Diminutive Bare-Consonant Reduplication in Stl'atl'imcets*

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1.0 Introduction

Stl'atl'imcets, otherwise known as Lillooet, is a Salish language spoken in British Columbia, Canada. Stl'atl'imcets exhibits 4 different patterns of reduplication, plus combinations[1]. In this paper I explore one of these patterns: the diminutive bare-consonant reduplication. The goal is threefold: 1) propose and Optimality Theory (OT) account of the diminutive bare-consonant reduplication in Stl'atl'imcets, 2) discuss the role of prosodic templates in reduplication, and 3) explore the use of morphologically defined constraints. The organization of the paper is as follows: first I present the basic facts of reduplication and account for them using the interaction between two constraints, REALIZEMORPHEME and CONTIGUITY. I show that together, these constraints avoid having to posit prosodic templates associated with the reduplicant and the base. Not only is it unnecessary to refer to prosodic templates, but doing so in fact achieves the wrong results. Second, I discuss cases where reduplication requires vowel epenthesis and propose that CONTIGUITY is morphologically defined, such that schwa-epenthesis does not violate it. Third, I look at reduplication involving consonant clusters, and show that the reduplicant must align to a stressed mora, rather than a stressed syllable. Finally, I conclude by discussing the implications of the proposed account, with respect to the need for prosodic templates (or lack thereof) and for morphologically defined constraints.

2.0 The data

Diminutive bare-consonant reduplication is the most productive type of reduplication in Stl'atl'imcets. It is generally used to mark the diminutive in nouns, although it is also used (less productively) with adjectives and sometimes with intransitive verbs. In the following sections I discuss the data in detail and propose an OT account for the various observed patterns.

2.1 The basic pattern

The following generalizations hold of bare-consonant reduplication:

(1) *Generalizations*
a. The reduplicant is a single consonant.
b. The reduplicant matches the consonant immediately preceding the stressed vowel[2].
c. The reduplicant is infixed after the stressed vowel[3].

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* This work was supported by SSHRC grant # 752-98-0274. Thanks to Sean Hendricks for useful discussion.
[1] Van Eijk, 1984.
[2] Only primary stress is considered here. For the purposes of this analysis, I am considering stress as specified in the input. In fact it is predictable, at least to a certain extent. However, proposing an OT account of stress is beyond the scope of this paper.
[3] It is possible to analyse the data as involving infixation of the reduplicant *before* the stressed vowel. Such an analysis would have to account for alternations in the presence/absence of the stressed vowel and epenthetic vowels as well as accounting for the stress shift (e.g. š-qáx̲ʔ > š-**q**ə́qx̲aʔ "puppy").

The data in (2) illustrate these generalizations. In (2)a for example, the reduplicant is the second [ʔ]. It matches the consonant immediately preceding the stressed vowel and is infixed after the stressed vowel [a]. I have presented very little data here; I only found a few reduplicated forms which do not involve schwa epenthesis, discussed in section 3.

(2) *Data*[4] *(the reduplicant is in brackets)*

root	*reduplicated form*	*English (of reduplicated form)*
a. ʔáma	ʔá[ʔ]ma	pretty, cute
b. pálaʔ	pá[p]laʔ	one person
c. kaɬás	kaɬə[ɬ]s	three animals

2.2 OT account of the basic pattern

There are three things to consider when accounting for bare-consonant reduplication: i) the nature of the base, ii) the placement of the reduplicant, and iii) the nature of the reduplicant.

2.2.1 The nature of the base[5] and the placement of the reduplicant

In this analysis, I am assuming that the onset consonant adjacent to the vowel shares the vowel's mora (Ishihara 1991, also Yoshiba 1983, Hyman 1985, Zec 1988, and Ito 1989). In doing this, it is possible to say that the reduplicant aligns with the stressed mora[6] (the base). The following example illustrates this representation:

(5) the base is a stressed mora:

$$\acute{\mu}$$
/|
x̲^{w} ʔ ú ʔ c i n' 'four animals'

The main evidence for positing a stressed mora as the base comes from cases of reduplication involving consonant clusters. As the following data illustrate, if the stressed vowel is preceded by a consonant cluster in onset position, it is the consonant *immediately* preceding the stressed vowel which reduplicates.

