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Multiple Correspondence in Reduplication*

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1. Introduction

This paper addresses the problem of double reduplications, in particular whether languages might avoid such reduplications. It is well attested that languages like Lushootseed have cases of double reduplications, as illustrated in (1) from Urbanczyk (1996:278), where each prefix represents a reduplicative morpheme. The outermost prefix is the distributed morpheme and the prefix adjacent to the stem is the diminutive morpheme:

(1)	a.	bí-bi-bəda?	'small children'
	b.	pí-pi-pšpiš	'kittens'
	c.	yú-yu-yəbil	'children are starving'

In this paper I will show that double reduplications are actually a disfavored configuration and I will argue for a constraint penalizing multiple correspondence between base and reduplicants. I will illustrate this with comparative data from three Ethiopian Semitic languages which use various strategies to avoid the creation of double reduplications. Optimality Theory, with its emphasis on violable constraints, allows us to capture why in certain cases, double reduplications are attested.

2. Double reduplications and violations

We can define double reduplications in one of two ways:

(2) a. two repetitions of a base consonant in the output form; or
b. two reduplicative affixes

The second definition in (2b) is the more familiar scenario and is that found in (1) above, but the definition in (2a) is more appropriate for Ethio-Semitic languages, where there may not always be a clear reduplicative affix triggering reduplication. Urbancyzk (1996) defines the base as 'the string immediately adjacent to the reduplicant', implying the relationship in (3b) rather than (3c). Correspondence between segments is indicated with numerical subscripts. In other words, for each affix, there is a one-to-one correspondence between base and reduplicant, irrespective of the fact that the base for the outermost affix itself is part of a base-reduplicant relationship. The outermost affix has no correspondence relationship with the original base.

(3) a. p_1i-[p_1špiš]
b. p_2i-[p_{12} i-p_1špiš]
c. p_1i-[p_1i[p_1špiš]

But, in languages which penalize double reduplications, the base-reduplicant correspondence relationship must be cumulative in the sense of (3c). Given this cumulative effect, we can penalize double reduplications by extending the constraint INTEGRITY to the base-reduplicant relationship, where S1 = input base and S2 = reduplicants:

(4) INTEGRITY No element of S1 has multiple correspondents in S2
McCarthy & Prince (1995)

This constraint will capture any configuration of double reduplication, whether one affix copies another (5a) or whether two affixes copy the input base (5b). Both configurations are found in Ethio-Semitic. Thus, the S2 comprises all reduplicants corresponding to the base[1]:

(5) a. s_1i-[s_1i[$s_1$ikan]
b. s_1i-[[$s_1$ikan]-s_1i]

There are three major kinds of reduplication in Ethio-Semitic, all occurring within the verb stem. The following examples are from Tigrinya.[2] As is well-known, the basic Semitic root has three consonants, normally assuming a disyllabic shape with the aspectual vowel melody. Reduplication occurs when the root has too few segments and expands to fill a triconsonantal template (6a), or when the root expands to fill a quadriconsonantal template (6a-c).

(6)

			Root	Stem	
a.	Final Doubling	biliteral:	zl	zəlәl	'jump'
			nd	nədəd	'burn'
		triliteral:	brg	bərgəg	'bolt (in fright)'
			dnz	dənzəz	'be numb'
b.	Total copy		mr	mərmər	'examine'
			rs	rəsrəs	'spray'
c.	Frequentative		grf	gərarəf	'whip again'
			sbr	səbabər	'break in pieces'

The reduplicated biliterals in (6a) are usually analyzed as spreading of the final consonant to fill a triconsonantal template (McCarthy 1981). I will argue that this is not spreading to create a long-distance geminate, but rather copying to fill the template (see Rose 1997 for additional arguments). In this manner, there is no reduplicative affix which triggers the reduplication, and it can be termed 'phonological reduplication'.[3] On the other hand, the biliterals in (6b) which expand to fill a quadriconsonantal template, as well as the triliterals in (6a) which also fill a quadriconsonantal template, are instances of lexical or morphological reduplication. Prunet & Petros (1996) argue that these verbs in Gurage share a common semantic notion of localized movement, or describe audio or visual properties. There is usually no corresponding non-reduplicated verb, even with the triliterals which reduplicate. For example, there is no verb bərəg corresponding to bərgəg.

