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Syllable contact and epenthesis in Yakut loanword phonology*

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Jang, Youngjun. 2016. Syllable contact and epenthesis in Yakut loanword phonology. *Linguistic Research* 33(1), 39-64. Consonant clusters tend to be reduced by deletion or repaired by epenthesis during the process of inter-language change. Yakut (or Sakha), the language of the Republic of Sakha, Russia, follows this general tendency. Since Yakut allows only one consonant in the syllable-initial position, all clusters in the Russian loan words into Yakut are reduced either by deletion or epenthesis. This paper examines this phenomenon and proposes the following. First, Yakut loanword adaptation can best be analyzed by adopting the split structure for sC sequence. Second, assuming the split sC structure, the /s + stop/ sequence does not violate the Syllable Contact Law (SCL). Third, the SCL applies only to sC clusters, but not to CC clusters. Fourth, CC clusters, but not sC sequences, are true onset clusters and have to break up in accordance with Yakut syllable structure. Finally, the single-member syllable with /s/ as coda needs a vowel as nucleus in Yakut loanword adaptation. Since /s/ is coda, edge epenthesis is the only possible repair strategy. **(North-Eastern Federal University)**

Keywords syllable contact, sonority, Yakut (Sakha), loanword, epenthesis

1. Introduction

Onset consonant clusters have been one of the most productive research topics in L1 and L2 acquisition, as well as in loanword phonology. They pose a common phonological problem on the part of L1 and L2 learners as well as loanword speakers (see Barlow 2001; Enochson 2014; Gierut 1999; Goad 2012; Gouskova 2001; Yildiz

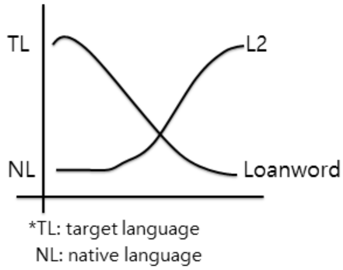
* The main idea of this paper emerged while I was discussing Yakut loanwords with the graduate students at the North-Eastern Federal University in Yakutsk, Russia. Many thanks go to them and other informants including Christina Degatyareva and Tatiana Olesova. My thanks also go to the anonymous reviewers of this journal. With their help and criticism through several stages of reviewing process, this paper could be greatly improved in its contents and format.

2005; among many others). For example, the onset clusters have to be either simplified by deleting one or more members of the clusters (in case of L1 acquisition) or have to be restructured through epenthesis (in case of L2 acquisition and loanword adaptation).

The challenge posed by onset clusters differs in its nature in L1 acquisition on the one hand and L2/loanword learners on the other. That is, the onset clusters fall within the syllable structure of the L1 learners. That is, the syllable structure of primary linguistic data (PLD) exposed to the L1 learners is exactly the same as that of the target language. In contrast, the syllable structure of the target language in L2 acquisition and that of loanwords differ from that of the native language of L2 learners and loanword speakers. The final destination of L2 acquisition and loanword adaptation also differ from each other: In L2 acquisition, the goal is to assimilate to the target language as far as possible, while that of loanword adaptation is to dissociate from the source language and assimilate to the native language as far as possible. In addition, the strategies for coping with onset clusters differ in L1 and L2/loanword acquisition: L1 learners predominantly delete parts of the onset clusters, whereas the L2 and loanword learners either delete parts of the onset clusters or alter the syllable structure of the target by inserting a vowel, the main reason for this being that their native languages do not allow onset clusters even though they want to maintain the input structure as much as possible (for discussion, see Broselow and Finer 1991; Eckman and Iverson 1993; Carlisle 2006; Cardoso 2008; to name a few).

L2 acquisition and loanword adaptation may generally be similar in that both employ the same strategy, namely epenthesis, but there are some differences in specific areas. As mentioned above, L2 learners try to acquire the target language as perfect as possible, while loanword adaptation tends to abandon the structure of the source language with time lapse and try to assimilate the target structure to that of their native languages as much as possible. In short, L2 acquisition and loanword adaptation diverge with the lapse of time. This is illustrated in the following graphic.

(1) L2 acquisition and loanword adaptation



What the graph in (1) means is that L2 assimilates to the target language (TL) with time lapse, while loanwords dissimilate from the source language (in this case TL) and assimilate to the native language (NL).

Recently Enochson (2014) proposes an analysis of onset consonant clusters in L2 based on the Syllable Contact Law (SCL), first proposed in Murray and Venneman (1983) and Vennemann (1988), and “split” sC syllable structure (see Kaye 1992; Goad 2012; Pan and Snyder 2004) — split in the sense that the initial /s/ and the following consonant (C) are in fact not the two members of the same onset; Rather /s/ is the coda of the preceding syllable and the following C is the onset of the next syllable. Under this analysis, sC is not an onset cluster any more, while only CC is an onset cluster. Without this split sC structure, the SCL may not be applied because the SCL states that if the sonority drops greater between a coda and the following onset, the relationship gets more harmonious. Given this, clusters like /st/ are more harmonious than /sw/ (see Gouskova 2004).[1]

Russian loanwords into Yakut, however, do not seem to neatly fall out within the analysis proposed in Enochson (2014). For example, some sC sequences allow internal epenthesis (e.g., *sreda* ‘Wednesday’ becomes [sɛrɛdɛ]), while others allow edge epenthesis (e.g., *stul* ‘chair’ becomes [ustuul]). Therefore, we have to either give up the dichotomy between sC clusters on the one hand and the CC clusters on the other, or we have to seek some modification to her analysis. We will pursue the second option in this paper. In order to extend her analysis of L2 acquisition (which is based on data from L2 English learners who are native speakers of Mandarin Chinese, Japanese, and Cantonese) to Yakut loanword adaptation, we have to explain

