

Buriat dorsal epenthesis is not reproduced with novel morphemes

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Abstract

In Buriat, the consonant realized contextually as dorsal or uvular alternates with zero at stem-suffix boundaries. This alternation has been analyzed as phonological epenthesis and has been known as a challenge to the existing theories of phonological markedness. The analysis of this alternation has also been debated. This paper presents new fieldwork and experimental ‘wug-testing’ evidence addressing the productivity of the reported epenthesis pattern. The results do not fully support the phonological insertion account of the alternation. An alternative analysis of Buriat dorsal-zero alternation in terms of floating features is proposed.

1 Introduction

The analysis of alternations between a consonant and zero is associated with a long-standing problem – the deletion-insertion ambiguity (Hale 1973; McCarthy 1991; Baković 1999; Morley 2015). Both kinds of analyses have been proposed for many known cases such as English dialectal r-zero alternations (McCarthy 1991; 1993; Harris 1994; Baković 1999; Gick 1999 a.o.), French liaison (Klausenburger 1974; 1977; Churma 1977; Tranel 1981; 1996; Wetzels 2002 a.o.) or Maori passive (Hale 1973; de Lacy 2003 a.o.). The typology of consonant-zero alternations is accordingly debated (Lombardi 2002; de Lacy 2002; 2006; Rice 2008; Blevins 2008; Hall 2013; Staroverov 2014), and Morely (2015) argues that it may not be possible to come up with general criteria that would differentiate between deletion and insertion cross-linguistically.

Buriat presents a famous and controversial case of consonant-zero alternations where the consonant realized contextually as dorsal [g, ɣ] or uvular [ɢ, ʁ] alternates with zero at stem-suffix boundaries between any two bimoraic vowels (Poppe 1938; 1960; Sanžeev 1941; Sanžeev, Bertagaev & Tsidendambaev 1962; Čeremisov 1973; Skribnik 2003). Although this alternation has been analyzed as phonological epenthesis (Rice 2008; Morley 2015; Vaux & Samuels 2017, Samuels and Vaux 2019), several arguments against a productive epenthesis process have been presented. Many existing theories of markedness assume that coronal epenthesis is universally preferred to dorsal epenthesis, and since Buriat has coronal consonants, these theories imply that the Buriat alternation is suppletive or lexicalized (de Lacy 2006; de Lacy & Kingston 2013). Relatedly, a pattern of dorsal insertion would constitute a perceptually non-minimal change or saltation, and we would therefore expect a learning bias against this pattern, based on the results of White (2014). Indeed the VV sequences are phonetically most similar to V-glide-V (Delattre, Liberman & Cooper 1955; Liberman et al. 1956; O'Connor et al. 1957; Wright 2004), but the inserted consonant is not a glide. Finally, some results from artificial grammar learning experiments also speak for a bias against all productive epenthesis rules (Morley 2017).

Many well-known phonological alternations have been argued to be unproductive (Alderete & Kochetov 2009; Zhang & Lai 2008; Zhang, Lai & Sailor 2011; Zhang 2016 a.o.), and for Buriat this is suggested by Staroverov (2016). Thus the inherent ambiguity of consonant-zero alternations as well as the theoretical expectations and preliminary results

outlined above all call for a detailed investigation of the psychological reality of Buriat dorsal insertion.

This paper presents new elicitation and experimental evidence in order to test whether the reported epenthesis pattern is productive. The results of an experiment using wug test methodology do not fully align with the hypothesis of a general insertion process, since only one speaker out of nine consistently generalized the reported dorsal/uvular insertion pattern. However, a more extensive experimental study may be needed to fully establish these results. New elicitation data on numerals also do not show consistent generalization of /g/-insertion.

Motivated by these new results, I propose an alternative account of the Buriat facts where the dorsal/uvular consonant alternating with zero corresponds to an underlying floating feature (e.g. Zoll 1996), similar to a featural affix (Akinlabi 1996; 2011). The paper explores the implications of this new account, and the ways of testing its predictions.

After introducing some background on Buriat (section 2), the potential accounts of the dorsal-zero alternation are introduced in section 3. Section 4 considers new elicitation evidence that bears on the possibility of dorsal epenthesis and section 5 presents the experiment. The proposed alternative analysis is laid out in section 6, and section 7 concludes.

2 Buriat basics

This section briefly surveys the aspects of Buriat phonology relevant to dorsal-zero alternations. All the data in this article come from the author's field investigation of the Barguzin dialect of Buriat (Radnaev 1965), as spoken in the village of Baragkhan (see also Bondarenko (2017a; 2017b; 2018a; 2018b) for some recent results on the syntax of this dialect). Unless otherwise noted, the generalizations do not differ substantially from Standard Buriat. More details on the consultants can be found in section 5.1.3. The transcription used here adheres to IPA.

The vowel inventory of Barguzin Buriat is given in (1).¹ Except for /ei/, all of these vowels contrast in the first syllable, while /ei/ only occurs in non-first syllables. The vowel inventory includes underlying short vowels, long vowels and diphthongs. On the surface, some underlying diphthongs appear as long monophthongs, but their underlying status is revealed in vowel harmony which is controlled by the first member of the underlying diphthong. In a number of morphemes /oi/ is realized close to [e:] in the Barguzin dialect, these morphemes pattern with other instances of /oi/ [œe] with respect to harmony.

(1) Buriat vowel inventory

Underlying monophthongs			Underlying diphthongs				
i i:	ʊ ʊ:	u u:	/ai/ ε:	/oi/ œe	/ui/ ui	/ɰi/ yi	/ei/ e:
ə ə:	ə:	o o:					
	a a:						

Non-first syllables present a reduced vocalic inventory lacking the short [u ʊ]. The vowels in non-first syllables are also subject to phonetic reduction which is not marked in our

¹ Vowel quality is reported based on my preliminary formant measurements. Compared to Standard Buriat (Buraev 1959; Radnaeva 2003a; 2003b; 2006; 2008), the high rounded vowels appear to be [ʊ ʊ:] rather than [u ʊ:]. The mid front vowels are centralized [ə ə:] rather than [e e:]. The non-high vowels transcribed [o a] here can have a quality closer to the Standard Buriat [ɔ a], but my data are not sufficient to firmly establish the general pronunciation of these vowels in Barguzin Buriat.

transcription: long vowels are shorter and short /o a/ are realized with a schwa-like quality (see Svantesson et al. (2005) on a similar reduction process in Mongolian).

Buriat has vowel harmony in frontness and rounding. Rounding harmony is not immediately relevant to our purposes, and while it is described somewhat differently in my main sources (Poppe 1960; Sanžeev, Bertagaev & Tsidendambaev 1962; Skribnik 2003) the studied dialect seems to match the description of Skribnik (2003). The principles of frontness harmony also mostly match what's reported for Standard Buriat. In what follows we use frontness harmony as a standard for productive processes, and compare its productivity to that of dorsal-zero alternations (see also Poppe 1960: 21). All vowels within a word agree in frontness, hence every word may contain either the vowels from a relatively back set /a a: ai o o: oi u u: ui/ or the vowels from a relatively front set /ə ə: ei ɛ ɛ: ʌ ʌ: ʊi/. The frontness value of the word is controlled by the first syllable vowel. The vowels /i i:/ act as neutral occurring in both kinds of words. /i:/ triggers front harmony, if it occurs in the first syllable. The phonetic basis of frontness harmony is obscured by the realization of diphthongs, e.g. /ai/ patterns as a back vowel even though it is realized as a front vowel [ɛ:].

The set of vowels in non-first syllables is limited to only seven underlying options, which will be symbolized as follows: /A/, /Ai/, /A:/, /U:/, /Ui/, /i/, /i:/. The so-called particles, such as the negation /gʷi/ [gyi] are known to escape harmony and start their own harmony domain (Poppe 1960). The studied dialect also has a number of non-harmonizing suffixes which are absent in Standard Buriat. The particles and non-harmonizing dialectal suffixes will be written here with an underlying lower case vowel symbol.

The Buriat consonant inventory is presented in (2). The segments in parentheses occur only in loanwords.

