An OT Analysis of Vowel Syncope in Georgian

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Abstract: This paper applies Optimality Theory to vowel syncope in Georgian. Final vowels of morphemes ending in sonorant consonants delete before vowel-initial suffixes. However, the nominative ending *-i* and [+high] vowels do not undergo syncope. This phenomenon figures prominently in the creation of large consonant clusters in syllable onset position.

1. Introduction

This study focuses on vowel syncope in native Georgian words and attempts to describe the phenomenon using Optimality Theory (OT). It also briefly considers the relationship of syncope to vowel apocope in nouns and the creation of consonant clusters through the process of vowel deletion.

Georgian [ISO 639-3 kat; EGIDS level 1] is the most prominent member of the Kartvelian, or South Caucasian, language family. It is also the only member of the family with its own traditional orthography and a literary tradition dating back to the medieval period (Aronson 1990). Georgian is the national language of Georgia, located in the southern Caucasus, spoken by an estimated 3,900,000 within the nation and another 355,270 in neighboring countries and abroad (Lewis 2009).

Georgian is (in)famous for the size and variety of the consonant clusters it permits in onset positions, as well as for roots that consist entirely of consonants (e.g. *prckvn* 'to skin'; *gvprckvnis* 'he peels us') (Ritter 2006:432). Much work has been done on the intricacies of the syllabification and internal structure of such clusters (Butskhrikidze 2002; Ritter 2006; Cho and King 2003). One commonly repeated historical observation is that many, if not most, of the more spectacular consonant clusters in the language result from syllabic syncope.

Butskhrikidze and van de Weijer (2001) have used Optimality Theory to analyze a phonological process related to vowel syncope: the metathesis of the segment /v/, which forms part of a thematic suffix in verbs with the form /-av/. Verbs whose roots end in a sonorant and whose initial segments are non-labial show a metathesis in the infinitival form of the *v* in this suffix with the final segment of the root. Vowel syncope occasions this unusual change.

Vowel syncope occurs in both nominal and verbal paradigms in Georgian. The general pattern involves vowels in the final syllables of noun and verb roots ending in sonorants that delete before morphological suffixes with the form -V(C). Vowels in other, sonorant-final suffixes also undergo syncope before additional vowel-initial suffixes. While Butskhrikidze and van de Weijer propose a new constraint, BALANCE, for use in an OT description of Georgian vowel syncope, they do not actually attempt to provide such a description. The purpose of the present paper is to supply one.

The remainder of the paper is structured as follows. In section 2, I provide an overview of the Georgian language and salient features of its phonology. In section 3, I lay out the data for the present analysis and discuss the problems my analysis will tackle. In sections 4 and 5, I present two OT analyses of the data, one using Butskhrikidze's and van de Weijer's suggested constraint, BALANCE, and one using just constraints already proposed in the previous OT literature. Section 6 offers conclusions and final observations.

2. Language background

In this section, I provide a brief outline of Georgian phonology, largely following Aronson (1997), Butskhrikidze (2002) and Butskhrikidze and van de Weijer (2001).

Georgian has 28 consonant phonemes and 5 vowels, /i e a o u/. Like numerous other languages of its geographical area, Georgian makes a three-way distinction among stops and affricates between voiced, voiceless, and glottalized sounds across five places of articulation. Fricatives spread over three places of articulation and distinguish the laryngeal features of voiced and voiceless only. Finally, the sonorant consonants in Georgian include the liquids /r l/, nasals /m n/ and the labio-velar /v/, which has the allophones [v Φ w] in certain contexts.

(1)

	Stops	Affricates	Fricatives
voiced	b d g	j (dz) ǰ(dž)	z ž ɣ
voiceless aspirated	p t k	c (ts) č(tš)	s š x
glottalized	p’t’ k’	c’ č’	χ’(q’)
laryngeal			h
sonorants	m n l r v		
vowels	i e u o a		

(Ritter 2006:431)

Georgian permits from two to six consonants in onset position in roots. Exactly how the syllable is constituted so as to deal with such clusters remains a contentious issue in the literature, involving complex proposals such as headless syllables and semisyllables as well as syllabic consonants and extrasyllabicity.[1] Unfortunately, there is little more agreement on stress placement in the language than syllable structure, so metrical arguments are precarious at best. Positions for stress range from the initial syllable to the initial and antepenultimate syllables to the initial and preantepenultimate syllables to the antepenultimate syllable only (Jun, Vicenik, and Lofstedt 2007:41; Aronson 1990:18-19; Hewitt 2005:6-7; Butskhrikidze 2002:96-97; Butskhrikidze and van de Weijer 2001:92). Two crucial facts, at least, seem clear: (a) the sonorants /r l m n/ may be syllabic in certain positions (e.g. *ḳlde* ‘rock’), and (b) only vowels may bear stress.

