Productivity of the Buriat dorsal-zero alternation*

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1. Introduction

In Buriat, the consonant realized contextually as dorsal [g] or uvular [ɢ, ʁ] alternates with zero at stem-suffix boundaries (Poppe 1960, Sanžeev 1941, Sanžeev et al. 1962). This alternation has been analyzed as phonological epenthesis and has been known as a challenge to the existing theories of phonological markedness (Rice 2008, Morley 2015, Vaux & Samuels 2015). The analysis of the relevant alternation has also been debated (de Lacy 2006, de Lacy & Kingston 2013). This paper presents preliminary experimental evidence showing that the reported epenthesis pattern fails to be generalized to new environments. The results offer some support for the analysis of Buriat dorsal-zero alternation in terms of floating features, present only on the relevant native affixes. Thus the quality of a segment alternating with zero in Buriat is lexically specified, rather than determined by phonology. The theoretical implications of this finding are explored.

2. Buriat basics

The data in this article come from the author's field investigation of the Kurumkan dialect of Buriat (part of the Barguzin dialect group), as spoken in the village of Baragkhan. Section 4.1.3 gives more details on the consultants. The transcription adheres to IPA.

The segment inventory of the studied dialect presents only few substantial differences from that of Standard Buriat. As relevant for current purposes, Buriat distinguishes labial, coronal, and dorsal stops. Although in general Buriat stops contrast for voicing and palatalization, the voiceless velar /k/ only occurs in loanwords. The phonetic realization of voiced dorsal /g/ (both underlying and 'epenthetic') varies with the vowel harmony

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class of the word. In front-vowel words this segment appears as [g], and sometimes lenites to [ɣ] intervocalically. In back-vowel words it appears as uvular [ɢ] and frequently lenites to [ʁ] between vowels. In what follows, this segment will be loosely referred to as 'dorsal'. The dorsal fricative /x/ varies according to similar principles, although the details of its positional allophones were not extensively studied.

The first syllable exhibits all vocalic contrasts in Buriat, and the relevant inventory is given in (1).[1] The system of diphthongs has undergone some diachronic changes, and the transcription in (1) reflects the most common surface realization for each diphthong. The underlying shape of the diphthongs is revealed in their patterning with respect to vowel harmony (see also Sanžeev 1941, Sanžeev et al. 1962, Poppe 1960).

(1) *Kurumkan Buriat vowel inventory: first syllable*

Underlying monophthongs			Underlying diphthongs				
i iː	ʉ ʉː	u uː	/ai/ ɛː	/oi/ œɛ	/ui/ ui	/ʉi/ yi	/ei/ eː
ɘ ɘː	ɵː	o oː					
	a aː						

The short vowels [u ʉ] do not occur in non-first syllables. The short /o ɘ a/ are often reduced to a schwa-like quality in this environment. Buriat exhibits both frontness and rounding harmony. All vowels within a word must agree in frontness hence every word may contain either the back vowels /a ai o oi u ui/ or the front vowels /ɘ ei ɵː ʉ ʉi/. The frontness value of the word, and the alternations of the suffixes are controlled by the first syllable vowel. The vowels /i iː/ act as neutral. Buriat also has rounding harmony affecting non-high vowels and operating according to a rather complicated set of rules. The exact patterns of rounding harmony are not relevant to our present purposes, and they match the patterns in Standard Buriat (Poppe 1960: 21-24). The underlying harmonizing vowels will be written as /A/ (alternates in both frontness and roundness) and /U/ (alternates in frontness).

Interestingly, a few dialectal suffixes systematically escape vowel harmony. Thus the dialectal ablative shows up as [-aːn] regardless of the harmony class of the word e.g. [ʃonaːn] 'from a wolf'; [bʉrgɘdaːn], *[bʉrgɘdɵːn] 'from an eagle'.

Buriat syllable structure is generally (C)VCC. Onsetless syllables are only allowed word-initially. Native words only allow [ŋg] as a complex coda while loanwords (mainly from Russian) allow large consonant clusters in both onset and coda.

