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Phonetic and phonological aspects of the opposition of ‘soft’ and ‘hard’ consonants in the modern Russian language

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Abstract

The present article deals with issues arising during articulatory, acoustic and perceptive description of the opposition of ‘soft’ and ‘hard’ consonants in modern Russian. Its phonological interpretation is also considered, as well as the main tendencies in the development of the pronunciation standard.

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The issues mentioned in the title of this article are not particularly new, as they have long been discussed in great detail both in Russian and international publications on phonetics. The author has devoted a number of experimental and theoretical studies to this issue. The summary of these studies is presented here for the judgment of the reader.

1. The consonant system of the contemporary standard Russian language is of great interest to any phonetician. First of all, it presents

a case almost unique, where the opposition of “soft”¹ vs. “hard” consonants pervades throughout almost the entire system. Few consonants are not involved in this opposition, while the total number of consonants is quite big; there are thirty-six of them in total. All labials are involved in the opposition, e.g. /p–p’/ as in *pal’tsy-p’al’tsy* /pal’tsi/–/p’al’tsi/,² /b–b’/ as in *truba–trub’a* /truba–trub’a/, /f–f’/ as in *grafa–graf’a* /grafa–graf’a/,

¹ In the international literature the opposition of “soft” vs. “hard” consonants is often referred to as the opposition of “palatalized” vs. “non-palatalized” consonants. As the discussion below shows, this distorts the essence of the opposition.

² In this paper stressed vowels are marked in bold type.

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/v–v'/ as in *val–v'al* /val–v'al/, /m–m'/ as in *mal–m'al* /mal–m'al/. Coronals are also systematically contrasted by this feature, e.g. /t–t'/ as in *kota–kot'ata* /kata–kat'ata/, /d–d'/ as in *doma–D'oma* /doma–d'oma/, /s–s'/ as in *sok–s'ok* /sok–s'ok/, /z–z'/ as in *groza–groz'a* /graza–graz'a/, /n–n'/ as in *nos–n'os* /nos–n'os/, /l–l'/ as in *klon–kl'on* /klon–kl'on/, /r–r'/ as in *pravij–pr'amo* /pravij–pr'ama/. Coronal affricates /tʃ/ and /dʃ/ (as in *tsepkij–tcheptchik* /tʃepk'ij–tʃeptʃik/) can also be considered as opposing each other as 'palatalized' vs. 'non-palatalized', although unlike the ones listed before, this particular opposition is not privative. There also exists a long 'palatalized' coronal consonant which claims phonemic status, i.e. /ʃ':/ as in *shch'otka* /ʃ':otka/, *shch'upat'* /ʃ':upat'/, *shchi* /ʃ':i/. /ʃ/ and /z/ are not involved in the opposition in question. Velar consonants are also involved in the opposition, although not all researchers accept the fact that velar palatalized consonants are actual phonemes, e.g. /k–k'/ as in *kot–tk'ot* /kot–tk'ot/, /g–g'/ as in *berega–bereg'a* /b'ir'iga–b'ir'ig'a/, /x–x'/ as in *Hempshyr–heres* /xempʃir–x'er'is/. Many researchers doubt that the hard-soft opposition is as significant for velar consonants as it is for the others, as there are few occasions of palatalized velar consonants before back vowels, which are found only in loan words. Palatalized consonants may occur in any place within the word, word-initially (*s'adu* /s'adu/), in the middle of a word (*ots'uda* /ats'uda/), and word-finally (*v'es'* /v'es'/). They may precede both vowels, as all of the examples above show, and consonants, e.g. *bol'no* /bol'nal/, *m'en'she* /m'en'ʃi/, *postav't'e* /pastaf't'i/, *r'ed'ka* /r'e-t'ka/.