(2) Buriat consonants

(p) b	p ^j b ^j	t d	t ^j d ^j	(k) g/G	g ^j
(f v)	(f ^j v ^j)	s s ^j z z ^j	ʃ ʒ	x/χ	x ^j /χ ^j fi
		(ts)	(tʃ)		
m	m ^j	n	n ^j		
		l	l ^j		
		r	r ^j		
(w)			j		

The phonetic realization of voiced dorsal /g/ (both underlying and 'epenthetic') varies with the vowel harmony class of the word. In front-vowel words this segment appears as [g], and sometimes undergoes lenition to [ɣ] intervocalically. In back-vowel words it appears as uvular [G] and frequently lenites to [ɣ] 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 here.

Buriat allows syllables to begin with a vowel only word-initially. Native Buriat words disallow onset clusters and only allow [ŋg] as a complex coda. The syllable structure for native words is thus CVCC word-medially and (C)VCC word-initially. Loanwords (mainly from Russian) allow larger consonant clusters in both onset and coda. A description of stress in the

studied dialect is left for future research. See Poppe (1960) and Walker (1994) for a description of stress in Standard Buriat.

3 Buriat dorsal-zero alternation

This section describes the patterns of hiatus resolution in Buriat (3.1). In order to assess the predictions for novel items, the possible alternative analyses of the /g/-zero alternations are presented (3.2 – 3.5).

3.1 Hiatus resolution: the data

Barguzin Buriat allows no word-medial vowel-initial syllables, and this generalization is also known from the descriptions of Standard Buriat (Sanžeev 1941; Poppe 1960). Diphthongs, that is sequences of vowels within a syllable, are allowed, e.g. [æɛ, ui, yi]. Buriat has no prefixes, so only suffixal boundaries are relevant to hiatus resolution. Although the underlying representations for some of the examples are debated, unambiguous surface morpheme boundaries are shown for ease of reference. The symbol ‘(g)’ will be used to refer to the dorsal alternating with zero, where its underlying status is left unspecified.

To set the scene, the behavior of *consonant-final stems* is illustrated in (3).² These stems end in a consonant in isolation, or before consonant-initial suffixes such as /xA/ ‘infinitive’ (3a). In (3b) these stems are followed by the *vowel-initial suffixes*. Most vowel-initial suffixes uncovered so far begin with a long vowel or diphthong. Although Barguzin Buriat has a couple vowel-initial suffixes starting with a short vowel, these suffixes do not trigger /g/-insertion and are thus irrelevant.

(3) Buriat consonant-final stems and vowel-initial affixes

- a. [xatar-xa] ‘dance-INF’
[bʉrgəd] ‘eagle’
[hʉ:l] ‘tail’
- b. [xatar-a:] ‘dance-IPF’
[bʉrgəd-ə:r] ‘eagle-INSTR’
[hʉ:l-ə:r] ‘tail-INSTR’
[bʉrgəd-a:n] ‘eagle-ABL.DIAL’

The examples in (4) illustrate the stems that I’ll refer to as *short vowel stems*. These end in a short vowel in isolation (4a). When short-vowel stems are followed by vowel-initial suffixes, hiatus is resolved by vowel deletion, as shown in (4b).

(4) Buriat short vowel stems and vowel deletion

- a. [nabʃa] ‘leaves’
[ʃono] ‘wolf’
- b. [nabʃ-a:r] ‘leaves-INSTR’
[ʃon-a:n] ‘wolf-ABL.DIAL’

² The following abbreviations are used in glosses: ABL.DIAL – dialectal ablative; CAUS(ative); COMIT(ative); DAT(ive); FREQ(uentative); INF(itive); INSTR(umental); IPF – imperfective; PASS(ive); PL.IMP – plural imperative; PST – past.

The /g/-zero alternations happen after *long vowel stems* (5). These stems end in a long vowel or a diphthong in isolation or before a consonant-initial suffix (5a). When long vowel stems are followed by (long) vowel-initial suffixes, a dorsal/uvular sound appears between the two vowels. The surface [g, ɣ, ɠ, ʁ] allophones are distributed according to the general pattern of /g/-realization (see section 2). The dorsal also appears between the comitative suffix [tɛ:] which is shown word-final in (5c), and the instrumental which was illustrated in (3). The comitative + instrumental combination is shown in (5d).³

(5) Buriat long vowel stems and the /g/-zero alternation

- a. [xʊlʲə:-dəg] ‘wait-FREQ’
[bu:] ‘gun, rifle’
[taxʲa:] ‘hen’
- b. [bu:ʁa:r] ‘rifle-INSTR’
[xʊlʲə:gə:] ‘wait-IPF’
[taxʲa:ʁa:n] ‘hen-ABL.DIAL’
- c. [fʉrga:l-tɛ:] ‘education-COMIT’
- d. [bajartɛ:ʁa:r] ‘pleasure-COMIT-INSTR’

To summarize, while a potential sequence of a short + long vowel triggers vowel deletion in Buriat (4), the potential sequences of bimoraic vowels show up with a surface dorsal (5b,d). This dorsal segment is absent on the relevant stems and suffixes in other contexts (3),(5a,c). The stem classes in (3-5) are quite pervasive in Buriat: they all include a large number of stems. The following suffixes trigger the /g/-zero alternation in the studied dialect: /(g)A:r/ ‘instrumental’; /(g)a:n/ ‘ablative (dialectal)’; /(g)A:d/ ‘approximative’; /(g)A:/ ‘imperfective, imperfective participle’; /(g)a:n/ ‘perfective, perfective participle (dialectal)’; /(g)A:ʃA/ ‘habitual participle’; /(g)A:d/ ‘perfective gerund’; /(g)A:rAi/ ‘future imperative’; /(g)i:/ ‘non-future 2nd person imperative’; /(g)U:ʒAn/ ‘non-future 3rd person imperative’.⁴ Finally, the suffix-suffix combinations are rather restricted but the comitative + instrumental sequences illustrated in (5c-d) also show /g/-zero alternations.

3.2 Deletion account and the non-alternators

In order to narrow down the space of possible hypotheses about Buriat data, this section presents evidence against a deletion analysis (Uffmann 2014). The deletion account has two varieties exemplified in (6) with stems and suffixes from (3-5). On the one hand, long vowel stems could underlyingly end in /g/, coupled with word-final and pre-consonantal /g/-deletion (6a). On the other hand, vowel-initial suffixes could start underlyingly in /g/, and in this case /g/ would be deleted after consonants (6b).

³ The combination of comitative and instrumental affixes also has a fast speech dialectal variant /tʲAAr/ showing apparent vowel deletion, e.g. /noxoi-tAi-A:r/ [noxœtʲor] ‘dog-COMIT-INSTR’.

⁴ This list is similar to that compiled by Morley (2015) for Standard Buriat, but it includes a few dialectal morphemes and excludes the morphemes which are not used in the studied dialect. In addition to these, Poppe (1960) also lists a number of derivational suffixes which start with a long vowel but which are not recorded after stems ending in long vowels (see also Morley 2015: fn 10). These derivational affixes are of limited productivity: they do not attach to the relevant stems, and some are absent in the studied dialect altogether.

(6) Deletion analyses of the Buriat data

Stem URs: examples	Suffix URs: examples	Deletion examples
a. /xʌlʲə:g/ ‘wait’; /xatar/ ‘dance’	/A:/ ‘IPF’; /dAg/ ‘FREQ’	/xʌlʲə:g-dAg/ → [xʌlʲə:dəg] ‘wait-FREQ’
b. /xʌlʲə:/ ‘wait’ /xatar/ ‘dance’	/gA:/ ‘IPF’; /dAg/ ‘FREQ’	/xatar-gA:/ → [xatara:] ‘dance-IPF’

Although an analysis along these lines has been considered by Uffmann (2014) and Morley (2015), some additional predictions have not been fully explored. If Buriat phonology included one of the deletion processes in (6), then we would expect that g+C or C+g clusters would be absent, or at least restricted in Buriat. The examples of non-deletion of /g/ next to a consonant are thus potential counterexamples to the deletion accounts. Hall (2013) argues for a similar criterion applied to rhotic-zero alternations.

However, both my elicitations and the existing descriptions of Standard Buriat present multiple examples of C+g and g+C sequences across a variety of morphological environments. Some examples are given in (7a) for gC sequences and in (7b) for Cg sequences.