Buriat stress is on the penultimate bimoraic nucleus (long vowel or diphthong), or else to the first syllable of the word (Poppe 1960, Walker 1994). Stress is predictable, and it will not be marked in the examples.

[1] This is based on my preliminary formant measurements. The existing descriptions of Standard Buriat (Radnaeva 2003a, b) report a few differences: [e] pro Kurumkan [ɘ], [ɔ ɑ] pro dialectal [o a], [ʊ] pro dialectal [ʉ].

3. Buriat dorsal-zero alternation

Buriat allows no hiatus. The vowel sequences containing a short vowel, which only arise at a morpheme boundary, are always resolved via vowel deletion, as shown in (2).[2]

(2) /nabʃa-Aːr/ [nabʃaːr] 'leaves-INSTR'; /ʃono-aːn/ [ʃonaːn] 'wolf-ABL.DIAL'

When two bimoraic vowels (long vowels or diphthongs) come together, the reported repair is dorsal insertion (Sanžeev 1941, Poppe 1960, Sanžeev et al. 1962). The examples in (3a) document this alternation, with the underlying forms assumed by the traditional insertion analysis. The examples in (3b-c) show that no dorsal appears either on the relevant stems or on the suffixes in other environments.

(3) *Examples of Buriat dorsal-zero alternation (presented on the epenthesis analysis)*

a.	/xʉlʲeː-Aː/	[xʉlʲɘːgɘː] 'wait-IPF'
	/taxʲaː-aːn/	[taxʲaːʁaːn] 'hen-ABL.DIAL'
b.	/xʉlʲɘː-dɘg/	[xʉlʲɘːdɘg] 'wait-FREQ'
	/taxʲaː/	[taxʲaː] 'hen'
c.	/xatar-Aː/	[xataraː] 'dance-IPF'
	/bʉrgɘd-aːn/	[bʉrgɘdaːn] 'eagle-ABL.DIAL'

On the *insertion analysis*, these is a phonological process inserting a dorsal between two bimoraic nuclei. However, this is not the only possible interpretation. For instance, de Lacy and colleagues argue that these data could equally stem from a pattern of phonologically-conditioned suppletion. On the suppletion analysis, the relevant affixes have two allomorphs whose selection is based on the last segment of the stem (de Lacy 2006, de Lacy & Kingston 2013). This parallels a couple nominal morphemes that are clearly suppletive: the accusative and the reflexive accusative.

A challenge for the suppletion analysis comes from the fact that the alternation is recorded with a large number of affixes (Morley 2015). In the studied dialect, the following suffixes show the /g/-zero alternation as in (3): /Aːr/ 'instrumental'; /aːn/ 'ablative (dialectal)'; /Aːd/ 'approximative'; /Aː/ 'imperfective'; /aːn/ 'perfective (dialectal)'; /AːʃA/ 'habitual participle'; /Aːd/ 'perfective gerund'; /AːrAi/ 'future imperative'; /iː/ 'non-future 2nd person imperative'; /UːʒAn/ 'non-future 3rd person imperative' (cf. Morley (2015) for Standard Buriat). The suppletion account would have to assume that all of these affixes accidentally match in their suppletive allomorphs.

Another possible analysis would assume that all relevant affixes start with a floating dorsal feature, which I will write as /^{g}/ (Zoll 1996). This feature is realized as [g/ʁ] between two long vowels (3a), but otherwise this feature is not realized (2, 3b-c). On this account, the similar alternations of the suffixes are accounted for by their similar underlying forms. In what follows I will refer to this analysis as *the morphological account*. A possible analysis along these lines is spelled out in detail in section 5.

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[2] The following glosses are employed in the examples: ABL.DIAL(dialectal ablative), DAT(ive), FREQ(uentative), INSTR(umental), IPF(imperfective), PL.IMP(plural imperative), PST(past)

Finally, the possibility of a *deletion analysis* needs to be discussed (Uffmann 2014). On this story, the relevant stems would end in a final /g/ which would then be deleted before consonants. Although such a possibility is hard to rule out completely (Morley 2015), the postulated deletion process would face multiple exceptions elsewhere in Buriat. The examples in (4) shows that /gC/ sequences do arise at stem-suffix boundary (4a) or morpheme-internally (4b).

