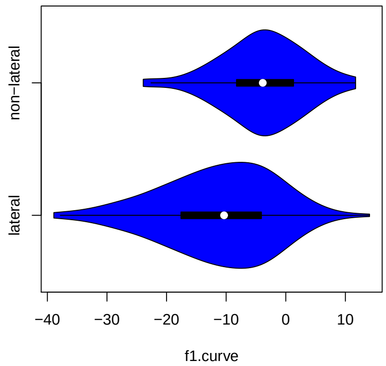

Figure 2

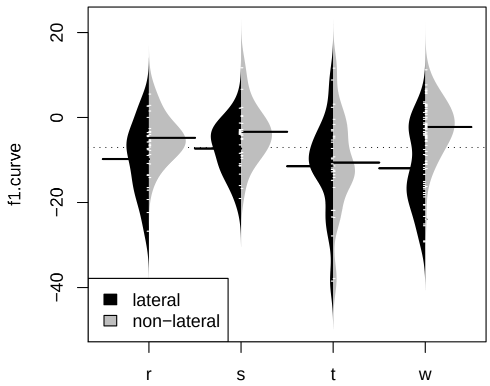

Figure 3

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