THE PHONOLOGY OF DAGBANI VERBAL REDUPLICATION

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This paper examines the phonology of reduplication in Dagbani; an under-researched Gur language spoken in Northern Ghana by the Dagbamba. I examine the data within the theoretical framework of Optimality Theory. I argue that, in Dagbani, the reduplicant has to be exactly two moras- that is, either a long vowel (CVV), two light syllables, (CV.CV) or a (CVN) syllable. I postulate that segment insertion and deletion are employed to meet the bimoraic size requirement of the reduplicant. The epenthetic segment is identified as a homorganic nasal suffixed to the stem of the reduplicant, whilst the deleted segment is invariably /**i**/. Reduplication could also be devoid of insertion and deletion in instances where complete copying of the base will yield the needed bimoraic size needed for the reduplicative stem. I hypothesize that the insertion of the homorganic nasal and deletion of /**i**/ could be analyzed as an instance of phonological conspiracy.

Ce papier examine la phonologie de la réduplication en Dagbani, une langue Gur moins étudiée mais parlée au Nord du Ghana par les Dagbamba. J'examine ces données suivant le modèle de la théorie de l'optimalité. J'avance l'argument qu'en Dagbani, le réduplicant doit exactement être deux segmentations c'est-à-dire, soit une longue voyelle (CVV) deux syllabes courtes (simples) (CV.CV), soit une syllabe (CVN). Je postule que l'insertion et la suppression d'un segment sont employées pour satisfaire à la taille de la bisegmentation exigée du duplicant. Le segment inserré est identifié comme un suffixe nasal homo-organique associé à la base du duplicant, tandis que le segment supprimé reste invariablement /**i**/. La réduplication pourrait aussi être dépourvue d'insertion ou de suppression dans le cas où une copie totale (complète) de la base produira la taille du bisegment exigée dont la base réduplicative a besoin. Je mets l'hypothèse que l'insertion du nasal homo-organique et la suppression de /**i**/ pourraient être analysées comme un cas de conspiration phonologique.

0. INTRODUCTION

This paper examines the phonology of verbal reduplication in Dagbani, a Gur language spoken in the Northern Region of Ghana by the Dagbamba (Dagomba). Dagbani belongs to the Niger-Congo language family. It is classified as a member of the South Western Oti-Volta Central Gur languages spoken in Northern Ghana, Bendor-Samuel (1989), Naden (1988) and Wilson (1970). It is spoken mainly in the north-eastern part of Ghana. Some other Gur languages which are somewhat close to Dagbani in terms of linguistic features include: Dagaare, Mampruli, Safaleba, Kusaal, Gurune. Hudu (2010:3) also argues that "Dagbani is the mother tongue of two ethnic groups, which include the Dagomba and Nanumba". By this he means that Nanuni is not a distinct language from Dagbani. He further assumes that Dagbani shares a high level of mutual intelligibility with the Mampruli speakers of Mampruli. Abdul-Rahman (2005) also makes the same argument that Nanuni be seen as a dialect of Dagbani rather than a language on its own.

The essence of this paper is to give a description of verbal reduplication as it operates in Dagbani. Though reduplication has received some attention from Dagbani scholars such as Olawsky (1999) and Hudu (2010), none of them gives any detailed analysis of the phenomenon. This work is unique in the sense that it is the first to discuss the phonology of reduplication in detail.

Though Dagbani has a continuum of geographical/regional dialects, three major dialects stand out***:*** **Tomosili** (the Western dialect) which is spoken in Tamale, the

Northern Regional capital and its environs, and **Nayahali** (the eastern dialect), spoken in and around Yendi, the seat of the political head of Dagboŋ, that is the land that is occupied by the Dagbamba, and **Nanuni** spoken around Bimbilla. Dialectal differences between these three major dialects are mainly at the phonological and lexical levels.

The data used in this paper is based on the **Tomosili** dialect of the Dagbani language. Though Dagbani does not mark tone orthographically, for the purposes of this paper, tone is marked. Nasalization is a very active phonological process in Dagbani[1]. Accordingly, it is very common for vowels which are adjacent to nasals to get the nasal quality of the consonant spread to them, resulting in their surfacing as nasalized vowels.

