Tone Spread and Reduplication in Kibondei

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Lee, Kent. 2013. Tone Spread and Reduplication in Kibondei. *The Journal of Studies in Language* 29.1, 129-150. This paper examines the tonal system of Kibondei, a Bantu language and its tonal and reduplication patterns. The appearance of otherwise unrealized tones from verb stems that spread onto adjacent materials is first discussed. Then reduplication patterns are examined, which exhibit some unusual tone shifting patterns. These are explained within the framework of Optimality Theory, with constraints on segments, tones and morphemes. Finally, implications of tone systems for Optimality Theory and the interface of different linguistic components are briefly discussed, as these hint at interesting and possible interpretations of Optimality Theory. (Korea University)

Key words: tone, reduplication, Bantu, Optimality Theory

1. Introduction

Kibondei (Kibondéi, or Bondei) is a Bantu language spoken in northeastern Tanzania, which has rarely been described or analyzed in the linguistics literature. Like many other Bantu languages it has a tonal system, with tones shifting within words and across morphemes. Kibondei mainly has phonologically distinctive high tones, in contrast to other syllables that are toneless, or that perhaps could be considered default low tones that act like toneless syllables, in that they do not spread or shift (see Lee & Lee, 2002). These high tones may appear invisible, particularly on verb stems, in that they are not phonetically realized on morphology simple forms, until affixes, complements or adjuncts are added, onto which the tones spread and become pronounced. Tones also appear in reduplicated forms, and these reduplications express emphatic, intensive or frequentive meanings.

This issue of tone invisibility and tone spreading from verb stems is

first discussed below, with a constraint based account for this behavior, appealing to fairly standard Optimality constraints. This type of tone spreading onto affixes is in itself not so problematic. However, verbal reduplication shows behavior that is more difficult to explain, and a couple of possible explanations for this are suggested below. The data here were elicited from a native speaker informant of Kibondei, who was a graduate student in the U.S. (specifically, at the University of Illinois at Urbana-Champaign) in the mid-1990s when the data were first collected (and the only informant for this language that was available). The speaker's productions were transcribed, using simple waveform software to determine the tonal patterns, and for the more difficult or unusual tone patterns, the speaker was asked to produce the same expressions again in subsequent sessions for confirmation. The transcriptions were also checked by comparison with a Kibondei lexicon (Cassimjee & Kisseberth, 1996).

Bantu tone spreading, shifting and reduplication, as in Kibondei, can be handled fairly well in Optimality Theory. However, such phenomena raise issues of cyclicity and the types of complexity that are desirable in Optimality Theory (OT), namely, whether cyclic or purely monostratal models are preferred. This in turn has implications for the nature of Optimality Theory itself, as well as for theories of linguistic interface. These implications are sketched out below.

2. Tone Features

Kibondei has some verbs whose lexical tones are not realized on the verb stems alone. For these verbs with underlying lexical tones, the lexical tone of tonal stem fails to show up in present indicative forms when the verb occurs in isolation, e.g., in simple elicitation form. Yet their effect is felt when prefixes with underlying lexical highs are added to the verb stem. Tonal prefixes such as *a-* 's/he' (present tense, third person prefix) and object prefixes such as *di-/zi-* (object prefix, noun class 5/6)[1] will spread their tones as far as possible into the verb

1) Nouns in Bantu languages typically into a dozen or more noun classes based on semantic categories. Class 5/6 is for fruits (di = singular, zi = plural);

tems. Although the lexical verb stem tones are not expressed, their ɔnal domain structures block high tones from prefixes from spreading nto the verb stem. Verb forms are created by prefixing markers onto ıe verb stems for subjects, tenses other than present (or the infinitive ıarker *ku-*), and sometimes object markers. Thus, the first syllable of erbs is generally a pronominal and/or tense morpheme. Verb stems ıay have underlying tones that are unexpressed in morphologically impler forms. The sponsors, or verb stem syllables to which these ɔnes are underlyingly assigned, are ascertained by their tonal behavior see Cassimjee & Kisseberth (1996)), and the domains marked in arentheses are tonal and foot domains.

Examples are given in Table 1 with their domain structures marked ı parentheses and tonal sponsors or anchors by underlining.