1 Without adopting the split sC structure (i.e., the coda-onset sequence), the SCL may still apply as an output constraint on possible candidates, as is done in Gouskova (2001).

why sC clusters do require edge epenthesis rather than internal epenthesis as in CC clusters. In her analysis of Russian loanwords into Yakut, Vasilyeva (2010) argues that a falling or flat sonority induces edge epenthesis, while a rising sonority induces internal epenthesis. Why is that so? We simply cannot incorporate this observation into our analysis, because the /s/ and the following consonant are not members of the same syllable anymore, under the split sC analysis. What she meant by sonority rising/falling is the sonority contour on the onset clusters. Under our analysis, the sC sequence is not an onset cluster but a coda-onset sequence, adopting a version of Enochson (2014). We assume that this /s/, as a stranded coda without an overt nucleus, is simply not allowed in the Yakut phonology and hence has to be rescued somehow.[2] Note that Yakut does not allow a syllable beginning with /r/, either, and any loanword beginning with /r/ should be modified with edge epenthesis. For example, Russian *rama* ‘frame’ becomes [a.raa.ma] in Yakut. We utilize this fact to account for the disallowance of the stranded coda /s/.

To summarize, we propose the following in this paper.

- Yakut loanword adaptation can best be analyzed by adopting the split structure for sC sequence.
- Assuming the split sC structure, the /s + stop/ sequence does not violate the SCL.
- The SCL applies only to sC clusters, but not to CC clusters.
- CC clusters, but not sC sequences, are true onset clusters and have to break up in accordance with the Yakut syllable structure.
- The single-member syllable with /s/ as coda needs a vowel as nucleus in Yakut loanword adaptation. Since /s/ is coda, edge epenthesis is the only possible repair strategy.

This paper is organized as follows. In Section 2, we briefly review how onset consonant clusters are coped with in L1 acquisition. In Section 3, we discuss the onset consonant clusters in L2 acquisition and how they are resolved by the L2 learners. Section 4 is devoted to discussion of Russian loanwords into Yakut. In this section, we propose that a modified version of Enochon’s (2014) SCL analysis of L2

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2 For relevant discussion, see footnote (14) of this paper.

acquisition can carry over to the given data from Yakut loanword phonology. Finally, in this section, we propose that Yakut phonology may not allow /s/ as a stranded coda and that it should be somehow rescued. Section 5 concludes the paper.

2. Sonority and cluster reduction in L1 acquisition

Reduction of onset consonant clusters is widely attested in many languages (e.g., Smith 1973; Fikkert 1994; Gnanadesikan 1995; Pater and Barlow 2003; Jongstra 2003; among many others). Children often reduce consonant clusters by deleting either the first or second member, as shown in (2)-(3) (examples from Vanderweide 2005).

(2) Reduction of the Second Consonant
 a. *clean* [kin]
  please [piz]
  friend [fèn] (Gnandesikan 1995)
 b. *bloemen* [bu:më] 'flowers'
  trein [tèi] 'train'
  snoep [su:p] 'sweet' (Fikkert 1994)
(3) Reduction of the First Consonant
 a. *sky* [gaj]
  spill [bíw] (Gnandesikan 1995)
 b. *stoel* [tu:f] 'stool' .
  stuk [ty:s] 'piece' (Fikkert 1994)

Reduction site in the above data is accounted for by the concept of sonority. That is, the least sonorous member of the cluster is retained (see Fikkert 1994; Gnandesikan 1995; Gierut 1999; Pater and Barlow 2003). There are various versions of sonority scale, but here we adopt the one proposed in Hogg and McCully (1987), given in (3).[3]

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[3] Sonority is also defined in terms of voicing (e.g., in Vennemann 1988). Thus voiced sounds are more sonorous than their voiceless counterparts. Another commonly referenced sonority scale is the five point sonority scale proposed by Clements (1990). This scale ranks the sounds as

(3) Hogg and McCully (1987)

Sounds	Sonority Index
Low vowels	10
Mid vowels	9
High vowels	8
Flaps	7
Laterals	6
Nasals	5
Voiced fricatives	4
Voiceless fricatives	3
Voiced stops	2
Voiceless stops	1

What is important here is the fact that voiceless stops /p, t, k/ are the least sonorant and these least sonorant sounds are retained in child phonology. Some examples from Smith (1973) are provided in (4) (retrieved from CHILDES).

(4) Smith (1973)

skin [gin]	*sky* [gai]	*slipper* [bibə]
smell [mɛl]	*Smith* [mit]	*snake* [ŋeɪk]
spanner [bænə]	*sport* [bɔ ː t]	*spoon* [bu:n]
stalk [gɔ ː k]	*stamp* [dæp]	*stap* [tɑp]
swing [wiŋ]	*switch* [wit]	

In case of /s + sonorant/, however, child production exhibits some variation. That is, either the sibilant fricative or the following sonorant sound can be retained, as shown in (5).

(5) Variation in /s/ + sonorant

slug [läg]	*small* [mò:] (Smith 1973)
snavel [na:fò] 'bill'	*slapen*[la:pë] 'to sleep' (Fikkert 1994)
small [mɑ]	*sleep* [sip] (O'Grady & Cho 2011)

As shown above, children do not always retain the more sonorant member of the

follows: obstruent < nasal < liquid < glide < vowel. Unlike the one that we adopt in this paper, this scale combines stops and fricatives into the category 'obstruent.'

cluster when the cluster consists of /s/ plus a sonorant. In (5c), it is the liquid that deletes (e.g., see *sleep* [sip]). In short, either one of the *sl-* cluster can be deleted (for discussion, see Ohala 1999; Pater and Barlow 2003; among others).