2. Traditionally, palatalized consonants are interpreted as the ones having a secondary articulation as compared to the corresponding "hard" ones. The secondary articulation, the raising of the tongue towards the palate, is a result of the fact that originally palatalized consonants appeared before front vowels /i/ and /e/ and the palatal sonorant /j/. Later on, this understanding was adjusted, as one can speak of secondary articulation only in the case of labial consonants /p', /b', /f', /v', and /m', where the main—labial—articulation is to a degree independent of the secondary tongue articulation. Palatalized consonants involving the pri-

mary tongue articulation are characterized by such a strong impact from this 'secondary' articulation that one has to admit that a new type of articulation emerges. As a result of the raising of the middle part of the tongue towards the palate, palatalized coronals are characterized by a wider contact area of the tongue and the palate, which influences the phonetic qualities of the "soft" consonants. Plosives /t'/ and /d'/ are strongly affricated, and it is no longer possible to pronounce /r'/ as a trill, so that it becomes almost a fricative. In palatalized velars, secondary articulation results in a great degree of fronting of the place of articulation, which is also caused by a wider contact area of the tongue. Therefore, it appears that the opposition of palatalized to non-palatalized consonants, phonetically, is realized differently: by combining the main and secondary articulation for labials; in coronals, there is a difference in the type of closure release, with non-palatalized consonants being plosives and "soft" consonants affricated; a palatalized trill is characterized by the absence of taps and increased noise components, i.e. lack of the consonant's main characteristics and its proximity to fricatives. The articulation of palatalized velar consonants is practically not velar any more, as the active part of the tongue is greatly advanced. The fact of such diversity of the realization of a single distinctive feature itself draws the attention of the researchers interested in the way phonological systems function in speech.

3. It is necessary to add that it has been known for quite some time that not only the soft consonants possess their own articulatory feature, palatalization, but also that the hard ones possess a feature present in all hard consonants, namely, velarization. This was first discovered by Skalozub in her X-ray study of consonant articulation as early as the 1960s. Later she wrote, "“Hard” and “soft” consonants are articulated autonomously; they are inherently characterized by invariant (category) features" (Skalozub, 1981, p. 240). Acoustic differences between soft and hard consonants are also very diverse. With reference to that it is necessary to mention an erroneous belief that there is an opposition of hard and velarized consonants in Russian. "In Russian, depending on the accent involved, palatalized consonants are in contrast with

plain consonants, or plain consonants in contrast with velarized consonants (author's emphasis—*LB*). An example from the Moscow accent (J. Harris, personal communication) is:

Plain versus velarized stops in Russian (Moscow)

[dal] 'distance' [dal^Y] 'gave'" (Laver, 1994, pp. 333–334).

In this example, the consonant in the first word is not hard, but soft; the consonant in the second word is hard and indeed velarized, as strong velarization of the lateral sonorant [l] (for some reason referred to by the author as a stop!) has been noted by all phoneticians.

It is worth mentioning that in the pairs /p–p'/, /b–b'/ the acoustic feature generally connected to consonant softness, i.e. sharpness, which can be seen in the impulse noise part of the plosion, is rather weak. Labials are known to have very weak plosion, and the sharpness is not marked at all. For fricatives and nasals the situation is similar, i.e. in the segments corresponding to each of these consonants it is difficult to find consistent differences in frequency components for soft consonants.

All of the mentioned articulatory differences are reflected in the spectrograms (see Figs. 1 and 2). Only the pairs of coronal fricatives meet "phonological" expectations, and soft consonants from those pairs show a significant increase in noise frequency. In this respect, the soft /r'/ joins the fricatives, rather than trills.

4. For the first time the problem of defining the acoustic correlates that provide for the opposition of soft vs. hard consonants has arisen in connection with automatic speech recognition. Due to the lack of a unique feature that would distinguish the soft and hard consonants and provide the basis for their recognition, it was necessary to investigate thoroughly the influence of the soft consonants on the adjacent sounds on the one hand, and the features used by Russian speakers to distinguish soft and hard consonants on the other.