Table 1. Tone Spreading from Prefixes

Base forms			Prefixed forms		
kuda	*to eat*	ku(da)	áda	*s/he eats*	(á)(da)
kuona	*to see*	ku(ona)	áona	*s/he sees*	(á)(ona)
kugua	*to buy*	ku(gua)	kuzigúa	*to buy them*	ku(zigú)(a)
nada	*I eat*	na(da)		[*zi*=5/6]	
naona	*I see*	na(ona)	kudída	*to eat it* [*di*=5/6]	ku(dí)(da)

Predictably, toneless verb stems (with no underlying high tones) will llow spreading of prefixal tones, since no domain structures exist on he stem to prevent tonal spread. An alignment constraint shifts the ɔne toward the end of the word, but the tone will surface on the ıenult due to a NonFinality constraint against ultimate tones.

other noun classes are for nouns referring to people, animals, plants, houses, abstract nouns, gerunds, and others. These noun classes have distinctive pronominal object morphemes that attach to verbs.

Table 2. Prefixes with and without Tones (base forms are toneless)

Base forms	Prefix	Prefixed forms	
kutoa, *to get wet*	na *'I'*	natoa	*I get wet*
kuzenga, *to build*	[toneless]	nazenga	*I build*
	a *'s/he'*	atóa	*s/he gets wet*
	[high tone]	azénga	*s/he builds*

The alignment constraint driving this tone shift can be easily identified as a right-alignment constraint that right-aligns the tone with the prosodic word: Align-R(Tone, PWd)[2]. Naturally this wide-scope alignment constraint dominates basic alignment for tone, BA-[T], and the wide-scope alignment is dominated by NonFinality, a constraint against ultima tones, so the tone is realized on the penultimate syllable (Table 3).

Table 3. Constraints for Tone Spreading from Prefixes

Constraints	NonFinality[Tone]: Tone may not fall on final syllable[3] Align-R(Tone, PWd): Right-align tone with prosodic word (for prefixal tone spread) BA[Tone]: Basic alignment of tone with its sponsor syllable
Constraint ranking	NonFinality ≫ Align-R(Tone, PWd) ≫ BA[Tone]

Thus, *azénga* would be the winner in the constraint ranking for satisfying NonFinality[Tone] over Align-R(Tone, PWd), at the expense

2) Another study (Lee & Lee, 2002) independently arrived at a similar set of constraints (unbeknownst to this author at the time), as these data here were originally collected and analyzed earlier, before being reanalyzed and published here. However, Lee & Lee's (2002) analysis assumed that the sponsor syllables for the tones were by default on the ultimas, but this assumption is not in agreement with the tonal behavior and evidence for ultimate and penultimate tones in Tables 1 and 2 above.

3) The NonFinality constraints for stress and tone could be different, but the existing data provide no evidence of such a distinction. For stress, it clearly seems undominated, as stress always falls on the penultimate mora; it also seems undominated for tone as well here.

of *BA[Tone]. Not shifting the tone to the verb stem (*<u>á</u>zenga) would violate Align-R(T, PWd), which can be avoided by tone shifting to the stem. The unexpressed high tone also makes itself known in longer phrases by showing up on the following lexeme in the predicate, i.e., a noun object, or an adjunct such as an adverb (Table 4).

Table 4. Examples of Tone Spreading to Predicate Lexemes

Example	Gloss	
kida kinyányi	*s/he ate greedily*	*[kinyanyi=quickly, greedily]*
nkhita guío	*I went to market*	*[guio=market]*
nada mabámía	*I am eating okra*	*[mabamia=okra]*
kagua báúti	*s/he bought gunpowder*	*[baúti=gunpowder]*
kiona ḿthu	*I saw a person*	*[mthu=person]*

An alternative outcome for these forms could be tonal fusion; the spreading base tone could have spread onto the penultimate tone of the complement and fused with it, rather than being realized on the antepenult. However, this is prevented by a faithfulness constraint against coalescence, e.g., the Uniformity constraint (Prince & McCarthy 1995), specified for tone (Uniformity[Tone]), mitigating against tonal coalescence.

2.1. Tone Spread

The tone shifting patterns are morphosyntactically conditioned, as the tone shifts occur within a prosodic phrases, which correspond to syntactic constituents. The verb is the head of the phrase, and shifts the lexical high from its stem rightward to the non-head (adjunct, complement, or daughter) element, such as the adverb or noun object of a VP. The tone will shift to the penult of the non-head element rather than to the final syllable due to NonFinality. However, if a lexical tone already occupies the penultimate position on the complement, then tone spreading from the preceding phrasal head will be blocked and the tone will fall on the antepenult. If no non-head element is present to receive the tone, the tone will go unexpressed. To explain these shifts, a

wide-scope alignment constraint is proposed, which aligns the tone rightward with the phrasal non-head element (see Table 5). This constraint is morphosyntactically specified to the higher level VP that includes adjuncts and objects, since this tonal behavior is specific to whole verb phrases.

