

Adjacency in Burmese Reduplication: An Optimality Theoretical Analysis

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Abstract. I propose an Optimality Theoretical analysis of reduplication in Burmese and discuss accompanying issues, including reduplicant (RED) placement and size, involved in dealing with it. Following Lunden's ADJACENCY constraints (2004), I argue for two hierarchies of constraint rankings which are able to account for two major types of Burmese reduplication in a principled manner; one hierarchy instantiates discontinuous reduplication, whereas the other full reduplication. A stark difference between these two types is attributed to the morphemic status of a base, specified as a lexeme in the lexicon or derived via affixation prior to reduplication. Granted such analysis, a tension between MAXBR and ADJACENCYBR constraints plays a role in regulating an adjacent and corresponding relation between the base and the RED, and further incurring the emergency of the unmarked (TETU) (McCarthy and Prince 1994) in Burmese reduplication.

Keywords: reduplication, Burmese, adjacency, placement

1. Introduction

Cases of full reduplication perhaps most clearly demonstrate the morphological nature of the reduplication process in natural language. Duplicating a morpheme or a word to derive new words and convey myriads of grammatical aspects is prevalent in the languages of the Tibeto-Burman family of South East and South Asia (see Abbi 1990). Burmese, the Burmish branch of the Burmese-Lolo subgroup of the South Easter branch of the Tibeto-Burman family (Romeo 2008:5), instantiates this duplicating process. There are various morphological operations motivated to derive complex compounds in Burmese, including prefixation, suffixation and reduplication (Okell 1969). Burmese reduplication is quite revealing in a way that it displays stringent compliance with locality in the sense of Marantz (1992), and adjacency in Lunden (2005). Precisely, a reduplicant (abbreviated RED henceforth) must be close to its base without

any intervening material. Another interesting phenomenon in Burmese reduplication is two patterns of full reduplication, *syllabic reduplication* when a base is monosyllabic or disyllabic specified as a lexeme in the lexicon (thus, a lexeme), and *foot reduplication* when a base has undergone affixation prior to a reduplication operation.

The goal of this paper is to examine reduplication phenomena in Burmese, and propose a proper analysis of it within the Optimality Theory (OT) framework by Prince and Smolensky (1993). Issues dealt with in this paper are RED placement, and the phonological manifestation of locality and adjacency in Burmese reduplication. Toward the end of this paper, I will argue for two hierarchies of constraint rankings well-motivated in Burmese reduplication. Such hierarchies receive substantial support from other Tibeto-Burman languages. In addition, an immediate consequence arising from the proposed analysis is that a set of alignment constraints in the OT framework plays no role, due to a conflicting force from the ADJACENCY constraints (Lunden 2004) that inactivate the alignment constraints.

This paper is structured as follows. Section 2 begins with an outline of the phonological and morphological architecture of Burmese, which has a direct bearing on the morphology of Burmese reduplication. Section 3 provides a layout of reduplication data in Burmese, and advances an Optimality-Theoretic (OT) account in accordance with the data in order to bring to light why Burmese reduplication cannot be properly accounted for within the existing OT framework. The goal of Section 4 is twofold. The outset of it is to review Lunden's proposed ADJACENCY BR constraints (2004), and demonstrate how these constraints interact with MAXBR and CONTBR in deriving discontinuous reduplication (ADBR-BY- σ) and full reduplication (ADBR-BY-Foot) in Burmese. The remainder of Section 4 is to present my proposed analysis of Burmese reduplication in the spirit of Lunden's proposal, and solve the relevant issues. Section 5 concludes this paper.

2. Phonological and Morphological Architecture of Burmese

This section primarily focuses on syllable structure in Burmese.¹ As will be discussed subsequently, syllable structure plays a critical role in motivating two hierarchies of constraint rankings available for the morphology and phonology of Burmese reduplication. Also, the database in this paper consists of existing examples in Okell (1968), Khin (1978), and Green (1995, 2005), and from my fieldwork. Data cited in this paper will be accompanied with their

¹ The phonemic inventory of Burmese consonants and vowels is not detailed at the moment since it does not have any direct bearing on reduplication. It is mentioned when necessary. The interested reader is referred to Okell (1969), Khin (1978), Green (2005) and Remeo (2008) for further details.

sources, (X, Y: Z), where X specifies authors, Y year, and Z pages. Unless particularly specified, data presented in this paper come from my field notes.²

Burmese allows both open syllables and closed syllables, as illustrated in (1). Note that the onset consists of a consonant optionally followed by a glide (G).

(1)	<i>Open Syllable</i>	<i>Closed Syllable</i>				
	V	<i>ei</i>	‘be cold’	VC	<i>eʔ</i>	‘crack’
	CV	<i>mei</i>	‘girl’	CVC	<i>caun</i>	‘be cold’
	CGV	<i>myei</i>	‘earth’	CGVC	<i>myeʔ</i>	‘eye’
	CGCV	<i>mywei</i>	‘snake’	CGCVC	<i>myweʔ</i>	‘utter’

(Okell 1969; Green 2005)

Among various shapes of Burmese syllable structure above, it is noted that consonant clusters are allowed in the onset position but not in the coda position. Specifically, the right edge of a syllable is prevented from having a vocalic or consonantal element. Instead, only the glottal stop /ʔ/ and the nasal vowel /N/ (Okell 1969) or a nasal final (Khin 1978) can be inserted into the coda position in closed syllables, because the coda position in Burmese only tolerates placeless sounds, which is formulated as *PLACE]_σ (see Green 2005).³

After introducing the syllable structure, we contend a need to review the inventory of morphemes in Burmese. Burmese morphemes can be divided into two major types, each of which can be further categorized into small ones, as depicted in (2).

² Most data presented in this paper have been re-examined with the informant. Nonetheless, some data are not accepted by the informant for unknowns. I will leave aside data of this sort for expository reasons.

³ Thus, to circumvent a coda position consisting of a glottal stop and a nasal, one of the coda consonants must be deleted (Green 2005). Also, to restrict the occurrence of place features in coda, Green adopts two constraints, as in (i). (ii) exemplifies how the two constraints prevent any consonant with place features from being in coda.

- (i) *Place]_σ
The rightmost mora of a syllable does not dominate Place features.

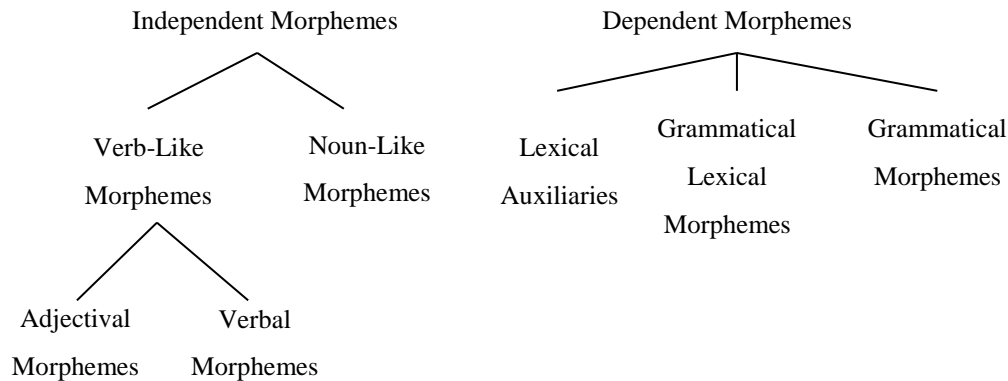
MAX(PLACE)
Place features in the input have correspondents in the output.

- (ii)

/keik/	*Place] _σ	MAX(PLACE)
/keik/	*!	
/keiʔ/		*

(Green 2005:11)

(2)



(Adopted from Khin (1979:28))

In the morphology of Burmese, grammatical morphemes, such as particles, aspectual markers, must accompany verbal morphemes, which amounts to their dependent/affixal status. Besides, most verbs in Burmese can be derived in the manner of compounding, as illustrated in (3).