(4) *Buriat consonant+dorsal and dorsal+consonant sequences*

a.	/bəʃəg-tA/	[bəsəgtə] 'letter-DAT'	
	/zurag-tA/	[zuraɢta] 'drawing-DAT'	
b.	/jaba-gtiː/	[jabagtiː] 'walk-PL.IMP'	

No existing deletion account spells out a detailed treatment of these exceptions, and therefore I will not consider the deletion possibility further.

To summarize, the Buriat dorsal-zero alternation can be analyzed in at least two ways: as a general insertion process, and as a morphologized alternation. Although the two accounts capture the core data equally well, they make different predictions for novel items, based on how the speakers represent the relevant alternation.

4. Experimental evidence: the new augmentative

On the insertion account, the general insertion process whereby /VːVː/ → [VːgVː] is expected to be generalized to novel items. On the other hand, on the morphological accounts the dorsal-zero alternation is represented as a property of affixes. According to this latter account, Buriat native data present little evidence of a general hiatus resolution strategy between bimoraic nuclei: the relevant sequences are mostly handled by morphologized alternations. Therefore the morphological account leads us to expect that Buriat speakers will not exhibit a uniform treatment of novel items. Some speakers may generalize vowel deletion (the hiatus resolution strategy observed with short vowels) while others may generalize the floating [^{g}], based on the large number of native suffixes which have this floater.

It should be noted that the two accounts do not differ in their predictions for novel stems. While the insertion account trivially predicts dorsal epenthesis in this case, the same prediction is yielded by the morphological account where the alternating dorsal is part of the representation of the affix, and hence native affixes are expected to trigger the alternation on novel stems. For this reason, the present study combines the wug test methodology (Berko 1958) with novel affixes acquisition (e.g. Tessier 2012).

The participants were taught a new affix /AːbA/ with an augmentative meaning. Phonologically similar affixes or native augmentatives are absent in Buriat. The insertion account predicts that the new affix would uniformly trigger dorsal/uvular epenthesis when attached to the stems ending in a bimoraic nucleus. According to the morphological accounts, the native data present no clear evidence of a general hiatus resolution strategy. Hence the speakers are expected to either apply vowel deletion or perhaps to try and guess the floating segment that the new suffix might have.

4.1 Method

4.1.1 Stimuli

Prior to the experiment, about 50 nominal stems ending in either a consonant or a bimoraic nucleus were identified using the Buriat-Russian dictionary (Čeremisov 1973). These stems were paired with appropriate pictures (obtained from Google picture search) and presented to the participants in a picture naming task, as slides on the screen of a 15-inch notebook computer. The participants were instructed to name the object they see in Buriat using the phrase [ɘnɘ ___] 'This is ___'. This was done to ensure that only familiar words are used in the main experiment.

The main experiment stimulus set was designed to include only the words that each participant volunteered as a first reaction to the relevant pictures. Although an effort was made to keep the stimulus set constant across participants, there were some inevitable differences. Thus some of the participants occasionally failed to provide the intended Buriat word or provided a dialectal variant, e.g. *saw* [xʲʉrɵː] (literary); [xʉreː] (dialectal).

All stems used in the main experiment were between one and three syllables long. All stimuli were embedded in a carrier sentence [ɘnɘ ___] 'This is ___'. The stimuli for the training phase were presented both auditorily and orthographically. The training set consisted of eight consonant-final stimuli for most participants. Due to occasional failure to produce the relevant words in the picture naming task, one participant (B) received seven training items, one received six (VV), and one – five (NV). The number of training items did not seem to affect the performance in the experiment.

All of the training stimuli were recorded from the same consultant, who did not participate in the main experiment, under the conditions described below in 4.1.2. The unmodified training stimuli were recorded in a picture naming task, and the modified stimuli bearing the novel affix were recorded from their orthographic representation. Each stimulus was recorded in the carrier phrase, and repeated three times. The resulting sound files were segmented using Praat (Boersma & Weenink 2012), and the most suitable instance was embedded in a Powerpoint presentation for the main experiment. The training stimuli always included stems of different frontness harmony classes.

