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*Morphological and prosodic constraints on Kinande verbal reduplication**

Laura J. Downing
University of British Columbia

1 Introduction

As Mutaka & Hyman (1990) and Mutaka (1994) show, the Kinande reduplication patterns in (1) present several analytical challenges (*eri-* is the infinitive prefix; the reduplicant is underlined):[1]

(1) *Kinande verbal reduplication* (Mutaka & Hyman 1990, Mutaka 1994)

stem	*reduplicated form*	
a. *Consonant-initial*		
eri-huma	eri-<u>huma</u> = huma	'to beat'
eri-humira	eri-<u>huma</u> = humira	'to beat for'
eri-humirana	eri-<u>huma</u> = humirana	'to beat for each other'
erí-tuma	erí-<u>tuma</u> = tuma	'to send'
erí-tumira	erí-<u>tuma</u> = tumira	'to send to'
erí-tumana	erí-<u>tuma</u> = tumana	'to send each other'
erí-tumirana	erí-<u>tuma</u> = tumirana	'to send to each other'
b. *Monosyllabic*		
eri-swa	eri-<u>swa.swa</u> = swa	'to grind'
erí-ta	erí-<u>ta.ta</u> = ta	'to bury'

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[1] Kinande is a Bantu language spoken in Congo-Kinshasa (ex-Zaire). All data cited in this paper are from Hyman (1989), Mutaka (1994, 1995) and Mutaka & Hyman (1990).

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c. *Vowel-initial, infixing*

ery-esera	ery-e = sera = sera	'to play for'
ery-óhera	ery-ó = hera = hera	'to pick for'

d. *Vowel-initial, prefixing*

ery-esa	ery-e.se.s = e.sa	'to play'
ery-ôha	ery-ó.ho.h = o.ha	'to pick'

One problem is that, as Mutaka & Human argue, morphological factors condition the occurrence of the fixed /a/ in the second syllable of the Kinande reduplicant. Another problem is how to account for the infixing position of the reduplicant with the vowel-initial stems in (1c) and overcopy with the bisyllabic vowel-initial stems in (1d). Mutaka & Hyman argue that these patterns are clearly linked to the fact that vowels do not begin well-formed syllables, but formalising how prosody conditions infixing and overcopy has proven problematic.

In this paper, I present an Optimality Theory (OT) analysis of Kinande verbal reduplication that resolves these problems. In §2, I show that the morphological conditions on reduplication are best accounted for by defining the RED as a morphological constituent, the Canonical Verb Stem. I will show that this proposal allows otherwise puzzling restrictions and variations in the realisation of the reduplicant to receive a straightforward explanation. In §3, I discuss the prosodic conditions motivating infixation and overcopy in vowel-initial stems. I show first that the infixing position of the longer vowel-initial stems is best accounted for by alignment constraints requiring the base for reduplication to begin with a syllable. I show that overcopy is motivated for shorter vowel-initial stems because this is the only way, given other constraints in Kinande, for the reduplicant to satisfy the bisyllabic weight requirement on reduplicants. Finally, since my analysis assumes that reduplicant size is determined by reduplication-specific prosodic constraints, I present arguments in §4 against recent proposals (McCarthy & Prince 1994, 1999, Spaelti 1997, Urbanczyk 1996) suggesting such reduplication-specific templates can be eliminated.

2 Morphological constraints

2.1 Motivating the Canonical Stem

I will begin the analysis of Kinande by accounting for the reduplication pattern of the consonant-initial stems in (1a). As we can see clearly from these forms, the verbal reduplicant (RED) is a bisyllabic prefix and ends in a fixed vowel /a/ (the reduplicated form means to do the action of the verb here and there or quickly). In this section I will first briefly introduce the prosodic constraints accounting for the bisyllabic shape of RED (they will be motivated in more detail in §3.2.2 below), then go on to argue that the fixed /a/ is best accounted for by defining the reduplicant as a morphological constituent, the Canonical Stem.

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The prefixal position of RED and its fixed bisyllabic length are, indeed, quite familiar conditions on reduplication and can be accounted for by the constraints below:

(2) a. CONTIGUITY (CONTIG)
RED (R) corresponds to a contiguous substring of Base (B).

b. ANCHOR
The initial element in R is identical to the initial element in B.

c. ALIGN RED (ALIGN): Align (RED-R, Stem-L)
The reduplicant subcategorises for a following Stem

d. RED = FT
i. The RED string is coextensive with a foot.
ii. The RED string is associated with the weight-bearing elements of a foot.

e. FTBIN
i. FTMIN: Feet are minimally bisyllabic.
ii. FTMAX: Feet are maximally bisyllabic.

f. SMAX-BR
Every segment of the Base (B) has a correspondent in the RED (R).

ranking: CONTIG, ANCHOR, ALIGN, RED = FT, FTBIN ≫ SMAX-BR

The RED includes only (part of) the first two syllables of the stem, due to the constraints in (2a–e). The prefixal position of the reduplicant is made optimal by the alignment constraint in (2c). As work like that of McCarthy & Prince (1995) makes clear, templatic constraints like those in (2d) are understood to evaluate the prosodic well-formedness of RED along two dimensions: alignment (this is the requirement in (2d.i)) and prosodic weight (this is the requirement in (2d.ii)). We can see that the RED's in (1a–c) straightforwardly satisfy both of these conditions. To account for the generalisation that RED's are never longer (or shorter) than two syllables no matter how long or short the Base is, RED = FT, FTBIN must be ranked above SMAX-BR (2f).

It is more problematic, however, to account for why the second Base vowel does not always have a correspondent in the RED, but is replaced by the fixed vowel /a/. Mutaka & Hyman propose that the Morpheme Integrity Constraint (MIC) blocks the second Base vowel from appearing in the RED:

(3) *Morpheme Integrity Constraint* (Mutaka & Hyman 1990: 83)

Mapping of a melody to a reduplicative template takes place *by morpheme*. If the whole of a morpheme cannot be successfully mapped into the bisyllabic reduplicative template, then none of the morpheme may be mapped.

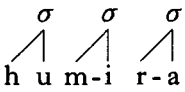
As shown in the derivation in (4) (adapted from Mutaka & Hyman 1990: 92), the second stem vowel may not copy in longer stems, because this would always split up a suffixal morpheme (in (4), this morpheme is the

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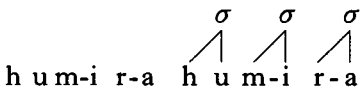
benefactive suffix /-ir-/), in violation of the MIC. The unmapped portion of the copied stem deletes by Stray Erasure (Itô 1986) and the fixed /a/ is inserted by default:

(4) *Derivation of* -huma = humira

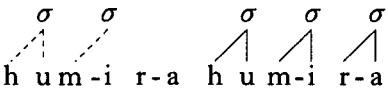
a. *input representation*



b. *affixing (trochee) and copying*



c. *left-to-right mapping (respects MIC)*



d. /a/ *inserted by default*

huma = humira

The problem with this analysis is that, as Hyman (1989) and Archangeli & Pulleyblank (1994) have shown, the arguments in favour of /a/ as the phonologically unmarked vowel of Kinande are weak. To cite just one problem, while Schlindwein (1987) and Mutaka (1995) argue that one could explain why /a/ is transparent to leftward vowel harmony by proposing that it is completely underspecified, Hyman (1989) and Archangeli & Pulleyblank (1994) note that /a/ in fact appears to harmonise in this context. Phonetic studies would need to be done to resolve this controversy. Further, as Hyman (1989) points out, /a/ would have to be specified as [+low] quite early in the derivation to account for its lowering effect on high vowels under coalescence. And, as Archangeli & Pulleyblank argue, /a/ would also have to be specified as [+low] quite early to give a grounded motivation for [a]'s not participating in [+ATR] vowel harmony if it in fact fails to harmonise. Finally, if /a/ were the unmarked phonological default vowel in Kinande, we would expect, following Archangeli (1984, 1988), that it would be the vowel which would be epenthesised to eliminate closed syllables in borrowed words (Kinande has strictly CV syllable structure). But as shown in (5), generally front vowels, never /a/, eliminate closed syllables in French borrowings:

(5) *French borrowings into Kinande* (Larry Hyman, Ngessimo Mutaka, personal communication)

a. a-masini 'machine'
b. kamutsere 'magistrate' (Fr. *commissaire*)
c. omu-sofere 'chauffeur'
d. e-sosote 'sock' (Fr. *chaussette*)
e. e-supu 'soup'

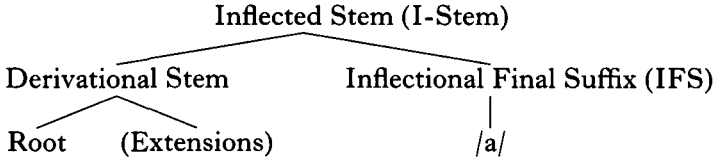
The epenthetic vowel in Bantu languages is typically a front vowel, in fact. To cite just a few examples, Kiyomi & Davis (1992) argue that /i/ is the epenthetic vowel in SiSwati, Myers (1987) that /i/ is the epenthetic

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vowel in Shona, and Odden (1996) that /i/ is the epenthetic vowel in Kikerewe.

If /a/ is not the phonological default vowel, then some other explanation for its occurrence in the final position in RED must be found. To account for a similar Kikuyu reduplication pattern, Peng (1991) proposes that the /a/ is phonologically prespecified to fill the second vowel slot in the template. But this implies that the fact that /a/ and not some other vowel occurs in the second syllable is unpredictable and arbitrary, contradicting work like that of Alderete *et al.* (1999) which shows that fixed segments in reduplication are almost always unmarked segments. And indeed, there is a morphological context in which the final /a/ is unmarked in Kinande. As shown in (10), what is striking about the form of RED's in Kinande is that they resemble a canonical Bantu verb stem, ending with the unmarked Inflectional Final Suffix (IFS), /a/:[2]

(6) *Canonical Inflected Stem*



That is, while phonologically /a/ is a marked vowel and its occurrence as the fixed second vowel in RED is completely arbitrary, morphologically the occurrence of /a/ is completely unsurprising if RED's are defined as verb stems.

To capture this generalisation, I propose that the prosodic constraint on RED shape in Kinande (RED = FT (2d)) must be supplemented by morphological constraints in (7):[3]

(7) a. RED = Inflected Stem (I-STEM)

b. IFS = /a/ (/a/)
The IFS is realised as /a/.

c. FDEP-BR
The features (F) of each segment of RED must have a correspondent in the relevant Base segment.

ranking: I-STEM, /a/ ≫ FDEP-BR

[2] I am following the tradition of most work on Bantu grammar (Doke 1943, 1954, Meeussen 1967, etc.) in describing /a/ as the least marked IFS. As this earlier work points out, /a/ is arguably the default IFS, as it occurs most frequently, being compatible with a wider range of tenses and aspects than the other IFS. See Mutaka (1994) for discussion of other phonological processes in Kinande which take the I-Stem as their domain. And see work like Myers (1987, 1998), Mchombo (1993) for arguments motivating the I-Stem in other Bantu languages.

