Discontiguous Reduplication

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Abstract

McCarthy & Prince (1995) outline a theory of reduplication in which segments in the reduplicant stand in correspondence with segments in the base. Discontiguous partial reduplication patterns, in which a string of segments in the reduplicant corresponds with a discontiguous string of segments in the base, have been observed in various languages in the Austronesian and Austroasiatic language families. Several such patterns show a preference for the anchoring of the segments at both edges of the base, as in the Semai example pajaɲ ➪ $\underline{\text{p}_1\text{ɲ}_5}$-$\text{p}_1\text{ajaɲ}_5$ "appearance of being disheveled." In this paper, I propose that edge-anchoring discontiguous reduplicants arise as a result of fundamental constraints on phonological properties of particular languages, arguing for what I call the *Reduction Model* of discontiguous reduplication, formulated in Optimality Theory (Prince & Smolensky 1993/2004). Under this model, discontiguous reduplicants are shown to be derivable from maximal prosodic constituents, which are reduced in size due to language-particular phonological requirements on sonority sequencing, syllable structure, prosodic correspondence, and positional faithfulness. I show how the interaction of these constraints with Contig-BR and constraints on reduplicant size yields discontiguous base-reduplicant correspondence strings in three languages: Type V/VI reduplication in Nakanai, Expressive reduplication in Semai, and Type III reduplication in Ulu Muar Malay. Furthermore, I argue that reference to the right edge of the base is not necessary to yield right-anchoring in any of these patterns (contrary to Hendricks 2001 and Nelson 2003), but that right-anchoring falls out from the same language-particular phonological requirements that limit reduplicant size.

1 Reduplication and Optimality Theory

1.1 Reduplication and Prosodic Templates

Reduplicative morphemes are found in many languages throughout the world. Unlike regular mor-

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phemes, reduplicative morphemes lack segmental material in their lexical entries. McCarthy & Prince (1986) and Steriade (1988) outline a process by which the timing slots in a reduplicative affix are linked to copied segmental material from the base, rather than to fixed material as specified in the lexical entry. Despite certain variation in the segmental material that a particular reduplicative affix may contain, the affix ordinarily does not vary in its prosodic structure — i.e., partial reduplicants[1] are typically confined to a given number of moras, syllables, or feet, whereas total reduplicants are copies of an entire prosodic word.

To illustrate, consider several possible reduplication patterns of the hypothetical root /tepanak/ below.[2]

(1) Some potential reduplicant prefixes derived from the hypothetical root te.pa.nak

a. RED=σ; $\underline{t_1e_2}$-t_1e_2.pa.nak

b. RED=$\sigma_{\mu\mu}$; $\underline{t_1e_2p_3}$-$t_1e_2.p_3$a.nak

c. RED=foot; $(\underline{t_1e_2.p_3a_4})_{foot}$-$(t_1e_2.p_3a_4)_{foot}(nak)_{foot}$

d. RED=PWd; $\underline{t_1e_2.p_3a_4.n_5a_6k_7}$-$t_1e_2.p_3a_4.n_5a_6k_7$

In (1a), RED's template is defined as a syllable, so the reduplicant morpheme's output must be exactly one syllable in length. The output form, $\underline{t_1e_2}$-t_1e_2.pa.nak satisfies this template since te forms a syllable. Similarly, the template is defined as a heavy syllable — or $\sigma_{\mu\mu}$ — in (1b), and the output form $\underline{t_1e_2p_3}$-$t_1e_2.p_3$a.nak again satisfies this template since $t(e)_\mu(p)_\mu$ is a heavy syllable. Next, the reduplicant must be foot-sized to satisfy the template in (1c), and $(\underline{t_1e_2.p_3a_4})_{foot}$-$(t_1e_2.p_3a_4)_{foot}(nak)_{foot}$ is a licit output form since $(te.pa)_{foot}$ is a foot. Finally, (1d) features an example of total reduplication, where each segment in the entire prosodic word stands in correspondence with a segment in the reduplicant prefix.

Languages tend to define the shape of their reduplicant morphemes according to prosodic categories, as in (1). For this reason, many recent generative theories of partial and total reduplication — whether formed within early Optimality Theory (Prince & Smolensky 1993/2004; henceforth OT) or within a framework that hinges on serial rule application — have relied on some instantiation of templatic morphology to explain the prosodic regularity of the numerous variants a particular reduplicative affix. In defining the input of RED as a prosodic template, linguists have been able to shed light on the prosodic consistency and segmental variation that reduplicant morphemes exhibit: the entire base is copied in its totality, and then the copy is constrained (if necessary) to satisfy the template (McCarthy & Prince 1986, Steriade 1988).

1.2 An Optimality Theoretic Approach

At the advent of OT, prosodic templates were imported from older analyses of reduplication as violable constraints. An OT constraint such as RED=σ — which specifies that the reduplicant be exactly one syllable in length — could be violable if its violation would facilitate the satisfaction of a constraint ranked higher, such as MAX-BR, which penalizes segments in the base that have no correspondent in the reduplicant. However, since the shape of words is defined by language-particular rankings of general constraints in OT, there was no reason why such stipulative templatic

[1]According to McCarthy & Prince (1994), the term "reduplicant" is attributable to Spring (1990).

[2]Corresponding segment pairs are indicated throughout this paper by the standard notation of matching numerical indices. Reduplicant morphemes are underlined in the output.

constraints should be invoked at all in order to generate the shape of reduplicant morphemes. As a result, templatic constraints of the form RED=P, where P is a prosodic category, have been conventionally abandoned in recent years in favor of more fundamental explanations of reduplicant shape.

In OT, reduplication is no longer thought of in terms of segment-copying — indeed, OT is a nonderivational framework. Instead, segments in the reduplicant form a *correspondence relation* with segments in the base. Current accounts of partial reduplication presented in OT have favored deriving the shape of the reduplicant through interaction of constraints on this base-reduplicant correspondence relation (McCarthy & Prince 1995a; abbreviated as BR-correspondence) with generalized alignment constraints (McCarthy & Prince 1993b) and phonological markedness constraints. BR-correspondence constraints are invoked to explain the apparent "copying" of segments in the reduplicant from segments in the base. Such constraints may be violated if segments in the base do not have correspondents in the reduplicant (formalized as MAX-BR) or if featural content of segments in the reduplicant do not match those of their correspondents in the base (formalized as the IDENT-BR family of constraints). Furthermore, the OT constraint CONTIGUITY-BR (cf. I-CONTIG and O-CONTIG: McCarthy & Prince 1995a), when ranked highly, assures that the correspondent base forms a contiguous string. That is, if S_1, S_2, and S_3 are contiguous segments in a base ...$S_1S_2S_3$... and if S_1 and S_3 have correspondents in the reduplicant, then S_2 must have a correspondent in the reduplicant as well.

Each of these constraints, along with a mini-tableau illustrating its utility (again using hypothetical bases), is defined below in (2) – (4).

(2) MAX-BR (McCarthy & Prince 1995a; cf. McCarthy & Prince 1993b): Let $\mathfrak{R}$ be a base-reduplicant correspondence relation, where S_1 is the domain of $\mathfrak{R}$ (the base) and S_1 is the codomain of $\mathfrak{R}$ (the reduplicant). Each segment in S_1 must have a correspondent in S_2. [Informal definition: segments in the base should not be deleted in the reduplicant.]

		RED-/tep/	MAX-BR
	a.	$\underline{t_1e_2}$-t_1e_2p	*!
☞	b.	$\underline{t_1e_2p_3}$-$t_1e_2p_3$	

Tableau 1: MAX-BR prohibits deletion of base segments in the reduplicant.

(3) IDENT-BR (McCarthy & Prince 1995a): Let F be a phonological feature, and let $\mathfrak{R}$ be a base-reduplicant correspondence relation, where S_1 is the domain of $\mathfrak{R}$ (the base) and S_1 is the codomain of $\mathfrak{R}$ (the reduplicant). For every segment α in S_1 that corresponds to a segment β in S_2, if α is specified as $[\gamma F]$, then β must also be specified as $[\gamma F]$. [Informal definition: corresponding segments must have matching feature specifications.]

		RED-/tep/	IDENT[voice]-BR
	a.	$\underline{d_1e_2}$-t_1e_2p	*!
☞	b.	$\underline{t_1e_2}$-t_1e_2p	

Tableau 2: IDENT-BR prohibits unmatching features in correspondent pairs.

(4) CONTIGUITY-BR (henceforth CONTIG-BR): Let $\mathfrak{R}$ be a base-reduplicant correspondence relation, where S_1 is the domain of $\mathfrak{R}$ (the base) and S_1 is the codomain of $\mathfrak{R}$ (the reduplicant). The portion of S_1 standing in correspondence with S_2 forms a contiguous string. [Informal definition: reduplicants must stand in correspondence with adjacent segments in the base.]

		Red-/tae/	Contig-BR
	a.	$\underline{t_1e_3}$-t_1ae_3	*!
☞	b.	$\underline{t_1a_2}$-t_1a_2e	

Tableau 3: Contig-BR prohibits discontiguous BR correspondence relations.

Beyond constraining reduplicants to a particular size and shape, there is the additional issue of reduplicant placement; reduplicant affixes may surface as prefixes, suffixes, or infixes. Marantz's Generalization (Marantz 1982: 447) is a cross-linguistic observation about partial reduplicants that states that there is a strong tendency for reduplicative prefixes to use copied segmental material from the beginning of the word and for reduplicative suffixes to use copied segmental material from the end of the word. To illustrate, envision a language with maximal syllable reduplicants and consider the hypothetical base /nabar/. Marantz's Generalization predicts outputs of Red-/nabar/ to be either nab-nabar or nabar-bar, but not *bar-nabar or *nabar-nab.[3]

Making use of the base-reduplicant correspondence relation defined by McCarthy & Prince (1995a), Lunden (2003: 1-13) reformulates Marantz's Generalization within OT by utilizing categorical Adjacency-BR constraints — quantized to segments, syllables, and feet — which penalize the occurrence of the relevant segmental or prosodic unit between the reduplicant and its correspondent base. Under this formulation, the placement of the reduplicant and direction of the correspondence relation are fundamentally connected: these constraints are satisfied when segmental material in a reduplicant prefix corresponds with segmental material at the left edge of the base and when a reduplicant suffix corresponds with the right edge of the base.[4]

An important thing to keep in mind is that Marantz's Generalization is applicable to partial reduplicants, but not to total reduplicants. Since the correspondent base of a total reduplicant contains every segment in the base, there is no sense in which the directionality of the correspondent base can be defined as "left-to-right" or "right-to-left." As such, Marantz's Generalization makes no predictions about the placement of the reduplicant — indeed, it does not need to, given the assumption that reduplicant affixes (like ordinary affixes) are lexically determined to align as prefixes or suffixes.[5] Taking into account the nature of partial reduplicants (they correspond with only a subset of the segments that make up the base), it is important to observe that the correspondent base must form a contiguous string of segments in order for Marantz's Generaliztion to make accurate predictions about partial reduplicant morphemes in a language. If the correspondent base is discontiguous, then it is not immediately obvious that its directionality can be defined as "left-to-right" or "right-to-left," particularly if both edges of the base have correspondents in the reduplicant.

These patterns are summarized below in (5).

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[3]Nonetheless, forms like bar-nabar or nabar-nab which display "opposite edge copying" are attested in some languages, showing that Marantz's Generalization is just that: a generalization, rather than a universal principle of human language.

[4]Various theories exist regarding how reduplicant infixes are aligned. Recently, reduplicant infixes have been analyzed as reduplicant prefixes or suffixes that must be infixed to satisfy higher ranking markedness constraints that would otherwise be violated if the reduplicant were aligned at an edge. See Yu (2003) and references therein.

[5]Following the line of reasoning in the previous footnote, it is an open question whether affixes may be lexically specified to align as an infix.

(5) Some possible reduplicant patterns of a hypothetical base poma

		Reduplication Pattern	Predicted by Marantz's Generalization?
a.	$\underline{p_1o_2m_3a_4}$-$p_1o_2m_3a_4$	total reduplication	Not applicable
b.	$p_1o_2m_3a_4$-$\underline{p_1o_2m_3a_4}$	total reduplication	Not applicable
c.	$\underline{p_1o_2}$-$p_1o_2$ma	prefix copies from left	Yes
d.	$\underline{m_3a_4}$-pom_3a_4	prefix copies from right	No
e.	pom_3a_4-$\underline{m_3a_4}$	suffix copies from right	Yes
f.	$p_1o_2$ma-$\underline{p_1o_2}$	suffix copies from left	No
g.	$\underline{p_1a_4}$-$p_1$oma_4	discontiguous partial reduplication	Not yet
h.	$p_1$oma_4-$\underline{p_1a_4}$	discontiguous partial reduplication	Not yet

No apparent directionality can be observed in the base-reduplicant correspondence relations shown in (5g-h). This lack of directionality of correspondence arises because both edges of the base are anchored at the same edge in the reduplicant, yet the correspondence relation does not form a contiguous string. Speaking in OT terminology, this type of reduplication pattern would be precluded by a highly ranking Contig-BR, which would generate patterns like in (5a-e) — the patterns in which the base-reduplicant correspondence relation forms a contiguous string in Domain($\mathfrak{R}$).[6] In order to account for discontiguous reduplication patterns of the type seen in (5g-h) above, Contig-BR would need to be outranked by some more exigent constraint that somehow would otherwise be violated if the correspondent base formed a contiguous string.

1.3 The Reduction Model of Discontiguous Reduplication

In OT, constraints are taken to be universal; the grammars of all human languages contain the same set of constraints. The grammars differ only in that they may rank these constraints differently with respect to one another. On this model, the inclusion of the constraint Contig-BR in the grammar is sufficient to predict the cross-linguistic tendency for partial reduplicants to be contiguous.[7] The fact that this constraint may be ranked freely with respect to other constraints to form a grammar of a particular language predicts that discontiguous reduplicants could surface in a possible natural language: the satisfaction of Contig-BR depends on whether said satisfaction prevents violation of higher-ranked constraints. Indeed, Moravcsik (1978) has observed that reduplicant segments need not correspond with a contiguous string of segments in the base. As is standard in OT, if Contig-BR comes into conflict with another constraint ranked higher, then satisfaction of this higher constraint takes precedence over satisfaction of Contig-BR.

Discontiguous partial reduplication patterns, in which a string of segments in the reduplicant corresponds with a discontiguous string of segments in the base, have indeed been observed in various languages in the Austronesian and Austroasiatic language families, including Kammu (Svantesson 1983), Semai (Diffloth 1976a, 1976b), East Temiar (Benjamin 1976), Ulu Muar and other dialects

[6] This result echoes the result of *Tableau 3*.

[7] Throughout this paper, I refer to reduplicants as "contiguous" if their correspondent segments in the base form a contiguous string. In the same vein, I use the term "discontiguous reduplicant" to describe reduplicants whose correspondent segments in the base form discontiguous strings. Discontiguous reduplicants are always partial, as total reduplication trivially satisfies Contig-BR.

of vernacular Malay (Hendon 1966, Onn 1976, Zaharani 1988), Nakanai (Johnston 1980), and surely others. Several such patterns show a preference for the anchoring of the segments at both edges of the base, as in Nakanai, Semai, and Ulu Muar Malay, examples of which are given below in (6).

