Constraints on Distribution of Palatalized Stops: Evidence for Licensing by Cue

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Alexei Kochetov

University of Toronto

0. Introduction

In this paper I investigate factors responsible for neutralization of plain-palatalized contrasts, focusing on coronal and labial stops in Standard Russian. I argue that the full range of distributional facts characterizing these segments can be adequately characterized only if one derives neutralization from phonetic perceptual and articulatory factors (*Licensing by Cue*: Steriade 1997; also Côté, this volume, Flemming 1995, Hamilton 1996, Silverman 1997). I propose a contextual markedness hierarchy based on the availability of perceptual cues to palatalized segments. I further demonstrate that the analysis based on Russian extends straightforwardly to the patterns attested in other languages that distinguish the contrast.

1. Distribution of palatality contrasts in Russian

1.1 Inventory and palatalized contrasts

The Russian consonant inventory is given in (1).[1] As we see, the language can be considered as fully representative of the typology of palatalization. The plain-palatalized phonemic distinction involves all places of articulation: labials, coronals and velars. Plain consonants may be velarized to some extent (Skalozub 1963, etc.).

(1)

p	**pʲ**	**t**	**tʲ**			**kʲ**	**k**
b	bʲ	d	dʲ			[gʲ]	g
		ts			tʃʲ		
f	fʲ	s	sʲ	ʃ	ʃʲ:	[xʲ]	x
v	vʲ	z	zʲ	ʒ			
m	mʲ	n	nʲ				
		l	lʲ				
		r	rʲ				
					j		

[1]My assumptions concerning phonotactics and articulatory and acoustic phonetics of Russian are based on the following sources: Avanesov 1972, Bolla 1981, Bondarko 1977, Derkach 1975, Halle 1959, Jones & Ward 1969, Kuznetsova 1969, Lazova 1974, Matusevich 1976, Skalozub 1963, and Tolstaia 1968.

Pius Tamanji, Masako Hirotani, and Nancy Hall (eds.), NELS 29: 167-181

In this paper I limit the discussion to the distribution of coronal and labial stops (highlighted in (1)), disregarding their laryngeal distinction. I show these segments again in (2).

(2)

	Labial	Coronal
Plain	p	t
Palatalized	pʲ	tʲ

1.2 Distribution of plain and palatalized stops

The distribution of plain and palatalized stops is summarized in (3).[2]

(3)

	Environment	Contrast C • Cʲ	
		Labial	Coronal
a.	V__V	yes	yes
b.	#__V	yes	yes
c.	C__V	yes	yes
d.	V__#	yes	yes
e.	C__#	yes/no (1)	yes/no (5)
f.	V__C[3]	no	yes/no (3)
g.	#__C	no	yes/no (1)
h.	C__C	no	no

Note: yes = unrestricted; yes/no = restricted, no = prohibited; (1) = the number of attested contrastive clusters.

I consider single stops and these segments in two- and three-consonant clusters. Note that while the unmarked, plain segments occur in all of the contexts under consideration, their palatalized counterparts exhibit rather asymmetrical distributional patterns. What we see in (3), is that in some environments both palatalized labials and coronals are unrestricted (3abcd), that is, fully contrastive. In other contexts they are restricted to a certain number of clusters. There is only one attested cluster with a final palatalized labial (3e). Coronals have a limited number of clusters in other positions (3fg). In still other positions the segments in question are completely neutralized in favour of the unmarked plain stops ((3h) and (3fg) for labials only). Interestingly, palatalized coronals enjoy a fuller contrastive potential than palatalized labials.

It is also worth emphasizing that some of these environments are subject to additional constraints imposed by the nature of the following consonant. In the preconsonantal positions (3fgh) coronals may be tolerated only if the following segment is of a different place of articulation (4). There are also some restrictions before front vowels (see Kochetov (to appear)).

(4)

		Labial	Coronal
a.	#__C_{hetero}V	no	yes/no (1)
b.	V__C_{hetero}(#)	no	yes/no (3)
c.	V__C_{homo}(#)	no	no

Note: C_{hetero} = a hetero-organic consonant; C_{homo} = a homorganic consonant.

[2]See Kochetov (to appear) for details.

[3]For simplicity I exclude the clusters with a palatalized C_2.(see Kochetov (to appear)).

