

Yer Triggered Vowel Lengthening in Slovak

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1. Introduction

In Slovak a yer can lengthen the preceding vowel. In this article I propose that this phenomenon is essentially a kind of compensatory lengthening effect; the lengthening of the vowel compensates for the loss of the following yer. Although this is the essence of the process, not all aspects of yer induced lengthening can be explained along these lines. In certain cases lengthening is opaque, in the sense that the position where the lengthened vowel appears is unexpected. I propose that this is the result of the universal tendency to avoid marked elements, i.e. long vowels, in the domain of affixes. In addition there is a second instance of opacity; lengthening does not take place if the triggering yer is located in the domain of the root. I will argue that this is an instance of the closely related phenomenon that faithfulness within roots is more strict than faithfulness within affixes.

This article is structured in the following way. In the next section I look at the structure of the yers, and I briefly show why it alternates with zero. Then, in the third section I present an analysis of vowel lengthening. In the fourth section I analyze the opaque aspects of yer induced lengthening in greater detail.

2. The structure of yer

Like all Slavic languages Slovak has a set of vowels, traditionally called yers, that alternate with zero. Examples illustrating this alternation are given in (1). The examples in (1), like all examples in this article, are taken from Rubach (1993). An acute accent over a vowel indicates that the vowel is long.

(1)

<i>yer vowels</i>		
nom. sg.		gen. sg.
sen	'dream'	sna
liter	'litre'	litra
šlágér	'hit'	šlágra
bobor	'beaver'	bobra
blázon	'fool'	blázna

There has been a lot of discussion whether it is possible to predict the presence of these vowels on the basis of syllable structure. On the one hand, it has turned out that the alternation in (1) cannot be treated as epenthesis in the environment C-C], because in this environment the presence of a yer is contrastive. Some examples illustrating this contrast are given in (2). The diacritic over *o* indicates that *o* is realized as the rising diphthong [uo].

- (2) a. *no yer appears in the environment C-C]*
- | | |
|------|---------------|
| falš | 'foul' |
| park | 'park' |
| pôct | 'distinction' |
- b. *a yer appears in the environment C-C]*
- | nom. sg. | | gen. sg. |
|----------|--------------|----------|
| faloš | 'dishonesty' | faše |
| Turek | 'Turk' | Turka |
| ocot | 'vinegar' | octu |

On the other hand, it has also become clear that the alternation in (1) cannot be explained in terms of deletion of a vowel in the environment C-CV], because in this environment there is a contrast between vowels that remain present, and vowels that disappear. Examples illustrating this contrast are given in (3).

- (3) a. *the vowel is deleted in the environment C-CV*
- | nom. sg. | | gen. sg. |
|----------|------------|----------|
| semester | 'semester' | semestra |
| šev | 'seam' | švu |
| kotol | 'cauldron' | kotla |
- b. *the vowel is not deleted in the environment C-CV*
- | nom. sg. | | gen. sg. |
|----------|------------|----------|
| jeseter | 'sturgeon' | jesetera |
| lev | 'lion' | leva |
| atol | 'atoll' | atolu |

The fact that the alternation in (1) is neither an instance of epenthesis nor of deletion has led to the commonly accepted view that yers are vowels which are not linked to the basic line of syllable structure (cf. Kenstowicz and Rubach 1987 and Rubach 1993 on Slovak, Szpyra 1992 on Polish, Yearley 1995 on Russian; cf. Rowicka 1999 for a complete overview).

One variant of this view is worked out in Yearley (1995). Yearley argues that yers are not linked to a mora at the underlying level. Accordingly, the underlying contrast between yers and non-alternating vowels of the same quality is as follows.

- (4) *the underlying representation of yers and stable vowels*
- | | | | |
|-----------|----------|----------|----------|
| front yer | back yer | stable e | stable o |
| | | μ | μ |
| | | | |
| e | o | e | o |

Consider a morpheme with a yer, *Turek/Turka* (cf. (2b)). The realization of the second vowel implies that a mora must be inserted. This violates DEP- μ . Yearley proposes that insertion of the mora is triggered by NOCOMPLEXCODA. This entails that this constraint is ranked higher than DEP- μ . The proof is given in (5). In the box containing the underlying form a yer is represented with a capital letter.