- (3) a. la-sa 'come, tease' (Khin, 1978: 47)
 b. thwa-tain 'go report' (Khin, 1978: 47)

A great number of Burmese words are monosyllables, and become multisyllabic via affixation or reduplication, especially verbs (Okell 1969). Most multisyllabic verbs and nouns can be analyzed into small syllables. Specifically, various formations consisting of two to six syllables are derived via reduplication (Khin 1978). As illustrated in (4), Burmese words are mostly monosyllabic but become multisyllabic via reduplication.

- (4) a. Bimorphemic words
sao-sao 'early'
phyu-phyu 'white'
 b. Trimorphemic words
jin-tin-tin 'elegant'
ni-ye-ye 'scarlet'
 c. Quadrimorphemic words
thei-thei-cja-cja 'carefully'
lut-lut-lap-lap 'independent'

Moreover, Green (1995, 2005) notes that compounds in Burmese as well as loan words can be comprised of more than one foot, and become prosodic words. In light of the standard definition of feet, Green assumes that heavy ($\mu\mu$) syllables are in fact feet. And, each prosodic word in Burmese ends with a major syllable, which can be a foot, (which might consist of one minor syllable and one major syllable, or just one major syllable) (Green 2005). In this light, *ne:* ‘stay’ in (5a), which is the major syllable, is a prosodic word itself. The same line of thinking applies to *t^haiN* ‘sit’. *Ne: t^haiN* ‘reside’ in (5a) is a verbal compound consisting of two prosodic words, *ne:* ‘stay’ and *t^haiN* ‘sit’, each of which is a prosodic word as well as a foot itself. (5b) is a loanword, and serves as a case showing that to be pronounceable, the second syllable in (5b) should be a major syllable ($\mu\mu$).

- (5) a. *ne:t^haiN* = (ne:) + (t^haiN) ‘reside’ = ‘stay’ + ‘sit’
 b. (mouN)(dàiN) ‘storm’

(Green 1995:18)

As will be discussed later, the disyllabic syllables in (4) are derived from monosyllabic words that undergo reduplication, and subsequently affixation of grammatical morphemes. However, whether the output is pronounceable or not is decided at a later stage. (5a) is a case illustrating the fact that though two lexemes are feet and major syllables themselves in the lexicon, only the second syllable will retain the major syllable after they are compounded. The first syllable in (5a) changes from a major syllable to a light one, due to the constraint that each prosodic word in Burmese must end with a major syllable, with others being light ones. It is apparent that the output will be prosodically re-adjusted after compounding. The minimal assumption I will take here is that since the prosodic constraint here is more like a later filter on the output (in the sense of OT, a low-ranked constraint)⁴, it is exempt from affecting reduplication, an early morphological operation. Thus, it occurs quite later than reduplication. In other words, this prosodic re-adjustment constraint has no direct influence on how reduplication operates but only ensures the optimal output to be pronounceable.

⁴ Green (2005) argues for an alignment constraint in (i), which ensures that a prosodic word ends with a major syllable, (which can be a foot).

- (i.) ALIGN-R(ω, f)
 The right edge of every pword is aligned with the right edge of some foot.

3. Reduplication Data in Burmese

In the ensuing four sub-sections, I will present four functions of full reduplication in Burmese. Meanwhile, various issues surrounding the reduplication data will be addressed, serving the baseline for discussion in this paper. It is concluded that full reduplication in Burmese can be sub-divided into two major types. One type is subject to syllable-sized restrictions (see Section 3.1), whereas the other is to foot-sized restrictions (see Section 3.2). Such distinction has to do with the morphemic status of a base, being a lexeme specified in the lexicon or a derived word.

Before proceeding to the following sections, I shall define my empirical coverage in this paper, and point out improper classification of REDs in the previous scholarship. Khin (1978) categorizes various REDs in Burmese into twelve types in terms of morphological change and function, as summarized below with illustrative examples provided.

(6)

Reduplicant form	Type	Function/Reduplicate	Examples
X is a onomatopoeic syllable	Type 1	Onomatopoeic reduplicates	i. <i>ha-ha-yi</i> ‘laughing heartily’ (Khin 1978:39)
			ii. <i>hin-hin-gnou</i> ‘crying chokingly’ (Khin 1978:39)
	Type 2	Rhyming reduplicates	i. <i>ni-ti-ti</i> ‘reddish’ (Khin 1978:41)
			ii. <i>wa-ta-ta</i> ‘yellowish’ (Khin 1978:41)
X is a formative syllable with no morphemic status.	Type 3	Syllable reduplicates	i. <i>a-neim-a-myin</i> ‘low and high situation, relative heights’ (Khin 1978:42)
			ii. <i>a-chou-a-chin</i> ‘eatables sweet and sour’ (Khin 1978:42)
is a monosyllabic morpheme	Type 4	Kinship term reduplicates	i. <i>mei-mei</i> ‘mother mother’
			ii. <i>noun-noun</i> ‘milk milk’ (Khin 1978:45)
	Type 5	Adverbial reduplicates	i. <i>la-la-sa</i> ‘keeping coming and teasing’ (Khin 1978:47)
			ii. <i>hwa-hwa-tain</i> ‘keep going and reporting’ (Khin 1978:47)

	Type 6	Adjectival reduplicates	i.	<i>pan-ni-ni</i> ‘red flower’ (Khin 1978: 48)
			ii.	<i>eim-tyi-tyi</i> ‘big house’ (Khin 1978:48)
	Type 7	Assertive reduplicates	i.	\emptyset - <i>ta-pwin-pwin</i> ⁵ ‘one person’ (Khin 1978:51)
	Type 8	Classifier reduplicates	i.	<i>eim-ta-eim</i> ‘one house’ (Khin 1978: 53)
			ii.	<i>bu-thoum-bu</i> ‘three boxes’ (Khin 1978:53)
	Type 9	Distributive reduplicates	i.	<i>a-mjou-mjou</i> ‘many kinds’ (Khin 1978:55)
			ii.	<i>a-kha-kha</i> ‘many times’ (Khin 1978 :55)
AB is a bimorphemic word	Type 10	AB and AC are nouns with supplementary/complem- entary meaning.	i.	<i>yap-swei-yap-mjou</i> ‘relatives from far and near’ (Khin 1978:56)
			ii.	<i>thek-shi-thek-me</i> ‘living and non-living things’ (Khin 1978:56)
	Type 11	AB is a bimorphemic verb.	i.	<i>njin-njin-tha-tha</i> ‘tenderly’ (Khin 1978:57)
			ii.	<i>sin-sin-sa-sa</i> ‘thoughtfully’ (Khin 1978:58)
	Type 12	AB is a bimorphemic adjectives.	i.	<i>ni-ni-ye-ye</i> ‘red scarlet’ (Khin 1978: 59)

In what follows, I will defend a view that some seeming reduplication cases in his analysis cannot be treated as genuine instances of reduplication.

First, Type 1 and Type 2 do not instantiate reduplication. The RED/base⁶ *ha* in Type1 or *ti* in Type 2 does not have an independent morphemic status, as pointed out by Khin (1978) and the informant I consulted. Instead, the base must co-occur with the RED as a whole to form a compound word, which is not analyzable into smaller elements. This suggests that the compound word has been ‘lexicalized’ and stored in the lexicon.

⁵ \emptyset in point means that a noun is dropped. The reason why *pwin* in \emptyset -*ta-pwin-pwin* can be reduplicated and interpreted as ‘one person’ is due to the historical origin of the Burmese classifier system, in which classifiers stemmed from nouns. The RED in point is not a genuine reduplicant, but has been grammaticalized as a classifier stored in the lexicon (see Simpson 2005a, b). Though used as a classifier, *pwin* can still mean ‘person’ in terms of denotation. The usage of this sort is quite limited, however.

