Russian Vowel Alternations:
Interaction between deletion and reduction

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Abstract

　本稿はロシア語における母音とゼロとの交替に焦点を当て、音韻文法がいかに非音韻論的要因を扱うべきかについて議論する。当該現象に関する主な問題の一つは、それが同一の音韻環境において必ずしも起こらないことである。この問題を解決するため、Gouskova（2012）は最適性理論の枠組みで制約に対する語彙的インデックスの付与（lexical indexation）を採用し、交替現象が生じる語彙にのみ作用する中母音に対する有標性制約によって当該現象が起こると主張した。しかしながら、有標性制約に対するインデックスの付与は、外来語音韻論において観察されないパタンを予測してしまうことから反論されてきた（Ito and Mester 1999, 2001）。本稿ではまず、ロシア語における当該の現象が、忠実性制約に対するインデックスの付与のみによって説明できることを論証する。その上で、有標性制約に対するインデックスの付与が、ロシア語の外来語についても観察されないパタンを予測しうることを提示し、インデックスの付与を忠実性制約に限定すべきであると主張する。

Key Words: Russian, phonology, yer vowels, lexical indexation, loanword adaptation

1. Introduction

　　Phonological theory has revealed the mechanism of many sound alternations, but some of them are still unpredictable in terms only of phonology. One such phenomenon is Slavic vowel-zero alternation (traditionally called "yer"), which this paper focuses on. In Slavic languages, a certain vowel in stem-final closed syllables may be deleted when another vowel follows. What is problematic is that such a vowel deletion does not always occur; a vowel in one phonological context undergoes the alternation in some words but does not do so in others. This fact suggests that phonological grammar needs to consider non-phonological (e.g., lexical, syntactic, and so on) factors in order to correctly predict this type of sound alternations.

　　In the framework of Optimality Theory (hereafter OT), some researchers have suggested that constraints should be indexed to lexical properties. The question is, then, whether or not certain

restrictions should be imposed on such lexical indexation (hereafter LI). In previous studies, there have been two points of view: one is that only faithfulness constraints can be lexically indexed (Ito and Mester 1999, 2001), and the other is that markedness constraints must also be lexically indexed (Pater 2007, 2010). One goal of this paper is to show that Russian vowel-zero alternation can be accounted for by LI of faithfulness constraints alone. This paper will focus especially on the Russian case because an interesting interaction between vowel-zero alternation and vowel reduction can be observed in this language. Furthermore, an argument against LI of markedness constraints will be made by considering Russian loanword phonology.

This paper is organized as follows. First, Section 2 summarizes the issues with Russian vowel-zero alternation. After the data are introduced in 2.1, 2.2 will review the previous research in the OT framework by Gouskova (2012). As will be discussed in 2.2.3, her analysis has some theoretical problems. Hence, an alternative account will be proposed in section 3. Section 3.1 will demonstrate that the given phenomena can be explained by LI of faithfulness constraints alone. Afterwards, Section 3.2 will argue against LI of markedness constraints on the ground that it predicts an unattested pattern of loanword phonology. Finally, Section 4 concludes the discussion.

2. Issues

This section will give an overview of the previous discussion on Russian vowel-zero alternation. After some data of the vowel-zero alternation are shown in the first subsection, the second subsection will review the previous OT analysis by Gouskova (2012).

2.1 Facts

To put it simply, Slavic vowel-zero alternation is deletion of certain stem-final vowels. For instance, [e] undergoes this process in Polish and Czech, while [a] does so in Serbian and Croatian (see also Townsend and Janda 1996). In Russian, the situation is more complicated due to the reduction of unstressed vowels. The phenomena are illustrated in (1): (1a) shows examples of stressed positions, (1b) shows those of unstressed ones, and (1c) indicates that vowel deletion does not occur in some words. In the first example of (1a), the vowel [o] in the nominative singular ([rot]) does not emerge in the genitive singular ([rta]) in which a suffix ([-a]) follows the stem. Likewise, in the second example, the stem-final [e] undergoes deletion when another suffix ([-i]) follows. In unstressed positions, as shown in (1b), [ə] and [i] take part in the vowel-zero alternation under the same phonological condition. However, even if these stem-final vowels are followed by another vowel, as can be seen in (1c), they are not deleted in some words. In the first row of (1c), for instance, [o] in the stem-final, stressed closed syllable in the genitive also emerges when it is followed by another vowel as in the nominative.