- (5) NOCOMCOD » DEP- μ

turEk	NOCOMCOD	DEP- μ
tur Ek		*
turk	*!	

In a case like *Turka* there is no threat of a coda cluster, because one consonant is located in the onset of the second syllable. Hence, the realization of the yer is not required. Suppose now that the yer would be left intact. This would violate PARSE-V, which penalizes unsyllabified vowels. In Slovak this constraint is ranked very high, perhaps it is even undominated. Since it is irrelevant in the context of this article, we will leave it out of consideration. There are two ways to get rid of an unsyllabified vowel; we can either delete it, or we can insert a mora. Obviously, the first option is preferred. This indicates that DEP- μ is ranked higher than MAX-V, the constraint which penalizes the deletion of a vowel. The proof is given in (6).

(6)

DEP- μ » MAX-V

turEka	DEP- μ	MAX-V
tureka	*!	
☞ turka		*

The two rankings ensure that a yer is deleted, unless its presence is required to break up a consonant cluster in coda position.

The question arises as to why a coda cluster can only be broken up by an underlying yer (cf. the contrast between (2a) and (2b)). Insertion of a vowel violates DEP-V. Apparently, insertion of a vowel is worse than a consonant cluster in a coda, suggesting that DEP-V is ranked higher than NoCoMCoD. This is shown in (7).

(7)

DEP-V » NoCoMCoD

faš	DEP-V	NoCoMCoD
☞ faš		*
faleš	*!	

Notice that insertion of the vowel is accompanied by the insertion of a mora. Yet, the fact that DEP- μ is violated cannot be the reason why *faleš* is not optimal, because, as we have seen in (5), DEP- μ is ranked below NoCoMCoD. Notice furthermore that the realization of a yer does not constitute a violation of DEP-V, because a yer is a vowel already at the underlying level, as was shown in (4).

Combining all the rankings we get the following hierarchy of constraints:

(8)

*The phonology of vowel/zero alternation*DEP-V » NoCoMCoD » DEP- μ » MAX-V

According to this hierarchy a yer is deleted, unless this leads to a consonant cluster in a coda. Furthermore, a coda cluster can only be split up by a yer vowel.

In the next section I propose an analysis of yer induced lengthening.

3. How the loss of yer leads to length

In Slovak the final vowel of the stem is lengthened in the gen. plur. of feminine and neuter nouns. Examples are given in (9).

(9)	<i>nom. sg.</i>		<i>gen. plur.</i>
	fabrik+a	'factory'	fabrík
	chat+a	'cottage'	cháť
	cel+o	'forehead'	ciel
	kol+o	'circle'	kôl

Long *e* and *o* are changed into rising diphthongs, resp. [ie] and [uo]. The last two examples in (9) illustrate this. Rubach argues that the gen. plur. is a yer at the underlying level. He furthermore claims that Slovak has a rule which lengthens a vowel if it is followed by a yer (Rubach 1993:144). The yer of the gen. plur. occupies the word final position. It is therefore not located in between two consonants. Accordingly, it never reaches the surface. This being the case, one might doubt whether Rubach's hypothesis that vowel lengthening is caused by an underlying yer is correct. In the absence of independent evidence in the form of a vowel/zero alternation one might feel inclined to assume that the lengthening process is simply a kind of allomorphic process triggered by an arbitrary set of morphemes, a process that has no phonological cause, like the loss of an underlying yer. It is clear, however, that this alternative is incorrect. There are in fact many morphemes where independent evidence for the presence of an underlying yer does exist. To see this consider the following examples (Rubach 1993:168,169).