(7) Preservation of /g/ next to a consonant

- a. [bəsəg-tə] ‘letter-DAT’
[zurak-ta] ‘drawing-DAT’
[tanʲi-gda-ba] ‘recognize-PASS-PST’
[jaba-gti:] ‘walk-PL.IMP’
- b. [ɛ:-lga:] ‘fear-CAUS.IPF’
[malgɛ:] ‘(winter) cap’
[xargi:] ‘road’
[ba:bge:] ‘bear’

Thus Buriat has a good deal of stems which end in a non-alternating /g/, illustrated by the first two examples in (7a). Buriat also has a number of suffixes beginning in a non-alternating /g/, illustrated by the suffixes /-gda/ ‘passive’ and /-gti:/ ‘plural imperative’ in (7a). (7b) shows consonant + g sequences stem-internally and suffix-initially. The suffixes which would begin in /g/ followed by a vowel seem hard to come by, but given that both g+C and C+g sequences are abundant it is not clear how this gap could be incorporated in a possible deletion analysis.

To summarize, the potential accounts where /g/ is deleted before or after a consonant face multiple counterexamples from g+C and C+g clusters. The abundance of counterexamples to /g/-deletion can be taken as evidence against the deletion accounts, and other accounts do not face this problem. The only potential argument for deletion accounts could come from the absence of suffixes starting in a g+V sequence but since suffixes are a closed class, this gap could be accidental. I will not be considering the deletion analysis in what follows, while acknowledging that further work may be needed to show that the lack of g+V-initial suffixes is a non-productive generalization.

This section has argued that the presence and generality of a consonant deletion process can be falsified by considering potential counterexamples, i.e. instances where /g/ does not alternate with zero in appropriate environments. Hall (2013) applies a very similar criterion in a typological study of rhotic-zero alternations. These results go against the idea that deletion is not distinguishable from insertion cross-linguistically (Morley 2015).

3.3 Insertion account

The insertion account of the /g/-zero alternation is schematized in (8), based on the examples in (3-5) (see also Rice 2008; Morley 2015; Samuels & Vaux 2019).

(8) Insertion analysis of the Buriat data

Stem URs: examples	Suffix URs: examples	Insertion examples
/xʌlʲə:/ ‘wait’;	/A:/ ‘IPF’	/xʌlʲə:-A:/ → [xʌlʲə:gə:] ‘wait-IPF’
/xatar/ ‘dance’		/xatar-A:/ → [xatarə:] ‘dance-IPF’

On this analysis, the long vowel stems underlyingly end in a vowel, and vowel-initial suffixes have no initial underlying consonant. A voiced dorsal consonant is inserted between any two bimoraic nuclei. The potential counterexamples to this analysis would be cases of unresolved hiatus, but these do not occur either in the elicitation results or in the existing descriptions. The insertion process described above also seems to be fairly general morphologically, i.e. it applies with a large number of suffixes and in all recorded cases of relevant suffix-suffix boundaries. De Lacy and colleagues cite two affixes which involve suppletive alternations instead of /g/-insertion in a similar context (de Lacy 2006; de Lacy & Kingston 2013), these will be discussed in more detail in section 3.4 below. However, the number of suppletive suffixes is small, compared to the number of suffixes which trigger the /g/-zero alternation (see also Morley 2015).

However, as outlined in section 1, there are a few theoretical arguments against a general process of dorsal insertion. Although an insertion account seems to capture the Buriat data relatively well, both the place markedness theory of epenthesis (de Lacy 2006) and the existing evidence for an anti-saltation bias in learning (White 2014) lead us to expect that dorsal insertion may be nonproductive or underlearned (Hayes et al. 2009; Zhang, Lai & Sailor 2011), even in the presence of relatively robust evidence.

3.4 Morphological accounts

This section describes possible approaches to the Buriat /g/-zero alternations where the alternation is not handled by the productive phonology of the language. This idea can be implemented in a number of ways. For example, the data in (5) could stem from a pattern of phonologically-conditioned suppletion (de Lacy 2006; de Lacy & Kingston 2013). On the suppletion account, the vowel-initial affixes have a lexically stored /g/-initial variant, thus the instrumental affix would have allomorphs /gA:r/ and /A:r/. An important assumption behind the suppletion analysis is that g-zero alternation is limited to only a few suffixes, and it is a mere accident that these affixes have a very similar pattern of suppletive allomorphy (de Lacy & Kingston 2013: 304). Although Buriat does have some affixes that exhibit irregular hiatus resolution strategies such as the reflexive accusative, the number of affixes triggering the dorsal-zero alternation is quite large (see section 3.1 and Morley (2015)), and therefore it seems unlikely that all of these affixes accidentally have the same suppletive allomorphs.

Another possible morphological account would assume that all relevant affixes start with a floating feature DORSAL (Zoll 1996; Akinlabi 1996), or possibly a bundle of features, which I

will write as /^g/. This account is summarized in (9). The floating /^g/ is realized only between two bimoraic nuclei, and otherwise it is left unrealized.

(9) Floating /g/ analysis of the Buriat data

Stem URs: examples	Suffix URs: examples	Floater realization examples
/xʌlʲə:/ ‘wait’;	/ ^g A:/ ‘IPF’	[xʌlʲə:gə:] ‘wait-IPF’;
/xatar/ ‘dance’		[xatara:] ‘dance-IPF’

On this account, Buriat phonology handles the realization and non-realization of the floating features, but the quality of a consonant alternating with zero is specified underlyingly for each affix. The floating /^g/ account seems to capture the syllabic motivation for the realization of a dorsal. However, on this story it is a coincidence that so many suffixes have /g/ rather than some other consonant alternating with zero.

Finally, one could assume that the floating /^g/ is part of the stem, but this possibility is not entertained here for two reasons. First, the stems are an open class, and it seems that it would be a highly unlikely coincidence that all stems that have a final syllable with a bimoraic vowel and no coda, also have a floating /^g/. Second, many of the relevant stems show a morphologically governed /n/-zero alternation in other environments (see section 4), and it is not clear how the floating /^g/ on the stem would combine with floating /ⁿ/.

To summarize, this section has presented the possible morphological accounts incorporating the assumption that the dorsal-zero alternation is encoded in the lexicon, at least partially. While these accounts capture the data, they seem to face an issue in explaining the fact that dorsals alternate with zero according to the same set of rules with a large number of suffixes.

3.5 Summary and predictions

This section has considered the possible treatments of the dorsal-zero alternation in Buriat. The deletion analysis faces multiple counterexamples from unresolved C+g and g+C clusters, and therefore it will not be considered here further (pace Morley 2015). According to the insertion account, Buriat has a general phonological alternation inserting a dorsal between two bimoraic nuclei (Morley 2015; Vaux & Samuels 2017). On the other hand, according to the morphological accounts, the dorsal alternating with zero is part of the underlying specification of the relevant suffixes (de Lacy 2002; 2006; de Lacy & Kingston 2013; Uffmann 2014). The morphological accounts have to assume that a large number of suffixes accidentally match in their morphophonological behavior.

Importantly, the two accounts make different predictions for the productivity of dorsal-zero alternations. These predictions specifically apply to new affixes, since morphological accounts postulate that the alternating dorsal is part of an affix.⁵ The phonological insertion account predicts that new and unfamiliar suffixes that start in a long vowel will trigger the application of dorsal insertion. On the other hand, the morphological account assumes that the long-vowel-initial suffixes listed in section 3.1 underlyingly start with a floating /^g/. Its predictions will then be distinct from those of the phonological insertion story, provided that two assumptions are true.

First, I assume that the existence of native affixes starting with a floating /^g/ does not *by itself* force the learner to postulate a floating /^g/ when novel suffixes are encountered. If such

⁵ However it is useful to think about the implications of the morphological accounts for novel stem + native affix combinations. I leave this issue for future research, and I thank an anonymous reviewer for pointing this out.

an automatic generalization existed, it would make the morphological account empirically indistinguishable from the phonological insertion story. Second, I propose that the postulation of a latent segment or of floating features on a novel affix only occurs if the learner gets positive evidence of an alternation. For most native affixes in section 3.1, such evidence is encountered in Buriat inflectional morphology. However, when there is no positive evidence of dorsal-zero alternation, the speakers may generalize the native hiatus resolution strategies (vowel deletion, /g/-insertion) or attempt to guess the floating features on the suffix.