The reduction tendency so far discussed seems to be universally found cross-linguistically. Consider the following Polish examples.

(6) Polish (Łukaszewicz 2007:59)

spotkał	/spɔtkaw/	[pɔtkaw] '(he) met'
spoko'j	/spɔkuj/	[pɔkuj] 'quiet!'
stąd	/stɔnt/	[tɔnt] 'from here'
swojego	/sfɔjɛgɔ/	[sɔjɛgɔ] 'his' (gen.sg.)
zbiera	/zb'jera/	[beja] 'collect' (3rd p.sg. present)

(7) Russian

stul	[tul] 'chair' (Gvozdev 1948/2007)[4]
sklat	[klat] 'small glass' (Ostapenko 2005)

As in English, the least sonorant consonant, i.e., the voiceless stop, is retained in Polish and Russian examples. Note that, in case of [sw] sequence, the less sonorant /s/ is retained in Polish, while it is deleted in English. Compare the following set of data.

(8) a. Polish: *swojego* [sɔjɛgɔ] *s'winki* [s'iŋk'i]
b. English: *swing* [wiŋ] *switch* [wit]

As shown in (8), the less sonorous /s/ is retained in Polish examples, whereas the more sonorous /w/ is retained in English. This kind of fluctuating situation, with regard to the deletion site of consonant clusters, is also found in other combinations. Take a look at the following examples (taken from Vanderweide 2005), in which /s/ is followed by a liquid or a nasal.

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4 This example is cited from Voeikova (2012). Also I conducted acquisition experiment with 12 children of ages between two and four at a kindergarten in Yakutsk, Russia, from March 12 to 14. The same tendency has been found.

(9) Reduction to a sonorant

a. *slug* [läg] *small* [mò:] (Smith 1973)

b. *snavel* [na:fò] 'bill' *slapen* [la:pë] 'to sleep' (Fikkert 1994)

(10) Reduction to /s/

a. *sleep* [sip] (Pater and Barlow 2003)

b. *snoep* [su:p] 'sweet' *snow* [se:w]

It is clear from the data that /s/ + C[+stop] and /s/ + C[-stop] behave in quite different ways. In case of the former, /s/ deletes invariably, while in the latter, either one of the two consonants deletes. Goad and Rose (2004) account for this variation in reduction site by proposing two acquisition stages. According to them, at stage one, children analyze /s/ as the head of the onset cluster, which is then retained on the basis of sonority, and at stage two, children re-analyze /s/ as an appendix and this deletes. It is not entirely clear, however, why an appendix deletes, while the head of the onset retains. It is also not clear why a head changes into an appendix anyway. It is well-attested that a single member onset, therefore the head of the onset, can sometimes be deleted in child phonology. To test the validity of this proposal, we may need data that show a clear-cut division between one stage where only the second consonant deletes and another where only /s/ deletes. It is not likely, however, that children retain one of the two consonants sequentially.

So far we have seen that, in L1 acquisition, sC clusters behave quite differently from other CC clusters. That is, in the /s/ plus stop cluster, only /s/ deletes, while in other CC clusters either one of the two consonants deletes. Before proposing our own analysis, let us discuss consonant clusters in L2 acquisition in the following section.

3. Onset clusters in L2 acquisition

In L2 acquisition, we see a parallel relationship between the sC clusters and other CC clusters. The only difference between L1 and L2 is that in L1 acquisition reduction is predominantly witnessed, while in L2 acquisition epenthesis is overwhelmingly witnessed. It is generally assumed in the literature that there is correlation between the deleted element and the epenthesis site (see Section 4 of this paper). Recall that, in L1 acquisition, /s/ is deleted in /s/ + stop clusters, while one of the two consonants can delete. In L2 acquisition, an epenthetic vowel is inserted externally in case of /s/ + stop clusters, while an epenthetic vowel is inserted internally in case of other CC clusters. As discussed earlier, the two most important strategies for syllable simplification found in L2 acquisition are reduction and epenthesis. There are two kinds of epenthesis according to the site of insertion, namely, edge epenthesis and internal epenthesis (see Cardoso 2008; Carlisle 2006; among many others). Having seen some difference between sC clusters and other CC clusters, let us now begin our discussion with this difference. Various explanations have been proposed regarding the differences between sC clusters and other CC clusters. They can be summarized as follows.

(11) On the nature of sC
  a. sC as a complex segment (Broselow 1992; Yildiz 2005)
  b. no structural differences between sC and CC clusters but phonotactic explanation (Gouskova 2001; Vasilyeva 2010)
  c. /s/ as a coda (Kaye 1992; Pan and Snyder 2004; Enochson 2014)

In her study on Iraqi Arabic and Egyptian Arabic learners of English, Broselow (1992) reports that these speakers insert a vowel before the cluster, if the cluster exhibits a drop in sonority. For example, when producing the loan word *school*, speakers insert a vowel before the cluster, resulting in [ɪskul]. In contrast, internal epenthesis is preferred for clusters with rising sonority. For example, when producing the loan word *fruit*, speakers insert a vowel between the two segments of the onset, resulting in [firut].