(10)	<i>base form</i>		<i>dim. nom. sg.</i>		<i>dim. gen. plur.</i>
	hlav+a	'head'	hláv+k+a		hláv+ok
	sirot+a	'orphan'	sirôt+k+a		sirôt+ok
	plec+e	'back'	pliec+k+o		pliec+ok
	čel+o	'forehead'	čiel+k+o		čiel+ok

The forms in the leftmost column consist of a root, followed by the nominative ending. The forms in the middle column consist of a root, followed by the diminutive morpheme *-k*, which is followed by the nominative ending. In these forms the diminutive suffix triggers lengthening of the preceding vowel. In Rubach's analysis this is only possible if the diminutive contains an underlying yer. Notice now that the forms in the rightmost column confirm the existence of the yer in the diminutive. In these forms the yer of the diminutive is located in between two consonants. Furthermore, there is no overt inflectional ending in the genitive plural. Conse-

quently, the underlying (back) yer of the diminutive surfaces (as *o*) in order to block the appearance of a coda cluster. The forms in the rightmost column, then, show that the strategy of postulating underlying yers in order to explain vowel lengthening can be motivated on independent grounds.

Rubach gives many more examples of suffixes that are similar to the diminutive in the following two relevant respects: first, they contain a vowel alternating with zero, and second, they lengthen a preceding vowel precisely in those cases where the yer does not show up. We can thus conclude, basing ourselves on Rubach (1993), that the non-realization of a yer makes a preceding vowel long.

Two refinements are in order before we can investigate why the loss of a yer triggers lengthening. First, in the overwhelming majority of the cases the stem vowel is not lengthened in the nom. sg. masc. Consider the examples in (11).

(11)	<i>nom. sg. masc.</i>		<i>gen. sg.</i>
	chlap	'man'	chlapa
	syn	'son'	syna
	med	'honey'	medu

In our analysis this can only mean that the nominative ending does not contain a yer. Hence there is nothing to delete, so that there is nothing to compensate for. In this respect the nom. sg. masc. differs crucially from the gen. plur. in feminine and neuter nouns. Our hypothesis that the nom. sg. masc. does not have a yer deviates from the traditional view, defended also in Rubach (1993). The traditional view is the necessary consequence of another traditional hypothesis, according to which a yer is realized if and only if it is followed by another yer. Recall, however, that we do not agree with this. We have argued in the preceding section, following Yearley (1995), that the realization of a yer is caused by the tendency to avoid a consonant cluster in coda position. This being the case, we are free to assume that the nom. sg. masc. does not have an underlying yer.

There is a second important restriction to the generalization that the loss of a yer makes the preceding vowel long. Lengthening is blocked if the vowel of the preceding syllable is long. This is a consequence of the Rhythmic Law of Slovak, which does not tolerate two consecutive long vowels. Consider the following forms:

(12)	<i>nom. sg.</i>		<i>gen. plur.</i>
	sídl+o	'trap'	sídel (*sídiel)
	pásm+o	'strand'	pásem (*pásiem)
	plátn+o	'cloth'	pláten (*plátien)

The three roots in these examples have long vowels at the underlying level. Notice now that there are two yers in the underlying representations of the forms on the right. One is located in the root, the other in the gen. plur. suffix. In order to realize both yers, some vowel must be lengthened. Since the first vowel is already long, only the second vowel could possibly be lengthened. This, however, does not happen, due to the Rhythmic Law. Compare this with the forms in the rightmost column in (10). These forms also contain two yers in the gen. plur. (one in the domain of the diminutive suffix and the second in the domain of the inflectional ending) and here lengthening does apply, because the environment of the Rhythmic Law is not met. Having made these two remarks we are ready to investigate why the loss of a yer makes the preceding syllable long.

Let us first consider the gen. plur. Following Rubach (1993) I assume that this morpheme consists of an underlying back yer. Accordingly, at this level the example *fabrik* (cf. (9)), the gen. plur. of *fabrika*, has the following representation:

- (13)
- | | | |
|---|-------------|----------------|
| μ | μ | moraic line |
| | | |
| f | a b r i k o | segmental line |

The hierarchy in (8) cannot account for the loss of the suffix yer and the accompanying lengthening of the preceding vowel. This is shown in (14).