In addition to the training stimuli, there were twelve test stems for each participant: five stems ending in a long vowel or a diphthong, and seven stems ending in a consonant. In total 108 test responses were obtained (12 responses from 9 participants), out of which 45 responses were potential cases of hiatus. The relatively small number of items per participant means that the results of this study should be interpreted with caution, although the wide variety of obtained responses is unlikely to result from the small number of items. The vowel-final test stimuli always included items of different harmony classes as well as items ending in both long vowels and diphthongs.

The consonant-final stimuli in the experiment never ended in /g/ since including these stems could independently explain possible /g/-insertion answers. The Buriat nominal stems very often end in liquids /r l/, and this tendency was inevitably present in the data.

4.1.2 Procedure

The participants were told that they would see modified words, and instructed to guess the meaning of word modification from pictures in the training part, and to remember the shape of the new morpheme. The study was presented as a game and the participants (many of whom were school teachers or kindergarten tutors) were encouraged to give feedback on whether they thought the game would be appropriate for children.

At the training phase, the participants were presented eight pairs of pictures where the first picture (normal object) corresponded to a training item in unmodified form while the second picture (big object) corresponded to a training item with the novel affix. The training items were presented both orthographically (on a computer screen) and auditorily (through Sennheiser HD 202 headphones), and the participants were asked to repeat what they heard three times for each slide.

After the training phase, the participants took a short break and were asked what they thought was the meaning of the new item. The test stimuli were presented to the participants only orthographically. At the test phase, the participants were presented with pairs of pictures where the first picture (normal object) was paired with the corresponding unmodified stem while the second picture (big object) appeared with a gapped phrase [ɘnɘ ___] 'This is ___'. The participants were instructed to fill the gap and to repeat the resulting phrase three times. The test phase always started with five consonant-final items in order to give the participants some practice in attaching the new affix. The remaining two consonant-final test items were randomly interspersed with vowel-final test items in the final part of the test phase.

The experiment lasted between ten and twenty minutes and was performed in a quiet room. The participants' responses were recorded using an AKG C-1000S microphone (cardioid) and a Zoom H4N portable solid-state recorder. The participants were asked to repeat each response three times. In cases of occasional stutterings, self-corrections, or interruptions, further repetitions were prompted.

The results were segmented using Praat (Boersma & Weenink 2012). Each of the test responses was coded for whether it reflects frontness harmony. The responses to vowel-final test items were additionally coded for the hiatus resolution strategy they employed. Additional modifications to the novel affix were also noted.

4.1.3 Participants

Nine native speakers of Kurumkan Buriat from the Baragkhan village took part in the experiment. One of the speakers (CDSh) spent their childhood in Southern Buriatia (close to Mongolian border), but was living in the area for more than forty years. Data from two additional speakers were discarded since these participants did not use the intended affix.

For sociolinguistic reasons eight out of nine participants were female, aged between 37 and 65. The one remaining participant (B) was a man aged 17. The consultant's job was not considered socially appropriate for older men.

4.2 Results

Each of the test responses was consistent across the three repetitions. In rare cases of self-correction, the participants clearly insisted on just one response. The participants understood the instructions and were using the novel affix (except for two additional subjects).