Table 5. Constraint Rankings for Tone Spreading to Predicate Lexemes

Constraints	Align-R(Tone), i.e., Align(Tone, R; Verb Phrase, R): Right-align tone with (non-head element of) the verb phrase. BA[Tone]: Basic alignment of tone on sponsor syllable. Uniformity[Tone]: No tonal element of output has no multiple correspondents in input, i.e., no tonal coalescence or fusion. Express[Tone]: Tonal features are to be realized in the output.
Constraint ranking	NonFinality, Uniformity[Tone] ≫ Align-R(Tone, VP) ≫ Express[Tone], BA[Tone]

Thus, for phrases like *naona* ('see') and *naona ḿthu* ('I see a person') the underlying lexical high fails to surface on the verb itself in isolation, but shifts to a following non-head item in the same morphosyntactic domain where it is realized in penultimate position. These constraints for *naona* and *naona ḿthu* are shown in Table 6. This constraint satisfaction also works for a phrase like *kagua báúti* ('she was buying gunpowder'), where the noun object has its own tone, so adjacent tones come together and the second tone undergoes downstep, as shown in Table 6.

Table 6. Evaluations of Tone Spreading to Predicates; *mthu* = 'a person,' and *baúti* = 'gunpowder'

Optimal form	NonFinality	Align-R(Tone)	Express	BA[Tone]
A. ✓ naona			*	*
B. ✓ naona ḿthu				*
C. ✓ kagua bá!úti				*

These forms win the constraint evaluations for satisfying Align-R Tone), which dominates Express and Basic Alignment; they properly lign the tone on the non-head element where it is realized. Other utputs that do not do so would fatally violate Align-R(Tone) or ionFinality, e.g., if the tone on the complements were not expressed at ll (*naona mthu). These examples above show that Basic Alignment or tone is rather lowly ranked in Kibondei. Tone spreading onto a omplement which already has its own lexical tone, such as *kagua báúti* 'she was buying gunpowder'), is shown in (C) above. Candidate C is vell formed, as it resolves the conflict between alignment and the lomain structure of the lexical tone on the noun by shifting the tone rom the verb stem to the object's antepenult, which satisfies Uniformity nd violates BasicAlignment. Predictably, the second high will be honetically realized as a downstepped high due to their adjacent tonal lomain structures: [kagu(a̲ bá)(ꜜú̲ti)]. Downstep resolves immediately djacent tonal domains or tonal sponsors within the same prosodic hrase, and thus, downstep serves as a phonetic mechanism to satisfy aithfulness constraints like Max-IO and Express, and also satisfying OCP constraints (cf. the OCP-like constraints No Adjacent Edges NAE) and/or No Adjacent Anchors in Cassimjee (1998). A few xamples of downstep within the same prosodic words or phrases are hown in Table 7[4].

Table 7. Tonal Downstepping Examples

example	gloss
kagua báꜜúti	*she was buying gunpowder*
agúa-gꜜúa	*she is buying (emphatic or frequentive)*
ádigꜜúa	*she is buying it*
áda-ꜜáda	*she is eating (emphatic or frequentive)*

Tone spreading is also seen in past plural subject prefixes that mpose their tones on the following verb stem, even upon a syllable

4) From the data, it is not clear whether this downstepping is constrained to a certain number of syllables. Similar instances of downstepping are discussed in Lee and Lee (2002), who take a similar OCP approach.

that has an underlying high tone, such as *tióna* 'we were seeing', where the high from *ti-* ('we') imposes itself upon *-ona* ('see'), which already bears a lexical tone. Present subject prefixes like third singular *a-* ('she') in *áda* 'she is eating' does not exhibit this kind of effect. This indicates the workings of a morphologically parameterized tonal alignment constraint for past tense subject prefix forms, a constraint which dominates a putative OCP-type constraint against overlapping tonal domains. This yields the set of constraints and ranking as shown in Table 8.

Table 8. Constraints for Adjacent Tones, Comparing Present and Past Tense Patterns

Constraints	Align-R(Tone[PSP]), i.e., ALign-R(Tone[past-subject-prefix], PWd): Right align tone of past subject prefixes with prosodic word NoOverlap: No overlapping tonal domains (OCP constraint)
Rankings	NonFinality ≫ Align-R(Tone[PSP]) ≫ NoOverlap
Constraint evaluations	(A) ✓ tióna (PAST): ✓NonFinality, ✓Align-R(Tone[PSP]), *NoOverlap (B) ✓ áda (PRESENT): ✓NonFinality, ✓NoOverlap, *Align-R(VP), *Express

In Example A in Table 8, the optimal forms properly align the tone with the prosodic word according to Align-R(Tone[PSP]), while obeying NonFinality and violating NoOverlap. In comparison, Example B satisfies NonFinality and NoOverlap, though violating the constraints Align-R(VP) and Express from above. These present and past tense patterns also show that NonFinality is undominated in Kibondei verbal tone.