(6) *Reduplication and consonant clusters*

a. x̲zum	x̲zə́[z]'əm	a bit bigger
b. x̲^{w}ʔúcin	x̲^{w}ʔú[ʔ]cin'	four animals
c. spzuʔ	spzú[z]aʔ	bird
d. sq^{w}əm	sq^{w}ə́[q^{w}]əm'	little mountain, hill

Given that the base is the stressed mora, the only consonant which is part of the base is the one

[4] All the data below is from Van Eijk 1984.
[5] Throughout this paper, I use 'base' as shorthand for 'prosodic constituent to which the reduplicant aligns'. We shall see that it is not actually necessary to define the base as a prosodic template.
[6] This analysis assumes that the prosodic template associated with the reduplicant can be a mora, even though the general syllabification patterns in Stl'atl'imcets are not based on the mora.

immediately preceding the stressed vowel; thus, it is this consonant which reduplicates. An alternative account of why the consonant *immediately* preceding the vowel reduplicates is due to Bagemihl (1990). Bagemihl, in his discussion of Bella Coola, proposes that consonants that cannot fit into a well-formed syllable are simply left unsyllabified. This explains the long sequences of consonants found in Bella Coola. In Stl'atl'imcets, the maximal syllable has the shape $C_1C_2VC_3C_4$, where C_1 and C_4 are obstruents, and C_2 and C_3 are resonants. Given this maximal syllable, it is not clear how a word like [x̲^{w}ʔúʔcin'] is syllabified. The cluster [x̲^{w}ʔ] is not a well-formed onset. It is possible that at the edges of words, strings of unsyllabified consonants are allowed, as in Bella Coola. The word [x̲^{w}ʔúʔcin'] could be syllabified as [<x̲^{w}>ʔúʔ.cin'], where the stressed syllable is [ʔú]. If this is the case, then one could say that the reduplicant aligns to the stressed syllable (rather than the stressed mora).

There are two arguments against the 'stressed-syllable' account: 1) the placement of the reduplicant, and 2) additional data involving legitimate onset clusters.

If the prosodic constituent to which the reduplicant aligns were a stressed syllable then, in cases where the stressed syllable has a coda, the reduplicant should be infixed following the coda, rather than immediately following the stressed vowel. The following example illustrates this; 7a illustrates the expected possible result, and 7b shows the actual output.

(7)	a.	/kaɬás + RED/ >	*ka.ɬə́sɬ, *ka.ɬás.əɬ	'three animals'
	b.		ka.ɬə́ɬs	

Another argument against the 'stressed-syllable' approach comes from additional data[7]. In the examples in (8), the onset clusters preceding the stressed vowel are legitimate; they consist of an obstruent followed by a resonant, both of which can be syllabified within the maximal syllable.

(8) *Additional data*

a. qyə́y'x̲	qyax̲	a little drunk
b. pmuml'x	pmilx	to hurry a bit

If the base were a stressed syllable, one would expect the first consonant of the cluster to reduplicate, rather than the second. The following example shows that this is *not* what we get.

(9) /qyax̲ + RED/ > qyə́y'x̲ *qə́y'x̲əq

These two arguments offer strong support for the proposal that the prosodic constituent to which the reduplicant aligns is a stressed mora rather than a stressed syllable. In section 2.5, we shall see how OT formalizes these arguments.

Although the reduplicant is aligned to a stressed mora, it is not necessary to posit a constraint BASE=μ́. The effect of such a constraint is achieved through an instance Generalized Alignment (McCarthy & Prince 1993b):

[7] This data is from Henry Davis – personal communication.

(10) ALIGN(L, RED, R, µ́): align the right edge of the reduplicant with the left edge of the stressed mora.

The assumption behind this constraint is that the stressed mora to which the reduplicant is aligned is the base. However, although the prosodic constituent µ́ is used in the alignment constraint, it is not necessary to appeal to this prosodic constituent to define the base. In fact, the base does not need to be defined at all[8].

ALIGN(R, RED, L, µ́) not only avoids the need to posit a prosodic template for the base, it is also responsible for infixation of the reduplicant in the proper place. Tableau 1. illustrates the role of ALIGN(R, RED, L, µ́) in properly infixing the reduplicant. We shall see in the next section how the reduplicant is actually chosen, for the time being the important is where it is placed in the reduplicated form ($[]_R$ indicates the reduplicant and $[]_B$ indicates the base).