To summarize, if the phonological insertion analysis is empirically different from the morphological accounts at all, they will differ on novel and unfamiliar affixes. Therefore the difference between the two accounts can be addressed with productivity experiments (Berko 1958) as well as with recovery experiments (Chuang, Chang & Hsieh 2011).

The rest of this paper presents new evidence of how Buriat speakers treat new or unfamiliar suffixes. Section 4 presents new elicitation results on the suffix /-A:dA:r/ which attaches to numerals and carries an adverbial distributive meaning (e.g. ‘in pairs’, ‘in bundles of three’ etc). Section 5 reports on the results of an experiment with a made-up augmentative suffix /-A:bA/.

4 The numeral distributive

Experiments with made-up ‘wug’ non-words have served as a way of assessing speakers’ knowledge of rules since Berko (1958). However, using the ‘wug’ items does not always guarantee that the speakers will treat these as native words, and it does not exclude the possibility that the non-application of native phonological rules is due to failed nativization (Chuang, Chang & Hsieh 2011). As a way to address this concern, this section reports on a native suffix that commonly occurs with only a few stems – the numeral distributive /-A:dA:r/. Combining this suffix with stems with which it was probably never seen before shows whether /g/-insertion may be internalized as a general phonological process by the speakers.

The numeral distributive is roughly translated ‘in bunches of size X’ where X is determined by the numeral stem. The suffix is expected to commonly occur with the numeral /xo:jo:r/ ‘two’ (in contexts of people working, walking etc. in pairs), and perhaps with the stem /zu:n/ ‘hundred’ (in contexts of exchanging a larger bill in bills of a hundred). It is likely that the consultants never produced, and perhaps never heard, this affix with a variety of other numerals. This affix thus serves as a potential novel environment for /g/-zero alternations. On the phonological insertion account, the amount of exposure to this particular suffix with particular stems should not matter, since Buriat dorsal insertion is a general phonological alternation affecting all sequences of bimoraic vowels. On the morphological account however, encountering the suffix with only a few stems may not constitute enough positive evidence to postulate a latent segment as part of the suffix, and therefore other hiatus resolution strategies may arise in the novel contexts.

The examples in (10) illustrate the underlying shape of numeral distributive, and of some numeral stems. The distributive surfaces with a long vowel after numeral stems ending in a short vowel or in a consonant (10a). On the other hand, the numeral stems which end in a bimoraic vowel do trigger dorsal-zero alternations in the instrumental (10b).

(10) Numeral distributive and numeral stems contain a long vowel

a. Numeral distributive with consonant-final stems

/xo:jo:r-A:dA:r/ [xo:jo:do:r] ‘in bundles of two’

/taba:n-A:dA:r/ [taba:da:r] ‘in bundles of five’

b. Numeral stems with other suffixes

/zurga:-A:r/	[zurɕa:ɕa:r] ‘six-INSTR’
/dolo: ⁿ -A:r/	[dolo:ɕo:r] ‘seven-INSTR’
/zu: ⁿ -A:r/	[zu:ɕa:r] ‘hundred-INSTR’

Some of the stems in (10b) end in a /V:ⁿ/ sequence containing a floating /ⁿ/. The distribution and realization of floating /ⁿ/ is entirely morphological: some stems have /ⁿ/ while others do not, and /ⁿ/ is obligatorily realized in some morphological contexts (e.g. the nominative) and never in others (e.g. the instrumental). We can assume that morphology determines if /ⁿ/ is realized or not, hence for phonological purposes stems in /ⁿ/ either have a final consonant (in some forms) or end in a vowel (in others). As a result, when the floating /ⁿ/ is not realized, the /V:ⁿ/ stems pattern exactly as long vowel stems, and hence a dorsal appears after these stems and before bimoraic vowel-initial suffixes (10b). Whenever possible, I use the stems clearly ending in a bimoraic vowel without /ⁿ/ to illustrate dorsal-zero alternations. However, since numeral stems are a small class and many numerals end in /V:ⁿ/, such stems are also cited here as relevant.

The insertion account makes a prediction about the combination of the numeral distributive with the stems in (10b): dorsal epenthesis is expected to occur in this case. This prediction is not fully confirmed, as illustrated by the data in (11). All forms here come from two consultants. The same forms elicited from one additional consultant exhibited some variation: on one session the pattern in (11) was produced whereas on a later session, the numeral distributive triggered g-zero alternations with all the stems in (11).

(11) Numeral distributive with stems ending in a bimoraic nucleus

/zurga:-A:dA:r/	[zurɕa:da:r] ‘in bundles of six’
/dolo: ⁿ -A:dA:r/	[dolo:do:r] ‘in bundles of seven’
/zu: ⁿ -A:dA:r/	[zu:ɕa:da:r] ‘in bundles of a hundred’

Overall, the numeral distributive consistently shows up with a dorsal only when attached to the numeral /zu:ⁿ/ ‘hundred’. The other numeral stems ending in a bimoraic nucleus exhibit some variation, most commonly showing vowel deletion with the distributive. The resistance of this suffix to dorsal epenthesis is unexpected on the phonological insertion account.

5 Experimental evidence: the new augmentative

The experimental part of this study addresses the question of how dorsal-zero alternations are applied with completely new, previously unseen morphemes. This study focuses on a wug test (Berko 1958) with novel affixes (Tessier 2012). Another way to address similar questions would be to do a recovery experiment (Chuang, Chang & Hsieh 2011) – present the native speakers with a form containing a dorsal and a novel affix, and test if they ‘recover’ the suffix without a dorsal with other stem types. The recovery experiments are left for future research, but I thank an anonymous reviewer for suggesting these to me.

Since morphological accounts postulate that the alternating dorsal is part of an affix, the wug test was conducted with a novel affix, rather than with novel stems. Indeed, both a phonological rule of /g/-insertion and a morphophonological account where relevant native affixes start with floating /^g/ predict that novel stems will show a surface dorsal when attaching native affixes. The participants were taught a new affix /A:bA/ with an augmentative meaning. Native augmentatives are absent in Buriat. This section details the experimental methods (5.1) and results (5.2), and ends with some summarizing discussion (5.3).

5.1 Method

5.1.1 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.⁶ The participants were instructed to name the object they see in Buriat using the phrase [ənə __] ‘This is ____’. The main experiment used the same pictures as those in the picture naming task. The stimulus set for each participant was designed to include only the words that he or she volunteered as a first reaction to the relevant picture. Although an effort was made to keep the stimulus set constant across participants, there were some inevitable differences. First, some of the participants occasionally failed to provide the intended Buriat word (usually replacing it with a Russian analog, or providing only a more general term such as *bird* for picture of an *eagle*). Second, some of the relevant words were found to have both a dialectal and a literary variant, e.g. *saw* /x^hurə:/ [x^hurə:] (literary); /x^hare:/ [x^hare:] (dialectal). In these cases, the form that the given consultant volunteered first was used in the experiment, provided that it was of the relevant phonological shape.

All stems used in the main experiment were between one and three syllables long. All stimuli were embedded in a carrier sentence [ənə __] ‘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 (S09) received seven training items, one received six (S11), and one – five (S10). 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 recording conditions described below in 5.1.2. 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. The vowels of the novel affix in modified stimuli varied according to the rules of vowel harmony (Poppe 1960). 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 the Powerpoint presentation for the experiment. All training stimuli were embedded with the maximal loudness setting of Powerpoint. The training stimuli always included stems of different frontness harmony classes, which means that the novel affix was always changing its shape according to the rules of vowel harmony.

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

⁶ Due to power outages, an Ipad 2 was used for picture naming with two participants. All participants did the main experiment with the same notebook computer.

were potential cases of hiatus. The relatively small number of items per participant was motivated by the fact that pilot subjects exhibited visible signs of tiredness and started to modify the shape of the novel affix more and more when additional items were added. 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. However, the training stimuli always included items ending in non-liquids, such as /bærgəd/ ‘eagle’, /ʒəməs/ ‘berry’, and /nom/ ‘book’. Whenever possible, consonant-final stems with a non-liquid ending were also included in the test set.