Finally, the 'frequentative' verbs in (6c) are more transparently morphological in the sense that there is a corresponding non-reduplicative verb and the frequentative conveys the notions of iteration, intensity or distributive. Some representative examples are given in (7) from three Ethio-Semitic languages:

(7)

	root	regular		frequentative	
Muher	sbr	səbbər	'break'	sɨβəbbər	'break in pieces'
(W. Gurage)	grf	gərrəf	'whip'	gɨrərrəf	'whip again'
Tigrinya	grf	gərəf	'whip'	gərarəf	'whip again'
	sbr	səbər	'break'	səbabər	'break in pieces'
Tigre	kdm	kədəm	'work'	kədadəm	'work on and off'
	ħrs	ħarəs	'plough'	ħararəs	'plough a little'

The frequentative is characterized by a quadriconsonantal template; in most languages, a vowel [a] appears between the second and third consonants, and the penultimate root consonant is copied and occupies the second position. The North Ethio-Semitic perfective template represented by Tigrinya and Tigre is CəCaCəC whereas the South Ethio-Semitic perfective template is CəCaCCəC in Amharic or CɨCəC(C)əC in Western Gurage. One could analyze the frequentative as having a reduplicative infix inserted before the final syllable of the regular stem, i.e. gərəf --> gə-Ca-rəf --> gərarəf. However, only the root is copied and the remaining vowels are determined by the output template; extracting the root from the regular verb stem and mapping it to the frequentative template therefore avoids problems of overwriting when there are too few vowels in the frequentative template to systematically overwrite all the vowels in the basic stem.

Because the frequentative is fairly productive, it can potentially cooccur with the other two types of reduplication, total copy and final doubling. I now turn to those cases.

2.1. Biliteral roots

I begin with an examination of biliteral roots and the frequentative. In Western Gurage, as exemplified by Chaha, the frequentative cannot be formed from a biliteral final doubling stem (R represents a coronal sonorant which may be realized as [n] or [r] depending on context - see Petros (1996)). While not all verbs will form a frequentative due to their semantics (i.e. statives and resultatives tend not to), it is categorically true that no biliteral doubled verb will form a frequentative in Chaha:

(8) Chaha

root		regular			frequentative	
Rd	a.	nədəd	burn	d.	*nɨdədəd	burn again
Rk'	b.	nək'ək'	detach	e.	*nɨk'ək'ək'	detach again
t'm	c.	t'əməm	bend	f.	*t'ɨməməm	bend again

In contrast, in Tigrinya, frequentatives of biliteral final doubling stems are attested. The reduplicant and frequentative [a] vowel are underlined:

(9) Tigrinya

root		regular			frequentative	
ħt	a.	ħatət	ask	f.	ħa<u>ta</u>tət	ask many people
k'd	b.	k'ədəd	tear	g.	k'ə<u>da</u>dəd	tear again
wt'	c.	wətt'ət'	pull, force	h.	wə<u>t'a</u>t'ət	force many people
gf	d.	gəfəf	collect, amass	i.	gə<u>fa</u>fəf	collect from many sources
fk'	e.	fək'ək'	pry open	j.	fə<u>k'a</u>k'ək'	pry open many places

The formation of the Tigrinya frequentatives in (9) violates Integrity, since the input base consonant corresponds to two reduplicants, the final doubled one and the frequentative reduplicant. What would drive the language to violate Integrity in this manner? I argue that this is due to a constraint requiring the frequentative to be expressed in the output:

(10) **Morphological Expression**: An input morphological category must be expressed in the output

This constraint is useful in cases of multiple exponence (see Rose 1997) in which there may be two possible methods of expressing a morphological category. If only one method is utilized but the input morpheme remains unparsed, a violation of M-Parse (Prince & Smolensky 1993) results, but not a violation of Morphological Expression. The difference between Chaha and Tigrinya with respect to Integrity and Morphological Expression is captured by a difference in ranking. In Tigrinya it is more important to realize the category of frequentative than to satisfy Integrity:

