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ON SOME DISTRIBUTIONAL PECULIARITIES OF THE HIGH UNROUNDED VOWELS IN RUSSIAN

The article aims at the explanation of some distributional peculiarities of two high unrounded vowels [i] and [ɨ] in Russian. More generally, it looks at some phonotactic constraints of Russian vowels which are directly related to a broader topic of palatalization and vowel reduction in this language. Although the discussion in this paper concerns only a tiny section of Russian phonology, which is the distribution of high unrounded vowels, it is necessary to introduce several facts from Russian phonology, such as palatalization, velarization, stress and vowel reduction. They, at first sight, may look pretty much irrelevant to the main topic of the paper but, as it will become evident, are closely related and actually indispensable to the understanding of vowel distribution including the two high unrounded vowels in Russian.

Keywords: vowels, phonotactic constraints, palatalization, Russian

1. Introduction

It is generally agreed that Russian palatalization is of great complexity, putatively comparable only to Polish palatalization. Rubach (2000: 39), for example, distinguishes four palatalization mechanisms in Russian. They include Velar Palatalization which changes velars into postalveolars, e.g. [k] > [tʃ], Affricate Palatalization which shifts alveolars to postalveolars, e.g. [ts] > [tʃ], Surface Palatalization, a mechanism which palatalizes consonants before front vowels and [j], e.g. [tʲ] > [tʃ] and Iotation, which triggers numerous consonant modifications, e.g. [t] > [tʲ]. As such, Russian palatalization is a highly interesting but at the same time an extremely complex phenomenon which

definitely deserves a separate work.¹ This study, however, does not aspire to a complete and in-depth analysis of Russian palatalization, rather the following discussion is confined to a single mechanism traditionally referred to as Surface Palatalization.² More specifically, this paper seeks to explain the distributional behavior of two high unrounded vowels in Russian, that is, [i] and [ɨ], which are involved in numerous context-specific alternations. Although both vowels are not sensitive to stress, i.e. they can occur in both stressed and unstressed syllables, they are strictly related to a preceding consonant in that [ɨ] occurs only after velarized and [i] after palatalized consonants. This constraint brings about various alternations widely described in the literature as palatalization, fronting and retraction (Rubach 2000). Generally speaking, this paper looks at the interaction between consonants and high vowels, showing that, on the one hand, [i] affects consonants (palatalization) and, on the other hand, consonants affect [i] and [ɨ] (retraction and fronting). Interestingly, the [ɨ] variant never occurs after velar consonants which unlike the rest of the consonants are not velarized in contemporary Russian. It follows that consonant-vowel sequences like *[kɨ], *[gɨ] and *[xɨ] are not possible in modern Russian. Velars can only be followed by [i] which makes them undergo palatalization [kʲi]. A satisfactory explanation of all these distributional facts, we claim, crucially depends on the appropriate melodic representation of vowels and the consonant secondary palatalization and velarization. Moreover, the solution we put forward has broader implementation in that it can shed some light on various phenomena such as consonant-vowel interactions, the loss of secondary velarization on velars, post-velar fronting and vowel reduction in Russian.

2. Background

This section presents a brief overview of the phonological system of standard Russian. For obvious reasons, we intend to discuss here only those aspects of Russian phonology which are directly relevant to the distribution of the high unrounded vowels [i] and [ɨ].

¹ Russian palatalization has been thoroughly discussed and analyzed in various theoretical models with some recent contributions including Rubach's (2000) Derivational Optimality Theory (DOT) account and Gussmann's (2002) Government Phonology approach, among many others.

² The term Surface Palatalization brings to mind the traditional generative derivational accounts where surface forms are derived from underlying forms by means of rules. Since the discussion in this paper is couched in Element Theory - a non-derivational framework, Surface Palatalization is used here merely for convenience reasons.