Initial clusters in Georgian are highly variable and violate the Sonority Sequencing Principle (SSP) in a fair number of cases (e.g. *mta* ‘mountain’). One possible simplifying factor in these combinations is the existence of harmonic clusters: CC sequences that agree in voicing and laryngeal specification and pattern as single, complex segments syllable-initially, medially, and finally (e.g. *tk*, *t’k’*, *p’q’*). Additionally, /v/ shows up as a labial off-glide following most consonants, such that harmonic cluster + /v/ sequences can perhaps be treated as singe complex segments with labial release (i.e. /tkv/= [tk^{w}]). Georgian also permits non-harmonic clusters, where the first consonant is pronounced further back in the mouth than the second (e.g. *gdeba* ‘throwing’), as well as harmonic, non-harmonic, and other clusters that freely violate the SSP (e.g. harmonic: *ǰgupi* ‘group’; non-harmonic: *cda* ‘to try’; other: *rgoli* ‘ring’). The sonorant /r/ often intervenes in sequences that violate the SSP in order to repair the violation (e.g. *zrdiloba* ‘politeness’).

[1]Butskhrikidze (2002), chapter 7, provides a good overview of several of these proposals with analysis of their relative strengths and weaknesses.

3. Data

In this section, I lay out the sources and nature of the data that form the focus of the study. The main data come from Butskhrikidze (2002) and Butskhrikidze and van de Weijer (2001). Some individual examples in the discussion were taken from other sources, principally Aronson (1997).

Historically, many of the consonant clusters in Georgian, including those that violate the SSP, resulted from vowel syncope (e.g. *tbili* 'warm' < *gan-t'ep-it* 'get warm'; *cda* 'to try' < *e-cad-e* 'try you'). However, the process is active synchronically as well. When a nominal or verbal root that ends in a sonorant receives a suffix with the form -VC, the vowel in the final syllable of the root deletes. Additional -VC suffixes cause previous such suffixes whose final consonant is a sonorant to undergo this same process of syncope.

(2)

NOM	mercxal-i	'swallow'	NOM	k'amat-i	'debate'
ERG	mercxal-ma		ERG	k'amat-ma	
DAT	mercxal-s		DAT	k'amat-s	
GEN	mercxl-is		GEN	k'amat-is	
INST	mercxl-it		INST	k'amat-it	
ABL	mercxl-ad		ABL	k'amat-ad	

(Butskhrikidze 2002:90)

(3) *Regular metathesis in verb forms*

root present tense, 3.SG (*-av-* thematic suffix)		infinitival form (*-a* infinitival suffix)	
xar	xr-av-s	xvr-a	'to gnaw'
/xar/-/av/-/s/		/xar/-/av/-/a/	
k'ar	k'r-av-s	k'vr-a	'to tie'
xan	xn-av-s	xvn-a	'to plough'
k'al	k'l-av-s	k'vl-a	'to kill'
sxal	sxl-av-s	sxvl-a	'to chop off'
jer	jr-av-s	jvr-a	'to move'

(Butskhrikidze and van de Weijer 2001:93)

(4) *Regular non-occurrence of vowel deletion*

a.

mamul-i	'patrimony'	mamul-is	id.-GEN
c'arsul-i	'past'	c'arsul-is	id.-GEN
čongur-i	'musical inst.'	čongur-is	id.-GEN
ǰebir-i	'dam'	ǰebir-is	id.-GEN
ɣimil-i	'smile'	ɣimil-is	id.-GEN
nadim-i	'feast'	nadim-is	id.-GEN

b.

