Akan Reduplication in Optimality / Correspondence Theory*

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Lee, Borim. 1996. **Akan Reduplication in Optimality / Correspondence Theory**. *Linguistics* 4, 215-229. Optimality Theory assumes a grammar of a language with a particular ranking of the constraints supplied by Universal Grammar. In this paper, we specifically examine the rankings of constraints related to B-R identity and I-O faithfulness with respect to some phonological or markedness-based constraints. The analysis is presented within a model assuming Correspondence between input (or base) and output (or reduplicant) to capture the parallels between I-O faithfulness and B-R identity. In the analysis, a case of phonology dominating B-R identity and/or I-O faithfulness, a case of emergence of the unmarked, and a case of underapplication are provided to validate the permuted rankings of relevant constraints. The goal of the paper is to prove that an analysis based on the Correspondence / Optimality theory allows for a proper and natural account for many seemingly unrelated phenomena of Akan reduplication. (**Wonkwang University**)

1. Introduction

The goal of this paper is to examine Akan reduplication phenomena within the framework of Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993). Reduplication, by its nature, strives for identity between base and reduplicant. The identity relation is captured by McCarthy and Prince's extension of the theory, namely Correspondence. To obtain the identity between input and output, phonological constraints are often sacrificed: in this framework by being dominated by constraints on base-reduplicant identity. However, identity between input (or base) and output (or reduplicant) is not always realized in the actual optimal output for various reasons,

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phonological and other.

The remainder of this paper is organized as follows: In Section 2, we will present the data of Akan reduplication which will be the focus of the discussion. Section 3 will begin by reviewing the Optimality Theory in which the notion of Correspondence will be highlighted, and then we will present an Optimality-theoretic analysis of the Akan reduplication focusing on three topics which are nicely divided by the typology. In Section 4, we will conclude the paper with a brief summary of the major issues discussed.

2. Akan Reduplication and Prosodic Morphology

Akan, one of the principal languages of Nigeria, consists of a few dialects. The Akan dialect considered in this study is the Akuapem dialect as described by Christaller (1875, 1964), and by Schachter and Fromkin (1968, S&F hereafter). In the following charts the consonant and vowel inventories of Akuapem are listed.

(1) Consonants

		lab	alveo	pal	vel	glottal
STOP	vl	p	t	c	k	ʔ
				cw	kw	
	vd	b	d	j	g	
				jw	gw	
FRIC		f	s	ç		h
				çw		hw
NASAL		m	n	ɲ	ŋ	
				ɲw	ŋw	
GLIDE			r	y	w	

(2) Vowels

Set 1		Set 2	
i	u	I	U
e	o	ɛ	ɔ
		a	

Cw's indicate labialized consonants and they are accounted for by phonological rules in S&F. In this paper, however, they are treated as underlying segments since there is no critical evidence to support those rules in a synchronic phonology of this language. The alternation of the vowels between set 1 and set 2 is, on the other hand, determined by the vowel harmony rule, which is governed by the [Advanced Tongue Root] feature. The low vowel is [-back] in Akan (S&F:29, 39).

Let us now turn to a close examination of the reduplication phenomena in the Akuapem dialect of Akan.

2.1 Two types of reduplication

Reduplication in Akan is straightforward. In this paper reduplication of verb root (VR), which adds a meaning of 'multiple activity' or 'multiple state' to the meaning of the VR, is considered. The reduplicating phenomena fall into two types according to the forms of VRs. They are introduced in turn.

The first type of reduplication (R1 hereafter) is shown in the following examples:[1]

(3) R1

	H		L-H	(Tonal patterns)
a.	ba	-->	bIba	'come'
b.	pam	-->	pImpam	'sew'
c.	kaŋ	-->	kIŋkaŋ	'count'
d.	seʔ	-->	siseʔ	'say'
e.	sɔʔ	-->	sUsɔʔ	'light'
f.	haw	-->	hIhaw	'trouble'
g.	sɔw	-->	sUsɔw	'catch'
h.	fɛr	-->	fIfɛr	'swing'

The most noticeable aspect of this reduplication is the change of the vowel quality when a VR is reduplicated. The vowel in the reduplicant

[1]The real surface outputs may differ from those presented in the data. Word-finally, a glottal stop is usually inserted resulting in [hihawʔ]. When a word ends in an *r* as in *fIrfɛr*, a low-toned *I* is inserted phonetically.

is always realized as a high counterpart of the stem vowel. The other salient aspect is related to the stem final consonants: the consonants do not copy except nasals.