[3] As Hyman *et al.* (1999) argue, an alternative approach to defining the RED as a verb stem would be to define Kinande reduplication as a form of stem self-compounding at the I-Stem level. It is beyond the scope of this paper to compare these approaches in detail. The important point is they both agree in defining the RED as a verb stem whose segmentism and morphological parse are required to correspond to its Base stem.

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Constraint (7a) states that the reduplicant string (RED) is optimally dominated by a morphologically complex constituent, the Inflectional Stem (I-Stem), which is composed of a Derivational Stem and an IFS (see (6)). I assume that alignment constraints not crucial to this analysis control the relative positions of the Derivational Stem and the IFS. (See McCarthy & Prince 1994, 1999, Urbanczyk 1995, 1996 for arguments that the prosodic and segmental shape of RED's in other languages is best accounted for by proposing that RED's optimally resemble a particular morphological category.) Constraint (7b) follows work like that of Yip (1998) in proposing that unmarked morphemes, especially, can be required to appear in outputs due to constraints which require a particular morphological category (IFS) to have a particular phonological realisation (/a/). Ranking /a/ (7b) above FDEP (7c) optimises the occurrence of /a/ in RED rather than an exact copy of the second vowel of the Base stem. This ranking illustrates The Emergence of the Unmarked effect that McCarthy & Prince (1994, 1999) and Alderete *et al.* (1999) argue is typically the explanation for fixed reduplicative segments. Ranking a markedness constraint (in this case, IFS (7b), a constraint defining unmarked morphological structure) above MAX/DEP-BR optimises the occurrence of only unmarked structure in RED, at the expense of incurring a mismatch with Base structure. Since IFS is ranked below MAX/DEP-IO, the output occurrence of marked structure from the input in the Base is also optimised. (This will be illustrated more concretely in the next section.)

The analysis is exemplified in (8):[4]

(8)

/eri-RED=humira/	RED=FT	FTBIN	I-STEM	/a/	SMAX-BR	FDEP-BR
☞ a. eri-(hum+a_i)=humi$_i$ra					**	*
b. eri-(hum+a)=humira					***!	
c. eri-(hum+i)=humira				*!	**	
d. eri-(humi)=humira			*!		**	
e. eri-(humir+a)=humira		*!				

Crucial constraint rankings:

RED=FT, FTBIN ≫ SMAX-BR:
optimises bisyllabic RED over total copy

/a/ ≫ FDEP-BR:
optimises /a/ in final syllable of RED over exact copy

I-STEM, /a/:
high-ranked because never violated by optimal candidate

[4] In all tableaux, RED is underlined; the RED-foot is in parentheses. A '+' indicates the Derivational Stem–IFS boundary, indicating that the RED string is dominated by an I-Stem.

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Candidates (8a, c, d) equally violate SMAX because their RED's contain the same number of segments and so fail to maximise the base by the same number of segments. Candidate (8a) is optimal because it satisfies the prosodic constraints on RED by being bisyllabic and also satisfies the morphological constraints on RED by being dominated by an I-Stem with the IFS, /a/. Notice in (8a) that the final /a/ of RED corresponds to the second vowel of the Base, even though it does not match the featural quality of the Base vowel. Since FDEP is crucially ranked below /a/, this mismatch is optimal. Candidate (8b) also ends in /a/, but note this /a/ does not correspond to the second Base vowel. Only the first three segments of the RED correspond to Base segments, while the /a/ is epenthetic (see Alderete *et al.* 1999 for discussion of this point). As a result, (8b) is non-optimal as it incurs more SMAX violations than candidate (8a), where there is correspondence between all (four) RED segments and some Base segment. (Ranking SDEP-BR, the constraint optimising segmental correspondence between RED and Base, as well as SMAX-BR, above FDEP-BR optimises segmental correspondence over featural correspondence.) Candidate (8d) is non-optimal because it is not dominated by an I-Stem. (And so it vacuously satisfies /a/, as only I-Stems are required to have an IFS.) Candidate (8c) is non-optimal because it does not end in /a/, so violates (7b). While the RED in (8b) is a more exact copy of the Base than (8a), ranking /a/ (7b) over FDEP (7c) makes exact copy non-optimal. Candidate (8e) satisfies the morphological constraints on RED, but is non-optimal because it violates FTBIN by being longer than two syllables.

The Canonical Stem analysis, then, straightforwardly solves both problems which the fixed /a/ pattern raises. The second vowel of the base does not occur in RED, because the RED must be a verb stem, and the second RED vowel must be identifiable as the Inflectional Final Suffix (IFS) of the stem. The vowel /a/ occurs in the reduplicant because it is the unmarked IFS.

2.2 Why Canonical Stem alternates with exact copy

The Canonical Stem (CS) analysis of Kinande reduplication predicts that the RED in Kinande should always end with the IFS /a/. But, as shown in (9a), if a bisyllabic stem ends with some other IFS – like subjunctive /-e/ – then that IFS vowel also occurs in the RED. However, /a/ does occur in the RED of longer stems, as shown in (9b):

(9) *Subjunctive verbs* (Mutaka & Hyman 1990: 93–94)

	stem	*reduplicated form*	
a.	*Two-syllable stems*		
	tú-húm-e	tú-<u>húme</u> = humè	'let's beat'
	tu-túm-ê	tu-<u>tume</u> = túmê	'let's send'
	tú-sw-er-è	tú-<u>swere</u> = swerè	'let's grind for'

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b. *Longer stems*

tú-húm-ir-è	tú-húma = humirè	'let's beat for'
	*tú-húme = humirè	
tu-tum-ír-ê	tu-tuma = tumírê	'let's send to'
	*tú-tume = tumirè	

While these data are problematic for the CS analysis, they support Mutaka & Hyman's (1990) MIC analysis. The MIC (3) predicts that the Final /-e/ in (9a) should be copied, as the subjunctive suffix may be fit into RED without splitting it. What I will argue in this section is that the Canonical Stem analysis actually provides a better account of these facts.

The crucial observation motivating the analysis is that exact copy is preferred to the Canonical Stem form of RED only for two-syllable stems. That is, it is optimal to copy the IFS of the base iff the Base is the same size (two syllables) as the RED, since in this case a perfect match between the RED and the Base may be achieved. But if copying the entire Base violates the maximality condition on RED (FTBIN (3e.ii)), so a perfect match between RED and the Base is not possible, RED is optimally a Canonical Stem, ending in /a/. The generalisation that the default /a/ is pre-empted by the Base's final vowel only if this would lead to perfect copy can be formalised by modifying the analysis slightly and conjoining SMAX-BR (2f) and FDEP-BR (7c):[5]

(10) SMAX∩FDEP

Every segment of the Base has a correspondent in RED *and* every feature of each RED segment has a correspondent in the relevant Base segment.

As shown by the tableau in (11), ranking this conjunction between CS (7a) and /a/ (7b) optimises the correct outputs. Candidate (11a) is optimal for a bisyllabic Base, because exact copy of the Base satisfies the conjunction (the RED has the same number of segments as the Base *and* all the RED segments are featurally dependent on those of the Base). Satisfying /a/, as in candidate (11b), is non-optimal because this violates FDEP and so violates the conjunction. However, with longer Bases (11c–g), exact copy of the Base is non-optimal because it necessarily violates the high-ranked prosodic conditions on RED size. All partial copy candidates (11c–f) equally violate the conjunction since all necessarily violate SMAX. (Candidates (11c, d, f) also violate FDEP since the second vowel of the RED is not identical to the second vowel of the Base.) As a result, /a/ is the crucial constraintchoosing (11c) as optimal. Notice in (11f) that ranking /a/

[5] As Crowhurst & Hewitt (1998), Hewitt & Crowhurst (1995) and Downing (1998) discuss at some length, this type of constraint conjunction optimises 'the best of the best' candidates, by imposing two joint conditions on the optimal candidate: in this case, MAX and DEP. Constraint conjunction is evaluated on analogy with logical conjunction: the conjunction is only satisfied if both constraints that make it up are satisfied. If either is violated, the conjunction is, too. Further, the conjunction is evaluated categorically, even if the conjuncts are gradient constraints. See the works just cited for further discussion of this type of constraint conjunction.

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(11)

	MAX-IO	RED=FT	FTBIN	I-STEM	SMAX∩FDEP	/a/
☞ a. tu-(hum+e)=hume					(✓) ✓ (✓)	*
b. tu-(hum+a)=hume					(✓) *! (*)	
☞ c. tu-(hum+a)=humire					(**) * (*)	
d. tu-(hum+e)=humire					(**) * (*)	*!
e. tu-(hum+i)=humire					(**) * (✓)	*!
f. tu-(hum+a)=humira	*!				(**) * (*)	
g. tu-(humir+e)=humire			*!		(✓) ✓ (✓)	*

Crucial constraint rankings:
RED=FT, FTBIN ≫ SMAX∩FDEP:
optimises bisyllabic RED over total copy
SMAX∩FDEP ≫ /a/:
optimises exact copy over final /a/
MAX-IO ≫ /a/:
optimises marked IFS in Base stem
I-STEM, MAX-IO:
high-ranked because never violated by optimal candidate

below MAX-IO makes it non-optimal for the Base stem to end in /a/ if a marked IFS occurs in the input, while the RED stem optimally ends in the unmarked IFS in the same form.

This analysis not only accounts for the Kinande facts as well as the MIC analysis, it has the further advantage of generalising to other languages showing the same sorts of alternations in RED between exact copy and fixed segmentism. As Steriade (1997) points out, this pattern is rather common, being found in Cebuano, Tagalog, Makassarese (see too Aronoff *et al.* 1987, McCarthy & Prince 1994, Alderete *et al.* 1999) and Lushootseed (Urbanczyk 1996, Alderete *et al.* 1999). In Makassarese, for example, with longer Bases RED is bisyllabic and ends in a glottal stop [ʔ], even if the corresponding Base consonant is not a glottal stop (12a). If the Base is bisyllabic, no glottal stop occurs in RED (12b). Instead there is a perfect match between RED and Base.