(1)　Vowel-zero alternations in Russian (see also Gouskova 2012)

a. Stressed positions

r**ó**t	'mouth'	rtá	(gen. sg.)
rʲimʲ**é**nʲ	'belt'	rʲimnʲí	(nom. pl.)

b. Unstressed positions

úg**ə**l	'corner'	uglí	(nom. pl.)
lívʲ**i**nʲ	'shower'	lívnʲə	(gen. sg.)

c. No alternations

var**ó**t	'gate (gen.)'	var**ó**tə	(nom.)
stʲépʲ**i**nʲ	'step'	stʲépʲ**i**nʲi	(nom. pl.)

The vowel-zero alternation in Russian can be summarized as follows. (i) Morpheme-final stressed mid vowels may be deleted when another vowel follows. (ii) Morpheme-final unstressed [ə, i] may be deleted when another vowel follows. (iii) The above mentioned vowel deletion does not occur in some words.

Since vowel reduction is related to this alternation in Russian, we have to consider the reduction process in order to discuss the vowel-zero alternation in more detail. As can be seen in (2), mid vowels change to different ones in unstressed positions: /o/ emerges as [ə] (2a),[1] and /e/ emerges as [i] (2b).

(2)　Vowel reductions in Russian (see also Crosswhite 2000)

a. /o/

dabr**ó**	'goodness'	dóbr**ə**	'well, kindly'

b. /e/

rʲ**é**kʲi	'river (nom.pl.)'	rʲ**i**kʲí	(gen. sg.)

In other words, it can be said that these unstressed vowels, i.e., [ə] and [i], may originate from mid vowels. Returning to the vowel-zero alternation, therefore, it can be suggested that the unstressed alternating vowels can result from the reduction of mid vowels. As a result, the given alternation can be interpreted in a simpler way: only originally or 'underlyingly' mid vowels undergo the vowel-zero alternation whether they are stressed or not.

2.2 Previous research

2.2.1 Whole morpheme analysis

In order to account for the phonological unpredictability, many researchers have assumed

certain specific underlying forms for the alternating vowels (see Gouskova 2012). Conversely, Gouskova claims that the vowel-zero alternation results from a property of morphemes and not segments. She argues against the previous segmental approaches on the ground that they can predict the vowel-zero alternation in any position within a morpheme. As noted in the last subsection, this alternation is observed exclusively in morpheme-final positions. Moreover, in the framework of OT, she turns down segmental approaches because they violate richness of the base, according to which the presence or absence of the vowel-zero alternation should be correctly predicted regardless of the underlying forms.

The main point in her analysis is that morphemes undergoing the alternation are indexed to a certain lexical property and she assumes a markedness constraint on the deleting vowels, which exclusively targets the indexed morphemes, as illustrated below.

(3)   Constraint triggering vowel deletion (Gouskova 2012)
*MID$_L$: "Assign a violation mark for every mid vowel that contains a phonological exponent of a morpheme specified as L."

If (3) is ranked higher than the constraint on vowel deletion (MAX-V), the vowel-zero alternation will be predicted. On the other hand, unindexed morphemes do not undergo the alternation, if the general constraint on mid vowels (*MID) is dominated by MAX-V. The constraint ranking can be schematized as (4).

(4)   Vowel-zero alternation: constraint ranking (Gouskova 2012)
*MID$_L$ >> MAX-V >> *MID

(5) shows that the current ranking correctly predicts the data. When a morpheme is indexed to L as in (5i), the non-deletion candidate (5ia) violates *MID$_L$; hence, it is defeated by the deletion candidate (5ib), which violates the lower-ranked constraint, MAX-V. By contrast, since the morpheme is not indexed to L in (5ii), the non-deletion candidate (5iia) does not violate *MID$_L$ and is preferred to the deletion candidate (5iib).