4.2.1 Frontness harmony

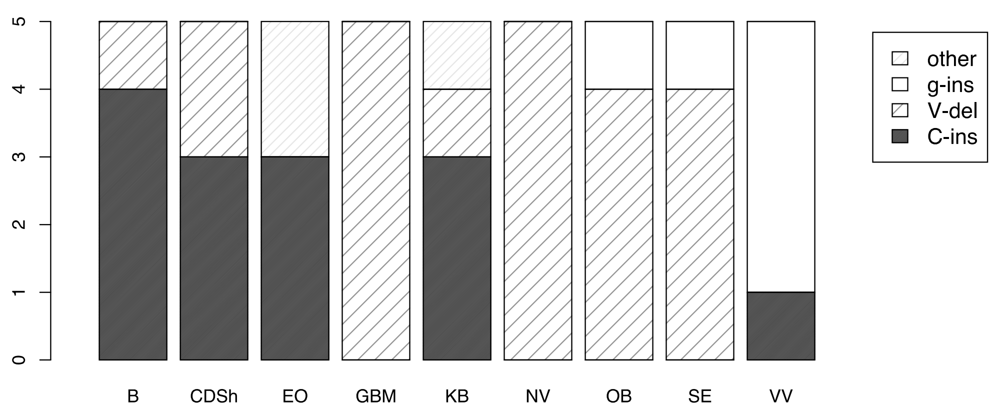
The participants correctly applied frontness harmony to the novel suffix in all cases. In total, the long vowel of the novel suffix correctly appeared as [ɘː/ɵː] after front-vowel stems in 32 responses, each participant provided at least three such responses. The long vowel of the suffix correctly appeared as [aː/oː] after back-vowel stems in 54 responses. These counts exclude the cases where the long vowel of the suffix was shortened (see 4.2.2), or where the first vowel of the suffix was deleted, in which case only a short suffixal vowel remained. Short vowels in non-first syllables are often subject to qualitative reduction, making the harmony class of the vowel hard to judge.

4.2.2 Hiatus resolution

The potential hiatus between a stem-final bimoraic nucleus and a long vowel of the novel suffix was always resolved. The strategies employed for hiatus resolution are summarized in (5) for each speaker.

Hiatus was resolved fairly consistently within each speaker. /g/-insertion was used as a hiatus strategy more or less reliably by only one speaker (VV, four out of five responses). The remaining speakers together produced only two /g/-insertion responses (one for each OB and SE), and the overall number of /g/-responses for these remaining speakers was not significantly different from zero (Fisher's exact test, $p = 0.25$). The /g/-responses for both OB and SE were produced with the same stem /buː/ 'gun, rifle', yielding the novel augmentative [buːʁaːba].

(5) *Buriat hiatus resolution with the novel affix*



Four speakers consistently employed vowel deletion in hiatus (GBM, NV, OB, SE). Vowel deletion was also commonly observed as an alternative response strategy for participants who overwhelmingly did insertion of a consonant other than /g/ (B, CDSh, EO, KB). This latter group of participants is rather heterogeneous. The inserted consonant was different for different participants. Two participants employed insertion of /r/, one participant inserted /l/, and one participant inserted /b/. The insertion of liquids is consistent with the fact that many training and filler consonant-final stems ended in /r l/ in the experiment. The responses coded as 'other' in (5) involved insertion of additional material, for example pronouncing the affix [-lulaːba] after a back-vowel stem.

In addition to hiatus repairs and harmony, the participants occasionally also applied other modifications to the novel affix. Shortening is perhaps most notable. The first vowel of the novel augmentative /-AːbA/ was shortened in all /r/-insertion repairs for participants B and KB (7 responses total). The suffix was realized as /rAbA/ in these cases. Shortening did not occur in any other responses. Occasionally other modifications were also applied to the novel affix with consonant-final stems. In these cases the affix appeared as /tAbA/, /bA/, or /VlAːbA/, where the first vowel copied the vowel of the stem.

4.3 Discussion

The consultants understood the task, correctly identified the meaning of the novel suffix in the feedback, and the participants used the novel augmentative (with the exception of two speakers whose data were excluded). For the most part, the participants also remembered and correctly reproduced the phonological form of the affix: the unexpected changes with consonant-final stems were relatively rare (only 7 responses out of 63). At the same time, the participants were not simply using the same string of segments all the time: they correctly varied the form of the affix according to the frontness harmony class of the stem. These observations suggest that the hiatus repair strategies may be indicative of the grammar of Kurumkan Buriat.

Although the relatively small number of items is a potential confound, the hiatus resolution strategies applied by the participants are suggestive of the morphological accounts for Buriat dorsal-zero alternations. The phonological insertion analysis predicts a general tendency to apply dorsal insertion with the novel suffix, but this prediction was not borne out. Dorsal insertion was used consistently by only one subject (VV).