root	*present tense, 3.SG*	*infinitival form*	
xed	xed-av-s	xedv-a (*xvd-a)	'to see'
tes	tes-av-s	tesv-a (*tvs-a)	'to sow'
les	les-av-s	lesv-a (*lvs-a)	'to sharpen'

c.	ber	ber-av-s	berv-a (*bvr-a)	‘to blow up’
	par	par-av-s	da-parv-a (*da-pvr-a)	‘to hide’
d.	lar	lar-av-s	lar-va (*lvr-a)	‘string’
(5)	k’er	k’er-av-s	k’erva (*k’vra)	‘to sew’
			k’vra	‘to blind’
	tes	tes-av-s (*ts-av-s)	tesv-a (*tvs-a)	‘to sow’
		c-av-s [tsavs]		‘to defend’
	kar-i	‘wind’	kar-is (*kr-is)	id.-GEN
			kris	‘blows’

(Butskhrikidze and van de Weijer 2001:94)

The first column in (2) demonstrates vowel syncope in a nominal stem. Note that the nominative ending *-i* never occasions syncope. The second column shows that roots that do not end in sonorants do not undergo syncope. The first column in (3) contains verb roots that have undergone vowel syncope. Column 2 shows the same roots with double syncope (both *-av* and *-a* suffixes) and *v* metathesis. (4a) contains noun roots that end in sonorants but do not undergo syncope due to the [+high] vowels in their final syllables. (4b) shows verbs that do not undergo syncope because their roots end in obstruents. The forms in (4c) are especially interesting: here, the vowel in the root does not delete because deletion would occasion the *v* metathesis which would, in turn, result in an unacceptable sequence of two adjacent labial segments. Butskhrikidze and van de Weijer invoke a version of the Obligatory Contour Principle, $OCP_{(LABIAL)}$, to forbid such double labials. (4d) shows that the processes of vowel syncope and *v* metathesis are similarly blocked if the resultant consonant sequence is simply not acceptable in the language. Departing from Butskhrikidze and van de Weijer, I note that the specific nature of the unacceptability of this form lies in its violation of the SSP. Finally (5) demonstrates certain forms that could and should undergo syncope but do not because the resultant forms would be homophonous with other words in the language.

4. Analysis in OT

In this section, I lay out my optimality theoretic analysis of the facts of vowel syncope observed above. Since Butskhrikidze and van de Weijer suggest it, I first adopt their new constraint BALANCE which is violated if vowel deletion does not happen when its preconditions are met. Butskhrikidze and van de Weijer note that their proposed name for this new constraint is taken from the term applied in traditional Georgian grammars to vowel syncope: a balance between the root and the series of suffixes (Butskhrikidze and van de Weijer 2001:95). In section 5, I evaluate the usefulness of this new constraint and consider alternatives. Though the data involve *v* metathesis, I do not treat it here, nor do I include in my analysis most of the constraints used by Butskhrikidze and van de Weijer to account for it. I take for granted that the process occurs together with syncope and refer the reader to their article for more details.

The motivation for vowel deletion is provided by Butskhrikidze’s and van de Weijer’s new constraint. On the basis of their description, I interpret its definition to be as follows:

(6) BALANCE
Vowel syncope must not fail to occur when the following conditions are met:
i. the final vowel of the root is not [+high]
ii. the suffix is not the nominative ending *-i*
iii. the root does not end in an obstruent or vowel (i.e. must be a sonorant)
iv. the suffix does not have the form -CV (i.e. must be -V(C))
"Don't fail to syncopate under right conditions." Assess one violation for each missed syncope.

We can understand this to be a Markedness constraint.

Since some roots and suffixes do not undergo vowel deletion, we need a Faithfulness constraint to militate against willful deletion of root segments. It must be ranked below BALANCE in order to ensure that syncope can affect the desired forms (tableau 1).

(7) MAX-root (McCarthy and Prince 1995)[2]
Every segment of the input has a correspondent in the output (no phonological deletion).

Tableau 1
BALANCE » MAX-root

input: /xar-av-a/ 'to gnaw'	BALANCE	MAX-root
a. ☞ xvra		*
b. xarava	*!*	
c. xrava	*!	*
d. xarva	*!	

We also need to control for unauthorized deletion of segments from the affixes. That is, it is possible that two forms both satisfy BALANCE and MAX-root, but one still has an unlicensed deletion in the affix. I invoke the general Faithfulness constraint MAX to handle such eventualities. It is ranked below MAX-root so as to protect the root first (tableaux 2).