In sum, not a single environment in (3) is free from some kind of constraint on palatalized stops. Several questions arise with regard to these data. Why are certain environments better for realization of the contrast than others? Why is the contrast tied up to the quality of the following consonant or vowel? How can we explain the distributional discrepancies between labials and coronals?

2. Licensing by Cue: Phonetic cues to palatalized consonants

In order to account for these complex distribution patterns, I turn to the hypothesis of *Licensing by Cue*, developed in the works of Steriade 1997, 1998, as well as Flemming 1995, Hamilton 1996, and Silverman 1997. According to this approach, phonological contrasts are neutralized in environments poor in terms of phonetic cues and are preserved or licensed in positions that are high on a scale of perceptibility. This scale is based on relative number of cues, their relative duration and perceptual salience.

2.1 Cues to palatalized stops

I will begin with identifying cues to palatalized stops. I frame my analysis in the gestural representations developed in the framework of Articulatory Phonology (Browman & Goldstein 1989 et seq.; Zsiga 1997, 1998) and the auditory representations worked out in Flemming 1995.

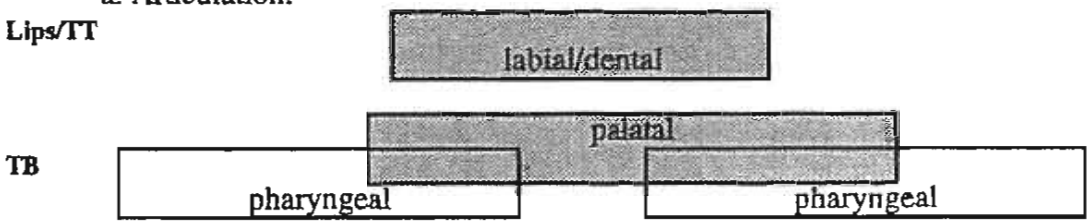
A palatalized consonant is characterized as having a primary gesture (Lips or Tongue Tip) with a secondary palatal articulation superimposed onto it. Consider the gestural score of sequences *apʲa-atʲa* (5a). The secondary gesture (Tongue Body-palatal), which is acoustically characterized by high F2, overlaps with the gestures of the preceding and following vowels, resulting in formant transitions. The overlap is usually more apparent at the release than at the formation of the primary constriction (Ladefoged & Maddieson 1996: 364; Flemming 1995: 35).[4]

This alignment of gestures provides the sequence of acoustic events in (6b): approach, closure, burst, and release. Of these four, approach (V-C formant transitions), release (C-V transitions), and burst of fricative noise are known to contain important information about the place of articulation of the stop (Flemming 1995: 33-37). It is crucial for our analysis to know what the relative importance, or perceptual salience of each of these cues is. Here I consider acoustic details of release, approach and burst. For simplicity I refer to them as cues. I do not discuss the properties of closure, since this component, having no acoustic energy, cannot differentiate stops.

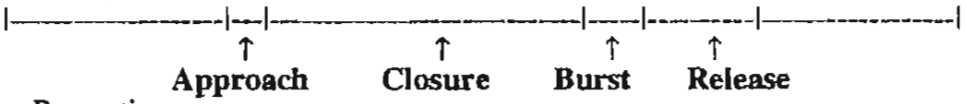
[4]More rarely we find pre-palatalized segments, e.g. in Estonian (Donca Steriade, p.c.; Abondolo 1998: 123).

(5) Intervocalic: [apʲa] or [atʲa]:

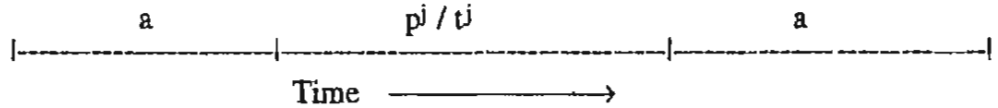
a. Articulation:



b. Acoustics:



c. Perception:



Note: TB = Tongue Body; TT = Tongue Tip; Constriction degree and gestures of Glottis and Velum are omitted.

A release after a palatalized consonant in Russian (6) is characterized by a fairly long period, taking up to 35-40% of the vowel.[5] A palatalized release is characterized by a high F2 at the beginning of the release. For example, the release of initial palatalized *тʲ* in *тʲатʲа* 'daddy' is 35% of the vowel time (Kuznetsova 1969: 73). The duration of release is approximately the same for labials and coronals (Bondarko 1977: 95-100).