The most common feature for all soft consonants preceding a vowel turned out to be the high location of the FII and a relatively low location of the FI in the beginning of the vowel. This transition part is called the i-transition. It is so impor-

tant for the perception of the softness of the adjacent consonant that the syllable composed of a hard consonant and a vowel with an i-transition segment is usually perceived as a syllable with a soft consonant. The vowel preceding a soft consonant also has a similar transition segment, but its duration and formant location is not so characteristic because of the weak linking between a vowel and the following consonant. The significance of the vowel transition segments for the perception of soft consonants is confirmed by the fact that phonetically untrained speakers of Russian are able to recognize and to distinguish combinative allophones of vowels appearing in the combinations CVC, CVC', C'VC, C'VC'. In experiments testing the perception of the vowels extracted from those combinations, the subjects used different marks in order to indicate the presence of a soft consonant in the context of the vowel under consideration and to show its position with reference to the vowel. The dissymmetry of the first and the second transition parts was reflected in the responses: the recognition rate of the softness of the first transition segment (i.e. in the combination C'V) was up to 90%, whereas the recognition rate of the second transition segment (i.e. in the combination VC')

5. The phonological interpretation of the opposition under consideration is quite ambiguous. N. S. Trubetskoy considers this opposition to be privative; hard consonants are treated as "unmarked", and soft consonants as "marked" ones, i.e. marked with a certain additional feature. This point of view was criticized by Reformatskiy (1970). The fact that neither from the point of view of their articulation, nor acoustically can the soft consonants be regarded as a result of the simple superposition of the attribute "softness" on the characteristics of the corresponding hard consonants, lead Reformatskiy to the conclusion that this opposition could not be described by the formula "a vs. a + 1". This statement could be considered correct, were we to interpret the nature of the opposition only on the basis of superficial phonetic data, namely the articulatory and acoustic correlates mentioned above.

However, one of the most important factors defining the substance of the phonological

