Bare-Consonant Reduplication in Yokuts: Minimal Reduplication by Compression

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1. Introduction

In Yokuts, a Penutian language, there is a pattern of reduplication in which the reduplicant surfaces as a copy of the first consonant and the last consonant of the root. This type of reduplication falls under the category of bare-consonant reduplication (Sloan 1988, Hendricks 1999), which is characterized as being a single consonant C, or a string of two consonants CC. Such examples of reduplication are incompatible with analyses in which the shape of the reduplicant is defined by a prosodic template constraint.

In this paper, I present data illustrating this pattern of reduplication in Yokuts and show how this data cannot be accounted for in Optimality Theory by a prosodic template. Also, I will provide an analysis without a template constraint, consistent with current accounts of reduplication (McCarthy & Prince 1994, 1997; Gafos 1997; Walker 1998; Nelson, to appear; Urbanczyk, to appear). This analysis is based on a compression model (Hendricks 1999), where the shape of the reduplicant is determined by constraints that determine morpheme ordering.

2. Yokuts Reduplicated Roots

Newman (1944) presents the following verbal paradigm, in which the reduplicant marks repetition:

(1) Yokuts CC Reduplication:

giy'i-**gy**-	'touch repeatedly'
kɔyi-**ky**-	'butt repeatedly'
mik'i-**mk'**-	'swallow repeatedly'
ʔut'u-**ʔt'**-	'steal repeatedly'
ʔili-**ʔl**-	'fan repeatedly'
lagi-**lg**-	'stay over night repeatedly'

As the data in (1) show, the reduplicant surfaces as a copy of the initial consonant of the root, and the final consonant of the root.

These reduplicated roots are used with a limited set of suffixes, which are shown below (the names in parentheses refer to the dialects of Yokuts in which these suffixes are attested):

(2) Suffixes Used With CC Reduplicated Roots:

-ʃta (Gashowu, Choynimni)	indirective
-wis (Yowlumne)	reflexive or reciprocal verbal noun
-w̓ʃa (Gashowu, Choynimni)	reflexive or reciprocal

These suffixes are ordered immediately following the reduplicant.

In the following sections, I present an account of this pattern of reduplication that accounts for the generalizations outlined below:

(3) Generalizations:

(a) The reduplicant is a suffix.
(b) The left edge of the reduplicant matches the leftmost consonant of the root, and the right edge of the reduplicant matches the rightmost consonant of the root.[1]
(c) The reduplicant is of the shape CC. The initial consonant of the reduplicant is the coda of a syllable, and the final consonant of the reduplicant is the onset of the following syllable.

In section 2.1, I present some background on the analysis of Yokuts verb roots. In section 2.2, I account for generalization (3)(a). In section 2.3, I account for generalization (3)(b). In section 0, I account for generalization (3)(c), the CC shape of the reduplicant.

2.1. Background on Yokuts Roots:

A full discussion of Yokuts roots is beyond the scope of this paper, but in this section, I give a basic sketch of the roots for the paradigm in (1). According to Archangeli (1991), biconsonantal roots fall into three different prosodic types ($\sigma, \sigma_{\mu\mu}, \sigma_{\mu}\sigma_{\mu\mu}$). These serve as default templates for those roots. However, particular affixes can enforce a specific template for a root to which it is attached. The roots in (1) can be shown to have varying default prosodic templates (Archangeli 1991), but the reduplicated root always surfaces with a σ template. Therefore, I assume that the reduplicant requires a σ template, and this serves as the input form of the root (see Archangeli & Hendricks (in prep) for further discussion of template selection in Optimality Theory).

Based upon this, the roots of the forms in (1) are the following:

(4) <u>Yokuts Roots</u>

giy′	mik′	?il
kɔy	?ut′	lag

These roots do not include the vowel that appears between the root and reduplicant (eg. giy′i̲-gy-). The segment [i][2] following the roots in (1) is an epenthetic segment and is separate

[1] The variation between [y] and [y′] is due to a positional restriction on glottalized semivowels in Yokuts (Newman 1944). The segment [y′] never surfaces when following a consonant.

from the root. The epenthetic segment appears to avoid tautosyllabic consonant clusters (Kuroda 1967, Archangeli 1984).