3. Reduplication

Reduplication in Kibondéi occurs freely with verbs, sometimes with adverbs, adjectives, possessives, and demonstratives, and to a rather limited degree with nouns. Meanings of reduplicated forms are intensive, frequentive, or emphatic. Some basic illustrative examples are given here; in this paper, a hyphen indicates morpheme boundaries, and when necessary, a period will indicate syllable boundaries. Some typical examples are shown below. This section offers an analysis of reduplication patterns, and the following sections will examine tones in reduplication, and the complexities of possible cyclicity.

Table 9. Reduplication Examples

Lexical class	Base and reduplicated forms	Glosses
verb	kuhuma	*to be sick*
	kuhuma-huma	*to be sick (frequently or intensively)*
adverb	kaita hae	*she went far*
	kaita hae-hae	*she went far and away*
	kitanzanía	*like a Tanzanian, in a Tanzanian manner*
	kitanzanía-tanzanía	*in a very Tanzanian manner*
adjective	gosi	*man-like, manly*
	gosi-gosi	*very man-like, manly*
demon-	aya makóko	*these pumpkins*
strative	aya-aya makóko	*these pumpkins*
possessive	vintu vyángu	*my things*
	vintu vyángu-vyangu	*my things*
	zumbuugutu dángu	*my iguana*
	zumbuugutu dángu-dángu	*my iguana*
noun	msisii	*skinny person*
	msisii-sisii	*very skinny person*
	mnene	*fatso*
	mnene-nene	*very fatso*

As seen in Table 9, the left item is the base and the right element is the reduplicant; reduplicants are suffixal. Hence the Kibondéi pattern is similar to Chizigula (Kenstowicz & Kisseberth, 1990), as oppossed to prefixal reduplication in Kihehe (Odden 1996). This is captured by an undominated morphological anchoring constraint that aligns the left edge of the reduplicant with the right edge of the prosodic word: Anchor (RED, L; PWd, R).

Reduplicants typically consist of the base of the prosodic word, i.e., the morphological stem, stripped of all prefixes (subject, object, applied, and reflexive/reciprocal of verbs, tense and prefixes, adjectival and adverbial prefixes, and noun class agreement prefixes). This will invariably be the case for bisyllabic and multisyllabic stems. However, monosyllablic stems will copy prefixal material into the reduplicant to satisfy a binarity constraint that the reduplicant be at least bisyllabic (or possibly, at least bimoraic). Copying of prefixal material will ideally be just enough to satisfy the syllabic binarity condition, and often just copying a prefixal vowel will suffice. But extra may be copied to satisfy the onset condition, as Kibondei reduplicants seem to like having onset consonants. So a consonant plus vowel sequence from the prefix may be copies to satisfy both Binarity and Onset.

This serves as a clear example of emergence of the unmarked, since Onset is normally ranked so low in Kibondei that it has little effect, and onsetless syllables abound in the language. But it shows up in reduplication, therefore it must outrank some other faithfulness constraint, as we shall see shortly. But satisfying Onset will not incur epenthesis of consonantal material, so a Dep-IO constraint must dominate Onset. Some examples of RED=base and RED≥σσ are shown in Table 10; the various reduplicated forms have readily apparent emphatic, intensive, or frequentive meanings.

Table 10. Reduplication Examples for *-gua* 'eat,' *-kunda* 'like much,' *-beza* 'ask,' and *-da* 'eat'

Pattern	Stem	Reduplicated form	Gloss
RED =	kagua	kagua-gua	*s/he was buying*
base	namkunda	namkunda-kunda	*I like her very much*

	áombeza	áombeza-ombéza	*s/he was asking for something*
	wáombezeána	wáombezeana-ombezeána	*they are asking for each other*
RED ≥ σσ	kada	ka.da-ada	*s/he was eating*
	nada	na.dá-ada	*I am eating*
	áda	á.da-áda	*s/he is eating*
	ádída	ádída-dída	*s/he is eating it [=fruit]*