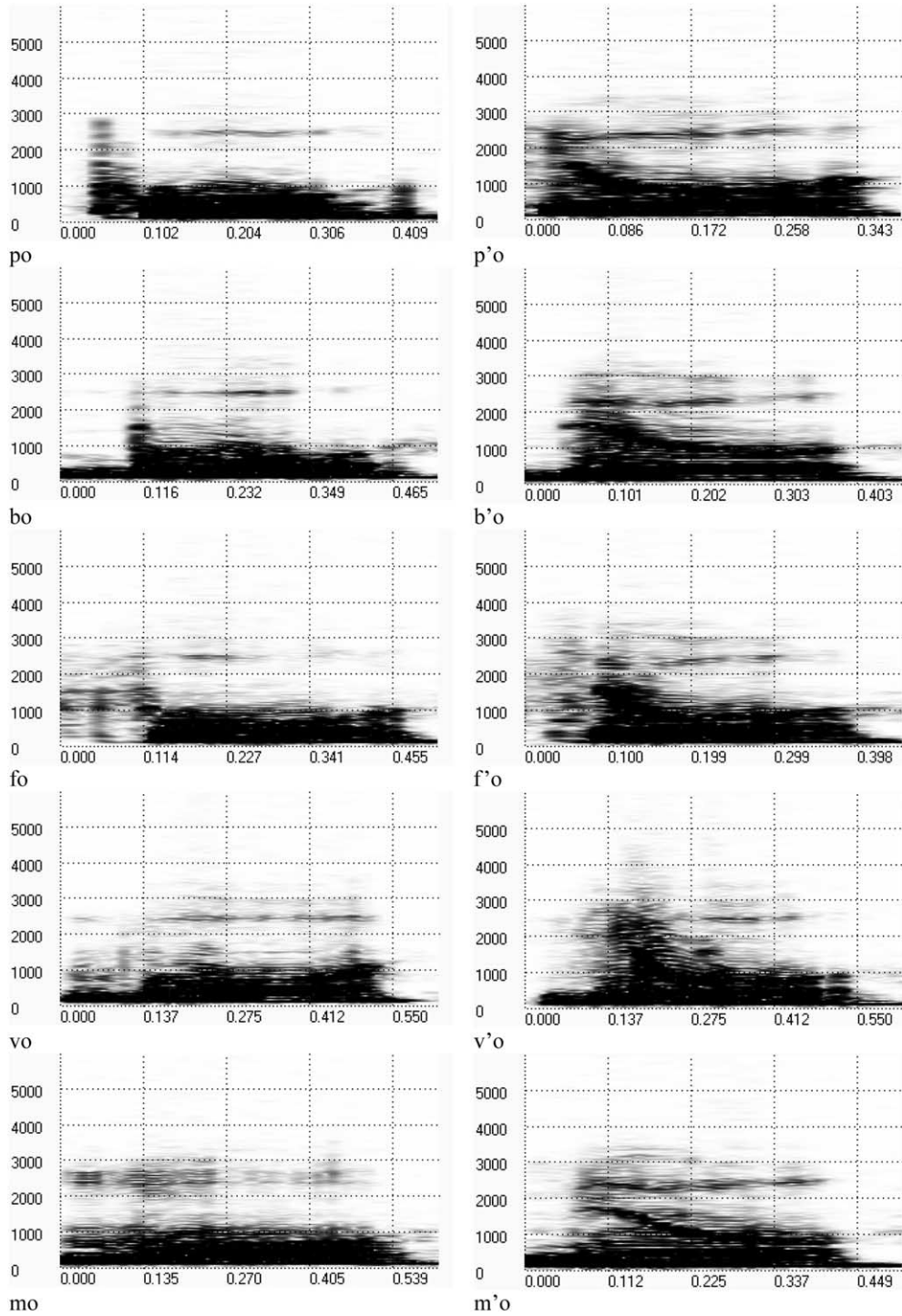


Fig. 1. Dynamic spectrograms of labials.