(12) *Makassarese reduplication* (Aronoff *et al.* 1987)

a. *Longer bases*

/manara/	manaʔ-manara	'sort of tower'
/balao/	balaʔ-balao	'toy rat'
/baine/	baiʔ-baine	'many women'
/baramban/	baraʔ-baramban	'sort of chest'

b. *Bisyllabic bases*

/batu/	batu-batu	'small stones'
/golla/	golla-golla	'sweets'
/bulaŋ/	bulaŋ-bulaŋ	'monthly'
/tau/	tau-tau	'person'

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The generalisation is the same as in Kinande: default segmentism (final [ʔ]) is found when exact copy of the Base is blocked by a bisyllabicity constraint on RED. When exact copy satisfies this prosodic constraint, default segmentism is not found. (Space permits only Makassarese to be discussed here, but the other languages cited above show the same alternations between perfect copy and default segmentism under the same conditions.)

In the CS approach, these data can also be given the same analysis as provided in (11) for Kinande.[6] As shown in (13), if the constraint requiring RED to end in the default consonant (glottal stop) is ranked below the conjunction requiring exact copy, the correct outputs are optimised:

(13)

	RED=FT	FTBIN	SMAX∩FDEP	[ʔ]
☞ a. (batu)-batu			(✓) ✓ (✓)	*
b. (batuʔ)-batu			(✓) *! (*)	*
☞ c. (baraʔ)-baramban			(***) * (*)	
d. (baram)-baramban			(***) * (✓)	*!
e. (bara)-baramban			(****) * (✓)	*!
f. (baramban)-baramban		*!		*

Crucial constraint rankings:

SMAX∩FDEP ≫ [ʔ]:
optimises exact copy over default RED-final [ʔ]

RED=FT, FTBIN ≫ SMAX∩FDEP:
optimises bisyllabic RED over total copy

In contrast, the MIC (3) would not generalise to account for the Makassarese data. According to the MIC, both RED's with default segmentism and those with exact copy must respect the MIC. Further, default segmentism is crucially motivated by the MIC: it is found when exact copy would split a morpheme. While exact copy respects the MIC in Makassarese, default segmentism does not: the [ʔ] occurs when a morpheme must be split to fit the bisyllabic reduplicative template. The MIC analysis therefore cannot be extended to account for the alternations between exact copy and default segmentism in languages other than Kinande, and so would miss the generalisation that these alternations have a similar motivation. It is a distinct advantage of the constraint conjunction analysis proposed here that it does extend to account for similar alternations in other languages.

The constraint analysis is also to be preferred to other recent analyses of this alternation (Alderete *et al.* 1999, McCarthy & Prince 1994, Steriade

[6] The discussion of Makassarese has been simplified somewhat for ease of comparison with Kinande. See Alderete *et al.* (1999), Aronoff *et al.* (1987) and McCarthy & Prince (1994) for a more detailed discussion of the intricacies of Makassarese reduplication.

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1997, Urbanczyk 1996), which appeal to IDENT to express the generalisation that exact copy is preferred to default segmentism. The main distinction which McCarthy & Prince (1995) define between MAX and DEP *vs.* IDENT is that MAX, DEP evaluate segmental correspondence, while IDENT evaluates featural correspondence. However, recent work by Myers (1997), Pulleyblank (1996, 1998) and Zoll (1996) argues there is little motivation for this distinction, since MAX, DEP must be able to refer to features. Further, as Cassimjee & Kisseberth (1998) and McCarthy & Prince (1999) have pointed out, featural MAX and/or DEP is necessarily also violated if IDENT is, rendering IDENT generally redundant. Conjoining SMAX-BR and FDEP-BR explains this redundancy by making explicit that MAX/DEP together define IDENT. The conjunction also makes explicit that it is the cumulative interaction of SMAX-BR and FDEP-BR which motivates the alternations between perfect copy and default segmentism in languages like Makassarese and Kinande. When SMAX-BR is necessarily violated (because the Base is too long), FDEP-BR can also be violated (by the default segment). When SMAX-BR can be satisfied, FDEP-BR must be, too.

2.3 Morphological correspondence between RED and Base

As Mutaka & Hyman (1990) argue, further evidence that morphology constrains Kinande reduplication is provided by the reduplication pattern of polysyllabic roots. As shown in (14), roots longer than CVC show variation in their reduplication patterns, with only a few following the bisyllabic CS pattern (14a). Others show total reduplication (14b), while many do not reduplicate at all (14c):

(14) *Reduplication of underived polysyllabic verb stems* (Mutaka & Hyman 1990: 106–107, n. 30)[7]

	stem	*reduplicated form*	
a.	eri-gambul-a	eri-gamb-a = gambul-a	'to talk'
	eri-goner-a	eri-gon-a = goner-a	'to neglect'
	erí-lender-a	erí-lend-a = lender-a	'to walk'
	eri-soloma	eri-sol-a = solom-a ~ eri-solo = solom-a	'to harvest'
b.	erí-bindul-a	erí-bindul-a = bindul-a	'to change'
		*erí-bind-a = bindul-a	
	eri-guluk-a	eri-guluk-a = guluk-a	'to fly'
		*eri-gul-a = guluk-a	
	erí-birikir-a	erí-birikir-a = birikir-a	'to call'
		*erí-bir-a = birikir-a	

[7] According to Mutaka & Hyman, out of some 200 polysyllabic verb roots, only 29 follow the regular bisyllabic CS reduplication pattern shown in (14a), while 108 have the total reduplication pattern shown in (14b) and 77 do not reduplicate. This restriction is by no means confined to Kinande. The bisyllabic /a/-final form of RED is also not possible for polysyllabic roots in other Bantu languages, like SiSwati (Downing 1997), KiKerewe (Odden 1996) and Ndebele (Hyman *et al.* 1999).

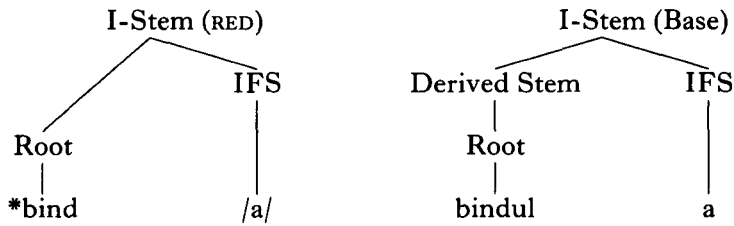
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c. erí-bugul-a	*none*	'to find'
	*erí-bug-a = bugul-a	
erí-balik-a	*none*	'to jump'
	*erí-bal-a = balik-a	

The patterns in (14b, c) are exactly what the MIC predicts: partial reduplication should be blocked if that splits the root. However, the MIC does not predict the partial reduplication patterns in (14a). What I will show in this section is that the Canonical Stem analysis better explains the range of possible patterns found in reduplicating longer roots like those in (14).

The first problem to account for is why the bisyllabic CS realisation of RED is blocked for the majority of these roots. Recall the original motivation for the Canonical Stem analysis is that Kinande RED's phonologically resemble verb stems. However, a bisyllabic, /a/-final RED for the longer verb roots in (14) would not be an actual verb stem of the language which is derivationally related to the Base stem. Instead, as shown in (15), in these cases there is a mismatch between the morphological parse of segments in the RED stem and the morphological parse of the corresponding segments in the Base stem. I propose that it is this mismatch which makes partial reduplication of polysyllabic roots non-optimal.

(15)



One way of formalising the requirement that the morphological parse of the RED stem and the corresponding Base stem must match is the morphological correspondence constraint in (16):[8]

(16) MDEP

The morphological parse of the RED string matches the morphological parse of the corresponding segments in the Base string.

This constraint finds an analogy in work like that of Gafos (1998a, b),

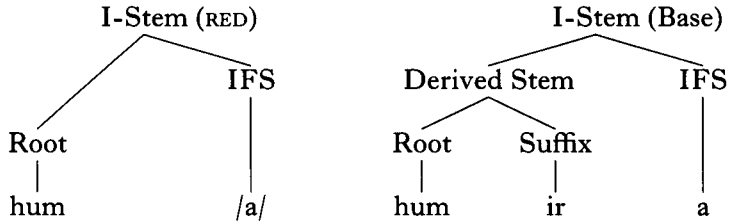
[8] An alternative way of formalising the requirement that the RED stem match the Base stem (see e.g. Steriade 1997) is to invoke an output–output constraint requiring the RED stem to match an actually occurring output stem. The problem with this alternative is that it is unclear how it formalises the further restriction that the RED stem must be derivationally related to the Base stem, not just an actually occurring stem. That this restriction is crucial is shown by the reduplication patterns of polysyllabic stems in Natal Zulu (Downing, field notes). In Natal Zulu, as in Kinande, underived polysyllabic stems cannot take bisyllabic, /a/-final RED's: e.g. *úkú-bális-a* 'to whine' → **úkú-bálá* = *bális-a* 'to whine from time to time'. However, homophonous derived polysyllabic stems can: e.g. *úkú-bál-is-a* 'to cause to count' → *úkú-bálá* = *bál-is-a* 'to cause to count from time to time'. See Benua (1997), Downing (1997, in press) and Kenstowicz (1996, 1997) for further discussion of output–output constraints.

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McCarthy & Prince (1999) and Steriade (1988), which argues that the prosodic parse of reduplicative segments can be required to match the prosodic parse of the corresponding Base segments by filling the same syllabic role. It is a straightforward extension of this idea to propose that the morphological parse of reduplicant segments can also be required to match the morphological parse of the corresponding Base segments. Like other DEP constraints, MDEP (16) penalises the occurrence of structure in RED that is not matched by structure in the Base. In this case, what is penalised is the occurrence of a morphological constituent edge in the RED string that is not matched by a constituent edge in the same position in the Base string.

The representation in (17) below shows that CS reduplication for stems derived from CVC roots satisfies MDEP because the string which is dominated by Root in the RED has the same morphological constituent structure as the corresponding Base string:

(17)



This contrasts with the representation in (15) above, which shows that bisyllabic CS reduplication for stems derived from longer roots violates MDEP, because a morphological break occurs after the first CVC of the RED which is not matched in the Base. As a result, the string dominated by Root in the RED does not have the same morphological constituent structure as the corresponding Base string. The analysis is exemplified in the tableaux in (18) (in both tableaux, '{}' marks the Root edges, indicating that a candidate RED has been parsed into an I-Stem).

As shown in (18a), stems with CVC roots optimally take the bisyllabic CS RED (18a.i), since it satisfies all prosodic and morphological constraints on RED, including MDEP. Candidate (18a.ii) is not optimal as it violates /a/ (7b). Candidate (18a.iii) vacuously satisfies MDEP since RED is not dominated by I-Stem, but this means it violates I-Stem (7a). Candidate (18a.iv) is non-optimal because it violates the bisyllabic maximality constraint on RED, FTBIN (3e).