(5)   Vowel-zero alternation: example tableaux (see also Gouskova 2012)
i.   /rot$_L$-a/ 'mouth (gen. sg.)'   → [rtá]
ii.   /vorot-a/ 'gate'   → [varótə]

		$^{*}\text{MID}_{L}$	MAX-V	$^{*}\text{MID}$
i.	/rot$_{L}$-a/			
a.	róta	W	L	*
b.	☞ rtá			
ii.	/vorot-a/			
a.	☞ varótə			
b.	vartá		W	L

As mentioned in the last subsection, mid vowels undergo reduction in unstressed syllables, so other vowels take part in the vowel-zero alternation under this condition. The unstressed alternating vowels (i.e., [ə] and [i]) are no longer regarded as mid, so the constraint assumed in (3) cannot eliminate non-alternating candidates. The current grammar thus needs another constraint in order to account for the alternation in unstressed positions.

Gouskova draws attention to the fact that mid vowels are ruled out both in the reduction and in the deletion, and she attempts to account for these two types of processes by the constraint on mid vowels ($^{*}\text{MID}$). The reduction can be predicted if $^{*}\text{MID}$ is ranked higher than the faithfulness constraint on the change in vowel quality (IDENT), as illustrated below.

(6)   Vowel reduction: constraint ranking (Gouskova 2012)
$^{*}\text{MID} \gg \text{IDENT}$

From what has been discussed, it can be suggested that the deletion and the reduction of mid vowels result from the dominance of $^{*}\text{MID}$ over the two types of faithfulness constraints. Which of the two processes occurs, therefore, depends on the hierarchy of these faithfulness constraints. Gouskova assumes the constraint rankings as follows: when a morpheme undergoes the vowel-zero alternation and is indexed as L, IDENT is ranked higher than MAX-V, and when a morpheme does not undergo this process, the ranking is reversed. Taking the lexical index into consideration, the variation in the constraint rankings can be schematized as (7).

(7)   Vowel deletion vs. reduction: constraint ranking (Gouskova 2012)
$\text{IDENT}_{L} \gg \text{MAX-V} \gg \text{IDENT}$

Since vowel reduction occurs independently of the occurrence of the vowel-zero alternation, the ranking (6) should be constant regardless of the lexical conditions. Therefore, the full ranking can be summarized as (8).

(8)   Vowel-zero alternation and vowel reduction: constraint ranking (Gouskova 2012)

*MID$_L$ >> IDENT$_L$ >> MAX-V >> *MID >> IDENT

(9) demonstrates how the current OT grammar correctly predicts the behavior of morpheme-final mid vowels in unstressed positions. When a morpheme is indexed to L, as shown in (9i), the non-changing candidate (9ia) violates *MID$_L$, and the reduction candidate (9ib) violates IDENT$_L$. Since these constraints are ranked higher than MAX-V, which is violated by the deletion candidate (9ic), this grammar should predict (9ic) as the optimal output. In contrast, in (9ii), when a morpheme is unindexed, the reduction candidate (9iib) violates only (the unindexed) IDENT, which is dominated by MAX-V, so it defeats the deletion candidate (9iic). The non-changing candidate (9iia) is still eliminated by *MID, which is ranked higher than IDENT.