Tableau 2
BALANCE » MAX-root » MAX

input: /ber-av-a/ 'to blow up'	BALANCE	MAX-root	MAX
a. ☞ berva	*		*
b. berava	**!		
c. brava	*	*!	*
d. berv	*		**!

It might also be possible for a form to satisfy the requirements of syncope by deleting whole morphemes, completely obliterating an affix like the infinitival suffix *-a*. This scenario presents itself as a problem for the current analysis principally where the winning candidate has to forego syncope in order to avoid violating a higher-ranked constraint. Thus, we need a

[2]All constraint names and definitions from sources not listed in the bibliography are taken from Ashley *et al*. (2010).

Faithfulness constraint ranked above BALANCE to militate against over-zealous deletion of meaningful units (tableau 3).

(8) EXPONENCE (Golston 1995)
A morpheme must be overtly realized.[3]

Tableau 3
EXPONENCE » BALANCE » MAX-root » MAX

input: /k'er-av-a/ 'to sew'	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ k'erva		*		*
b. k'erava		**!		
c. k'vr	*!		*	***
d. k'rava		*	*!	*
e. k'rav	*!	*	*	**

As just alluded to above, there are situations in which all the conditions for syncope are met, but if a given candidate underwent syncope, the resultant form would be homophonous with an already existing form in the language. To cover such situations, we need a Faithfulness constraint to militate against homophonous outputs. I invoke PRESERVE CONTRAST-output, which must outrank BALANCE and MAX so as to ensure that such forms remain unaffected.

(9) PC_{OUT} (Łubowicz 2003:20)
For each output that corresponds to two or more inputs contrasting in P assign a violation mark. Formally, assign one mark for every output, out_k, if $in_a \rightarrow out_k$, $in_b \rightarrow out_k$, in_a has P, and in_b lacks P. "Avoid outputs ambiguous in P property."

Rather than specify a particular property for this constraint, I leave it open; any ambiguous output is dispreferred, whether root or affix (tableaux 4-5).

[3]Ashley *et al*. (2010) comment in their constraint catalogue that this constraint is a reworking of the earlier constraint M-PARSE or MORPHOLOGICAL-PARSE from Prince and Smolensky (1993), which requires the structural realization of morphological properties (58). See also Gnanadesikan (1997:93-94), who invokes a similar concept under the title MORPHEME REALIZATION or MORPH-REAL, first proposed in Samek-Lodovici (1993).

Tableau 4
PC_{OUT}, EXPONENCE » BALANCE » MAX-root » MAX

input: /k'er-av-a/ 'to sew'	PC-out	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ k'erva			*		*
b. k'erava			**!		
c. k'vra 'to blind'	*!			*	***
d. k'vr		*!		*	***
e. k'rava			*	*!	*
f. k'rav		*!		*	**

Tableau 5

input: /kar-is/ 'wind.GEN'	PC-out	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ karis			*		
b. kr		*!		*	**
c. kris 'blows'	*!			*	*
d. kri NOM ending	*!			*	**
e. kari NOM ending	*!		*		*

Tableau 3 shows that the homophone [k'vra] is not allowed. Tableau 4 demonstrates that the homophone [kris], as well as forms whose genitive ending loses the segment [s] that distinguishes it from the nominative case ending, are not allowed.

Finally, instead of positing another constraint to penalize occurrences of syncope where it is not licensed by the conditions of BALANCE, I rely on the SSP and OCP-labial.

(10) SON-SEQ (Clements 1990)[4]
Complex onsets rise in sonority, and complex codas fall in sonority.

(11) OCP-LAB (Coetzee and Pater 2006)
No adjacent labials.

Both SON-SEQ and OCP-LAB must be high ranking since they cannot be violated during the syncope process. However, they are not crucially ranked with respect to one another or either PC_{OUT} or EXPONENCE (tableaux 6-8).

[4] As defined in Kager (1999:267).