However, as shown in (18b), the bisyllabic CS RED candidate (18b.i) violates MDEP if the base root is longer than CVC, making this variant non-optimal if MDEP is highly ranked. Instead, the total reduplication candidate (18b.iv) is optimal with this ranking, since it satisfies MDEP. While (18b.iii) also satisfies MDEP (vacuously, since no morphological parse has been assigned to this candidate so no mismatch with the Base is possible), (18b.iv) best satisfies the constraints (I-STEM, /a/, the conjunction) requiring RED to resemble a verb stem and be identical to the Base stem.

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(18)

	-hum-ir-a/	MDEP	RED=FT	FTBIN	I-STEM	SMAX∩FDEP	/a/
a.	☞ i. ({hum}a)={hum}ir-a					(**) * (*)	
	ii. ({hum}i)={hum}ir-a					(**) * (✓)	*!
	iii. (humi)={hum}ir-a				*!	(**) * (✓)	
	iv. ({hum}ir-a)={hum}ir-a			*!			
b.	/-bindul-a/						
	i. ({bind}a)={bindul}a	*!				(**) * (*)	
	ii. ({bind}u)={bindul}a	*!				(**) * (✓)	*
	iii. (bindu)={bindul}a				*	(**) *! (✓)	
	☞ iv. ({bindul}a)={bindul}a			*			

Crucial constraint rankings: same as (11), plus
MDEP ≫ RED=FT, FTBIN:
optimises matching morphological parse of RED with Base over bisyllabic length restriction

To account for the variation in possible reduplication patterns for Kinande polysyllabic roots in (14), I propose that the ranking of MDEP, I-STEM and FTBIN is variable.[9] If all three must be satisfied by the optimal candidate, then reduplication is blocked, as it is for verbs like those cited in (14c). (See Orgun 1996 and Orgun & Sprouse 1999 for discussion of the role of non-violable constraints in blocking the surface realisation of a morpheme.) If MDEP ≫ FTBIN, total reduplication is optimal, as shown in (18b). If FTBIN ≫ MDEP, partial reduplication (18b.i) is optimal, as it is for verbs like those cited in (14a). If MDEP, FTBIN ≫ I-STEM, another variation is predicted, namely that the first two syllables should copy, as shown in (18b.iii). As shown in (14a), this variant is, in fact, attested for a few verbs like *eri-soloma* 'to harvest'. Because it does not seem possible to predict which polysyllabic root will take which variant (or not reduplicate at all), the appropriate variant ranking must be specified for each stem.[10] If no ranking is specified for a stem, then the default ranking (the one given in (18)) defines the reduplication pattern.

As we see, then, proposing that RED has the morphological structure of a verb stem also allows us to account for why polysyllabic roots rarely allow the bisyllabic CS reduplication pattern. MDEP (16) optimises RED's in which the morphological parse of corresponding segments in RED and

[9] It is beyond the scope of this paper to address the theoretical problems raised by variable rankings in OT. The interested reader will find insightful discussion of this issue in Nagy (1996), Nagy & Reynolds (1997) and Ringen & Heinämäki (1999).

[10] One way of associating each stem derived form a polysyllabic root with the proper constraint ranking for its reduplication pattern would be to define a co-phonology for each variant constraint ranking that is introduced in reduplicating the stem. See Inkelas (1998), Inkelas & Orgun (1998), Inkelas *et al.* (1997) and Orgun (1996) for more detailed discussion of co-phonologies.

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the Base is identical. Since partial reduplication of polysyllabic roots necessarily violates this constraint, this pattern is non-optimal with the constraint ranking that optimises partial reduplication for CVC roots. This analysis provides additional motivation for the proposal that the /a/-final reduplicant is a morphologically complex constituent, the Inflected Stem. It is crucially a subconstituent of the RED stem, the Root, which is compared to the Root of the Base stem by MDEP in evaluating derivational similarity between the two stems.

While the MIC account also explains the failure of polysyllabic roots to undergo partial reduplication by penalising reduplicants that do not copy the entire Base root, the analysis presented here has several clear advantages over the MIC approach. First, the MIC wrongly predicts that the fixed /a/ bisyllabic reduplication pattern should be an impossible variant for these stems. This is because the fixed /a/ should never occur if the MIC is exceptionally violated by partially reduplicating the root morpheme. On the contrary, as noted in the previous section, fixed segmentism is only motivated as a way of insuring that the MIC is satisfied. Mutaka & Hyman's (1990) analysis also cannot explain why total reduplication is a possible variant to bisyllabic reduplication. In the prosodic theory of reduplication they adopt (McCarthy & Prince 1986), it is impossible to capture what these variants have in common, since total reduplication has a morphological template, while partial reduplication has a prosodic template.

In contrast, in the Canonical Stem analysis, there is no necessary correlation between satisfying MDEP (in some ways an equivalent constraint to the MIC since it also penalises partial morpheme copy) and satisfying /a/ (7b), the constraint optimising fixed segmentism. Variably ranking MDEP and FTBIN (and keeping the ranking of /a/ the same) accounts for why the /a/-final, bisyllabic reduplication pattern is optimal for some polysyllabic roots but not others. Further, as shown in (18), the same constraints and rankings that optimise a bisyllabic CS RED for CVC roots also optimise total reduplication for longer roots. Since bisyllabic and total reduplication candidates (18b.i, ii) are the only two that qualify as possible Canonical Stems, by satisfying both I-STEM and /a/ (7a, b), this analysis, unlike the MIC analysis, is able to clearly show what unifies those two variants.

To sum up this section, while most work on reduplication since McCarthy & Prince (1986) has focused on the way prosody constrains reduplication, I have followed Mutaka & Hyman (1990) in arguing that Kinande provides good evidence that reduplicant shape is also determined by morphological constraints. I have shown that Mutaka & Hyman's original insights into the role morphology plays in constraining reduplication are best analysed by proposing that RED must meet a morphological constraint: it must be a Canonical Inflected Stem. This explains why the reduplicant is /a/-final: /a/ is the unmarked IFS for verb stems. Proposing that RED is a verb stem with internal morphological constituency also explains why most polysyllabic verb roots cannot take

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the bisyllabic Canonical Stem reduplication pattern. Since RED phonologically resembles a verb stem, the expectation is that it should be an actual verb stem, which is morphologically related to the Base for reduplication. When this expectation fails, the bisyllabic Canonical Stem reduplication pattern is non-optimal.[11]

3 Prosodic constraints

So far, only the reduplication pattern of consonant-initial stems has been discussed, and the focus has been on the role of morphological constraints in determining the shape of the RED. In this section, the reduplication patterns of vowel-initial stems are analysed. The problem posed in accounting for longer vowel-initial stems is that they are infixed, rather than prefixed, to their base. The problem posed in accounting for the reduplication of bisyllabic vowel-initial stems is that they pattern with monosyllabic stems in copying twice to fill out the bisyllabic template. As Mutaka & Hyman (1990) argue, both these problems are motivated by the fact that vowels do not begin well-formed syllables, but formalising this generalisation proved problematic in their analysis. In §3.1, I will first show that infixation is motivated by a prosodic well-formedness constraint on the Base for reduplication: the Base must begin with an onsetful syllable. In §3.2, I will show that overcopy is motivated for both monosyllabic and VCV stems by a prosodic well-formedness constraint on RED: overcopy is the only way, given other constraints in the language, for RED to satisfy FTBIN.

3.1 Infixation of longer V-initial stems

As we have seen, the RED's of consonant-initial stems always appear as prefixes to their Bases. As shown in (19a), the RED's of bisyllabic vowel-initial stems are also prefixed, but the RED's of longer vowel-initial stems are infixed after the stem-initial vowel, as shown in (19b):

(19) *Reduplicated vowel-initial stems* (Mutaka & Hyman 1990, Mutaka 1994)

stem	*reduplicated form*	
a. *Vowel-initial, prefixing*		
ery-esa	ery-e.se.s = e.sa	'to play'
ery-ôha	ery-ó.ho.h = o.ha	'to pick'
ery-ôta	ery-ó.to.t = o.ta	'to light'
ery-ûma	ery-ú.mu.m = u.ma	'to dry'

[11] See Downing (1997, 1999b, in press, to appear) and Hyman *et al.* (1999) for further arguments supporting the claim that Bantu /a/-final RED's are morphologically verb stems.

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b. *Vowel-initial, infixing*

ery-esera	ery-e = sera = sera	'to play for'
ery-óhera	ery-ó = hera = hera	'to pick for'
ery-ótera	ery-ó = tera = tera	'to light for'
ery-ambala	ery-a = mbala = mbala	'to clothe'
ery-úsula	ery-ú = sula = sula	'to fill'

The infixing position of the RED after the stem-initial vowel has the usual advantage (McCarthy & Prince 1993a, b) of improving the prosodic well-formedness of both the Base and the RED: both are left-aligned with optimal syllables. To account for the infixing position of RED in these forms, I follow Mutaka & Hyman (1990) and Mutaka (1994) in proposing that the stem-initial vowel is extraprosodic: it is excluded from the base for reduplication because it does not begin a syllable. As Downing (1998) shows, extraprosodicity is best accounted for by adopting Inkelas' (1989, 1993) theory of prosodic misalignment. In this theory, phonological processes take morpho-prosodic constituents (P-constituents) as their domains. In the default case, P-constituents are coextensive with the morphological constituent on which they are based. But they may be misaligned to satisfy higher-ranked constraints. When the misalignment excludes some segments of the morphological constituent from the corresponding P-constituent, the excluded segments are by definition extraprosodic. Within this theory, stem-initial vowels are made extra-prosodic by the constraints in (20):

(20) a. ALIGN P-Stem-σ (STEM)
Align-L (P-Stem, σ)

b. ONSET
*Align-L (σ, μ_s)

c. (default): I-STEM $\approx$ P-STEM

ranking: STEM, ONSET $\gg$ I-STEM $\approx$ P-Stem

The constraints in (20a, b) outrank the default P-Stem alignment constraint in (20c), making it optimal for the P-Stem to be aligned with a syllable edge rather than with the morphological stem (I-Stem) edge.[12] Because a stem-initial vowel cannot begin a syllable (all word-medial syllables must begin with an onset in Kinande), the constraints in (20a, b) optimise misalignment of P-Stem with a vowel-initial I-Stem to improve the prosodic well-formedness of the P-Stem.

To explain why RED's of the VCV stems in (19a) are prefixed, not infixed, I follow Mutaka & Hyman (1990) in proposing that extra-

[12] See Downing (1999a) for arguments supporting the claim that the P-Stem, rather than some other P-constituent like P-Word, is the base for reduplication in Kinande. Work like Downing (1999a), Myers (1987, 1998), Mchombo (1993) provides arguments motivating the M-Stem and P-Stem as phonological domains in other Bantu languages. And for comparison with Kinande, see Hyman & Mtenje (1999) for discussion of a language, Chichewa, where P-Word, not P-Stem, is the base for reduplication.