(9)   Vowel-zero alternation in unstressed syllables: example tableaux[2]

(see also Gouskova 2012)

i.   /ugol$_L$-a/ 'corner (gen. sg.)   → [uglá]
ii.   /stʲepʲenʲ-i/ 'step (nom. pl.)'   → [stʲépʲinʲi]

		*MID$_L$	IDENT$_L$	MAX-V	*MID	IDENT
i.	/ugol$_L$-a/					
a.	ugolá	W		L	*	
b.	ugəlá		W	L		*
c.	☞ uglá					
ii.	/stʲepʲenʲ-i/					
a.	stʲépʲenʲi				W	L
b.	☞ stʲépʲinʲi					
c.	stʲépnʲi			W		L

2.2.2 Positional restriction

Next, it should be considered why the vowel-zero alternation occurs only in morpheme-final positions. Since this fact is irrelevant to morpheme properties, it can be suggested that a certain phonological principle controls the position of this alternation.

Gouskova (2012) claims that the constraints on syllable structure restrict the position in which the alternation takes place. In general, vowel deletion results in a consonant cluster. In morpheme-final positions, however, such a cluster can be avoided if a vowel in another morpheme follows. She thus suggests that vowel deletion is blocked except in morpheme-final positions in order to avoid a consonant cluster. Note that it can be explained why an alternating

vowel emerges when no vowel follows on this account. Meanwhile, various consonant clusters are actually observed in Russian, so it cannot be the case that they are completely prohibited. With regard to clusters, they can be generalized as follows: they are not generated by vowel deletion on the one hand, but, on the other hand, not destroyed by vowel insertion. Gouskova formalizes this situation in OT terms by assuming the constraint on vowel insertion (DEP-V) that is ranked higher than the constraint on clusters.[3] Her analysis can be simplified as the following tableaux (vowel reduction and voicing assimilation are not discussed here).

(10) Restriction on syllable structure: example tableaux (see also Gouskova 2012)

i.   /veter$_L$/ 'wind'   → [vʲétʲir] / *[vʲétr]
ii. /veter$_L$-a/ 'wind (gen. sg.)'   → [vʲétrə] / *[ftʲérə]
iii. /metr/ 'meter'   → [mʲétr] / *[mʲétʲir]
iv. /vtornik/ 'Tuesday'   → [ftórnʲik] / *[vʲitórnʲik]

		DEP-V	*CC	IDENT$_L$	MAX-V
i.	/veter$_L$/				
a.	☞ vʲétʲir				
b.	vʲétr		W	L	*
ii.	/veter$_L$-a/				
a.	vʲétʲirə			W	L
b.	ftʲérə		W		
c.	☞ vʲétrə				
iii.	/metr/				
a.	mʲétʲir	W	L		
b.	☞ mʲétr				
iv.	/vtornik/				
a.	☞ ftórnʲik				
b.	vʲitórnʲik	W	L		

In (10i), when an indexed morpheme is not followed by another morpheme, the vowel deletion (10ib) violates the constraint on clusters. If this constraint dominates IDENT$_L$, which is violated by (10ia), this grammar can correctly predict (10ia) as the optimal output. Next, in (10ii), when an indexed morpheme is followed by another morpheme, the deletion of a non-final vowel (10iib) is eliminated by the constraint on clusters. By contrast, when these clusters underlie in a morpheme, as in (10iii) and (10iv), the vowel insertion (10iiia, 10ivb) is eliminated by DEP-V, and the clusters will emerge.

However, it is difficult to attribute the positional restriction on the vowel-zero alternation only to the constraint on syllable structure. As Rubach (2013) asserts, vowel deletion in trisyllabic morphemes fails to be predicted: the deletion of the second vowel cannot be eliminated by the constraint on clusters. As the purpose of this paper differs, this topic will not be discussed in what follows.

2.2.3 Problems

Gouskova's (2012) analysis seems to work successfully, but one theoretical problem should be pointed out. In Russian, the low vowel (/a/) undergoes reduction like mid vowels but never alternates with zero. As can be seen in (11a), /a/ reduces to schwa or [i] in unstressed syllables.[4] Even if /a/ in a morpheme-final closed syllable is followed by another vowel, as shown in (11b), it is never deleted.

(11) /a/ in unstressed positions
a. Reduction
slavá 'word (nom. pl.)'   slóvə (gen. sg.)
garʲátʃii 'hot (mas.)'   garʲitʃó (predicative)
b. No deletion
dʲál 'gave (mas.)'   vídəli / *vídli 'handed out (pl.)'
rʲát 'row'   rʲidú / *rʲdú (loc. sg.)