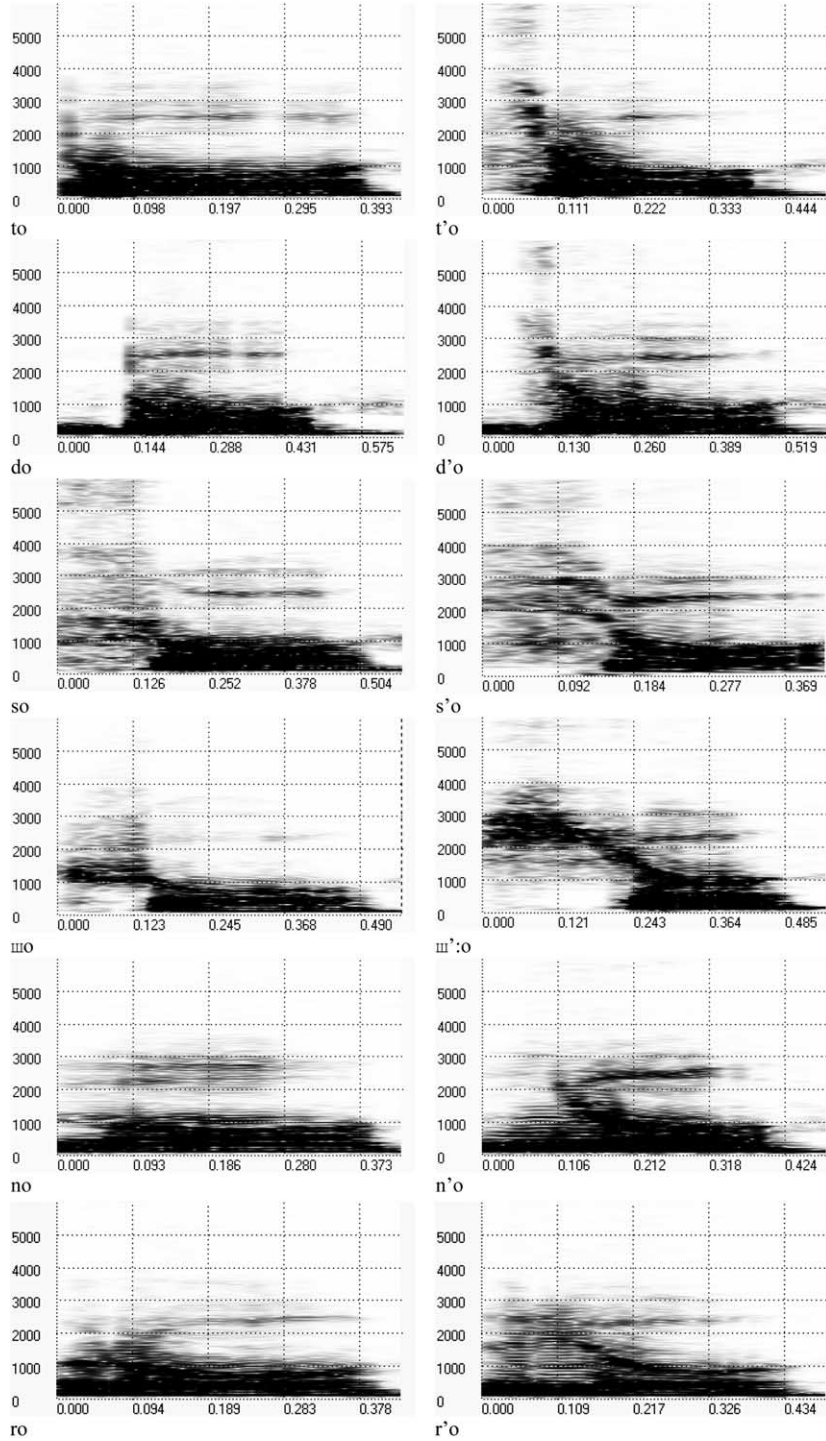


Fig. 2. Dynamic spectrograms of some coronal consonants.

relationship should be taken into account, namely a psycho-phonetic evaluation of this opposition in the speech mechanism of Russian speakers. Taking into account this factor, it turns out that the consonants in this opposition, i.e. soft and hard consonants, are not equivalent as Reformatskiy supposed. Here are some examples showing that soft consonants have a weaker status in the speaker's "consciousness" as compared to hard ones.

- (1) Nearly all the subjects who were asked to enumerate Russian consonants mentioned only the hard ones. However, when asked "What about soft consonants?", they recollected that the soft consonants also existed and easily named them.
- (2) In perceptual experiments testing the perception of consonants under adverse conditions, for example, when they are extracted from the context or presented in noisy conditions, both soft and hard consonants were mainly recognized as hard ones.
- (3) The preference given to hard consonants reveals itself also in the way the pronunciation of the letters of the Russian alphabet has changed over the last few decades. It is known that many names of Russian consonants are pronounced with a front vowel [e], which follows soft consonants in normal words. But it is different for the names of letters, namely such letters as **п** [pe], **б** [be], **в** [ve], **т** [te], **д** [de], **з** [ze] are pronounced with a hard consonant. As late as the mid 1950s, the softness was still preserved in the pronunciation of letters **г** [g'e] and **л** [el'], but now these letters are also pronounced with hard consonants.

It is impossible to explain these facts by purely phonetic reasons. The morphological system of the Russian language contributes considerably to the fact that soft consonants, although recognized as a special kind of phoneme, are positioned somewhere in the back of the speaker's memory. In particular, within the paradigm of a noun with the stem ending with a hard consonant, the basic form, i.e. the nominative singular (*vada* /vada/, *stol* /stol/), is the primary one; this being supported by the fact

that 11 forms out of 12 (singular and plural) contain a hard consonant, and only one form contains a soft one. There is no such phenomenon within the declension paradigm of nouns with a soft stem, i.e. the soft consonants in the basic form never alternate with hard ones within the paradigm.

6. The statistic studies of consonant frequency show that soft consonants are considerably less frequent as compared to hard ones. The data on Russian vowel and consonant ranks based on the corpora of different size are summarized in Table 1.

The phonemes are listed according to their frequency of occurrence. The ranking is based on two corpora of different sizes, namely, 100,000 phonemes (Leningrad State University, LGU—in Table 1) and 1,000,000 (Russian Academy of Sciences, Siberian Institute of Mathematics, IM in Table 1). In both corpora any soft phoneme occurred less frequently than the corresponding hard one. 8 of the least frequent consonants are also the soft ones (Bondarko et al., 1977).