- (14)
- | | fabrikO | DEP-V | NoCOMCOD | DEP-μ | MAX-V |
|---|---------|-------|----------|-------|-------|
| 1 | fabriko | | | *! | |
| 2 | fabrik | | | | * |
| 3 | fabri:k | | | *! | |

Since the candidates 1 and 3 contain an extra mora compared to the input, they violate DEP-μ. The second candidate just violates MAX-V. Since the elimination of the yer does not lead to a consonant cluster in coda position, the second candidate should be the winner, as is indicated by the reversed pointing finger. It is clear, then, that the hierarchy in (8) must be modified in order to account for the fact that the loss of a yer lengthens the preceding vowel.

As a first step I propose that the constraint DEP-μ in the hierarchy in (8) is replaced by the constraint HEAD-DEP-μ. This new constraint penalizes the insertion of a new mora, if and only if the insertion site is the *head position* of the syllable. The constraint DEP-μ is moved to the right of MAX-V. We thus get the following system of ranked constraints.

(15) *The phonology of vowel/zero alternation; second version*
DEP-V » NoCoMCoD » HEAD-DEP-μ » MAX-V » DEP-μ

If we now evaluate the candidates in (14) according to the new standards we get the right results.

(16)

	fabrikO	DEP-V	NoCoMCoD	HEAD-DEP-μ	MAX-V	DEP-μ
1	fabriko			*!		*
2	fabrik				*!	
3	fabrik					*

The first candidate violates HEAD-DEP-μ, because a mora is inserted in the head position of the (third) syllable. This is fatal. The second candidate violates MAX-V, because there is no trace of the yer. Again, this is fatal, because in the new hierarchy MAX-V dominates DEP-μ. The third candidate is optimal, because it only violates DEP-μ. Crucially, it does not violate HEAD-DEP-μ, because the new mora is a non-head mora; it is the dependent half of a long vowel. Neither does it violate MAX-V, because the root node of the underlying yer is not deleted; it corresponds to the root node which is linked to the first (non-head) mora of the long vowel.

Before we can accept this analysis several points must be made explicit. The first one concerns the representation of long vowels. Notice that the lengthened vowel must have two root nodes each linked to a separate mora, as in (17A), rather than one root node linked to two moras, as in (17B). The indices represent the correspondence relations holding between the root nodes of vowels.

(17)	<i>input</i>	<i>output A</i> (=16.3)	<i>output B</i> (=16.2)	<i>output C</i>	
	μ μ	μ μ μ	μ μ μ	μ μ	moraic line
			\ /		
	• ₃ • ₂ • ₁	• ₃ • ₁ • ₂	• ₃ • ₂	• ₃ • ₂	root node line
		\ /			
	f a b r i k o	f a b r i k	f a b r i k	f a b r i k	segmental line


The representation in (17B) violates MAX-V, because the root node of the gen. plur. yer is deleted. Formulated more precisely, it has no correspondent in the output. In addition it also violates DEP-μ, because the output has more moras than the input.

If we claim that long vowels have a (multiply linked) single root node, then we cannot explain the compensatory lengthening effect triggered by yers. The reason is that, under this view, the configuration in (17B) is always less harmonic than ((17C) = (16.2)), because the former violates MAX-V and DEP- μ , whereas the latter only violates MAX-V. Hence, in this theory of vowel length (17B) can never be optimal. On the other hand, if we assume that, at least in Slovak, long vowels have two root nodes (and two moras), then we do understand why a lengthened vowel can be more harmonic than a deleted vowel. The reason is that, under this view, ((17A) = (16.3)) is more harmonic than ((17C) = (16.2)), because the former violates DEP- μ , whereas the latter violates MAX-V, and in the revised hierarchy of (15) MAX-V is ranked higher than DEP- μ . This shows that we have to stick to the two root-node theory of vowel length, at least with respect to Slovak.