(6) Examples of discontiguous reduplication in Austronesian and Austroasiatic languages
   a. Nakanai Type V/VI Reduplication (Johnston 1980)
      i. kavu ➩ $\underline{k_1a_2u_4}$-$k_1a_2vu_4$ "wearing lime on the face"
      ii. sio ➩ $\underline{s_1o_3}$-s_1io_3 "carrying on ceremonial litter"
   b. Semai Expressive Reduplication (Diffloth 1976a, 1976b)
      i. taʔəh ➩ $\underline{t_1h_5}$-$t_1aʔəh_5$ "appearance of large stomach constantly bulging out"
      ii. ghʉːp ➩ $\underline{g_1p_4}$-$g_1hʉːp_4$ "irritation on skin (e.g., from bamboo hair)"
   c. Ulu Muar Malay Type III Reduplication (Hendon 1966)
      i. tarɪʔ ➩ $\underline{t_1a_2ʔ_5}$-$t_1a_2rɪʔ_5$ "accordion"
      ii. budaʔ ➩ $\underline{b_1ʊ_2ʔ_5}$-$b_1u_2daʔ_5$ "children"

In the all of the reduplicants represented above in (6), the correspondence relation between segments in the base and segments in the reduplicant is discontiguous. In the Nakanai data in (6a), the left edge of the base is preserved, along with one or both vowels from the base. In the Semai data in (6b), the segments at the left and the right edge of the base are preserved at the exclusion of all intervening segmental content internal to the base. And finally, in the Ulu Muar Malay data in (6c), the initial CV syllable of the base is preserved in the reduplicant, along with the segment at the right edge of the base.

The primary goal of this paper is to develop an analysis of these three superficially similar types of reduplication set within the framework of Optimality Theory, using what I call the *Reduction Model* as a set of guidelines for a successful analysis. Under the Reduction Model, the patterns of discontiguous reduplication shown in (6) share a common analysis composed of three parts, shown below in (7):

(7) Components of a Reduction Model analysis:
   a. An identified set of constraints which outrank MAX-BR, since discontiguous reduplication is partial reduplication, not total reduplication
   b. An identified set of constraints which outrank CONTIG-BR to motivate the discontiguity observed
   c. A ranking of these constraints which generates the shape of each type of reduplicant

A successful analysis of discontiguous partial reduplicants should have at least these three components in (7). First, the fact that reduplication is partial rather than total must be explained by (7a). Partial reduplicants must be restricted in size, and the nature of such restrictions must motivated by well-justified constraints. On one hand, it might be the case that the reduplicant would ordinarily be total were it not for some markedness condition licensing deletion of one or more medial segments. On the other hand, the base may first be reduced[8] to a smaller prosodic category, e.g. a maximal syllable, and then the correspondence mapping of segments in the reduplicant to

[8] This is one concrete sense in which the Reduction Model performs a form of reduction: it reduces a base to the size of a smaller prosodic category, occasionally at the expense of contiguity.

segments in the base must be explained by the next component, (7b). As we have determined that discontiguous reduplicants may surface only when the constraint Contig-BR is ranked below at least one more demanding constraint that precludes its satisfaction, it is necessary to isolate such constraints in the grammar. Finally, once a constraint ranking is achieved that permits discontiguous reduplicants to surface in a language along the lines of (7c), the shape of the reduplicant and the nature of its discontiguity are explained. I show that each of the three patterns of reduplication exemplified above in (6) have different requirements limiting reduplicant size, regulating discontiguity, and determining reduplicant shape, but that these differences can all share the properties of arising from effects of positional faithfulness (Beckman 1998/1999) and the "emergence of the unmarked" (McCarthy & Prince 1994). Parochial constraints that serve no other function than to yield discontiguity are not necessary.[9]

2 Theoretical Background

2.1 Positional Faithfulness Theory

Before I propose my analyses of Nakanai, Semai, and Ulu Muar Malay discontiguous reduplication, it is important to introduce several recurring notions that are central in these analyses, the first of which is the notion of positional faithfulness. Positional Faithfulness Theory (Beckman 1998/1999) is the idea that certain linguistic positions are privileged, playing a central role in the phonological systems of the world's languages, and that these privileged positions may be subject to faithfulness restrictions separate from those of non-privileged positions. Beckman (1999: 3) lists the privileged positions which have a perceptual advantage in the processing system as a result of psycholinguistic of phonetic prominence (over their complementary non-privileged positions). I resummarize this list below in (8).

(8) Privileged positions and their corresponding non-privileged positions (Beckman 1999: 3)

Privileged Positions	**Non-privileged Positions**
Root-initial syllables	Non-initial syllables
Stressed syllables	Unstressed syllables
Syllable onsets	Syllable codas
Roots	Affixes, clitics, function words
Long vowels	Short vowels

Beckman showcases properties of phonologically privileged positions that are not characteristic of non-privileged positions, reproduced below in (9).

(9) Phonological asymmetries diagnostic of positional privilege (Beckman 1999: 4)

a. Positional maintenance of contrasts which are neutralized elsewhere

b. Positional triggering of phonological processes

c. Positional resistance to processes which apply elsewhere

[9] This is an abstract sense in which the Reduction Model performs a form of reduction: it eliminates the need for extraneous constraints specifically conditioning discontiguity, producing an Occam's Razor-style effect on the analysis. I thank Jaye Padgett for pointing out this connection.

Beckman explains the asymmetries in (9) with a generalized positional faithfulness ranking. Positional faithfulness constraints may only be formulated to make reference to privileged positions, never to non-privileged positions. To illustrate with a simple example, consider the case of Catalan codas, which must be voiceless unless they agree in voicing with a following voiced onset.

(10) Voicing assimilation of the coda in gát "cat" (Hualde 1992, Beckman 1999: 37)
  a. gát "cat"
  b. gát trenkíl "quiet cat"
  c. gád dulén "bad cat"

Imagine a constraint ranking of AGREE(voice) ≫ *VDOBSTR — these constraints are defined below in (11) and (12).

(11) AGREE(voice) (Lombardi 1999, cf. Ito, Mester, and Padgett 1995, Pater 1999): Let α and β range over contiguous [-sonorant] segments. For all α, β, if α is [voice], then β is [voice]. [Informal definition: Obstruent clusters must agree in voicing.]

(12) *VDOBSTR: *[-son, +voice][10] [Informal definition: Voiced obstruents are prohibited.]

With AGREE(voice) ≫ *VDOBSTR, all obstruents will become voiceless because even if consonant clusters agree in voicing, fewer violations are incurred if they are specified as voiceless, as shown below in *Tableau 4*.

		/gat dulen/	AGREE(voice)	*VDOBSTR
	a.	gát dulén	*!	**
☞	b.	kát tulen		
☹	c.	gád dulen		*!**

Tableau 4: AGREE(voice) ≫ *VDOBSTR alone has no positional faithfulness effect.
☞ indicates the winner in the tableau; ☹ indicates the attested output.

Tableau 4 does not derive the actual output in Catalan. The attested output in *4*:c does surface because even though the segments in its obstruent cluster agree in voice, it incurs violations of *VDOBSTR whereas the incorrect winner, *4*:b, contains no voiced obstruents at all. These constraints do not refer to the prominence of the onset, so Beckman proposes a generalized positional faithfulness ranking to target prominent positions, given below in (13).

(13) Generalized Positional Faithfulness Ranking Schema (Beckman 1998/1999):
FAITH-PROMINENTPOSITION(F) ≫ $\mathbb{C}$ ≫ FAITH(F), where $\mathbb{C}$ is a constraint whose satisfaction may necessitate violations of FAITH(F), but not of FAITH-PROMINENTPOSITION(F).

Beckman argues that this ranking is fixed in Universal Grammar, i.e., the context-sensitive constraint FAITH-PROMINENTPOSITION(F), which is relativized to a prominent position, is ranked above the context-free constraint FAITH(F) in every language's grammar (Beckman 1999: 35ff.).

[10] As Beckman (1999: Ch 1, fn. 20) points out, this analysis is not adversely affected by the decision of whether to treat [voice] as unary or binary. Beckman further notes (1999: 29), interestingly, that if [voice] is treated as unary, then it will be impossible to formulate markedness constraints penalizing voiceless obstruents since there would be no [-voice] feature specification to penalize.

In the Catalan scenario presently under discussion, the relevant prominent position is the onset position, and the relevant feature F is [voice]. Since onsets remain faithful to the input and only codas are neutralized to satisfy AGREE(voice), the relevant constraint ℂ is *VDOBSTR. *Tableau 4* will now be revised to include the positional faithfulness ranking schema, shown below as *Tableau 5*.

	/gat dulen/	IDENT-ONSET(voice)	AGREE(voice)	*VDOBSTR	IDENT(voice)
	a. gát dulén		*!	**	
	b. kát tulen	*!*			**
☞	c. gád dulen			***	*

Tableau 5: Derivation of Catalan voicing asymmetry using positional faithfulness.

In *Tableau 5*, the completely faithful candidate 5:a is ruled out because the segments in the obstruent cluster do not agree in voice, violating AGREE(voice). The candidate with only voiceless obstruents, candidate 5:b, loses because underlyingly voiced onsets are realized as voiceless, violating IDENT-ONEST(voice). The attested output, candidate 5:c, is the winner because all onsets remain faithful to their inputs, and the obstruent cluster agrees in voicing.

In *Tableau 6 & 7*, these same conditions manifest themselves in the respective winning candidates.

	/gat/	IDENT-ONSET(voice)	AGREE(voice)	*VDOBSTR	IDENT(voice)
	a. gád			**!	
	b. kát	*!			
☞	c. gát			*	

Tableau 6: The root gat satisfies Catalan's condition that codas must be voiceless.

	/gat trenkil/	IDENT-ONSET(voice)	AGREE(voice)	*VDOBSTR	IDENT(voice)
	a. kát trenkíl	*!			
	b. gád drenkíl	*!		***	
☞	c. gát trenkíl			*	

Tableau 7: The obstruent cluster in gát trenkíl is already voiceless.

Tableau 6 shows that single words whose codas are underlyingly voiceless also contain voiceless codas in the output, while onsets that are underlyingly voiced remain voiced in the output, as is predicted. *Tableau 7* shows that underlyingly voiceless obstruent clusters do not need to be neutralized, which is also predicted.

In this subsection, I have laid out an overview of Positional Faithfulness Theory (Beckman 1998/1999). The positional faithfulness ranking schema is FAITH-PROMINENTPOSITION(F) ≫ ℂ ≫ FAITH(F), which carries over into the theory of anchoring in the next subsection. The relevant privileged phonological position that plays a role in my analyses of Nakanai, Semai, and Ulu Muar Malay discontiguous reduplication in §3-5 is the root-initial syllable. Beckman (1998: 49ff.) cites a host of research that indicates that the word-initial position plays a pivotal role in lexical access, word recognition, and speech production. This position is futher examined in the next subsection. In §6.4, implications that the analyses presented in §3-5 have for Positional Faithfulness Theory are discussed.

2.2 Asymmetric Anchoring Theory

Another key notion that is important to consider in comparing analyses of reduplication is the theory of Asymmetric Anchoring developed by Nelson (2003). This subsection contains a brief summary of the literature on anchoring constraints, as they play a central role in the following analyses of discontiguous reduplication in Nakanai, Semai, and Ulu Muar Malay.

Anchoring constraints were originally introduced into OT phonology by McCarthy & Prince (1993b, 1995a, 1995b) to account for prefixal reduplicants' tendency to anchor the left edge of the base and suffixal reduplicants' tendency to anchor to the right edge of the base. Two formulations of ANCHOR are given below in (14) and (15).

(14) ANCHOR (McCarthy & Prince 1993b):
If the reduplicant (R) prefixes to the base (B), the initial element in R is identical to the initial element in B. If the reduplicant (R) suffixes to the base (B), the final element in R is identical to the final element in B.

(15) RIGHT, LEFT-ANCHOR(S_1, S_2) (McCarthy & Prince 1995a):
Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.
Let *Edge*(X, {L, R}) = the element standing at the Edge = {L, R} of X.

- RIGHT-ANCHOR: If x = *Edge*(S_1, R) and y = *Edge*(S_2, R) then $x\mathfrak{R}y$.
- LEFT-ANCHOR: Likewise, mutatis mutandis.

The formulation of ANCHOR in (14) differs from that above in (15) in that the former draws a parallel between reduplicant alignment and the relevant edge which must be anchored, whereas the latter simply defines anchoring as holding either at the left edge or the right edge.

Taking Beckman's work as a starting point, Nelson (2003) imports the idea of positional faithfulness into the domain of base-reduplicant anchoring to account for asymmetries that do not arise in fixed-segment affixation. While Hawkins & Cutler (1988) have argued that suffixation is the unmarked alignment of fixed-segment morphemes, Nelson argues that prefixation is the unmarked alignment of reduplicant morphemes. Furthermore, she has observed that many apparent cases of right-edge anchoring appear to depend on the occurrence of left-edge anchoring.

The formulation of ANCHOR in both (14) and (15) is symmetric — reference is made to both edges of the base. The goal in Nelson (2003) is to apply the theory of positional faithfulness to the domain of anchoring so that only prominent positions are referenced in context-sensitive constraints. She reformulates the notion of anchoring to explain the preference for reduplicant prefixation as the result of positional faithfulness as applied to the base-reduplicant correspondence relation. The outcome is positional anchoring.

(16) Positional Anchoring (Nelson 2003: 6):
a. Anchoring can target the *initial* position (important for root access).
b. Anchoring can target a *stressed* position (acoustically prominent).
c. The right edge does not qualify as a target for anchoring.

Using the conditions in (16) to constrain the set of possible elements available for anchoring, Nelson argues that anchoring constraints (like other faithfulness constraints) should come in a context-sensitive and a context-free variety. The context-sensitive anchoring constraint targets the initial position of the relevant unit (base or head foot), whereas the "context-free" variety targets both edges of the same root or head foot. These constraints are defined below in (17) – (19).

(17) Left-Anchor-BR (Nelson 2003: 85): The left edge of the reduplicant corresponds to the left edge of the base.[11]

(18) Edge-Anchor-BR (Nelson 2003: 94)[12]: The segment at each edge of the base must have a correspondent at the same edge in the reduplicant.

(19) Edge-Anchor-BR$_{\text{HeadFoot}}$ (Nelson 2003: 94)[13]: The segment at each edge of the main stressed foot in the base must have a correspondent at the same edge in the reduplicant.

In §1, examples of discontiguous reduplication from Nakanai (e.g. $\underline{s_1o_3}$-s_1io_3 "carrying on ceremonial litter"), Semai (e.g. $\underline{t_1h_5}$-t_1aʔəh_5 "appearance of large stomach constantly bulging out"), and Ulu Muar Malay (e.g. $\underline{t_1a_2ʔ_5}$-t_1a_2rɪ$ʔ_5$ "accordion") were given in (6a-c), and these examples superficially appear to support the notion of edge-anchoring. In all of the reduplicants in these examples, both edges of the base have correspondents at the same edge in the reduplicant even while base-medial segments do not, thus forming a discontiguous string of corresponding segments. Thereby, Contig-BR is violated, contrary to what might be expected given the traditionally high ranking of Contig-BR in OT analyses of contiguous reduplication.