On the other hand, the morphological accounts predict that a number of different hiatus repairs may be generalized, and that each speaker would tend to generalize one hiatus resolution strategy more than others. The observed response patterns generally match the predictions of the morphological accounts. The responses are fairly consistent within each speaker, but dorsal insertion is far from the only strategy generalized to repair novel hiatus. Thus, four consultants (GBM, NV, OB, SE) consistently generalized vowel deletion – the strategy observed in Buriat with short vowels. Four other consultants (B, CDSh, EO, KB) usually resolved hiatus via consonant insertion, consistent with postulating a floating segment that is part of the affix.

To summarize, the results of an experiment with the novel augmentative /-AːbA/ go against the view that Buriat has a phonological process of dorsal epenthesis, and instead support the idea that the dorsal-zero alternations are represented as properties of particular suffixal morphemes. The next section presents an analysis of the alternation which captures these results.

5. Analysis of the Buriat dorsal-zero alternation

The aim of this section is to spell out a possible morphological analysis of the Buriat dorsal-zero alternation. The approach presented here is casted within Optimality Theory (Prince & Smolensky 2004), and it relies on floating features to capture the fact that the alternation is morphologically prespecified (Trommer 2011, Bermúdez-Otero 2012). Similar generalizations can be encoded in other morphophonological frameworks such as indexed constraints (e.g. Pater 2006), sublexicon grammars (Becker & Gouskova 2016), or cophonologies (e.g. Inkelas & Zoll 2007).

I will assume that all affixes that trigger dorsal-zero alternations come with a floating feature DORSAL at the beginning, which will be written /ᵍ/ in underlying forms. Thus the application of the relevant alternation is encoded as part of the representation of the particular morphemes. The exact realization of Buriat /g/ depends on the quality of the vowels in the word: dorsal in front-vowel words and uvular in back-vowel words, with a possibility of intervocalic lenition. These alternations equally apply to all underlying dorsals, floating or not. In what follows I will abstract away from these alternations, which are somewhat unique in the typology of harmony processes since they present a case of an arguably non-local vowel-consonant place feature interaction (Padgett 2011, Rose & Walker 2011). Providing a theoretically-informed analysis of these alternations would lead us too far afield.

In Buriat, the floating dorsal can only be realized by inserting a root node,[3] in violation of the constraint DEP (McCarthy & Prince 1995). However segmental insertion is generally disallowed in Buriat, and therefore the floating DORSAL normally remains unassociated in violation of the constraint *FLOAT in (6).

(6) *FLOAT: assign a violation mark for every feature that is not associated to a segmental root node

(7) shows the attachment of the imperfective suffix /-ᵍAː/ to a consonant-final stem /xatar/ 'dance' (3c). This paper combines the comparative tableau format of Prince (2002) with numbers showing violation marks.

(7) *Floating dorsal is normally left unrealized*

	hʉːl-ᵍAːr	DEP	*FLOAT
☞ a.	hʉːl(ᵍ)ɘːr		1
b.	hʉːlgɘːr	W1	L

The winning candidate (7a) has a floating dorsal, shown in parentheses. These floating features remain unassociated, and hence not phonetically realized. The losing candidate (7b) represents an attempt to realize the floater that fatally violates DEP.

A more interesting case of floating dorsal non-realization comes from hiatus environments with a short vowel, e.g. /nabʃa-ᵍAːr/ → [nabʃaːr] 'leaves-INSTR' (2). In these

[3] Alternatively, the realization of the floating dorsal could be analyzed as splitting, i.e. creation of a root node corresponding to an underlying vowel (Staroverov 2014). The difference between the two approaches to epenthesis is irrelevant here.

cases inserting a root node could help to avoid a violation of ONSET (Prince & Smolensky 2004). Nevertheless, vowel deletion is preferred in this environment, because MAX is ranked below DEP. The analysis of Buriat vowel deletion in hiatus is presented in (8). Here and below the dots show syllabification.