(11) Chaha: Integrity > Morphological Expression
Tigrinya: Morphological Expression > Integrity

Other means of satisfying Morphological Expression are ruled out because they have no reduplication of the penultimate consonant as well as other higher-ranked violations.[4] I give both the Chaha and Tigrinya candidates:

(12)

	Chaha	Tigrinya	
a.	nɨnədəd	nənadəd	Anchor violation
b.	nɨʔədəd	nəʔadəd	DEP violation
c.	nɨədəd	nəadəd	ONSET violation
d.	nadəd	nadəd	Template violation

In (12a), the wrong consonant has been reduplicated. Assuming that the base is the string to the right of the reduplicant, this can be expressed as an Anchor-L violation, since the reduplicant does not correspond to the consonant at the left edge of the base. The candidates in (12b) and (12c) represent straightforward violations. (12d) has a smaller template than is necessary to convey the frequentative; the frequentative requires at least three syllables. Furthermore, it is identical to the Type C verb, violating Morphological Expression.

2.2 Quadriliterals in Tigrinya

Quadriliteral roots in Tigrinya can form the frequentative by one of two methods, either the quadriliteral root maps to the frequentative template and there is no reduplication as in (13a), or reduplication occurs and the frequentative has a longer quadrisyllabic shape instead of trisyllabic as in (13b):

(13)

a) a frequentative template with no reduplication (CəCaCəC) OR
b) reduplication to form a longer frequentative stem ($CəCəC_1aC_1əC$)

In (14) I give examples of both kinds:

(14)

root		**regular**			**frequentative**	
glbt'	a.	gəlbət'	turn over (tr.)	i.	gəlabət'	turn over and over
				ii.	gələbabət'	
fnčl	b.	fənəčəl	break off, chip	i.	fənačəl	break off many pieces
				ii.	fənəčačəl	
fns'g	c.	fəns'əg	penetrate	i.	fənas'əg	keep penetrating
				ii.	fənəs'as'əg	
g^{w}ndb	d.	g^{w}əndəb	cut in half	i.	g^{w}ənadəb	cut in half again
				ii.	g^{w}ənədadəb	

The longer form in (15a) fares better on the constraint $MAX_{B\text{-}R}$ which requires the frequentative to be expressed by reduplication, but the shorter form in (15b) obeys the templatic constraint which restricts the frequentative to its normal trisyllabic shape (I label this informally Template):

(15) a) gələbabət' $MAX_{B\text{-}R}$ > Template

b) gəlabət' Template > $MAX_{B\text{-}R}$

Both forms are attested because *both* forms satisfy Morphological Expression as well as Integrity. The shorter form is distinguished from the regular quadriliteral by the presence of the vowel [a] between the second and third root consonants; therefore, Morphological Expression is satisfied:

(16) **glbt'- Frequentative**

glbt' Freq	MORPH EXPR	INTEGRITY
a. ☞ gələbabət'		
b. ☞ gəlabət'		
c. gəlbət'	*!	

Selection of one form or the other will depend on the ranking of $MAX_{B\text{-}R}$ and Template. My consultants tended to prefer the shorter form, whereas in Leslau's (1941) description of Tigrinya, the longer form is given.

2.3 Reduplicative quadriliterals in Tigrinya

Total copy quadriliterals already have one form of reduplication. Those that do form the frequentative do so by selecting the regular frequentative template with no reduplication:

(17)

root		regular			frequentative	
bs'	a.	bəs'bəs'	mix	f.	bəs'abəs'	mix many things/ continuously
t'b	b.	t'əbt'əb	pat	g.	t'əbat'əb	pat continuously
k^{w}s	c.	k^{w}ək^{w}əs	antagonize	h.	k^{w}əsak^{w}əs	antagonize continuously
tb	d.	təbtəb	beat	i.	təbatəb	beat continuously
tx	e.	təxtəx	tickle/ pick on weak points	j.	təxatəx	tickle a lot or pick on many weak points

It is systematic that total copy verbs may never form a frequentative by copying the penultimate consonant and adopting the longer form:

(18) *bəs'əbabəs'
*k'ətək'ak'ət
*təbətatəb

This is because the longer form would violate Integrity. Given that there is an alternate method of conveying the frequentative, through adopting the frequentative template with no reduplication, this is the candidate which is preferred:

(19) **tb - Frequentative**

tb Freq	MORPH EXPR	INTEGRITY
a. təbətatəb		*!
b. ☞ təbatəb		
c. təbtəb	*!	