5.1.2 Procedure

At the time of the picture naming task, all participants were unaware of its goal. In the main experiment, the participants were instructed to remember the way in which the words are changed, and to guess the meaning associated with the change from pictures they were presented. The participants were also encouraged to give feedback on whether they thought the experiment was game-like enough to be appropriate for children, since an extension to children was planned in the future.

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 [ənə __] ‘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, although they rarely occurred.

5.1.3 Participants

Nine speakers of Barguzin Buriat from the village of Baragkhan took part in the experiment. One of the speakers (S03) 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, and instead used a completely new morpheme or the Russian augmentative.

For sociolinguistic reasons eight out of nine participants were female, aged between 37 and 65. The one remaining participant (S09) was a man aged 17. The consultant's job was not considered socially appropriate for older men.

5.2 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). Since the number of items and participants is relatively small, most of the results reported here are qualitative rather than quantitative. Nevertheless, the pattern is clear in many cases, as we shall see.

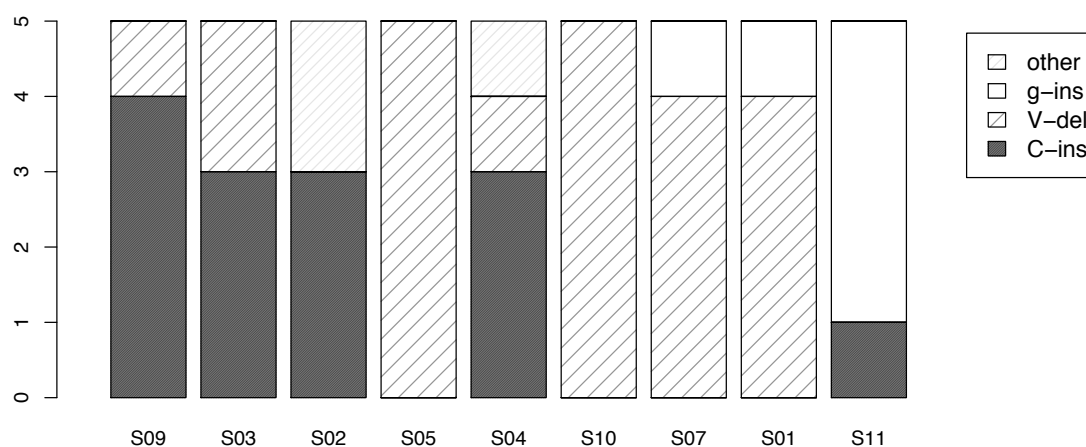
5.2.1 Frontness harmony

The participants correctly applied frontness harmony to the novel suffix in all cases. This was judged by the acoustics of the long vowel in the suffix /A:bA/. Short vowels in non-first syllables are subject to qualitative reduction, and the harmony class of the reduced vowel is much harder to judge acoustically. For that reason, all instances where the first long vowel of the suffix was deleted or shortened were excluded from assessing harmony patterns (see 5.2.3 on shortening). Across all participants, the long vowel of the novel suffix correctly appeared as [ə/ø:] after front-vowel stems in 32 responses. Each participant provided at least three such responses, each repeated three times. The long vowel of the suffix correctly appeared as [a/o:] after back-vowel stems in 54 responses.

5.2.2 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 (12) for each speaker.

(12) Buriat hiatus resolution with the novel affix



It can be observed that hiatus was resolved fairly consistently within each speaker. Six out of nine speakers gave either four or five responses using the same hiatus resolution strategy.

/g/-insertion was used as a consistent hiatus strategy by only one speaker (S11, four out of five responses). The remaining speakers together produced only two /g/-insertion responses (one for each S07 and S01), 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 S07 and S01 were produced with the same stem /bu:/ 'gun, rifle', yielding the novel augmentative [bu:kɑ:ba].

Four speakers consistently employed vowel deletion in hiatus (S05, S10, S07, S01). Vowel deletion was also commonly observed as an alternative response strategy for participants who overwhelmingly did insertion of a consonant other than /g/ (S09, S03, S02, S04). This latter group of participants is in fact rather heterogeneous. For one thing, the participant responses were less consistent within this group (three out of four group members gave only three of the same response). Furthermore, 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 (see section 5.3 for further discussion). The three responses coded as 'other' in (12) constituted inserting an additional CV or CVC sequence between the stem and the suffix.

5.2.3 Shortening and other modifications

In addition to hiatus repairs and harmony after vowel-final stems, the participants occasionally also applied other modifications to the novel affix. Shortening is perhaps most notable. The first vowel of the novel augmentative /A:bA/ was shortened in /r/-insertion repairs for participants S09 and S04 (7 responses total). The suffix was realized as /rAbA/ in these cases. Shortening did not occur in any other responses. The duration of the shortened vowel was quite substantial and hardly interpretable as an instantiation of /r/ release: mean 74,66 ms., sd 21.7 ms. for consultant S09 (24 tokens); mean 61,37 ms., sd 13,4 ms. for consultant S04 (18 tokens).

Across all participants, there were only seven responses where the suffix /A:bA/ was unexpectedly modified after consonant stems. These responses consisted in inserting a consonant or a vowel before the suffix (consultants S04 and S11) or truncating the suffix to /bA/ (one response from consultant S09).

5.3 Discussion

The consultants understood the task, most of them 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). Importantly, 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. The extension of frontness harmony to the novel suffix also suggests (contra Samuels and Vaux 2019) that the participants did not ignore the rules of Buriat phonology in giving their responses.

The hiatus resolution strategies applied by the participants are not fully consistent with phonological /g/-insertion. Thus only one participant (S11) applied dorsal epenthesis while the majority of subjects either deleted one of the vowels or inserted some consonant other than /g/. The generalization of native hiatus resolution strategies stands in a sharp contrast with the native frontness harmony patterns which were applied consistently by all participants in all cases.

On the other hand, the results are consistent with morphological accounts of the Buriat dorsal-zero alternation. The morphological account can only be distinguished from a phonological rule-based analysis if we adopt two assumptions. First, I assume that the existence of native affixes starting with a floating /^ʁ/ does not *by itself* force the learner to postulate a

floating /^g/ when novel suffixes are encountered. Second, I propose that the postulation of a latent segment or of floating features on a novel affix only occurs if the learner gets positive evidence of an alternation.

Given these assumptions, and based on a theoretically possible bias against dorsal insertion (see section 1), we may hypothesize that speakers will show propensity to generalize not only /g/-zero alternations, but also other hiatus resolution strategies such as vowel deletion. Furthermore, the morphological account allows for possible suffixes which would start in non-dorsal floating consonants. The speakers may thus attempt to guess the floating features present on the given affix.

The results from two new environments are largely consistent with these two strategies being used. The numeral distributive may not have been encountered in sufficiently distinct environments to postulate a floating /^g/, and therefore it often shows vowel deletion with stems with which it is rarely combined. Similarly, the participants in the wug test did not get positive evidence of a /g/-zero alternation on the novel affix. The majority of the participants (to the extent that the responses were consistent within a subject) either applied vowel deletion, or inserted a consonant other than /g/, consistent with attempting to guess the floater which is part of the suffix.

To summarize, the new data in sections 4 - 5 are consistent with the morphological accounts, but not with a phonological dorsal insertion rule. However, these results should be interpreted with a number of caveats in mind. There remains a possibility that the experiment did not yield robust generalization of dorsal insertion due to lack of power and high response variability. This study has a small number of participants and items, coupled with a high degree of variation in hiatus resolution strategies, and with some unexpected changes to the novel affix after consonant-final stems. For those reasons the experiment doesn't allow us to make a statistically valid conclusion about the population of speakers as a whole. It remains to be seen how rarely the performance of /g/-inserting subject occurs in general in the studied dialect. Although the results are suggestive and come from two independent domains, it may be premature to conclude that /g/ insertion is not productive from these data alone.