Reduplication is the morphological process by which a root or stem of a base, or part of it is repeated. It is usually described phonologically as either: reduplicated segments, (sequence of vowels and consonants) or as reduplicated prosodic units (syllables and moras). In Dagbani, it will be argued that verbal reduplication occurs as reduplicated prosodic units. Though reduplication is a very prominent phenomenon in Dagbani, for purposes of this paper, only verbal reduplication which indicates frequency of events denoted by a verb is discussed. However other word classes such as nouns and adjectives in Dagbani could be reduplicated as argued by Olawsky (1999).

Reduplication has contributed a lot to the field of phonology. It has accordingly won the attention of phonologists especially those within the study of Prosodic Morphology: Marantz (1982), Steriade (1988) and McCarthy and Prince (1995) McCarthy and Prince (1994), Kager (1999) just to mention a few. Though different approaches have been used in the analysis of reduplication in OT literature, this paper will use Correspondence Theory to discuss the phenomenon in the Dagbani language.

I claim that Dagbani verbal reduplication copies just enough of prosodic units as required by the prosodic size of the reduplicant. The claim is that, in the Dagbani language, the reduplicant has to be exactly two moras - that is, either a long vowel (CVV), two light syllables, (CV.CV) or a (CVN) syllable. Accordingly, in /CVV/, /CV.CV/ and /CVN/ syllables, a complete copying of the base will have enough moras to satisfy the size requirement. This therefore gives rise to complete reduplication as in **píí**, which reduplicates as **pìì-píí** 'to select repeatedly', or **gbíhí** as **gbìhì-gbíhí** 'to sleep repeatedly' **dám** which also has its reduplicant as **dàm-dám** 'to shake repeatedly'.

It is also possible however, to have reduplication in which there is not an exact correspondence between the base and the reduplicant. These are instances where copying the base would fail to yield the size requirement of the reduplicative stem and also when complete copying of the base will yield a size larger than the needed size of the reduplicative stem.

In instances where complete copying of the base will produce a reduplicative stem less than the size requirement of the reduplicant as in CV words, then there is epenthesis. The epenthetic segment is identified to be invariably a homorganic nasal segment which serves as a reduplicant coda as in **dàn-dá** 'to buy repeatedly' **kpé** as **kpèŋ–kpé** 'to enter repeatedly' **gbí** as **gbìŋ-gbí** 'to dig repeatedly', **bó** which reduplicates as **bòm-bó** "to find repeatedly".

[1] I am grateful to the anonymous referee for his/her constructive suggestions and comments that have shaped up this paper. All analytical shortcomings are however, mine.

It will also be shown that in CVV.V stems, there is a deletion of the onsetless syllable in the reduplicant since copying of the CVV will be enough of the prosodic size of the reduplicant. Examples include words as **móóí** which reduplicates as **mòò-móóí** 'to ripe repeatedly', **gúúí** as **gùù-gúúí** 'to run repeatedly' and **gááí** as **gàà-gááí** 'to unbutton repeatedly' The deleted segment is **/i/.** The author then hypothesizes that the two employed repair mechanisms aimed at meeting the bimoraic requirement of the reduplicant, that is the elision of the /**i**/ segment and the insertion of the homorganic nasal segment could be analyzed as an instance of phonological "conspiracy". (Kisseberth 1970).

This paper, beyond this section, is structured as follows: part one gives us a background to the paper, discussing the various formal approaches that have been used in the analysis of reduplication. It also outlines the syllabic structure of the Dagbani verbal word and a brief discussion on nasalization since these are crucial to later discussion in this paper. Part two presents us with the data on the various types of reduplication that this paper identifies in Dagbani: data on homorganic nasal epenthetic reduplication, partial reduplication and complete or total reduplication. The basic generalizations made about each set of data are also stated. The issue of the interaction between tone reduplication is also mentioned in this section. Part three gives an analysis of the data using Optimality Theory as a phonological tool. Conclusions and summary end the paper in section four.