While I believe that Nelson's (2003) Positional Anchoring analysis may successfully account for these patterns of discontiguous reduplication in Austronesian and Austroasiatic languages, I also believe that a Positional Anchoring analysis misses several key observations that might explain *why* such discontiguous reduplicants might surface especially in languages like Nakanai and Ulu Muar Malay, which contain contiguous reduplicants as well. Sonority sequencing requirements, restrictions on syllable structure and unstressed vowels, and prosodic correspondence effects remain unaccounted for. In §6.3, I compare the analyses I present in §3, §4, and §5 to those in Nelson (2003) (as well as Hendricks (2001), who proposes a similar analysis of Semai using his Compression Model).

2.3 Prosodic Correspondence

Prosodic correspondence is the idea that correspondence relations should hold between segments that are syllabified in the same class of syllabic position. Prosodic correspondence has been motivated by constraints on base-reduplicant correspondence (McCarthy & Prince 1993b), base-truncatum correspondence (Benua 1995), and base-argot correspondence (Ito, Kitagawa, and Mester 1996). Essentially, when all pairs of segments that stand in correspondence with one another via some form of output-output correspondence share the same syllabic role, prosodic correspondence obtains. Under standard OO-correspondence, for example, the addition of a reduplicative

[11] Nelson (2003) does not include a constraint Left-Anchor-BR$_{\text{HeadFoot}}$ as a context-sensitive cognate of the constraint in (19). I propose in §3 that such a constraint is necessary.

[12] In the interests of space and uniformity with other faithfulness constraints on base-reduplicant correspondence, I have taken the liberty to name this constraint Edge-Anchor-BR. Nelson (2003) calls it Edge-Anchor$_{\text{Base}}$, but the definition I give is identical to Nelson's.

[13] To distinguish this constraint from the previous one Edge-Anchor-BR, I have appended Nelson's $_{\text{HeadFoot}}$ designator, but keep the naming convention the same, yielding the name Edge-Anchor-BR$_{\text{HeadFoot}}$. Again, the definition is taken directly from Nelson (2003).

affix does not alter the prosodic profile of the stem to which it attaches: onsets in the stem remain onsets once the affix is attached, nuclei remain nuclei, and codas remain codas.

To show clearly how prosodic correspondence works, take the case of Spanish diminutives discussed in Kenstowicz (2005). The Spanish data in (20) shows that the Spanish diminutive morpheme can take the form of either -sito/-sita or -ito/-ita, depending on the shape of the stem to which it attaches.

(20) Spanish diminutive allomorphy (Aguero-Bautista 1998, Kenstowicz 2005)

a. i. amor ➪ amor-sit-o "love"
   ii. balkon ➪ balkon-sit-o "balcony"
   iii. limon ➪ limon-sit-o "lemon"

b. i. koron-a ➪ koron-it-a "crown"
   ii. libr-o ➪ libr-it-o "book"
   iii. bark-o ➪ bark-it-o "ship"

The -sit allomorph is chosen when the non-diminutive base word ends in [r] or [n]; -it is chosen when the base word ends in a vowel. Kenstowicz (2005) uses the constraint Corr-Σ-Role, based on the observations in Aguero-Bautista (1998), to explain this alternation.

(21) Corr-Σ-Role: ∀x and ∀y such that x and y are segments and x$\mathfrak{R}$y, assess a violation if x and y have different syllabic roles (onset, nucleus, or coda).

To satisfy Corr-Σ-Role, the appropriate prefix is chosen to maintain prosodic correspondence between the segments in the base and the segments in the diminutive form.

		amor-DIM-o	Corr-Σ-Role
☞	a.	amor-sit-o	
	b.	amor-it-o	*!

Tableau 8: amorsito is chosen to preserve the coda status of [r], cf. amor.

		koron-DIM-a	Corr-Σ-Role
	a.	koron-sit-a	!*
☞	b.	koron-it-a	

Tableau 9: koronita is chosen to preserve the onset status of [n], cf. korona.

The form amorsito is chosen over amorito because the [r] maintains the same syllabic role it has in the base form amor (coda) and therefore remains prosodically faithful to the unaffixed form. The same holds for the form koronita: it is chosen over koronsita because the [n] maintains its syllabic role (onset) that is shared with the unaffixed form korona.

It should be noted that in the cases presented here, Corr-Σ-Role affects the output-output correspondence relation (Benua 1997/2000), preserving root segments' syllabic roles after an affix is attached. In §6.2 of this paper, the utility of Corr-Σ-Role as a constraint on the base-reduplicant correspondence relation itself is examined.[14]

[14] cf. McCarthy & Prince (1993a) for an account of reduplicant placement in Kamaiurá and Chamorro using the constraint StRole (essentially equivalent to Corr-Σ-Role), which again essentially constrains the output-output correspondence relation between the unaffixed form and the base of the reduplicated form, rather than between the base and the reduplicant. This account is also briefly discussed in §6.2.

2.4 The Emergence of the Unmarked (TETU)

The Emergence of the Unmarked (McCarthy & Prince 1994; also known as TETU) is a concept related to the infrastructure of Optimality Theory. Since constraints determine the properties of linguistic outputs, a particular linguistic form is "marked" if it violates a constraint, in constrast to an "unmarked" form which does not violate this constraint. Because constraints are ranked, a particular form may have to violate a particular constraint in order to satisfy another constraint that is ranked more highly and therefore may sometimes be marked with respect to this constraint. If the constraint is undominated, then no form in the language will be marked as such. McCarthy & Prince claim that this is the exact notion of implicational markedness that is standard in the phonological literature: some languages only have the unmarked forms, some languages have both the marked and unmarked forms, and *no* language has only the marked forms (McCarthy & Prince 1994: 333).

In the instances of reduplication discussed in sections §3-5, the majority of the TETU effects observed are analyzed according to the Reduction Model as the result of the ranking MAX-IO $\gg$ $\mathbb{C}$ $\gg$ MAX-BR. With this ranking, a candidate that is marked with respect to $\mathbb{C}$ will surface if such violation is necessary to satisfy MAX-IO. Essentially, under input-output correspondence, deletion of segments in the output cannot be invoked to prevent violations of $\mathbb{C}$. On the other hand, $\mathbb{C}$ will be satisfied in reduplicants even if such satisfaction conflicts with MAX-BR, which is ranked lower. That is, segments in the base can be deleted in the reduplicant if such deletion prevents an otherwise necessary violation of $\mathbb{C}$.

This type of TETU effect accounts for much of the analysis of why reduplicants like those in (6) are discontiguous. Discontiguous reduplicants are partial reduplicants that correspond with a discontiguous portion of the base with which they form the BR-correspondence relation, and I argue that such discontiguity is related to markedness effects arising from the TETU ranking. Many interesting TETU effects arise in the following sections, which I discuss together in §6.1.

3 Nakanai Type V/VI Reduplication

3.1 Patterns of Reduplication of Nakanai

Nakanai is a member of the Malayo-Polynesian subgroup of Austronesian languages, spoken in New West Britain, a province of Papua New Guinea. There are approximately 13,000 speakers (Wurm & Hattori 1981).

Nakanai contains two forms of reduplication which copy a discontiguous string of segments from the base to form the reduplicant, as shown below in (22) and (23) respectively.

(22) Nakanai Type V Reduplication (Johnston 1980, Spaelti 1997, Carlson 1997)

a. pati ➪ pai-pati "floating"
b. kavu ➪ kau-kavu "wearing lime on the face"
c. gapu ➪ gau-gapu "beads"
d. kedi ➪ kei-kedi "being careful"
e. sobe ➪ soe-sobe "young women"
f. gove ➪ goe-gove "mountains"

(23) Nakanai Type VI Reduplication (Johnston 1980, Spaelti 1997, Carlson 1997)
  a. pita ➪ pa-pita "muddy"
  b. beta ➪ ba-beta "wet"
  c. biso ➪ bo-biso "members of the Biso subgroup"
  d. tuga ➪ ta-tuga "depart/walk"
  e. sio ➪ so-sio "carrying on ceremonial litter"
  f. toa ➪ ta-toa "treading/kicking"

Given a $C_1V_2.(C_3)V_4$ base, both Type V and Type VI reduplicants in Nakanai contain segments which bear a correspondence relation with the initial consonant (C_1) and the final vowel (V_4), but Type V differs from Type VI in that the first vowel in the base (V_2) also has a correspondent in the reduplicant. No semantic difference is reported in the choice between Type V and Type VI reduplication (or among Types I through IV, for that matter); it is rather the case that the possible forms of the reduplicant are determined by the shape of the base, as is shown in this section.

The goal of this section is to examine these patterns of reduplication in more detail and to construct an explanatorily adequate OT analysis using the Reduction Model. As described in §1, such an analysis will have three components:

- An identified set of constraints which must outrank MAX-BR that accounts for the partiality of Type V/VI reduplication (in §3.2)
- An isolated set of constraints which must outrank CONTIG-BR to allow discontiguity (in §3.3)
- A ranking of these two sets of constraints which generates the shape of both Type V and Type VI reduplicants with an OT analysis (in §3.4).[15]

3.2 OCP Effects in Nakanai Reduplication

It was claimed in §1.3 that in order for reduplication to be discontiguous, it must be partial. In this subsection, the nature of the requirements on reduplicant size in Type V and Type VI reduplication is examined in detail.

Initially, both Type V and Type VI reduplicant length appears to be restricted to a single syllable; what appear to be heavy syllables surface in the Type V reduplicants underlined in (22) and light syllables surface in the Type VI reduplicants underlined in (23). Following Spaelti (1997) and Carlson (1997), I argue that both of these observations are indeed true: Type V reduplicants are to be analyzed as heavy syllables, while Type VI reduplicants are to be analyzed, somewhat less controversially, as light syllables. The nature of the alternation between heavy and light syllables is explored further in subsection §3.4.

[15] Many elements of my analysis are drawn from the line of argumentation presented by Spaelti (1997: Ch. 3) and Carlson (1997), which I refer the reader to, as they contain very competent analyses of Nakanai Type V and Type VI reduplication. There exists a substantial literature on these forms of reduplication, however, including Broselow & McCarthy (1983), Williams (1984), Davis (1986), Kitagawa (1986), Spencer (1991), Howe & Pulleyblank (2001), and possibly others. My contribution is to place this line of research into a larger picture of discontiguous reduplication in general, drawing ties to forms of discontiguous reduplication in Semai and Ulu Muar Malay, presented in §4 and §5, respectively.

In recent accounts of partial reduplication, syllable sized reduplicants have been generated via interaction of alignment constraints, e.g. ALIGN(Root, L, PWd, L), with MAX. To illustrate this interaction, please refer to *Tableau 10*.

	RED-/tipa/	*COMPLEX	ALIGN(Root, L, PWd, L)	MAX-BR
	a. $\underline{t_1i_2p_3a_4}$-$t_1i_2p_3a_4$		***!*	
	b. $\underline{t_1}$-$t_1$ipa	*!	*	***
☞	c. $\underline{t_1i_2}$-$t_1i_2$pa		**	**

Tableau 10: Syllable-sized reduplicant derivation with hypothetical base tipa.

In *Tableau 8*, syllable sized reduplicants are derived through interaction of ALIGN(Root, L, PWd, L) and MAX-BR. Since ALIGN(Root, L, PWd, L) ≫ MAX-BR, the optimal output will contain the fewest possible segments in the reduplicant so as to align the root as close as possible to the edge of the prosodic word. The fully faithful reduplicant in candidate *10*:a loses because it incurs more violations of ALIGN(Root, L, PWd, L) than are necessary. The single-segment reduplicant in candidate *10*:b also is suboptimal since it violates *COMPLEX: ordinarily, reduplicants must be parsed in a syllable, and a language which does not allow complex onsets should also not allow single-segment reduplicants.[16] Thus, the winner is candidate *10*:c, which contains a syllable-sized reduplicant, because the root is as close as possible to the left edge of the prosodic word, and all segmental material in the reduplicant can be parsed into a syllable.

Following Spaelti (1997), I argue that although the reduplicants in (22) and (23) are syllable-sized, they do not surface as syllables as a result of restrictions on root alignment, as sketched above in *Tableau 10*. Instead, reduplicant size is determined by the shape of the base. Consider the data below in (24), showing Nakanai Type I reduplication, a related form in which the base is reduplicated completely.

(24) Nakanai Type I Reduplication (Johnston 1980, Spaelti 1997, Carlson 1997)
  a. luku ➪ luku-luku "dig taro"
  b. ligi ➪ ligi-ligi "hurting"
  c. vore ➪ vore-vore "sway"
  d. raga ➪ raga-raga "jumping"
  e. voro ➪ voro-voro "pounding"
  f. karusu ➪ ka-rusu-rusu "ribs/battens"
  g. balava ➪ ba-lava-lava "lie"
  h. vigilemuli ➪ vigile-muli-muli "tell a story ➪ story"

Two key observations should be noted upon consideration of the Type I reduplication data in (24). First, the base for reduplication is not the entire root, but rather the rightmost foot within the root, as indicated by (24f-h). This is not surprising, as reduplication often targets the head foot within a root as this is a prominent position, and Nakanai has penultimate stress (Carlson 1997: 5). As it happens that only disyllabic roots are considered in (22) and (23), it makes no difference whether the root or the rightmost foot is identified as the base for reduplication because these roots

[16] However, cf. Shaw (1993) for discussion of single-segment minor syllable reduplicants in Semai, a language which prohibits complex onsets.

contain only one foot: the head foot. For the sake of accuracy, let us assume that constraints on the base-reduplicant correspondence relation will hold between the reduplicant and the head foot in the base.

Second, and more importantly with regard to the current discussion of how Type V and Type VI reduplicant size is determined, observe that each base in (24) contains at most one obstruent. Presumably, this fact is what leads to the possibility of total reduplication in (24), especially upon consideration of the bases for Type V and Type VI reduplication in (22) & (23). Each base in (22) & (23) — with the exception of the final two bases in (23) — contains two obstruents, namely the onset of each syllable in the base. While it is perfectly acceptable for the roots (and indeed the bases) in (22), (23), and (24) to contain more than a single obstruent, reduplicants may contain at most a single obstruent. So, if the base only contains a single obstruent, total reduplication is possible and results in Type I reduplication, whereas if the base contains more than a single obstruent, one obstruent is deleted. In this way, the base is reduced so that only one obstruent surfaces in the reduplicant. Taking these observations into consideration, at least two questions arise:

(25) What constraint (or set of constraints) limits Nakanai reduplicants such that they contain no more than a single obstruent?

(26) Which obstruent should be preserved in a reduplicant given a base with more than one obstruent?

To uphold the idea that OT constraints are universal, a satisfying solution to the question in (25) would identify one or more markedness constraints that applies to a prosodic or morphological category in general, rather than relativizing the constraint (or constraints) to apply solely to Nakanai reduplicants. The necessary theoretical machinery is already in place to restrict the co-occurrence of obstruents within Nakanai reduplicants: one needs only to appeal to the emergence of the unmarked ranking. Imagine the constraint $\mathbb{C}$ prohibits multiple obstruents within a morpheme. The ranking MAX-IO $\gg$ $\mathbb{C}$ $\gg$ MAX-BR permits multiple obstruents in output morphemes which have correspondents in the input but prohibits multiple obstruents in reduplicants that simply have correspondents in the base.