2.2. *Placement of the Reduplicant*

As generalization (3)(a) states, the reduplicant is a suffix to the root. Therefore, the reduplicant must be placed to the right of the root. In this section, I provide an account of this ordering. Based on work by McCarthy & Prince (1993b), Russell (1995), and Hammond (to appear), the input of a morphologically complex form is an unordered array of morphemes. The order of morphemes in the output is determined by the constraint ranking.

Under the compression model (Hendricks 1999), the order of morphemes in the output is determined by the relative rankings of alignment constraints of the following form:

(5) ALIGN-Morpheme-X (based on McCarthy & Prince 1993b)
Align (Morpheme, X, Word, X)
Align edge X of Morpheme to edge X of the morphological word.

All morphemes, including the root, have such a constraint in the ranking. The relative rankings of these constraints determine the surface order of the morphemes in the input array.

For a form such as *giy'igyiʃta*, there are three distinct morphemes in the array: /*giy*, RED, *ʃta*[3]/. Therefore, there are three relevant alignment constraints, given below in (6)-(8):

(6) ALIGN-Root-L
Align (Root, L, Word, L)
Align the left edge of the root to the left edge of the morphological word.

(7) ALIGN-RED-L
Align (RED, L, Word, L)
Align the left edge of the reduplicant to the left edge of the morphological word.

(8) ALIGN-*ʃta*-L
Align (*ʃta*, L, Word, L)
Align the left edge of *ʃta* to the left edge of the morphological word.

By these constraints, the morphemes in the form compete for the same edge of the morphological word. The following ranking ensures that the proper order of morphemes is chosen as optimal: ALIGN-Root-L >> ALIGN-RED-L >> ALIGN-*ʃta*-L. By this ranking, it is more important for a root to be closest to the left edge, the reduplicant to be next closest, and so on.

The following tableau illustrates the evaluation of this ranking for the form *giy'igyiʃta* (I assume a CC reduplicant):

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[2] This vowel appears as [u] in the form ˀut'u-ˀt'-but this is the result of harmony with the root vowel (Kuroda 1967, Archangeli 1984).

[3] I list the form of this morpheme as *ʃta*, rather than *iʃta*, following Kuroda (1967) and Archangeli (1984, 1991). The vowel [i] is epenthetic.

(9) ALIGN-Root-L >> ALIGN-RED-L >> ALIGN-*ʃta*-L

/giy′, RED, ʃta/	ALIGN-Root-L	ALIGN-RED-L	ALIGN-*ʃta*-L
☞a. giy′i-**gy**-iʃta		giy′i	giy′igyi
b. iʃta-giy′i-**gy**	i!ʃta	iʃtagiy′i	
c. **gy**-giy′-iʃta	g!y		gygiy′i
d. giy′-iʃta-**gy**		giy′iʃ!ta	

As the tableau in (9) shows, candidates (b) and (c) are eliminated, since the root must be initial; any other ordering will incur violations of ALIGN-Root-L. Also, as shown by candidate (d), the reduplicant must be second, in order to incur the fewest violations of ALIGN-RED-L. Thus, (a) is correctly chosen as optimal, at the expense of numerous violations of ALIGN-*ʃta*-L.[4]

2.3. Edge-Matching of the Reduplicant:

As generalization (3)(b) states, the left edge of the reduplicant matches the left edge of the root, and the right edge of the reduplicant matches the rightmost consonant of the root. The matching of edges between two strings is generally handled by the ANCHOR schema of constraints (McCarthy & Prince (1995).

(10) {RIGHT, LEFT}-ANCHOR(S_1, S_2)
Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.

In the case of Yokuts reduplication, it is clear that one of the relevant strings is the reduplicant. However, the question remains as to what the second string is to which the reduplicant corresponds. A set of strings and their possible correspondences was proposed in McCarthy & Prince (1995), and is illustrated by the diagram below:

(11) Modeled after McCarthy & Prince (1995)

Input: /AfRED + Stem/

I-R Faithfulness ⇙⇗ ⇅ *I-B Faithfulness*

Output: Reduplicant ⇔ Base
B-R Identity

Under this model, there are three basic strings: input stem, base, and reduplicant. The reduplicant string is self-explanatory, as it is the output exponent of the input RED. As for the base string, the definition is somewhat more complicated. The base is the string from which the

[4] Although I am assuming leftward alignment for these constraints, there is no theoretical requirement on directionality. Thus, the ranking ALIGN-*ʃta*-R >> ALIGN-RED-R >> ALIGN-Root-R will result in the same morphological ordering (see Hendricks 1999 for further discussion).

reduplicant gets material for the copy. However, there must be some way to determine what part of the output comprises the base.