The second point concerns the loss of the place features of the underlying yer. The representation ((17A) = (16.3)), which in our view is the output of compensatory lengthening, shows that more is going on in the transition from input to output. Notice in particular that all place features of the yer are removed (although its root node is preserved). This shows that IDENT[Place], the constraint which penalizes any difference between two corresponding segments at the level of the place features, must be ranked below MAX-V. This is demonstrated in the following tableau.

(18)

MAX-V » IDENT[PI]

fabrikO	MAX-V	IDENT[PI]	DEP- μ
fabrik	*!		
 fabrik		*	*

The first candidate in ((18) = (17C)) violates MAX-V, because the underlying yer does not correspond to a segment in the surface string. In the second candidate in ((18) = (17A)) the root node of the underlying yer does correspond with the root node in the dependent position of the long vowel. Hence, it does not violate MAX-V. However, it does violate IDENT[PI], because the place features that are linked to the root node of the yer at the underlying level (cf. the input representation in (17)) have been replaced by the spreading features of the segment in head position (cf. (17A)). Given the fact that IDENT[PI] is lower in the hierarchy than MAX-V, the candidate which preserves the root node, but removes the original place features, is more harmonic than the candidate which removes the underlying root node. This explains why the candidate with the lengthened vowel is the optimal candidate.

This brings us to the third point. Why are the place features of the underlying yer deleted? Obviously, the reason is that diphthongs are avoided. The constraint penalizing diphthongs, NODIPHTONG, must therefore dominate IDENT[Pl]. This is shown in the following tableau:

(18) NODIPHTONG » IDENT[Pl]

fabrikO	NODIPHTONG	IDENT[Pl]
fabroik	*!	
fabri:k		*

I will assume that the same constraint also rules out various other types of complex structure. For instance, it will rule out all candidates with some sort of *light* diphthong, i.e. a representation where one single mora is linked to two root nodes, or to two separate sets of place features. Naturally, a full analysis has to make explicit all these possibilities. Within the limited space of this article I cannot go into the details. I will therefore use NODIPHTONG as a convenient abbreviation for all the constraints that rule out the various types of complex structure.

The fourth point concerns the fact that in the mapping from the input in (17) to the (optimal) output in (17A) the linear order of the last two vowels standing in correspondence is reversed. The reason is that the new mora which must be inserted in order to house the root node which corresponds to the underlying yer may not be located in the syllable's head position. This follows from the revised hierarchy in (15). In Slovak it is the case that the head mora is the last mora of a given syllable, as is convincingly shown in Rubach (1993). Combining the latter hypothesis with the hierarchy in (15) we are forced to assume that the linear order of the vowels standing in correspondence is reversed, in the way indicated in (17A). Reversal of the linear order violates the constraint LINEARITY. We have to assume, then, that this constraint is lower in the hierarchy than MAX-V, because in Slovak a candidate which preserves the root node of the underlying yer, and moves it to another (non-head) position, is more harmonic than any candidate which does not preserve the underlying yer.

Having established why the loss of a yer makes the preceding vowel long we can go on to investigate the two opacity problems.

4. Opacity

There are two problems for our analysis. Interestingly, lengthening does not apply if the triggering yer is located in the domain of the root. Relevant examples have already been given in (1). Two of them are repeated below:

- (19) *no lengthening in the domain of a root*
- | | | | |
|-------|----------|-------|----------|
| liter | 'litre' | litra | (*lítra) |
| bobor | 'beaver' | bobra | (*bôbra) |

The roots in (19) must have an underlying yer, because the consonant cluster is broken up. Given the hierarchy in (15) we expect that, if an inflectional ending is added, the yer is retained in the form of a lengthened vowel. Yet, this does not happen, as the forms in the column on the right demonstrate.