Tableau 1. Placement of the Reduplicant

/ʔáma +RED/	**ALIGN(R, RED, L, µ́)**
a. ☞ $[ʔá]_B[ʔ]_R$ma	
b. $[ʔ]_R[ʔá]_B$ma[9]	*!

2.2.2 Nature of the reduplicant: 2 approaches

One way to analyze the data presented in (2) above is to say that the reduplicant is a bare consonant. This has the advantage of making the data easy to account for. One simply needs to state a constraint aligning the reduplicant to the right edge of the base, *et voilà!* This analysis requires, however, that we expand our understanding of prosodic hierarchy and prosodic templates to include a bare consonant. Apart from the type of reduplication discussed here, there is no motivation for adding the bare consonant to the prosodic hierarchy. Given the implications of adding such an important level of complexity to the prosodic system, it should be avoided unless it is absolutely necessary.

An alternative approach is to say that the reduplicant is not associated to a prosodic template at all (Hendricks, 1998). This approach has the advantage of not requiring any additional structure of the prosodic hierarchy. It has the disadvantage of making the data slightly more difficult to account for (discussed in section 2.3 below). I follow Hendricks (1998) here in assuming that the diminutive reduplicant is not associated with a prosodic template. Instead, the effect of reduplicating a bare consonant is achieved through the interaction of the following two constraints:

(11) *Constraints responsible for bare-consonant reduplication*

RMORPH: a morpheme must be phonologically realized in the output (Gnanadesikan 1997, after Samek-Lodovici 1993).

[8] For a discussion on the nature of the base in reduplication, see Bird & Hendricks (forthcoming).

[9] Note: candidate b. is also ruled out by the constraint **Syllabicity** (introduced in section 2.3) because the two glottal stops cannot be syllabified. However, even if schwa were inserted between the two glottal stops, candidate b. would still lose to candidate a.

CONTIGUITY: a contiguous string in the input must be contiguous in the output (McCarthy & Prince 1995).

RMORPH requires that the reduplicant surface in the output, since it is a morpheme associated with a concrete semantic meaning. CONTIGUITY disallows any segments intervening between segments present in the input. It is a gradient constraint, such that the more intervening segments there are in the output, the worse the violation is. Crucially, Rmorph must be ranked higher than CONTIGUITY, since the reduplicant *does* appear. To satisfy RMORPH while causing as few violations of CONTIGUITY as possible, a single segment - a bare consonant - is inserted. Using these two constraints, it is not necessary to posit a prosodic template for the reduplicant. Tableau 2. below illustrates the interaction between RMORPH and CONTIGUITY.

To account for why the reduplicant matches the first segment of the stressed mora (the onset consonant rather than the vowel), I use the following ANCHOR constraint (McCarthy & Prince, 1993a):

(12) ANCHORL$_{R\acute{\mu}}$: the left edge of the reduplicant must correspond to the left edge of the stressed mora.[10]

The following tableau illustrates the role of ANCHORL$_{R\acute{\mu}}$, as well as the interaction between RMORPH and CONTIGUITY.

Tableau 2. Reduplicant without a prosodic template.

/ x̱ʷʔúcin + RED /	**RMORPH**	**CONTIGUITY**	**ANCHORL$_{R\acute{\mu}}$**
a. x̱ʷ[ʔú]$_B$cin'	*!		
b. ☞ x̱ʷ[ʔú]$_B$[ʔ]$_R$cin'		ʔ	
c. x̱ʷ[ʔú]$_B$[ʔu]$_R$cin'		ʔu!	
d. x̱ʷ[ʔú]$_B$[x̱ʷ]$_R$cin'		x̱ʷ	*!

To account for the basic facts of bare-consonant reduplication, 4 constraints were used: ALIGN(R, RED, L, $\acute{\mu}$), RMORPH, CONTIGUITY and ANCHORL$_{R\acute{\mu}}$, where RMORPH >> CONTIGUITY. The following tableau shows that ALIGN(R, RED, L, $\acute{\mu}$) must also outrank CONTIGUITY, otherwise the reduplicant would be prefixed rather than infixed.

[10] This constraint could also be called ALIGN$_{RB}$ where the base is defined by the alignment constraint ALIGN(R,RED,L,$\acute{\mu}$). The idea behind this constraint is that the only thing something can anchor to is the thing that it aligns to. This restricts greatly the Anchoring possibilities, which makes sense given what this constraint is used for.