(6) Release (based on Bondarko 1977, Kuznetsova 1969):

	F2 at the release	Duration
Cʲa	≥ 1700 Hz	35-40%

Release is considered to be the main acoustic cue to palatalized consonants in general (e.g. Ladefoged & Maddieson 1996: 364, Derkach 1975). However, this is the case only if the following vowel has a lower F2, that is, there is a perceptible difference between the release and the nucleus of the vowel. For example, the difference in F2 between the beginning of the release (F2 = 1700 Hz) and F2 of the vowel [a] (F2 = 1200 Hz) is significant (500 Hz), while this difference may be minimal with the following front vowel (Bondarko 1977).

Unlike release, an approach to a palatalized stop is a much shorter period of 6-9% characterized by a lower F2 (7). For example, the approach to the intervocalic palatalized *тʲ* in *тʲатʲа* 'daddy' is 6% of the overall duration of the vowel. Approach tends to be slightly shorter for labials, accompanied by a still lower F2 (based on spectrograms in Bondarko 1977: 95-100).

[5]Here the release includes the period of the vowel with F2 typical for front vowels [i] and [ɛ]; the duration of release may vary in different positions (Kuznetsova 1969: 73).

(7) Approach (based on Kuznetsova 1969: 73, 78; Bondarko 1977):

	F2 at the release	Duration
aCi	≈ 1500 Hz	6-9%

The values of burst in terms of fricative noise are given in (8). What is striking here is the significant acoustic difference between the labial and coronal stops. While the palatalized labial has a rather short period of fricative noise (12% of the overall duration of the consonant), the coronal stop with a secondary palatal articulation exhibits a very long (51%) high frequency strong, strident noise. This factor makes palatalized coronal stops similar to affricates.

(8) Burst (based on Bolla 1981: 117-121; cf. Kuznetsova 1969 for *t'*):[6]

		Burst quality	Duration
pʲ	[φʲç]	fricative	av. 12%
tʲ	[sʲç]	fricative strident	av. 51%

Notice that release and approach are measured in terms of how much of the vowel time they occupy. Thus, these components are present *only* if there is a following or preceding vowel correspondingly. Burst is also context-sensitive: it may occur before some consonants and may be inhibited before others. These factors relate the cues crucially to linear environments.

After considering the components of approach, burst, and release of a palatalized stop, we can propose an implicational hierarchy of salience, as in (9). The relative salience of the cues is based on their durational characteristics, as well as on acoustic salience of different phonetic properties (e.g. high intensity strident fricative noise) (Flemming 1995: 31). The implication in (9a) holds that releas, constitutes the most important cue to a palatalized stop, followed by burst, while approach is the least important in cueing the segment. (9b) states an important place of articulation difference: the coronal burst is more salient than the labial burst.

(9) Implicational hierarchy of salience: release, burst, and approach:

a. Release > Burst > Approach
b. Coronal Burst > Labial Burst

Having established the cues to palatalized stops and their relative salience, we will take a closer look at three different sets of cues present in certain environments and we will see whether these sets correlate with preserving or neutralization of the contrast between plain and palatalized stops.

[6]The values for burst are average. Burst tends to be longer before unstressed vowels, as well we in final and preconsonantal positions (Kuznetsova 1969: 105).

2.1.1 All cues: intervocalic

The presence of all cues to palatality (release, burst, and approach) makes the intervocalic environment (5) ideal for realization of the contrast (10).

(10)	*Environment:*	V__V	
	Cues:	release, burst, approach	
	Input:	apʲa	atʲa
	Output:	apʲa	atʲa

As we would expect, Russian palatalized labials and coronals are fully contrastive in this environment, as we see in (11).

(11)	a. Labial:	ko[p]at'[7]	'dig'	o[pʲ]at'	'again'
		sa[p]og	'high boot'	sa[pʲ]ër	'combat engineer'
		lo[p]ux	'burdock'	ku[pʲ]ura	'banknote'
	b. Coronal:	va[t]a	'cotton'	ba[tʲ]a	'dad'
		po[t]ok	'stream'	po[tʲ]ok	'began to flow'
		pe[t]ux	'rooster'	u[tʲ]ug	'iron'

We may reasonably expect that with the removal of any of the three significant cues to a palatalized stop the perception of the segment will deteriorate, and thus, it will be more likely to be neutralized in a given environment.