Practically, of course, morphemes that end with a closed syllable consisting of /a/ are never indexed as a participant in the alternation. In theoretical terms, however, the deletion of /a/ should be predicted if such a morpheme were to be indexed to the lexical property.

(12) Wrong prediction of /a/-deletion

	/CVCaC$_L$-V/	*HIGH$_L$	IDENT$_L$	MAX
a.	CV́CaCV	*!		
b.	☹ CV́CəCV		*!	
c.	☞ CV́CCV			*

As can be seen in (12), the vowel reduction (12b) is defeated by the deletion (12c), since IDENT$_L$ dominates MAX. Note that the constraint on high vowels should be ranked higher than IDENT regardless of the lexical property in order to predict vowel reduction.

The deletion of /a/ is not only an unattested, but also a phonologically impossible pattern. As

Pater (2007, 2010) asserts, impossible patterns should be blocked under any lexical condition by the phonological grammar.[5] In order to resolve this problem, in the next section, this paper will propose the LI of the *faithfulness* constraint on mid vowels, not of the *markedness* one.

Before concluding this subsection, the background behind LI of OT constraints should be briefly mentioned. As can be seen in the preceding discussion, Gouskova, following Pater (2007, 2010), admits the indexation of markedness and faithfulness constraints. By contrast, as noted briefly in section 1, Ito and Mester (1999, 2001) have restricted the range of the LI only to faithfulness constraints. They argue that the indexation of markedness constraints can predict unattested patterns. With regard to the restriction on LI, this paper will argue for Ito and Mester's claim by considering Russian loanword phonology in section 3.2.

In summary, LI has made it unnecessary to assume an abstract special segment for the alternating vowels and got a certain result in the OT framework. However, some theoretical problems still remain unresolved in Gouskova's approach. The next section will improve the whole-morpheme approach to the Russian vowel-zero alternation.

3. Proposal

This section analyzes the Russian vowel-zero alternation from a slightly different viewpoint. The main point in the claim is that LI of faithfulness constraints alone is necessary and sufficient to account for the given alternation process. The first subsection will demonstrate the successful prediction using the current OT grammar. The second subsection will further argue against the LI of markedness constraints by discussing Russian loanword phonology.

3.1 Faithfulness constraints on a certain type of vowels

As discussed in 2.1, the vowels that participate in the vowel-zero alternation are 'underlyingly' mid vowels. In order to account for this fact directly, it can be hypothesized as follows: the faithfulness constraint on mid vowels is dominated by a certain markedness constraint triggering vowel deletion, whereas the faithfulness constraint on non-mid vowels is ranked higher than the markedness constraint. First of all, the faithfulness constraints are assumed as illustrated below.

(13) Faithfulness constraints on each height of vowels

a. MAX-V (Mid): Assign one violation mark for each mid vowel in the input that is not mapped onto the output.

b. MAX-V (High): Assign one violation mark for each high vowel in the input that is not mapped onto the output.

c. MAX-V (Low): Assign one violation mark for each low vowel in the input that is not mapped onto the output.

With regard to the constraint that causes the vowel deletion, the current analysis tentatively assumes the following constraint on vowels as a whole, taking into account the fact that several types of vowels undergo deletion on the surface.

(14)   Markedness constraints on vowel deletion
*V: Assign one violation mark for each vowel in the output.

Next, let us move on to the discussion of LI. Unlike Gouskova (2012), the current analysis assumes indexation of faithfulness constraints. What is to be noted is that lexically indexed faithfulness constraints *block* phonological processes. Therefore, the *non-alternating* morphemes must be specified for the lexical index. If the indexed version of (13a) is ranked higher than (14), the OT grammar can predict the absence of the vowel-zero alternation among the indexed morphemes. In contrast, (14) should dominate the unindexed counterpart of (13a) in order to predict the occurrence of the alternation among other morphemes. This constraint ranking can be schematized as (15).