1. FORMAL APPROACHES TO THE STUDY OF REDUPLICATION

There have been different approaches to the study of reduplication in OT literature. Some of them are: Morphological Doubling Theory (Inkelas and Zoll 2004) and Correspondence Theory (McCarthy and Prince 1995). In McCarthy and Prince's (1995) Correspondence Theory, reduplication is seen basically as a phonological issue. Correspondence Theory has to do with the relationship between the participants in reduplication-the base and the reduplicant- (BR identity) or input-output identity-(IO identity). Correspondence Theory asserts that reduplication is the result of interaction of three basic constraints: well-formedness constraints, faithfulness constraints and then base reduplicant identity constraints. The theory further claims that there is always a phonological identity between a base and its reduplicant. According to the tenets of Correspondence Theory, reduplication is analyzed as a phenomenon motivated by a set of morpheme-specific constraints that expect that there invariably be a phonological identity between a base and its reduplicant. It is a part of the grammar of a language and, for that matter, a set of constraints in a language that regulate how an abstract morpheme (RED) surfaces in a particular language.

Also, Correspondence Theory holds that owing to the fact that there is invariably a need for identity between the base and the reduplicant, there may be instances of *overapplication* and *underapplication*, two "unexpected phonological" phenomena motivated by the need to maintain phonological identity between a base and its reduplicant. In instances of *underapplication*, the unmarked member of an opposition appears in an environment that will have been occupied by the marked member. *Overapplication* is a phenomenon in which a phonological process applies in a context in which it does not "qualify" because of need to maintain phonological identity between a base and its reduplicant. *Underapplication* on the other hand, is a phenomenon in which a phonological process "fails" to apply in a context in which it qualifies to take place, and is also motivated by need to ensure that there is

phonological identity between the base and its reduplicant. Wilbur (1973) sees *underapplication* and *overapplication* as "identity preserving interactions"[2]. In other words, the occurrence of these two phenomena is simply motivated by the need for identity between a base and its reduplicant.

In this paper, reduplication is analyzed using the BR-Ident constrained-based approach of McCarthy and Prince's (1995) Correspondence Theory.

Dagbani mostly has open syllables. Where there are codas they are limited to nasals: /**n**/, /**m**/ /**ŋ**/ or the lateral /**l**/. Olawsky (1999:19) argues that the Dagbani syllable structure permits coda positions to be occupied by /**m**, **n**, **l**, **ŋ**/ in CVVN words plus a small number of CVN words Syllabic nasals also do occur in Dagbani. Olawsky (1999:81) argues that Dagbani verbs may have any of the following syllabic structure:

1. CV 2. CVN. 3. CVV.i. 4. CVVN.

This paper discusses reduplication as it occurs in verbs with these syllable types mentioned above. The fourth type is however quite a marked form of syllable in Dagbani. There are also a few instances of CVC.CV types of verbs, but they are not considered in this paper.

It should be noted that in a CVV.V syllable in Dagbani, the sequence is always /**aa** + **i**/, /**uu** + **i**/ /**oo** + **i**/ or /**ee** + **i**/. This phonological restriction on vowel sequence in CVV.V syllables is borne out of the fact that /**ɛ**/ and /**ɔ**/ have no lengthened counterparts in the phonology of Dagbani. Nasalization is a very active phonological process in Dagbani. Accordingly, readers are to note that all vowels that are adjacent to nasal segments are nasalized vowels in Dagbani even when not indicated phonetically.

2. DATA SET ONE: EPENTHESIZED REDUPLICATION

In monosyllabic (CV) words as earlier stated, reduplication will always involve an epenthetic segment. This epenthetic segment invariably becomes part of the reduplicant. I argue in this paper that the epenthetic segment is a homorganic nasal. The data below illustrates the phenomenon of homorganic nasal epenthetic reduplication in Dagbani.

Table 1 Reduplication in CV stems

	Base	Reduplicant	Gloss
a.	**tú** to abuse, insult	**tùn-tú**	to abuse or insult repeatedly
b.	**bú** to beat	**bùm-bú**	to beat repeatedly
c.	**dá** to buy	**dàn-dá**	to buy repeatedly
d.	**ɲú** to drink	**ɲùɲ-ɲú**	to drink repeatedly
e.	**kú** to kill	**kùŋ-kú**	to kill repeatedly
f.	**bó** to find	**bòm-bó**	to find repeatedly
g.	**kpé** to enter	**kpèŋ-kpé**	to enter repeatedly
h.	**gbí** to dig	**gbìŋ-gbí**	to dig repeatedly
i.	**gó** to travel	**gòŋ-gó**	to travel repeatedly

[2] For details of the other approaches to the study of reduplication, see Inkelas and Zoll (2004) and also Golston (1996). As conventionally done in the literature, I indicate the reduplicant by underlining it.

j.	**mí** to rain	**mìm-mí**	to rain repeatedly
k.	**dí** to eat	**dìn-dí**	to eat repeatedly
l.	**dú** to climb	**dùn-dú**	to climb repeatedly
m.	**ɲá** to see	**ɲàɲ-ɲá**	to see repeatedly.