It is common knowledge that Russian contrasts palatalized and velarized consonants. They are contrastive in that palatalized and velarized (or non-palatalized) consonants can occur in an identical context, i.e. pre-consonantly, before a back vowel and word-finally, e.g. *po*[l^ɣ]*ka* ‘shelf’ vs. *po*[l^ʲ]*ka* ‘polka’, [n^ɣ]*os* ‘nose’ vs. [n^ʲ]*os* ‘he carried’, *kro*[f^ɣ]*’* ‘shelter’ vs. *kro*[f^ʲ]*’* ‘blood’ (Trubetzkoy 1939[1969], Fant 1960, Evans-Romaine 1998). In short, most of the consonants in this language are paired into the opposition between palatalized (soft) and velarized (hard). In the literature, the palatalized consonants are usually transcribed as accompanied with the diacritic [ʲ], while the velarized ones are either represented by the diacritic [ɣ] or they appear without any additional symbol. Thus, for instance, a bilabial voiceless plosive is transcribed [p^ʲ] when palatalized and [p^ɣ] or [p] when velarized. In what follows, we adopt the strategy of representing velarization with an appropriate diacritic. This is because it is more practical³ and, more importantly, because Russian is said to contain no plain consonants. The latter observation is supported by the findings in most of the previous studies, e.g. Trubetzkoy (1939[1969]); Fant (1960); Evans-Romaine (1998) and Rubach (2000); cf. Padgett (2001); Padgett and Tabain (2005). Rubach (2000:40), for example, notes that in Russian “every consonant is articulated with one of the following two tongue-body positions: forward movement and raising towards the hard palate (palatalization) or backward movement and raising towards the velum (velarization). These are the so-called secondary articulation effects, because the gesture performed by the tongue-body is simultaneous with but independent of the primary gesture that is responsible for determining the place of articulation.” Interestingly, there is a partial asymmetry between the palatalized and the velarized series in that the voiceless post-alveolar affricate is always soft [tʃ^ʲ], while [ts^ɣ], [ʃ^ɣ] and [ʒ^ɣ] do not have soft counterparts.⁴ Similarly, velars [k g x] and the palatal glide [j] remain unpaired supposedly because velarity and palatality are their primary places of articulation, respectively.

As for the vocalic system of Russian, it contains five vowels /i e a o u/ which, pretty uncontroversially, are subject to various allophonic realizations depending on the quality of the preceding consonant and stress, among several other factors. To anticipate the discussion below, this paper focuses on one particular case of such consonant-vowel interactions. More specifically, in what follows we look at the realization of the high front unrounded vowel /i/ which is regularly realized as [i] after palatalized consonants and, no less regularly, as [i̠] after velarized consonants both in stressed and unstressed syllables. Hence, one of the

³ Note, however, that in the provided transcription we mark for velarization only those consonants which are directly relevant to the discussion.

⁴ In a footnote, Padgett (2003: 41) notes that while [ʒ^ʲ] is of a marginal status in Modern Russian, the occurrence of [ʃ^ʲ] is at best interpreted as a sequence of other sibilants.

immediate conclusions is that consonant-vowel sequences of the *[p^yi] and *[p^ji] type are not possible in Russian.⁵ Note further that the behavior of the other front vowel, i.e. [e], is somewhat less predictable. Although the preceding consonants are predominantly palatalized, e.g. *den*’ [d^jen] ‘day’, *sem*’ [s^jem] ‘seven’, velarized consonants can also appear before [e] but only in unassimilated loans, e.g. *tenisist* [t^yen^jis^jist] ‘tennis player’, or when the preceding consonant belongs to the so-called hard group [ts ʃ ʒ], e.g. *centr* [ts^yentr] ‘center’, *żest* [ʒ^yest] ‘gesture’. By the same token, Padgett (2003) points out that even though palatalization is non-contrastive before [e] in that the consonants in this position are predictably palatalized (1), some loan words such as *tennis* and *tent* retain non-palatalized (velarized) consonants here.⁶

(1) Palatalization before the front mid-vowel [e] (Padgett 2003: 42)

[s ^j est ^j]‘to sit down’	*[s ^y est ^j]	[n ^j et]‘no’	*[n ^y et]
[p ^j et ^j]‘to sing’	*[p ^y et ^j]	[gd ^j e]‘where’	*[gd ^y e]
[v ^j et ^j er]‘wind’	*[v ^y et ^y er]	[k ^j em]‘who (instr.sg.)’	*[k ^y em]

This situation, he argues, increases the possibility of treating palatalization before [e] as contrastive. However, this contrastivity would be true only within roots because at morpheme boundaries palatalization before [e] is regular as exemplified by nominative singular *do*[m^y] ‘house’ and *bra*[t^y] ‘brother’ versus prepositional *do*[m^je] and *bra*[t^je].

As already mentioned, in Russian the palatalized and velarized consonants are contrastive. However, this is true to a certain extent as it is only the palatalized consonants which can be followed by either front or back vowels. To put it differently, while the front vowels [i e] are not found in the context of the preceding velarized consonants (with some minor exceptions concerning [e] in loans), the back ones [a o u] may occur freely both after the palatalized and velarized consonants, e.g. *djadi* [d^ja^jdi] ‘uncle, nom.pl.’ vs. *dast* [d^ya^jst] ‘(s)he will give’, *vjol* [v^jo^jl] ‘he led’ vs. *vol* [v^yo^jl] ‘ox’, and *sjuda* [s^ju^jda] ‘here, this way’ vs. *suda* [s^yu^jda] ‘court of law (gen.sg.)’. This situation changes dramatically when stress comes into play. Thus, in the group of the six tonic (stress-bearing) vowels [i ĩ e a o u]⁷, there are only three which are fully

⁵ Note that Padgett (2001) and Padgett and Tabain (2005) argue for a different solution according to which Russian contrasts palatalized and plain consonants. In their functional phonetic explanation, plain series occurring before /i/ becomes velarized in order to strengthen the contrast between palatalized and plain consonants. In this situation the front vowel /i/ is realized as a centralized variant [i̠] or, more specifically, as some sort of a diphthong transcribed as [i̠] or [u̠] especially in a stressed position (for details see Padgett 2001 and Padgett and Tabain 2005).

