The Optimal L2 Russian Syllable Onset

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1 Introduction

The purpose of this paper is to explore the acquisition of Russian (L2) syllable onsets by native speakers of English (L1): although both languages allow for complex structure in onsets, Russian consonant clusters present difficulty for L2 learners. The L2 learners tend to exhibit different ways of simplifying Russian syllable onsets: producing vowel epenthesis, reducing consonant clusters, or substituting consonant segments even within syllables permissible in the native language.

These phenomena are described within the framework of Optimality Theory (OT) (Prince & Smolensky 1993) which provides the explanation for both the origin and the choice of simplification strategies in the interlanguage grammars.

I will first give some background information on the structure of syllable onsets in English and Russian. The remainder of the paper will present the interlanguage data analysis and its account within OT.

2 Syllable structure

Syllables consist of an onset, nucleus, and coda. The onset and coda are occupied by consonants forming the margins of the syllable, and the nucleus is universally obligatory and usually occupied by vowels. Thus, the universal structure for syllables looks like this:

(1) bit [bit]

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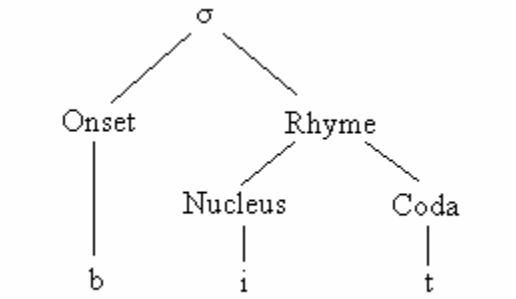
(2) Syllable Structure



The nucleus of the syllable is generally a vowel, except in marked cases, such as in Berber, where consonants sometimes take the nuclear position, such as the word *txznt* 'you sg. stored, pf.' (Dell & Elmedlaoui 1985: 106). As for the onset and coda, languages have constraints on which segments are allowed to occur in consonant clusters in each position. Russian, as we will discover, has more variety of consonant cluster combinations in the onset position than English does. We will now turn to the description of permissible onsets in both languages.

2.1 English syllable onsets

English allows onsetless syllables, and any consonant with the exception of [ŋ] can stand alone in the onset. English also permits two consonants in the onset position of the syllable, where the first one must be an obstruent, followed by an approximant /l r w j/, unless the first consonant is /s/, then nasals, except [ŋ], voiceless stops and approximants can occur in the second position of the cluster. English even allows three consonants to occupy the onset of the syllable, but the first one must be /s/, followed by a voiceless oral stop, and the third position is occupied by an approximant, as in ***spr****out* or ***str****ange*.

Furthermore, consonant clusters in the English onset must be rising in sonority.[1]

The sonority hierarchy, ranking the segments from least to most sonorous, is as follows (Roca & Johnson, 1999: 255):

[1]As Selkirk (1984) argues, I consider clusters of /s/ plus obstruent to function as a single unit at this level. She also points out that that these clusters pattern as single consonants in syllable-final position as well.

Table 1: Sonority Hierarchy

Sounds	Sonority index
obstruents	0
nasals	1
liquids	2
glides	3
vowels	4

Permissible syllable constructions in English tend to follow this hierarchy, going from least sonorous to most sonorous within the syllable. For example, in the English word *plant*, the syllable begins with the voiceless obstruent /p/, which has the lowest sonority of 0. It then is followed by the more sonorous liquid /l/ (sonority of 2), and the peak (nucleus) of the syllable is occupied by the most sonorous segment on the hierarchy: the vowel.

