An investigation of palatalization in Russian through ultrasound

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Even though the question of the phonological representation of palatalization is far from resolved (Hall 2007), it is generally agreed that a palatalized segment consists of the articulator node that represents the primary place plus the features responsible for the secondary palatalization (e.g., [Dorsal, -back] according to Sagey (1986)). Interpreted phonetically, this configuration implies that palatalization is a gesture that will have similar instantiation when combined with all consonants. However, an earlier gating experiment has shown that palatalization is instantiated differently in nasals and in stops (Kavitskaya, 2006), and it has been also demonstrated through an ultrasound study that palatalization affects trills differently from other consonants (Kavitskaya et al., 2008).

Russian provides a rich test case for the study of palatalization. Contrastive palatalization is pervasive in Russian: almost all non-palatalized consonants have palatalized counterparts. In the current experiment, we analyze ultrasound data from 5 speakers of Russian pronouncing real words with non-palatalized and palatalized consonants in word-initial and intervocalic positions. On the basis of our data, we show that palatalization is not a single property superimposed on any consonant, but rather depends on the tongue involvement in the primary articulation (place of articulation) and also on the manner of articulation of the consonant being palatalized. Data was acquired using the HOCUS system (Whalen et al., 2005) on a digital Aloka system at 127 Hz. The high frame rate was essential, since it allowed us to investigate the time course of secondary palatalization. The independent variable in the experiment is the degree to which the tongue dorsum is constrained by the primary articulation of the consonant, with consonants varying by place and degree of constriction. The dependent variable was the time course of palatalization measured at two points in the palatal region. We tested two hypotheses: 1) if the tongue dorsum is highly constrained, then secondary palatalization will be lesser in magnitude; 2) if the tongue dorsum is highly constrained, then secondary palatalization will be sequenced with respect to the primary articulation, but will have the same magnitude as it does in consonants with a weak constraint on the dorsum. It was found that there is partial support for each of the hypotheses, depending on the particular place and manner involved.