The second type of reduplication (R2) seems to be a case of total reduplication. A whole morpheme of the VR that falls into the R2 category is repeated without changing any forms except the same kind of stem-final consonant alternations as that occurring in R1.

(4) R2

	L H		L H L L	(Tonal patterns)
a.	kasa	-->	kasakasa	'speak'
b.	nantew	-->	nantenantew	'walk'
c.	(san->) sInsan	-->	sInsansInsan	'return'
d.	(pam->) pImpam	-->	pImpampImpam	'sew'

What is remarkable here is that the VRs which result from R1, e.g., pImpam, are again subject to R2.

From the data given so far in (3) and (4), the type of reduplication seems to be determined by the number of syllables in the affected VRs, i.e., monosyllabic VRs undergo R1 and disyllabic VRs R2. This is exactly what S&F propose for Akan reduplication. When more data are taken into account, however, this assumption deserves reconsideration. This is the main concern of the following section.

2.2 Troublesome cases

In the following examples, we are faced with the VRs whose reduplication type is not determined by looking at their segmental forms alone. This is because the VRs which have exactly the same sequences of segments but different tonal melodies undergo different types of reduplication.

(5) R1'

	H		L H	(Tonal patterns)
a.	daŋ	-->	dInnaŋ	'apply to'
b.	pam	-->	pImpam	'sew'

c.	dɔŋ	-->	dUnnɔŋ	'soak'
d.	gwaŋ	-->	guŋŋaŋ	'wither'
e.	ɲaŋ	-->	ɲiɲɲaŋ	'get sour'

(6) R2'

	LH		LH LL	(Tonal patterns)
a.	daŋ	-->	dannaŋ	'turn'
b.	pam	-->	pampam	'drive away'
c.	dɔŋ	-->	dɔnnɔŋ	'walk affectedly'
d.	gwaŋ	-->	gwaŋŋaŋ	'flee'
e.	ɲaŋ	-->	ɲaɲɲaŋ	'awake'

Although segmentally identical, the VRs in (5) take R1 whereas those in (6) take R2. The apparent difference in the VRs in (5) and (6) lies in their tonal patterns. That is to say, VRs undergoing R1 have only one tone, Low, but those undergoing R2 have a contour tone, Low-High. The reduplicating outputs also display the same tonal patterns, i.e., R1 has LH, and R2 LHLL. The forms in (6) show that syllable final nasals can bear tones as well as the vowels. The segmental alternations in the reduplicated forms exhibit place assimilation of the nasals to the following consonants and the nasalization of stem-initial voiced consonants after nasals. These alternations also will be dealt with within the framework of Optimality Theory in the next section.

3. Prosodic Morphology in Optimality Theory

3.1 Theoretical background

The Optimality Theory framework is a constraint-based model proposed by Prince and Smolensky (1993) and developed by McCarthy and Prince (1993). In this theory, there are no rules or derivations. Instead, a set of violable constraints that are ranked determine the well-formedness of output forms. The outputs are generated by the function GEN, which is in turn governed by the principle of Containment, which requires that all input material be literally contained in the output candidates.

This principle of Containment is later replaced by the theory of Correspondence developed in McCarthy and Prince (1995). The correspondence theory attempts to capture a wide range of parallels between base-reduplicant identity in reduplicative morphology and input-output faithfulness in phonology. The function of correspondence, therefore, expresses the dependency of the output or the reduplicant (S2) on the input or the base (S1). The constraints of correspondence include Max, which requires that every element of S1 have a correspondent in S2, and Dep, which demands that every element of S2 have a correspondent in S1. Max and Dep replace Parse and Fill of the previous framework.

Interaction of these faithfulness/identity constraints with the more familiar phonological constraints, including phonotactic and markedness constraints, results in typological diversity in crosslinguistic morphophonological phenomena. In this study, Akan reduplicative morphology is used to test this new framework.

3.2 Distinction of two types of reduplication

As illustrated above, determination of the type of reduplication cannot be made by looking at the segmental information of the base alone. The same CVC may be subject to either R1 or R2 depending on the quality of the postvocalic segment. Therefore, scanning the so-called CV skeleton tier or X-tier wouldn't be sufficient; we have to consider the prosodic information of the base.