2.1 DATA SET TWO: PARTIAL REDUPLICATION

This set of data presents us with Dagbani verbs that are syllabified as CVV.V. This is the form of syllable that Olawsky (1999:81) refers to as CVV.i. This paper assumes that Olawsky (ibid) might have termed this syllable type as CVV.i as a result of the fact that syllables of this type invariably end with the /**i**/ segment. It is seen that there is always a deletion of the second syllable which is made up of only a V that is an onsetless syllable. The possible phonological reasons that might be responsible for the deletion of this onsetless syllable will be discussed under the data analysis section of this paper.

Table 2 Reduplication in CVV.V Stems

	Base	Reduplicant	Gloss
a.	**góóí** to stop a quarrel	**gòò- góóí**	to stop a quarrel repeatedly
b.	**páái** to arrive	**pàà-páái**	to arrive repeatedly
c.	**wáái** to stem	**wàà-wáái**	to stem repeatedly
d.	**yáái** to open (mouth)	**yàà-yáái**	to open repeatedly
e.	**sáái** to price	**sàà-sáái**	to price repeatedly
f.	**bóói** to pour	**bòò-bóói**	to pour repeatedly
g.	**bééí** to cut into pieces	**bèè-bééí**	to cut into pieces repeatedly
h.	**dééí** to receive	**dèè-dééí**	to receive repeatedly
i.	**kúúí** to get dried	**kùù-kúúí**	to get dried repeatedly
j.	**gúúí** to run	**gùù-gúúí**	to run repeatedly
k.	**póói** to get rotten	**pòò-póói**	to get rotten repeatedly
l.	**dáái** to push	**dàà- dáái**	to push repeatedly
m.	**gáái** to unbutton	**gàà-gáái**	to unbutton repeatedly

2.2 DATA SET THREE: COMPLETE REDUPLICATION

In this data set, we are presented with words that have the syllable structure: CVN or CV.CV. It will be argued that this set of words undergo complete reduplication. It is observed that in this data is unlike the two discussed earlier, in that; there is complete phonological identity between the base and its reduplicant. In the section devoted to data analysis, we shall consider the reason(s) behind this complete copying of the base in this type of reduplication. It is based on this that I claim that the type of reduplication that a verb undergoes in Dagbani is solely dependent on the syllable structure of that verb stem. This is illustrated with the data under Tables 3 and 4.

Table 3 Data on Reduplication in CV.CV Stems.

	Base	Reduplicant	Gloss
a.	**kólí** to sweep	**kòlì-kólí**	to sweep repeatedly
b.	**víhí** to check	**vìhì-víhí**	to check repeatedly
c.	**dáɣí** to dirty	**dàɣì-dáɣí**	to dirty repeatedly
d.	**líhí** to look	**lìhì-líhí**	to look (at) repeatedly
e.	**dúhí** to drive	**dùhì-dúhí**	to drive (a car) repeatedly
f.	**gbélí** to stare at	**gbèlì-gbélí**	to stare repeatedly at
g.	**vúbí** to fan	**vùbì-vúbí**	to fan repeatedly
h.	**kpúɣí** to take	**kpùɣì-kpúɣí**	to take repeatedly
i.	**táhí** to shout	**tàhì-táhí**	to shout repeatedly
j.	**kúhí** to cry	**kùhì-kúhí**	to play repeatedly
k.	**kálí** to count (something)	**kàlì- kálí**	to count (something) repeatedly

Table 4 Data on Reduplication in CVN Stems.