Broselow (1992) also remarks that /fl/ sequence is quite different from, say, /st/ sequence. According to her, Egyptian speakers tend to pronounce *flow* as [filo], whereas Iraqi speakers as [iflo]. The Egyptian rule of internal epenthesis inserts a vowel inside the cluster so that the inserted vowel forms a new CV syllable. In contrast, Iraqi speakers insert a vowel to the left of the cluster so that it forms a VC syllable.[5] Broselow (1992) claims that this is an indication that /s + stop/ clusters are

5 Broselow (1992) also reports that Iraqi speakers tend to pronounce *snow, slow*, and *steep* as [esno], [eslo], and [estip], respectively, not as [seno], [selo], or [setip]. This result is somewhat deviant from what we expect. But one thing that is clear from this result is that sC clusters are different

complex segments that cannot be broken up by epenthesis, unlike other CC clusters. We will eventually reject this proposal and instead adopt a theory that states that /s/ is the coda of the preceding syllable and the following C is the onset of the following syllable (for similar proposals, see Kaye 1992; Pan and Snyder 2004; Goad and Rose 2004; Goad 2012; Enochson 2014).

Research by Yildiz (2005) also shows the correlation between deletion site in sC clusters (in L1 acquisition) and the epenthesis site in sC clusters (in L2 acquisition). She conducted both L1 and L2 acquisition and found out that L1 learners repair onset sC clusters by deleting the entire cluster while L2 learners insert a vowel in front of the sC clusters, i.e., edge epenthesis.[6] Even though Yildiz suggests, like Broselow (1992), that sC clusters are complex segments, the evidence presented does not seem to directly support this claim. In other words, /s/ can be separated from the following consonant but it can still behave as if it were part of the cluster.

So far we have reviewed three different proposals with regard to the structure of sC sequence. That is, (i) sC as a complex segment, (ii) uniform structure for both sC sequences and CC clusters, and (iii) split sC structure with /s/ as a coda and C as onset of the following syllable (see Barlow 2001; Goad and Rose 2004; Goad 2011, 2012; Kaye 1992; Pan and Snyder 2004; Enochson 2014). In particular, Barlow (2001) suggests that /s/ is an adjunct and Goad and Rose (2004) argue that /s/ is not connected to the syllable node, but to some higher prosodic word level. Kaye (1992) proposes that /s/ is governed by an empty nucleus of a previous syllable. Goad (2012) provides support for this claim by both positive and negative arguments. That is, she suggests that if /s/ is part of the onset, then sonority predicts that clusters with a larger sonority distance are more harmonic than clusters with a smaller sonority distance. She also suggests that if /s/ is a coda, then sonority does not make any prediction about the cluster and that the SCL makes the opposite prediction of sonority. In short, sC sequences that exhibit a drop in sonority are more harmonic than those that exhibit a rise in sonority. We will adopt this proposal for our analysis of Yakut loanword adaptation later (for relevant discussion, see Lleó and Prinz 1996; Levelt, Schiller and Levelt 1999).

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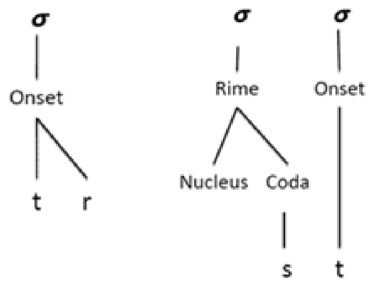
from other CC clusters.

6 Yildiz (2005) also found cases in which a vowel is inserted in front of the cluster even when the sonority rises as in [sl]. This case is clearly problematic not only to her analysis but also to any that tries to distinguish /s + stop/ clusters and others.

Now let us turn to the split structure of sC sequences. Enochson (2014: 176) provides two structures for onset clusters, as shown in (12).[7]

(12) Branching onset versus Split sC sequence
a. Branching onset b. Split sC sequence



Enochson (2014) seems to posit (12a) for all cases of CC cluster, while (12b) for all cases of sC cluster. We know that not all sC sequences behave in a uniform way. Rather sC sequences seem to be divided into two subgroups: That is, /s + stop/ sequences behave differently from other sC sequences and all CC clusters. This subdivision will play an important role in accounting for Yakut loanword adaptation later. Thus we will adopt the general idea of her proposal, but with some minor modification later.

How then does this split structure for sC sequences account for both L1 and L2 acquisition of onset clusters? Adopting the syllable contact law (SCL), originally proposed by Murray and Vennemann (1983: 520), we will offer an analysis for the given data.

(13) The Syllable Contact Law (SCL) (restated in terms of sonority):
The sonority of the coda must not be lower than that of the onset of the adjacent syllable that follows.

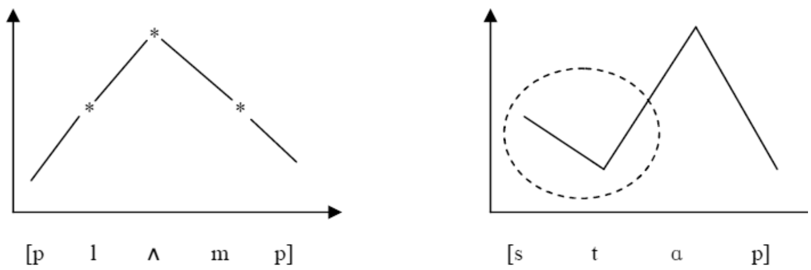
Given (13), onset CC clusters are not covered by this law, because they are two members of one onset. On the other hand, sC sequences are treated as coda-onset sequence and thus the SCL is operative with the sequence (for L2 acquisition, see Goad 2012). Once

7 Here /s/ is under the coda of the preceding syllable, but what we presume here is that not only /s/ but other sibilants also fall under this node.

we adopt this split structure for sC sequence, then we may not be able to appeal to the Sonority Sequencing Principle (SSP) (see Steriade 1994; Selkirk 1984; Clements 1990; Blevins 1995) or the Minimal Sonority Distance (see Broselow and Finer 1991; Clements 1990), both of which are intended to account for the sC sequence. The SSP is defined as a universal tendency whereby onsets exhibit a sonority rise from peripheral segments towards the nucleus. In other words, a felicitous syllable displays a continuous rise in sonority towards the peak and a decrease in sonority towards the edge. This is illustrated by the syllable structure of the English word *plump* in (14a). On the other hand, infelicitous syllable such as /st/ sequence in the English word *stop* exhibits a sonority decrease from the first member /s/ to the second member /t/ of the onset. This is illustrated by the dotted circle in (14b).