⁶ Rubach (2000: 45) notes that all exceptions to palatalizations occur before [e] and none in the environment of [i].

independent, that is [a o u], in that they are unconstrained by the nature of the preceding consonants (see above). However, in the group of atonic nuclei (those that lack stress), we can find only the high vowels [i i̯ u] plus the open vowel [a].⁸ Note further that when it occurs in the unstressed position, the latter vowel, i.e. [a], is subject to various phonetic modifications and context-specific alternations. Basically, it is realized as one of the central variants [ə] or [ʌ] which differ in the degree of openness, i.e. half-close [ə] and half-open [ʌ]. To cut the long story short, in the context of the preceding velarized consonant we find [ʌ] in the directly pretonic position, while [ə] occurs further away from the stressed syllable including the final position, e.g. *paroxoda* [pəɾʌˈxodə] ‘steamship, gen. sg.’, *golova* [gəɫʌˈva] ‘head’, *alfavit* [ʌlfʌˈvʲit] ‘alphabet’.⁹ In short, when unstressed the vowel /a/ is realized as one of the non-high, unrounded, non-front variants, i.e. [ə] or [ʌ], which either follow hard consonants or appear initially. These realizational modifications are part of a broader phenomenon which affects unstressed vowels in Russian. Such vowels are regularly centralized with the exception of [i] after a palatalized consonant (cf. Padgett and Tabain 2005).

To sum up the discussion so far, only four out of the six Russian vowels [i i̯ e a o u] may appear in unstressed syllables, that is [i i̯ u a]. In the latter context, these vowels remain basically unaffected, not counting some minor phonetic implementational modifications such as a slight shortening of the vowel, and centralization in the case of /u/ and centralization and raising in the case of /a/ (narrowly transcribed as [ʊ] and [ə]/[ʌ], respectively). What is important for us here, however, is that the high unrounded vowels [i i̯] must agree in frontness or backness with the preceding consonant both in a stressed and unstressed position. This distributional requirement does not hold for the back rounded vowel /u/ which can be preceded by a palatalized or a velarized consonant in both stressed and unstressed position, e.g. *pastux* [pastʲux] ‘herdsman’ vs. *pastuxa* [pastʲuːxa] gen.sg.’ and *tjur’my* [tʲurʲmi] ‘prison, nom.pl.’ vs. *tjur’ma* [tʲurʲma] ‘nom.sg.’.¹⁰ Furthermore, note that the vowel /a/ which, together with /u/ and /o/, belongs to the class of fully independent vowels in that it can follow any consonant, should

⁷ In most of the studies, the vowel [i̯] is perceived as a contextual variant of the high front vowel /i/.

⁸ This phenomenon known as vowel reduction has been widely studied by, for example, Lightner (1972) Flemming (2004), Crosswhite (2001, 2004), Padgett and Tabain (2005) and Jaworski (2010), among many others.

⁹ Most of the language data in this paper are adopted from Rubach (2000), Gussmann (2002), Padgett (2001, 2003) and Padgett and Tabain (2005). As not directly relevant to the examples at hand, velarization is not indicated.

¹⁰ Rubach (2000: 47) notes that back vowels, hence also /u/, may be phonetically fronted or centralized in the context of a palatalized consonant and especially when sandwiched between two palatalized consonants. This allophonic variation, he explains, is dialect- and/or speaker-specific.