(8) *Hiatus resolution via vowel deletion with short vowels*

	nabʃa-ᵍAːr	ONSET	DEP	MAX	*FLOAT
☞ a.	nab.ʃ(ᵍ)aːr			1	1
b.	nab.ʃa.ʁaːr		W1	L	L
c.	nab.ʃa(ᵍ).aːr	W1		L	1

Buriat does not tolerate word-medial onsetless syllables, and therefore when two vowels come together at a morpheme boundary hiatus has to be resolved, (8c) cannot win. However, it is better to delete a stem-final short vowel and leave the /ᵍ/ floating than to insert a root node (DEP >> MAX). Therefore the deletion candidate (8a) beats the insertion candidate (8b).

When two bimoraic nuclei come together, deletion is not applicable in Buriat. The special behavior of long vowels in hiatus environments is well-documented cross-linguistically (Casali 1998, Staroverov 2014). In Buriat, the set of protected vowels is further extended to include all bimoraic nuclei, i.e. long vowels and diphthongs. As we have seen, the diphthongs pattern together with long vowels in other respects as well (vowel harmony, stress assignment). Here I follow Casali (1998) and Beckman (1998) in assuming that bimoraic nuclei are protected by a special family of positional faithfulness constraints. In particular, MAX-BIMORAIC (9) protects bimoraic vowels from deletion.

(9) MAX-BIMOR(aic): assign a violation mark for every underlying bimoraic segment which does not have a correspondent in the output

MAX-BIMORAIC is ranked high enough to trigger violations of DEP. Therefore a consonant root node is inserted between two bimoraic nuclei, providing a docking site for the floating /ᵍ/. This is illustrated in (10) with the analysis of the mapping /xʉlʲɘː-ᵍAː/ → [xʉlʲɘːgɘː] 'wait-IPF' (3a).

(10) *Hiatus resolution via root node insertion between two long vowels*

	xʉlʲɘː-ᵍAː	ONSET	MAX-BIMOR	DEP	MAX	*FLOAT
☞ a.	xʉ.lʲɘː.gɘː			1		
b.	xʉ.lʲɘː(ᵍ)		W1	L	W1	W1
c.	xʉ.lʲɘː.(ᵍ)ɘː	W1		L		W1

The winning candidate (10a) keeps both input long vowels and avoids the potential ONSET violation through floating /ᵍ/ realization. The competitors on the other hand either delete a bimoraic nucleus (10b) or have a violation of ONSET (10c).

Of course, a bare root node together with dorsal place does not yield a full specification of a dorsal. It may be that some other features of the consonant alternating with zero are filled by additional processes. Some relevant features may also be inserted together with the root node. However at least one feature of the floating /^{g}/ is marked, and therefore it has to be underlying – that is the specification for [voice]. Thus the floating /^{g}/ should probably be more precisely represented as two floating features, not as one. However, it seems unnecessary to assume that the two floating features are underlyingly linked together (cf. Zoll 1996): their association to the inserted root node can be entirely independent. In fact, in many models of feature geometry there is no node lower than the root node which could bring together place and [voice]

On this account of Buriat, native data present no evidence of a general hiatus resolution strategy for sequences of two bimoraic vowels. As we have seen from the experimental data in section 4, such sequences are typically resolved either via vowel deletion or via postulating some floating consonant. Crucially, bimoraic vowel deletion was attested in the experiment. The experimental data thus could be used as evidence for further refining our grammatical model of Buriat. The responses with long vowel deletion evidently do violate MAX-BIMORAIC, which we were assuming to be top ranked so far. However, in the absence of a floating /^{g}/, consonant epenthesis would always involve insertion of place features. We can therefore assume that Buriat prohibits place insertion via a ranking DEP-PLACE >> MAX-BIMORAIC, relevant at least for the speakers who produced long vowel deletion in the absence of a floater.