This predicts that triliterals with final doubling should behave the same way:

(20)

root		regular			frequentative	
šrm	a.	šərməm	chip	e.	šəraməm	chip many times
k'rd	b.	k'ərdəd	dice	f.	k'əradəd	dice a lot
ʕbl	c.	ʕablәl	dominate	g.	ʕabalәl	be dictatorial
zrt	d.	zərt'ət'	disrespect elders	h.	zəratət	disrespect many elders

Indeed they do, and there is no double reduplication possible:

(21) *šərəmaməm
*k'ərədadəd
*ʕabəlaləl
*zərət'at'ət

In conclusion, Tigrinya quadriliterals may all form frequentatives by selecting the regular frequentative template with the characteristic vowel [a] between the second and third consonants, but forgo the reduplication. Only regular quadriliterals may form the longer stem with reduplication because doing so will not violate Integrity. Additional reduplication in the case of total copy or final doubling will violate Integrity, so the shorter form is the only one attested. This shows that there is nothing inherent in the semantics of the reduplicative roots which prevents the reduplicative frequentative, but rather their phonological makeup.

2.4 Chaha quadriliterals

No frequentatives, either with a short or a long template, are formed from any kind of quadriliteral in Chaha, including the regular quadriliteral:

(22)

regular	**total copy**	**final doubling**
*mɨsakər	*kɨmakəm	*gɨradəd
*mɨsəkakər	*kɨməkakəm	*gɨrədadəd

It turns out that, unlike Tigrinya, Chaha quadriliterals have the same templatic shape as the frequentative as shown in (23) (except in the jussive: sɨbəbɨr vs. məskɨr):

(23)

		CɨCəCəC
a.	Frequentative	sɨbəbər
b.	Quadriliteral	mɨsəkər
c.	Total copy	kɨməkəm
d.	Doubled	bɨrəgəg

Forming the frequentative by adopting the regular template with no reduplication does not adequately express the frequentative, because there is nothing to distinguish it from the regular quadriliteral. Besides the fact that the syllable structure of quadriliterals and frequentatives is identical, the vowel [a] between the second and third consonants is not a consistent exponent of the frequentative in Chaha, as it is in Tigrinya. For example, we find the frequentatives sɨbəbər 'break in pieces' kɨfəfət 'chop again' mɨzəzər 'count again' but only occasionally one with a vowel [a]: nɨgagəd 'touch again'. Furthermore, many non-frequentative quadriliterals have [a] between C_2 and C_3:

(24)

a.	šɨrašər	level ground	
b.	zɨrasər	scatter objects	(cf. zɨrəsər cut meat into strips)
c.	tə-dβatəβ	hesitate	
d.	a-xramət'	chew	

Therefore, the presence of the vowel [a] does not satisfy Morphological Expression. As for the longer template with reduplication, Chaha places a strict limit on the size of the template. Chaha has no stems with five surface consonants whereas Tigrinya has many $C_1C_2C_3C_2C_3$ stems, usually with the auxiliary bələ 'to say': sələmləm bələ 'to yawn', kəfətfət 'open here and there' < kəfət 'open'.

We can conclude that the constraint on the size of the frequentative template outranks Morphological Expression in Chaha. Since the regular quadriliteral cannot use /a/ nor make the template bigger to form the frequentative, neither of these are options for reduplicated quadriliterals either.

2.5 Amharic

Amharic shares certain properties with Tigrinya and certain properties with Chaha in the formation of frequentatives.