The above examples copy the bases which are already bisyllabic or polysyllabic and simultaneously satisfy RED=base and RED≥σσ. In copying prefixal vowels that lead to an onsetless reduplicant suffix, syllabification of the output will provide an onset by syllabifying across the morpheme boundary and coalescing base and reduplicant material into one syllable. This violates a putative constraint that would align the syllable with the morpheme boundary, along the lines of the older "crisp" alignment. Integrity, a faithfulness constraint from Prince & McCarthy (1995), is invoked and specified for morphemic integrity, which prevents breaking up morphemic material. This Integrity constraint is violated in forms like *kada-ada* in order to satisfy Onset, since *ka-* is broken apart in reduplication and *-a-* only finds its way into the reduplicant to satisfy Binarity. Epenthetic segmental material will not be inserted to satisfy Onset, due to a higher ranked Dep-IO constraint against addition of segmental material. Since the bases and reduplicants seen thus far correspond well to one another, the base-reduplicant identity constraint Ident-BR seems not to be undominated by the other constraints considered so far. Its role in reduplication will be taken up later. The proposed constraints are shown in Table 11, with the proposed constraint ranking. In Table 12, several optimal forms and their constraint satisfaction are shown, for *ada* + RED, *kada* + RED, and *adída* + RED.

Table 11. Reduplication Constraints

Constraints	RED = base: the reduplicant is the same as the base RED ≥ σσ: reduplicative binarity, i.e., the reduplicant is at least bisyllabic Dep-IO[seg]: no insertion of segmental material Align(σ, morpheme) or Align-σ: Align syllable with morpheme ("crisp" alignment) Integrity[morpheme]: No breaking up morphemic material
Constraint ranking	RED≥σσ ≫ RED=base; Dep-IO ≫ Onset ≫ Align-σ, Integrity

Table 12. Constraint Satisfaction of Reduplicated Forms, with Violations Shown (blank cells indicate satisfied constraints)

Optimal form	RED≥σσ	RED=base	Dep-IO	Onset	Align-σ	Integ.
A. ✓ á.da-á.da		*a		*	*	
B. ✓ ka.da-a.da		*a		*	*	*
C. ✓ á.dí.da-dí.da		*dí				

Example A in Table 12 is well formed because it satisfies the binarity condition and syllabifies across a morpheme boundary to provide an onset, violating RED=base and Align-σ. A form like **á.da-da* would fail the binarity condition, while a form like **áda.-áda* would violate the Onset condition. Example B is optimal because it provides an onset to the reduplicant without epenthesis, although the syllabification violates Align-σ, and although it copies half a morpheme (*-a-*) in violation of Integrity in order to satisfy Binarity with minimal violations of RED=base. Alternatives like **kada-kada* would incur greater violations of RED=base, others like kada.-da would crucially violate RED≥σσ, and others like **kada.-ada* would violate RED=base and Onset, incurring more violations than the optimal form. Finally, Example C illustrates the copying of object prefixes into the reduplicant. The verb *ádída* reduplicates as *ádída-dída*, not as, say, **ádída-ída,* for the latter would violation of Onset and Integrity. Copying only the verb stem (e.g., **ádída-da*) incurs crucial violation of Binarity, and full

:opying of the entire verbal form (e.g., **ádída-adída*) incurs excessive 'iolations of RED=base.

3.1. Tones in Reduplication

Tones in reduplication exhibit behaviors that are more unusual and nore difficult to analyze, so hereafter the discussion will sometimes nay tend more toward the descriptive than a full Optimality Theoretic ıccount. Verbs with lexical tones that are unexpressed in the base do show an overt, expressed tone in their reduplicant, as in Table 13. As ɔefore, reduplicated forms have intensive, emphatic or frequentive neanings.

Table 13. Tones in Reduplication

Plain form	Reduplicated form	Gloss
kuona	kuona-óna	*to see*
nkhiona	nkhiona-óna	*I have seen*
tidíona	tidíona-óna	*we have seen*
naona	naona-óna	*I am seeing*
áona	áona-óna	*s/he is seeing*
kuibana	kuibana-bána	*s/he is squeezing [-bana] it*

The high tone in the reduplicant is apparently a tone copied from the ɔase, rather than from shifting of the base tone to the reduplicative suffix. Evidence for this comes from (1) the fact that the high tone (H) in the reduplicative suffix is downstepped, as shown in Table 14 below, and (2) the fact that following objects often receive a high tone (H) from the verb, and this shifted high must come from the base; see (19b) below. When prefixal material is copied into the reduplicant to satisfy Binarity for monosyllabic verb stems, tonal material is copied also. This satisfies Ident-BR and Max-BR, as in *ádída-dída* 's/he is eating it' and *áda-áda* 's/he is eating.' When the third singular present form of toneless verbs takes a H from the subject prefix, the H is copied in the reduplicant. Here the reduplicant appears not to be copying the input form of the base, but rather its output. Furthermore, the

reduplicated verb can shift a tone onto a following object (Table 14).