In McCarthy & Prince (1993a), the authors state that "in any output candidate, the Base comprises the phonological material that immediately precedes [or follows] the exponent of the…morpheme." Since the Yokuts reduplicant is a suffix, the base is the material directly preceding the reduplicant. Under this definition, the base-reduplicant relationship for *giy'igyiʃta* would be the following:

(12) Base-Reduplicant Structure in Yokuts:

$[\text{giy'i}]_{\text{BASE}}[\text{gy}]_{\text{RED}}\text{iʃta}$

However, as the structure in (12) shows, the right edge of the reduplicant does not correspond to the right edge of the base. Therefore, the relevant string is not the base.

The third possible string under the model in (11) is the input stem. In McCarthy & Prince (1995), the authors state that "the base is the output of the input stem." The input stem is therefore the material in the input that corresponds to the base. Since the epenthetic segment is not present in the input, the input material that corresponds to the base is the root.[5]

Therefore, ANCHOR can be defined over an input stem-reduplicant correspondence, as shown by the following diagram:

(13) Input stem-Reduplicant Structure in Yokuts

$[\text{giy'}]_{\text{INPUT STEM}}\ [\text{gy}]_{\text{REDUPLICANT}}$

As the diagram in (13) shows, the left edge of the input stem has a segment that corresponds to a segment at the left edge of the reduplicant. Likewise, the right edge of the input stem has a segment that corresponds to a segment at the right edge of the reduplicant. Therefore, the relevant ANCHOR constraints are LEFT-ANCHORIR and RIGHT-ANCHORIR.

Since both edges of the reduplicant match the input root, both anchoring constraints must be unranked with respect to each other. The following illustrates the evaluation:

(14) Left-ANCHORIR, Right-ANCHORIR[6]

/[giy']$_{I}$, RED, ʃta/	L-ANCHORIR	R-ANCHORIR
☞a. [giy'i]$_{B}$ $_{R}$[<u>gy</u>]-iʃta		
b. [giy'i]$_{B}$ $_{R}$[<u>gi</u>]-iʃta		*!

As tableau (14) shows, if the right edge of the reduplicant matches the right edge of the base, a violation of R-ANCHORIR is incurred (candidate (b)). Candidate (a) is therefore chosen as optimal. In the next section, I provide an account for the CC shape of the Yokuts reduplicant.

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[5] For further discussion regarding the relationship between input stem and base, see Urbanczyk (to appear) and Bird & Hendricks (in prep.).

[6] Nelson (1999) proposes the constraint EDGE-ANCHOR, which requires that both edges of one string correspond to the other string. This constraint is to replace RIGHT-ANCHOR. Further investigation of this possibility is necessary, but for now, I will assume both LEFT- and RIGHT-ANCHOR.

2.4. *Shape of the Reduplicant:*

The generalization in (3)(c) is the aspect of Yokuts reduplication that is of particular interest in this paper. The reduplicant surfaces as a CC string. The primary difficulty inherent in this reduplicant shape is that the reduplicant is never part of a single prosodic unit.

(15) Surface prosody of the reduplicant
gi.y'**ig.yi**ʃ.ta

Since the reduplicant never surfaces as a prosodic unit, the shape of the reduplicant cannot be determined by mapping to a prosodic template constraint like the following, proposed in McCarthy & Prince (1993a):

(16) Template constraints (McCarthy & Prince 1993a):
Mcat = PCat
where Mcat ≡ Morphological Category ≡ Prefix, Suffix, RED, Root, Stem, LexWd, etc.
and PCat ≡ Prosodic Category ≡ Syllable (type), Foot (type), PrWd (type), etc.

Since the Yokuts reduplicant never surfaces as a single prosodic unit, there is no prosodic unit to serve as PCat for such a constraint.