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prosodicity is blocked if the resulting constituent would be sub-minimal. Ranking the P-Stem minimality constraint, MIN (21), above STEM (20a) optimises prefixing the RED of bisyllabic stems:

(21) MIN

The P-Stem must minimally contain two syllables.[13]

The tableau in (22) shows how these constraints and constraint rankings optimise excluding the M-Stem-initial vowel from P-Stem, subject to minimality (in the tableau, '[' is the P-Stem edge):

(22)

	DEP-IO	RED=FT	FTBIN	MIN	ONSET	STEM	I-STEM	/a/
☞ a. ery-e-(ser+a)=[sera								
b. e(ry-e.s+a)=[.e.sera		?			*!			
c. e(ry-e.s=[e).sera		?				*!	*	
d. e(ry-es+a)=[ye.sera	*!	?						
☞? e. e(ry-e.se).s=[e.sa		?				*	*	
☞? f. e(ry-e.s.=[e).sa		?				*	*	
g. e(ry-es+a)=[yesa	*!	?						
h. ery-e-(sa.s+a)=[sa				*!				

Crucial constraint rankings:

DEP-IO ≫ ONSET, STEM:
epenthesis not optimal means to satisfy ONSET, STEM

MIN ≫ ONSET, STEM:
optimal for Base to be bisyllabic at expense of prosodic well-formedness of Base

ONSET, STEM ≫ I-STEM, /a/:
optimal to satisfy ONSET at expense of morphological well-formedness of RED

RED=FT, FTBIN:
high-ranked because not violated except to satisfy MDEP

Infixing the RED after the extraprosodic stem-initial vowel is optimal for longer stems, as shown by candidate (22a), because it satisfies ONSET (20b) and STEM (20a), as well as the high-ranked prosodic constraints on the size of the RED and the Base. Candidate (22b) is non-optimal, since it violates ONSET, while (22c) violates STEM (20a), since the left edge is not left-aligned with a syllable. Candidate (22d) satisfies all the well-formedness constraints on the RED and the Base, but does so at the expense of fatally

[13] As pointed out by Doug Pulleyblank (personal communication), a possible alternative formulation of MIN (21) would be to require P-Stems to be feet (P-STEM = FT). The minimality clause of FTBIN (3e.i) would then enforce P-Stem minimality. The maximality clause of FTBIN (3e.ii) would have to be ranked in such a way that it restricts only the size of RED's, not other P-constituents, like P-Stem and P-Word, since only RED's are restricted to be both minimally and maximally bisyllabic. Other constituents are only subject to a minimality condition. See §4 for further discussion of this point.

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violating high-ranked DEP-IO, the constraint penalising epenthesis (epenthetic segments are outlined). However, as shown by candidates (22e, f), in shorter vowel-initial stems, it is optimal to violate STEM (20a) in order to satisfy Base minimality (MIN (21)). Making the initial vowel extraprosodic, as in (22h), violates MIN, while (22g) satisfies MIN and ONSET at the expense of a fatal DEP-IO violation.[14]

To sum up this section, infixation of RED's with longer vowel-initial stems in Kinande, as in other languages (Downing 1998), is best accounted for by proposing that the base for reduplication is the P-Stem, a morpho-prosodic constituent based on the morphological Stem but misaligned with it by making the initial vowel extraprosodic. (See Downing 1999a, Mutaka 1994 for additional arguments that the initial vowel of infixing stems is extraprosodic in Kinande.) As expected, if the base for reduplication is a prosodic constituent, P-Stem, infixing reduplication imposes a minimality condition on its base. This explains why the reduplicant of VCV stems is not infixed but rather prefixed: infixing the reduplicant in these stems would make the Base stem subminimal.

3.2 Overcopy in monosyllabic and VCV stems

Turning to bisyllabic vowel-initial stems, the first problem they pose is why one copy of the Base is not sufficient to satisfy the bisyllabic condition on RED (FTBIN (2e)), even though the Base satisfies the bisyllabic minimality condition on P-Stems, MIN (21). As Mutaka & Hyman (1990) show, bisyllabic vowel-initial stems (23b) pattern with monosyllabic stems (23a) in requiring two copies of the Base (overcopy) to fill out the second syllable of the reduplicative foot:

(23) *Kinande verbal reduplication* (Mutaka & Hyman 1990, Mutaka 1994)

stem	*reduplicated form*	
a. *Monosyllabic*		
eri-swa	eri-swa.swa = swa	'to grind'
eri-ta	eri-ta.ta. = ta	'to bury'
erí-lya	erí-lya.lya = lya	'to eat'
erí-hwa	erí-hwa.hwa = hwa	'to finish'
b. *Vowel-initial, prefixing*		
ery-esa	ery-e.se.s = e.sa	'to play'
ery-ôha	ery-ó.ho.h = o.ha	'to pick'
ery-ôta	ery-ó.to.t = o.ta	'to light'
ery-ûma	ery-ú.mu.m = u.ma	'to dry'
er-íba	er-í.bi.b = i.ba	'to steal'

A further challenge for a formal analysis of overcopy in Kinande is to explain why in related languages, like Kikuyu, which have a near-identical reduplication pattern for consonant-initial stems, vowel-initial stems like

[14] So far, the analysis chooses (22e, f) as equally optimal. As I will show in §3.2.2, deciding between the two depends on the definition of RED = FT. The question marks in tableau (22) highlight this point.

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those in (24c) satisfy the bisyllabic minimality requirement on RED without overcopy.

(24) *Kikuyu verbal reduplication*

infinitive	*reduplicated form*	
a. *Consonant-initial*		
go-cama	go-cama = cama	'taste'
go-thuura	go-thuura = thuura	'choose'
ko-hetoka	ko-heta = hetoka	'pass'
ko-hetokana	ko-heta = hetokana	'pass each other'
b. *Monosyllabic*		
ko-goa	ko-goo.a = goo.a	'fall'
ko-hea	ko-hee.a = hee.a	'be burnt'
c. *Vowel-initial*		
kw-ɛɛnya	kw-ɛɛ.nyɛ = ɛ.nya	'run'
kw-aandeka	kw-aanda = a.ndeka	'write'
g-ookera	g-ookɔ = ɔ.kɛra	'wake up'
ko-inaina	ko-ina = i.naina	'shiver'

Mutaka & Hyman (1990) propose that overcopy in monosyllabic stems and in bisyllabic vowel-initial stems have different motivations. Monosyllabic stems overcopy to satisfy the weight condition on RED. But bisyllabic vowel-initial stems overcopy for the same reason RED's of longer vowel-initial stems are infixed: RED's, like Bases, optimally begin with an onset. However, I argue in this section that overcopy for bisyllabic vowel-initial stems has the same motivation as for the monosyllabic stems. Overcopy is the only way, given other constraints in Kinande, to satisfy the requirement that each syllable of the RED foot be associated with a moraic element in the RED string. To formalise this generalisation, I propose that templatic constraints like RED = FT must be split into two constraints, one evaluating the alignment and the other evaluating the weight of RED. As I show, this allows us to make explicit how the interaction of other constraints with the weight condition on RED accounts both for overcopy in Kinande and for why overcopy is not found in Kikuyu. Conflating weight and alignment conditions in a single constraint obscures these relations.

3.2.1 *Monosyllabic verb stems.* Before turning to an analysis of overcopy in VCV stems, I will first present an analysis of reduplication of monosyllabic stems in both Kinande and Kikuyu. As we have seen, in Kinande RED is both minimally and maximally bisyllabic. Peng (1991, 1992) has shown that the same size constraint holds for the Kikuyu RED's illustrated in (24). The monosyllabic stems in (23a), (24b) show that Kinande and Kikuyu RED's must also be bisyllabic even when the Base is subminimal. In Kinande monosyllabic stems are expanded by double reduplication (overcopy), in violation of INTEGRITY (25a). This is accounted for by ranking RED = FT, FTBIN above INTEGRITY (25a). In Kikuyu, monosyllabic stems are expanded by lengthening the root vowel,

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forcing hiatus between the root vowel and final /a/ in both the Base and RED. If lengthening is a violation of *VV (25b), a constraint banning tautosyllabic vowel sequences, then ranking *VV below RED = FT, FTBIN optimises lengthening to satisfy RED minimality.

(25) a. INTEGRITY (INTEG)
No morpheme of S1 has multiple correspondents in S2 (McCarthy & Prince 1995, Rose, to appear).

b. *VV
No long vowels or diphthongs (Rosenthall 1994).

The tableaux in (26) and (27) exemplify the analysis:

(26) *Exemplification of Kinande analysis*

eri-RED=humirana	DEP-IO	RED=FT	FT BIN	MIN	I-STEM	*VV	SMAX∩FDEP	INTEG
☞ a. eri-(hum+a)= humirana							*	
b. eri-(humiran+a)= humirana			*!					
eri-RED=swa								
☞ c. eri-(swasw+a)=swa				*				*
d. eri-(sw+a)=swa			*!	*				
e. eri-(soo+a)=swa				*		*!		
f. eri-(yisw+a)=swa				*			*!	

Crucial constraint rankings: same as (22), plus
RED=FT, FTBIN, *VV, SMAX∩FDEP ≫ INTEG:
overcopy optimal means to satisfy RED minimality

(27) *Exemplification of Kikuyu analysis*

eri-RED=hetokana	DEP-IO	RED=FT	FT BIN	MIN	I-STEM	INTEG	SMAX∩FDEP	*VV
☞ a. eri-(het+a)= hetokana							*	
b. eri-(hetokan+a)= hetokana			*!					
eri-RED=goa								
☞ c. eri-(goo+a)=goo.a								*
d. eri-(go+a)=goa			*!					
e. eri-(goa.go+a)=goa				*!		*		
f. eri-(yigo+a)=goa				*!			**	

Crucial constraint reranking:
INTEG ≫ *VV:
lengthening optimal means to satisfy RED minimality

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As shown in (26), ranking FTBIN and *VV above INTEG in Kinande makes overcopy the optimal way to satisfy the requirement that RED be minimally bisyllabic. Filling out the second syllable of the RED with either an epenthetic syllable, as in candidate (26f), or by lengthening the RED vowel, as in (26e), violates higher-ranked constraints. As shown in (27), the opposite ranking of *VV and INTEG in Kikuyu make lengthening the RED (and Base) vowel the optimal way to satisfy the minimality requirement on RED. With this ranking, filling out the second syllable of RED either by overcopy, as in candidate (27e), or by an epenthetic syllable, as in candidate (27f), violates higher-ranked constraints.