6 Analysis: the floating dorsal

Although the hypothesized dorsal insertion rule arguably provides an elegant account of the native data in (3 - 5), two kinds of novel environments provide preliminary evidence against the productivity of dorsal insertion. First, a rarely occurring numeral distributive suffix was frequently found to trigger vowel deletion rather than dorsal insertion with the stems with which it is rarely combined (section 4). This suffix induced dorsal insertion only in one speaker, and only variably. Second, the experiment with a novel suffix yielded no conclusive support for extension of dorsal insertion to new environments since only one speaker consistently applied this strategy. While more extensive experimental data may be needed to fully establish that dorsal insertion is non-productive, it makes sense at this point to briefly consider the possible alternative analysis of the complete Buriat dataset. This section spells out such an alternative account assuming a floating /^g/ and comments on the predictions of this theory.

The proposed account captures the general alternation pattern while abstracting away from a couple of affixes which are clearly suppletive (see section 3.4). The approach presented here is casted within Optimality Theory (Prince & Smolensky 2004), and it implements the floating /^g/ idea in line with existing work in autosegmental OT (Zoll 1996; Akinlabi 1996; 2011; Trommer 2011; Bermúdez-Otero 2012 a.o.).

I will assume that all affixes that trigger dorsal-zero alternations come with the floating features [dorsal] and [+voice] at the beginning, which is written /^g/ in underlying forms. The voicing specification is necessary to ensure that the floating features are realized as a voiced

segment [g/ɣ/ŋ/ɣ] rather than voiceless. The quality of a segment alternating with zero is thus 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 dorsals, regardless of their derivational history. In what follows I will abstract away from these alternations. Although they could be analyzed by some ad-hoc constraint requiring VC feature sharing, analogous to the spreading rule proposed for Mongolian by Svantesson et al. (2005), these alternations 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; Becker 2016). 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, in violation of the constraint DEP, as defined in (13) (McCarthy & Prince 1995; 1999). Alternatively, the realization of 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.

- (13) DEP: assign a violation mark for every surface segmental root node which does not have a correspondent in the input

This analysis treats the Buriat dorsal-zero alternation as an epenthesis process where an empty root node rather than a dorsal consonant is inserted.

Segmental insertion is generally disallowed in Buriat, and therefore the floating /^g/ normally remains unassociated, hence violating of the constraint *FLOAT (Wolf 2007).

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

This is illustrated in the tableau (15) showing attachment of the instrumental suffix /^gA:r/ to a consonant-final stem /hæ:l/ ‘tail’ (3b). This paper combines the comparative tableau format of Prince (2002) with numbers showing violation marks.

- (15) Floating dorsal is normally left unrealized

	/hæ:l- ^g A:r/	DEP	*FLOAT
☞ a.	hæ:l(^g)ə:r		2
b.	hæ:lgə:r	W1	L

The losing candidate (15b) represents an attempt to realize the floater which fatally violates DEP. The winning candidate (15a) has a floating dorsal, shown in parentheses. These floating features remain unassociated, and hence not phonetically realized.

No constraint specifically protects the floating material (cf. MAX-FLOAT in Wolf (2007)), and therefore a candidate [hæ:lə:r] which would remove the floating features would tie with the winner in (15a).⁷ Our constraints do not distinguish the two representations, and this is arguably a welcome result since they are pronounced the same. When the floating dorsal *is* realized, its appearance is required not by a constraint requiring preservation of floaters but by the

⁷ I am grateful to an anonymous reviewer for questions on this issue.

constraint DEP-PLACE (Rubach 2000; Uffmann 2007) which prohibits inserting new features. This will be illustrated in more detail in the tableau (21) below.

(16) DEP-PLACE: assign a violation mark for each place node without an input correspondent

Another case of floating dorsal non-realization comes from hiatus environments with a short vowel, e.g. /nabʃa-^gA:r/ → [nabʃa:r] 'leaves-INSTR' (4). In these 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 relevant constraints are defined in (17) and (18).

(17) ONSET: assign a violation mark for every surface syllable without an onset consonant

(18) MAX: assign a violation mark for every underlying segmental root node which does not have a correspondent in the output

The analysis of Buriat short vowel deletion in hiatus is presented in (19). Here and below dots show syllabification. Again, a candidate removing the floating features [nabʃa:r] would do just as well as the winner.

(19) Hiatus resolution via vowel deletion with short vowels

	nabʃa- ^g A:r	ONSET	DEP	MAX	*FLOAT
☞ a.	nab.ʃ(^g)a:r			1	2
b.	nab.ʃa.ka:r		W1	L	L
c.	nab.ʃa(^g).a:r	W1		L	2

Buriat does not tolerate word-medial onsetless syllables, and therefore when two vowels come together at a morpheme boundary hiatus has to be resolved, (19c) cannot win. However, it is better to delete a stem-final short vowel and leave the /^g/ floating (or delete it) than to insert a root node (DEP >> MAX). Therefore the deletion candidate (19a) beats the insertion candidate (19b).

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 long vowels is further extended to include all bimoraic nuclei, i.e. long vowels and diphthongs. Diphthongs also pattern together with long vowels with respect to rounding harmony (Poppe 1960). 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 (20) protects bimoraic vowels from deletion.

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

The high ranked MAX-BIMORAIC protects long vowels from deletion in hiatus environments. In this case, DEP is violated instead: a consonant root node is inserted, providing a docking site for the floating /^g/. This is illustrated in (21) with the analysis of the mapping /bu:-^gA:r/ → [bu:ka:r] 'rifle-INSTR' (5b).

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

	[bu:‑Aɪr]	ONSET	MAX-BIMOR	DEP	MAX	*FLOAT	DEP-PLC
✂ a.	bu:kaɪr			1			
b.	bu:(^g)r		W1	L	W1	W2	
c.	bu:(^g).aɪr	W1		L		W2	
d.	bu:ɦaɪr			1			W1

The winning candidate (21a) 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 (21b) or have a violation of ONSET (21c).

The candidate (21d) is harmonically bounded by the winner, but it illustrates an important point about my analysis. I assume that insertion of place features is penalized by the constraint DEP-PLACE, similar constraints are often used in the analysis of glide insertion (Rubach 2000; Kawahara 2002; Uffmann 2007; Naderi & van Oostendorp 2011). The sheer existence of this constraint guarantees that epenthesis will be kept to a minimum: if the epenthetic root node can get its place from the underlyingly present floating features, it will always do so. The candidate [bu:ɦaɪr] can never win in the present system, although the addition of constraints against feature association (*SPREAD, Kirchner (1993)) could ‘unbound’ such candidates.⁸

Of course, a bare root node together with dorsal place and [+voice] does not yield a full specification of Buriat /g/. Most of the other features are left unspecified and filled in by phonological and phonetic processes of Buriat.

The proposed grammar of Buriat hiatus correctly predicts that the floating /^g/ should be highly restricted in its distribution: it should only be 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 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.

As argued in section 5.3, this account is compatible with the new experimental and elicitation data in sections 4-5, on the assumption that postulating a floating /^g/ requires positive evidence. On the floating /^g/ account, nothing in principle excludes suffixes with other floating features, and some of the experimental responses with consonant insertion may be interpreted as an indication that Buriat grammar allows other floaters.

Interestingly, while bimoraic vowel deletion does not occur with native data, it is attested with the numeral distributive and in the experiment. These examples 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

⁸ If [ɦ] was placeless [ɦ]-insertion would satisfy DEP-PLACE. However, there is no evidence that [ɦ] is placeless in Buriat. A candidate inserting [ɦ] is also harmonically bounded by the winner due to DEP-LAR, a constraint against insertion of laryngeal features.

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.

To summarize, this section has provided an autosegmental OT account of the Buriat dorsal-zero alternation. This account does not postulate a general dorsal insertion process, it is compatible with the evidence in sections 4 – 5, and it correctly derives the distribution of the floating /^g/.

7 Conclusion

This paper has provided a detailed examination of the Buriat dorsal-zero alternation, based on new elicitation and experimental data from the Barguzin dialect. While Morley (2015) argues that deletion and insertion analyses cannot be generally separated from each other, the new elicitation data in this paper present counterexamples to the deletion analysis (section 3.2). Thus the deletion hypothesis seems falsifiable, at least in Buriat.