2.1.2 No release: preconsonantal (__C_{hetero})

Let's consider the result of removing one of the cues, a release of a palatalized stop, while retaining burst and approach. We will look at the medial preconsonantal environment. Taking into account the fact that in Russian stops retain their burst when followed by another hetero-organic consonants, especially by stops and nasals (Jones and Ward 1969: 89, 105; cf. Zsiga 1998), we will consider only hetero-organic clusters. In sequences *apʲka-atʲka* (12) the most important cue, release, is missing. The two other components, burst and approach, are still present.

(12)	*Environment:*	V__C_{hetero}	
	Cues:	burst, approach	
	Input:	apʲka	atʲka
	Output:	apka	atʲka

How does the loss of the most important cue affect the distribution of the contrast? As we see from (13a), palatalized labials are completely disallowed in this environment. As for coronals (13b), we find here a few sequences, all of which are hetero-morphemic clusters. Palatalized coronals are prohibited in clusters within morphemes.

[7]Here and below I use the transliteration adopted in North American literature on Russian, while using the IPA symbols for transcription. ë = fronted [o] (Cʲ__), y = [ɨ], C' = [Cʲ].

(13)	a. Labial:	šlë[pn]ut'#	'to slap'	*-[pʲn]-	
		le[pt]a	'mite'	*-[pʲt]-	
		to[pk]a#	'furnace'	*-[pʲk]-	
	b. Coronal:	po[dm]oga#	'help'	ve[dʲm]a#	'witch'
		o[tp]ast'#	'to fall off'	su[dʲb]a#	'fate'
		re[tk]o#	'rarely'	re[tʲk]a#	'radish'

Note: # = a hetero-morphemic cluster.

Similar patterns are also manifested in alternations in (14). While adding a hetero-organic suffix depalatalizes labials, it does not necessarily affect coronals.

(14)	a.	golu[pʲ]	'pigeon'	golu[pk]a#	'female pigeon'
		ce[pʲ]	'chain'	ce[pn]oj#	'chain', adj.
	b.	ba[tʲ]a	'dad'	ba[tʲk]a#	'dad', familiar
		xo[dʲ]it'	'to walk'	xo[dʲb]a	'walking'

The table in (15) summarizes the distribution of labials and coronals in the absence of release providing the number of attested clusters with plain and palatalized stops, as well as the number of contrastive clusters (in parenthesis).

(15)

V__C$_{hetero}$V	Labial	Coronal
Clusters with C	9	4
Clusters with Cʲ	0	3
Contrasts C • Cʲ	no	yes/no (3)

2.1.3 No release, no burst: preconsonantal (__C$_{homo}$)

Let's consider environments that lack both release and burst, which possess the two most salient cue sets. Here we look at positions before homorganic consonants or a lateral, since stops in Russian do not have their independent burst when followed by these segments (Jones and Ward 1969: 89, 105). The sequences *apʲma-atʲna* (16) are different from those in (12) only in the quality of following segment: it is a consonant of the same primary place of articulation as the palatalized stop (either labial or coronal). The only cues available here are those of the approach, the least important cueing component.

(16)	*Environment:*	V__C$_{homo}$	
	Cues:	approach	
	Input:	apʲma	atʲna
	Output:	apma	atna

The result of this poorly cued combination of gestures is a complete neutralization of both palatalized labials (17a) and coronals (17b).

(17)	a. Labials:	o[bm]an#	'deception'	*-[bʲm]-
		ca[pf]a	'pin'	*-[pʲf]-
	b. Coronals:	e[tn]os	'ethnos'	*-[t̪n]-
		o[tl]ožit'#	'to put off'	*-[t̪l]-
		o[tt]orgnut'#	'to tear away'	*-[t̪t]-
		o[ts]adit'#	'to displant'	*-[t̪s]-
		o[tʃ]el'nik	'hermit'	*-[t̪ʃ]-
		o[tts]epit'#	'to unhook'	*-[t̪ts]-

This is also evident in the synchronic depalatalization in (18). For example, the nasal plosion in *pu*[tn]*yj* or lateral plosion in *ko*[tl]*y*, or the following fricative in *my*[ts]*a* do not allow for an independent burst, and lead to neutralization of the underlying palatalized coronal.