(14) Sonority Rising and Sonority Falling (Boudaoud and Cardoso 2009)

a. Sonority rising   b. Sonority falling



Since the onset cluster /st/ violates the SSP, this structure is assumed to be the most marked and therefore the most difficult to acquire (see Eckman 1977; Eckman and Iverson 1993). Once again, we may not resort to the SSP anymore, because the sequence [st] does not belong to the same onset, but the sequence is rather split into the coda /s/ and the onset /t/. But what the SSP is intended to account for can still be obtained in terms of split sC structure with the SCL. For example, both SSP and SCL can readily account for why sequences of an obstruent plus a glide or liquid are common among languages that allow onset clusters, while [obstruent plus nasal] or [nasal plus liquid] clusters are less common. One advantage with the SSP analysis will be the dichotomy between /s + stop/ clusters and /s + others/, as the following data shows.

(15) SSP-abiding and SPP-violating clusters

SSP-abiding	**SPP-violating**
s + liquid (sl), s + nasal (sn, sm) *slave, snail, smile*	s + voiceless stop (sp, st, sk) *spare, still, skill*

As we discuss in Section 4, in the loanword phonology of Yakut, only the SPP-violating clusters allow edge epenthesis, while the SPP-abiding clusters allow internal epenthesis.

4. Russian loanwords into Yakut[8]

There are not many works on Russian loanwords into Yakut in the literature. To the best of my knowledge, Vasilyeva (2010) is one of the few researches that deal with the loanword adaptation in Yakut extensively.[9] Gouskova (2001) offers an account for the loanword adaptation in Kirghiz, one of the Turkic languages related to Yakut.

Yakut does not allow consonant clusters in onset position, like many other Altaic languages (including Japanese and Korean).[10] Thus a Russian word with complex onset is modified in its syllable structure, when borrowed into Yakut. Unlike in L1 acquisition, however, a vowel will be inserted either before the cluster (edge epenthesis) or between the two consonants (internal epenthesis), rather than deleting one of the cluster members.

Based on the analysis of Kirghiz loanword adaptation by Gouskova (2001), Vasilyeva (2010) offers an analysis of Yakut loanwords. She first observes that onset consonant clusters of the Russian loanwords into Yakut are modified in accordance with the sonority of clusters. That is, in case of falling or flat sonority, edge epenthesis is employed, while in case of rising sonority, internal epenthesis is employed. Note that Russian has a wide variety of falling and flat sonority clusters and these clusters should be repaired by edge epenthesis in falling and flat sonority onsets, and by internal epenthesis in rising sonority onsets in the loanwords into Yakut. Vasilyeva (2010) summarizes the pattern as follows.

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8 For the Russian loanwords into Yakut, we referred to Petrova's (2008) dictionary.

9 Other relevant works include Anderson (1998), Baertsch (2003), Finch (1985), Gouskova (2001, 2004), Krueger (1962), and Schönig (1988).

10 Regarding vowel epenthesis in Korean L2 learners of English, see Kwon 2006 and Kang 2003, among others.

(16) Onset clusters in Russian

Examples	st, sk, ʃt, sp, ʃk	pl, kn, bl, tr, pr, kr, kl, xl, sm, sv, br, vr, dv, fl, gr, xr
Sonority	Falling/Flat	Rising
Epenthesis	Edge	Internal

Her observation that only the falling and flat sonority allows edge epenthesis, i.e., the insertion of a vowel to the left of /s/ seems to be borne out by the following examples (taken from Vasilyeva 2010), even though she does not explain why falling and flat sonority allows edge epenthesis and why rising sonority allows internal epenthesis.[11]

(17) Peripheral epenthesis in Yakut loanwords

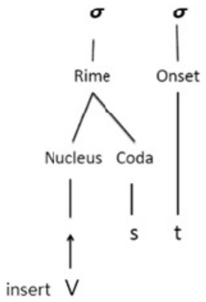
skatərtʲ [ɯskaaçar] 'tablecloth'	*skaməjka* [ɯskamɯajka] 'bench'
spisok [ispiihek] 'list'	*spitsɨ* [ispiisse] 'knitting needles'
stol [ostuol] 'table'	*stul* [ustuul] 'chair'
stəklo [østyøkyle] 'glass'	*Stəpan* [ɯstapaan] 'male name'
storoʐ [ostuoras] 'watchman'	*struna* [usturuuna] 'string'
studənt[ustuɟuon] 'student'	*stəna* [istiene] 'wall'
ʃkaf [ɯskaap] 'closet'	*ʃkola* [oskuola] 'school'
ʃtuka [ustuuka] 'item'	*ʃtanɨ* [ɯstaan] 'pants'

Notice that all the examples in (19) include /s/ + voiceless stop clusters. As expected, an epenthetic vowel is inserted to the left of the cluster, thereby forming a VC syllable. Under the split structure of the sC sequence, the initial /s/ is the coda of the preceding syllable.[12] Given this, the epenthetic vowel is in fact inserted into the empty nucleus position of this putative syllable. This is illustrated in (18).