Tableau 6
OCP-$_{LAB}$, SON-SEQ » PC$_{OUT}$, EXPONENCE » BALANCE » MAX-root » MAX

input: /ber-av-a/ ‘to blow up’	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ berva					*		*
b. berava					**!		
c. brva		*!					
d. bvra	*!						
e. brava					*	*!	*
f. berv				*!	*		**

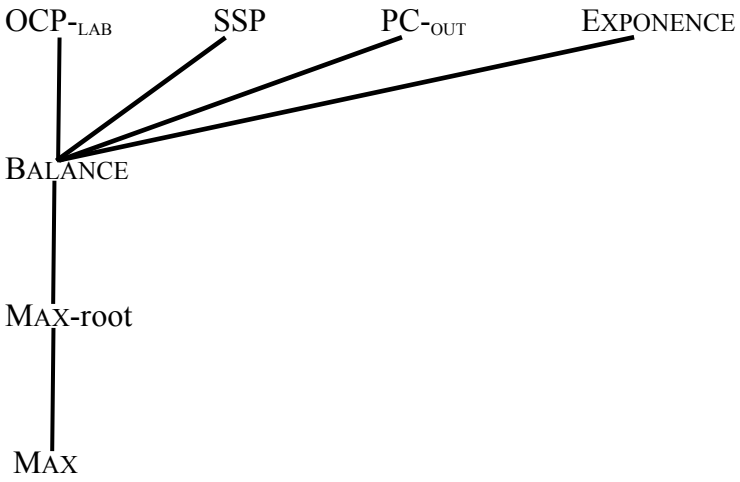
Tableau 7

input: /k’amat-is/ ‘debate.GEN’	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ k’amat-is							
b. k’amtis						*!	*
c. k’amts		*!				*	**
d. k’mts		*!				**	***
e. k’mtis		*!				**	**
f. k’amats		*!					*
g. k’amat				*!			**
h. k’amati NOM ending			*!				*

Tableau 8

input: /tes-av-s/ ‘to sow’	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	BALANCE	MAX-root	MAX
a. ☞ tesavs							
b. tesvs		*!					*
c. tsavs			*!			*	*
d. tvs		*!					
e. tsv						*!	*
f. tsav						*!	**
g. tsas						*!	**
h. tesas							*!
i. tesav							*!

To summarize the formal OT analysis to this point, the relevant constraints and their crucial rankings for Georgian vowel syncope are as follows:



In the next section, I lay out another analysis of the same phenomena using constraints previously posited in the OT literature in place of BALANCE.

5. Alternative to BALANCE

While functional, Butzkhrikidze's and van de Weijer's proposed constraint BALANCE seems too ad hoc and language-specific. In particular, it contains a number of preconditions that might be handled just as well by other constraints of more universal applicability. In this section, my goal is to perform the same OT analysis using constraints already contained in the inventory compiled by Ashley *et al*. (2010).

In order to replace BALANCE, we need separate constraints for some of the basic prerequisites of syncope, namely the impetus to syncopate and the prohibition against [+high] vowels participating in or occasioning syncope. I propose to replace BALANCE with *STRUCTURE-syllable and MAX-V_{HIGH}, adapted from MAX-V.

(12) *STRUC-σ (Urbanczyk 2006)
No syllables. (i.e. reduce the amount of syllables to 1)

(13) Max-V_{HIGH} (adapted from McCarthy 2000)
Every [+high] vowel of an input has a correspondent in the output. "Don't delete high vowels."

The motivation for *STRUC-σ lies in the fact that Georgian apparently avoids adding syllable nuclei, preferring to keep the syllable count small. Another instantiation of this phenomenon is vowel apocope before -V(C) suffixes in vowel-final roots (e.g. *rdze* 'milk' + *-is* 'GEN' = *rdzis*; *deda* 'mother' + *-is* 'GEN' = *dedis*). The motivation for MAX-V_{HIGH} is the apparent stability of [+high] vowels in Georgian, another cross-linguistically rare trait, though one shared with Estonian (Gouskova 2003:211). Ordinarily, one expects the [+high] vowels to be among the least stable, while the highly sonorous [a] should be most stable as a syllabic nucleus (Graf and Krämer 2005). MAX-V_{HIGH} must dominate *STRUC-σ in order to guarantee that [+high] vowels remain unchanged. The ranking of MAX-V_{HIGH}, OCP-$_{LAB}$, SSP, PC_{OUT}, and EXPONENCE, however, is not crucial (tableaux 9-11).