⁶ I use ‘RED/Base’ here because I still fail to identify which is a base or a RED for the time being.

Second, Type 3 is excluded from the present paper.⁷ In the case of *a-neim-a-myin* 'low and high situation' in Type 3, the neutral vowel /a/ or /ə/ is seemingly reduplicated, and prefixed to two elements. Yet, as pointed out by the informant, /a/ in point seems to participate in combining two elements, being a conjunction marker. Also, as noted in (Khin 1979:42), /a/ can be used to form 'stock phrases', which amounts to the conjunctive status of /a/. Granted this status, /a/ should be properly considered to be a grammatical linker or conjunctive. It is recursively used to link separate noun phrases. Thus, Type 3 is not taken into our consideration.

Third, as for Type 4, the informant clarified that *mei* 'mother' alone cannot stand alone; instead, *mei* must be derivationally used as *mei-me* or *a-me*. Given this fact, *mei* is not an eligible base, thus excluded.

Fourth, Type 7 and 8 are not taken into consideration in this paper, because syntax has a direct bearing on reduplication in point; in other words, the identical resemblance of the classifier *eim* to the noun *eim* 'house' has to do with historical origins of classifiers. Classifiers in Burmese grew out of nouns (See Simpson 2005a, b). It is not surprising that classifiers and nouns bear the identical resemblance. In this view, these apparent cases of REDs instantiate lexicalization, however.⁸

Fourth, Type 10, similar to Type 3, displays some sort of conjunction, putting two constituents of the same meaning or opposite meanings together to form a complex compound via lexicalization.

Given the improper classification cases discussed above, the types, including Type 1, 2, 3, 4, 7, 8, 10, are therefore excluded, and I will deal with the remaining data and categorize them into four major categories in view of functions they display. Another piece of evidence supporting the defended view that reduplication facts in Type 1 and 4 do not instantiate genuine reduplication comes from the reduplication phenomena in some Tibeto-Burman languages of South Asia, which bear a typological affinity to Burmese. Note the following data set.

- (7) Onomatopoeias⁹
- a. Meiteri
- | | |
|------------------|-----------------------|
| <i>uʔ-uʔ</i> | '(monkey) chattering' |
| <i>grən-grən</i> | 'thundering sounds' |
| <i>khe-khe</i> | 'laughing sounds' |

(Abbi 1990:172)

⁷ Type 3 is also called 'positive and negative opposition' (see Vollmann 2009).

⁸ The interested reader is referred to Simpson (2005a, b) and Jheng (2012) for details.

⁹ Abbi (1990) terms onomatopoeias such as 'Expressives', including imitatives, sound symbolisms, mimic words and onomatopoeic constructions, which are employed to emote all the five senses of human perception in South Asian languages.

iv.	<i>sei</i> 'to be attentive'	<i>sei-sei</i> 'more or less attentively'
		(Khin 1978: 83)
v.	<i>hsek</i> 'to be certain'	<i>hsek-hsek</i> 'more or less certainly or truly'

Take (9.i.) for example. After reduplication, the output *myan-myan* means something like 'more or less quickly/quickly to some degree or other' rather than 'quickly' alone. One might note that bases in (9) are solely monosyllabic. Now let us consider disyllabic bases in (10).

(10)	Verb/Adjective	>	Adverb
i.	<i>kʰeʔ-kʰé</i> 'to be difficult'		<i>kʰeʔ-kʰeʔ-kʰé-kʰé</i> 'more or less difficultly'
ii.	<i>njin-tha</i> 'to be tender'		<i>njin-njin-tha-tha</i> 'more or less tenderly'
iii.	<i>thei-cja</i> 'to be careful'		<i>thei-thei-cja-cja</i> 'more or less carefully'
iv.	<i>sin-sa</i> 'to think'		<i>sin-sin-sa-sa</i> 'more or less thoughtfully'
v.	<i>léi-za</i> 'to respect'		<i>léi-léi-za-za</i> 'more or less respectfully'
vi.	<i>ʃí-má</i> 'huge'		<i>ʃí-ʃí-má-ma</i> 'more or less hugely'
vii.	<i>tʰũ-pq</i> 'to be bright'		<i>tʰũ-tʰũ-pq-pq</i> 'more or less brightly'

A bird's view of the data in (9) points to full reduplication only in Burmese (see Schwaiger 2013), when a given base is monosyllabic. Thus, a reduplication template for (9) can be generalized as CV-CV(=RED) or CV(=RED)-CV.¹¹ The template, when the base is disyllabic in (10), changes, however. The template for (10) is written as CV₁-RED₁-CV₂-RED₂, RED₁-CV₁-RED₂-CV₂ or other ways around. The vantage for discussion is that each RED in (9-10) must be aligned with its base, either leftward or rightward, without intervening materials. The generalizations of the RED_{Disjunctive-Distributive} to be accounted for can be outlined below:

¹¹ I will address the absence of the alignment of the RED, leftward or rightward, in Section 4.

- (11) Generalizations of the RED_{Disjunctive-Distributive}
- a. A proper base for reduplication is syllable-sized.
 - b. The RED_{Disjunctive-Distributive} is monosyllabic in spite of the disyllabic size of a base (the RED must be syllable-sized).
 - c. The RED_{Disjunctive-Distributive} is, either rightward or leftward, aligned with its base.

In Section 4, I argue that the generalizations in (11) can be accounted for by a set of ADJACENCY constraints in the spirit of Lunden (2004).

3.1.1.1 *Statement of Problems*

In this sub-section, I will raise problems surrounding RED_{Disjunctive-Distributive} within the traditional OT framework. The problems also apply to the other three types of reduplication from Section 3.2 to 3.4.

I shall begin with the size of the RED_{Disjunctive-Distributive} within the OT framework. For the sake of discussion, let us first assume that the RED_{Disjunctive-Distributive} is prefixed to the base, (that is, left-aligned to the base). Later, I will show that this assumption is incorrect in accounting for the placement of the RED. Rather, no alignment constraint is responsible for the placement of the RED in Burmese.

First, one correspondence constraint is necessary to account for the segments of the RED_{Disjunctive-Distributive}, as in (12). MAX-BR, if obeyed, guarantees the RED of bearing the identical resemblance to its base.

- (12) MAX-BR: Every element in base has a correspondent in the reduplicant (Anti-deletion).
(Adapted from McCarthy and Prince (1999))

Tableau in (13) exhibits the reduplication of a monosyllabic base, *myan* ‘be hard’. Candidate (13a) is the attested output because the base is fully reduplicated, whereas Candidate (13b) is fatal due to the absence of a segment /n/ in the output.

- (13) ☞ indicates the winner in the tableau. The part in bold indicates a RED.

Input: /RED, myan/ ‘be hard’	MAX-BR
a. ☞ myan -myan	
b. mya -myan	*

MAX-BR alone, nevertheless, predicts two possible candidates, as in (14). At first glance, both Candidate (14a) and Candidate (14b) are the attested outputs.

(14)

Input: /RED,RED, njin-tha/ 'to be tender	MAX-BR
a. ☞ <u>njin-njin-tha</u> -tha	
b. ☞ njin- <u>njin-tha</u> - <u>tha</u>	
c. njin-tha- <u>nji-tha</u>	*!

It is shown that when the base is disyllabic, as in Candidate (14a-b), MAX-BR can be obeyed but allows for two potential candidates. We fail to select the optimal candidate by simply relying on this correspondence constraint alone. Besides, in light of another constraint, CONTIGUITY-BR in (15), Candidate (16a) apparently violates it. This violation renders Candidate (16a) as not the optimal output, though the output is the attested one.

(15) Contiguity-BR

The portion of the base standing in correspondence forms a contiguous string, as does correspondent portion of the reduplicant.