One of the plausible analyses for this may utilize the notion of syllable as a tone-bearing unit to distinguish /CVC/ with a high tone from /CVC/ with a rising tone. In this analysis, every syllable would be a tone-bearing unit and be assigned only one tone. The consonants having tones (in this respect, only *m* and *n* are attested from the sources, and I do not know if *w* does occur here or not), therefore, are to be [+syllabic], which is represented as V.

This analysis, where each syllable node dominates one and only one V(=[+syll]), is sure to be one possibility to solve the problem under discussion since it distinguishes R1 and R2 verb roots by syllable structure. However, it cannot avoid a criticism on an explanatory ground: assigning different syllable structures on a segmentally identical string is at best arbitrary. The only reason behind that move is that a CVC with one tone takes R1 and the usual stems of R1 are monosyllables and that a CVC with a contour tone takes R2 and R2 stems are usually two syllables or more. In summary, the arbitrarily determined syllable structure for the segmentally identical CVC strings may not be compatible with phonetic criteria of syllable.

On the other hand, proposing a moraic tier would be a better alternative to the arbitrary syllable structure discussed above. Since the emergence of Prosodic Theory advocated by McCarthy and Prince (1986 et seq.), mora has been recognized as the lowest unit of prosody, whereas CV or X timing tier lost its appeal in the prosodic theory. In fact, a moraic tier can find its origin in Hyman's proposal of phonological weight (1983). Hyman introduces "a weight tier (x-tier)" projecting "moras" as weight bearing units, where each "x" represents a potential beat or syllabicity. In the theory of Prosodic Morphology, templates and circumscription must be defined in terms of the authentic units of prosody which include mora, syllable, foot, and prosodic word.

Recognizing a mora as an authentic unit of prosody and utilizing it, therefore, would do the job. That is, in Akan, mora is a tone bearing unit, and the choice in two distinct patterns of reduplication is to be determined by the length of the base which is measured in moras: Monomoraic stems undergo R1 and bimoraic stems R2. A CVC stem with a high tone is monomoraic and it belongs to R1 stems, and a CVC with two tones is bimoraic and naturally belongs to R2 stems.

A plausible question which may arise at this point is whether Akan reduplication can be fully analyzed without an appeal to Cs or Vs, the original skeletal slots for timing. The relevant discussion on this subject comes from the template of the reduplicant. In the reduplicant, the vowel of the base shows up modified and the postvocalic consonants of the base do not always appear. This is dealt with in the next section.

3.3 Markedness Constraints and Faithfulness

One of the properties of Akan reduplication (R1) mentioned in section 2 was [+high] version of the base vowel in the reduplicant. The data are repeated below for convenience:

(7)	a. ba	-->	bIba	'come'
	b. pam	-->	pImpam	'sew'
	c. kaŋ	-->	kIŋIkaŋ	'count'
	d. seʔ	-->	siseʔ	'say'
	e. sɔʔ	-->	sUsɔʔ	'light'
	f. haw	-->	hIhaw	'trouble'
	g. sɔw	-->	sUsɔw	'catch'
	h. fɛr	-->	fIfɛr	'swing'

To recapitulate, the vowel of the reduplicant is always high but agrees with the base vowel in other respects.

A traditional analysis was to pre-specify the feature [+high] on the template of the reduplicative prefix so that the reduplicant would copy all the properties of the base vowel except for the height specification (Marantz 1982, Lieber 1987). The template for this reduplicant, then, would be as follows:

(8)
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[+high]
   |
C  V  (C)
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Not only would this kind of analysis be tricky for the prosodic morphology framework which does not endorse CV tier (Lee 1984), but it fails to explain why the pre-specified feature has the unmarked, as opposed to marked, quality as McCarthy and Prince (1995: 83) points out.

This problem, however, is nicely solved under the framework of Optimality advocating Prosodic Morphology as a case of emergence of the unmarked by utilizing markedness constraints as in McCarthy and Prince (1995:83), whose analysis will be presented here. They argue that *[-High] is a markedness constraint of Universal Grammar. In the ordinary phonology of Akan, it is heavily violated, suggesting that

Input-Output faithfulness is more highly ranked than this markedness constraint: IDENT-IO(high) ≫ *[-High]. However, the reduplicant obeys *[-High], showing that it dominates Base-Reduplicant identity: *[-High] ≫ IDENT-BR(high). The following tableau compares the relevant candidates:

(9) Emergence of the Unmarked in Akan (MaCarthy and Prince 1995:83)

/RED-so?/	IDENT-IO(high)	*[-HIGH]	IDENT-BR(high)
a. su-su?	*!		
b. so-so?		**!	
c. ☞ su-so?		*!	*

Since *[-High] is ranked between IDENT-IO and IDENT-BR, this particular constraint shows an effective result in the reduplicant only: therefore, the optimal output is (9c).