In this section, I propose a method to account for the surface form of the Yokuts reduplicant based upon the compression model introduced in Hendricks (1998, 1999). Under compression, a reduplicant surfaces minimally, in order to maximally satisfy the alignment constraints that determine the order of morphemes. The following tableau illustrates the interaction of the constraints thus far (I assume an undominated ranking for *CC, I eliminate ALIGN-Root-L from the ranking, and do not consider candidates with incorrect morpheme order).

(17) Shape of the Reduplicant

/giy', RED, ʃta/	*CC	DEPIO	L-ANCHIR	R-ANCHIR	AL-RED-L	AL-*ʃta*-L
☞a. gi.y'i-[**g.y**]-iʃ.ta		*!			giy'i	giy'igyi
b. gi.y'i-[**g**].-iʃ.ta		*!		*	giy'i	giy'igi
c. gi.y'i.-[**y**]-iʃ.ta		*!	*		giy'i	giy'iyi
d. gi.y'i-[**gi.y**]-iʃ.ta		*!			giy'i	giy'igiyi
❽ e. giy'.-[**gi.y**]-iʃ.ta					giy'	giy'giyi
f. giy'.-[**gy**]-iʃ.ta	*!				giy'	giy'gyi
g. giy'.-[**g**]-iʃ.ta				*!	giy'	giy'gi

As tableau (17) shows, the incorrect candidate (e) is chosen as optimal, as it reduplicates the entire root in order to avoid consonant clusters.

The resolution of this problem has two parts. One part is that DEP_{IO} must be ranked low, so that epenthesis is possible:

(18) Low Ranking DEPIO

/giy', RED, ʃta/	*CC	L-ANCHIR	R-ANCHIR	AL-RED-L	AL-*ʃta*-L	DEPIO
☞a. gi.y'i-[**g.y**]-iʃ.ta				giy'i!	giy'igyi	*
b. gi.y'i-[**g**].-iʃ.ta			*!	giy'i	giy'igi	*
c. gi.y'i.-[**y**]-iʃ.ta		*!		giy'i	giy'iyi	*
d. gi.y'i-[**gi.y**]-iʃ.ta				giy'i!	giy'igiyi	*
❽ e. giy'.-[**gi.y**]-iʃ.ta				giy'	giy'giyi	
f. giy'.-[**g**]-iʃ.ta			*!	giy'	giy'gi	

The incorrect candidate (e) is still chosen as optimal. However, it is clear that the reduplicant must be at least two consonants, in order to satisfy the anchoring constraints (candidate (f)).

The second part to this solution hinges upon a fact regarding the prosodic structure of the entire reduplicated form. Candidate (18)(e), which is incorrectly chosen as optimal, includes an initial CVC syllable, while the correct surface candidate (18)(a) is a CV syllable.

(19) ALIGN-REP-σ_μ
Align (Repetitive, L, σ_μ, L)
Align the left edge of a repetitive form to the left edge of a light syllable.

The constraint Align-Rep-σ_μ is satisfied as long as the form marking the repetitive begins with a light syllable. Since the reduplication pattern discussed in this paper marks a repetitive form, any form that includes reduplication must begin with a light syllable. Such a move is consistent with work on templates in Yokuts (Archangeli & Hendricks, in prep).

(20) Light-Syllable Alignment

/giy', RED, ʃta/	L,R-ANCHIR	ALIGN-REP-σ_μ	AL-RED-L	AL-*ʃta*-L	DEPIO
☞a. gi.y'i-[**g.y**]-iʃ.ta			giy'i	giy'igyi	*
b. gi.y'i.-[**gi.y**]-iʃ.ta			giy'i	giy'igiyi!	*
c. giy'.-[**gi.y**]-iʃ.ta		σ!σ	giy'	giy'giyi	

As tableau (20) shows, the reduplicant surfaces as only two consonants, in order to maximally satisfy the alignment constraints while ensuring an initial light syllable.

3. Conclusion

In this paper, I have shown that the pattern of reduplication in (1) cannot be accounted for by prosodic template constraint, as the reduplicant never surfaces as a prosodic unit. Therefore, there must be some other constraint interaction that accounts for the minimal CC reduplicant. In order to account for the minimal size of the reduplicant, I have proposed an analysis using compression, which allows the size of the reduplicant to emerge in order to maximally satisfy alignment constraints that determine morpheme ordering.

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