The remaining two kinds of accounts include morphological prespecification and general phonological epenthesis. The phonological analysis postulates a general dorsal epenthesis process. However, this process does not appear to be generalized to novel environments in at least two kinds of situations. First, the relatively infrequent numeral distributive /-A:dA:r/ does not trigger dorsal epenthesis with stems with which it was probably never seen before by the consultants. Second, when nine Buriat speakers were taught a novel augmentative suffix /-A:bA/, only one speaker systematically generalized dorsal insertion to this suffix. This is in contrast with frontness harmony which was always consistently applied by all speakers. Although the experimental results are suggestive, the relatively small number of items and participants coupled with high degree of response variability makes it hard to interpret the data quantitatively.

A theoretical model of the Buriat dorsal-zero alternation was proposed in section 6. This model encodes the quality of the alternating segment as an underlying property of the relevant suffixes. The model is compatible with the new data in this paper, on the assumption that postulating a floater requires positive evidence.

To summarize, the present results suggest that the hypothesized dorsal insertion rule is not fully productive in Buriat. The data are thus better captured by the floating /^g/ account. To address the shortcomings of the present experiment, the predictions of the morphological analysis should ideally be tested in future studies with greater power.

Buriat epenthesis is known as a potential counterexample to the view that dorsal consonants are relatively marked (Lombardi 2002; de Lacy 2006; de Lacy & Kingston 2013). If the results of this article are on the right track, then this counterexample may be due to a non-productive pattern. Of course, the investigation of Buriat has only indirect implications for markedness, since a detailed investigation of the reportedly *unmarked* glottals and coronals is impossible in this language. The present results are also consistent with a naturalness bias for learning and generalizing phonological alternations (Wilson 2006; Zuraw 2007; Zhang & Lai 2010; Baer-Henney & van de Vijver 2012; White 2014): despite the relatively robust evidence, the arguably unnatural dorsal epenthesis pattern is productive only for one consultant. The link between Buriat results and naturalness is also indirect, since the phonetically natural patterns are not considered here.

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References

- Akinlabi, Akinbiyi. 1996. Featural affixation. *Journal of Linguistics* 32(2). 239–289.
- Akinlabi, Akinbiyi. 2011. Featural affixes. In Marc Van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology, 1945–1971*. Malden, MA: Blackwell.
- Alderete, John & Alexei Kochetov. 2009. Japanese mimetic palatalization revisited: implications for conflicting directionality. *Phonology* 26. 369–388.
- Baer-Henney, Dinah & Ruben van de Vijver. 2012. On the role of substance, locality, and amount of exposure in the acquisition of morphophonemic alternations. *Laboratory Phonology* 3(2). 221–249.
- Baković, Eric. 1999. Deletion, insertion and symmetrical identity. *Harvard Working Papers in Linguistics* 7.
- Becker, Laura. 2016. Vowel-consonant harmony in Uyghur. Ms, Leipzig University.
- Beckman, Jill. 1998. *Positional Faithfulness*. PhD dissertation, UMass Amherst.
- Berko, Jean. 1958. The child's learning of English morphology. *Word* 14. 150–177.
- Bermúdez-Otero, Ricardo. 2012. The architecture of grammar and the division of labour in exponence. In Jochen Trommer (ed.), *The phonology and morphology of exponence*, 8–83. Oxford: OUP.
- Blevins, Juliette. 2008. Consonant epenthesis: natural and unnatural histories. In Jeff Good (ed.), *Linguistic Universals and Language Change*, 79–107. Oxford: OUP.
- Boersma, Paul & David Weenink. 2012. *Praat: doing phonetics by computer* (Software). www.praat.org.
- Bondarenko, Tatiana. 2017a. Passivization of matrix predicates in the light of constructions with accusative subjects: the case of Barguzin Buryat. *Ural-Altaic Studies* 26(3). 117–126.
- Bondarenko, Tatiana. 2017b. ECM in Buryat and the optionality of movement. *WAFL 12 Proceedings*. Cambridge, Mass.: MIT Press.
- Bondarenko, Tatiana. 2018a. Voice restructuring in Buryat. *WAFL 13 Proceedings*. Cambridge, Mass.: MIT Press.
- Bondarenko, Tatiana. 2018b. žə-converbs in Barguzin Buryat as reduced sentential arguments. *Voprosy Iazykoznanija* To appear.
- Buraev, Ignatii D. 1959. *Zvukovoi sostav buriatskogo iazyka*. Ulan-Ude: Buriatskii kompleksnyi nauchno-issledovatel'skii institut SO AN SSSR.
- Casali, Roderic. 1998. *Resolving Hiatus*. New York: Taylor & Francis.

- Čeremisov, Konstantin M. 1973. *Buriatsko-Russkii Slovar'*. Moskva: Sovetskaya Entsiklopediya.
- Chuang, Ching-ting, Yueh-chin Chang & Feng-fan Hsieh. 2011. Productivity in Taiwanese Tone Sandhi Redux. *Proceedings ICPHS 17*, 492–495.
- Churma, Donald G. 1977. On choosing between linguistic analyses: A reply to Klausenburger. *Lingua* 42(2). 131–152.
- De Lacy, Paul. 2002. *The Formal Expression of Markedness*. PhD dissertation, UMass Amherst.
- De Lacy, Paul. 2003. Maximal words and the Maori passive. In John J McCarthy (ed.), *Optimality Theory in phonology: a reader*, 495–512. Oxford: Blackwell.
- De Lacy, Paul. 2006. *Markedness: Reduction and Preservation in Phonology*. Cambridge: CUP.
- De Lacy, Paul & John Kingston. 2013. Synchronic explanation. *NLLT* 31(2). 287–355.
- Delattre, Pierre C., Alvin M. Liberman & Franklin S. Cooper. 1955. Acoustic loci and transitional cues for consonants. *The Journal of the Acoustical Society of America* 27(4). 769–773.
- Gick, Bryan. 1999. A gesture-based account of intrusive consonants in English. *Phonology* 16. 29–54.
- Hale, Kenneth. 1973. Deep-surface canonical disparities in relation to an analysis and change: an Australian example. In Thomas Sebeok (ed.), *Current Trends in Linguistics*. The Hague: Mouton.
- Hall, Tracy Alan. 2013. How common is r-Epenthesis? *Folia Linguistica* 47(1).
- Harris, John. 1994. *English Sound Structure*. Oxford: Blackwell.
- Hayes, Bruce, Péter Siptár, Kie Zuraw & Zsuzsa Londe. 2009. Natural and Unnatural Constraints in Hungarian Vowel Harmony. *Language* 85(4). 822–863.
- Kawahara, Shigeto. 2002. Feature recycling: hiatus resolution by way of glide formation in Japanese. Paper presented at Japan Phonology Association.
- Kirchner, Robert. 1993. Turkish vowel harmony and disharmony: an Optimality Theoretic account. Ms, University of Alberta. ROA-4.
- Klausenburger, Jürgen. 1974. Rule inversion, opacity, conspiracies: French liaison and elision. *Lingua* 34(2–3). 167–179.
- Klausenburger, Jürgen. 1977. Deletion vs. epenthesis: Intra- vs. inter-paradigmatic arguments in linguistics. *Lingua* 42(2). 153–160.
- Liberman, Alvin M., Pierre C. Delattre, Louis J. Gertsman & Franklin S. Cooper. 1956. Tempo of frequency change as a cue for distinguishing classes of speech sounds. *Journal of Experimental Psychology* 52(2). 127–137.
- Lombardi, Linda. 2002. Coronal epenthesis and markedness. *Phonology* 19(2). 219–251.
- McCarthy, John J. 1991. Synchronic rule inversion. *Proceedings of BLS 17*. University of California.
- McCarthy, John J. 1993. A case of surface constraint violation. *Canadian Journal of Linguistics* 38. 169–195.
- McCarthy, John J. & Alan Prince. 1995. Faithfulness and Reduplicative Identity. Ms, UMass Amherst and Rutgers University.
- McCarthy, John J. & Alan Prince. 1999. Faithfulness and identity in Prosodic Morphology. In René Kager, Harry van der Hulst & Wim Zonneveld (eds.), *Prosody-morphology interface*. Cambridge: CUP.
- Morley, Rebecca. 2015. Deletion or epenthesis? On the falsifiability of phonological universals. *Lingua* 154. 1–26.
- Morley, Rebecca. 2017. Is phonological consonant epenthesis possible? A Series of artificial grammar learning experiments. Ms, Ohio State University. lingbuzz/003354.