In this section, we reconsidered one of the prosodic morphology phenomena -- so-called pre-specification -- which seemed problematic without recognizing the CV-tier. The above analysis assuming Correspondence/Optimality framework proves that the issue does not necessitate the prosodically unauthorized unit, Cs and Vs, and that the new framework can provide a recalcitrant problem a better interpretation, i.e., a case of emergence of the unmarked.

3.4 Phonological Constraints and Faithfulness

Crosslinguistically, it is commonly found that syllable-final consonants are highly restricted. In the Akuapem dialect of Akan also, only homorganic nasals to the following onset consonants are licensed medially. Let us look at the relevant data:

(10)
a. pam --> pImpam
b. kaŋ --> kIŋkaŋ
c. haw --> hIhaw
d. fɛr --> fIfɛr

e. daŋ --> dInnaŋ

f. ɲaŋ --> ɲiɲɲaŋ

Consonant clusters all agree in place of articulation, suggesting that homorganic nasal assimilation has taken place. A closer comparison of root-final consonants in (10a) and (b) with (10c) and (d) shows that only nasals are allowed in the reduplicant. On the other hand, (10e) and (f) show nasalization of root-initial voiced consonants preceded by nasals.

Homorganicity of adjacent consonants can be accounted for by proposing the following familiar constraint on coda:

