

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 /ɨ/ and neutral-context allophones of vowels - can follow the 'hard' consonants.

Hard Cs context	Soft Cs context
Phonemic	
i ^a	i
Allophonic	
u	u ^b
ε	e, ε ^c
ɔ, ə	ə ^b
a	a, ə ^b

^atriggering consonant precedes vowel
^bbetween two consonants from the soft set
^cthe triggering C follows the vowel (Hamilton 1980)

Consonants

Hard /t/

Soft /tj/

TaO

Hard posterior fricative

Soft posterior fricative

Back <-> Front

Soft consonants are: [-back], [+high], and systematically [+ATR]

Vowels

Speaker 1: Hard /t/ and soft /tj/; bilateral /a-/context

Speaker 1: /u/ and /ɨ/; high vowel context

Speaker 1: /o/ and /a/; high vowel context

Speaker 1: /u/ becomes front in soft C context, front-centralized /i/ does not become back in the hard C context

Speaker 1: /o/ is centralized but still back in soft C context, /e/ is centralized but not back in hard C context

Speaker 1: /u/ and /o/ are not fronted in the soft C context, /i/ is centralized – though not back – in the hard C context, /a/ becomes a front vowel in the soft C context

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 /z/ can feature either **uvularization or velarization**." (underline MC)

Speaker 1: Russian vowels in a dental consonant context

Speaker 1: /u/ and /o/ are not fronted in the soft C context, /i/ is centralized – though not back – in the hard C context, /a/ becomes a front vowel in the soft 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].

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:

Physical Context

Normal Context

Raw Images

Thresholded Images

Color Images

Overlay Images

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.

Henry Gray: "Anatomy of the Human Body"

[ɪ] in 'sikst'
[ɪ] in 'čyngiš'
[ɪ] in 'pašč'

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

TR advancement (x) ~ TB fronting (y)

TR advancement (x) ~ TB advancement (y)

- 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: Phonetics

Tongue Dorsum Fronting

Tongue Body Raising

Tongue Root Advancement

Speaker 1 Speaker 2 Speaker 3 Speaker 4 Speaker 5 Speaker 6 Speaker 7 Speaker 8 Speaker 9

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.

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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.