(16) ☺ indicates the attested output

Input: /RED,RED, njin-tha/ 'to be tender	Max-BR	Contiguity-BR
a. ☺ <u>njin-njin-tha</u> -tha		**
b. ☞ <u>njin-tha</u> -njin-tha		
c. njin-tha- <u>nji-tha</u>	*	

As shown in (16), Candidate (16a), however, is the attested output rather than Candidate (16b). In the case of Candidate (16a), reduplication proceeds in terms of reduplicating the first syllable of the base *njin-tha*, thus njin-njin-tha, and the second syllable of the base, njin-njin-tha-tha, accordingly. Such output violates Contiguity-BR, which forbids skipping of elements in B, where there Range (*f*) in B is {*njin*, *tha*}, two noncontiguous substrings of the base. Even if Contiguity-BR outranks Max-BR, the optimal candidate, Candidate (17a), is not selected, as in (17).

(17)

Input: /RED,RED, njin-tha/ 'to be tender	CONTIGUITY-BR	MAX-BR
a. ☺ <u>njin-njin-tha</u> -tha	**	
b. ☞ <u>njin-tha</u> -njin-tha		
c. njin-tha- <u>nji-tha</u>		*

Hence, for some unknown, each syllable-sized RED needs to be adjacent to its base at the expense of CONTIGUITY-BR. A satisfactory analysis needs to capture this adjacency.

Moreover, the size of the RED remains to be solved. To precisely specify the size of a RED *Disjunctive-Distributive* and to facilitate the subsequent discussion, I adopt an *ad hoc* constraint, as in (18), in order to ensure that the RED is a monosyllable-sized unit.

(18) $R = \sigma$ ¹²

A reduplicant itself is a syllable-size unit and corresponds to a syllable-sized base.

With the addition of this constraint, the optimal Candidate (19a) wins, as in Tableau (19).

(19)

Input: /RED,RED, njin-tha/ 'to be tender	MAX-BR	$R = \sigma$	CONTIGUITY-BR
a. \curvearrowright <u>njin-njin-tha</u> -tha			**
b. [njin-tha]-njin-tha		*	
c. njin-tha- <u>nji-th</u>	*		

After recruiting two correspondence constraints, we have not addressed alignment issues; namely, the RED *Disjunctive-Distributive* is a prefix or a suffix. Let us consider anchoring constraints and alignment constraints (McCarthy & Prince 1993, 1995), with the aim of determining the placement of the RED *Disjunctive-Distributive*; the former are used to decide which edge of the base of the reduplication will be in correspondence to the RED in (20), whereas the latter pertain to the Generalized Alignment in (21).

(20) ANCHOR-BR-Left/Right

The left (right) peripheral element of R corresponds to the left (right) peripheral of B, if R is to the left of B.

(McCarthy & Prince 1995)

¹² One should be aware that the constraint $R = \sigma$ in (18) is defined differently by Kager (1999:227, (71)), as in (i).

(i) $R = \sigma$
Align both edges of the reduplicant with the edges of a syllable.

As will be shown in section 4, the constraint is arguably subject to other general constraints.

(21) Generalized Alignment

- a. RED-PRWD-L: Align the left edge of a RED with the left edge of a prosodic word.
- b. RED-PRWD-R: Align the right edge of a RED with the right edge of a prosodic word.

(McCarthy and Prince 1993)

As illustrated in Tableau (22), it is noted that if we look at a case where a RED **Disjunctive-Distributive**, *myan-myán*, is anchored and aligned with the edge of a prosodic word, we have four logical combinations.

(22)

	ANCHOR-BR-Left	ANCHOR-BR-Right
RED-PRWD-L	<i><u>myán</u>-myán</i>	<i>myán-<u>myán</u></i>
RED-PRWD-R	<i>myán-<u>myán</u></i>	<i>myán-<u>myán</u></i>

In the case of a monosyllabic base, the four anchoring-alignment possibilities on equal grounds can be selected as the optimal candidates, *myán-myán*. The co-existence of candidates, nevertheless, is not desired on theoretical grounds. Failing to determine a crucial anchoring constraint and an alignment constraint in the monosyllabic reduplication, we recruit two alignments, either RED-PRWD-L or RED-PRWD-Right. Each of them, however, predicts the same optimal output, as exemplified in (23-24).

(23)

Input: /RED,RED, njin-tha/ 'to be tender	MAX-BR	R= σ	RED-PRWD-L	CONTIGUITY-BR
a. \curvearrowright njin-njin-tha-tha			*	**
b. njin-tha- [njin-tha]		*		
c. nji -njin-tha-tha	*			

(24)

Input: /RED,RED, k ^{he?} ,k ^{he} / 'to be difficult'	MAX-BR	R= σ	RED-PRWD-R	CONTIGUITY-BR
a. \curvearrowright njin- njin-tha-tha			*	**
b. njin-tha- [njin-tha]		*		
c. nji -njin-tha-tha	*			

In the case of the optimal candidate (23a), it is shown that RED-PRWD-L must be violated anyhow at once; though the first RED *njin* can be aligned with the left edge of the prosodic word, the second RED *tha* obligatorily violates it because it is not left-aligned with the prosodic word, * *that*-[_{PWD} *njin-njin-tha*] but a syllabic base it adjacently corresponds to. The line of thinking in Tableau (23) can apply to Tableau (24), where the RED *tha* is aligned with the right edge of the

first base, but the RED *njin* must violate RED-PRWD-R because it is not placed to the right of the base *tha*. In view of the tableaux in (23) and (24), we cannot identify whether the RED_{Disjunctive-Distributive} resorts to RED-PRWD-R or RED-PRWD-L. Specifically, following either alignment constraint, the RED of the first syllable or the second must violate the alignment constraint once. Such consequence is not expected.

Apart from the alignment issue, the *ad hoc* constraint $R = \sigma$ seems undesired. In Section 4, I will resort to a set of ADJACENCY-BR constraints based on the notion of locality (Lunden 2004), which can capture the RED size and the alignment of the RED_{Disjunctive-Distributive} as well as other patterns of reduplication to come. The *ad hoc* constraint, $R = \sigma$, can be therefore dispensed with and generalized into other constraints.

3.1.2 RED_{Frequency}

Reduplication in Burmese can be used to convey the notion of frequency or continuousness of occurrence, as illustrated in (25). Bases can be verbs or nouns. A word of reminder is that the output of reduplication is usually accompanied with a grammatical suffix. To provide an account of what each grammatical suffix is and its relation to the output goes beyond the scope of the present paper. A minimal assumption I take here is that each grammatical suffix has no direct bearing on reduplication; specifically, it is not within the domain to which reduplication applies. Take (25.i) for example. The base *hta* and the RED together derive an adverb to convey frequency of the action ‘play’.

(25)	Verb	>	Adverb
i.	<i>hta</i> ‘repeat’		<i>hta-hta-ti</i> ‘play again and again’
ii.	<i>cou</i> ‘be in advance’		<i>cou-cou-pou</i> ‘keep sending in advance’
iii.	<i>win</i> ‘enter’		<i>win-win-pyo</i> ‘keep going in and speaking’
iv.	<i>la</i> ‘keep’		<i>la-la-mei</i> ‘keep coming and asking’
v.	<i>we</i> ‘buy’		<i>we-we-pei</i> ‘keep on buying for (him)’

Nonetheless, a word of caveat is that when a compound is suffixed with a particle, the suffix is not reduplicated, as evident in (26). In the case of (26.i), the suffix *-pu* is not reduplicated. Such

pattern of reduplication provides direct evidence showing that reduplication takes place prior to suffixation of grammatical morphemes.

(26)	Verb-Particle	>	Adverb
i.	<i>hta-pu</i>		<i>hta-hta-pu ti</i>
	‘repeat’		‘play again and again’
ii.	<i>la-pi</i>		<i>la-la-pi-mei</i>
	‘come’		‘keep coming and asking’
iii.	<i>thaw-pi</i>		<i>thwathwa-thwathwa-pi-a</i>
	‘go’		‘keep on and on going and handing over.’