(18)	pu[t̪]	'way'	pu[tn]yj#	'worthwhile'
	my[t̪]	'to wash'	my[ts]a#	'to wash oneself'
	ko[t̪]ël	'boiler' , sg.	ko[tl]y	'boiler', pl.
	o[t̪]ec	'father'	o[ts:]a	'father', gen.sg.

I summarize the outcome caused by the absence of two most salient cue sets in (19): palatalized stops are never found here.

(19)

$V\_\_C_{homo}$	Labial	Coronal
Clusters with C	2	7
Clusters with Cʲ	0	0
Contrast C • Cʲ	no	no

As we can see in (20) only the sequences that allow for a burst constitute a set of well-formed clusters: *t̪p, t̪k, t̪m,* and *t̪f* (20a). Those that are not characterized by burst result in ungrammatical sequences (20b).

(20)	a.	t̪p, t̪k, t̪m, tʲf	Burst: yes
	b.	*t̪t, *tʲs, *t̪ʃ, *t̪n, *t̪l, *tʲts	Burst: no

Summing up the facts reviewed here, the presence of all cues to palatality results in the most contrastive context. An absence of release leads to neutralization of palatalized labials. And the absence of burst is the factor that triggers neutralization of palatalized coronals. Having no approach does not affect palatalized stops to the same degree as having no release or burst.

2.2 Word edges

It should be noted that segments at word edges (21) may benefit from more acoustic cues in connected speech than segments in word-internal clusters (Hamilton 1996: 235). Thus a word-initial consonant following a vowel-final word receives additional approach cues (21a), and a word-final consonant preceding a vowel-initial word is supplied with release cues (21b) correspondingly. On the other hand, segments in internal clusters are not affected and thus are at a disadvantage. Thus, we are to expect systematic distributional asymmetries between these contexts.

(21)	a.	(V#) #__	approach	vo t'mu -[ʌtʲm]-	'in the dark'
	b.	__# (#V)	release	golup' uletel -[upʲu]-	'a pigeon flew away'

2.3 Summary

Let's now summarize how the available phonetic cues determine whether palatality in Russian is preserved or neutralized. In (22a-k) I show sets of cues that differ in perceptual salience and can be found in the corresponding linear environments.

(22)

	Cues			Environment	Contrast C • Cʲ	
	Release >	Burst >	Approach		Labial	Coronal
a.	√	√	√	V__V	yes	yes
b.	√	√	(√)	#__V	yes	yes
c.	√	√		C__V	yes	yes
d.	(√)	√	√	V__#	yes	yes
e.	(√)	√		C__#	yes/no (1)	yes/no (5)
f.		√	√	V__C_{hetero}	no	yes/no (3)
g.		√	(√)	#__C_{hetero}	no	yes/no (1)
h.		√		C__C_{hetero}	no	no
i.			√	V__C_{homo}	no	no
j.			(√)	#__C_{homo}	no	no
k.				C__C_{homo}	no	no

Note: (√) = the cue is optionally provided in connected speech; (1) = one contrastive cluster is attested.

Comparing the sets of cues and environments with the corresponding neutralization patterns reveals the fact that licensing of a plain-palatalized contrast depends crucially on the cues. Having at least two high salient cues, those of release and burst, results in a fully licensed plain-palatalized contrast (22abc). Burst and approach with an optional release are sufficient to support the distinction (22d). However, removing approach from this set causes minor restrictions, more apparent with labials: there is only one contrastive cluster (22e). Having no release is deadly for labials; coronals still survive, provided two other components are present (22fg). Only burst (22h) or only approach (22i, j) do not constitute a sufficient cueing environment. Even more so, no contextual cues (22k) will inevitably lead to non-recoverability of the contrast by a listener. The discrepancies between the places of articulation follow from the hierarchy of salience (10), repeated in (23).