be allowed (just like /u/) to occur in unstressed position not only after a velarized consonant but also after a palatalized one. This, however, does not happen, and what we observe here instead are some alternations where [a] is replaced with [i] after a palatalized consonant in unstressed syllable, e.g. *mjagko* [m^jaxka] ‘softly’ vs. *mjagka* [m^jix’ka] ‘soft, fem. nom. sg.’, *mjaso* [m^jasa] ‘meat’ vs. *mjasnoj* [m^jis’noj] ‘meaty’ (Gussmann 2002: 143). To put it differently, in unstressed position after a palatalized consonant we find instances of [i] which directly corresponds to [a] in a stressed syllable. Somewhat less predictably, the tonic [a] corresponds to atonic [i] after unpaired hard consonants [ts ʃ ʒ], as in, for example, *žarko* [ʒarka] ‘hot’ vs. *žara* [ʒira] ‘heat’. Recall that the same vowel, i.e. [a], after a velarized consonant in unstressed position is centralized to [ə] or [ʌ] (see the discussion above). Finally, the mid-vowels /e o/ never occur in unstressed syllables, in this position they alternate with [i] or [i] depending on the preceding consonant. Quite predictably, they correspond to [i] after palatalized consonants and [i] after velarized and unpaired hard consonants [ts ʃ ʒ], e.g. *bedy* [b^jedi] ‘misfortune, nom.pl.’ vs. *beda* [b^jida] ‘nom.sg.’, *nos* [n^jos] ‘he carried’ vs. *nesla* [n^jis’la] ‘she carried’, *šest* [ʃes^t] ‘six’ vs. *šestoj* [i^stoj] ‘sixth’ and *žony* [ʒoni] ‘wife, nom.pl.’ vs. *žena* [ʒina] ‘nom.sg.’.

In a nutshell, there are only three vowels that can unconditionally appear in stressed and unstressed positions, these are [i i u]. In unstressed syllables, the vowel [a] is realized as [ə] or [ʌ] after a non-palatalized consonant (and word-initially). It never follows palatalized consonants in this position. Similarly, the other back vowel, i.e. [u], also becomes centralized here but it can be found after both palatalized and velarized consonants. Finally, [i] appears only after a palatalized consonant, and [i] after a non-palatalized one. All these distributional facts are piled up and represented in a table below.

(2) Vowel distribution in Russian

<i>Context</i>	<i>stressed syllables</i>	<i>unstressed syllables</i>
after palatalized consonants only	[i e]	[i]
after velarized consonants only	[i]	[i] [ə/ʌ]
after both palatalized & velarized consonants	[a o u]	[u]
after unpaired hard consonants [ts ʃ ʒ]	[i a o u] *[e]	[i u]

Moreover, it should be kept in mind that in unstressed syllables the tonic vowels [e a o] are replaced by [i] after palatalized consonants and [i] after velarized and unpaired hard consonants.

One of the immediate conclusions we arrive at here is that the unstressed position imposes more severe constraints on the vowel-consonant mutual dependence. More specifically, in stressed syllables all back vowels can be preceded by palatalized consonants. This is not an option for unstressed syllables in which the only unconstrained vowel is [ʊ]. All other unstressed vowels behave quite predictably in that we find [i] after palatalized and [i̯ ə/ʌ] after velarized consonants. Moreover, similarly to other languages such as English, Bulgarian and Spanish, Russian curtails the vocalic inventory in unstressed positions. In the latter language the selection of unstressed vowels is to a large extent connected with the quality of the preceding consonants. In other words, in Russian unstressed syllables we can observe mutual dependence of vowels and consonants in that, on the one hand, the frontness of vowels and the palatalization of consonants are nearly inseparable, and, on the other hand, the character of consonants determines the quality of the following vowels.

In section 3 below, we formulate a working hypothesis for the distribution of atonic vowels in Russian. Note, however, that it is just a first approximation to the problem of vowel phonotactics as it does not take into account all the available facts the presentation of which is postponed until section 4.

3. Hypothesis

Before we start, it must be stressed here that the following discussion and the hypothesis we advance encompasses mainly the set of unstressed vowels in Russian with only fragmentary reference to stressed vowels when necessary. Now, recall from the previous section that the set of atonic vowels is a reduced version of the tonic group as it contains only four vocalic segments [i], [i̯], [ə ʌ]¹¹ and [ʊ]. This distributional asymmetry is a result of the vowel reduction mechanism operating in many languages including Spanish, English and Russian, among many others (Backley 2011). In Element Theory¹², a model of segmental phonology adopted in the present study, vowel reduction is interpreted as the reduction in vowel complexity in that the vowels containing more than one element in their internal structure are simplified to mono-elemental vocalic expressions (see Backley 2011, Bloch-Rozmej 2008 and Cyran 2010, among others). This is exactly what happens in Russian. In this language the mid vowels

¹¹ As was already mentioned above, in the unstressed position the vowel /a/ can be realized as either [ə] or [ʌ] depending on the distance from the stressed syllable.

¹² Element Theory has been developing continuously since the late 80's. For details concerning the history and the main tenets of the model see, for example, Harris (1994), Harris and Lindsey (1995), Bloch-Rozmej (2008) and Backley (2011).

[e o] do not survive in unstressed syllables as they contain two elements each, i.e. [e] |IA| and [o] |UA| and so they must be reduced to or replaced by simplex vowels containing one element, for example [i̠] |I|. More interestingly, while all the tonic vowels, apart from [i̠], are headed, the atonic ones are both mono-elemental and headless, except for [i̠].¹³ Both tonic and atonic sets are represented in element terms under (3) below.