11 She offers an analysis for the vowel harmony for the Russian loanwords into Yakut. The examples are arranged in terms of various types of vowel harmony. Regarding the vowel changes, refer to her analysis. In Section 7 of her paper, Vasilyeva offers a descriptive observation on Yakut loanword adaptation, adopting Gouskova's (2001) analysis of Kirgiz loanword adaptation. Since her analysis adopts a version of the SCL, it seems that she assumes a split structure of sC cluster, though it is not explicitly specified.

12 An anonymous reviewer raises a question regarding whether split sC hypothesis is the only option for accounting for the Yakut loanword phonology. The reviewer proposes a possibility that both sC[+stop] and other clusters may be in the same syllable-internal positions. Yakut allows CVC syllable structure, and that is why syllable-initial clusters are re-syllabicized.

(18) Edge epenthesis



Recall that the SCL, given in (13), states that the sonority of the coda must not be lower than that of the onset of the adjacent syllable that follows. The structure in (18) does not violate the SCL, because the coda /s/ is higher than the following onset /t/ on sonority scale. Regarding this split sC structure, one might raise a question about syllabification in Yakut, since the resulting syllable structure will be VC.CVC, as exemplified by stul 'chair' à [us.tuul].[13] Considering the fact that cross-linguistically, CV is more natural and unmarked than VC, the resultant syllable structure, i.e., VC, is more marked one.[14] Not only in Yakut, but in many other languages (including Iraqi and Egyptian Arabic, for example) this type of resyllabification has been attested (see Broselow 1992; Yildiz 2005). No matter what theoretical framework we take, the fact is that some sC clusters yield VC.CV(C) structure, while others CV.CV(C)) structure, as we will see soon (for relevant discussed, see footnote 16 of this paper).

Given that the SCL is independently motivated, it would be much more advantageous to adopt an analysis that does not involve any extra assumptions such as SSP or MSD. Furthermore, an analysis based on the SCL may account for Vasilyeva (2010)'s correct observation that only [st], [sp], and [sk] sequences in Yakut loanwords allow edge epenthesis.[15]

One might raise a question why then other sequences containing sC such as [sm], [sn], [sl], [sr] do not allow edge epenthesis, but internal epenthesis, because

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13 Here, the dot (.) between segments indicates syllable boundary.

14 as has been pointed out by an anonymous reviewer.

15 Vasilyeva (2010) remarks that "the cluster [sk] is falling sonority so it does not violate SYLLABLE CONTACT constraint which is ranked higher than CONTIGUITY." The split structure for the sC sequence must be assumed.

they all have the split structure of sC sequence just like /s + voiceless stop/ sequence. This problem does not arise, though, under the SCL formulated as in (13). The SCL prohibits clusters such that the onset is higher than the coda on sonority scale. Recall that liquids and nasals are much higher than /s/ in terms of sonority hierarchy (see Hogg & McCully's sonority scale, given in (3)). Indeed, these clusters do violate the SCL. Therefore, these clusters need to be modified in accordance with the syllable structure of the host language, which is CVC in Yakut. By inserting a vowel between the less sonorous /s/ and the following more sonorous consonant, the SCL may not be violated. Consider the following examples (taken from Vasilyeva 2010).

(19) Violation of SCL
sledstvie [siliɛstiiɛlɛɛhii] 'consequence'
sliz [salɯn] 'slime'
sluʐba [suluuspa] 'service'
smola [sɯʍala] 'pitch'
smjats] [imit]
sreda [sɛrɛdɛ] 'Wednesday'
srok [soruok] 'term'
svitər [sibiitere] 'sweater'
Sveta [Sibiete] 'female diminutive name'

All the examples in (19) violate the SCL, because the initial consonant /s/, the coda of the preceding syllable, is less sonorous than the following consonant, namely /l/, /m/, /r/, and /v/, which is the onset of the next syllable.[16]

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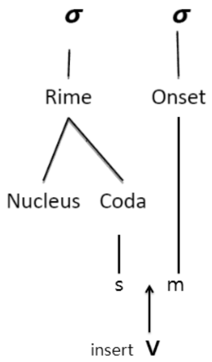
16 An anonymous reviewer points out that the notion of 'syllable' and 'syllabification' has to be more restrictively defined. Russian seems to allow a syllable that does not contain a vowel as in the single-member syllable such prepositions as *v* 'at' and *c* 'with'. The reviewer remarks that languages like Berber allow consonants as nucleus of a syllable. It seems to be a valid point that the very existence of Russian prepositions like *v* and *c* does not imply that they are all in the coda position of a syllable. The reviewer further notes that sonority plays an important role in deciding the number of syllables. Thus it seems that we need to take into consideration the profiling of the sonority to decide the syllabification. In this paper, I simply take the standard view that Yakut allows CVC syllable structure and that all extra consonants have to be repaired in accordance with the SCL, given the sonority scaling (3). Thanks to the reviewer for attracting my attention to this.

(20) Internal epenthesis



Thanks to internal epenthesis of the form in (20) that applies to sC clusters (except /s/ + voiceless stop sequences), the resultant syllable does not violate the SCL anymore and conforms to the syllable structure of the host language, i.e., the syllable structure of Yakut. These clusters are somewhat different from CC clusters such as {pl, kn, bl, tr, pr, kr, kl, xl, sm, sv, br, vr, dv, fl, gr, xr} given in (16). CC clusters do not have split structure; rather, they are true onset clusters. Thus we have three groups of sequences, as shown in (21) below.