To solve this problem I propose to relate the constraint LIN(EARITY) to the domain within which it applies. Specifically I would like to argue that the constraint (*Root*)LIN is ranked above MAX-V, which in its turn is ranked above the general constraint LIN. The effect of (*Root*)LIN is that the linear order of two underlying segments that are both located in the root morpheme is preserved, whereas the linear order of two underlying segments, one of which is located in an affix, can be changed. This is an instance of the universal tendency that root morphemes tend to be more faithful to their underlying representation than affixes (cf. in particular McCarthy and Prince 1995). Incorporating (*Root*)LIN into our system of constraints we get the following revised hierarchy:

- (20) *The phonology of yer (vowel/zero alternation and lengthening); third version*
 DEP-V » NOCOMCOD » HEAD-DEP-μ, (*Root*)LIN » MAX-V » LIN, DEP-μ

The second opacity problem is of a different nature. Sometimes the position of the lengthened vowel is rather unexpected. This happens when two consecutive yer suffixes are added to a root. Some examples have already been given in the rightmost column in (10), where the diminutive suffix, which contains a back yer, is followed by the gen. plur. suffix, which also contains a back yer. These examples are repeated immediately below.

- (21)
- | <i>base form</i> | | <i>dim. nom. sg.</i> | <i>dim. gen. plur.</i> |
|------------------|------------|----------------------|------------------------|
| hlav+a | 'head' | hláv+k+a | hláv+ok (*hlav+ôk) |
| sirot+a | 'orphan' | sirôt+k+a | sirôt+ok (*sirot+ôk) |
| plec+e | 'back' | pliec+k+o | pliec+ok (*plec+ôk) |
| čel+o | 'forehead' | čiel+k+o | čiel+ok (*čel+ôk) |

From the perspective of the hierarchy in (20) it is not obvious why the forms in the rightmost column are less harmonic than the alternatives in the third column. The difference between them is that in the optimal forms the yer of the diminutive is realized in the root, and the yer of the gen. plur. is realized in the diminutive, whereas in the rejected alternatives both yers are realized in the diminutive.

The appearance of the long vowel in the root rather than the affix is obviously an instance of the universal tendency to avoid marked elements, like long vowels, in the domain of affixes. McCarthy and Prince (1995) explain this in terms of the interaction between domain specific faithfulness constraints and markedness constraints. We have pursued a similar strategy in our solution to the first opacity problem. In this particular case we follow more or less the same strategy.

Notice that underlying long vowels in the domain of affixes are freely possible in Slovak, as is shown in Rubach (1993). Underlying long vowels in affixes are not systematically shortened, neither do they move to a position in the root. One way to account for the fact that affixes tend to avoid only long vowels that are created by yers is to add a domain specific DEP constraint to the hierarchy, viz. (*Affix*)DEP- μ .

This constraint must be ranked higher than LIN, because a candidate with a moved yer is preferred over a candidate with a long vowel in the affix. The effects of this constraint are illustrated in the tableau in (22). The underlying form consists of the root 'head', followed by the diminutive, followed by the gen. plur. suffix (cf. (21)). In the tableau in (22) the linear order of consonants is neglected; in the LIN column a mark indicates that somewhere in the representation a vowel changes its position with respect to another vowel.

(22)

hlav Ok O	(<i>Affix</i>)DEP- μ	LIN
hlavuok	**!	
hlavok	*	*

In the first candidate the linear order of the underlying yers is preserved; both yers can be realized in the domain of the diminutive in the order given by the underlying representation. Hence, there is no violation of LIN. However, the candidate violates (*Affix*)DEP- μ twice. The second violation is fatal. The second candidate violates LIN, because the yer of the diminutive moves to the first half of the final vowel of the root. Consequently, it violates (*Affix*)DEP- μ only once. It is therefore the optimal candidate.

We thus arrive at the following final revision of our constraint hierarchy.

- (23) *The phonology of yers; final version*
 DEP-V » NOCOMCOD » HEAD-DEP- μ ,
 (Root)LIN » MAX-V, (Affix)DEP- μ » LIN, DEP- μ

5. Conclusion

In this article I have argued that it is possible to interpret the lengthening triggered by yers as a kind of compensation; the length of a given vowel compensates for the loss of a following yer. We can maintain this claim even if we assume that underlyingly the Slovak yers are moraless vowels. This makes Slovak identical to other Slavic languages for which the same representation has been proposed. This brings us closer to a general theory of Slavic yers.

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