(3) Sonority index:

In addition to the fact that English onsets must be rising, there is another important constraint on consonant clusters in English onsets; namely, the minimal sonority distance between consonants has to be 2. Therefore, clusters like stop + nasal; fricative (except /s/) + nasal; stop + stop or nasal + nasal, etc. are not permissible in English:

Table 2: Onsets not possible in English

Consonant clusters	examples	Sonority distance
stop (obstruent) + nasal	*pn-, *kn-, *tm- *gn-	1
fricative (obstruent) + nasal	*vn-, *vm-, *zn-, *žm-	1
stop + stop	*pt-, *tk-, *kt-	0
nasal + nasal	*mn-	0

2.2 Russian syllable onsets

Russian allows for onsetless syllables, and any consonant can stand alone at the beginning of the word. Russian tolerates a wider range of consonant clusters in onset position than English does. For example, the illegitimate biconsonantal onsets in English mentioned in the table above are permissible in Russian: *pn^{j}i* 'stumps', *kn^{j}iga* 'book', *gnom* 'gnome', *vnuk* 'grandson', *tkan^{j}* 'fabric', *pt^{j}itsa* 'bird', etc.

Having three consonants in the onset is typical for Russian as well, and the clusters are more diverse than the English ones. In addition to those clusters that are permissible in English (spr-, spl-, str-, skr-, skl-, skw- (skv- in Russian), Russian allows for the following tri-consonantal clusters: stl-, spr-, zdr-, zbr-, zbl-, zgr-, zgl-, zgn-, vzv-, vgl-, vzb-, fkl-, ftr-, vbr-, sxv-, vsk-, etc.

The possible onset in Russian can be even more complex, as it tolerates up to four consonants at the beginning of the syllable. The permissible quad-consonantal clusters are: fspl-, fstr-, fskr-, vzdr-, vzgl-, vzbr-, vzgr-, vzdr-, fsxl-, fspr-, etc.

It is interesting that all the clusters that contain four consonants begin with the vz-/fs- (regressive voice assimilation) combination. As for tri-consonantal clusters, they either start with z/s or with v/f. To talk about the peculiarities of Russian syllable structure is beyond the scope of this paper, but I think that the clusters vz-/fs- (both fricatives, both agreeing in voice) can be considered to function as a single consonant when it occupies the onset of the syllable. These segments never occur in the syllable final position, and vz- is prohibited there due to syllable-final devoicing.

The same can be said about s-/z-: they are unmarked in terms of syllable organization. It seems that English and Russian share the same perception of /s/: when it occurs together with other consonants the cluster is viewed as a single consonant.

The considerable variety of consonant clusters in Russian onsets can be accounted for by the greater flexibility of sonority distance between segments. As has already been pointed out, the minimal sonority distance for English consonants in the onset is two, while in Russian it can be as low as zero (two stops or two fricatives, other than /s/).

3 Data analysis

L2 Russian students of lower intermediate (1 subject) and upper intermediate (2 subjects) levels were presented with a list of Russian words that they were to read. The words contained complex consonant clusters in onsets both prohibited in the English language as well as those that English permits, e.g. *sk-, st-, str-, pl-, pr-,*

etc. The first half of the data was organized in sentences; the second half was just separate words.

Table 3: Subjects of the study

Subject	WW	CC	BK
Level	2 semesters	5th semester	3rd semester
Age	42	34	25
NL	English	English	English
Foreign language background			2 years of German 1 year of French

We now turn to a description of the data analysis, which revealed some interesting phenomena.

Table 4: Errors in the onsets permissible in L1

Target form	**WW**	**CC**	**BK**
krʲeməm	**kər**'eməm		
pə**tr**ʲisʲtʲi	pə**tər**ʲisətʲi		
pəf**str**ʲičafšisʲ	pə**st**ičašisʲ	pəf**st**ičašisʲ	pə**st**ičavišisʲ
is**pr**avʲitʲ			is**pər**avitʲ
svʲe**kr**ofʲ	svʲ**er**ofʲ	svʲe**kor**ofʲ	svʲe**kor**
sklanʲatsa	**sl**anʲatsa (deletion)		
o**str**aja		o**star**aja	
smakavatʲ	**səm**akavatʲ		
snʲi**skʲ**ivatʲ		snʲi**kʲ**ivat' (deletion)	
spri**sk**ʲivatʲ		spri**k**ʲivatʲ (deletion)	
stradaəš			**sətr**adaəš
skalʲi**st**ʲij			skalʲi**t**ʲij (deletion)
plʲintus	pʲintus (deletion)		
sklat	klat (deletion)		