(15)   Vowel-zero alternation: the constraint ranking
MAX$_L$-V (Mid) $>>$ *V $>>$ MAX-V (Mid)

Non-mid vowels never participate in the vowel-zero alternation. As discussed in the last section, such phonologically impossible patterns must be blocked regardless of the lexical properties; hence, (13b) and (13c) always dominate (14). From this, the constraint ranking can be completed as illustrated in (16).

(16)   Vowel-zero alternation: the constraint ranking (full version)
MAX-V (High), MAX-V (Low), MAX$_L$-V (Mid) $>>$ *V $>>$ MAX-V (Mid)

Now, let us see how the current OT grammar correctly predicts the given phonological patterns. (17) demonstrates the declension of some nominal stems: (17i) deals with a non-indexed morpheme that ends with a potentially stressed mid vowel, (17ii) a non-indexed morpheme that ends with a potentially unstressed mid vowel, (17iii) an indexed morpheme that ends with a mid vowel, and (17iv) a morpheme (either indexed or non-indexed) that ends with a non-mid vowel.

In (17i) and (17ii), in which the morphemes are unindexed, the non-deletion candidates, i.e., (17ia) and (17iia), violate *V, whereas the deletion candidates, i.e., (17ib) and (17iib), violate MAX-V (Mid). Since the former constraint is ranked higher than the latter, the current grammar predicts vowel deletion for (17i) and (17ii). Notice that this grammar has nothing to do with stress positions: the faithfulness constraints target the vowel quality only in the inputs, so the vowel-zero alternation in stressed and unstressed positions can be predicted in a uniform way. In (17iii), in which a morpheme is indexed as L, by contrast, the deletion candidate (17iiib) is defeated by the non-deletion candidate (17iiia) because the former violates MAX$_L$-V (Mid), which dominates *V. When the morpheme-final vowel is not mid, as in (17iv), the deletion candidate (17ivb) is eliminated by MAX-V (High) or MAX-V (Low), regardless of the lexical conditions.

(17)   Vowel-zero alternation: demonstration

i.   /rot-a/ 'mouth (gen. sg.)'   → [rtá]
ii.   /ugol-a/ 'corner (gen. sg.)'   → [uglá]
iii.   /vorot$_L$-a/ 'gate'   → [varótə]
iv.   /r^{j}ad-u/ 'row (loc. sg.)'   → [r^{j}idú]

		MAX-V (High); MAX-V (Low)	MAX$_L$-V (Mid)	*V	MAX-V (Mid)
i.	/rot-a/				
a.	róta			W	L
b.	☞ rtá				
ii.	/ugol-a/				
a.	ugəlá			W	L
b.	☞ uglá				
iii.	/vorot$_L$-a/				
a.	☞ varótə				
b.	vartá		W	L	
iv.	/r^{j}ad-u/				
a.	☞ r^{j}idú				
b.	r^{j}dú	W		L	

Thus far, it has been argued that the LI of certain faithfulness constraints can explain the Russian vowel-zero alternation, but it remains questionable whether LI of markedness constraints should be turned down. The next subsection will consider some patterns in Russian loanword phonology and dismiss the indexation of markedness constraints.

3.2 Strict markedness hierarchy

Ito and Mester (1999, 2001) have argued that LI of markedness constraints can predict unattested patterns in loanword phonology. In this subsection, following their view, it will be determined that such an indexation predicts an unattested pattern in Russian loanword phonology also.

The preceding sections have discussed the vowel-zero alternation and vowel reduction in Russian native phonology. The latter can be observed in some loanwords as can be seen in (18a), although many loanwords avoid it as seen in (18b).