(21) a. SCL-abiding: st, sk, ʃt, sp, ʃk (coda-onset sequence)
b. SCL-violating: sm, sl, sn, sv
c. true onset clusters: pl, kn, bl, tr, pr, kr, kl, xl, br, vr, dv, fl, gr, xr

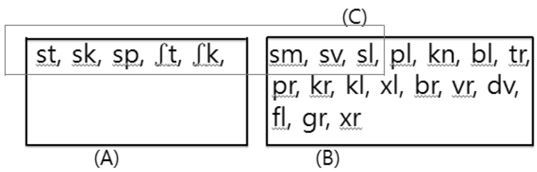
Internal epenthesis applies only to the group of (21b) as a repairing strategy. What about (21c)? These clusters do not violate the SCL, because SCL applies between syllable boundaries such as coda-onset sequences. However, since Yakut phonology does not allow onset clusters, the same strategy as for cases that violate the SCL, namely internal epenthesis, has to apply, thereby obtaining the same result as that in (21b). The following are some of the relevant examples (taken from Vasilyeva 2010).

(22) CC clusters in Yakut loanwords
brigadir [birigejiir] ‘brigadier’

grabli [kɯraabɯl] ‘rake’
klad [kɯlaat] ‘treasure’
kniga [kingie] ‘book’
krasavitsa [kɯrasaabɯssa] ‘female cutie’
krəslo [kiriehile] ‘armchair’
krupa [kuruuppa] ‘grain’
kvartira [kɯbartɯɯra] ‘apartment’
platʲə [bɯlaaçça] ‘dress’
vraç [bɯraas] ‘doctor’
vrəmʲa [birieme] ‘time’
xləb [kiliep] ‘bread’

The discussion so far is summarized as follows.

(23) Onset Clusters in Russian



First of all, Box (C) is distinguished from other CCs in its split structure for sC clusters (see Kaye 1992). Under this assumption, the clusters in Box (B) except those in Box (C) do not fall out within the SCL, simply because they are not in adjacent syllable boundaries: they are simply two members of the same onset. The clusters in Box (A) and (B) are distinguished by the falling/flat sonority in the former and the rising sonority in the latter (see Gouskova 2004; Vasilyeva 2010). Our analysis is to incorporate these two groupings in a sense. That is, our analysis assumes that (i) sC clusters are fundamentally different from other CC clusters in that they have split structure of coda-onset sequence and that (ii) clusters in Box (A) conform to the SCL while those in the intersection between Box (B) and (C) do not. Furthermore, we want to emphasize that the clusters in the intersection between Box (B) and (C) and those in Box (B) minus Box (C) are different from each other, although they would be treated in the same way under the analysis of Vasilyeva

(2010) and Gouskova (2001). The reason is that those clusters in Box (B) except those in Box (C) are not coda-onset sequences but true onset clusters, as mentioned earlier. The discussion can be summarized as follows:

(24) a. sC versus CC: Box (C) vs. Box (B)
b. sonority falling/flat versus sonority rising: Box (A) vs. Box (B)
c. split sC with SCL: Box (A) versus {Box (C) minus Box (A)} versus {Box (B) minus Box (C)}

Note that Gouskova (2001) and Vasilyeva (2010) assume the SCL as a constraint on output, under the Optimality Theory (OT) framework. Thus, their analysis does not distinguish any subgroups of the onset clusters. Instead, if the output obeys any constraints including the SCL and Contiguity, then it survives.[17] Furthermore, we assume that clusters in Box (B) minus (C) have nothing to do with the SCL, simply because they are not coda-onset sequence but just two members of the same onset. Breaking up the CC clusters in onset position is the only option for L2 learners or loanword adaptation, as attested by huge number of research works. Epenthesis applies to the clusters in the intersection between Box (B) and (C), because they violate the Syllable Contact Law.

Why then does epenthesis apply to the clusters in Box (A), even though they do not violate the SCL? Once again, recall that the initial /s/ is the coda of the preceding syllable, while the second consonant is the onset of the following syllable under our split structure of sC clusters. If this split structure for sC clusters holds universally, then the syllable consisting of a single member /s/ needs any form of nucleus at least and the nucleus is typically a vowel. That's why we need edge epenthesis and this solution seems to be universally borne out (but see footnote 16 of this paper).

Our analysis fundamentally differs from Gouskova-Vasilyeva analysis in the sense

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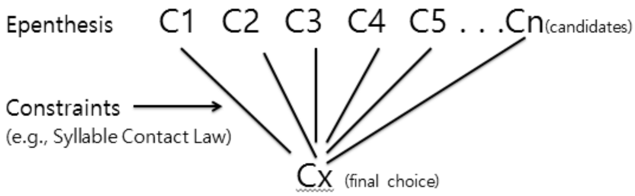
17 Gouskova (2001) offers the following definition and the output is selected according to the relativized ranking of various constraints, as usual in OT framework.

(i) Contiguity: elements adjacent in the input must be adjacent in the output.