	Base	Reduplicant	Gloss
a.	**dám** to shake	**dàm-dám**	to shake repeatedly
b.	**chím** to fry	**chìm-chím**	to fry repeatedly
c.	**dím** to bite	**dìm-dím**	to bite repeatedly
d.	**níŋ** to do	**nìŋ-níŋ**	to do repeatedly
e.	**cháŋ** to go	**chàŋ-cháŋ**	to go repeatedly
f.	**páŋ** to borrow	**pàŋ-páŋ**	to borrow repeatedly
g.	**tím** to send	**tìm-tím**	to send repeatedly

Table 5 Data on Reduplication in CV: Stems

	Base	Reduplicant	Gloss
a.	**píí** to select	**pìì-píí**	to select repeatedly
b.	**ɲíí** to bite a little	**ɲìì-ɲíí**	to bite repeatedly
c.	**víí** to open	**vìì-víí**	to open repeatedly
d.	**bíí** to get warm	**bìì-bíí**	to get warm repeatedly
e.	**míí** to get spoilt-soup	**mìì-míí**	to get spoilt repeatedly

2.3 INTERACTION BETWEEN TONE AND REDUPLICATION

Another area in the study of reduplication that has won the attention of scholars has been the interaction between tone and reduplication. Several recent works on reduplication expect that the reduplicant should not only be faithful to the base in segmental information, but also in tonal information. For instance Steriade (1988), McCarthy and Prince (1995), Inkelas and Zoll (1999, 2000) assume that reduplication should not be devoid of tonal faithfulness between the base and reduplicant. Accordingly, reduplicants are not expected to copy only the segmental features of the base, but also the tonal patterns. An example of such a language in which there is tonal faithfulness between a base and its reduplicant is Chiwewa, a Bantu language as argued in Hyman and Mtenjen (1999). The authors argue that in this language, the tone of the base is invariably copied by the reduplicant.

On the other hand, there are also languages in which the tone of the base is never copied by the reduplicant. For instance, in Yoruba, reduplicants are believed to have their own morphological tone as argued by Pulleyblank (1988). In other Bantu language such as Kinande, as argued in Mutaka and Hyman (1990) and also in Runyankore as argued by Polleto (1998), it has been attested that reduplication is devoid of tonal faithfulness between the base and reduplicant.

Though languages differ in what they do with tone in reduplication in languages, this current paper does not give any detailed description of what the interaction between tone and reduplication is in Dagbani. It however, does seem that the reduplicant invariably has a default low tone. Based on this observation, I make the tentative argument that reduplicants do not copy tonal features of the base, but only the segmental features. It is however hoped that future research will shed more light on the interaction between tone and reduplication in Dagbani.

3. THE DATA ANALYSES

This section of the paper is aimed at giving a formal analysis of the data presented earlier on the various types of reduplication discussed in Dagbani. The analysis is done within the theoretical framework of Optimality Theory (OT).

3.1 THE HOMORGANIC NASAL SEGMENT EPENTHESIS DATA

It is argued in this paper that the epenthesis of the homorganic nasal segment is motivated by the need for the reduplicant to attain the needed bimoraic size of the reduplicant. It is further claimed that the need to meet well-formedness of the reduplicant brings about the violation of DEP-SEG (BR). One interesting observation in these data is the fact that the language opts for an epenthetic segment at the expense of just lengthening the vowel (adding a mora) since adding a mora would have also yielded the bimoraic size of the reduplicant. This paper however does not have a readily plausible phonological reason for this particular observation in the language. It is then assumed that future research into this area might shed more light on to why the language opts for segment epenthesis at the expense of vowel lengthening which will have also yielded the needed bimoraic size of the reduplicant.

It is also seen that nasalization which is an active phonological process in Dagbani, imposes itself on the vowels that are adjacent to the epenthetic nasal segment. Though Dagbani does not have nasal vowels, it should be noted as mentioned earlier in Section 1 of this work that nasalization is an active phenomenon in the language. Accordingly, vowels that are adjacent to nasal consonants have the

nasal qualities of those consonantal segments spreading onto them. There is therefore consonant-vowel assimilation whenever nasal segment is epenthesized in the reduplicant. The nasal epenthesis therefore results in a distortion of the sameness of the base and the reduplicant caused by the need to satisfy the size requirement of the reduplicant. In OT terms, therefore, it could be argued that well-formedness constraints dominate faithfulness constraints.

An OT account of the interactions of constraints in this form of reduplication is given below in the Table 6. I use this to illustrate constraint interaction that yield the homorganic nasal segment epenthesis form of verbal reduplication in the Dagbani language. The constraints are:

Rule 1 WT-IDENT-(BR): a vowel should have the same weight in the base as in the Reduplicant.

Rule 2 DEP-BR (N): prohibits the insertion of a nasal consonant in the reduplicant.