Table 14. Tone Spreading in Reduplication for *-ona* 'see,' *-gua* 'buy,' and *-zenga* 'build'

pattern	examples	gloss
H in reduplicant, downstepped high	tidíona-!óna	*we have seen*
	wadíona-!óna	*they have seen them*
	timuóna-!óna	*they have seen him*
H from base	tiona-óna thu	*we have seen a person*
	kuona-ona thu	*you saw a person*
H from prefix	azénga, azénga-zénga	*s/he is building*
	kuzigúa, kuzigúa-gúa	*to buy them* (*zi* = *'them' for fruits*)

Extra tonal material is copied into the reduplicant than what is in the base's input so that the reduplicant will correspond to its base, which violates the input-output base-root faithfulness constraints. Here it seems as if the reduplicant is copying from the output of the base with its surface tonal forms, rather than copying from the input. Identity-BR and input-output faithfulness constraints would predict an output in which the reduplicant copies material from the input: *azénga-zenga, kuzigúa-gua.* This leads to issues of how to handle complex morphophonology in OT, as discussed in the next section.

3.2. Cyclicity Effects

Two options exist within the OT framework for patterns like those above. One could invoke a cyclical OT, where the basic tone and verb form constraints apply to the first stage, the output of the base form; and then these constraints plus the constraints on reduplication forms apply to the result of the reduplication process. This would be economical in that the same constraints can apply at both stages, and no extra constraints need to be invoked. On the other hand, this loses the original purely monostratal nature of OT, as cyclicity is introduced, and thus, an extra level of complexity. The other option is to invoke

onstraints relating the base output to the reduplication output, or utput-output correspondence constraints. Since is simpler in that it is till monostratal, but the need for more constraints sacrifices parsimony.

For the purely monostratal approach, rather than an Identity onstraint or IO constraint, the operative constraint would be an utput-output constraint between the base and reduplicant, which was irst proposed for Bantu in Odden's (1996) treatment of Kihehe eduplication. In Odden's output-output correspondence, two outputs are valuated in parallel, the second being evaluated according to its orrespondence with the first. The second stands in a dependency elationship with the first output, and since both are evaluated together n parallel, cyclicity is avoided and the analysis is kept to a monostratal ccount in accord with the non-derivational, non-procedural spirit of T. Thus, the dependent, i.e., the reduplicant, is evaluated with eference to the first output. For at least the examples given above, this O/O dependency correspondence seems to work. A brief example is given below for O/O relations in Table 15.

Table 15. Constraint Satisfaction in Tonal Reduplication, Using O/O Correspondence

azenga + RED	Ident-O/O	Max-O/O	Dep-O/O	Ident-BR	Max-BR	Dep-BR
A. ✓ azénga						
B. ✓ azénga-zénga				*		*
C. *azénga-azenga	*!	*				

Since forms obeying O/O faithfulness are optimal, it would seem that O/O faithfulness outranks BR and IO faithfulness. However, some forms might call this into question—verb forms with lexical tones in which he reduplicant realizes an overt, expressed tone which does not show up on the base. In these cases the reduplicant seems to show more faithfulness to the input than the base; see examples in (19), such as *ukhiona-óna* 'I have seen'. This difficulty could be resolved by ranking Align-R(Tone) over the O/O faithfulness contraints, and by parameterizing this constraint as Align-R(Tone[V]) to affect underlying, lexical verb stem tones. Align-R(Tone[V]) will thus not effect forms

like *azénga-zénga* above since the tone comes from a prefix, but it will cause the base in tonal verb stems to have an unexpressed tone but an expressed overt tone in its reduplicant, since Align-R(Tone[V]) overrides O/O faithfulness. The reformulated constraint is shown with its ranking in Table 16.

Table 16. Constraint Ranking for Tonal Reduplication

Constraint	Align-R(Tone[V]), i.e., Align-R(Tone[verb stem], VP): Rright-alignment of tone of verb stem with non-head element
Constraint ranking	Align-R(Tone[V]) ≫ Max-BR ≫ Ident-O/O, Express