(3) Internal structure of Russian vowels

Tonic vowels		Atonic vowels	
phonetic symbol	element(s)	phonetic symbol	element
[i]	<u>I</u>	[i̠]	I
[i̠]	I	[i̠]	I
[e]	<u>I</u> A		
[a]	<u>A</u>	[ə]/[ʌ]	A
[o]	<u>U</u> A		
[u]	<u>U</u>	[ʊ]	U

The hypothesis we put forth here is that vowel reduction in Russian consists in both vowel decomplexification and the loss of headedness. More specifically, unstressed nuclei cannot support complex segments, nor can they support headed elements. The only exception to this constraint is the high front vowel [i̠] which is always preceded by a palatalized consonant and so it is assumed to share the palatality element with the preceding consonant. In short, complex vocalic expressions [e o] are reduced to mono-elemental ones and the headed vowels become headless, i.e. [a] > [ə/ʌ] and [u] > [ʊ].¹⁴

Furthermore, we propose to represent consonant secondary palatalization and velarization with the element |I| and |U|, respectively.¹⁵ Both categories, i.e. palatalized and velarized consonants, are represented in (4) on the example of the voiceless bilabial plosive [p].

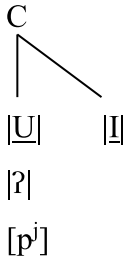
¹³ In Element Theory headedness is used to indicate, among other things, the element strength in the sense that a headed element displays a stronger and more prominent acoustic pattern than a dependent (non-headed) element.

¹⁴ Since the back vowel [ʊ] can be preceded by both velarized and palatalized consonants in unstressed syllables, we need an explanation of why [ʊ], unlike [i̠], becomes headless after a palatalized consonant. A tentative solution is proposed in the following section.

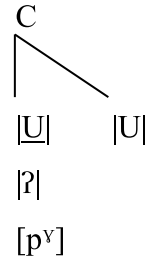
¹⁵ The solution according to which velarity/velarization is represented by the non-headed element |U| is motivated by the findings of a cross-linguistic study (see Kijak 2017).

(4) Representation of palatalized and velarized consonants in Russian

a. palatalized [pʲ]



b. velarized [pʷ]



From the representation in (4) it follows that the secondary palatalization and velarization boils down to the presence of additional elements [I] and [U] in the internal structure of Russian consonants, which makes them branching structures.¹⁶ Finally, it is assumed here that the reason why in unstressed syllables palatalized consonants are predominantly followed by [i] lies in the sharing condition, a requirement according to which the element [I] is shared by both segments, i.e. a palatalized consonant and the high front vowel [i]. Quite predictably, this explanation raises numerous doubts such as the apparent lack of sharing condition in stressed syllables. However, before we address some of the burning questions which may occur to the reader, we should first look at the distribution of two high unrounded vowels [i] and [ɨ] in more detail. This is done in the immediately following section.

4. Distribution of [i] and [ɨ] in Russian

It has now become evident that the distribution of the high unrounded vowels [i] and [ɨ] in Russian strictly depends on the preceding consonant. Palatalized consonants go with the front vowel [i], while the velarized ones are followed by the retracted vowel [ɨ], e.g. [bʲit] ‘beaten’ vs. [bʷit] ‘way of life’, [xodʲi] ‘walk!’ vs. [xodʷɨ] ‘gaits’. Now, since the front vowel [i] can also occur independently of the preceding consonant, e.g. [igratʲ] ‘to play’, it is logical to assume that the variant [ɨ] is enforced by the preceding velarized consonant. However, in Modern Russian the situation is complicated by the fact that velar consonants are assumed to be just of the plain kind and so velar palatalization is allophonic, i.e. it depends

¹⁶ In (4) the symbol C stands for a consonantal slot in the syllable structure such as Onset and the element [ʔ], which is found in plosives, represents occlusion/stopness.