3.2.2 *Problems with conflating weight and alignment.* Overcopy is clearly motivated in reduplicating Kinande monosyllabic stems, since that is the optimal way to satisfy the minimality requirement on RED. What is not yet clear is why VCV stems should pattern with monosyllabic stems in requiring overcopy. Since they satisfy the bisyllabic minimality requirement on P-Stem, one would expect one copy of the stem to also satisfy the requirement that RED be a bisyllabic foot. To answer this question, we need to look more carefully at the definition of RED = FT.

As noted in §2.1 above, templatic constraints like RED = FT are generally understood to evaluate the RED string along two dimensions, weight and alignment. The alignment and weight conditions defining RED = FT often appear to be redundant since consonant-initial RED's generally satisfy both. But the tableau in (28) shows that when RED's (and Bases) are V-initial the correct surface candidate (28e) cannot satisfy the alignment conditions on feet if feet are always aligned with syllable edges. Does it satisfy RED = FT, then, or not?

(28)

	DEP-IO	RED=FT	FT BIN	MIN	ONSET	STEM	I-STEM	INTEG
☞ a. ery-e-(ser+a)=[sera								
b. e(ry-e.s+a)=[.e.sera		?			*!			
c. e(ry-e.s=[e).sera		?				*!	*	*
d. e(ry-es+a)=[ye.sera	*!	?						
☞? e. e(ry=e.se).s=[e.sa		?				*	*	*
☞? f. e(ry=(e.s.=[e).sa		?				*	*	*
g. e(ry-es+a)=[yesa	*!	?						
h. ery-e-(sa.s+a)=[sa				*!				

Crucial constraint rankings: same as (22), plus
INTEG:
low-ranked to optimise overcopy to satisfy RED minimality

The question marks in tableau (28) emphasise why it is crucial to resolve this problem. Candidate (28f), which has only one copy of the Base, is

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optimal if both it and the overcopy candidate, (28e), equally violate RED = FT, because overcopy violates an additional constraint, namely INTEG. However, in comparing (28e) and (28f), we can see that overcopy has the advantage over a single copy of allowing the RED string to better fill the RED foot: both syllables of the foot are associated with a moraic element of the RED string in (28e), but only one syllable of the foot is filled by the RED string in (28f). But does the RED in (28e) satisfy RED = FT, as we need it to in order to be optimal, if it satisfies the weight condition on feet but not the alignment condition?

Different authors provide different responses to this question. McCarthy & Prince's (1995) analysis of the Chumash reduplication data in (29) proposes that the reduplicative 'template' is a bimoraic syllable.

(29) *Ineseño Chumash reduplication* (Applegate 1976)

a. *Consonant-initial stems*

tʃʰumaʃ	tʃʰum-tʃʰumaʃ	'islanders, Chumash people'
s-tʃeq	ʃ-tʃeq-tʃeq	'it is very torn'
ʃtexex'	ʃ-tex-texex'	'rivers'
skon	s-kon-kon'	'worms, reptiles'

b. *Vowel-initial stems*

k-ic'is	kic-kic'is'	'my sisters'
s-ikuk	sik-sikuk	'he is chopping'
s-iʃ-expetʃ	ʃi-ʃex-ʃexpetʃ	'they two are singing'

In evaluating competing candidates, they crucially claim that candidate (d) in (30) (adapted from McCarthy & Prince 1995: 312) violates RED = $\sigma_{\mu\mu}$. The RED in this candidate satisfies the weight condition (it is bimoraic), but violates alignment so violates the constraint:[15]

(30) *Chumash reduplication*

/s-RED-ikuk/	ANCHOR	ID-BR(F)	RED=$\sigma_{\mu\mu}$	DEP-IO	MORPHDIS
☞ a. sik-**s** ikuk				*	*
b. sik-**C** ikuk	*!		*	*	
c. sik-**C** ikuk		*!		*	*
d. s-ik.k-ikuk			*!		

However, Blevins' (1996) analysis of Mokilese reduplication takes a different view. She follows McCarthy & Prince (1986) in proposing that the 'template' for the Mokilese reduplication pattern illustrated in (31) is

[15] It is worth noting that McCarthy & Prince's conclusion, that alignment is the factor defining RED shape, contradicts work like that of Steriade (1988), which argues that weight is the crucial templatic condition.

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a bimoraic syllable. In contrast to Chumash, gemination or overcopy of partial geminates is the optimal strategy for resolving hiatus between a vowel-initial Base and a prefixed RED in Mokilese:

(31) *Mokilese* (Blevins 1996, McCarthy & Prince 1986)

	base	*progressive*	
a.	*Consonant-initial*		
	pɔdok	pɔd-pɔdok	'to plant'
	pilɔd	pil-pilɔd	'to pick breadfruit'
	sɔɔrɔk	sɔɔ-sɔɔrɔk	'to tear'
	pa	paa-pa	'to weave'
	wi.a	wii-wi.a	'to do'
b.	*Vowel-initial*		
	alu	al.l-alu	'to walk'
	andip	an.d-andip	'to split'
	onop	on.n-onop	'to prepare'

As shown in (32) (adapted from Blevins 1996: 526), it is crucial to her analysis for RED's which are bimoraic, but misaligned with a syllable, to partially satisfy RED = $\sigma_{\mu\mu}$.

(32) *Mokilese reduplication*

/RED+andip/	ANCHOR	CONTIG	ONSET	RED=$\sigma_{\mu\mu}$	MAX-BR	DEP-IO
☞ a. an.d=an.dip			*	+	**	
b. an.**n**=an.dip			*	+	***!	*
c. a**n**.n=an.dip		*!	*	+	***	*
d. an=.an.dip			**!		***	
e. a.n=an.dip			*	*!	***	
f. an.di.p=an.dip			*	*!		
g. **n**an.d=an.dip	*!			+	**	*

Blevins introduces a new diacritic, the '+' sign, to indicate partial satisfaction of the 'templatic' constraint. The interpretation of the '+' is explained in a footnote (1996: 528, n. 5):

> Violations of [RED =]$\sigma_{\mu\mu}$ are of two sorts: those that satisfy the constraint but have more material (marked with + for each additional segment, * for each additional syllable), and those that do not satisfy the constraint in having too little material [also marked with *].

In other words, the '+' diacritic indicates candidates which satisfy the weight condition defined by RED = $\sigma_{\mu\mu}$, but which violate the alignment condition. This new diacritic encodes Blevins' claim that candidates which satisfy weight still minimally satisfy the heavy syllable template. Only candidates which violate alignment and weight completely violate

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the template, earning a '*'. Notice, it is crucial in this analysis to distinguish minimal and maximal violation of the template. Otherwise the actual surface candidate (32a) would violate the same number of constraints as other misaligned candidates which are underweight or overweight and so not be chosen as optimal.

While this analysis would work for Kinande, it is undesirable to introduce a new type of constraint satisfaction, namely the contrast between minimal and maximal satisfaction encoded in the '+' *vs.* '*' distinction. Even if we use two different diacritics to distinguish violations of the weight *vs.* alignment conditions defined by the templatic constraint, conflating the conditions makes it impossible to make explicit which other constraints motivate violations of the alignment condition. More seriously, there is no way to show explicitly that the weight condition decides the winning candidate when alignment cannot be satisfied due to higher-ranked alignment-related constraints.

3.2.3 *Splitting weight and alignment.* I propose that these problems can be solved by splitting templatic constraints like RED = FT into two constraint families: one evaluating the alignment of the RED string with the constituent defining the shape of RED, the other evaluating the mapping between weight-bearing segments in the RED string and the required weight units (syllables or moras) of that constituent.

I follow Crowhurst & Hewitt (1998) in proposing that alignment constraint conjunctions like the one in (33) best define the requirement that a RED string be coextensive with some prosodic constituent (PCat) like a heavy syllable or a foot.[16]

(33) *Alignment condition*

Align-L (RED, PCat)$\cap$Align-R (RED, PCat)
For example, RED = FT: Align-L (RED, Ft)$\cap$Align-R (RED, Ft)

I propose that we can use the correspondence constraints in (34) to evaluate the weight of the RED string. MAX RED-PCat (34a) defines RED maximality: it is violated if the RED string contains more segments that can be mapped into the weight units of the relevant PCat. DEP RED-PCat (34b) defines RED minimality: it is violated if the RED string contains fewer segments than are required to fill the weight units of the relevant PCat.

(34) *Weight conditions*

a. MAX RED-PCat
Every weight unit of the RED string (syllable nucleus if PCat is not quantity-sensitive, mora if it is) is parsed into a weight-bearing position (syllable nucleus/mora) of the RED PCat.
For example, MAX RED-Ft: Every nuclear element of the RED string is parsed in a syllable nucleus of the RED Ft.

[16] As noted above, this type of constraint conjunction is evaluated on analogy with logical conjunction. The conjunction is satisfied iff both constraints making up the conjunction are satisfied. If either of the constraints or both are violated, the conjunction is violated.

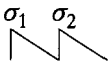
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b. DEP RED-PCat
Every weight unit (syllable nucleus if PCat is not quantity-sensitive, mora if it is) of the RED PCat is associated with an element of the RED string.
For example, DEP RED-Ft: Every nucleus of the RED Ft is associated with an element of the RED string.

Typically, only alignment constraints are used to compare strings with the prosodic constituents that parse them, while correspondence constraints compare strings only with other strings (McCarthy & Prince 1995). The use of correspondence in (34) builds on McCarthy & Prince's (1999: 228) observation that correspondence constraints parallel Goldsmith's (1976) autosegmental Well-Formedness Condition. MAX is the equivalent of 'every tone-bearing element is associated with some tone'. DEP is the equivalent of 'every tone is associated with some tone-bearing unit'. It is a straightforward extension of this conception of correspondence constraints to propose they evaluate associations between weight-bearing units and the weight tier.[17]

This correspondence approach to evaluating reduplicant weight also finds an analogy in Itô & Mester's (1999) recasting of alignment theory. As they show, geminates raise a problem for the classic alignment theory (McCarthy & Prince 1993a, b) of syllable parsing, because, at the segmental level, geminates straddle syllable edges. (They assume a single root note representation of geminates.) As shown in (35) (adapted from Itô & Mester 1999: (31)), if one traces upward from the string to the syllable edges, the geminate fails alignment because the trace leads to two syllables. Only if one can also define a trace down from syllable to string is the geminate well aligned with each syllable.

(35) *Realignment*

a. 

[atta]

b. $|\sigma_2| = /ta/$ — A trace downwards from σ_2 converges on /ta/ as the [edges of] the maximal terminal substring dominated by σ_2.

c. $/ta/ \neq |\sigma_2|$ — A trace upwards from the terminal elements of the [edges of] /ta/ does not converge on a single node labelled σ_2.

The weight constraints in (34) can be understood as the correspondence equivalent of realignment. MAX RED-PCat evaluates an upward trace from a string to a weight unit, not an edge, of a prosodic constituent. DEP RED-PCat evaluates a trace down from the weight units of a prosodic constituent to the string.