Disyllabic bases for reduplication are provided below. The RED in (27.i) behaves differently from the RED in (26) in a way that the whole disyllabic base is reduplicated without complying with the syllable-sized restriction. Also, the base in point is not analyzable, not able to be further decomposed into smaller elements because it is a lexeme. (27.i) shows that if an existing base is a lexeme, regardless of its size, should be reduplicated without following the syllable-sized restriction.

(27)	Noun	>	Adverb _{Frequency}
i.	<i>hkana</i>		<i>hkana-hkana-pye[?]te</i>
	‘moment’		‘(it) goes wrong every moment - frequently’
ii.	<i>ne</i>		<i>ne-ne-cweiate</i>
	‘a little’		‘(One) has to feed (them) a little at one time – little by little.’

However, I argue against Okell’s view that when a base itself is a compound word, consisting of two syllables, only the first syllable will be reduplicated to convey frequency. Substantial evidence comes from Section 3.2.1, where a given base is a genuine compound word; the whole compound undergoes reduplication to convey frequency, not just the first syllable. I argue that the data in this section should be treated in a way that reduplication takes place prior to suffixation of particles. The case of (27.i) can be considered to be robust evidence showing that if a base is disyllabic in the lexicon, two syllables in this base cannot be discontinuously reduplicated as **hka-na-hka-na-pye[?]te*.

3.2 *Foot-Based Reduplication*

3.2.1 *RED_{Frequency2}*

Burmese also displays another reduplication pattern of conveying frequency, in which the base is disyllabic, as illustrated below. It is noted that the output from the reduplication is accompanied with a verb in order to express an intact meaning.

- | | | | |
|------|----------------------------------|---|--|
| (28) | Noun-Number | > | Adverb _{Frequency} |
| i. | <i>ta-hce</i>
'one stroke' | | <i>ta-hce-ta-hce nate</i>
'(It) hurts every now and then- intermittently' |
| ii. | <i>ta-hka</i>
'one time' | | <i>ta-hka- ta-hka tweite</i>
'(I) meet (her) sometimes' |
| (29) | Noun-Quantifier | > | Adverb _{Frequency} |
| i. | <i>ein-tain</i>
'every house' | | <i>ein-tain-ein-tain-ma hyite</i>
'there is (one) in every house.' |
| ii. | <i>lu-tain</i>
'everyone' | | <i>lu-tain-lu-tain meite</i>
'(He) asks everyone.' |

It should be borne in mind that the reduplicating behavior of *RED_{Frequency2}* is markedly different from that of *RED_{Disjunctive-Distributive}*, where reduplication proceeds on a syllable-size basis. That is, in the case of *ta-hce* 'one stroke' in (28.i), the attested output is *ta-hce-ta-hce* rather than **ta-ta-hce-hce*. A major difference is that bases in *RED_{Disjunctive-Distributive}* are whole units specified as lexemes in the lexicon, whereas bases in *RED_{Frequency2}* are compound nouns, not constructed in the lexicon. A word of clarification is that *RED_{Frequency2}* is similar to *RED_{Frequency1}* in conveying the same function, but operations for their patterns of reduplication are different.

Similar patterns of reduplication can be found in the following two data sets, where verbs can be suffixed with quantifiers in (30) and adverbs in (31) to serve the frequency function of reduplication.

- | | | | |
|------|--|---|---|
| (30) | Verb-Quantifier | > | Adverb _{Frequency} |
| i. | <i>tweit-tain</i>
'every time (we) meet' | | <i>tweit-tain-tweit-tain-pyote</i>
'(He) tells (me) every time (we) meet.' |
| ii. | <i>ca-tain</i>
'every time (I) hear (it)' | | <i>ca-tain-ca-tain-lunte</i>
'(I) feel sad every time (I) hear it.' |

- | | | | |
|------|-------------------------------------|---|--|
| (31) | Verb-Adverb | > | Adverb _{Frequency} |
| i. | <i>thin-yin</i>
'while learning' | | <i>thin-yin-thin-yin-ne tjwe[?]late</i>
'(You) become more fluent as (you) go on learning' |
| ii. | <i>thwa-yin</i>
'while going' | | <i>thwa-yin-thwa-yin sinsate</i>
'(He) used to think (it) over as (he) went along.' |

3.2.2 RED_{Diversity}

The fourth function of reduplication is to convey diversity (plurality), or multiplicity in nouns, as illustrated below.

- | | | | |
|------|--------------------------------|---|---|
| (32) | Noun | > | Noun _{Diversity} |
| i. | <i>bathu</i>
'who' | | <i>bathu-bathu lathale</i>
'Who (were the various people who) came?' |
| ii. | <i>batei</i>
'what(things)' | | <i>batei-batei wethale</i>
'What (various things) have you bought?' |
| iii. | <i>ne</i>
'district' | | <i>ə-ne-ne</i>
'many districts' |
| iv. | <i>pyei</i>
'country' | | <i>ə-pyei-pyei</i>
'many countries' |
| v. | <i>myou</i>
'kind' | | <i>ə-myou-myou</i>
'many kinds' |
| vi. | <i>ywa</i>
'village' | | <i>ə-ywa-ywa</i>
'many villages' |

Reduplication in RED_{Diversity} is different from RED_{Distributive-Disjunctive} and RED_{Frequency1} in that disyllabic bases in RED_{Diversity} are fully reduplicated not on a syllable-sized basis. In the case of (32.i), the attested output is *bathu-bathu lathale* rather than **ba-ba-thu-thu lathale*. Thus, RED_{Diversity} runs parallel to RED_{Frequency2}.

3.3 Summary

(33) summarizes the patterns of reduplication introduced in this section.

(33)

	Syllable-Based Reduplication	Not Syllable-Based Reduplication
RED _{Disjunctive-Distributive}	✓	✗
RED _{Frequency1}	✓	✗
RED _{Frequency2}	✗	✓
RED _{Diversity}	✗	✓

As discussed in the previous sections, a possible reason for making reduplication not follow a syllable-size RED constraint has to do with whether a given base itself is an intact unit, precisely a lexeme specified in the lexicon, or a compound base with other affixes. It is apparent that affixation blocks syllable-size reduplication from taking effect, as generalized in (34).

(34) Generalizations of the size of the RED

a. RED = σ

The RED is syllable-sized iff the base for reduplication has not undergone any affixation before reduplication.

b. RED \neq σ

The RED is NOT syllable-sized iff the base for reduplication has undergone any affixation before reduplication.

One piece of evidence supporting this generalization comes from an alternation in (35).

- (35)
- | | | | |
|-----|------------------------------|---|------------------------------|
| i. | Verb | > | Adverb _{Frequency1} |
| | <i>thwa</i> | | <i>thwa-thwa</i> |
| | ‘go’ | | ‘keep going’ |
| | | | (Okell 1969: 35) |
| ii. | Adverb _{Frequency1} | > | Adverb _{Frequency2} |
| | <i>thwa-thwa</i> | | <i>thwa-thwa-thwa-thwa</i> |
| | | | ‘keep going on and on’ |
| | | | (Okell 1969: 35) |

(35i) instantiates RED_{Frequency1}, whereas (35ii) RED_{Frequency2}. After *thwa-thwa* as an adverb is formed via RED_{Frequency1}, this complex base can be reduplicated again to convey a great degree of frequency in (35ii). A contrast between (35i) and (35ii) displays what has been observed so far with respect to whether the base is a lexeme specified in the lexicon or a compound word which

has undergone any affixation before reduplication. I argue that this contrast plays a crucial role in postulating two hierarchies of constraint rankings motivated in Burmese reduplication.