on the context. Thus before the front vowels [i] and [e], the velar stop undergoes palatalization, e.g. [k^jipa] ‘pile’, [g^jerp] ‘(coat of) arms’, while the same velar is realized as plain in the context of a back vowel, in the pre-consonantal and word-final position, e.g. [koʃka] ‘cat’, [xudo] ‘harm, evil’, [gd^je] ‘where’, [ix] ‘them’.¹⁷ What is peculiar about velars is that the plain variant cannot be followed by the vowel [i]. It is surprising inasmuch as this vowel is directly related to the velarized consonants. Thus in Russian sequences such as *[ki] or *[xi] are banned, and can be found only in a broader context, i.e. between words or between the prefix and the stem, e.g. [i]van ‘Ivan’ vs. [k i]vanu ‘to Ivan’. In other words, morpheme-internally the only option for velars is to be followed by the front vowel [i] which triggers velar palatalization. In short, the front vowel [i] is realized as [i] after velarized consonants, and since velars are assumed to be just of a single plain kind, it is not possible to get *[ki] but instead we find the palatalized variant before the front vowel [i], i.e. [k^ji]. It is assumed that the responsibility for this state of affairs falls on a sound change known as post-velar fronting which affected East Slavic between roughly the twelfth and fourteenth centuries. Note that before this change velars did not occur before front vowels at all, while they did occur before [i]. In other words, the distribution of velars was exactly opposite in that sequences like [ki], [gi], and [xi] were well-formed in contrast to [k^ji], [g^ji], and [x^ji] which were banned. In short, post-velar fronting affected sequences like [ki] and changed them into [k^ji] as shown in (5) below.

(5) Post-velar fronting (Padgett 2003: 45)

a.	[kijev]	>	[k ^j ijev]	<i>Kiev</i>
	[ruki]	>	[ruk ^j i]	<i>hands, acc.pl.</i>
b.	[gib ^j eɫ ^j]	>	[g ^j ib ^j eɫ ^j]	<i>ruin/death</i>
	[drug ^j i]	>	[drug ^j i]	<i>friends, acc.pl.</i>
c.	[xitrij]	>	[x ^j itrij]	<i>clever</i>
	[pastux ^j i]	>	[pastux ^j i]	<i>shepherds, acc.pl.</i>

Leaving aside for now the question of what triggered the post-velar fronting, the data in (5) show that before the change velars occurred together with [i], which may indicate that velars were velarized like other consonants in Modern Russian. After the change, however, velars lost their secondary velarization and so now they must be followed by the front variant [i] which is their palatalization trigger, i.e. [k^ji]. To complicate the picture even further, note that it has been suggested that the responsibility for this situation falls on a still earlier change

¹⁷ Note that it is possible for a palatalized velar to be followed by a back vowel, e.g. [ɫik^jor] ‘liqueur’, [tk^joʃ] ‘you weave’ or [p^jek^joʃ] ‘you bake’. Such forms, however, are either loans or dialectal/exceptional realizations, for details see Flier (1982).

which affected velars and turned them into palato-alveolars (mutation) $[k^j] > [tʃ^j]$. For instance, Jakobson (1962) argues that since the earlier development changed palatalized velars into palato-alveolars, an inventory gap occurred which was filled by the post-velar fronting $[ki] > [kʲi]$ (cf. Padgett 2003; Dresher 2009). Be that as it may, velars have lost their secondary velarization and so they function as plain velars in contemporary Russian, which is confirmed by their distribution. One of the consequences of this loss is that velars are no longer able to ‘retract’ the following $[i]$ into $[i̠]$. This explains the lack of $*[ki]$ sequences and the fact that before the front $[i]$ the plain velar undergoes palatalization to $[kʲi]$.

If we agree that velarity, including secondary velarization, is represented by the non-headed element $|U|$, we can provide a solution to both the loss of velarization on Russian velars (recall that they used to be velarized but lost secondary velarization historically) and the distribution of atonic vowels (in particular the high unrounded vowels $[i]$ and $[i̠]$). The loss of secondary velarization on velars is explained here as the suppression of the non-headed $|U|$ triggered by a type of Obligatory Contour Principle (OCP) which bans two identical elements within one single segment. This situation is depicted under (6) below.

(6) Loss of secondary velarization in Russian $[k^y] > [k]$

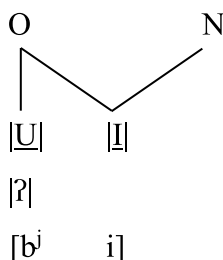


The loss of velarization affects velar consonants because both velarity and secondary velarization are defined by an identical non-headed element $|U|$. In other words, due to the operation of the OCP at a certain stage of the language development, the element $|U|$ responsible for secondary velarization got delinked and in consequence a group of plain velars appeared in Russian. Now, if we represent $[i̠]$ as a non-headed variant of $[i]$, hence $[i] |I|$ vs. $[i̠] |I|$, the explanation for the distribution of these vowels can be sought in the fusion principle or element sharing. Building on the observation that velarized consonants are never followed by front vowels, we claim that palatalized consonants and front vowels share the element $|I|$ (7a). Moreover, since the velarized consonants contain the element $|U|$, they are unable to set a sharing relation with front vowels. Instead, consonant secondary velarization represented by the non-headed element $|U|$ enforces the loss of headedness on the following front vowel which gives $[i̠]$ (7b).