(11) Coda Constraints[2]

```
*  C]σ        *  C]σ
    |             |
  PLACE        [-nas]
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These constraints state that codas may not be specified in place feature and that only nasals are licensed in the coda position. These constraints apparently are not observed word-finally, suggesting that Input-Output faithfulness is more important than Coda Constraints. On the other hand, Coda Constraints are ranked higher than Base-Reduplicant Identity. The relevant candidates in the following tableaux are provided to summarize the argument.

(12)

/RED-pam/	MAX-IO	Coda-Con	MAX-BR
a. pIpam		*	*!
b. pIpa	*!		
c. ☞ pImpam V		*	

2These constraints can be rephrased by the following Alignment constraints:
Align-L(PLACE, σ)
Align-L ([-nas], σ)

(13)

/RED-fɛr/	MAX-IO	Coda-Con	MAX-BR
a. ☞ fIfɛr		*	*
b. fIfɛ	*!		
c. fIrfɛr		**!	

In (12), candidates (a) and (c) tie in the first two constraints, whereas (b) makes a fatal move by leaving an input segment unparsed, a violation of Max-IO. Final decision is made at the last constraint provided, Max-BR. (c) is selected as optimal because it passes BR-identity constraint by preserving the base coda in the reduplicant which has no inherent place feature, place specification comes from the following onset which is homorganic to the preceding coda. In (13), however, the most faithful candidate (c) fails because it violates the Coda Constraints twice, once in the base and again in the reduplicant. (13b), which satisfies both Coda-Condition and BR-identity, also fails because IO-faithfulness is ranked higher than both of these constraints. Therefore, (13a), which violates BR-identity ranked the lowest, is selected as the optimal output.

Now let us turn to nasalization of base-initial voiced consonants which happens to stand after the reduplicant-final nasals: e.g., /daŋ/ --> [dInnaŋ]. The fact that voiced nonnasal segments cannot follow a nasal is captured by the following constraint:

(14) VOI-NAS

$$
\begin{array}{c} * \ [\text{voiced}] \\ \wedge \\ [\alpha\text{nas}] \ [-\alpha\text{nas}] \end{array}
$$

This constraint says that a sequence of voiced consonants should not have distinct nasal specifications. This constraint then has to be ranked higher than Input-Output faithfulness: Voi-Nas ≫ IDENT-IO(nas). Consider the following tableau:

(15)

/daŋ/	Voi-Nas	Ident-IO(voi)	Ident-IO(Nas)
a. dIŋdaŋ	*!		
b. dIndaŋ	*!		
c. ☞ dInnaŋ			*
d. dIntaŋ		*!	

The most faithful candidate (15a) regarding both Input-Output and Base-Reduplicant relationships is fatal since it violates both the high ranking phonological constraints. (15b) is fine with Coda-Constraints, but fatally violates Voi-Nas constraint also. (15d) presents an interesting way of avoiding a violation of the highest ranked contraint, Voi-Nas, by changing featural identity (voice) of its base-initial consonant. It is still not a chosen output, and therefore, we should arrange the constraints on featural identity as shown above, i.e., voicing feature identity dominating nasal feature identity.

So far in sections 3.3 and 3.4, we have seen cases of phonological or markedness constraints dominating faithfulness constraints. In that way, strings of input surface with phonological alternations. In the next section, however, we will shift gears to a case of reversed ranking where Base-Reduplicant Identity is ranked higher than phonological constraint(s).

3.5 Identity-based blocking of expected phonology

At the core of reduplication lies the idea of identity between the base and the reduplicant. When the identity is obtained by applying phonology where it is not expected, we get a case of overapplication. On the other hand, when expected phonology is blocked to obtain identity, we have a case of underapplication. For illustration, let us consider the following hypothetical case of reduplication and nasal harmony which applies to vowels and glides following a nasal.

(16) input /yat/

a.	Normal Application	yat-nĕŷăt
b.	Overapplication	ŷăt-nĕŷăt
c.	Underapplication	yat-nĕyat

The case of normal application belongs to the same category that we have seen in 3.4 where specific phonological constraints are ranked higher than BR-identity and IO-faithfulness. Overapplication, though we have not considered it in this paper, is a case of Identity constraints dominating phonology, which in turn dominates IO-faithfulness. Underapplication, which apparently seeks to achieve the same goal as overapplication can only become effective by assuming some superior constraint to the phonological constraint at hand, together with BR-identity constraints that are needed for overapplication.

We will present an analysis of an underapplication case in Akan which is taken from McCarthy and Prince (1995:92-97) to fill the gaps in typology. In this case, the phonological constraint at issue will be Palatalization and the additional constraint proposed will be OCP. Although palatalization does not seem to be part of synchronic phonology of Akan and it is rather a part of the language's morpheme structure constraints, there is a generalization that velars do not come before non-low front vowels, e.g., [tɕɛ] but *[kɛ] 'divide'.

However, in the reduplicant a velar can surface before a high front vowel [I]:

(17)	a.	kI-ka?	*tɕI-ka?	'bite'
	b.	hI-haw?	*ɕI-haw?	'trouble'

McCarthy and Prince propose the OCP to prevent palatalization when a coronal/coronal sequence in successive syllables would result, since palatalization involves spreading a coronal from a front vowel to a preceding dorsal. Ranking of the relevant constraints will be OCP(cor), Ident-BR(cor) ≫ PAL ≫ Ident-IO(cor).[3]

[3]McCarthy and Prince's analysis on this case is in fact more complicated than presented here.. For a clearer understanding, refer to McCarthy and Prince (1995:92-97).

(18) Underapplication in Akan

/RED-ka/	OCP(cor)	Ident-BR (cor)	PAL	Ident-IO (cor)
a. tɕI-tɕa	*!**			*
b. tɕI-ka		*!		
c. ☞ kI-ka			*	

The optimal candidate is (18c) which violates palatalization. The normal candidate in (b) fails by violating BR-identity whereas the overapplied candidate in (a) fails by violating the OCP. Without the interference of an additional constraint, the OCP in this case, we would normally obtain an overapplicational candidate to achieve BR-identity.

4. Conclusion

In this paper, we have examined details of Akan reduplication, with specific data from the Akuapem dialect. Under the framework of Optimality theory, we followed its recent development in Correspondence which assumes identity relation between input and output. We have shown cases of phonology dominating BR-identity and/or IO-faithfulness, from which we get the result of normal application of phonological alternations. And a case of emergence of the unmarked was presented where a specific markedness constraint was dominated by IDENT-IO, but dominating IDENT-BR, and as a result the unmarked feature can only be salient in the reduplicant. Finally, a case of underapplication, for which an additional constraint together with a familiar BR-Identity constraint should be proposed to be ranked higher than a relevant phonological constraint. In summary, an anlysis based on the Correspondence / Optimality theory allows for a proper and natural account for many seemingly unrelated phonemena of Akan reduplication.

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