The advantage of splitting the alignment and weight conditions into two constraint families is that this allows us to state explicitly the constraint

[17] See, too, work like Broselow *et al.* (1997) for discussion of other uses of correspondence to evaluate string-constituent associations.

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rankings that optimise overcopy in RED's of Kinande VCV stems. The alignment conditions on vowel-initial RED's are violated, because prosodic well-formedness constraints outrank RED alignment. (I am assuming feet must be aligned with syllables.) The weight conditions on the reduplicative foot are optimally satisfied by overcopy, because DEP RED-Ft, the constraint requiring both syllables (nuclei) of the RED foot to be associated with elements of the RED string, outranks INTEG. The analysis is exemplified in (36), where the correspondence constraints in (34) replace RED = FT in earlier tableaux:

(36)

	DEP-IO	MAX RED-Ft	DEP RED-Ft	MIN	ON-SET	*VV	I-STEM	IN-TEG	ALIGN RED-Ft
☞ a. e(ry-e.se).s=[e.sa							*	*	**
b. e(ry-e.s=[e).sa			*!				*		**
c. eri-(e.s+a).=[e.sa					*!*				
d. e(ry-es+a)=[yesa	*!								*
e. e(ry-ese=[e)sa						*!*	*		**
f. ery=e.(se.s=[e).sa		*!	*				*	*	**
g. ery-e-(sas+a)=[sa				*!				*	**
☞ h. eri-(swasw+a)=[swa				*				*	
i. eri-(swasw+a)= [swa**yi**	*!*							*	

Crucial constraint rankings:

DEP-IO ≫ ONSET, STEM:
epenthesis not optimal means to satisfy ONSET, STEM

MIN ≫ ONSET:
optimal for Base to be bisyllabic at expense of prosodic well-formedness of Base

INTEG:
low-ranked to optimise overcopy to satisfy RED minimality

ONSET, STEM ≫ I-STEM, /a/, ALIGN RED-FT:[18]
optimal to satisfy ONSET at expense of morphological well-formedness of RED and RED alignment

MAX RED-FT, DEP RED-FT:
high-ranked because not violated by optimal candidate

FTBIN:
high-ranked (and omitted from this tableau) because not violated except to satisfy MDEP

Candidate (36a) is optimal for VCV Bases, because it satisfies the weight conditions on RED even though it is misaligned. Candidates (36b, f), while

[18] /a/ (7b) is not included in this tableau for reasons of space. See (22) for exemplification and motivation of this ranking.

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equally misaligned, are non-optimal because the second syllable of the RED-Ft is not filled by an element of the RED string. Comparing (36a, b) with (28e, f) above shows that making explicit the weight conditions on RED crucially allows us to optimise the overcopy candidate (36a), since it satisfies the weight conditions on RED while (36b) does not. Better-aligned candidates (36c, d) are non-optimal because they violate higher-ranked prosodic constraints. Candidate (36e) is interesting because it represents the optimal output in Kikuyu. Notice that the same constraint ranking, *VV ≫ INTEG, which makes overcopy, not vowel lengthening, the optimal way to satisfy minimality for monosyllabic Bases like (36g), crucially also optimises overcopy to satisfy the minimal weight constraint for VCV bases.

It is worth noting that the parse in (36f) is the one given to the reduplicants of VCV Bases by Mutaka & Hyman (1990) and Mutaka (1994). They assign this parse because they argue that overcopy is motivated by a requirement that the RED-Ft align at its left edge with an onsetful syllable. That is, the initial vowel of the RED string is excluded from the RED-Ft for the same reason that stem-initial vowels are excluded from longer Bases. If the RED-initial vowel is excluded from the string, they propose, a second copy of the Base is required to fill out the RED-Ft. However, as we can see in (36f), if the RED-initial vowel is outside the RED-Ft, the parse violates both weight conditions on RED. The excluded vowel incurs a MAX violation, and a DEP violation is incurred because the second vowel of RED-Ft lies outside the RED string. In fact, the RED-Ft overlaps the P-Stem at the right edge. These problems make (36f) a much worse prosodic parse of the same string than (36a) and so not the optimal output.

The tableau in (37) shows that simply reversing the ranking of *VV and INTEG makes lengthening, not overcopy, the optimal way to satisfy weight conditions on the RED's of both CV and VCV Bases in Kikuyu:

(37) *Kikuyu*

	DEP-IO	FT BIN	MAX RED-Ft	DEP RED-Ft	IN-TEG	ON-SET	*VV	ALIGN RED-Ft
☞ a. (ko-i.na=i).naina							*	**
b. (ko-i.nai.)na=i.naina			*!		*			**
c. ko.-(i.na).=[i.naina						**!		
d. (ko-i.na)=[yinaina	*!							*
e. (ko-i.n=i).naina				*!				**
☞ f. ko-(goo.a)=goo.a						*	*	
g. ko-(goa.goa)=goa					*!			
h. ko-(goa)=goa		*!						

Crucial constraint rankings: same as (36), except:
INTEG ≫ ONSET, *VV

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Candidate (37a) is optimal because the first half of the diphthong is associated with the second syllable of the RED foot, satisfying DEP RED-Ft. Even though this candidate is misaligned with RED-Ft, better-aligned candidates violate higher-ranked prosodic constraints. Notice that the same constraint ranking that optimises lengthening to satisfy minimality for monosyllabic Bases (37f) crucially also optimises a bimoraic syllable at the RED-Base juncture to satisfy the minimal weight requirement on RED for vowel-initial Bases.

To sum up this section, if weight and alignment are made separate conditions on the prosodic well-formedness of the reduplicative string, the original puzzles posed by Kinande overcopy have a straightforward solution.[19] Overcopy is required for VCV Bases even though they are bisyllabic because obligatory hiatus resolution (with no long vowels) at the RED-Base juncture means that one copy of the Base will necessarily only provide one syllable for the RED-Ft (see (36b) above). There is no overcopy in Kikuyu, because it has bimoraic syllables. This allows a single copy of a VCV Base to be associated with both syllables of the RED-Ft, as shown in (37a), even though there is obligatory hiatus resolution at the RED-Base juncture.

4 Why prosodic templates are still necessary

In this paper, I have argued that the bisyllabic size condition on Kinande reduplicants is best accounted for by reduplication-specific prosodic well-formedness constraints, or templates, like RED = FT (33) and MAX/DEP RED-Ft (34) defining the size of RED. This position has become controversial due to work like Gafos (1998a, b), McCarthy & Prince (1994, 1999), Spaelti (1997) and Urbanczyk (1995, 1996), which questions the necessity of reduplication-specific templates. In this section, I will examine the arguments presented against appealing to templates, and show that they are problematic for languages like Kinande.[20]

Two main arguments against templates are found in this recent literature. First, templates constraining reduplicant size are said to simply repeat general prosodic well-formedness constraints that hold elsewhere in the grammar of the language or ones available to universal grammar

[19] See Downing (1999c) for discussion of how splitting weight and alignment also resolves a similar overcopy problem in Arrernte reduplication.

[20] It is important to note that by 'reduplication-specific template' I mean constraints like (33), (34) that specifically refer both to a morphological category (e.g. RED) and a prosodic constituent (e.g. Foot) restricting RED size. This definition of templates follows most work on reduplication since Steriade (1988), in assuming that templatic restrictions on RED's are best considered prosodic well-formedness constraints on the output of reduplication rather than lexically specified prosodic constituency in the input of RED. (But see Inkelas 1999 for a different view.)

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(Gafos 1998a, b, McCarthy & Prince 1994, 1999). For example, McCarthy & Prince (1999) propose that constraints like RED = FT restricting reduplicants to be foot-sized could be recast as general constraints on foot parsing like those in (38):

(38) a. ALLFTR
Every foot is [P-Stem] final (McCarthy & Prince 1999).

b. PARSE-σ
Every syllable must be parsed into a foot.

These constraints act as a size restrictor only on reduplicants, but not non-RED P-Stems or the Base P-Stem, if they are ranked above MAX-BR but below MAX-IO, as shown in (39):

(39)

RED=humirana	MAX-IO	ALL FTR	PARSE-σ	I-STEM	SMAX-BR	/a/	FDEP-BR
☞ a. (hum+a)]=humi(rana)]			**		****		*
b. (humi)(ran+a)]=(humi)(rana)]		*!*					
c. (hum+a)]=(huma)]	*!***						
d. (hum+a)]=humirana]			***!*		****		*
e. humi(ran+a)]=humi(rana)]			***!*				
f. hum+a]=humi(rana)]			***!*		****		*

Crucial constraint rankings:
MAX-IO ≫ ALLFTR ≫ PARSE-σ ≫ SMAX-BR:
TETU ranking optimises bisyllabic RED
ALLFTR ≫ PARSE-σ:
optimises one foot per stem

The constraints and rankings in this tableau are essentially identical to the one in (8), above, except that RED = FT has been replaced with the general foot-parsing constraints in (38). In (39), we can see that these foot-parsing constraints, like RED = FT, optimise a footed, bisyllabic reduplicant (39a). As shown by candidates (39b, e), a longer reduplicant would either have more than one foot, as in (39b), and so violate ALLFTR, or not be exhaustively parsed into bisyllabic feet, as in (39e), and so violate PARSE-σ (38b). As shown in (39c), high-ranking MAX-IO penalises reducing the Base to a single foot to satisfy the size restrictors in (38). Parsing only the RED string and not the Base into feet, as in (39d), or parsing only the Base but not the RED, as in (39f), is not optimal, as this violates PARSE-σ (38b). It is worth noting that candidate (39d) is the one chosen as optimal in the templatic analysis developed so far in this paper, since footing is not general in the templatic analysis, rather restricted to the reduplicant.

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As McCarthy & Prince (1999) and Spaelti (1997) argue, an important advantage of deriving size restrictions on RED's by ranking general foot-parsing constraints like those in (38) between MAX-IO and MAX-BR is that this allows reduplicative size restrictions to be considered a type of EMERGENCE OF THE UNMARKED (TETU) effect. As shown most clearly by comparing candidates (39a, d), general constraints on foot parsing (39a, b) require both RED and Base to be parsed into feet. Ranking MAX-IO above these constraints makes it optimal for the RED to contain a single foot while imposing no size restriction on the Base. As discussed in §2.1 above, Alderete *et al.* (1999) argue that typically the explanation for mismatches between the structure of RED's and that of their Bases is a TETU ranking like that in (39) which optimises unmarked structure in RED's while allowing marked structure in the Base. It is a welcome result to fit size mismatches into this general typology. A reduplication-specific template like RED = FT, in contrast, fails to express that the reduplicant is exactly foot-sized because this is the unmarked size for all stems due to general foot-parsing constraints on the language as a whole. Further, mentioning the morphological context for the size restriction in the formalisation of a templatic constraint like RED = FT is redundant if the TETU ranking also limits the effect of the constraint to a single morphological context, namely reduplication.