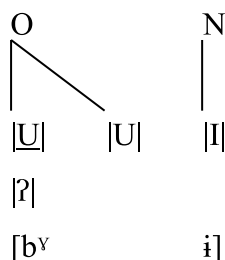
Both scenarios are represented on the example of [b^jit] ‘beaten’ vs. [b^ɣit] ‘way of life’ under (7) below.¹⁸

(7) Mutual dependence of consonants and high unrounded vowels

a. [b^jit]



b. [b^ɣit]



The interdependence of a palatalized consonant and the front vowel [i] in (7a) is explained as element sharing or more specifically as a fusion of two identical elements (one standing for palatalization and the second for the front vowel) into one. Note that the front vowel [i] must share the element [I] with the palatalized consonant (7a) regardless of the syllabic status (stressed or unstressed) and there are no exceptions to this fusion principle. Since the front mid vowel [e] also contains the element [I], i.e. [e]=[I A] (see Table 3 above), this solution can be broadened to explain its distribution in stressed syllables with one minor proviso concerning hard unpaired consonants. In (7b), on the other hand, the velarized consonant requires the following front vowel to be headless, i.e. the element [I] is reduced to a non-headed element [I]. The loss of headedness is dictated by the secondary velarization of the preceding consonant which is itself a non-headed element [U]. In other words, since the elements [U] and [I] are banned to fuse in languages which lack front rounded vowels¹⁹, the elements in question are at least made similar in that both of them are headless. Finally, the explanation why the atonic vowel /u/ is retracted to [ɯ] in the context of the preceding palatalized consonant should be sought in a broader context, that is, in the behavior of vowels in unstressed syllables rather than in the nature of the

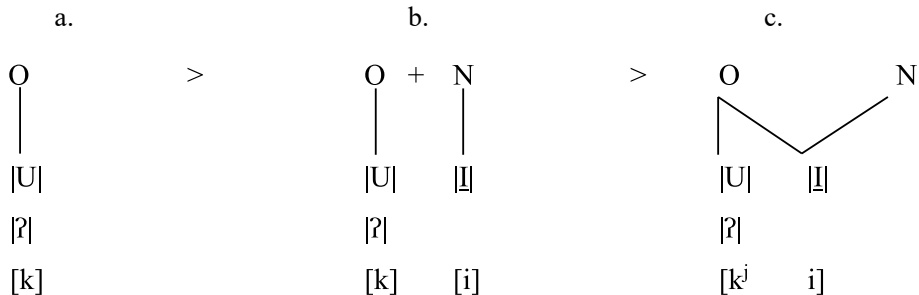
¹⁸ The explanation of the loss of headedness in (7b) could be sought in the concept of head alignment frequently observed in bridging relations, for details see Bloch-Rozmej (2008).

¹⁹ This is the case in Russian which does not contain front rounded vowels. Note that even though some researchers like Avanesov (1968) point to the possibility of the front variant of /u/ in Russian, i.e. *ü*, in the context between two palatalized consonants, it is treated here as a mere phonetic implementation since it occurs in “the colloquial pronunciation of some selected lexical items which carry emotional meaning” (see Rubach 2000: 47).

preceding consonant. Recall that all vowels which are not subject to the fusion principle are centralized or retracted in unstressed syllables (loss of headedness). Note that in the latter context the vowel /u/ is centralized to [ʊ] both after palatalized and velarized consonants.

From the discussion above it follows that since velars lost secondary velarization, they are never followed by [ɨ] but can be followed by [i] which triggers velar palatalization as illustrated in (8).

(8) [k] + [i] > [kʲi]



Since velars lost secondary velarization, they can be palatalized in the context of front vowels [i e]. Recall that in contemporary Russian velar palatalization is allophonic, i.e. it depends on the context.

5. Summary and concluding remarks

The discussion in this article has shown that contrary to common opinion the distribution of Russian vowels is less consonant dependent than is generally believed. Note that in stressed syllables we can find almost all vowels in the palatalized and velarized context. The only exception to this observation is the distribution of two high unrounded vowels [i] and [ɨ] which is totally regular in that palatalized consonants must be followed by [i] while the velarized ones by [ɨ]. The same conclusion is drawn while looking at the unstressed position. The only difference is that in the latter context vocalic contrasts are limited in that the complex vowels [e o] never occur here (vowel reduction). Additionally, vowels in this position become headless which triggers some phonetic modifications such as centralization and/or raising. The situation in Russian is further complicated by the presence of numerous morphophonological alternations as in the case of the stressed vowel [a] which alternates with [i] or [ɨ] in unstressed position.