Rule 3 DEP-BR (V): prohibits vowel insertion in the reduplicant.

Rule 4 RED-FT: a reduplicant must be bimoraic in size.

These constraints have the ranking schema as shown below:

Schema 1 RED-FT >>WT-IDENT (BR)> > DEP-BR (N) >> DEP-BR (V).

Table 6 OT analysis of nasal epenthesis reduplication in Dagbani.

Input**:** /RED+**dí**/	RED-FT	WT-IDENT-(BR)	DEP-BR(N)	DEP-BR(V)
a. **dí - dí**	***!**			
b.→ **dì<u>n</u>-dí**			*	
c. **díí- dí**		***!**		*

In this Table, candidates (6a) and (6c) are ruled out as optimal candidates since they violate the higher-ranking constraints. Candidate (6a) for instance violates the two higher-ranked constraints: RED-FT and WT-IDENT (BR). The ranking schema between RED-FT and WT-IDENT (BR) is very crucial in accounting for the optimality of candidate (6b). Candidate (6b) then emerges as the optimal candidate (the winner) as it satisfies all the higher-ranking constraints in the language as shown in the Table. It only violates DEP-BR (N) which is a lower-ranked constraint as seen in the Table. It is a challenge addressing the question why we get an inserted nasal rather than vowel lengthening which would have also produced the needed size of the reduplicant. However, at least, descriptively, the crucial ranking: DEP-BR (N)>> DEP-BR (V) accounts for the language preferring a CVN as a reduplicant rather than CVV.

3.2 ANALYSES OF DATA ON PARTIAL REDUPLICATION

In this section of the paper, I give an analysis of the partial reduplication data that were presented earlier in section 2.1. It is shown in this analysis that in stem verbs that have the structure CVV.V in Dagbani, there is always partial reduplication, since copying of the base is done as much as would be needed to meet the bimoraic size

requirement of the reduplicative form. Unlike in CV stems as shown earlier where there is always an epenthetic segment on the reduplicant to ensure that it meets the bimoraic requirement of the reduplicant, in this form of reduplication, I show that there is invariably a deletion of a segment. I argue tentatively that this deletion is necessitated by the same reason of ensuring that the size of the reduplicant does not exceed the bimoraic size requirement that is imposed on the prosodic size of the reduplicant.

This deletion of segment in the partial reduplication results in violation of MAX-BR thereby distorting phonological identity between the base and the reduplicant. It is hypothesized in this paper that the violation of MAX-BR is based on the fact that copying the CVV structure of the base is enough to meet the bimoraic size requirement of the reduplicant. Thus, "resemblance" between the base and the reduplicant is distorted for the purpose of satisfying the bimoraic requirements of the reduplicant.

Below is an OT analysis of the partial reduplication, which is reduplication as it occurs in CVV.V syllables. The constraints involved and their interactions/ranking schemas are:

Rule 5 MAX-V: outputs have the same vowel segments as in inputs.

Rule 6 RED-FT: a reduplicant must be bimoraic in size.

Rule 7 MAX-BR: every element of the base has a correspondent in the reduplicant.

These constraints have the ranking schema as shown below:

Schema 2 RED-FT >> MAX-V >> MAX-BR.

Table 7 OT analysis of partial reduplication in Dagbani

Input. /RED + **tóó.í**/	RED-FT	MAX-V	MAX-BR
a. **tóó.í-tóóí**	*!		
b. → **tòò-tóóí**			*
c. **tón-tóói**		*!	

In this Table, candidate (7a) fails as optimal candidates as it fatally violates the highest-ranking constraints. Candidate (7c) also fails as optimal candidate because it violates the second highest ranking constraint which is MAX-V. Accordingly, candidate (7b) emerges as the optimal since it satisfies the highest ranking constraint. It violates only the lower-ranked constraint and so still emerges as the winner. As mentioned earlier, with the understanding that a reduplicant must be bimoraic in size, it means that, the constraint RED-FT is very important as it is what drives this pattern of reduplication in the language. The ranking schema between RED-FT>> MAX-V is also very important as it tells us the preference of losing a vowel to violating RED-FT.