- Naderi, Navid & Marc van Oostendorp. 2011. Reducing the number of Farsi epenthetic consonants. In Agnes Korn, Geoffrey Haig, Simin Karimi & Pollet Samvelian (eds.), *Topics in Iranian Linguistics*, 153–166. Weisbaden: Ludwig Reichert Verlag.
- O'Connor, J.D., Louis J. Gertsman, Alvin M. Liberman, Pierre C. Delattre & Franklin S. Cooper. 1957. Acoustic cues for the perception of initial /w,j,r,l/ in English. *Word* 13. 24–43.
- Padgett, Jaye. 2011. Consonant-vowel place feature interactions. In Marc Van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, vol. 3. Malden, MA: Blackwell.
- Poppe, Nicholas N. 1938. *Grammatika Buriat-Mongol'skogo iazyka*. Moskva, Leningrad: Izdatel'stvo AN SSSR.
- Poppe, Nicholas N. 1960. *Buriat grammar*. Bloomington: Indiana University.
- Prince, Alan. 2002. Arguing optimality. In Andries Coetzee, Angela Carpenter & Paul de Lacy (eds.), *UMOP 26. Papers in Optimality Theory II*. Amherst, Mass: GLSA.
- Prince, Alan & Paul Smolensky. 2004. *Optimality Theory. Constraint Interaction in Generative Grammar*. Malden, Mass: Blackwell.
- Radnaev, Erhito R. 1965. Barguzinskiy govor. In I. D. Buraev & C. B. Cydendambaev (eds.), *Issledovanie burjatskih govorov I* (Trudy Burjatskogo Kompleksnogo Nauchno-Issledovatel'skogo Instituta), 71–107. Ulan-Ude: SO AN SSSR.
- Radnaeva, Ljubov D. 2003a. The two types of transcription (the Buryat Language Database). *Proceedings of ICPhS 15*, 2737–2740. Barcelona.
- Radnaeva, Ljubov D. 2003b. *Zvukovaja forma sovremennogo buriatskogo jazyka. Teoreticheskiye i prakticheskiye aspekty kachestvennogo i kolichestvennogo analiza*. Doctoral Dissertation, Saint Petersburg State University.
- Radnaeva, Ljubov D. 2006. Phonetic research of the sound form of Modern Buryat language. *Proceedings of the XIth International Conference "Speech and Computer,"* 577–582. Saint-Petersburg.
- Radnaeva, Ljubov D. 2008. Issledovanie zvukovoi formy sovremennogo buriatskogo jazyka. *Proceedings of the 36th International Conference "Problemy Izucheniya, sokhraneniya i prepodavaniya jazykov narodov Rossii."* Saint-Petersburg.
- Rice, Keren. 2008. Review of de Lacy (2006). *Phonology* 25(2). 361–371.
- Rose, Sharon & Rachel Walker. 2011. Harmony systems. In John Goldsmith, Jason Riggle & Alan C.L. Yu (eds.), *The Handbook of Phonological Theory, Second Edition*, 240–290. Oxford: Blackwell.
- Rubach, Jerzy. 2000. Glide and Glottal Stop Insertion in Slavic Languages: A DOT Analysis. *Linguistic Inquiry* 31(2). 271–317.
- Samuels, Bridget and Bert Vaux. 2019. Mongolic dorsals are truly epenthetic. Manuscript available in Radical: A Journal of Phonology. <http://radical.cnrs.fr/samuels-vaux-mongolic-dorsals-are-truly-epenthetic/>.
- Sanžeev, Garma D. 1941. *Grammatika Buriat-Mongol'skogo iazyka*. Moskva, Leningrad: Izdatel'stvo AN SSSR.
- Sanžeev, Garma D., T. A. Bertagaev & Ts. B. Tsidendambaev (eds.). 1962. *Grammatika buriatskogo iazyka*. Moskva: Izdatel'stvo Vostochnoi Literatury.
- Skribnik, Elena. 2003. Buryat. In Juha Janhunen (ed.), *The Mongolic Languages*, 102–128. London & New York: Routledge.
- Staroverov, Peter. 2014. *Splitting theory and consonant epenthesis*. PhD dissertation, Rutgers University.
- Staroverov, Peter. 2016. Productivity of the Buriat dorsal-zero alternation. In Christopher Hammerly & Brandon Prickett (eds.), *Proceedings of NELS 46*, 207–220. Amherst, Mass: GLSA.

- Svantesson, Jan-Olof, Anna Tsendina, Anastasia Karlsson & Vivian Franzén. 2005. *The phonology of Mongolian*. Oxford; New York: Oxford University Press.
- Tessier, Anne-Michelle. 2012. Testing for OO-Faithfulness in the Acquisition of Consonant Clusters. *Language Acquisition: A Journal of Developmental Linguistics* 19(2). 144–173.
- Tranel, Bernard. 1981. *Concreteness in generative phonology: evidence from French*. Berkeley: University of California Press.
- Tranel, Bernard. 1996. French liaison and elision revisited: A unified account within Optimality Theory. In C Paradis, C Quicoli, M Saltarelli & M. L Zubizarreta (eds.), *Aspects of Romance Linguistics*, 433–455. Washington, DC: Georgetown University Press.
- Trommer, Jochen. 2011. *Phonological aspects of Western Nilotic mutation morphology*. Habilitation thesis, University of Leipzig.
- Uffmann, Christian. 2007. Intrusive [r] and optimal epenthetic consonants. *Language Sciences* 29(2–3). 451–476.
- Uffmann, Christian. 2014. Possible epenthetic segments: the role of faithfulness. Handout from a talk presented at Manchester Phonology Meeting 22.
- Vaux, Bert & Bridget Samuels. 2017. Consonant epenthesis and markedness. In Bridget Samuels (ed.), *Beyond Markedness in Formal Phonology*, 69–100. Amsterdam: Benjamins.
- Walker, Rachel. 1994. Buriat syllable weight and head prominence. *Phonology at Santa Cruz vol. 3*, 99–110. Santa Cruz, CA.
- Wetzels, Leo W. 2002. Les adjectifs pré-nominaux du français: formes longues et formes féminines. In Haike Jacobs & Leo Wetzels (eds.), *Liber amicorum Bernard Bichakjian*. Maatsricht: Shaker Publications.
- White, James. 2014. Evidence for a learning bias against saltatory phonological alternations. *Cognition* 130(1). 96–115.
- Wilson, Colin. 2006. Learning phonology with substantive bias: an experimental and computational study of velar palatalization. *Cognitive Science* 30(5). 945–982.
- Wolf, Matthew. 2007. For an autosegmental theory of mutation. In Leah Bateman, Michael O’Keefe, Ehren Reilly & Adam Werle (eds.), *UMOP 32: Papers in Optimality Theory III*, 315–404. Amherst, Mass: GLSA.
- Wright, Richard. 2004. A review of perceptual cues and cue robustness. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically based phonology*, 34–57. Cambridge: CUP.
- Zhang, Jie. 2016. Using Nonce-probe Tests and Auditory Priming to Investigate Speakers’ Phonological Knowledge of Tone Sandhi. 12–18. (19 December, 2017).
- Zhang, Jie & Yuwen Lai. 2008. Phonological knowledge beyond the lexicon in Taiwanese double reduplication. In Y.C.-E. Hsiao, H.-C. Hsu, L.H. Wee & D.-A. Ho (eds.), *Interfaces in Chinese Phonology: Festschrift in Honor of Matthew Y. Chen on His 70th Birthday*, 183–222. Taiwan: Academia Sinica.
- Zhang, Jie & Yuwen Lai. 2010. Testing the role of phonetic knowledge in Mandarin tone sandhi. *Phonology* 27(01). 153–201.
- Zhang, Jie, Yuwen Lai & Craig Sailor. 2011. Modeling Taiwanese speakers’ knowledge of tone sandhi in reduplication. *Lingua* 121(2). 181–206.
- Zoll, Cheryl. 1996. *Parsing below the segment in a constraint based framework*. PhD dissertation, UC Berkeley.
- Zuraw, Kie. 2007. The role of phonetic knowledge in phonological patterning: corpus and survey evidence from Tagalog infixation. *Language* 83(2). 277–316.