Tableau 9
OCP-LAB, SON-SEQ, PC_{OUT}, EXPONENCE, MAX-V_{HIGH} » *STRUC-σ » MAX-root » MAX

input: /mamul-is/ 'patrimony.GEN'	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	MAX-V_{HIGH}	*STRUC-σ	MAX-root	MAX
a. ☞ mamulis						*		
b. mamlis					*!	*	*	*
c. mamls					*!		*	**
d. mamli					*!	*	*	**
e. mamul				*!	*	*		*
f. mmulis	*!					*		

Tableau 10

input: /mercxal-i/ 'swallow.NOM'	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	MAX-V_{HIGH}	*STRUC-σ	MAX-root	MAX
a. ☞ mercxali						*		
b. mercxli						*	*!	*
c. mrcxli						*	*!	*
d. mercxal				*!	*			*
e. mercxl				*!	*			*

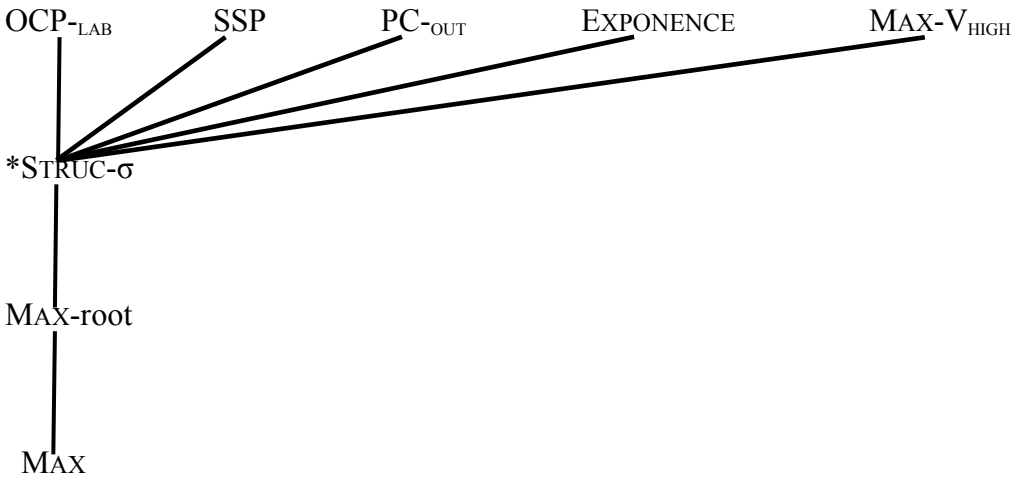
Tableau 11

input: /k'amat-is/ 'debate.GEN'	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	MAX-V_{HIGH}	*STRUC-σ	MAX-root	MAX
a. ☞ k'amat-is						*		
b. k'amtis						*	*!	*
c. k'amts					*!		*	**
d. k'mts					*!		**	***
e. k'mtis		*!					**	**
f. k'amats					*!	*		*

Tableau 12

input: /xar-av-a/ 'to gnaw'	OCP-$_{LAB}$	SSP	PC-$_{OUT}$	EXPONENCE	MAX-V_{HIGH}	*STRUC-σ	MAX-root	MAX
a. ☞ xvra							*	*
b. xarava						*!		
c. xrva		*!					*	*
d. xrava						*!	*	*
e. xarva						*!		
f. xvr				*!			*	***
g. xrv		*!		*			*	***

The overall ranking for these constraints is shown below.



6. Conclusion

In this paper, I have examined the phenomenon of vowel syncope in Georgian and have proposed two analyses for it in Optimality Theory. In the first analysis, I utilized the constraint BALANCE proposed by Butskhrikidze and van de Weijer (2001) that states that vowel deletion must occur when all of the necessary conditions are met. In the second analysis, I used constraints already contained in the inventory prepared by Ashley *et al*. (2010), with the one modification of adding a feature [+high] to MAX-V. This is a logical, benign, and restrictive expansion of a previous constraint based on the observable facts of [+high] vowel stability in Georgian and Estonian. The motivation for the second analysis is the possibly too ad hoc nature of BALANCE.

One significant implication of the present study is that Georgian strives to simplify lexical items to a single syllable, a claim that seems to contradict the position of Butskhrikidze (2002:96) that the minimal Georgian word is disyllabic of the CVCV type. She bases her claim on the fact that no CVC root types are expressed in the language without a vowel suffix (case marker). There are, however, roots of types CV, CCV, and CCCV (e.g. *xe* 'tree', *rk'o* 'acorn', *brge* 'tall'). Thus, the present analysis is not incompatible with her position; it merely reflects a tension in the language between the morphology and the phonology.

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