To illustrate the interaction of $\mathbb{C}$, the constraint on multiple obstruents, with MAX-IO and MAX-BR, consider *Tableau 11* and *Tableau 12* below, which generate the Nakanai Type I reduplicant in <u>ligi</u>-ligi "hurting" as well as the Nakanai Type V reduplicant in <u>kau</u>-kavu "wearing lime on the face."

	RED-/ligi/	MAX-IO	$\mathbb{C}$	MAX-BR
☞	a. $\underline{l_1i_2g_3i_4}$-$l_1i_2g_3i_4$			
	b. $\underline{l_1i_2i_4}$-$l_1i_2g_3i_4$			*!

Tableau 11: Total reduplication of ligi.

	RED-/kavu/	MAX-IO	$\mathbb{C}$	MAX-BR
	a. $\underline{k_1a_2v_3u_4}$-$k_1a_2v_3u_4$		**!	
☞	b. $\underline{k_1a_2u_4}$-$k_1a_2v_3u_4$		*	*
	c. $\underline{k_1a_2u_4}$-$k_1a_2u_4$	*!		

Tableau 12: Partial reduplication of kavu, resolving obstruent clash in the reduplicant.

The input root ligi in *Tableau 11* contains only a single obstruent, [g]. The optimal candidate *11*:a exhibits total reduplication because $\mathbb{C}$ only prohibits multiple obstruents. Since the input root contains only one obstruent, [g], this obstruent is free to surface in the reduplicant: in fact, deleting it results in ungrammaticality, as shown in candidate *11*:b. On the other hand, the input root kavu in *Tableau 12* contains two obstruents, [k] and [v] which will incur a violation of $\mathbb{C}$. Max-IO is the highest ranked constraint in this tableau, so $\mathbb{C}$'s violation must be tolerated in the root because deleting either the [k] or the [v] would incur a violation of Max-IO, e.g. in candidate *12*:c. However, since $\mathbb{C} \gg$ Max-IO, an obstruent must be deleted in the reduplicant since satisfying $\mathbb{C}$ is more important than satisfying Max-BR. As a result, multiple obstruents are permitted to surface in the root, but not in the reduplicant, as shown in the winning candidate *12*:b.

Returning to question (25), it is now time to define the constraint $\mathbb{C}$. I argue that $\mathbb{C}$ should be formulated as a locally conjoined constraint on obstruents along the lines of Ito & Mester's (2003: 37) formulation of the constraint on multiple voiced obstruents in Japanese, as shown below in (27).

(27) *2-Obs$_{\mathbb{M}}$ (cf. Spaelti 1997: 110): $*[\text{-son}]^2_{\mathbb{M}}$ (= $*[\text{-son}]\ \&_{\mathbb{M}}\ *[\text{-son}]$), or "No two obstruents per morpheme domain."[17]

For *2-Obs$_{\mathbb{M}}$ to constrain the Nakanai reduplication data appropriately, the domain should be defined as a morpheme, hence the designator $_{\mathbb{M}}$. In this way, one is able to rank *2-Obs$_{\mathbb{M}}$ to yield the emergence of the unmarked effect observed in Nakanai reduplicants, distinguishing between morphemes that bear a correspondence relation with the input (roots, lexical affixes) and morphemes that bear a correspondence relation with a reduplicative base (reduplicative affixes). A more theoretically satisfying formulation of the constraint in (27) is probably possible, but for the present purposes, this constraint will suffice to yield the desired minimizing effect.[18] The intuition that needs to be captured — that multiple obstruents cannot surface in reduplicant morphemes — is expressed well enough for present purposes with the formulation of (27) and the TETU ranking of Max-IO $\gg$ *2-Obs$_{\mathbb{M}}$ $\gg$ Max-BR.

To address the second question about this restriction on obstruents in (26), it is important to discuss why it is the base-initial obstruent that is preserved rather than the base-medial obstruent. One might predict that Contig-BR and Max-BR would insist that the reduplicant correspond with the largest possible contiguous string in the base, preferring deletion of the initial onset obstruent. However, the data in (22) and (23) shows otherwise.

The answer is simple: Left-Anchor-BR$_{\text{HeadFoot}}$ targets the left edge of the base as a prominent position, and prohibits deletion of the segment in this position. Consider *Tableau 13 & 14* below, which illustrate how Left-Anchor-BR$_{\text{HeadFoot}}$ functions to preserve the the leftmost obstruent in both Type V and Type VI reduplicants.

	Red-/kavu/	Left-Anchor-BR$_{\text{HeadFoot}}$	*2-Obs$_{\mathbb{M}}$	Max-BR
	a. $\underline{k_1a_2v_3u_4}$-$k_1a_2v_3u_4$		**!	
	b. $\underline{a_2v_3u_4}$-$k_1a_2v_3u_4$	*!	*	*
☞	c. $\underline{k_1a_2u_4}$-$k_1a_2v_3u_4$		*	*

Tableau 13: Left-Anchor-BR$_{\text{HeadFoot}}$ preserves the base-initial obstruent in Type V reduplicants.

[17] cf. Carlson's (1997: 19) constraint OCP$_{[-\text{son}]}$ which achieves an equivalent effect.

[18] cf. ProsTarg(X) (Carlson 1997, citing Gafos 1997), which states that the reduplicant must be the size of a particular prosodic constituent X, for another possible route to take.

		RED-/beta/	LEFT-ANCHOR-BR$_{\text{HeadFoot}}$	*2-OBS$_{\mathbb{M}}$	MAX-BR
	a.	$\underline{b_1e_2t_3a_4}$-$b_1e_2t_3a_4$		**!	
	b.	$\underline{t_3a_4}$-bet_3a_4	*!	*	**
☞	c.	$\underline{b_1a_4}$-b_1eta_4		*	**

Tableau 14: LEFT-ANCHOR-BR$_{\text{HeadFoot}}$ preserves the base-initial obstruent in Type VI reduplicants.

In both *Tableau 13* and *Tableau 14*, LEFT-ANCHOR-BR$_{\text{HeadFoot}}$ eliminates candidates whose reduplicants' left edges are not anchored with the left edge of the base, namely candidates *13*:b and *14*:b. Then *2-OBS$_{\mathbb{M}}$ eliminates candidates whose reduplicants contain more than one obstruent (i.e., candidates *13*:a and *14*:a), forbidding total reduplication because the bases contain multiple obstruents. The optimal outputs with discontiguous reduplicants surface as the winners, in *13*:c and *14*:c.

In this subsection, it has been established that the size of the reduplicant depends on the shape of the base. Bases containing no more than one obstruent may reduplicate completely, whereas reduplicants containing more than a single obstruent must be reduced to satisfy *2-OBS$_{\mathbb{M}}$. Thus, the partial reduplication patterns attested in Type V and Type VI reduplication are a result of the TETU interaction of *2-OBS$_{\mathbb{M}}$ with MAX-IO and MAX-BR. The ranking needed to derive the partiality of Type V and Type VI reduplication in Nakanai is shown below in (28).

(28) MAX-IO $\gg$ *2-OBS$_{\mathbb{M}}$, LEFT-ANCHOR-BR$_{\text{HeadFoot}}$ $\gg$ MAX-BR

This ranking of constraints crucially dominating MAX-BR in (28) serves as the first component of the Reduction Model of Type V and Type VI reduplication advanced in this section.

In the next subsection, the source of the discontiguity of the BR-correspondence relation is examined in more detail.

3.3 Sonority Sequencing

In this section, the nature of the discontiguity of Type V and Type VI reduplication is unveiled. It has already been established in the previous subsection that both Type V and Type VI reduplication are partial because of the restriction on having multiple obstruents in the reduplicant. The key difference between the two patterns, however, is that Type V reduplication preserves both of the base's vowels in the reduplicant, whereas Type VI reduplication preserves only the final vowel. That is, given a base of the shape $C_1V_2C_3V_4$, the Type V reduplicant is $C_1V_2V_4$, but the Type VI reduplicant is C_1V_4. The goal of this subsection is to determine which set of constraints must outrank CONTIG-BR, thereby permitting discontiguous reduplicants to surface. This set of constraints will serve as the second component of the Reduction Model.

Before addressing this goal, certain key observations about the data in (22) and (23) must be made. First, it should be noted that if both Type V and Type VI reduplicants are treated as syllables, and the head of each syllable is the vowel immediately following the onset, then the syllable head corresponds to the most sonorant vowel in the base, according to the Sonority Hierarchy.

(29) Sonority Hierarchy (Sievers 1881, Jespersen 1904, de Saussure 1916, inter alia):
$a \succ o, e \succ u, i$

Let's begin by looking more closely at Type VI reduplication. Type VI reduplication manifests itself when the sonority of V_4 is greater than the sonority of V_2 on the sonority hierarchy in (29).

Because V_4 has greater sonority than V_2, this vowel is preferred as the nucleus of the reduplicant syllable. In Optimality Theory, this preference can be explained by formulating the sonority hierarchy as an inverted, universally ranked list of prohibited syllable peaks, as shown below in (30).[19]

(30) Peak Prominence Hierarchy (Prince & Smolensky 1993/2004: Ch. 8):
*P/u, *P/i ≫ *P/o, *P/e ≫ *P/a

In (30), the high vowels [u] and [i] are identified as the least optimal syllable peaks by virtue of the ranking of *P/u and *P/i above constraints on vowel peaks having higher sonority (the mid and low vowels). The mid vowels [o] and [e] are better syllable peaks than high vowels, but not as good as low vowels, express in OT by ranking *P/o and *P/e below the constraints on vowel peaks having lower sonority (the high vowels), but above the constraints on vowel peaks having higher sonority (the low vowels). Finally, the low vowel [a] — which has the highest sonority — is the optimal syllable peak, and *P/a is ranked below the constraints on vowel peaks having lower sonority (the mid and high vowels). Assuming that this ranking in (30) holds in all grammars, the preference of [a] over [e] as the nucleus of the Type VI reduplicant syllable in ba-beta follows from (30). The Type VI forms in (23e-f) which contain bases of the form CVV are similarly subject to this constraint, unifying these bases with the CVCV bases containing two obstruents. Furthermore, the preference of [a] over [i] in the Type V reduplicant in pai-pati follows as well.[20]

What is curious is the difference in shape between Type V and Type VI reduplicants: Type V reduplicants permit the second, less sonorous vowel in the base to surface in the reduplicant, whereas Type VI reduplicants do not. Following Carlson (1997: 2, 10), I argue that this is a result of a constraint on sonority within a diphthong, formalized as *LHDiph and defined below in (31).

(31) *LHDiph (cf. SonFall, Rosenthall 1994):
Diphthongs must not rise in sonority.

The intuition behind the constraint in (31) is that syllables have a preferred sonority pattern (Clements 1990, Zec 1995), including a sharp rise in sonority between the onset and the nucleus. When a diphthong rises in sonority, the sonority "slope" is not as steep as it could be between the onset and the most sonorous vowel in the nucleus because a less sonorous vowel intervenes between the two. Diphthongs that exhibit falling sonority, on the other hand, begin with the more sonorous of the two vowels adjacent to the onset, maximizing the sonority increase between the two positions.

While the *LHDiph constraint suffices to penalize diphthongs with rising sonority, another constraint is necessary to prevent the re-ordering of vowels to form diphthongs with falling sonority. This constraint is Linearity-BR, defined below in (32).

[19] cf. Spaelti (1997, Ch. 3), who utilizes the constraint HNuc to explain the sonority sequencing alternations.

[20] It is assumed throughout the rest of this section that the *P constraint hierarchy is ranked below constraints on vowel height identity, such as $\text{Ident}_{[high]}$ and $\text{Ident}_{[low]}$; if this were not the case, all vowels might just all change to [a] to form the most sonorous possible syllable nucleus.

(32) LINEARITY (“No Metathesis,” McCarthy & Prince 1995a):
S_1 is consistent with the precedence structure of S_2, and vice versa.

- Let $x, y \in S_1$ and $x', y' \in S_2$.
- If $x\mathfrak{R}x'$ and $y\mathfrak{R}y'$ then $x \succ y$ iff $\neg\,(y' \succ x')$.

Type V reduplicants preserve both vowels because the vowels in the bases of such reduplicants are already ordered appropriately such that the first vowel is the more sonorous vowel in the diphthong. However, in order for both vowels to be preserved in the reduplicated forms of Type VI bases, the order of precedence of the two vowels would need to be reversed so that the final vowel (as the more sonorous vowel) could surface as the first vowel in the reduplicant’s diphthong, leaving the initial vowel (as the less sonorous vowel) to surface to its right, producing a diphthong with falling sonority. LINEARITY-BR is exactly the constraint that prohibits such a reversal. This contrast between the two forms is presented schematically below in *Tableau 15 & 16*.[21]

		RED-/kavu/	*2-OBS$_{\mathbb{M}}$	*LHDIPH	LIN-BR	MAX-BR	*P/u, *P/i	*P/o, *P/e	*P/a
	a.	$\underline{k_1a_2v_3u_4}$-$k_1a_2v_3u_4$	**!				**		**
	b.	$\underline{k_1u_4a_2}$-$k_1a_2vu_4$	*	*!	*	*	**		*
	c.	$\underline{k_1u_2}$-k_1avu_4	*			**!	**		*
	d.	$\underline{k_1a_2}$-k_1a_2vu	*			**!	*		**
☞	e.	$\underline{k_1a_2u_4}$-$k_1a_2vu_4$	*			*	*		**

Tableau 15: *LHDIPH and LINEARITY-BR are trivially satisfied in Type V reduplicants.

		RED-/beta/	*2-OBS$_{\mathbb{M}}$	*LHDIPH	LIN-BR	MAX-BR	*P/u, *P/i	*P/o, *P/e	*P/a
	a.	$\underline{b_1e_2t_3a_4}$-$b_1e_2t_3a_4$	**!			**		**	**
	b.	$\underline{b_1e_2a_4}$-$b_1e_2ta_4$	*	*!		*		**	*
	c.	$\underline{b_1a_4e_2}$-$b_1e_2ta_4$	*		*!	*		*	**
	d.	$\underline{b_1e_2}$-b_1e_2ta	*			**		**!	*
☞	e.	$\underline{b_1a_4}$-b_1eta_4	*			**		*	**

Tableau 16: *LHDIPH and LINEARITY-BR is satisfied in Type VI reduplicants by deletion of V_2.

Crucially, *LHDIPH, LINEARITY-BR ≫ MAX-BR to prevent outputs such as *16*:b & *16*:c, respectively, from surfacing for bases that license Type VI reduplication. Furthermore, the *P constraints must be ranked below MAX-BR to allow for the Type I reduplicants given in (24) to surface as total reduplicants. For each base in (24), both sonorant consonants are permitted to remain in the reduplicant without violating *2-OBS$_{\mathbb{M}}$, yielding a disyllabic reduplicant. Ranking the *P constraints above MAX-BR would penalize both vowels and force deletion of one of them, resulting in an unattested partial reduplicant.

[21] In the interest of space and presentational ease, I exclude candidates which violate MAX-IO and LEFT-ANCHOR-BR, which rank above all the constraints shown in *Tableau 15 & 16*.