To no surprise, the lower intermediate L2 learner produced more instances of erroneous utterances than more advanced Russian (TL) acquirers, although their speech was also far from flawless. To resolve difficulties in pronouncing consonant clusters at the beginning of the word, the subjects would mainly use two strategies: vowel epenthesis and consonant deletion.

The most interesting cases of vowel epenthesis in my opinion would be the breaking of consonant clusters that are actually allowed in the L2 learners' native language (NL), shown in Table 4.

In her study of L2 English onset acquisition by L1 Arabic speakers, Broselow (1987: 302) points out that L2 learners did not break s-consonant clusters of English which, she concludes, might be evidence for their perceiving s-clusters as a single unit. My data, as shown above, have some counterexamples, which led me to hypothesize that L2 learners may not see s-clusters as a single segment, performing vowel epenthesis especially in those cases where the Sonority Hierarchy is violated.

On the other hand, we see instances of vowel epenthesis in such consonant clusters as pl-, pr-, kr-, sm-, tr- which do not violate the sonority hierarchy. Clusters like pr-, kr-, and tr- even have a sonority distance of 2, just as required in the learners' NL.

I now discuss how the subjects resolved pronunciation difficulties in consonant clusters that are not permissible in the speakers' NL.

We see instances of vowel epenthesis, consonant deletion, and even metathesis used to make the word more 'pronounceable' in the learner's interlanguage, e.g.: [špaga] is pronounced as [šəpaga], [prʲixramɨvatʲ] is pronounced as [prʲixamɨvatʲ], and the words [flakon] and [škval] are uttered as [falkon] and [šklaf].

The further analysis of the subjects' interlanguages revealed that the most difficult consonant clusters tend to be the ones that either violate the sonority hierarchy or have the minimal sonority distance between segments.

All three subjects produced the words [lbu] 'forehead.M.DAT.SG,' [rtom] 'mouth.M.INST.SG,' and [lži] 'lie.F.GEN.SG' as [lubu], [rətom], and [liži] respectively. It is interesting that the vowels used in epenthesis are sometimes the ones that have the same place and manner of articulation as the vowel in the following syllable. In addition to [lubu] or [liži] (which, by the way, means 'ski' and not 'lie' as the original) we can also mention [mčišsʲja] 'you go fast.SG.IMP,' which was pronounced as [mičišsʲja]. This seems to be an example of vowel harmony in the learner's interlanguage which is not a characteristic of either the TL or NL.

I found quite a number of instances of vowel epenthesis or consonant deletion in the clusters with a sonority distance of zero. Table 5 presents some examples.

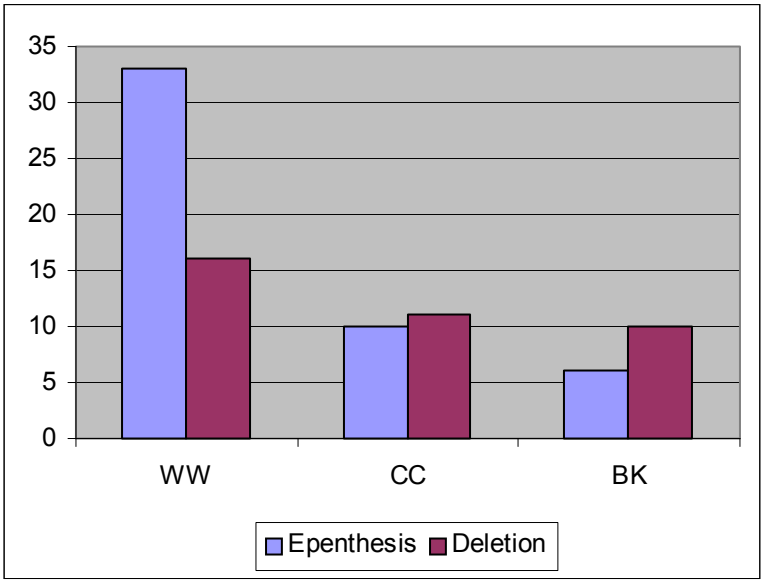
Table 5: Epenthesis in the clusters with zero sonority