I argue in this paper that the two "repair" mechanisms discussed above, that is, the deletion of the /**i**/ segment and the insertion of the homorganic nasal segment as observed in Dagbani verbal reduplication are instances of "phonological conspiracy" following Kisseberth (1970), Pater (1999) and McCarthy (2002). Kisseberth (1970) who is believed to have originally identified "phonological conspiracy" describes it as a phenomenon in which two or more phonological processes or rules serve the same

purpose in a language. Kisseberth further argues that "phonological conspiracy" could be seen as a process that is motivated by the need to rid the surface forms of a language of certain undesirable marked configurations.

The epenthesis of the homorganic nasal segment and the deletion of the /**i**/ as discussed above are assumed to be motivated by the same reason: the need to maintain the bimoraicity of the reduplicant. Thus, while the homorganic nasal segment insertion is motivated by the need to ensure that the reduplicant meets its prosodic size requirement (does not fall below the required minimal size), the /**i**/ segment deletion is also claimed to be motivated by the need to ensure that copying the base does not produce a reduplicant bigger than needed of the stem of the reduplicant. The author's assumption then is that these two processes of segment insertion and deletion "conspire" to achieve the same thing in the language: to attain the bimoraic size requirement of the reduplicant. It should be noted that there is somewhat an advantage in using the same constraints to account for two different sets of data since it captures the conspiracy idea.

3.3 ANALYSIS OF DATA ON COMPLETE REDUPLICATION

This section deals with the analysis of the CVN verbs (single heavy monosyllabic words) as well as CV.CV (two light syllables) and their reduplicative forms. Words of the syllabic structure CVN and CV.CV as observed earlier undergo complete reduplication. This, it is argued, is due to the fact that complete copying of a single heavy syllable satisfies the bimoraic requirement expected of the stem of the reduplicant. Also, the complete copying of CVCV (two light syllables) also satisfies the bimoraic requirement thereby resulting in complete reduplication. Accordingly, there is no violation of faithfulness constraints as the total copying of the base by the reduplicant maintains complete mapping or correspondence between the reduplicant and the base. As argued in this paper, faithfulness dominates over markedness once the size requirement of the reduplicant can be met by complete copying of the base. I give an OT account of reduplication as it occurs in CVN verbs in Dagbani. The constraints involved and their ranking are:

Rule 8 MAX-BR: every segment of the base has a correspondent in the reduplicant.

Rule 9 RED-FT: a reduplicant must be a bimoraic in size

Rule 10 NO-CODA: a syllable must not have a coda

Rule 11 *STRUC: An output with fewer segments is preferred to one with larger segments.

Complete copying of the entire base with CVV, CVCV or CVN structure means that the reduplicated element is structurally large. This is uneconomical. Previous suggestions have been made on how to account for the structurally large units in morphological processes. In this paper, I adopt Kager's (1999:404) use of the constraint *Struc. Kager defines it as "no phonological structure". However, it is used here as a gradient constraint favoring smaller reduplicants. Thus an output form with one segment in the reduplicant incurs one less violations of this constraint than one with two segments, which in turn incurs one less violation than one with three segments etc.

These constraints have the ranking schema as shown in Schema 3:

Schema 3 RED-FT >> MAX-BR >>NO-CODA>>*STRUC:

Table 8 OT analysis of complete reduplication with CVN syllables structure

Input /RED+ dám /	RED-FT	MAX-BR	NO-CODA	*STRUC
a. **dá - dám**		*!	*	**
b.→ **dàm-dám**			**	***
c. **dám-dá**		*!	*	***

In this Table, candidate (8b) emerges as the optimal candidate as it does not violate the highest ranking constraints. Candidates (8a) and (8c) are rejected as they fatally violate the constraints which are higher-ranked. It is the case that RED-FT is very crucial in determining the winning candidate and that yields an instance of complete reduplication as discussed earlier in Section 1.2. All the candidates violate NO-CODA and *STRUC which are lower-ranked constraints. However, the optimal candidate has two violations of NO-CODA as it has codas in both the reduplicant and base and three violations of *STRUC. This however, does not affect its status as the optimal candidate since both constraints are lower ranked. It is worth pointing out that the nasal in **dàm-dám,** unlike the epenthetic nasal does not assimilate in place. This explains why there is no homorganicity in this example

In Table 9 below, I give an OT account of CV.CV reduplicants in Dagbani, which yields another instance of complete reduplication in Dagbani. The same constraints as in Table 8 above are used in Table 9.