Summing up, the main constraint imposed on sequences of consonants and vowels is limited to only two Russian vowels, i.e. [i] and [i̯]. The front vowel must share the element [I] with a palatalized consonant, while velarized consonants enforce vowel retraction which is explained here as the loss of headedness of [I].²⁰ In other words, front vowels are not expected in the context of the preceding velarized consonant as in this situation either the velarization would be wiped out or a front vowel would be retracted. The latter scenario is chosen in Russian. Generally speaking, there are two vocalic patterns Russian vowels must follow: a) all vowels except for the two front unrounded ones are sensitive to stress in that in unstressed position complex vocalic expressions (i.e. [e] and [o]) are banned and headed vowels become headless and b) the distribution of the front unrounded vowels [i] and [i̯] is closely related to the nature of the preceding consonant. It seems that the responsibility for distributional complexity of Russian vowels falls on the fact that these two patterns are inextricably intertwined.

References

- Avanesov, R.I. 1968. *Russkoje literaturnoje proiznoshienie* [Literary Russian Pronunciation]. Moscow: Prosveshcheniye.
- Backley, Ph. 2011. *An Introduction to Element Theory*. Edinburgh: Edinburgh University Press.
- Bloch-Rozmej, A. 2008. *Melody in Government Phonology*. Lublin: Wydawnictwo KUL.
- Crosswhite, K. 2001. *Vowel Reduction in Optimality Theory*. New York: Routledge.
- Crosswhite, K. 2004. Vowel reduction. In B. Hayes, R. Kirchner and D. Steriade (eds.), *Phonetically Based Phonology*, 191-231. Cambridge: Cambridge University Press.
- Cyran, E. 2010. *Complexity Scales and Licensing in Phonology*. Berlin: Mouton de Gruyter.
- Dresher, E.B. 2009. *The Contrastive Hierarchy in Phonology*. Cambridge: Cambridge University Press.
- Evans-Romaine, D.K. 1998. *Palatalization and Coarticulation in Russian*. Ph.D. Dissertation. University of Michigan: Ann Arbor.
- Fant, G. 1960. *Acoustic Theory of Speech Production*. The Hague: Mouton.
- Flemming, E. 2004. Contrast and perceptual distinctiveness. In B. Hayes, R. Kirchner and D. Steriade (eds.), *Phonetically Based Phonology*, 232-276. Cambridge: Cambridge University Press.

²⁰ Gussmann (2002) calls this constraint frontness sharing. Since, however, he also recognizes backness sharing and he does not give any detail concerning the representation of segments in question, our proposals differ.

- Flier, M.S. 1982. Morphophonemic change as evidence of phonemic change: The status of the sharpened velars in Russian. *International Journal of Slavic Linguistics and Poetics* 25.6: 137-148.
- Gussmann, E. 2002. *Phonology: Analysis and Theory*. Cambridge: Cambridge University Press.
- Harris, J. 1994. *English Sound Structure*. Oxford: Blackwell.
- Harris, J., and G. Lindsey 1995. The elements of phonological representation. In J. Durand and F. Katamba (eds.), *Frontiers of Phonology: Atoms, Structures, Derivations*, 34-79. London & New York: Longman.
- Hayes, B., R. Kirchner and D. Steriade, eds. 2004. *Phonetically Based Phonology*. Cambridge: Cambridge University Press.
- Jakobson, R. 1962. *Selected Writings, vol. 1: Phonological Studies*. 's-Gravenhage: Mouton.
- Jaworski, S. 2010. Phonetic and phonological vowel reduction in Russian. *Poznań Studies in Contemporary Linguistics* 46.1: 51-68.
- Kijak, A. 2017. *Labial-Dorsal Interactions: A Phonologically Based Approach*. Katowice: Wydawnictwo Uniwersytetu Śląskiego.
- Lightner, Th.M. 1972. *Problems in the Theory of Phonology: Russian Phonology and Turkish Phonology*. Edmonton, Alberta: Linguistic Research Inc.
- Padgett, J. 2001. Contrast dispersion and Russian palatalization. In E. Hume and K. Johnson (eds.), *The Role of Speech Perception in Phonology*, 187-218. San Diego, CA: Academic Press.
- Padgett, J. 2003. Contrast and post-velar fronting in Russian. *Natural Language and Linguistic Theory* 21: 39-87.
- Padgett, J., and M. Tabain 2005. Adaptive dispersion theory and phonological vowel reduction in Russian. *Phonetica* 62: 14-54.
- Rubach, J. 2000. Backness switch in Russian. *Phonology* 17.1: 39-64.
- Trubetzkoy, N.S. 1939[1969]. *Grundzüge der Phonologie*. Göttingen: van der Hoeck and Ruprecht. Translated 1969 by Christiane A.M. Baltaxe as *Principles of Phonology*. Berkeley and Los Angeles: University of California Press.