An articulatory perspective on the secondary palatalization contrast in Romanian postalveolar fricatives

In phonemic inventories, postalveolars usually pattern with either plain or palatalized consonants but not both (Bateman 2007, Kochetov 2017). This has been attributed to the low salience of the secondary palatalization (SP) contrast at this place of articulation, which may be related to gestural timing - the overlap or blending of the palatalization gesture with that of the primary place (Zsiga 2000). Due to morphological conditioning, this contrast is present in Romanian, where SP arises from the combination of a root-final consonant with the suffix /-i/, e.g. /pom+i/ [pom^{j}] *trees (*/pom/ [pom] *tree*). Recent work has found evidence of acoustic separation between plain and palatalized Romanian consonants for a majority of the subjects tested (Spinu, 2018), while experimental studies with native speakers revealed low perceptual salience to this contrast (Spinu et al. 2012, Spinu 2018). According to the phonetically-driven phonology approach (Hayes & Steriade 2004), perceptually fragile contrasts tend to undergo either enhancement or neutralization over time. It is thus unclear from a synchronic perspective whether SP in Romanian postalveolars is robustly implemented in articulation, but at the same time obscured acoustically by the primary place of articulation, or whether it is an articulatorily weak contrast and/or variable across speakers (indicating a certain degree of neutralization).

To address this question, this study is the first to explore articulatory characteristics of SP in Romanian. Ten native speakers (5 females) read 24 words ending in labial, dental, and postalveolar fricatives - either plain or morphologically palatalized (e.g. [panto**f**]-[panto**f**^{j}] *shoe-shoes*, [kine**z**]-[kine**z**^{j}] *Chinese.sg - Chinese.pl*, [koko**ʃ**]-[koko**ʃ**^{j}] *rooster-roosters*). Each word was produced 6 times in a meaningful carrier phrase, resulting in 1,440 tokens used for the analysis. Midsagittal ultrasound videos of the tongue were recorded at a rate of 38 frames/second with the probe held using a stabilization headset. Tongue tracings for target consonants were performed at a frame around the fricative midpoint. For each token, contours were extracted as series of X and Y coordinates and rotated with respect to the occlusal plane (Fig. 1, left). Smoothing Spline ANOVAs were performed on individual data converted to polar coordinates (Fig. 1, right) to determine the presence/absence of differences between consonants. In addition, radius distance (R, in mm) was measured from the origin of the probe to the tongue surface in the tongue back and front regions (determined individually based on [f] and [f^{j}] contours). The radius distance data for all speakers were submitted to Linear Mixed Effects Models with R as a dependent variable, Consonant (f, z, ʃ) and Palatalization (plain, palatalized) as fixed effects, and Speaker and Utterance as random effects.

The results showed that plain and palatalized targets differ significantly in both the back and front tongue region (Fig. 2), but the magnitude of this difference is not the same, being the highest for labials and the lowest for postalveolars ([f]-[f^{j}] > [z]-[z^{j}] > [ʃ]-[ʃ^{j}]). The postalveolars also revealed higher individual variation: only 3 speakers robustly distinguished the contrast, 4 seemed to exhibit a weak contrast and 3 exhibited no differences at all. These findings are consistent with the previously observed low perceptual salience of the contrast (Spinu et al. 2012, Spinu 2018), and may be interpreted as evidence of neutralization in progress. Our results thus support the predictions of the phonetically-driven phonology approach (Hayes & Steriade 2004). However, as the measurements were taken at the consonant midpoint, it is conceivable that the contrast might be realized later in the segment - a question to be explored in the next stage of this project. In conclusion, our study contributes new data from an understudied language and adds to the body of work on fricative properties as well as on contrast maintenance and neutralization.

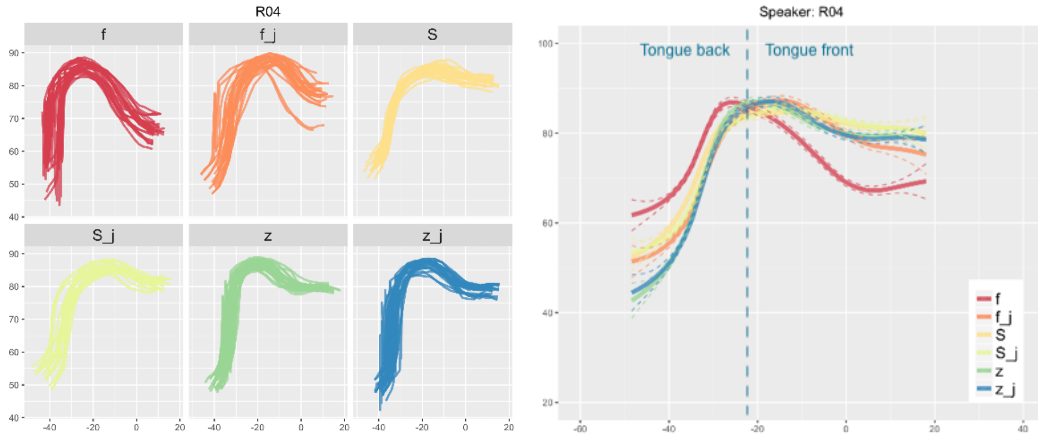

Figure 1: Sample tongue tracings (left) and SS-ANOVA results by consonant (right); S = [ʃ], _j = [ʲ].

Figure 2: Radius distance (mm) for tongue back (left) and tongue front (right), all speakers; S = [ʃ].

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