Table 9 OT analysis of complete reduplication with CV.CV syllables structure

Input /RED + **víhí** /	RED-FT	MAX-BR	NO-CODA	*STRUC
a.→ **vìhì- víhí**				****
b. **víh- víhí**		*!	*	***
c. **ví- víhí**	*!	**		**

In this Table, candidates (9c) and (9b) fatally violate the two top-ranked constraints: RED-FT and MAX-BR. Candidate (9c) for instance scores two violation marks for lack of two identical segments in the reduplicant. This, rules out these two candidates as the optimal candidate. The optimal candidate, (9a) however satisfies the highest-ranking constraints RED-FT and violates only *STRUC which is the lowest-ranked constraint. Just as noted for the Table 8, it does not seem that the ranking order between NO-CODA and *STRUC affects the optimality of candidate (9b).

In Table 10, I give another instance of complete reduplication with the syllable structure CV: syllable structure. The same constraints used are the same as in Table 9 and have the same ranking schema.

Table 10 OT analysis of complete reduplication with CV: syllables structure

Input /RED+ **víí** /	RED-FT	MAX-BR	NO-CODA	*STRUC
a.→ **vìì-víí**				***
b. **vì- víí**	*!	*		**
c. **vín- víí**		*!	*	***

The Table 10 also shows a pattern in which the optimal candidate (10a) only violates *STRUC, a gradient constraint which does not allow the reduplicant to copy all the segmental features of the base. Since the constraint that it violates is the lowest-ranked in the Table, it does not threaten its status as an optimal candidate. Candidates (10b) and (10c) however fail as optimal candidates since they violate RED-FT and MAX-BR respectively which are higher-ranked constraints. The interesting thing we note is that the instance of CV.CV and CV: syllables have their optimal candidates violating only the gradient constraint *STRUC which happens to be the lowest-ranked constraint.

4. CONCLUSIONS AND SUMMARY

This paper set out to give an account of the phonology of verbal reduplication in Dagbani. Based on the data presented in this paper, it has been hypothesized that there is a size requirement imposed on the reduplicant in Dagbani verbal reduplication. It was argued that the reduplicant has to be exactly two moras, that is either two light syllables or one heavy syllable. Accordingly, in instances where complete copying of the base will not meet this prosodic size requirement of the reduplicant, as in cases of CV syllables then there is an epenthetic segment.

In an attempt to give a plausible phonological reason responsible for the insertion of this segment, the paper makes a tentative argument that the epenthesis might be motivated by the need to ensure that the reduplicant does not fall short of the size requirement expected of the stem of the reduplicant. The epenthesized segment identified in this paper is invariably a homorganic nasal. This insertion I argue in OT grammar brings about the violation of DEP (N). The paper however could not offer any phonological reason for the observation that the language opts for an epenthetic segment at the expense of vowel lengthening which could have also yielded the needed bimoraic size of the reduplicative stem. It is hoped that future research will shed light on this issue.

It was also observed that when complete copying of the base will yield a reduplicant with a size more than the needed bimoraic size of the reduplicant, as in CVV.V verbs, then there was segment deletion. I also make the argument that the deletion is done to maintain the prosodic size of the reduplicant within the bimoraic requirement since a total copying of the CVV.V structure would produce a size larger than needed of the reduplicative stem. It was thus claimed in this paper that the two mora target motivates the insertion of the homorganic nasal segment and the deletion of the /**i**/ segments. This was then analyzed as an instance of ”phonological conspiracy” in Dagbani, that is, a set of phonological processes that serve the same purpose in a language.

Contrary to the observations made on insertion and elision of segments aimed at ensuring that the stem of the reduplicant does not exceed the size requirement imposed on it, I observe that when copying the base will neither yield a size larger than needed nor a size less than the needed size of the stem of the reduplicant, then there is complete copying. This was observed to be the case in CVN or CV.CV syllable structures. Reduplicative verbs of syllables with this structure have total reduplication whilst those observed in the homorganic nasal epenthesis and the vowel deletion are analysed as instances of partial reduplication.

On the interaction between tone and reduplication, though a detailed look is not given to this phenomenon, the data used suggest that the reduplicant does have a default low tone. Though I make the tentative claim that the reduplicant in Dagbani invariably has a low tone, it is hoped that future research, would help shed light on this phenomenon.

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