Target form	**Sonority distance**	**Vowel epenthesis**	**Consonant deletion**
s**tk**at^{j}	0	stikat^{j}	stakt^{j}
dvajnoj	0	dəvajnoj	
mn^{j}e	0	men^{j}e	
u-**tk**nut^{j}	0		uk-nut^{j}

The findings also indicate the learners' inclination to maximize onsets to get rid of complex codas, as in [štrom] instead of [štorm], or to break codas to make a CV syllable as in [vv^{j}i-n^{j}i-t^{j}it^{j}] for the target form [vv^{j}in-t^{j}it^{j}].

The correlation of epenthesis/deletion strategies are presented visually in the following graph:

Figure 1: Epenthesis and deletion in the interlanguage



According to a number of studies (Broselow 1987, Bhatt & Hancin-Bhatt 1997), learners prefer to epenthesize a vowel while trying to pronounce the L2 syllable onset. As shown in the graph, in the present case this generalization is justified only for the low-intermediate learner (WW). As far as more advanced learners are concerned, consonant deletion wins over vowel epenthesis: it seems the more TL experience the learner gets the more the errors involve more instances of consonant deletion. This fact, of course, needs further investigation.

Another intriguing phenomenon is the L2 learners' alternation between the liquids /l/ and /r/. The subject CC pronounced the word [patk**l**^{j}jeit^{j}] as [patk**r**^{j}eit^{j}] and all the participants made mistakes in the word [ašpa**r**il] saying it as [ashpa**l**il]. Both /r/ and /l/ are separate phonemes in English and Russian, although we know that many languages have them as allophones or do not have one of them at all. Obviously, more research is needed on the status of /r/ and /l/ in interlanguage grammars.

Having presented the analysis of the data, I can summarize the findings by postulating that the consonant clusters that violate the Sonority Sequencing Generalization are very hard for L2ers to acquire – the problem is resolved by vowel epenthesis and consonant deletion strategies. Very problematic are the consonant clusters that have minimal sonority distance between segments: one or zero.

4 L2 Syllable onset and Optimality Theory (OT)

The learners' inserting a vowel or deleting one of the segments in the cluster would support their preference for the typologically unmarked syllable structure: CV. The problem in need of explanation however is the one of multiple output grammars, e.g. the target word [sv^{j}e-krof^{j}] 'husband's mother' was pronounced differently by all our subjects: [sv^{j}e**r**of^{j}], [sv^{j}e**kor**of^{j}], and [sv^{j}e**kor**] respectively.

I will now demonstrate how an OT analysis of the interlanguage data can account for the problem of multiple output results. I will assume that the constraint set contains the following constraints (Prince and Smolensky 1993):

Faithfulness (relation between the output structure and the input)

MAX – underlying segments must be parsed into the syllable structure
DEP – syllable positions must be filled with underlying segments

Markedness (enforce the universally unmarked characteristics of the structures involved)

OSon (Colina 1995) – for 2 segments to be parsed in the same onset, a certain distance in the sonority scale must be maintained. This distance would be different for different languges.
*Complex (Prince and Smolensky 1993) – no more than one C or V may associate to any syllable position node.