7. One can assume that it is for phonological reasons that the pronunciation standard is changing. The Russian standard pronunciation has two main variants—the Moscow standard (of earlier origin) and the St. Petersburg standard. One of the main differences in the two variants is a large amount of so-called assimilative softness of consonants in the Moscow variant whereas in St. Petersburg pronunciation the number of such cases is rather small. For example, the softening of consonants before a soft consonant in different forms of the same word (*lampa*–*lamp'e* /lampal–/lam'p'i/, *dva*–*dv'e* /dval–/d'v'e/ etc.) is typical for the Moscow variant (Avanesov, 1972). In the last few years, this phenomenon has become less frequent (Kasatkin, 1993). The researchers consider this fact to be the evidence of the two variants becoming closer. Although from the point of view of articulation it would be more convenient to pronounce both consonants as soft ones in any combination of two consonants, the assimilation processes are restricted by the phonological status of soft consonants which are in the subordinate position with reference to hard ones.

8. Learning to pronounce soft consonants in Russian as a foreign language (RFL) courses is

Table 1
Phoneme frequency in texts

Phoneme rank	LGU data	IM data
a	1	1
i	2	2
t	3	4
o	4	6
n	5	3
j	6	5
s	7	7
u	8	9
r	9	8
k	10	11
v	11	10
l	12	18
e	13	12
n'	14	16
y	15	20
p	16	14
m	17	15
l'	18	13
d	19	21
t'	20	17
r'	21	22
z	22	23
s'	23	19
ʃ	24	25
b	25	24
ʒ	26	32
g	27	28
f	28	29
ʒ	29	33
d'	30	27
v'	31	30
x	32	31
m'	33	26
c	34	34
ʃ:	35	37
k'	36	36
p'	37	35
b'	38	39
z'	39	38
g'	40	40
f'	41	41
x'	42	42

particularly difficult. The most common mistake is pronouncing the combination C'V as CjV, that is, replacing softness with an additional sound [j], i.e. sharpness in its pure form. Teachers of Russian hypothesize that one of the reasons for such difficulties is the difference between the articulatory base of Russian and the students' mother tongue. Thus, for American students, the general tendency

towards apical articulation prevalent in American English (as opposed to the dorsal articulation prevalent in Russian) impedes the articulation gesture necessary to provide for the correct pronunciation (Diehm and Erin, 1998). As it has been shown above, there are no general articulatory characteristics of softness because every soft consonant is characterized by its own articulation gesture dependent on other features (place and manner of articulation). It should be noted that the notion of soft consonants, the interpretation of those consonants as derivatives from the hard ones, and finally, the transcription sign used in IPA for describing the softness provokes the foreign students' erroneous articulation and creates difficulties for the teacher of phonetics.

9. All of the above-stated forces us to draw our attention once more to the necessity of the detailed analysis of all the phenomena defining the place of this particular or any other opposition in the phonetic realization of speech sounds and in the phonological system. First of all, the historical facts should not be transferred to the modern system: indeed, soft consonants historically appeared in Russian as a result of palatalization of hard consonants. In modern Russian, however, soft consonants form an independent group, just like the other groups of consonants—hard consonants in this opposition, or stops, fricatives, trills etc.

Phonetically, soft consonants present some interest as well, because the articulatory and acoustic correlates of softness depend on other characteristics of every particular consonant. The only common characteristic for all soft consonants is the i-transition of the adjacent vowel, which carries the information on the consonant softness on the perceptual level.

Unlike the phonetic characteristics, the phonological status of the soft consonants reveals traces of historical processes. Since soft consonants emerged as a result of word-inflection and word-formation processes, their subordinate status was defined by morphological and lexical factors. Thus from the point of view of phonology and terminology it would be more appropriate to speak about the opposition of "soft" vs. "hard" consonants rather than the opposition of palatalized vs. non-palatalized ones.

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