Granted the descriptive observations made above and the problems stated in Section 3.1.1.1, this paper attempts at scrutinizing the RED size and its placement by recruiting a set of correspondence constraints and adjacency constraints in order to eliminate redundancies in postulating languages-specific constraints, such as $RED = \sigma$, but retain the same empirical coverage.

4. Reduplicant Size and Alignment: ADJACENCY BR

In this section, I will begin with a brief review of Lunden's re-account of Maranz's Generalization (2004) within the Optimality Theory framework, and ADJACENCY-BR constraints will be introduced. I will argue that reduplication in Burmese should be analyzed as instantiating locality in the sense of Maranz or adjacency in Lunden (2004). Namely, the RED intends to be adjacent to its base without other intervening materials. This merits the lack of robust evidence for directionality of the RED placement. An immediate consequence is that alignment constraints play no role, or, in other words, are low-ranked.

4.1 ADJACENCY BR and Discontinuous Reduplication

Maranz (1982) generalizes about several tendencies of reduplication as in (36).

(36) Maranz's Generalization (Maranz 1982:447)

In the unmarked case, reduplicating prefixes associates with melodies [(segment)-AL] from left to right, reduplicating suffixes from right to left.

Lunden (2004) considers Maranz's Generalization to be a statement of explicit directionality and implicit locality, and interprets it as the locality generalization in which reduplicants are usually adjacent to the segments of the base with which they stand in correspondence. To incorporate Maranz's Generalization into the OT framework, where directionality is absent, Lunden (2004) proposes a constraint family, which can motivate and predict the locality generalization, as illustrated below.

(37) ADJACENCY BR family constraints

- a. ADJACENCY BR-BY-SEG:
Every segment in the reduplicant is next to its correspondent base.
- b. ADJACENCY BR-BY- σ :
Every syllable in the reduplicant is next to its correspondent base.

- c. ADJACENCY BR-BY-Foot:
Every foot in the reduplicant is next to its correspondent base.

Tableau in (38) shows hypothetical examples of satisfaction and violations of the ADJACENCY BR constraints.

(38)

	ADBR-BY-SEG	ADBR-BY- σ	ADBR-BY-Foot
a. $\text{ga-}\underline{\mathbf{b}}\text{-badu}$			
b. $\underline{\mathbf{ga}}\text{-gabadu}$	*		
c. $\underline{\mathbf{gaba}}\text{-gabadu}$	*	*	
d. $\text{gabadu-}\underline{\mathbf{ga}}$	*	*	*

In the above tableau, the size of a RED depends on which AD BR the RED satisfies; for example, satisfaction of AD BR-BY-SEG selects a segmental RED, $\text{ga-}\underline{\mathbf{b}}\text{-badu}$, and satisfaction of ADBR-BY- σ attests $\underline{\mathbf{ga}}\text{-gabadu}$. Moreover, the ADJACENCY BR constraints are ranked in a stringent relation: violation of AD BR-BY-Foot entails violation of AD BR-BY-SEG and ADBR-BY- σ . Lunden claims that the postulation of ADJACENCY BR constraints in the grammar gives rise to a consequence that *anchoring and alignments referring to the same edge is simply a coincidence*; instead, it is ADJACENCY BR family constraints that tie the anchoring requirement to the placement of the RED.

Furthermore, Lunden extends her proposal by stating a tension between the ADJACENCY BR constraints and the constraint MAX BR in imposing restrictions on the RED size, as instantiated in (39).¹³

(39) Reduplicant size

- a. Full reduplication
MAXBR >> ADBR-BY-SEG, ADBR-BY- σ , ADBR-BY-Foot
- b. Segment RED
ADBR-BY-SEG >> MAXBR

¹³ The reviewer indicates that a OT constraint is needed to motivate the promotion of ADBR-BY-SEG in (39c) or ADBR-BY-Foot in (39d), compared with these two constraints in (39a). However, one of the major merits of Lunden's proposal is that the RED size is regulated by a tension between MAXBR and one of the three constraints in (37). When one of the ADJACENCY constraints is parameterized to be ranked to a higher order than the other two, and interact with MAXBR in a certain way, a target output can be selected. This might eliminate any extra postulation of a constraint responsible for the promotion of a certain ADJACENCY constraint in the sense of Lunden.

- c. Syllable RED
ADBR-BY- σ >>MAXBR >> ADBR-BY-SEG
- d. Foot RED
ADBR-BY-Foot >>MAXBR >> ADBR-BY-SEG, ADBR-BY- σ

In line with the tension stated in (39), if a hypothetical language is parameterized to follow the ranking in (39c), then the RED is syllable-sized, as instantiated in the tableau below.

(40)

Input: /RED+gabadu/	ADBR-BY-Foot	ADBR-BY- σ	MAXBR	ADBR-BY-SEG
a. ga- <u>b</u> -badu			g,a,a,d,u!	
b. ^o ga-gabadu			b,a,d,u	*
c. <u>gaba</u> -gabadu		*!	d,u	*
d. <u>gabadu</u> -gabudu	*!	*		*

(Lunden 2004:17)

In (40), MAX BR is dominated by AD BR-BY-Foot and ADBR-BY- σ , both of which give rise to an incomplete size of the RED as the optimal output. In addition, there is no ranking relation between AD BR-BY-Foot and AD BR-BY- σ . Satisfaction of ADBR-BY- σ entails satisfaction of ADBR-BY-Foot; thus a smaller size syllable can be derived, namely Candidate (40b) *ga-gabadu*.

In brief, the ADJACENCY BR constraints can be ranked in a certain way to motivate a smaller size of the RED. This is because the segments of a smaller RED will be closer to their correspondents in the base than those of a larger RED. This motivation subsumes what is offered by two size restrictor constraints in the OT, All- σ –Left and ALL-Feet-Left, which force all syllables or feet respectively to occur at the left edge of the base. Along the line of a tension between ADJACENCY BR constraints and MAXBR in regulating the RED size, Lunden points out that a RED is able to satisfy an ADJACENCY BR constraint and better satisfy MAX BR if it instantiates *discontinuous reduplication*. Take discontinuous reduplication in Mandarin for example. Adjectival reduplication in Mandarin is a case where ADBR-BY- σ is satisfied by a syllabic RED. Data of this sort are provided in (41). Lunden cited the data in (40) from Zhang (1987).

(41) Mandarin

- i. *ganjing* > *gang-gang-jing-jing*
'clean' 'quite clean'

- ii. *gaoxing* > *gao-gao-xing-xing*
 ‘happy’ ‘quite happy’
- iii. *qinchu* > *qin-qin-chu-chu*
 ‘clear’ ‘quite clear’

Similar to reduplication in Burmese, the RED in Mandarin adjectival reduplication is syllable-sized. A bird view of (42a), for example, makes it hard to determine whether the first syllable *gan* or the second one *gan* in the output is a base or a RED. Nevertheless, these bases or REDs are adjacent to each other without any intervening segment. The tableau in (42) illustrates the rankings of ADJACENCYBR and MAXBR, and how an optimal output wins.

(42) Mandarin *gangangjingjing* ‘quite’

Input: /RED+ganjing/	MAXBR	* COMPLEX	ADBR-BY- σ	CONTBR
a. \curvearrowright <u>gan-gan-jing-jing</u>				*
\curvearrowright gan- <u>gan-jing-jing</u>				*
\curvearrowright <u>gan-gan-jing-jing</u>				*
\curvearrowright gan- <u>gan-jing-jing</u>				*
b. gan-jing-gan-jing			*!	
c. gan-gan-jing	j!ing			
d. ggaangngnjijingng		*!***		*

(Lunden 2004: 23)

Candidate (42a) wins but it includes four possible combinations. What is of our immediate concern is that a commonality between all the possibilities is that each syllable-sized RED is adjacent to its individual corresponding base. Which possible output in Candidate (41a) actually wins depends on several unknowns. While all the four forms violate CONTIGUITYBR, the first two forms are worse since both the RED and the base are discontinuous. To decide which form is the optimal candidate, Lunden suggests that alignment and/or input-output anchoring constraints could shed light on this puzzle. In view of discontinuous reduplication, to satisfy both a particular ADJACENCY BR constraints and MAXBR, the monosyllabic syllabic RED must violate CONTIGUITY BR.