2.5.1 Frequentatives

In Amharic, the long frequentatives are formed from quadriliterals:

(25)

root	regular			frequentative	
frks	a. fərəkkəs	crack	e.	fərəkakkəs	crack in pieces
gnt'l	b. gənətt'əl	tear off	f.	gənət'att'əl	disassemble
glbt'	c. gələbbət'	turn over (tr)	g.	gələbabbət'	turn over many things
fnk'l	d. fənəkk'əl	uproot	h.	fənək'akk'əl	uproot several things

The short form with no reduplication is used only when Integrity prevents the longer form:

(26)

root	regular		frequentative	
mr	a. mərəmmər	research	i. mərammər	do a cursory study
			ii. *mərəmammər	
sb	b. səbəssəb	gather	i. səbassəb	gather here and there
			ii. *səbəsassəb	

In this manner, Amharic resembles Tigrinya, but only uses the short form as a last resort strategy. Like Chaha, Amharic disallows frequentatives formed from biliteral final doubled verbs:

(27)

root	regular		frequentative	
ks	a. kəssəs	accuse	c. *kəsassəs	
sd	b. səddəd	banish	d. *sədaddəd	

2.5.2 Reciprocals

Reciprocals are another class of verb forms which utilize reduplication (Leslau 1995). Triliterals form the reciprocal by either a short form with the vowel [a] tə-CaCəC or a longer form with reduplication tə-C$_1$aC$_1$C$_1$əC (note: tə- alone is the passive prefix).

Quadriliterals either have the tə-CəCaCCəC form with no reduplication or a longer form with reduplication. With regular triliterals and quadriliterals, either of the forms is possible, but a verb will usually select just one:

(28)

root		regular			reciprocal	
gdl	a.	gəddəl	kill	d.	tə-gaddəl	kill each other
nks	b.	nəkkəs	bite	e.	tə-nəkakkəs	bite one another
sdb	c.	səddəb	insult	f.	tə-sədaddəb	insult one another
fnkt	g.	fənəkkət	break heads	j.	tə-fənakkət	break each other's heads
dblk'	h.	dəbəlləkʼ	mingle	k.	tə-dəbəlalləkʼ	mingle with one another
mskr	i.	məsəkkər	testify	l.	tə-məsəkakkər	testify against one another

In contrast, only the form with no reduplication is possible with total copy and final doubling verbs:

(29)

regular					reciprocal	
lf	a.	ləfəlləf	chatter	i.	tə-ləfalləf	argue (chatter with
				ii.	*tə-ləfəlalləf	one another)
db	b.	dəbəddəb	hit	i.	tə-dəbaddəb	hit one another
				ii.	*tə-dəbədaddəb	
ks	c.	kəssəs	accuse	i.	tə-kassəs	accuse one another
				ii.	*tə-kəsassəs	
lkʼ	d.	ləkkʼək'	let go	i.	tə-lakkʼək'	let go of one another
				ii.	*tə-ləkʼakkʼək'	

This shows that even if Amharic allows a longer template with frequentatives and reciprocals, it never allows Integrity to be violated in any winning candidate. We can summarize the rankings for the three languages as follows:

(30) Summary of Rankings:

Tigrinya	Morph Expr > Integrity, Template
Chaha	Template > Integrity > Morph Expr
Amharic	Integrity > Morph Expr > Template

In Tigrinya, the high ranking Morphological Expression allows Integrity violations in some cases, and a longer template which does not meet the trisyllabic requirement of the frequentative. In Chaha, the high ranking of Template and Integrity prevents the frequentative from being formed from any stem other than regular triliterals which can satisfy both of these constraints. Finally, in Amharic, high-ranking Integrity disallows frequentatives and reciprocals with double reduplications but its ranking of Template below Morphological Expression allows longer templates to accommodate reduplication.

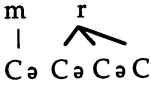
3. Final Doubling as Copying

Before concluding, I will give a brief rundown of why final doubling is interpreted as copying. Prunet & Petros (1996) observe that a biliteral root √mr will never expand to fill a quadriconsonantal template by spreading (31a) but will do so by total copy (31b):

(31) a. *mirərər b. ✔ mirəmər 'examine'

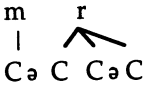
In order to explain this under the spreading account, there must be a ban on *long-distance* triple linking:

(32)



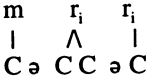
The ban must be long-distance, i.e. a link with a vowel position intervening, in order to license a geminate with double linking which occurs in Muher, a Western Gurage dialect with gemination as in (33):

(33)



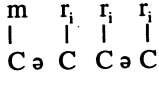
mərrər 'be bitter, become angry'

This problematic formulation disappears if we analyze all putative long-distance spreading as **copying** (see Gafos 1995, Rose 1997 for rejection of long-distance geminates). A local geminate and a copy do not violate Integrity (34a), but a double reduplication does (34b):

(34) a. 

b. 