(23) Implicational hierarchy of salience: release, burst, and approach:
- a. Release > Burst > Approach
- b. Coronal Burst > Labial Burst

In short, all the characteristic constraints on distribution of palatalized stops are derivable from phonetic information manifested in acoustic cues.[8]

We can formalize these results in the following way. We recast the hierarchy of cued environments given in (22) into a perceptibility scale, or fixed ranking of constraints (cf. Steriade 1997, Boersma 1997). These constraints, illustrated in (24), require

[8]See Kochetov (to appear) on the neutralization before front vowels.

neutralization of palatality in different environments. The constraints on gesture combinations that result in fewer cues are ranked higher, and those with more cues are ranked lower.

(24) *PAL/V__V: Neutralize palatality contrast between vowels.
*PAL/#__V: Neutralize palatality contrast word-initially (in the absence of the preceding vowel).
*PAL/V__#: Neutralize palatality contrast word-finally (in the absence of the following vowel), etc.

The faithfulness constraint to palatalized consonants, PRESPAL (25), can be ranked against the fixed hierarchy, determining a language-specific pattern of neutralization, or a threshold of perceptibility of the contrast. Preserving the contrast in a less cued environment implies maintaining it in a more informative context. (26) illustrates the distributional patterns attested in Russian.

(25) PRESPAL: Preserve a plain-palatalized contrast.

(26)

	Constraint hierarchy		Cues
	Labials	*Coronals*	
neutralize	*PAL/(C)__C_{homo}		*fewer cues*
	*PAL/V__C_{homo}		
	*PAL/(C)__C_{hetero}	*PAL/(C)__C_{homo}	
	*PAL/V__C_{hetero}	*PAL/V__C_{homo}	
PRESPAL	----------	----------	⇓
	*PAL/C__#	*PAL/(C)__C_{hetero}	
	*PAL/V__#	*PAL/V__C_{hetero}	
	*PAL/__V	*PAL/C__#	
preserve	*PAL/V__V	*PAL/V__#	
		*PAL/__V	
		*PAL/V__V	*more cues*

It is important that this hierarchy of constraints is not a devised stipulation, but an epiphenomenon of the presence or absence of phonetic cues provided by the environments.

3. Typology of licensing palatality by cue

Let's suppose that general properties of release, burst, and approach to palatalized stops and their relative salience are universal, allowing for certain timing and other gradient differences. If this is true, the conclusions made for Russian should extend to other languages that make use of plain-palatalized contrast. In this section I test this prediction, looking at some Balto-Slavic, Celtic, and Uralic languages and dialects.[9] Here

[9]The following sources are used: Abondolo 1998 (Saami, Erzya Mordva, Nenets), Ball & Fife 1993 (Scots

I use a simplified version of the hierarchy of environments (27). Again, it is based on different sets of cues and their relevant salience.

(27)

Release	Burst	Approach	Hierarchy
	(√)		*PAL/C__C
	(√)	√	*PAL/V__C
	√	√	*PAL/V__#
√	√		*PAL/#__V
√	√	√	*PAL/V__V

Note: (√) = burst before certain consonants.

Different ranking of PRESPAL with regards to the given hierarchy results in a highly constrained set of language types (28), ranging from the type that preserves the contrast in all environments (type A) to the one that neutralizes the contrast in all contexts (type F).

(28)

Type	1. V__V *aCʲa • aCa*	2. #__V *Cʲa • Ca*	3. V__# *aCʲ • aC*	4. V__C *aCʲka • aCka*	5. C__C *arCʲka • arCka*
A	yes	yes	yes	yes	yes
B	yes	yes	yes	yes	no
C	yes	yes	yes	no	no
D	yes	yes	no	no	no
E	yes	no	no	no	no
F	no	no	no	no	no

Based on our hierarchy and relative salience of cues, we may predict that some types are more likely or less likely to be found than others, both in general and with respect to places of articulation. Type A is the least likely, since one of its contexts (environment 5) provides no contextual cues or only burst. Types B and C (environments 1-4 and 1-3 correspondingly) are less likely to be found for labials than for coronals. Recall that the coronal burst is more salient than the labial burst, which is important for environment 3 and even more so for environment 4. Type D (environments 1-2) is very likely to be found due to the presence of release and burst, the most important cueing components. Type E (environment 1 only), on the other hand, is less likely, since the environment in question differs from the previous one only in the least important component of approach. Recall also that the coronal approach is ranked higher than the labial approach. Finally, type F would be rather common, comprising languages with no plain-palatalized contrast. In these languages palatalized stops may be conditioned positionally or absent altogether.