Now that the way in which *LHDiph, Linearity-BR, and the *P constraints condition the shape of the reduplicants has been clarified, it is possible to determine where Contig-BR fits into the picture. The winning outputs in *Tableau 15* and *Tableau 16* contain discontiguous reduplicants because *2-Obs$_{\mathbb{M}}$ prohibits total reduplication of feet which contain two obstruents, while *LHDiph, Linearity-BR, and the *P constraints work together to ensure that the vowel with the highest level of sonority functions as the nucleus of the reduplicant syllable, even if such selection yields discontiguity.

We are now in a position to argue for a ranking of Contig-BR. If Contig-BR outranked *2-Obs$_{\mathbb{M}}$ in *Tableau 15*, the total reduplicant in canadidate *15*:a would incorrectly surface as the output. If Contig-BR outranked the *P constraints in *Tableau 16*, the contiguous reduplicant in candidate *16*:d would incorrectly surface as the output. From these facts, we may conclude that both *2-Obs$_{\mathbb{M}}$ and the *P constraints outrank Contig-BR. Since all other constraints considered thus far outrank the *P constraints, these constraints also dominate Contig-BR by transitivity.

It has been shown in this subsection that, according to the Reduction Model, several constraints outrank Contig-BR, yielding discontiguous reduplication. A ranking can now be established to show exactly where Contig-BR fits into the system of Nakanai reduplication, given below in (33). The ranking of Contig-BR in this system successfully explains how discontiguous reduplicants arise in Nakanai.

(33) *LHDiph, Linearity-BR ≫ Max-BR ≫ [*P/u, *P/i ≫ *P/o, *P/e ≫ *P/a] ≫ Contig-BR

In the next subsection, this ranking in (33) will be combined with that in (28) to construct an OT analysis of Nakanai discontiguous reduplication.

3.4 An OT Analysis of Nakanai Discontiguous Reduplication

In this subsection, the pieces of the analysis presented in §3.2 – §3.3 fit together in explaining how discontiguous reduplication patterns in Nakanai surface. Recall that in §3.2, the restriction on multiple obstruents in the reduplicant was examined, and was shown to result from the TETU ranking Max-IO ≫ *2-Obs$_{\mathbb{M}}$ ≫ Max-BR. With this ranking, partial reduplication is licensed when a base contains more than one obstruent. In §3.3, it was shown that *LHDiph and Linearity-BR must additionally dominate Max-BR to prohibit diphthongs with rising sonority profiles. Furthermore, Max-BR and the sonority sequencing constraints *P/u, *P/i ≫ *P/o, *P/e ≫ *P/a crucially dominate Contig-BR, which permits discontiguous reduplicants to surface. The objective of this subsection is to present a unified OT analysis of Type V and Type VI reduplication in Nakanai which successfully derives the differences in the shape of these two different reduplication patterns and predicts which reduplicant shape will surface, given a particular base.

Combining the ranking arguments presented in §3.2 – §3.3, it is shown in *Tableau 17.1 & 17.2* that the following ranking schema in (34) yields both patterns of discontiguous reduplication attested in Nakanai: Type V (partial discontiguous reduplication with both vowels of the head foot preserved) and Type VI (partial discontiguous reduplication with just the edges anchored). Furthermore, *Tableau 18* shows that the same ranking suffices to produce the Type I reduplicants in (24).

(34) Ranking Schema for Nakanai Type V and Type VI Reduplication:

Max-IO   Left-Anchor-BR$_{\text{HeadFoot}}$

*2-Obs$_{\mathbb{M}}$ *LHDiph   Linearity-BR

Max-BR

*P/u   *P/i

*P/o   *P/e

*P/a

Contig-BR

As shown in *Tableau 17.1 & 17.2*, the ranking in (34) derives both patterns of discontiguous reduplication. In *Tableau 17.1*, the optimal candidate is kau-kavu, and in *Tableau 17.2*, the optimal candidate is ba-beta. These reduplication patterns cannot be made contiguous by deleting the [v] or the [et] from the base as well, as shown by candidates *17.1*:a and *17.2*:a's fatal violations of Max-IO. *2-Obs$_{\mathbb{M}}$ specifies that a morpheme may not have more than one obstruent in it, but since Max-IO ≫ *2-Obs$_{\mathbb{M}}$, this constraint only applies to reduplicants. Thus, one of the two obstruents in the base cannot have a correspondent in the reduplicant, preventing total reduplication, as exhibited in candidates *17.1*:c and *17.2*:c. Left-Anchor-BR$_{\text{HeadFoot}}$ triggers preservation of the consonant at the prominent left edge of the base (which is also the onset position of the main-stressed syllable), excluding candidates *17.1*:b and *17.2*:b. At this point, only candidates whose reduplicants are one syllable in length remain. *LHDiph discards candidates containing a diphthong with rising sonority whether created via metathesis, as in *17.1*:f, or not, as in *17.2*:d.[22]

Here, the two analyses differ. In *Tableau 17.1*, Max-BR selects candidate *17.1*:d, in which both the [a] and the [u] are preserved in a licit diphthong, over *17.1*:e and *17.1*:g, in which either of these vowels is deleted. Candidate *17.1*:d is the final candidate and emerges victoriously. In *Tableau 17.2*, this choice is not available because preserving the [e] in the base would require metathesis to form a licit diphthong with falling sonority, thereby violating Linearity-BR as in *17.2*:f. Next, the sonority sequencing constraints are called into play to pick out the most sonorous vowel as the nucleus of the

[22] It is important to note that Nakanai reduplicants never contain long vowels. The ranking as it stands here does not account for this, but with a simple amendment, bases containing two obstruents and two identical vowels pose no problem. An example is boto ➪ bo-boto "short." By including a constraint like NLV (Rosenthall 1994: 15-16, citing Selkirk 1984, Paradis 1989, 1990, Kaye 1989), defined below in (i), in the TETU ranking here, long vowels will not surface in the reduplicant.

(i) NLV (No Long Vowels, Rosenthall 1994: 15-16):
No vowel may be linked to more than one mora.

	Red-/kavu/	Max-IO	Left-Anchor-BR	*2-Obs$_{\mathbb{M}}$	*LHDiph	Lin-BR	Max-BR	*P/u, *P/i	*P/o, *P/e	*P/a	Contig-BR
	a. $\underline{k_1a_2u_3}$-$k_1a_2u_3$	*!								**	
	b. $\underline{a_2v_3u_4}$-$k_1a_2v_3u_4$		*!	*			*	**		**	
	c. $\underline{k_1a_2v_3u_4}$-$k_1a_2v_3u_4$			**!				**		**	
☞	d. $\underline{k_1a_2u_4}$-$k_1a_2vu_4$			*			*	*		**	*
	e. $\underline{k_1a_2}$-k_1a_2vu			*			**!	*		**	
	f. $\underline{k_1u_4a_2}$-$k_1a_2vu_4$			*	*!	*	*	**		*	*
	g. $\underline{k_1u_4}$-k_1avu_4			*			**!	**		*	**

Tableau 17.1: Complete OT analysis of Nakanai Type V reduplication. Obstruents: [k], [v].

	Red-/beta/	Max-IO	Left-Anchor-BR	*2-Obs$_{\mathbb{M}}$	*LHDiph	Lin-BR	Max-BR	*P/u, *P/i	*P/o, *P/e	*P/a	Contig-BR
	a. $\underline{b_1a_2}$-b_1a_2	*!*								**	
	b. $\underline{e_2t_3a_4}$-$b_1e_2t_3a_4$		*!	*			*		**	**	
	c. $\underline{b_1e_2t_3a_4}$-$b_1e_2t_3a_4$			**!					**	**	
	d. $\underline{b_1e_2a_4}$-$b_1e_2ta_4$			*	*!		*		**	*	*
	e. $\underline{b_1e_2}$-b_1e_2ta			*			**		**!	*	
	f. $\underline{b_1a_4e_2}$-$b_1e_2ta_4$			*		*!	*		*	**	*
☞	g. $\underline{b_1a_4}$-b_1eta_4			*			**		*	**	**

Tableau 17.2: Complete OT analysis of Nakanai Type VI reduplication. Obstruents: [b], [t].

	Red-/vore/	Left-Anchor-BR	*2-Obs$_{\mathbb{M}}$	*LHDiph	Lin-BR	Max-BR	*P/u, *P/i	*P/o, *P/e	*P/a	Contig-BR
☞	a. $\underline{v_1o_2r_3e_4}$-$v_1o_2r_3e_4$							****		
	b. $\underline{o_2r_3e_4}$-$v_1o_2r_3e_4$	*!				*		****		
	c. $\underline{v_1o_2e_4}$-$v_1o_2re_4$					*!		***		*
	d. $\underline{v_1o_2}$-v_1o_2re					*!*		***		
	e. $\underline{v_1e_4o_2}$-$v_1o_2re_4$				*!	*		***		*
	f. $\underline{v_1e_4}$-v_1ore_4					*!*		***		**

Tableau 18: Complete OT analysis of Nakanai Type I reduplication. Obstruent: [v].

reduplicant syllable, eliminating candidate *17.2*:e (which incorrectly selects [e] over [a], even though [a] is more sonorous). Candidate *17.2*:g is left as the winner because its reduplicant's nucleus is [a], the most sonorous vowel in the base.

To summarize, the difference between Type V and Type VI reduplication boils down to whether both vowels in the reduplicated foot may be preserved without violating Linearity-BR. If so, both vowels remain, yielding a Type V reduplicant syllable, but if not, only the most sonorous vowel remains, yielding a Type VI reduplicant syllable.

Turning to *Tableau 18*, it is immediately apparent that the ranking given in (34) is capable of generating the total reduplicants conditioned by Type I bases as well. Left-Anchor-$BR_{HeadFoot}$ once again triggers preservation of the consonant at the prominent left edge of the base, excluding candidate *18*:b. Since there is only one obstruent in a Type I base, *2-$Obs_{\mathbb{M}}$ is unviolated, and Left-Anchor-$BR_{HeadFoot}$ becomes inert because neither consonant need be deleted. Similarly, *LHDiph and Linearity-BR have no effect because there is no diphthong formed by deletion of a consonant, and thus there is no reason for any form to undergo metathesis to repair an illicit diphthong with rising sonority. Nevertheless, a CVV base containing vowels with equal sonority would require the inclusion of Linearity-BR to ensure that they preserve the order of precedence they display in the base. As the next constraint is Max-BR and the total reduplicant in candidate *18*:a has not been ruled out, all remaining candidates containing partial reduplicants are eliminated, leaving candidate *18*:a alone as the sole winner. Correctly, the *P constraints are not utilized for evaluation because there are no illicit diphthongs created by *2-$Obs_{\mathbb{M}}$ for these constraints to repair.

The three components for a successful Reduction Model analysis of discontiguous reduplication have now been established for Nakanai Type V/VI reduplication. In §3.2, the set of constraints that must outrank Max-BR to permit partial reduplication was presented in (28). In §3.3, the set of constraints that must outrank Contig-BR to permit discontiguity in the base-reduplicant correspondence relation was presented in (33). In this subsection, these two rankings were combined to show how a unified analysis of Type V and Type VI reduplication could be constructed that explained the difference between the two types of discontiguity.

4 Semai Expressive Reduplication

4.1 Edge-Anchoring Minor Syllables

Semai is a member of the Senoic branch of Austroasiatic languages, spoken in peninsular Malaysia. According to Ethnologue, there are approximately 33,000 speakers of Semai.

Semai Expressive reduplication copies the base-initial and base-final consonants to form a minor syllable (Diffloth 1976a, 1976b), shown below in (35).

(35) Semai Expressive Reduplication (Diffloth 1976b: 252)

a. Initial C Root:

i. taʔəh ➪ th-taʔəh "appearance of large stomach constantly bulging out"

ii. pajaɲ ➪ pɲ-pajaɲ "appearance of being disheveled"

iii. sulɔɲ ➪ sɲ-sulɔɲ "the odd appearance of a snake's head"

iv. cajɛm ➪ cm-cajɛm "contracted fingers of human or animal, not moving"

v. ruhɔ:ɲ ➪ rɲ-ruhɔ:ɲ "the appearance of teeth attacked by decay"

b. Initial CC Root:

  i. dŋɔh ➪ dh-dŋɔh “appearance of nodding constantly”
  ii. cʔɛːt ➪ ct-cʔɛːt “sweet”
  iii. cfaːl ➪ cl-cfaːl “appearance of flickering red object”
  iv. bʔəl ➪ bl-bʔəl “painful embarrassment”
  v. ghʉːp ➪ gp-ghʉːp “irritation on skin (e.g., from bamboo hair)”
  vi. cruhaːw ➪ cw-cruhaːw “sound of waterfall, monsoon rain”
  vii. slajɛːw ➪ sw-slajɛːw “long hair in order”

Semai Expressive reduplicants are of the form C_1C_2, where C_1 corresponds to the leftmost consonant in the base, and C_2 corresponds to the rightmost consonant in the base. Each reduplicant lacks a vowel. No major syllables in the base are closed except the rightmost syllable, and Semai roots end with a consonant, in general (Sloan 1988: 324).

The goal of this section is to present a Reduction Model analysis of Semai Expressive reduplication similar to that of Nakanai Type V and Type VI reduplication presented in §3. The analysis is composed of the same three components:

- A set of constraints which must outrank Max-BR to explain why Semai Expressive reduplicants are partial, rather than total reduplicants, presented in §4.2
- A set of constraints which must outrank Contig-BR to explain why the partial reduplicants observed in Semai Expressive reduplication are permitted to be discontiguous, presented in §4.3
- A unified ranking of both sets of constraints and an OT analysis, presented in §4.4.

4.2 The Partiality of Semai Expressive Reduplicants

Semai Expressive reduplication is partial and does not permit vowels to surface in the reduplicant. Instead, the reduplicant is a CC sequence, which Diffloth (1976a, 1976b) calls a minor syllable. Several researchers (e.g. Sloan 1988, Shaw 1993, Hendricks 2001; cf. Kiparsky 2003) analyze Semai minor syllables as syllables which do not have vocalic heads — similar to Berber, for example — shown schematically in (36).

(36) Minor syllable structure

σ

μ

C C

Several observations may be made about Semai minor syllables. Semai speakers treat minor syllables as prosodic constituents and perceive them as distinct syllables (Sloan 1988: 321). Speakers pronounce a short vocalic sound between C_1 and C_2 at regular intervals of CCCC(...) sequences (Diffloth 1976a). Minor syllables in a PWd never occur word-finally (Sloan 1988: 320, Shaw 1993:

127), presumably because syllabification is right-to-left, with main stress on the final syllable (Shaw 1993: 127), as is also the case in the related language East Temiar (Ito 1986).

The Reduction Model analysis advanced in this paper explains discontiguous reduplication as a consequence of the reduction of the base to some prosodic category based on properties of a particular language's phonology, which prevent the segments in the reduplicant from corresponding with a contiguous string of segments in the base. In this subsection, I follow Sloan (1988) and Shaw (1993) in arguing that Semai Expressive reduplicants are minor syllables, which are derived from maximal syllable reduplicants. The crux of this argument hinges on the fact that Semai Expressive reduplicants are never stressed, and as such, cannot contain segments which correspond with vowels in the base.

First, it should be observed from the data in (35) that the base for reduplication in Semai is the entire root. The fact that Expressive reduplicants are single syllables, regardless of base size, is indicative of size restriction. As discussed in §1, reduplicant size was traditionally restricted with the use of templates specifying that a reduplicant's form should match a prosodic category, e.g. RED=σ. With the advent of Generalized Alignment (McCarthy & Prince 1993b), size restriction has been treated as the result of alignment of the relevant prosodic category to a particular edge. The Generalized Alignment schema is reproduced below as (37), and in (38), the Generalized Alignment constraint ALL-σ-LEFT states that all syllables in the PWd should be aligned to the left edge.