A form like *nkhiona-óna* 'I saw' is the optimal output, as it satisfies the above Align-R(Tone[V]) constraint and Max-BR, though violating Ident-O/O (and the minor Express constraint). Thus, the ideal outuput *nkhiona-óna* is optimal due to proper alignment of lexical tone so that it does not show up on the base but does appear on the reduplicant. The base and RED are now non-identical tonally, violating the lower ranked Ident-O/O constraint. An alternate form like *nkhiona-ona* with no tone on *-ona* would violate Max-BR (and Express), so *nkhiona-óna* is better (and a form like *nkhióna-óna* crucially violates the above Align-R(Tone[V]) constraint, and assumes the input form *nkhióna*, which itself violates Align-R(Tone[V]). The input *kuona* + RED *mthu* 'to see a person' will likewise be realized as *kuona-óna thu:* non-head alignment will shift the tone from the verbal stem to the noun object; thanks to Max-BR, the reduplicant will copy the tonal material and will express the tone because it is not affected by non-head alignment if this constraint is parameterized to underlying, lexical verb stem tones; and Ident-O/O is violated to satisfy alignment.

3.3. Apparent Anomalies

This investigation uncovered two apparent anomalies, the first involving emphatic intonation, and the second involving reduplication of

toneless stems. Insufficient data exist for a conclusive analysis.

In the first type, emphatic prosody affects tonal realization. Possessive adjectives like *ángu* 'my' carry a high tone, which cannot shift to the final syllable due to NonFinality. These possessives may reduplicate to create pragmatically emphatic forms ("my X!") in which the tone is copied into the reduplicant. Invariably the reduplicant will realize the tone on the penultimate syllable, just like its unreduplicated counterpart. However, tone-shifting was observed in the base portion, from the initial syllable to the final syllable of the base, in some samples, but not in others. The Kibondei informant was asked to produce these reduplicated forms with regular intonation and again with contrastive emphasis, and found that contrastive emphasis on the possessive prevented tone shifting, while normal emphasis intonation allowed tone shifting in the base (it is also possible that this difference could also be induced by varying speech rates.) Nevertheless, the informant's intuition was that the high appeared on the same syllable in both base and reduplicant. Yet somehow the prosodic break that is introduced by contrastive sentential emphasis blocked a tone shift that would occur in more natural intonation patterns. Some examples are given below with a vertical bar marking prosodic breaks before emphasized items. These involve possessive adjectives for 'my,' which agree with the different noun classes to which the nouns belong (e.g., *dangu*, Class 5; *yangu*, Class 6).

Table 17. Tones in Emphatic Reduplication

Input	Normal intonation	Emphatic	Gloss
koko	kóko	kóko |	*my pumpkin!*
dangu+RED	dangú-dángu	dángu-dángu	*[5sg]*
zumbuugutu	zumbuugutu	zumbuugutu |	*my iguanas!*
yangu+RED	yangú-yángu	yángu-yángu	*[6pl]*

In normal intonation, NonFinality does not affect the base in the reduplicative form, since the final syllable of the base is followed by a reduplicative suffix in the same prosodic word; it only keeps the tone in

the reduplicant from spreading to final position. Thus, a constraint like Align-R(Tone, PWd) as the one above shifts the base tone rightward up to the next tonal domain, the one in the reduplicant. However, constrastive emphasis introduces a prosodic break. Most likely, the initial high tone is a marker of emphatic stress, much like the extra high tone with emphatic stress in Western languages (e.g., "I said do it now!" with extra-high intonation). If so, then this emphatic stress overrides the lexical stresses, and imposes itself on the reduplicant as well, in that the emphatic stress is preferentially copied into the reduplicant, while overriding lexical stress in copying. In OT terms, this would involve a constraint for emphatic stress that overrides other constraints. Since emphatic stress is a discourse feature, this needs to be studied in conversational Kibondei contexts with multiple speakers, rather than in the artificial environment in which these data were elicited.

The other anomaly was found in verbal reduplication, where some toneless verbs exhibit odd behaviors in reduplication. Bases that are without lexical tone or tones from prefixes nonetheless show tones in their reduplicants and possibly on complements. This may be an effect of Align-R(Tone[V]) on the bases or entire verb phrases, but more data are needed for any meaningful analysis.

Table 18. Tones in Toneless Verbs

Original form	Reduplicated form	Gloss
nazenga	nazenga-zénga	*I am building*
wazenga	wazenga-zénga	*you are building*
azénga	azénga-zénga zi	*s/he is building (a village)*

4. Discussion

The tonal reduplication patterns above raise the problem of cyclicity in OT. One can make use of a cyclical analysis for some tone and stress patterns in OT, and such an approach would work just as well as the output-output correspondence (OOC) approach above. This, however, sacrifices some simplicity by invoking what are essentially

lerivations in a theory that was intended to do away with derivations ır cyclicity, and cyclical OT fails to appeal to OT purists who hold to his core principle of OT. Yet cyclicity requires fewer constraints than he OOC approach, as one must invoke more faithfulness constraints for)OC (see, e.g., Duanmu (1999), Bermúdez-Otero (2011) for more on :yclicity). Yet this raises other questions. Could OOC simply be 'egarded as a notational variant of cyclicity? Is not evaluating Output 2 o Output 1 not the same as cyclicity? Also, what is the mental nature)f the mental representations for Output 1 and Output 2, if they are not :yclical or derivational forms?