(18) Vowel reduction in Russian loanwords (see also Es'kova et al. 2015)
a. Reduction

intⁱindánt (int**e**ndant); dⁱizáⁱinⁱir (design**e**r)

b. No reduction

t**e**ndéntsiə (t**e**ndency); tⁱún**e**r (tun**e**r)

In contrast, the vowel-zero alternation is never observed in loanwords. This fact suggests that these two alternations have different statuses in Russian phonology. In OT terms, it can be mentioned that the markedness constraints related to these alternations have a certain hierarchical relationship.

In accordance with the occurrence of the two alternations, the current analysis can theoretically expect 2*2=4 patterns, as can be seen below. However, the unexceptional absence of the vowel-zero alternation in loanwords results in the distributional gap: (19d) is unattested.

(19) Factorial phonological patterns

	Vowel reduction	Vowel-zero alternation	
a.	✓	✓	attested
b.	✓	✗	attested
c.	✗	✗	attested (loanwords)
d.	✗	✓	**unattested!**

In the manner of the preceding analyses, these phonological patterns can be predicted by a constant constraint ranking if they are related to certain lexical properties. At this time, however, in order to simplify the discussion, (20) illustrates the different constraint rankings that predict each phonological pattern.

(20) Factorial phonological patterns: OT analysis[6]

a. *MID/Unstressed,[7] *V >> MAX-V (Mid), MAX (Mid)[8]   (for 19a)

b. *MID/Unstressed, MAX-V (Mid) >> *V, MAX (Mid)   (for 19b)

c. MAX-V (Mid), MAX (Mid) >> *MID/Unstressed, *V   (for 19c)

d. *V >> MAX (Mid) >> *MID/Unstressed, MAX-V (Mid)   (for 19d, <u>unattested</u>)

Among the rankings for the attested patterns (20a–c), it can be noticed that the ranking of the markedness constraints is constant, as illustrated below.

(21) The constant ranking of markedness constraints

*MID/Unstressed >> *V (or TIE)

Therefore, it is enough for the current analysis to assume LI of the faithfulness constraints. The full ranking can be summarized as below (L1 stands for the lexical property corresponding to the pattern (19b), and L2 for that corresponding to (19c), i.e., in loanwords).

(22) Full constraint ranking

MAX $_{L2}$-V (Mid), MAX $_{L2}$ (Mid) >> *MID/Unstressed, MAX$_{L1}$-V (Mid) >> *V >> MAX-V (Mid), MAX (Mid)

On the other hand, if the indexation of markedness constraints is admitted, (19d) should also be predicted because the following ranking can be fixed (L3 stands for the lexical property related to (19d)).

(23) Incorrect ranking raised by LI of markedness constraints

*V$_{L3}$ >> MAX$_{L3}$ (Mid) >> *MID/Unstressed >> MAX-V (Mid)

In summary, this incorrect prediction in Russian loanword phonology is consistent with Ito and Mester's (1999, 2001) suggestion that LI of markedness constraints should be dismissed.

4. Concluding remarks

The discussion in this paper can be summarized as follows: (i) in order to account for phonologically unpredictable idiosyncrasies, some constraints should be indexed to the lexical properties, and (ii) with regard to the Russian vowel-zero alternation, it is necessary and sufficient for only certain faithfulness constraints to be lexically indexed. The conclusion is that lexical

properties are referred to by faithfulness constraints, and markedness constraints focus exclusively on phonological properties. In other words, sound alternations are governed by lexical as well as phonological faithfulness and phonological markedness.

Acknowledgements

Appendix: Ranking arguments for (20)

1. Both the deletion and the reduction occur (20a).

*MID/Unstressed, *V >> MAX-V (Mid), MAX (Mid)

| | i. | /ugol/ 'corner' | → [úgəl] |
| | ii. | /ugol-a/ 'corner (gen. sg.)' | → [uglá] |

		*MID/UNSTRESSED	*V	MAX-V (Mid)	MAX (Mid)
i.	/ugol/				
a.	úgol	*W	**		L
b.	☞ úgəl		**		*
ii.	/ugol-a/				
a.	ugolá	*W	***W	L	
b.	ugəlá		***W	L	*
c.	☞ uglá		**	*	*

2. The deletion does not occur, whereas the reduction does (20b). Note that this type of loanwords undergo palatalization, which is predicted by the following ranking: AGREE >> DEP (Cor).