(37) ALIGN(Cat1, Edge1, Cat2, Edge2) (McCarthy & Prince 1993b):
∀Cat1 ∃Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.

- Cat1, Cat2 ∈ PCat ∪ GCat
- Edge1, Edge2 ∈ {Right, Left}

(38) ALIGN(σ, L, PWd, L) (Mester & Padgett 1994; henceforth ALL-σ-LEFT):
Align the left edge of each syllable to the left edge of the prosodic word in which it is contained.

Violations of ALL-σ-LEFT are calculated gradiently: each syllable that intervenes between the left edge of another syllable and the left edge of the PWd incurs one violation mark. Thus, monosyllabic PWds will incur no violations of ALL-σ-LEFT as the left edge of the single syllable will automatically coincide with the left edge of the prosodic word. It is for this reason that ALL-σ-LEFT favors monosyllabic PWds. In order to allow for polysyllabic roots and monosyllabic reduplicants, the TETU ranking of MAX-IO ≫ ALL-σ-LEFT ≫ MAX-BR guarantees that segments in the input cannot be deleted in the output to reduce violations of ALL-σ-LEFT because MAX-IO outranks ALL-σ-LEFT; however, segments in the base can be deleted in the reduplicant to satisfy ALL-σ-LEFT since this constraint outranks MAX-BR. This constraint interaction is illustrated below in *Tableau 19*.

		RED-/taʔəh/	MAX-IO	ALL-σ-LEFT	MAX-BR
	a.	$\underline{t_1a_2ʔ_3ə_4h_5}$-$t_1a_2ʔ_3ə_4h_5$		****!**	
☹	b.	$\underline{t_1h_5}$-$t_1aʔəh_5$		***	***!
☞	c.	$\underline{t_1a_2ʔ_3}$-$t_1a_2ʔ_3əh$		***	**
	d.	taʔ	*!*		***

Tableau 19: Reduplicant size restricted by ALL-σ-LEFT.[23]
☞ indicates the winner in the tableau; ☹ indicates the attested output.

[23] Recall that minor syllables are analyzed as true syllables, and thus incur a violation of ALL-σ-LEFT if they intervene

In *Tableau 19*, candidate *19*:d is the only candidate incurring no violations of All-σ-Left. Still, this candidate is not selected as the winner because it is unfaithful to the segments in the input, violating the higher ranked Max-IO. Total reduplication is exhibited in candidate *19*:a, which loses because the additional syllable in the disyllabic reduplicant incurs unnecessary extra violations of All-σ-Left, which candidates *19*:b and *19*:c do not violate. The incorrect candidate *19*:c wins since the reduplicant corresponds with a greater number of segments in the base, thereby incurring fewer violations of Max-BR. With this ranking, this is what is predicted: the reduplicant should be a maximal syllable.[24] Further work must now be done to restrict this maximal syllable to a minor syllable, along the lines of the Reduction Model.

As was observed above, Expressive reduplicants are always unstressed and never contain vowels. I suggest that these two facts are related, and that vowels are reduced in unstressed reduplicant syllables. Crosswhite (1999) draws a distinction between two types of vowel reduction: perceptually-motivated contrast enhancement and articulatorily-motivated prominence reduction. In the present case, the connection between lack of vowel faithfulness in the reduplicant and the fact that the reduplicant minor syllable is unstressed falls into the category of prominence reduction. More sonorous vowels take more time to articulate, and are therefore dispreferred in unstressed syllables.

Crosswhite proposes that unstressed syllables are non-moraic, and introduces the constraint family below in (39).

(39) *NonMoraic[low] ≫ *NonMoraic[mid] ≫ *NonMoraic[high] ≫ *NonMoraic[ə]

I prefer to remain agnostic about whether unstressed vowels are moraic or non-moraic, so I substitute Crosswhite's constraint family with that below in (40).[25]

(40) *Unstressed[low] ≫ *Unstressed[mid] ≫ *Unstressed[high] ≫ *Unstressed[ə]

Crosswhite (1999) does not examine cases of vowel deletion, but Zuraw (2003: 387-388) shows that in Palauan, short vowels either reduce to schwa or delete, depending on the environment. She captures this effect by ranking the *entire* hierarchy of constraints in (39), which I substitute with (40) in Semai, over Max-V, which I substitute for Max-BR in Semai since there is no motivation for a necessary distinction between vowels and consonants in the present discussion.

		Red-/taʔəh/	Max-IO	All-σ-Left	*Unstressed [low]	*Unstressed [ə]	Max-BR
☞	a.	$\underline{t_1h_5}$-$t_1aʔə́h_5$		***	*		**
	b.	$\underline{t_1a_2ʔ_3}$-$t_1a_2ʔ_3ə́h$		***	**!		**
	c.	$\underline{ʔ_3ə_4h_5}$-$taʔ_3ə́_4h_5$		***	*	*!	**

Tableau 20: The *Unstressed family of constraints, when ranked above Max-BR, prohibits vowels in the reduplicant.[26]

between the left edge of the PWd and the left edge of another syllable to their right, just as any other syllable would incur a violation in this context.

[24]If one prefers not to use gradient constraints to capture this effect, a similar effect could be achieved with the categorical OT constraint Align-by-σ-Left (McCarthy 2003).

[25]See also Crosswhite (2000) for a slightly revised version of the hierarchy in (39) that more closely resembles (40), based loosely on Kenstowicz (1994).

[26]In the interest of space and expositional clarity, the constraints *Unstressed[mid] and *Unstressed[high] have been excluded from this tableau since none of the candidates contain mid or high vowels which would violate them.

In *Tableau 20*, all three candidates contain monosyllabic reduplicants, which incur the fewest possible violations of ALL-σ-LEFT.[27] Candidate *20*:c is ruled out because the reduplicant contains an unstressed low vowel, [a], and candidate *20*:d is ruled out because the reduplicant contains an unstressed schwa [ə]. Therefore, candidate *20*:b remains as the winner. All vowels, including unstressed vowels, remain in the root because of the high-ranking MAX-IO.

The *UNSTRESSED hierarchy accounts for vowel deletion in Semai reduplication in a manner analogous to vowel deletion in Palauan. Since Semai allows CC minor syllable reduplicants which have no segmental material specified in their lexical entry, deletion of vowels in the reduplicant does not violate constraints on syllable structure or on IO-faithfulness.

The goal of this subsection was to derive the partiality of the base-reduplicant correspondence relation by isolating a group of constraints which must outrank MAX-BR. It was observed that Semai Expressive reduplicants are no larger than a syllable, and ALL-σ-LEFT was ranked above MAX-BR to derive maximal syllable reduplicants: according to the Reduction Model, discontiguous reduplicants must be obtained by reducing a maximal prosodic category, and the relevant prosodic category in Semai expressive reduplication is a syllable. Furthermore, vowels are not permitted in reduplicant minor syllables. I argued that this is the result of their not being stressed, which I have formulated in OT as a ranking of the *UNSTRESSED family of constraints over MAX-BR. Thus, the set of constraints that must outrank MAX-BR is given below in (41).

(41) MAX-IO ≫ ALL-σ-LEFT ≫ *UNSTRESSED[low] ≫ *UNSTRESSED[mid] ≫ *UNSTRESSED[high] ≫ *UNSTRESSED[ə] ≫ MAX-BR

4.3 Unstressed Vowel Deletion in Semai Expressive Reduplication

In the previous subsection, the partiality of the base-reduplicant correspondence relation holding between Semai Expressive reduplicants and their bases was investigated. Such reduplicants were argued to be derived from maximal syllables, with the constraint on vowels surfacing in the reduplicant invoked to explain the CC shape. In this subsection, the status of consonants in the reduplicant is discussed in more detail.

As was the case in Nakanai Type VI reduplication, the leftmost consonant in the base in Semai Expressive reduplication is preserved at the left edge of each reduplicant in the data shown in (35). I argue that this is a positional faithfulness effect, again resulting from LEFT-ANCHOR-BR.

		RED-/taʔəh/	ALL-σ-LEFT	*UNSTRESSED [low]	*UNSTRESSED [ə]	LEFT-ANCHOR-BR	MAX-BR
☞	a.	$\underline{t_1h_5}$-t_1aʔ$\acute{ə}h_5$	***	*			***
	b.	$\underline{ʔ_3h_5}$-$taʔ_3\acute{ə}h_5$	***	*		*!	***

Tableau 21: LEFT-ANCHOR-BR preserves the leftmost segment in the base.

In *Tableau 21*, with all else being equal, the leftmost consonant in the base in candidate *21*:b does not have a correspondent at the left edge of the reduplicant as required by LEFT-ANCHOR-BR, and thus loses to candidate *21*:c which satisfies this constraint. The consonant at the left edge of the

[27]Note that I crucially assume a high ranking constraint guaranteeing realization of the reduplicant, along the lines of REALIZEMORPHEME (Kurisu 2001). Obviously the null reduplicant would best satisfy ALL-σ-LEFT, but REALIZE-MORPHEME requires that the reduplicant be realized.

base has been argued to be preserved in the reduplicant as a positional faithfulness effect (which is also consistent with Marantz's Generalization on reduplicative prefixes), so the principal question that arises at this point is why it is the consonant at the right edge of the base that must correspond with the consonant at the right edge of the reduplicant syllable, rather than a medial consonant, for example.

I argue that the preservation of the rightmost consonant in the base is the result of prosodic correspondence, which was introduced in §2.3. In the case of Semai Expressive reduplication, it was noted that in the data shown in (35), the reduplicant syllable was a minor syllable, the structure of which was given in (36). The non-vocalic head of the reduplicant syllable is moraic (Shaw 1993). Furthermore, this moraic consonant always corresponds with the rightmost segment in the base, which is always a coda consonant since Semai roots end with closed CVC syllables. Therefore, while the non-moraic consonant in the reduplicant corresponds with an onset in the base due to Left-Anchor-BR, I argue that the moraic consonant corresponds with a moraic segment in the base due to Corr-Σ-Role.

However, the utility of Corr-Σ-Role differs slightly from its use in §2.3. Previously, Corr-Σ-Role was a constraint on OO-correspondence, working transderivationally to preserve the syllabic roles in root output forms even after an affix is attached. The constraint Corr-Σ-Role in this case operates on the base-reduplicant correspondence relation rather than an output-output correspondence relation. Its usage is not transderivational: it operates as a constraint on an output form and may affect the shape of the base, the reduplicant, or both, depending on its ranking. This extension of Corr-Σ-Role to the domain of BR-correspondence is discussed further in §6.2.

As the only moraic segment in the base for Semai Expressive reduplication is the root-final coda, it is this segment that is selected by Corr-Σ-Role to correspond with the moraic consonant in the reduplicant. Note that the definition of Corr-Σ-Role requires that the non-vocalic heads of the minor syllable reduplicants in (35) be analyzed as codas. I do not find such an analysis to be controversial, for two reasons.

First, it was mentioned in §4.2 that native speakers of Semai produce vowellike elements between the two consonants in a minor syllable (Diffloth 1976a). Presumably, such a vowel could be analyzed phonologically as corresponding with one of the vowels in the base, which is then reduced according to the modified version of Crosswhite's (1999) constraint hierarchy presented in (40). This would require a reranking of Max-BR to some position within Crosswhite's hierarchy, depending on how one chooses to analyze this vowellike element — e.g., if it is a schwa, Max-BR should be ranked above *Unstressed[ə]. However, I prefer to remain faithful to the data and analyze minor syllables as phonologically CC syllables, attributing the vowellike element between them to a phonetic process which causes CC syllables become easier to recognize perceptually, since consonants are perceived in a large part by the formant transitions they induce on neighboring vowels. In this way, the phonetics is able to play a peripheral role in determining the phonology of minor syllable reduplicants.[28]

Second, nuclei and codas are both moraic. They are distinguished within a syllable by whether or not they serve as the syllable's head. It is not clear whether the moraic consonants in Semai minor syllables should be treated as their heads. For the moment, let us imagine that the moraic consonants in Semai minor syllables *are* the heads of these syllables. If Corr-Σ-Role were ranked

[28] cf. Van Allen (2006) for an account of effects of phonetic vowel lengthening in Hungarian on the OO-correspondence relation.

above the *Unstressed family of constraints, one would predict that it would be more important to keep a vowel in the nucleus to satisfy Corr-Σ-Role, even if this vowel violated one of the *Unstressed constraints. Since the reduplicant syllable is ideally maximal because of Max-BR, closed CVC reduplicant syllables would be predicted where the vowel corresponded with a reduced form of a vowel in the base. On the other hand, if the *Unstressed family of constraints ranked above Corr-Σ-Role, one would predict that the non-vocalic head of a minor syllable Expressive reduplicant could correspond with any consonant in the base because it should not make a difference whether the consonant were an onset or coda, as Corr-Σ-Role would be violated in either case. It can be seen in (35) that neither of these two cases obtains: Expressive reduplicants are CC, with the moraic C corresponding with the only coda in the base, not with an onset or a nucleus. I therefore assume that the moraic consonant in a Semai minor syllable should not be treated as a nucleus, but as a coda. If this is correct, one can easily explain right-edge faithfulness between the reduplicant and the base: both the rightmost segment in the base and the rightmost segment in the reduplicant are codas, and so they correspond prosodically. Furthermore, the ranking of the *Unstressed constraints with respect to Corr-Σ-Role is no longer crucial if the moraic consonant in Semai Expressive reduplicants is treated as a coda.[29]

To see how Corr-Σ-Role functions to select the consonants in the reduplicant, consider *Tableau 22* below.

		Red-/taʔəh/	Corr-Σ-Role	Max-BR	Contig-BR
☞	a.	$\underline{t_1 h_5}$-t_1aʔəh_5		***	***
	b.	$\underline{t_1\text{ʔ}_3}$-$t_1a\text{ʔ}_3$əh	*!	***	*
	c.	$\underline{t_1}$-t_1aʔəh		****!	

Tableau 22: Corr-Σ-Role-BR ensures that segments in the reduplicant that have moras correspond with segments in the base that have moras, and likewise for segments without moras.[30]

In *Tableau 22*, candidate 22:b loses because of Corr-Σ-Role: the [ʔ] in the reduplicant is syllabified as a coda, whereas it is syllabified as an onset in the base. Candidate 22:c loses as well because although it satisfies Corr-Σ-Role, it is not as maximal as it could be, as shown by its extra violation of Max-BR. As such, candidate 22:a, the actual attested output, emerges as the winner. Again, Contig-BR must be ranked low enough to account for the discontiguity observed in Semai Expressive reduplication, just as in Nakanai Type V and Type VI reduplication.

This analysis makes a very clear, strong prediction. It is predicted that if there were any medial codas in the base, these codas would be selected to correspond with the reduplicant's non-vocalic head. As mentioned above, codas generally occur only word finally: initial and medial syllables in a word are usually open. Nonetheless, Semai does exhibit the occasional medial prenasalized onset,

[29] It should also be noted that this question becomes a non-issue if Corr-Σ-Role is reformulated in terms of moraicity. Consider an alternative definition below in (i).