Assuming a family of ADJACENCYBR constraints and explaining how they interact with MAX BR under a tension in regulating the RED size, I will show that reduplication in Burmese is virtually subject to ADJACENCY BR constraints. Moreover, the first two types of reduplication in Section 3 (that is, Section 3.1 and 3.2) are instances of discontinuous reduplication where the syllable-sized RED must be adjacent to its corresponding base.

4.2 Alignment: Rightward or Leftward?

In the preceding section, it is noted that the inclusion of CONTIGUITY BR constraints fails to pick the optimal candidate in the case of Mandarin adjectival reduplication; in this light, alignment constraints are needed in order to determine the placement of the RED. Nevertheless, I will show that there is no robust evidence showing whether the alignment of the RED is rightward or leftward in the case of Burmese reduplication.

First, note that Burmese allows Neg(ation)-V compounds to derive the RED Disjunctive-Distributive, in which the verbal base is reduplicated, as illustrated in (43).

- | | | | |
|------|-------------------------|---|------------------------|
| (43) | Negative-Verb/Adjective | > | Adverb (NEG-V-one-V) |
| i. | <i>ma-chin</i> | | <i>ma-chin-ta-chin</i> |
| | ‘not sour’ | | ‘not quite sour’ |
| ii. | <i>ma-eik</i> | | <i>ma-eik-ta-eik</i> |
| | ‘not sleep’ | | ‘not quite asleep’ |
| iii. | <i>ma-pyei</i> | | <i>ma-pyei-ta-pyei</i> |
| | ‘not full’ | | ‘not quite full.’ |
- (Khin 1978: 44-45)

At first glance, one might argue that if the base *ma-chin* ‘not sour’ in (43i), for instance, is the input that will be exposed to a reduplication operation, the RED *chin* must be right-aligned with the edge of the base to derive *ma-chin-one-chin*.¹⁴ Nonetheless, this line of reasoning is problematic. As discussed previously, grammatical morphemes, particles suffixed with verbal bases for example, are not within the domain to which the reduplication operation applies. On this view, (43i) can be derived in two ways, as summarized in (44-45).

- (44)
- The base *chin* is reduplicated as the RED.
 - The RED is right-aligned with the base as *chin*_{BASE}-*chin*_{RED},
 - The negation morpheme is prefixed to *chin*_{BASE}-*chin*_{RED}, as *ma-chin*_{BASE}-*chin*_{RED}
 - The numeral *ta* ‘one’ is inserted between the base and the RED,
as *ma-chin*_{BASE}-*ta-chin*_{RED}.

¹⁴ The insertion of a numeral *ta* ‘one’ in these compounds remains a piece of the jigsaw so far. I have no satisfactory solution to this puzzle at the moment. Though the reduplication data in Section 3 clearly show that a RED must be adjacent to its base without any intervening material, this adjacency is reminiscent of Lunden’s a set of ADJACENCY constraints. Yet, there is an independent reason to argue that the ADJACENCY constraints are violable on some occasion. I will leave this issue for further research.

(45)

- a. The base *chin* is reduplicated.
- b. The RED is left-aligned with the base as *chin*_{RED}-*chin*_{BASE},
- c. The negation morpheme is prefixed to *chin*_{RED}-*chin*_{BASE}, as *ma-chin*_{RED}-*chin*_{BASE}
- d. The numeral *ta* ‘one’ is inserted between the base and the RED,
as *ma-chin*_{RED}-*ta-chin*_{BASE}.

Clearly, either the rightward or leftward alignment of the RED with the base derives the identical output. Thus, resorting to the alignment constraints, ALIGN-RED -R /L, sheds no light on the placement of the RED.

Second, consider minor tonal changes in reduplication. Khin (1978) observes that there are tonal changes (level tones)¹⁵ in Burmese reduplication, as summarized below.

(46)

- a. **Tone 1.** When a syllable with Tone 1, (which is a weak fall,) is reduplicated, there is no tonal change on the second syllable.
- b. **Tone 2.** When a syllable with Tone 2 is pronounced in combination with its reduplication, the stress is usually on the first syllable.
- c. **Tone 3.** When a syllable in Tone 3 is reduplicated, the high pitch of the first syllable is maintained until the second syllable is reached and the fall is within the second syllable.

What matters to us is (46b) and (46c), since (46a) does not provide a crucial clue for the alignment issues. Tones bear a close phonological relation with stress assignment in Burmese. Okell (1968) makes a generalization that a pitch of a syllable in one of the two low-tone syllables or high-tone syllables is lowered, causing such syllable to be unstressed. This is activated in order to ensure a high-low tonal pattern. Granted Okell’s generalization, (46b) and (46c) both point to a tonal pattern that the second syllable of a given syllable pattern BASE-RED or RED-BASE must be unstressed. In view of these tonal changes, it is clear that rules of tonal changes apply only after reduplication has taken place in order to ensure that (46b) and (46c) are strictly obeyed. More specially, if the output that has undergone a reduplication operation does not display a high-low tonal pattern, phonological rules or constraints in (46b-c) must be motivated as a last resort to ensure the proper output. Granted the line of reasoning above, the

¹⁵ Three level tones are identified by Okell (1978:11), *heavy tone*, *creaky tone*, and *stop tone*. However, other studies point to four level tones in Burmese, including Jenks (2007) or Green (1995).

reduplication operation and the tonal changes are motivated at two disparate levels. Thus, the tonal changes cannot be treated as evidence or cues in support of any alignment constraint.

4.3 The proposal

In this section, I will present my analysis of the Burmese reduplication in light of Lunden's ADJACENCY BR constraints.

4.3.1 AD BR-by-SYLLABLE: RED_{Disjunctive-Distributive} & RED_{Frequency1}

As discussed in Section 3, I have shown that RED_{Disjunctive-Distributive} and RED_{Frequency1} belong to the same type of reduplication, in which a RED is always syllable-sized regardless of the size of a base. I argue that this syllable-based shape is due to a tension between ADJACENCY-BY- σ and MAX-BR, which imposes a restriction on the size of a RED. Tableau in (47) shows how a RED_{Disjunctive-Distributive} wins over other candidates.

(47)

Input: /RED, RED, sin-sa/ 'to think'	MA X- BR	AD- BY- σ	CONT-BR
a. \curvearrowright sin- sin -sa- sa			*
b. sin- si -sa- sa	*		
c. sin-sa- sin - sa		*	
d. \curvearrowright sin -sin- sa -sa			*

In (47), there is no dominant ranking relation between ADJACENCY-BY- σ and MAX-BR. The reverse of them produces the same result; that is, the RED must be syllable-sized, and every segment of the RED must correspond to that of its base. Candidate (47b) is ruled out by MAX-BR because a segment /n/ is reduplicated, and Candidate (47c) is ruled out because the second RED *sa* is not adjacent to its base, thus violating AD-BY- σ . The remaining candidates (47a) and (47d), however, are the optimal candidates because the REDs are adjacent to their base at the expenses of CONT-BR.

The constraint ranking in dealing with RED_{Disjunctive-Distributive} above can also apply to RED_{Frequency1}, as illustrated in (48).

(48)

Input: /RED, win/ 'to enter	MAX-BR	AD-BY- σ	CONT-BR
a. \curvearrowright win- win			
b. \curvearrowright win -win			
c. wi -win	*		

As one might notice, a sharp contrast between (47) and (48) is that CONTIGUITY-BR is violated anyway if a base is disyllabic. Reduplication at the expense of a correspondence constraint, CONTIGUITY-BR, is what Lunden terms as discontinuous reduplication, where REDs in a prosodic word are not adjacent to each other but their bases. (47) instantiates discontinuous reduplication.