4.1 Constraint ranking in NL, TL, and IL

4.1.1 English: OSon>Max,Dep>*Complex

As mentioned above, English syllable onset clusters have to maintain a sonority distance of at least 2, so violation of OSon is fatal. The ranking of the English word *presumptive* and the choice of the optimal candidate is shown in the following tableau (the one that violates the lowest ranked constraints is indicated by ☞):

/pri-zump-tiv/	OSon	Dep	Max	*Complex
pri-zum-pi-tiv		*!		*
priz-um-ptiv	*!			*
pri-zum-ptiv	*!			*
☞ pri-zump-tiv				*
pri-zum-tiv			*!	*
pi-ri-zum-pi-tiv		*!		

If a native speaker of Russian were asked to syllabify the word *presumptive* according to Russian syllabification rules he would do it as 'pre-sum-ptive.' This is because Russian ranks syllable onset constraints differently:

4.1.2 Russian: Max,Dep>OSon>*Complex

/lži/ (lie.F.GEN.SG)	Max	Dep	OSon	*Complex
liž		*!		
liži	*!			
☞lži				*
lši		*!		*
li	*!			

As we see, both languages rank *Complex very low. The markedness constraint OSon is ranked very high in English, whereas in Russian faithfulness constraints Max and Dep outrank OSon.

4.1.3 Interlanguage

According to Hancin-Bhatt, markedness constraints are ranked above faithfulness at the initial stage$_n$ of L2 learning. My data support this hypothesis: TL /pl^{j}in-tus/ vs. IL /pin-tus/ indicates the ranking ***Complex>OSon>Max,Dep.**

The sonority distance between /p/ and /l/ is 2 (which English allows), but the learner would rather delete the lateral sound in order to avoid violating *Complex.

We can present the multiple outputs of the word /sv^{j}e-krof^{j}/ in the following tableau:

Target form: /sv^{j}e-krof^{j}/	*Comp	OSon	Max	Dep
sv^{j}e-**krof**^{j}	*!			
☞ sv^{j}e-**ko-rof**^{j}				*
☞ sv^{j}e-**kor**			*	
☞ sv^{j}e-**rof**^{j}			*	

All three outputs exist in the interlanguages since the optimal forms violate faithfulness constraints ranked low at this stage of language acquisition. It is interesting that none of the subjects epenthesized the onset of the first syllable, which may be due the perception of biconsonantal s-clusters as a single unit. On the way to TL constraint acquisition the learner goes through the next stage (stage$_{n+1}$), where we can observe re-rankings within markedness constraints.

All the subjects made an error in the word /u-dva-i-vat^{j}/ (sonority distance between *d* and *v* is 1) 'to double.' The forms produced by the L2 acquirers were *udaivat^{j}* and *uvaivat^{j}*:

Target form: /u-dva-i-vat^{j}/	OSon	*Complex	Dep	Max
u-dva-i-vat^{j}	*!	*		
☞u-da-i-vat^{j}				*
☞u-va-i-vat^{j}				*
u-di-va-i-vat^{j}			*!	

U-va-i-vat^{j} and *u-da-i-vat^{j}* are the two optimal forms for IL at the stage where markedness outranks faithfulness. Here is another example:

/pra-skvazit^{j}/	OSon	*Comp	Max	Dep
☞ pra-svazit^{j}		*	*	
pra-skvazit^{j}	*!			

At the stage$_{target}$ faithfulness will dominate markedness constraints when the L2 learner produces the target-like form (IL=TL): ***vzb**uhat^{j}*.

5 Conclusion

The analysis of the IL syllable onset structure showed the learners' preference towards the least marked syllable type: CV. Different strategies of consonant cluster simplification are accounted for within the OT approach, which views grammar as a set of universal constraints and gives a more explicit account of the variations among the IL grammars. The L2 learner starts with faithfulness constraints ranked low, as a result performing vowel epenthesis and consonant deletion. As acquisition proceeds, faithfulness wins out over markedness and the learner's pronunciation becomes target-like.

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