(i) Corr-Σ-Role: ∀x and ∀y such that x and y are segments and $x\mathfrak{R}y$, assess a violation if either
   a. x is moraic and y is not, or
   b. if y is moraic and x is not.

[30] In the base taʔəh, [h] is the only coda, and therefore the only moraic consonant since onsets are non-moraic.

or so-called NC-cluster. I have not found any data that shows how bases containing medial NC-clusters fare under Expressive reduplication. Future fieldwork on Semai could potentially answer this empirical question. Such research would either provide evidence for my analysis if the medial nasals did not function as codas in the reduplicant and the right-edge coda was still preserved (indicating that the nasal should indeed be analyzed as prenasalization of the following onset), or evidence against my analysis if the nasal could indeed correspond with the coda in the reduplicant syllable (indicating that the nasal should be analyzed as a true coda).

In this subsection, I have identified a set of constraints which must outrank CONTIG-BR, which accounts for the discontiguity of Semai expressive reduplicants. It was observed that the leftmost consonant in the base is always preserved, which I analyzed as a positional faithfulness effect resulting from LEFT-ANCHOR-BR. Furthermore, the connection between right-edge preservation and the fact that the only closed syllable in each base was the final syllable was made by appealing to prosodic correspondence, formulated as CORR-Σ-ROLE. The set of constraints that must outrank CONTIG-BR is given below in (42).

(42) MAX-IO ≫ LEFT-ANCHOR-BR, CORR-Σ-ROLE ≫ MAX-BR ≫ CONTIG-BR

4.4 An OT Analysis of Semai Expressive Reduplication

In this subsection, the pieces of the analysis presented in §4.2 – §4.3 fit together in explaining how the discontiguous reduplication pattern of Semai Expressive reduplicants arises. Recall that in §4.2, the nature of minor syllables in Semai was examined. Expressive reduplicant minor syllables were argued to result from a reduction of maximal syllables, according to the Reduction Model. The maximal syllable was derived from the ranking MAX-IO ≫ ALL-σ-LEFT ≫ MAX-BR. The lack of vowels in the unstressed reduplicant syllables was shown to be an effect of the TETU ranking MAX-IO ≫ *UNSTRESSED[low] ≫ *UNSTRESSED[mid] ≫ *UNSTRESSED[high] ≫ *UNSTRESSED[ə] ≫ MAX-BR. With this ranking, Expressive reduplicants are reduced from maximal syllables to minor syllables, as they are never stressed and therefore do not contain vowels. In §4.3, it was shown that LEFT-ANCHOR-BR and CORR-Σ-ROLE work together to select the leftmost and rightmost consonants in the base, an analysis which draws much of its descriptive power from the facts about Semai phonology.

The objective of this subsection is to present an OT analysis of Semai Expressive reduplication which successfully derives the fact that Expressive reduplicants are CC minor syllables which correspond with the segments at the edges of the base.

Combining the rankings presented in §4.2 – §4.3, it is shown in *Tableau 23* that the ranking below in (43) generates the discontiguous BR-correspondence relation exhibited in Semai Expressive reduplication. The optimal candidate is th-taʔəh. The reduplication pattern cannot be made contiguous by deleting the [aʔə] from the base as well, as shown by candidate *23*:h's fatal violation of MAX-IO. ALL-σ-LEFT guarantees that the left edge of each syllable coincides with the left edge of the PWd in which it is contained, limiting the reduplicant to a single syllable in length. Since MAX-IO ≫ ALL-σ-LEFT, the base is nevertheless permitted to be polysyllabic. Thus, some segments in the base cannot have a correspondent in the reduplicant, reducing it to one syllable and preventing total reduplication as exhibited in candidate *23*:a. At this point, only candidates with monosyllabic

(43) Ranking Schema for Semai Expressive Reduplication:

LEFT-ANCHOR-BR CORR-Σ-ROLE MAX-IO

ALL-σ-LEFT *UNSTRESSED[low]

*UNSTRESSED[mid]

*UNSTRESSED[high]

*UNSTRESSED[ə]

MAX-BR

CONTIG-BR

reduplicants remain. CORR-Σ-ROLE ensures that each segment in the reduplicant bears the same syllabic role (or moraicity) as its correspondent in the base, thereby excluding candidate *23*:d because [ʔ] is a coda (moraic) in the reduplicant but an onset (non-moraic) in the base. The entire *UNSTRESSED family of constraints is ranked above MAX-BR, triggering vowel deletion in unstressed reduplicant syllables, eliminating candidates *23*:e-f which contain [a] and [ə] in the reduplicant, respectively. Finally, MAX-BR ≫ CONTIG-BR ensures that the reduplicant is as large as possible even at the expense of contiguity, ruling out candidate *23*:g which contains a contiguous reduplicant that is smaller than it could be, cf. candidate *23*:b, which is the winner.

The three components for a successful Reduction Model analysis of discontiguous reduplication have now been established for Semai Expressive reduplication. In §4.2, the set of constraints that must outrank MAX-BR to permit partial reduplication was presented in (41). In §4.3, the set of constraints that must outrank CONTIG-BR to permit discontiguity in the base-reduplicant correspondence relation was presented in (42). In this subsection, these two rankings were combined to show how an analysis of Expressive reduplication could be constructed in Optimality Theory that explained the nature of the edge-anchoring, minor syllable reduplicant.

		Red-/taʔəh/	Max-IO	All-σ-Left	Left-Anchor-BR	Corr-Σ-Role	*Unstressed [low]	*Unstressed [ə]	Max-BR	Contig-BR
	a.	$\underline{t_1a_2ʔ_3ə_4h_5}$-$t_1a_2ʔ_3ə́_4h_5$		****!**			**			
☞	b.	$\underline{t_1h_5}$-$t_1aʔə́h_5$		***			*		***	***
	c.	$\underline{ʔ_3h_5}$-$taʔ_3ə́h_5$		***	*!		*		***	*
	d.	$\underline{t_1ʔ_3}$-$t_1aʔ_3ə́h$		***		*!	*		***	*
	e.	$\underline{t_1a_2h_5}$-$t_1a_2ʔə́h_5$		***			**!		**	**
	f.	$\underline{t_1ə_4h_5}$-$t_1aʔə́_4h_5$		***			*	*!	**	**
	g.	$\underline{t_1}$-$t_1aʔə́h$		***			*		****!	
	h.	$\underline{t_1h_2}$-$t_1á_2h_2$	*!*	*						

Tableau 23: Complete OT analysis of Semai Expressive reduplication

5 Ulu Muar Malay Type III Reduplication

5.1 Base Form Restrictions

Ulu Muar Malay is a dialect of vernacular Malay, which is in the Malayo-Polynesian subgroup of Austronesian languages. Ulu Muar Malay is spoken on the Malay Peninsula in the Negeri Sembilan region. It is unknown how many remaining speakers are left today: as of 1966, when the major fieldwork on this language was conducted, it was already a low-prestige dialect faced with extinction (Rufus Hendon, p.c.).

Hendon (1966) has classified six different forms of reduplication in Ulu Muar Malay. As was the case in Nakanai reduplication, no semantic difference is attested in the choice between these six forms, but they are instead conditioned by the shape of the base for reduplication. In this section, I am concerned with analyzing a form of discontiguous reduplication known as Type III reduplication, examples of which shown below in (44).

(44) Ulu Muar Malay Type III reduplication (Hendon 1966: 58-59)

a. sieʔ ➪ $\underline{s_1ɪ_2ʔ_4}$-$s_1i_2eʔ_4$ "is torn repeatedly"
b. tarɪʔ ➪ $\underline{t_1a_2ʔ_5}$-$t_1a_2rɪʔ_5$ "accordion"
c. budaʔ ➪ $\underline{b_1ʊ_2ʔ_5}$-$b_1u_2daʔ_5$ "children"
d. laŋɪt ➪ $\underline{l_1a_2ʔ_5}$-$l_1a_2ŋɪt_5$ "palate"
e. sikɪt ➪ $\underline{s_1ɪ_2ʔ_5}$-$s_1i_2kɪt_5$ "various small quantities"
f. gɑlap ➪ $\underline{g_1ɑ_2ʔ_5}$-$g_1ɑ_2lap_5$ "is repeatedly dark"
g. cakap ➪ $\underline{c_1a_2ʔ_5}$-$c_1a_2kap_5$ kɑciʔ "talks in a low tone"

h. kawan ➪ $\underline{k_1a_2ŋ_5}$-$k_1a_2wan_5$ "friend"
i. soraŋ ➪ $\underline{s_1o_2ɲ_5}$-$s_1o_2ra_4ŋ_5$ "alone, all by oneself"
j. siaŋ ➪ $\underline{s_1ɪ_2ɲ_4}$-$s_1i_2aŋ_4$ "during the daytime on various days"
k. dajaŋ ➪ $\underline{d_1a_2n_5}$-$d_1a_2jaŋ_5$ "handmaidens"
l. diam ➪ $\underline{d_1ɪ_2n_4}$-$d_1i_2am_4$ "remains silent"

m. pueh ➪ so-$\underline{p_1ʊ_2h_4}$-$p_1u_2eh_4$ "to their complete satisfaction"

In all the data in (44), it can be observed that the reduplicant is a CVC syllable whose initial CV corresponds with the initial CV syllable in the base and whose coda consonant stands in correspondence with the base-final consonant, which is also a coda. According to Hendon, this type of reduplication is found only with stems which either:

1. end in a stop, nasal, [h], or [ʔ] and begin with a consonant, or
2. end in a nasal and begin with a stop or [s].

The goal of this section is to present a Reduction Model analysis of Ulu Muar Malay Type III reduplication similar to that of Nakanai Type V and Type VI reduplication presented in §3 and of Semai Expressive reduplication presented in §4. The analysis is again composed of three components:

- A set of constraints which must outrank MAX-BR to explain why Ulu Muar Malay Type III reduplicants result from partial reduplication, rather than total reduplication, presented in §5.2
- A set of constraints which must outrank CONTIG-BR to explain why the partial reduplicants observed in Ulu Muar Malay Type III reduplication are permitted to be discontiguous, presented in §5.3
- A unified ranking of both sets of constraints and an OT analysis, presented in §5.4.

5.2 Maximal Syllable Reduplicants in Ulu Muar Malay

Type III reduplication in Ulu Muar Malay yields partial reduplicants, not total reduplicants. These reduplicants are of the form CVC. In the previous section, Semai minor syllable reduplicants were argued to arise from the reduction of the base to a maximal syllable which was then further constrained to prohibit vowels. In this subsection, I reprise this style of analysis to yield maximal syllable reduplicants in Ulu Muar Malay.

Recall that the Generalized Alignment (McCarthy & Prince 1993b) constraint ALL-σ-LEFT was called upon to constrain polysyllabic bases to form maximal syllable reduplicants with the TETU ranking of MAX-IO ≫ ALL-σ-LEFT ≫ MAX-BR. Below in *Tableau 24*, it can be seen how this ranking achieves the same effect for Type III reduplication in Ulu Muar Malay.

		RED-/gɑlap/	MAX-IO	ALL-σ-LEFT	MAX-BR
	a.	$\underline{g_1ɑ_2l_3a_4p_5}$-$g_1ɑ_2l_3a_4p_5$		****!**	
	b.	$\underline{g_1ɑ_2}$-$g_1ɑ_2lap$		***	***!
☞	c.	$\underline{g_1ɑ_2l_3}$-$g_1ɑ_2l_3ap$		***	**
☞	d.	$\underline{g_1ɑ_2p_5}$-$g_1ɑ_2lap_5$		***	**
☛	e.	$\underline{g_1ɑ_2ʔ_5}$-$g_1ɑ_2lap_5$		***	**

Tableau 24: Reduplicant size restricted by ALL-σ-LEFT.[31]
☞ & ☛ indicate the winners in the tableau; ☛ indicates the attested output.

In *Tableau 24*, candidate *24*:a is ruled out because the reduplicant's length exceeds a single syllable, thereby incurring extraneous violations of ALL-σ-LEFT. Candidate *24*:b incurs the same number of violations of ALL-σ-LEFT as the winning candidates, but the reduplicant in *24*:b is not a maximal syllable, and incurs one more violation of MAX-BR than the winners. Candidates *24*:c-e all emerge as winners in this tableau because their reduplicants are maximal syllables. However, the actual output is candidate *24*:e, in which the coda of the maximal syllable reduplicant corresponds with the rightmost segment in the base and is a glottal stop.

The goal of this subsection was to derive the partiality of the base-reduplicant correspondence relation by isolating a group of constraints which must outrank MAX-BR. In the case of Ulu Muar Malay Type III reduplication, this set of constraints is a singleton set consisting simply of ALL-σ-LEFT in a TETU ranking. It was observed that Ulu Muar Malay Type III reduplicants are monosyllabic, and ALL-σ-LEFT was ranked above MAX-BR to derive maximal syllable reduplicants. According to the Reduction Model, discontiguous reduplicants must be derived from a maximal prosodic category, and the relevant prosodic category in Ulu Muar Malay Type III reduplication is a syllable.

[31] Again, I assume a highly ranked REALIZEMORPHEME (Kurisu 2001) to prevent null reduplicants from surfacing.

Clearly, more must be said about the nature of this discontiguous correspondence relation and the fact that the reduplicant's coda consonant does not match the place specification of its correspondent in the base. These are the topics of the following two subsections.

5.3 Initial Syllable Prominence and Prosodic Correspondence in Ulu Muar Malay

In the previous subsection, the partiality of the base-reduplicant correspondence relation holding between Ulu Muar Malay Type III reduplicants and their bases was investigated. Such reduplicants were shown to be maximal syllables resulting from a TETU ranking of ALL-σ-LEFT. In this subsection, the status of the discontiguity exhibited by Type III reduplicants is examined in more detail.

As was discussed in §3-4, the first question that arises for Ulu Muar Malay Type III reduplication is why the reduplicant syllable corresponds with both edges of the base, at the expense of contiguity violations. I follow the same line of argumentation as in the previous two sections, assuming that Positional Faithfulness plays a decisive role in this phenomenon. It can be observed in (44) that each Type III reduplicant's onset corresponds with the leftmost consonant in the base. Again, I argue that such correspondence is due to the constraint LEFT-ANCHOR-BR, the effect of which is demonstrated in *Tableau 25*, below.

		RED-/gɑlap/	LEFT-ANCHOR-BR	ALL-σ-LEFT	MAX-BR
	a.	$\underline{l_3a_4p_5}$-gɑ$l_3a_4p_5$	*!	***	**
☞	b.	$\underline{g_1ɑ_2l_3}$-$g_1ɑ_2l_3$ap		***	**
☞	c.	$\underline{g_1a_4p_5}$-g_1ɑla_4p_5		***	**
☞	d.	$\underline{g_1ɑ_2p_5}$-$g_1ɑ_2$lap_5		***	**
☛	e.	$\underline{g_1ɑ_2ʔ_5}$-$g_1ɑ_2$lap_5		***	**

Tableau 25: LEFT-ANCHOR-BR preserves the leftmost consonant.
☞ & ☛ indicate the winners in the tableau; ☛ indicates the attested output.