These issues are still problematic for current formulations of OT. They ultimately boil down to theoretical assumptions that are currently lifficult to prove. Cyclicity approaches are seemingly influenced by)re-OT forms of derivational phonology for dealing with prosodic)henomena, e.g., for analyzing English lexical stress. This view would ıssume that complex morphophonological forms are derived from other 'orms in situ, e.g., base form X > output form Y, and in turn a more :omplex form Z is derived from Y on the spot, where Z represents nore complex prosodic forms. On the other hand, OT was originally :onceived as a purely monostratal theory, and OT purists who a priori 'eject derivations would prefer output-output correspondence. This would assume that output forms like form Y is held in speakers' ong-term memories, or perhaps a lexical store like other lexemes. However, this would be required for every possible output form Y, and such a scenario would be less plausible for less common words or)hrases that exhibit apparent cyclical effects. These are different :heoretical assumptions that are difficult to prove empirically. The ınswers would shape the basic nature of OT as either a purely nonostratal theory, or one that allows for some procedural complexity. For answers, we need to turn to psycholinguistic models and language)rocessing experiments of morphological and phonological processings. However, no clear answers seem forthcoming at this time from the :mpirical cognitive sciences.

OT has nonetheless proven particularly useful for explaining a number)f prosodic phenomena such as tone, stress and reduplication, and for :xplaining the interactions of features and structures in phonology,

morphology and syntax. As seen above, OT can account for most or all the problematic cases discussed above (all of it, if one is willing to embrace the current tension over cyclicity). In fact, the potential of OT in this regard remains underdeveloped. Jackendoff (1996) discusses the interface of these various linguistic components and sketches out his theory of interface, termed Representational Modularity, which he revisits in Jackendoff (2002). OT can be useful for explaining the types of interface discussed by Jackendoff. For example, the constraints above perform two essential functions: aligning phonological features with segments, and explaining the interaction of phonological material, prosodic domains, and morphosyntactic domains (prefixes and complements). This use of OT for aligning prosodic and morphological domains was first hinted at in an early variety of OT known as Optimal Domains Theory, whereby prosodic features such as tone exist as local domains (e.g., on a sponsor syllable) that can extend to larger domains such as prosodic words. This model was developed and invoked, e.g., for Bantu tonal patterns some years ago (Cassimjee & Kisseberth, 1998; Cassimjee, 1998), but has since fallen out of use. OT contraints have essentially been doing the work of interface in the linguistics literature, in aligning prosodic domains, features, lexemes and segments among the domains of prosodic phonology, segmental phonology, morphology and syntax. Using OT to explain linguistic interface has unrealized potential, and this author suspects that such an approach to OT might offer a resolution to the aforementioned issue of cyclicity in OT.

5. Conclusion

Much of Kibondei tonality and reduplication can be accounted for in correspondence theory and optimality theory, including base-dependent (O/O) correspondence. Tonal verb stems often do not realize their lexical tones because of an alignment constraint that pushes them off the head element and onto the complement or non-head element; in the abscence of a complement, the tone will be unexpressed. Reduplicants will be at least binary, and behave as suffixes. Correspondence or lack

f correspondence between bases and reduplicants with respect to tonal eatures result from interaction among BR faithfulness, O/O faithfulness, nd alignment constraints. Output-output correspondence in reduplication onology can be captured without resorting to two-level or cyclical pplication versions of optimality theory, but rather by appealing to a ase-dependency version of correspondence theory. Some anomalies and rosodies require further investigation, and irregularities suggest the ossibility of a tonal system in a state of flux or historical change, e.g., xtension by analogy to nontonal stems.

Finally, the success of OT in prosodic systems, such as the Kibondei one and reduplication systems, points to a greater potential for leveloping OT, and perhaps allowing us to make the theory more arsimonious and seemingly less arbitrary to its critics. Using OT to xplain the interface phonology, syntax and morphology, along the lines f Jackendoff's models of interface, could help better define what onstraints are in language, and how they should be understood and ormulated. This then can help OT researchers to avoid over-proposing onstraints, or proposing constraints that lack a strong theoretical ationale in OT. More research on this will be forthcoming.

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