*MID/Unstressed, MAX-V (Mid) >> *V, MAX (Mid)

/master-a/ 'master (gen. sg.)' → [mástʲirə]

	/mastera/	AGREE	*MID/UN-STRESSED	MAX-V (Mid)	DEP (Cor)	*V	MAX (Mid)
a.	másterə	*W	*W		L	***	L
b.	mástʲerə		*W		*	***	L
c.	mástirə	*W			L	***	*
d.	☞ mástʲirə				*	***	*
e.	mástrə			*W	L	**L	*

3. Neither the deletion nor the reduction occur (20c). Note that this type of loanwords do not undergo palatalization.

MAX-V (Mid), MAX (Mid) >> *MID/Unstressed,*V

/adapter-a/ 'adapter (gen. sg.)' → [adáptera]

		MAX-V (Mid)	MAX (Mid)	DEP (Cor)	*MID/UNSTRESSED	AGREE	*V
	/adaptera/						
a.	☞ adáptera				*	*	****
b.	adáptʲera			*W	*	L	****
c.	adáptira		*W		L	*	****
d.	adáptʲira		*W	*W	L	L	****
e.	adáptra	*W	*W		L	L	***L

4. The deletion occurs, whereas the reduction does not. (20d, unattested)

*V >> MAX (Mid) >> *MID/Unstressed, MAX-V (Mid)

i.   /CVCoC/   → [CV́CoC]

ii.   /CVCoC-V/   → [CV́CCV]

		*V	MAX (Mid)	*MID/UNSTRESSED	MAX-V (Mid)
i.	/CVCoC/				
a.	☞ CV́CoC	**		*	
b.	CV́CəC	**	*W	L	
ii.	/CVCoC-V/				
a.	CV́CoCV	***W	L	*	L
b.	CV́CəCV	***W	*		L
c.	☞ CV́CCV	**	*		*

Notes

[1]   As can be seen in (2a), /o/ emerges as [a] when it immediately precedes a stressed syllable.

[2]   Only unstressed mid vowels are considered here, and the ranking changes in stressed positions: Gouskova (2012) suggests that the IDENT constraint on stressed vowels (IDENT-ó) is ranked higher than *MID. The precise ranking is illustrated below:

IDENT-ó >> *MIDL >> IDENTL >> MAX >> *MID >> IDENT

Another way to account for the preservation of stressed mid vowels is to assume the markedness constraint on unstressed mid vowels (*MID/UNSTRESSED) that is ranked higher than the IDENT constraint (see Crosswhite 2000). The reduction can be predicted by the following ranking:

*MID/UNSTRESSED >> IDENT >> *MID

The current analysis adopts the latter approach, because stress is regarded as a surface property that should be considered by markedness constraints.

3 Gouskova (2012) assumes several types of constraints on consonant clusters, but they are simplified here as one constraint, *CC.

4 /a/ emerges as [a] immediately before a stressed syllable when it follows non-palatalized consonants, whereas it changes to [i] in any unstressed syllable when it follows palatalized consonants (see Kniazev and Pozharitskaya 2011).

5 Pater (2007, 2010) distinguishes impossible patterns from lexical exceptions. Following *Richness of the Base*, which is one of the fundamental principles in OT, he asserts that phonologically impossible patterns must be eliminated, whatever lexical properties the phonological forms have.

6 The ranking arguments are shown in Appendix.

7 Following Crosswhite (2000), the current analysis assumes the constraint on unstressed mid vowels in order to predict vowel reduction.

8 This constraint blocks the deletion of the feature [mid] accompanied by the vowel reduction. Unlike Gouskova (2012), the current analysis does not adopt the IDENT constraint as a blocker of the reduction because this process is not regarded as a simple change in vowel height but as a restriction on the emergence of a certain height feature.

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