4.3.2 ADBR-by-Foot: $Red_{Frequency2}$ & $Red_{Diversity}$

Sharply differing from $RED_{Disjunctive-Distributive}$ and $RED_{Frequency1}$, $RED_{Frequency2}$ and $RED_{Diversity}$ involve reduplication of more than one syllable as a whole, which amounts to saying that the constraint AD-BY- σ has no effect on regulating the RED size. To pin down the RED size, I argue that AD-BY-Foot must outrank AD-BY- σ to ensure that the RED in point is foot-sized and still stays adjacent to its base. Tableau (49) exemplifies the ranking of $Red_{Frequency2}$.

(49)

Input: /RED, thwa-yin/ 'while learning'	MAX-BR	AD-BY-Foot	CONT-BR
a. \curvearrowright thwa-yin- thwa-yin			
b. thwa- thwa-yin-yin		*	
c. \curvearrowright thwa-yin -thwa-thin			
d. thwa-yin- thwa-in	*		

As shown above, the tension between MAX-BR and AD-BY-Foot determines the disyllabic size of the RED *thwa-yi*, and ensures that it is adjacent to the base *thwa-yin*. Candidate (49b) is fatal because the REDs, *thwa* and *yin*, are reduplicated on the syllable-sized basis and this type of reduplication violates AD-BY-Foot, though satisfying MAX-BR. Still, the two candidates (49a) and (49c) win at the same time.

The same line of thinking in (49) also applies to $RED_{Diversity}$, as illustrated in Tableau (50).

(50)

Input: /RED, bathu/ 'who'	MAX-BR	AD-BY- Foot	CONT-BR
a. \hookrightarrow bathu- bathu			
b. \hookrightarrow bathu -bathu			
c. ba -bathu	*		
d. bathu- ba - thu		*	

A sharp contrast is that when the RED is syllable-sized, CONTIGUITY-BR is violated, or otherwise. Such constraint violation is markedly different from what has been shown in Tableau (47).

In the spirit of Lunden's proposal, RED_{Frequency2} and RED_{Diversity} are not instances of discontinuous reduplication. The reason for this is attributable to a higher-ranked constraint AD-BY-Foot, which has targeted the size of a disyllabic compound base, motivated a complete copy of it and maintained an adjacent relation. Thus, CONTIGUITY-BR is not violated. By contrast, if AD-BY- σ outranks CONTIGUITY-BR, the latter must be violated anyhow, because each RED is expected to be adjacent to its base, thus yielding discontinuous reduplication. Such ranking relation can be stated in a hierarchy in (51).

- (51) Discontinuous reduplication
AD-BY-Foot >> CONTIGUITY-BR

4.4 Summary and General Discussion

In Section 4.3, I have argued for the two hierarchies of constraint rankings that can best capture Burmese reduplication, as represented in (52).

- (52) a. RED_{Disjunctive-Distributive} and RED_{Frequency1}
MAX-BR, AD-by- σ
>>CONTIGUITY-BR
- b. RED_{Frequency2} and RED_{Diversity}
MAX-BR, AD-by-FOOT
>>CONTIGUITY-BR

Highest-ranked constraints, MAX-BR and AD-by- σ /AD-by-FOOT, are responsible for the RED size and the placement of the RED. The correspondence constraint, MAX-BR, ensures a one-to-one mapping relation between the base and the RED, while the adjacency constraint, AD-by- σ or

AD-by-Foot, restricts the RED size and the distance between the base and the RED. Put equally, these two constraints instantiate locality observed by Marantz (1992). Due to the adjacency constraints, the alignment constraints play no role in deciding the placement of the RED. Moreover, the morphemic status of a base plays an important role in motivating (52a) or (52b) with respect to reduplication; if a base itself is a lexeme in the lexicon, either monosyllabic or disyllabic, (52a) is motivated; by contrast, if the base is a derived complex compound, (52b) applies. In addition, (52a) exhibits discontinuous reduplication, similar to adjectival reduplication in Mandarin. This type of reduplication attempts to render REDs as small as possible and as close as possible to their bases.

The hierarchies in (52) lead to three welcome consequences, or properly put, merit the generalized observations from Burmese reduplication facts. First, the hierarchies in (52) merit reduplication templates generalized by Khin (1978) in (53).

- (53) a. AB > AAB
 b. AB > ABB
 c. AB > AABB
 d. AB > ABAB
 e. AB > ABAY (Y is a morpheme whose meaning is complementary or supplementary to B.)

Nevertheless, in his analysis, Khin does not consider how the regulation of REDs interfaces with phonology and morphology. (53) indeed brings to light the importance of adjacency under discussion. Following the proposed constraint rankings in (52), the above templates should be reclassified as (53a-c) as one type and (53d-e) as the other; the former resorts to (52a), whereas the latter to (52b).

Second, Khin (1978) draws an intriguing conclusion that only lexical morphemes are REDs. A natural translation of his conclusion states that grammatical morphemes, such as particles, aspects, negation markers, and so on, cannot be reduplicated. This statement supports the view I took in the previous sections that grammatical morphemes are not within the scope to which the reduplication operation applies.

Third, the RED obeys adjacency, and intends to maintain its distance to the base by disallowing insertion or deletion. This can be considered to be the emergency of the unmarked (TETU) (McCarthy and Prince 1994), which eliminated the marked structure. Such TETU phenomenon results from a tension between MAX-BR and a set of ADJACENCY constraints.

The reviewer points out that some alignment constraint, RED-PRWD-L or RED-PRWD-R, is needed to guarantee a desired output, as directly addressed in Lunden's proposal. Nevertheless,

it is observed that there is no direct empirical evidence supporting either alignment constraint and pointing to certain directionality. Tentatively, I suggest that if these two constraints are conventionally needed, they might be parameterized to be low-ranking constraints; thus, their influence cannot be deciphered in a set of high-ranking constraints, including a set of ADJACENCY constraints and MAX BR. I will leave this issued for further research.

5. Concluding Remarks

This paper has attempted to provide an OT analysis of full reduplication in Burmese and issues involved in dealing with it. In light of Lunden's ADJACENCY constraints (2004), I have argued for two hierarchies of constraint rankings, which regulate the size of the RED in two major types of reduplication respectively. In addition, I have suggested that adjacency plays a crucial role in blocking unattested reduplicants and inactivating a set of alignment constraints in Burmese reduplication. Moreover, the proposed hierarchies can apply to the languages of the Tibeto-Buman family of South East and South Asia, such as Tibetan (Vollmann 2009), Gangte (Abbi 1990), Meiteri (Abbi 1990), to name a few. Similar to reduplication patterns in Burmese, the RED in these languages obeys adjacency, the RED being adjacent to its base without any intervening material. It remains of interest in exploring how adjacency has a direct bearing on this typological consistency in instantiating reduplication.

This paper, however, has not thoroughly explained one set of data, in which the insertion of a syllable/element is possible after reduplication takes place. This insertion seemingly violates ADJACENCY constraints, as shown in (43), repeated in (54), where the element *ta* 'one' is inserted.

(54)

	Negative-Verb/Adjective	>	Adverb (NEG-V-one-V)
i.	<i>ma-chin</i> not-sour'		<i>ma-chin-ta-chin</i> 'not quite sour'
ii.	<i>ma-eik</i> 'not sleep'		<i>ma-eik-ta-eik</i> 'not quite asleep'
iii.	<i>ma-pyei</i> 'not full'		<i>ma-pyei-ta-pyei</i> 'not quite full. (Khin 1978: 44-45)

These exceptions point out that adjacency at some level can be violated or outranked by other constraints. I will leave this issue for another occasion.

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