The proposed grammar of Buriat hiatus correctly predicts that the floating /^{g}/ should be highly restricted in its distribution: it is found in a suffix-initial position before a bimoraic nucleus. According to Richness of the Base, we have to consider inputs where floating /^{g}/ would occur in other environments, but none of these inputs would give surface evidence of a dorsal-zero alternation. Indeed, if /^{g}/ occurred next to a short vowel or next to a consonant, it would not have a chance to be realized, since its realization is always triggered by MAX-BIMORAIC. On the other hand, if /^{g}/ occurred morpheme-internally between two bimoraic nuclei it would always be realized, and thus equivalent to a fully specified /g/. In both of these cases, the learner would fail to postulate a floating segment because input optimization (Prince & Smolensky 2004) would crucially rely on the constraint prohibiting floating material, namely *FLOAT. The only environment where a floating /^{g}/ can be reasonably postulated is at an edge of a morpheme, next to a bimoraic nucleus. Since Buriat has no prefixes and very limited compounding and reduplication, this is equivalent to the environment where /^{g}/ actually occurs.

To summarize, this section has provided an autosegmental account of the Buriat dorsal-zero alternation. This account does not postulate a general dorsal insertion process, it is compatible with the evidence in section 4, and it correctly derives the distribution of the floating /^{g}/.

6. Conclusion and implications

This paper has provided a detailed examination of the Buriat dorsal-zero alternation, based on new experimental data from the Kurumkan dialect. I presented preliminary evidence that the speakers of Buriat do not have a productive phonological dorsal insertion pattern. When Buriat speakers were taught a novel augmentative suffix /-Aːb A/, many speakers failed to generalize dorsal insertion to this suffix. The experimental responses matched the predictions of the morphological account of the alternation: several speakers resolved hiatus via vowel deletion (a strategy attested with short vowels) while other speakers inserted a consonant, consistent with guessing the floating segment that may be present on the affix. Only one speaker consistently inserted a dorsal.

A theoretical model of the Buriat dorsal-zero alternation was proposed in section 5. The model encodes the quality of the alternating segment as an underlying property of the relevant affixes. These affixes bear a floating feature DORSAL whose realization is governed by the phonology of Buriat. The model is compatible with the experimental results, and it correctly accounts for the distribution of dorsal-zero alternations.

The analysis of the Buriat dorsal-zero alternation has significant theoretical consequences in at least three domains: treatment of consonant insertion, phonological markedness, and learning biases. In many existing approaches to insertion (de Lacy 2006, Lombardi 2002, de Lacy & Kingston 2013), epenthetic quality can show the effects of the emergence of the unmarked or TETU (McCarthy & Prince 1994). Since the epenthetic segments are assymed to lack an input correspondent their quality can be determined by the markedness constraints, e.g. the place markedness hierarchy. Thus Buriat could be a potential test case for the place markedness hierarchy, since the same segment appears between any two vowels, and hence no context-specific constraints are at stake (barring the general dorsal/uvular alternation). In fact, Buriat has been cited as a counterexample to the relatively marked status of dorsal consonants (Rice 2008, Morley 2015, Vaux & Samuels 2015). However, the results in this paper suggest that the Buriat data could be irrelevant to the theory of markedness, because the quality of the epenthetic segment is not regulated by the phonology, but results from lexical specification. In other words, the Buriat data seem to do little to either support or refute the theory of place markedness. My results also show that it is hard to find clear examples of default consonant insertion (Morley 2015).

The Buriat pattern is also expected to be relatively marked on the perceptual grounds. Thus a growing body of literature argues that alternations between perceptually close sounds are easier to learn than those spanning a larger acoustic distance (Wilson 2006, White 2014, Hayes & White 2015). VV sequences are most phonetically similar to V-glide-V out of all potential VCV sequences (Delattre et al. 1955, Liberman et al. 1956, Wright 2004). Thus intervocalic dorsal insertion involves a relatively large perceptual change, and it is therefore expected to be disfavored by a learning bias (Steriade 2008, White 2014). This paper suggests that despite the relatively robust evidence, the Buriat dorsal-zero alternation is not represented as a fully general pattern by many speakers. This finding is consistent with the prediction of the learning bias for perceptually minimal changes.

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