However, as Mutaka & Hyman (1990) show, one cannot easily subsume RED = FT into a general foot-parsing constraint for Kinande. Kinande is a tone language, and the only evidence for stress assignment is that penult vowels are lengthened pre-pausally. (This is true of many Bantu languages, as noted in Doke 1954.) I concur with Mutaka & Hyman that pre-pausal lengthening provides a very weak argument for assigning metrical bisyllabic foot structure to the right edge of every P-Stem in Kinande. This is problematic for the analysis in (39). As we have seen, since ALLFTR, PARSE-σ (38a, b) are high-ranked, the optimal candidate must parse a foot at the right edge both of the Base and the RED. Even though candidate (39d) is arguably the correct surface output when the form is not pre-pausal (so there is no evidence for footing in the Base), in the analysis exemplified in (39) it could never be optimal. Notice it incurs the same number of PARSE-σ violations as (39e), a total reduplication candidate, and (39f), a candidate in which the Base, not the RED, is parsed into a foot. Since there is no evidence for parsing non-RED P-Stems into metrical feet, ALLFTR is too general, requiring foot structure in P-Stems which show no evidence of having a metrical parse just to insure that RED P-Stems are also footed.

Moreover, as work like Crowhurst (1992) has argued, morphologically motivated feet cannot be easily equated with metrically motivated feet. Morphological feet can be unheaded, while metrical feet are necessarily headed. This distinction is highlighted by considering the two feet in the optimal candidate in (39a). The foot of the Base is motivated pre-pausally be penult lengthening: the headedness of the foot-initial syllable is realised as lengthening that syllable. In contrast, the initial syllable of the

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RED foot is never lengthened (it is never pre-pausal), and, indeed, there is no independent motivation for designating either syllable of the RED foot as the head. Morphological feet are also not all subject to the same size constraints as metrical feet. Reduplicative feet, like metrical feet, are both minimally and maximally bisyllabic in many languages like Kinande. However, feet constraining the size of words and stems only typically require these categories to be minimally bisyllabic; they do not impose a maximality constraint. (See Downing 1999a, Hyman & Mutaka 1990 for further discussion of this point.) It is difficult to see, then, how the bisyllabicity condition on RED size in Kinande falls out straightforwardly from general principles of morphological or metrical foot construction in Kinande.

As work like McCarthy & Prince (1999), Spaelti (1997) argues, another reason to prefer generally parsing constraints like those in (38) over morpheme-specific templates is the so-called Hamilton–Kager Conundrum (HKC). This conundrum arises as follows. In the template approach adopted in this paper, RED = FT acts as a size restrictor on RED if it is ranked above MAX-BR (and below MAX-IO). However, factorial typology predicts we can rerank RED = FT, MAX-BR above MAX-IO to give a new grammar. As shown in (40), this ranking optimises 'back-copying' the templatic size restriction of the RED on to the Base, resulting in truncation of longer bases like *-humira* and augmentation for shorter ones like *-swa*:

(40)

eri-RED=humira	SMAX-BR	RED=FT	FT BIN	/a/	I-STEM	FDEP-BR	MAX/DEP-IO
a. eri-(hum+a)=humira]	*!*					*	
b. eri-(humir+a)=humira]			*!				
☞ c. eri-(hum+a)]=huma]							**
eri-RED-swa							
☞ d. eri-(yisw+a)=yiswa							**
e. eri-(yisw+a)=swa						**!	
f. eri-(sw+a)=swa			*!				

Crucial constraint rankings:
SMAX-BR, RED=FT, FTBIN ≫ MAX-IO:
derives HKC by optimising backcopy of size restrictors

The conundrum is that this is claimed never to happen in human languages: Bases never expand or contract to match the size restriction on the reduplicant.

As shown in (41), replacing RED = FT with ALLFTR, PARSE-σ (38a, b) does not entirely resolve the conundrum. It is still optimal to truncate or augment the Base to match the reduplicant size in this analysis, just as it is in the templatic analysis in (40):

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(41)

eri-RED=humira	SMAX-BR	ALLFTR FTBIN	PARSE-σ	/a/	I-STEM	FDEP-BR	MAX/DEP-IO
a. eri-(hum+a)]=hu(mira)]	*!*		*			*	
b. eri-(hum+a)]=humira]	*!*		***			*	
☞ c. eri-(hum+a)]=(huma)]							**
eri-RED-swa							
☞ d. eri-(yisw+a)=(yiswa)							**
e. eri-(yisw+a)=swa			*!			**	
f. eri-(sw+a)=(swa)		*!*					

Crucial constraint rankings:
SMAX-BR, ALLFTR, FTBIN, PARSE-σ ≫ MAX-IO

However, it is easy to see (by covering up SMAX-BR in (41)) that ranking ALLFTR, FTBIN and PARSE-σ above MAX/DEP-IO optimises truncating and augmenting all morphemes to be exactly two syllables. These processes are not restricted to the reduplicative context. That is, the Base is not truncated or augmented in (41) to match the RED, as in (40). Rather, the Base is independently constrained to be exactly two syllables in size, and RED is copying this property from the Base.

While the analysis in (41) does avoid backcopy, we are now faced with another conundrum. Most languages do not show alternations motivating an active word-maximality constraint. Instead maximality is a property of only certain morphological constructions, like hypocoristic formation and reduplication. This makes size restrictors quite different from other markedness constraints in the TETU ranking in that they almost always outrank morpheme-specific faithfulness constraints. They cannot be freely reordered above MAX-IO, because most morphological categories do not routinely violate faithfulness to satisfy size constraints. This is a surprising ranking restriction, since, as noted since the earliest work in OT (McCarthy & Prince 1993a, Prince & Smolensky 1993), phonological alternations can only arise when general markedness constraints outrank general (IO) faithfulness constraints. Indeed, phonological alternations are our most important source of evidence for markedness constraints. It is unexpected, then, for a general markedness constraint to be required to always be outranked by IO faithfulness so that it only motivates alternations in particular morphological contexts.

A more serious problem with the HKC is that one can find examples of reduplication patterns where templates do appear to be backcopied, contrary to the claim that this never happens in human languages. For example, as shown in (48), in Hausa reduplicated ideophones, each half of the reduplicated form must be identical in length, even though this can result in truncating the Base (unreduplicated) form. (According to Paul

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Newman (personal communication), the shortened base is not a Hausa word; it only occurs in the reduplicative context.)

(42) *Hausa* (Abraham 1962, Newman 1989)[21]

isolation form		*reduplicated*	
cakwale	'to be slushy'	cakwal = cakwal	'slushy'
buntsura	'joggling'	buntsur = buntsur	'joggling'
facaka	'squandering'	faca = faca	'squandering'
dabule	'trampled'	dabul = dabul	'trampled'
cukunkune	'to become tangled'	cukun = cukun	'state of confusion'

The most straightforward analysis of this pattern is to propose that the Base is shortened to match a bisyllabic maximality constraint on RED, by an analysis like that in (40).

Similarly, there are examples of reduplicative minimality being backcopied on to the Base. One such case is illustrated in the Kikuyu data in (24) above. Notice in the monosyllabic forms in (24b) that the vowel of the Base has been lengthened to match the lengthening of the RED vowel. Since the unreduplicated form of the Base shows that the Base vowel is usually short (a glide, in fact), the most straightforward explanation for lengthening in the reduplicative context is that the minimality constraint that motivates lengthening in the RED is backcopied to motivate lengthening in the Base. (See Hyman *et al.* 1999 for discussion of another case of minimality backcopy in Ndebele.)

I conclude, then, that the most straightforward way to require Kinande reduplicants to be minimally and maximally bisyllabic is by appealing to reduplication-specific prosodic constraints. The foot-size restriction does not fall out of general footing properties of Kinande, since only RED's are obligatorily footed. It also does not fall out of general size constraints on stems since only RED stems are maximally, as well as minimally, bisyllabic. The templatic approach correctly limits the size restrictor to the reduplicative morphology, while general footing constraints wrongly predict, by factorial typology, that truncation or augmentation might apply to all morphological categories of some language. Finally, the templatic approach correctly predicts that the size restrictions on RED can be backcopied to the Base, resulting in augmentation or truncation of the Base to match the size of the reduplicant.

5 Conclusion

In this paper, I have argued that Kinande verbal reduplication patterns are defined by the interaction of morphological and prosodic constraints. Morphologically, RED is defined as a Canonical Verb Stem. This explains,

[21] Thanks to Sharon Inkelas for bringing the Hausa data to my attention. Many thanks to Paul Newman for discussion of this pattern as well as for additional data. See Inkelas & Zoll (1999) and Niepokuj (1991), as well as Newman (1989), for further discussion of this Hausa reduplication pattern.

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first, why RED's are /a/-final: verb stems are generally /a/-final because the unmarked IFS is /a/. It also explains why certain reduplicative patterns are blocked with longer roots or with causative stems: reduplication fails if the bisyllabic RED fails to phonologically resemble an actual verb stem derivationally related to its base. Prosodically, RED is defined as maximally and minimally bisyllabic. I have shown that this minimal weight requirement motivates overcopy of both monosyllabic and VCV stems in Kinande. For both types of stems, overcopy is the only way, given the constraint rankings of the language, for the RED's to satisfy the minimal weight condition.

Proposing that Kinande reduplication is subject to both morphological and prosodic constraints is controversial in the light of recent work suggesting that prosodic templates like RED = FT should be eliminated in favour of general prosodic parsing constraints (McCarthy & Prince 1994, Spaelti 1997) or in favour of purely morphological 'templates' (Urbanczyk 1995, 1996). However, I have shown that an adequate analysis of Kinande reduplication requires both a morphological and a prosodic template. RED = FT cannot easily be replaced by a general alignment constraint adding a metrical foot to the right stem edge, because, as Mutaka & Hyman (1990) argue, there is no good evidence for metrical foot structure in Kinande. RED = FT also cannot be eliminated in favour of a purely morphological template requiring RED's to be, say, minimal (bisyllabic) verb stems, because Kinande RED's are both minimally and maximally bisyllabic. Stems are subject only to a minimality constraint. Further, in other Bantu languages like Kikerewe (Downing, in press, Odden 1996) RED's have the same morphological 'template' as Kinande (RED must be a canonical, /a/-final verb stem) but lack the prosodic size condition. This confirms that the morphological and prosodic templates are independent of each other and that both are necessary to define a typology of the interaction of morphology and prosody in constraining reduplication.

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