Tableau 3. Constraints used so far

/kałás +RED/	ALIGN(R, RED, L, µ́)	RMORPH	CONTIGUITY	ANCHORL$_{R\acute{\mu}}$
a. ka[łá]$_B$s		*!		
b. ☞ ka[łá]$_B$[ł]$_R$s			*	
c. [ł]$_R$ka[łá]$_B$s	*!			
d. ka[łá]$_B$[ła]$_R$s			**!	
e. ka[łá]$_B$[a]$_R$s			*	*!

2.3 Reduplication and schwa insertion

Having discussed the basic pattern of bare-consonant reduplication, let us turn to cases where reduplication results in schwa-insertion (majority of cases). As mentioned above, the maximal syllable in Stl'atl'imcets is $C_1C_2VC_3C_4$, where C_1 and C_4 are obstruents, and C_2 and C_3 are resonants (Van Eijk 1984). If reduplication results in a string which cannot be syllabified into this maximal syllable, a schwa is inserted (or [a] before ʔ[11]). The following data illustrate ə-epenthesis.

(13) *Data – schwa epenthesis*

a. š-qax̱ʔ	š-qə́[q]x̱aʔ[12]	puppy
b. pun	pú[p]ən'	find by accident
c. š-yaqča?	š-yə́[y']qčaʔ	girl (lower dialect)
d. m'aw	mə́[m']əw	kitten
e. cilskt	cə́[c]l'əkst	five animals
f. šámaʔ	šə́[š]maʔ	white person
g. šmúłač	š-mə́-[m']łač	girl (upper dialect)

As mentioned in section 2.2.2 above, this data makes it slightly harder to propose an account of reduplication without positing a prosodic template associated to the reduplicant. Given that the base is stressed mora (which includes the stressed vowel), why is it that when syllabification requires an extra vowel, we epenthesis [ə] rather than reduplicating the vowel of the base? As an example, take the form *pún*. Reduplication results in an unsyllabifiable string: *púpn*. Given that the base is the stressed mora *pú*, why doesn't the reduplicated for surface as [púpun]? As (14) illustrates, the reduplicated form has a [ə] in it:

(14) pún > pú**p**ən' (*púpun) 'find by accident'

The solution to this problem involves modifying CONTIGUITY slightly to account for morphological affiliation[13]. The difference between [ə] and the base vowel is that [ə] is not morphologically affiliated, whereas the base vowel is. Indeed, [ə] is inserted for syllabification

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[11] The reason [a] is inserted before a glottal stop is probably phonetic, due to the position of the articulators necessary to produce a glottal stop.

[12] The stressed vowel often surfaces as a schwa in the reduplicated form. This is not discussed here.

[13] thanks to Sean Hendricks for this useful insight.

purposes only; it is a purely phonological segment, with no morphological or semantic associations. The base vowel, on the other hand, it part of a morpheme (since it is part of the stem). The proposal here is that CONTIGUITY is *morphologically* defined, such that only morphologically affiliated segments cause violations. Under this analysis, CONTIGUITY needs to be modified in the following way:

(15) CONTIGUITY [revisited]: (morphologically defined) a contiguous morphological string in the input must be acontiguous morphological string in the output.

Adding a schwa to a word for syllabification purposes does not cause a constraint of CONTIGUITY, since schwa is not morphologically affiliated[14]. In Tableau 4, the role of morphologically defined CONTIGUITY is illustrated. Since the focus of this paper is reduplication and not syllabification, I do not go into the details of the well-formedness constraints that require vowel epenthesis. I use the following contraint as shorthand to account for where a vowel is epenthesized.

(16) SYLLABICITY: shorthand for the syllable well-formedness constraints responsible for schwa insertion.

In Tableau 4, ANCHORL$_{R\acute{\mu}}$ is excluded as well as any candidates which would violate it.

Tableau 4. Bare-consonant reduplication with ə-epenthesis

/ pun +RED /	SYLLABICITY	RMORPH	CONTIGUITY
a. [pú]$_B$n		*!	
b. [pú]$_B$[p]$_R$n’	*!		
c. [pú]$_B$[pu]$_R$n’			pu!
d. ☞ [pú]$_B$[p]$_R$ən’			p

2.4 Reduplication across morpheme boundaries

Examples in (17) show that reduplication is not limited to the root. Since it depends on stress, it reduplicates suffixes when they contain the stressed vowel.

