



# The role of the tongue root in palatalization: the softness distinction in Russian re-interpreted

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## Introduction

- Russian has two series of contrasting consonants, “soft” articulated with a raising of the tongue body towards the palate, and the non-palatalized “hard” series, usually described as velarized.
- Only a subset of vowels may follow the palatalized consonants, namely phoneme /i/ and all ‘fronted’ allophones of other vowels (/e, u, o, a/), while the complementary set of vowels – including phoneme /i/ and neutral-context allophones of vowels – can follow the ‘hard’ consonants.

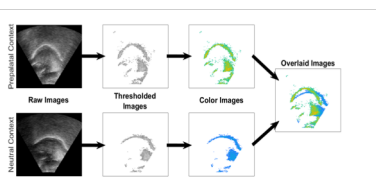
Hard Cs context	Soft Cs context
Phonemic	
i <sup>a</sup>	i
Allophonic	
u	u <sup>b</sup>
ɛ	e, ɛ <sup>c</sup>
ɔ, ɒ	ə <sup>b</sup>
a	ə, ə <sup>b</sup>

<sup>a</sup>triggering consonant precedes vowel  
<sup>b</sup>between two consonants from the soft set  
<sup>c</sup>the triggering C follows the vowel (Hamilton 1980)

- Softness distinction has traditionally been regarded as a contrast in tongue body features: [back] (SPE 1968, Halle 1995), or translated into the Clements & Hume model (Hume 1992, Clements & Hume 1995) as Coronal[anterior] attached to the V-Place node.
- The analysis of ultrasound images of consonants and vowels, the phonotactics of the CVC sequences, finally, arguments from anatomy indicate that the distinction in both vowels and consonants can be better captured in terms of feature [ATR].

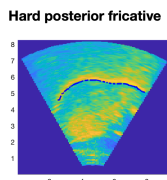
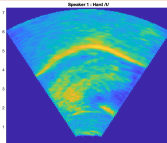
## Speech Research with Ultrasounds. Method

- 9 Russian native speakers (5 women, 4 men)
- Participants read word lists.
- Ultrasound images were recorded with a Philips EpiQ7G system using an xMatrix6-1 digital 3D/4D transducer secured under the chin using an Articulate Instruments ultrasound stabilization headset.
- Fully uncompressed DICOM ultrasound files were transferred to a Windows 7 computer.
- Ultrasound files were analyzed w/ a custom MATLAB toolbox, called “WASL”.
- Audio was recorded with a SHURE KSM32 microphone placed approximately 1 meter in front of the participant, at 48kHz sampling rate.
- TaO imaging procedure:

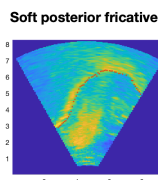
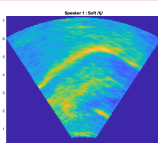


## Consonants

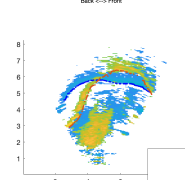
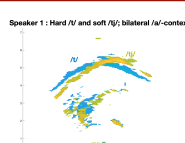
### Hard /t/



### Soft /tj/

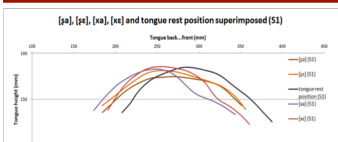


### TaO



Back <=> Front  
 Soft consonants are: [-back], [+high], and systematically [+ATR]

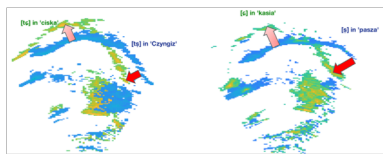
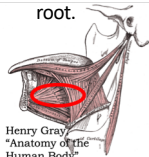
## Litvin (2014) on Hard Consonants



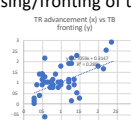
- Litvin (2014): “Russian non-palatalized consonants are not pharyngealized in the sense of Esling (1996, 1999, 2005)(...) /l/ and /f/ are **uvularized**, /s/ and /ʃ/ can feature either **uvularization** or **velarization**” (underline MC)
- velarized sounds [+high][+back] [-ATR]
- uvularized sounds [-high][+back] [-ATR]
- Ergo: [-high] is not a consistent feature of hard consonants, the soft-back contrast in consonants has to rely on either [back] or [ATR]

## Argument(s) from Anatomy

- There is no muscle that can pull the tongue body up and forward in a palatal gesture.
- The gesture itself must originate in another part of the tongue and must be effected through passive forces such as volume preservation.
- The tongue is a volume-preserving muscular hydrostat.
- The tongue body can be raised and fronted by contracting the posterior genioglossus muscle, which also advances the tongue root.

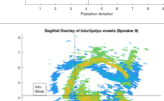
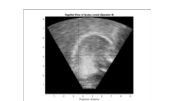
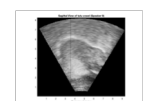
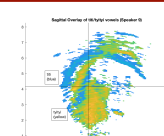
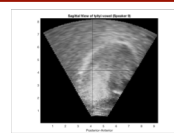
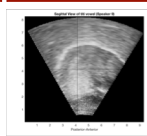


- There is a correlation between the amount of TR advancement and raising/fronting of the tongue.

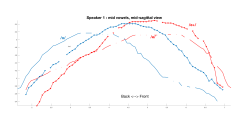
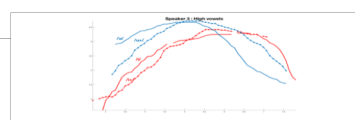


- A better correlation between TR advancement and combined movement of TB than between TR advancement and TB fronting alone indicates again that fronting alone /feature [back] .

## Vowels

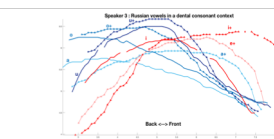


- Front vowels do not have to become back when adjacent to hard consonants
- Back vowels do not have to become front.



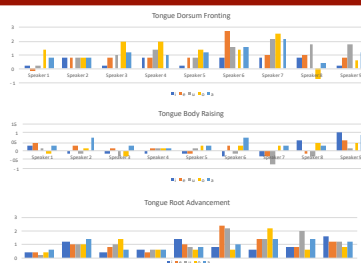
S3: /u/ becomes front in soft C context, front-centralized /i/ does not become back in the hard C context

S1: /o/ is centralized but still back in soft C context, /e/ is centralized but not back in hard C context



In all the contexts/vowels/speakers though, vowels in the soft C context are [+ATR], and vowels in the hard C context are [-ATR].

## Vowels: Phonetics



Even at the phonetic level, neither fronting nor raising are a necessary and consistent characteristic of the soft-hard context distinction, unlike advancement of the tongue root.

## Conclusions

- [+high] is a feature of soft Cs but [-high] is **not** a feature of hard Cs and does not explain CV phonotactics
- [-back] is a feature of soft Cs and [+back] is a feature of hard Cs but [back] is **not** a feature that systematically explains CV phonotactics
- [+ATR] is a systematic feature of soft Cs and vowels in a soft C-context, [-ATR] is a systematic feature of hard Cs and vowels in hard C context
- Explanation in terms of [ATR] is descriptively adequate, explanatory, phonetically-grounded, non-abstract and systematic, offering a holistic solution to a number of previously unrelated processes.
- Evidence from other languages (not presented here) indicate that ATR might be systematically involved in the interpretation of the palatalization contrast cross-linguistically.

## Selected References

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