This formulation accounts for two properties that the linking account cannot capture. First, verb forms which do not have intervening vowels between copied segments are still ruled out. This would rule out Tigrinya or Tigre quadriliterals <u>mərrər</u> based on the quadriliteral shape <u>məskər</u> (as different from Type B verbs which have medial gemination):

(35) 

*mərrər

Second, the copying analysis unites the double reduplication avoidance found with both final doubling and total copy cases. The triple-linking account could only rule out final doubling + frequentative but not total copy + frequentative, since total copy does not involve linking but copying in any analysis.

Several strong arguments for spreading as opposed to copying can be reanalyzed. Coincidentally, some of the strongest arguments for linking come from Chaha itself. First, the double labialization and palatalization found in Chaha morphophonology, i.e. nɨzəz --> nɨžəž 'dream! (2sf)' (McCarthy 1983, Rose 1994) can be reanalyzed as involving Reduplicative Identity (Rose 1997). Second, Chaha devoicing, a historical process which devoiced and simplified a penultimate geminate, was argued not to apply to long-distance geminates due to a strict interpretation of the linking constraint (McCarthy 1986): i.e. zəggər --> zəkər 'jump' but fəggəg --> fəgəg 'die without being slaughtered' and not *fəkəg. However, Petros (1997) shows that devoicing is blocked when the final consonant is any obstruent, not just an obstruent identical to the penultimate one, so zəggər --> zəkər 'jump' but nəggəd --> nəgəd 'touch' with no devoicing because the final consonant is an obstruent.

4. Conclusion

In conclusion, the analysis of double reduplication using the constraint Integrity coupled with Morphological Expression accounts for a number of properties of reduplication in Ethio-Semitic languages. It explains why biliterals do not form quadriconsonantal stems by double reduplication but by total copy. The ranking of the two constraints captures the difference between Tigrinya and Chaha in the formation of biliteral frequentatives and explains why Tigrinya only allows double reduplications under duress. And finally, it explains why all kinds of double reduplications are penalized, be they doubling or total copying. Extending this analysis to other languages would be relatively straightforward. Languages which allow double reduplications sacrifice Integrity violations for higher ranked constraints such as Morphological Expression or MAX.

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1. Another possible formulation of the constraint would be to penalize multiple relationships, ie. a constraint like 'No Bigamy' - no element involved in one relationship can be involved in another.
2. All verbs are given in the bare perfective stem with no inflectional affixes. While I elicited the forms in the gerundive, because the perfective is not commonly used in Tigrinya, I place the stems in the perfective for easy comparison with other languages.
3. An important piece of evidence for treating the final doubling cases on a par with total copy cases as reduplication is the overapplication of palatalization which occurs with both in W. Gurage: nɨzəz --> nɨžəž 'dream! (2sf)' k'ət'k'ɨt' --> k'əč'k'ɨč' 'hammer! (2sf)'
4. Another possible analysis would be to place Integrity in CONTROL in Chaha but not in Tigrinya. CONTROL is a separate level of unviolable constraints proposed by Orgun & Sprouse (1996) to account for morphological gaps which are not rescued by independently available repair mechanisms in the language. Frequentatives of biliterals would be formed in the regular constraint system and then rejected in CONTROL by Integrity. I do not adopt this analysis because it runs into problems in accounting for Amharic. If Integrity were in CONTROL to account for Amharic final doubled biliterals, it could not capture quadriliterals, for which a form with no reduplication is adopted only when a longer form with reduplication cannot be produced. If Integrity is in CONTROL, then the output should be no attested form and not an alternate form.

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