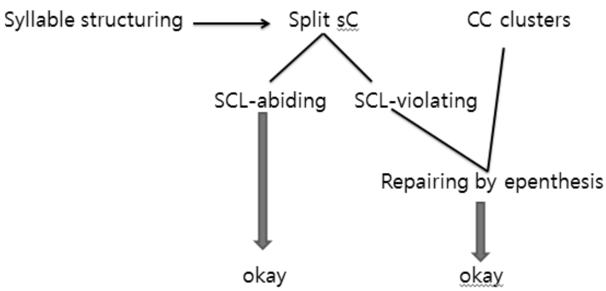
For example, *speech* /spiʧ/ may have two candidates in Central Pahari, namely, [sipiiʧ] and [ispiiʧ], but in this case CONTIGUITY has priority and choose the latter. On the other hand, English *fruit* becomes [firut] in Hindi over [ifrut] due to the priority of the SCL.

that the SCL applies only to clusters in Box (C) in (25) as a repairing strategy. In other words, while Gouskova-Vasilyeva analysis is a constraint or a filter on output candidates, as usual in OT framework, our analysis is sort of a derivational approach. The reason is as follows. Under Gouskova-Vasilyeva analysis, all possible outputs are candidates and relevant ranked constraints including the SCL and Contiguity select the best output. In a sense, this approach is representational. On the other hand, under our analysis, only the SSC-violating derivations should be "repaired" by epenthesis and other CC clusters also have to be repaired by epenthesis in accordance with the syllable structure of the loanword-hosting language. In this sense our analysis is derivational. These two different approaches can be schematized as follows:

(25) a. Representational constraint on output (Gouskova-Vasilyeva)



b. Derivational repairing approach



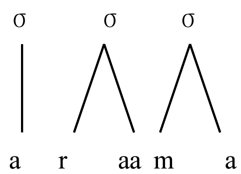
As shown in (25b), the loanwords in Yakut undergo syllabification such that sC sequences are not onset clusters but a coda-onset sequence. Once again, recall that Yakut allows only CVC and any extra consonants should be repaired. Adopting the split sC structure, the stranded /s/ must be re-syllabicized by an epenthetic vowel, thereby forming a VC or CV syllable. If we insert a vowel to the empty nucleus position, we will get VC syllable, and if we insert a vowel between the /s/ and the following onset, we will get CV syllable. Both cases are attested in Yakut. Some of the sC clusters abide the SCL, while some others do not. If the sC sequence abides the SCL, then it is okay, even though a vowel should be inserted in the edge position for independent reasons. If the sC sequence violates the SCL, then it should be "repaired" by epenthesis, just like all other CC clusters should be repaired in accordance with the syllable structure of Yakut. Our analysis may superficially seem more complicated than the constraint-based representational one proposed in Gouskova (2001) and Vasilyeva (2010). If, however, the split sC structure is independently motivated and validated, our analysis should be the right one and may not be abstained from.

One final point to make here is the phonotactic restriction in Yakut phonology. Krueger (1962) observes that Yakut never allows /r/ in a word-initial position, as shown in what follows.

(26) Word-initial /r/ in Yakut loanwords
rama [araama] 'frame'
rɨnok [ɯrɯɯɯnak] 'market'
ruçka [uruuçuka] 'pen'
rʲumka [yryymke] 'shot (glass)'
raboçij [orobuoçaj] 'worker'
rubaxa [ɯrbaaχɯ] 'shirt'
rɨçag [ɯrɯçaak] 'lever'

Even though an extra vowel is inserted in examples in (26), it is not the case that the epenthetic vowel re-syllabicizes the following /r/ and forms a new syllable in which the vowel and the following /r/ belong to the same syllable. Rather, the epenthetic vowel stays as an independent vowel, while /r/ is still the onset of the original syllable to which it belongs. This is illustrated in (27).

(27) araama



We speculate that, together with the tendency to avoid a single member syllable with coda /s/, Yakut avoids syllable-initial /r/ due to some language-specific reasons that are not at all clearly understood (but see footnote 16 of this paper).

5. Summary and concluding remarks

In this paper, we have seen that sC sequences behave quite differently from other CC clusters. Following previous suggestions made by various scholars (Kaye 1992; Enochson 2014, for example), we have assumed that sC clusters are in fact not onset clusters. Rather we have assumed that they have a split structure in which /s/ is the coda of a preceding syllable, while C is the onset of the following syllable. Adopting such split structure, we have tried to offer an analysis of Yakut loanword adaptation by appealing to the SCL (Murray and Vennemann 1983).

We first reviewed, in Section 2, the data and analyses of L1 acquisition and have seen that onset clusters are predominantly reduced. One important point to note is that sC clusters and other CC clusters behave differently in L1 acquisition. This has led us to view L2 acquisition, in Section 3, and we have seen that onset clusters pose the same kind of challenge to the L2 learners as the L1 learners. We have seen that L2 learners employ epenthesis rather than reduction, but what is interesting is the fact that the epenthesis phenomenon also seems to be quite similar to cluster reduction in the sense that sC clusters are different from other CC clusters. In Section 4, we have discussed the Russian loanwords into Yakut. Adopting the split sC cluster structure and the SCL, we offered a derivational analysis for the Yakut loanword phonology. Specifically, we have proposed the following:

- Yakut loanword adaptation can best be analyzed by adopting the split structure for sC sequences.
- Under the split sC structure, the /s + voiceless stop/ sequence does not violate the SCL.
- The SCL applies only to sC clusters, but not to CC clusters.
- CC clusters, but not sC clusters, are true onset clusters and have to break up.
- The single-member syllable with /s/ as coda needs a vowel as nucleus in Yakut loanword adaptation for language-specific reasons.

As for the last point regarding the insertion of a vowel into the nucleus position with the /s/ coda, we have speculated that in many languages a syllable consisting of a single consonant tends to be not tolerated. In this regard, Russian prepositions are special. Prepositions like *v* 'at' and *s* 'with' are allowed. Since Yakut does not allow syllables like a single C, the stranded /s/ in the split sC structure should be supported with a vowel so that it constitutes a VC syllable.

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