Gaelic, Manx, and Welsh), Chekman 1970 (Belorussian and Bulgarian dialects), Comrie & Corbett 1993 (Belorussian, Ukrainian, and Slovene), De Burca 1958 (Irish), Decsy 1966 (Nenets), Leskinen 1968 (Karelian dialects), Macaulay 1992 (Scots Gaelic, Manx, and Welsh), Mathiassen 1996 (Lithuanian), Redei 1984 (Erzya Mordva), Tolstaia 1968 (Bulgarian).

Now let's turn to the results of the survey. In (29) I present the neutralization patterns of palatalized coronals. What all of these languages have in common is the distribution of the plain-palatalized contrast in accordance with our predictions made by the contextual markedness hierarchy. Five out of six types are attested, lacking the least likely type A. Type E seems to be less common, while types B, C and D are widely attested, as we expected. The distribution of the contrast in labials is illustrated in (30).

(29)

Type	Language	V__V *aʲa • ata*	#__V *ʲa • ta*	V__# *aʲ • at*	V__C *aʲka • atka*	C__C *arʲka • artka*
A	???	yes	yes	yes	yes	yes
B	Russian Belorussian[10] Bulgarian (NN) Erzya Mordva Ukrainian Scots Gaelic	yes	yes	yes	yes	no
C	Bulgarian (BC) Irish Manx Karelian (O1)	yes	yes	yes	no	no
D	Bulgarian (S) Karelian (O2) Lithuanian Nenets	yes	yes	no	no	no
E	Karelian (A) Saami	yes	no	no	no	no
F	Slovene Welsh	no	no	no	no	no

Note: Bulgarian (S) = Standard Bulgarian; Bulgarian (NN) = the Nova Nadezhda dialect of Bulgarian; Bulgarian (BC) = the Bela Cherkva dialect of Bulgarian; Karelian (A) = the Arkhangelsk dialect of Karelian; Karelian (O1) = the Olonetsk dialect of Karelian 1; Karelian (O2) = the Olonetsk dialect of Karelian 2.

[10]In some languages (e.g. Belorussian and Irish) palatalized coronal stops surface as alveolar (tsʲ) or post-alveolar affricates (tɕ or tʃ).

(30)

Type	Language	V__V *apʲa • apa*	#__V *pʲa • pa*	V__# *apʲ • ap*	V__C *apʲta • apta*	C__C *arpʲta • arpta*
A	???	yes	yes	yes	yes	yes
B	Bulgarian (NN)	yes	yes	yes	yes	no
C	Russian Irish	yes	yes	yes	no	no
D	Bulgarian (S) Belorussian Nenets	yes	yes	no	no	no
E	Lithuanian	yes	no	no	no	no
F	Erzya Mordva Scots Gaelic Ukrainian, etc.	no[11]	no	no	no	no

No languages in the sample belong to type A. The relative paucity of languages of types B, C, and E is also in accordance with our predictions. I leave other details of typological patterns for further investigation. In considering these patterns a more refined hierarchy, morpheme boundaries, relative frequency and other factors should be examined. So far, however, we can conclude that all the attested language types are far from being random and are based on the reference to contextual phonetic cues (28) and particularly, to their number, duration, and salience.

4. Conclusion

The presented analysis of neutralization of plain-palatalized contrasts in stops is based on the phonetic and phonotactic facts of Russian as well as distributional patterns in other related and unrelated languages. The account provides evidence for the hypothesis of *Licensing by Cue*, demonstrating that palatalized stops can be licensed or neutralized depending on availability of phonetic auditory information, and, particularly, the contextual cues of release, burst, and approach, and their relative salience. Further, differences between places of articulation are based on acoustic properties of burst and approach. Finally, the account provides additional support for the view that phonotactics make reference to phonetic information available in contextual cues and that phonetics plays an important role in determining environments for the neutralization of phonological contrasts.

[11]The sequence pjV may be allowed, e.g. Ukrainian and Scots Gaelic.

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Department of Linguistics
University of Toronto
130 St. George Street, Room 6076
Toronto, Ontario
Canada M5S 1A1

akocheto@chass.utoronto.ca