(17) *Reduplication across morpheme boundaries*

a. $\underline{x}^{w}$m – ílx	$\underline{x}^{w}$əm-í[m]l’əx	to hurry up ($\underline{x}^{w}$əm: fast, – ílx: body)
b. wəp-l-íc’aʔ	wəp-l-í[l]c’aʔ	caterpillar (wəp: hair, -l-: connective, -íc’aʔ: skin)
c. ɬap-ən-úɬ	ɬəp-ɬəpn-ú[n]’ɬ	forgetful (ɬap-ən: to forget (trans), - úɬ: always)

The cases involving reduplication across morpheme boundaries raise an interesting question about the use of morphologically defined CONTIGUITY. As it stands, CONTIGUITY predicts that if the reduplicant were to fall at a morpheme boundary, the whole stressed mora could be

[14] Phenomena which apply to morphologically affiliated segments can be seen in other domain of phonology. In Lillooet, epenthetic vowels cannot bear stress. The same pattern occurs in Tohono O’odham, where stress must fall on a morphologically affiliated segment (Fitzgerald 1998).

reduplicated, since this would not cause any violations of CONTIGUITY. Take the following hypothetical example: **wəplí-c'aʔ**. Table 5 illustrates that CONTIGUITY would not distinguish between the candidate in which the whole base is reduplicated, and the one in which only the consonant reduplicated.

Tableau 5. Hypothetical reduplication at morpheme boundaries

/ wəplí-c'aʔ +RED /	SYLLABICITY	RMORPH	CONTIGUITY
☞ wə[plí]$_B$[li]$_R$-c'aʔ			
☞ wə[plí]$_B$[l]$_R$-c'aʔ			

If it the case that the whole stressed mora reduplicates, then another low ranked constraint of the type MAX$_{BR}$ is needed, to ensure that, wherever it can, the reduplicant will be identical to the base. If on the other hand, only a bare consonant reduplicates, CONTIGUITY needs to be modified further, such that it is violated within a prosodic word, even if across morphemes. Unfortunately, I could not find any cases where the stressed reduplicant is morpheme-final. Morphemes ending in a vowel are extremely rare, and do not seem to participate in reduplication[15]. Without the necessary data, this issue must remain unresolved.

3 Summary

Tableau 8 illustrates the interactions between all of the constraints used in this analysis. The rankings are as follows: SYLLABICITY, ALIGN(R, RED, L, μ), RMORPH >> CONTIGUITY, ANCHORL$_{R\mu}$ (unranked).

Tableau 8. Interaction of constraints

/spzuʔ + RED/	SYLLABICITY	ALIGN(L,RED,R,μ́)	RMORPH	CONTIGUITY	ANCHORL
a. sp[zú]$_B$ʔ			*!		
b. sp[zú]$_B$[z]$_R$ʔ	*!			z	
c. sp[zú]$_B$[zu]$_R$ʔ				zu!	
d. ☞ sp[zú]$_B$[z]$_R$aʔ				z	
e. sp[zú]$_B$[s]$_R$aʔ				s	*!
f. [z]$_R$əsp[zú]$_B$ʔ		*!			

6.0 Conclusion

In this paper, I have proposed an OT account of diminutive bare-consonant reduplication in Stl'atl'imcets without positing prosodic templates associated with the reduplicant and the base. The interaction between RMORPH and CONTIGUITY achieves the same effect as positing a prosodic template consisting of a bare consonant. The reduplicant is the minimum amount of material necessary to realize the morpheme, and base is simply what the reduplicant aligns to. This supports Hendrick's (1998) proposal that reduplication does not necessarily involve as much templatic structure as it has traditionally been given, and implies that it may be possible to eliminate reduplication templates altogether. An interesting fact about the analysis proposed above is that it does not use the constraint MAX$_{BR}$, which requires the base and the reduplicant to

[15] Henry Davis – personal communication.

be identical. What does this say about reduplication, and the relationship between the base and the reduplicant? Is it necessary to formalize this relationship at all? Although it has traditionally been assumed that the base is an obligatory component of reduplication, it seems that using alignment constraints, it is not necessary to overtly define the base at all.

The analysis presented above also makes the distinction between morphologically defined constraints like CONTIGUITY and phonologically defined ones, like those responsible for syllable well-formedness. This implies that there may be other phenomena which are best accounted for using constraints which distinguish between the morphological plane (in Fulmer's terms) and the phonological one. Further research will hopefully test the validity of making such a distinction between such constraints.

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