Next, right edge faithfulness must be justified. As in §4.3, I argue that prosodic correspondence again functions to select the reduplicant's coda consonant. The prosodic correspondence analysis of Semai Expressive reduplication hinged on the condition that the data in (35) must not contain medial clusters. The final segment in the base was selected as a correspondent for the reduplicant's coda by virtue of its being the only segment in a coda position in the base. In order for this analysis to be extended to account for Ulu Muar Malay Type III reduplication, the same condition must hold for the data in (44). Upon inspection, one can see that this condition does indeed hold: there is no piece of data in (44) that contains a medial cluster, and I have not found an attested base containing a medial cluster that has successfully undergone Type III reduplication in Hendon (1966). As such, the use of CORR-Σ-ROLE achieves the same effect of targeting the base-final segment (the only coda) as a correspondent of the coda in the reduplicant.

In *Tableau 26*, candidate *26*:a is ruled out because, although its reduplicant is a maximal syllable, the reduplicant's [l] is syllabified as a coda, but its correspondent is syllabified as an onset in the base. As the only coda consonant in the base is [p], it is this consonant that is selected by CORR-Σ-ROLE to correspond with the coda in the reduplicant. Additionally, the candidate containing a core syllable reduplicant, candidate *26*:e, loses as well because this syllable is not maximal, indicating that the ranking of MAX-BR ≫ CONTIG-BR is crucial. Nevertheless, three candidates, *25*:b-d, still emerge victoriously, which shows that the analysis is incomplete, as there may only one be one attested output.

		Red-/gɑlap/	Left-Anchor-BR	Corr-Σ-Role	All-σ-Left	Max-BR
	a.	$\underline{g_1ɑ_2l_3}$-$g_1ɑ_2l_3$ap		*!	***	**
☞	b.	$\underline{g_1a_4p_5}$-g_1ɑla_4p_5			***	**
☞	c.	$\underline{g_1ɑ_2p_5}$-$g_1ɑ_2$lap_5			***	**
☚	d.	$\underline{g_1ɑ_2ʔ_5}$-$g_1ɑ_2$lap_5			***	**
	e.	$\underline{g_1ɑ_2}$-$g_1ɑ_4$lap			***	***!

Tableau 26: Corr-Σ-Role-BR and Left-Anchor-BR preserve the left and right base-edge segments in the reduplicant.
☞ & ☚ indicate the winners in the tableau; ☚ indicates the attested output.

Unlike Semai Expressive reduplicants, Ulu Muar Malay Type III reduplicants are permitted to contain vowels. Now that the edge consonants have been anchored in the reduplicant via positional faithfulness and prosodic correspondence, a new question arises. If both consonantal edges of a polysyllabic base are anchored in a monosyllabic reduplicant, which vowel in the base should correspond with the vowel in the reduplicant? In contiguous reduplication, Marantz's Generalization states that BR-correspondence strings should have a left-to-right directionality or a right-to-left directionality, but neither of these options is possible for a partial reduplicant that corresponds with both the leftmost *and* the rightmost consonants in the base.

Ulu Muar Malay type III reduplicants show preservation of the base-initial syllable's nucleus in the reduplicant even though this is not the main-stressed vowel, as Malay has final stress (Nelson 2003: 93). Nelson (2003) accounts for this fact with the constraint Faith-V_1, which requires faithfulness to the leftmost vowel, citing evidence from both Parisian and Québec French (Charette 1991: 203).[32] Furthermore, Beckman (1998/1999: Ch. 2) provides phonological evidence for faithfulness to the root-initial vowel in patterns of Shona vowel neutralization showing that initial vowels remain unneutralized, as well as phonological evidence for a constraint on faithfulness to the initial syllable in general.

I follow this line of argumentation assuming that although both the main-stressed syllable and the initial syllable are prominent positions, the initial syllable is treated as the more important position in Type III reduplication, formalized by ranking Faith-Initial-σ ≫ Faith-Stressed-σ. As Max is a Correspondence-Theoretic constraint on deletion, I argue that a constraint Max-Initial-σ-BR is active in the grammar, which prevents deletion of segments in the initial syllable. The inclusion of this constraint in the ranking we have so far achieves an interesting effect in that Left-Anchor-BR becomes redundant, which is discussed below.

[32]Deletion of [ə] is allowed in medial syllables in both Parisian and Quebec French, e.g. *mat<u>e</u>las* "mattress." cf. The *pas de rôle* "no role" example, where [pa.də.ʁol] ➪ [pa.dʁol] (Rialland 1986, Raffelsiefen 2005). However, [ə] is not deleted in initial syllable position in a disyllabic word in Parisian French (*cheval*, vs. Quebec French *ch<u>e</u>val* "horse"). In both dialects, deletion is not allowed in polysyllabic words (*c<u>e</u>pendant*) "however".

	Red-/gɑlap/	Left-Anchor-BR	Max-Initial-σ-BR	Corr-Σ-Role	All-σ-Left	Max-BR	Contig-BR
	a. g$_1$ɑ$_2$l$_3$-g$_1$ɑ$_2$l$_3$ap			*!	***	**	
	b. g$_1$a$_4$p$_5$-g$_1$ɑla$_4$p$_5$		*!		***	**	**
☞	c. g$_1$ɑ$_2$p$_5$-g$_1$ɑ$_2$lap$_5$				***	**	**
☚	d. g$_1$ɑ$_2$ʔ$_5$-g$_1$ɑ$_2$lap$_5$				***	**	**
	e. l$_3$a$_4$p$_5$-gɑl$_3$a$_4$p$_5$	*!	**		***	**	
	f. g$_1$ɑ$_2$-g$_1$ɑ$_4$lap				***	***!	

Tableau 27: Max-Initial-σ-BR ensures that the vowel in the initial syllable of the base corresponds with the vowel in the reduplicant syllable.
☞ & ☚ indicate the winners in the tableau; ☚ indicates the attested output.

The crucial distinction in *Tableau 27* is between candidates 27:b and 27:c-d. The reduplicant's vowel in candidate 27:b corresponds with the vowel in the main stressed syllable (the final vowel), rather than the vowel in the initial syllable. Candidates 27:c-d, on the other hand, contain reduplicants whose vowels correspond with the vowels in the base-initial syllables, as required by Max-Initial-σ-BR, and are thus selected as the winners. Of course, Contig-BR must be lowly ranked so as to prevent contiguous reduplicants, as in 27:a, 27:e, and 27:f, from emerging as the output. Furthermore, note that the ranking of Max-Initial-σ-BR is not crucial with respect to Left-Anchor-BR. Max-Initial-σ-BR not only guarantees that the initial vowel is preserved, but that the initial onset is preserved as well. As such, Max-Initial-σ-BR kills two birds with one stone, so to speak, and one is able to remove Left-Anchor-BR from the ranking without any undesirable effects, as ranking it higher or lower makes no difference to the output.

Once again, this analysis makes a very clear, strong prediction. Importantly, the data shown in (44) does not contain roots with closed initial syllables. If such roots are able to undergo Type III reduplication, this analysis would predict that it would be this coda in the initial syllable and not the final coda that would correspond with the coda in the reduplicant. This prediction results from two constraints: Max-Initial-σ-BR would predict that the entire initial syllable would be reduplicated, which would satisfy Corr-Σ-Role, leaving no need for right-edge correspondence.

I have found several potential Ulu Muar Malay roots in Hendon (1966) which fit the description of stems that are permitted to undergo Type III reduplication, many of them borrowings. A partial list is given below in (45).

(45) Ulu Muar Malay words containing medial clusters (Hendon 1966: 25)

a. lintah "water leech"
b. caklat "chocolate"
c. paspʊt "passport"
d. kastam "customs service"

In order to test the analysis presented in this section, one would simply need to conduct a bit of fieldwork to see whether forms like lin-lintah arise at the exclusion of lɪh-lintah, cak-caklat at the exclusion of caʔ-caklat, etc. Unfortunately, it is likely that few speakers remain who might still be fluent in this local dialect of Malay. This dialect is not a prestige form of speech, except in certain ceremonial contexts, and it is too dissimilar to "standard" Malay to pass as simply a pleasant regional accent. Furthermore, use of this dialect has dwindled over the past few decades, in part because of the adoption of a standardized form of Malay as the national language, the spread of education in schools using "standard" Malay, and the increasing urbanization of a once primarily rural population (Rufus Hendon, p.c.). However, if speakers can be found, then the analysis presented here can easily be supported or refuted by determining how it may be applied to bases of different shapes than those in (44), such as the bases in (45). Even if my analysis turns out not to be the correct one, this knowledge would nevertheless be beneficial to phonological theory, as it would provide stronger empirical support for Nelson's Asymmetric Anchoring Theory.

In this subsection, I have identified a set of constraints which must outrank CONTIG-BR, which explains the discontiguity of Ulu Muar Malay Type III reduplicants. It was observed that the left-most consonant and the initial vowel in the base are always preserved, which I analyzed as a positional faithfulness effect resulting from MAX-INITIAL-σ-BR. Furthermore, the connection between right-edge preservation and the fact that the only closed syllable in each base is the final syllable was made by appealing to prosodic correspondence, formalized as CORR-Σ-ROLE. Thus, the set of constraints that must outrank MAX-BR is given below in (46).

(46) MAX-IO ≫ MAX-INITIAL-σ-BR, CORR-Σ-ROLE ≫ MAX-BR ≫ CONTIG-BR

5.4 Reduplicant Coda Placelessness

One peripheral issue remains to be analyzed, which is not directly related to discontiguity of the BR-correspondence relation, namely the neutralization of the coda consonants in Type III reduplicants. As shown in the data in (44), Type III reduplicant coda consonants are [ʔ] if the rightmost segment in the base is a stop, a homorganic nasal if the rightmost segment in the base is a nasal, and [h] if the rightmost segment in the base is [h]. These segments all share the property of being placeless.

I analyze this placelessness as an emergence of the unmarked effect. The fact that placeless codas are prohibited from surfacing in bases is indicative of reduplication patterns in which bases may contain codas but reduplicants may not. In this case, codaless reduplicants are generated by the TETU ranking MAX-IO ≫ NOCODA ≫ MAX-BR.

		RED-/pat/	MAX-IO	NOCODA	MAX-BR
	a.	$\underline{p_1a_2t_3}$-$p_1a_2t_3$		**!	
☞	b.	$\underline{p_1a_2}$-p_1a_2t		*	*
	c.	$\underline{p_1a_2}$-p_1a_2	*!		

Tableau 28: Reduplication of the hypothetical base pat, showing the TETU effect of NOCODA.

In *Tableau 28*, candidate *28*:a loses because the reduplicant contains a coda, creating an unnecessary violation of NOCODA. However, the coda must be preserved in the base, as candidate *28*:c shows: deletion of this coda violates MAX-IO, which outranks NOCODA. Thus, candidate *28*:b, which contains a coda in the base but not in the reduplicant, wins.

In Type III reduplication, one does not observe codaless reduplicants, but rather reduplicants with placeless codas. This is also reminiscent of a TETU effect of placelessness, where segments in a reduplicant must be placeless but segments in the base cannot be. In this case, placeless reduplicants are derived by the TETU ranking $\text{MAX}_{[\text{Place}]}$-IO ≫ *PLACE[33] ≫ $\text{MAX}_{[\text{Place}]}$-BR.

[33] See Kiparsky (1994) for more on *PLACE.

	Red-/pat/	Max$_{[Place]}$-IO	*Place	Max$_{[Place]}$-BR
	a. $\underline{p_1a_2t_3}$-$p_1a_2t_3$		****!**	
☞	b. $\underline{\text{ʔ}_1\text{ə}_2\text{ʔ}_3}$-$p_1a_2t3$		***	***
	c. $\underline{\text{ʔ}_1\text{ə}_2\text{ʔ}_3}$-$\text{ʔ}_1\text{ə}_2\text{ʔ}_3$	*!**		***

Tableau 29: Reduplication of the hypothetical base pat, showing the TETU effect of *Place.

In *Tableau 29*, candidate *29*:a loses because the reduplicant contains segments specified for place, creating unnecessary violations of *Place. However, place must be preserved on segments in the base, as candidate *29*:c shows: place features must be preserved from the input in the output or else violations of Max-IO — which outranks *Place — are fatal. Thus, the winner is candidate *29*:b, which only contains placeless segments in the reduplicant.

Neither of these constraints, NoCoda or *Place, exactly captures the effect of placeless codas in Ulu Muar Malay Type III reduplication, but I argue that a local conjunction of them does. When two constraints are locally conjoined, the resulting conjoined constraint is only violated if both of its component constraints are violated in a local domain. The idea is that violating both constraints in unison is worse than violating either of the two constraints individually. So, consider the constraint NoCoda &$_{Segment}$ *Place. This constraint is only violated when the same segment violates both NoCoda and *Place.[34]

	Red-/pat/	Max-IO	Max$_{[Place]}$-IO	NoCoda &$_{Segment}$ *Place	Max-BR	Max$_{[Place]}$-BR	NoCoda	*Place
	a. $\underline{p_1a_2t_3}$-$p_1a_2t_3$			**!			**	******
☞	b. $\underline{p_1a_2\text{ʔ}_3}$-$p_1a_2t_3$			*		*	**	*****
	c. $\underline{p_1a_2}$-p_1a_2t			*	*!		*	*****
	d. $\underline{\text{ʔ}_1\text{ə}_2\text{ʔ}_3}$-$p_1a_2t_3$			*		**!*	**	***

Tableau 30: Reduplication of the hypothetical base pat with coda neutralization, showing the TETU effect of NoCoda &$_{Segment}$ *Place.

In *Tableau 30*, candidate *30*:a loses due to a fatal violation of NoCoda &$_{Segment}$ *Place as it contains a coda in the reduplicant that is specified for place. Codas in the base that are specified for place are, however, permitted by virtue of the ranking Max-IO ≫ Max$_{[Place]}$-IO ≫ NoCoda &$_{Segment}$ *Place. Next, Max-BR eliminates candidate *30*:c, in which there is no coda in the reduplicant. Similarly, *30*:d is ruled out because more segments in the reduplicant lose their place features than is necessary. As such, candidate *30*:b emerges victoriously.

This ranking appears to be exactly what is necessary to account for placelessness in Ulu Muar Malay Type III reduplicants. The ranking in *Tableau 30* is used to account for coda placelessness in Type III reduplicants in the following section.

5.5 An OT Analysis of Ulu Muar Malay Discontiguous Reduplication

In this subsection, the pieces of the analysis presented in §5.2 – §5.4 fit together in explaining how the discontiguous reduplication pattern exhibited in Ulu Muar Malay Type III reduplicants arises.

[34]Further possible evidence for feature markedness in coda position comes from the Doka Timur dialect of West Tarangan (Nivens 1993), which prohibits voiced codas in reduplicants. e.g. jaban ➪ jip-jaban "dry," and kudam ➪ kit-kudam "cloud." See also §6.2 for a comparison of this data with that in Ulu Muar Malay Type III reduplication in view of the constraint Corr-Σ-Role.

Recall that in §5.2, the reduplicant was limited to a maximal syllable with the TETU ranking of Max-IO ≫ All-σ-Left ≫ Max-BR. In §5.3, it was shown that Corr-Σ-Role functions to select the rightmost consonant in the base to stand in correspondence with the reduplicant's coda. Additionally, Max-Initial-σ-BR ensured that segments that occupy the initial syllable in the root have correspondents in the reduplicant. Max-Initial-σ-BR was shown to account for a superset of the effects accounted for by Left-Anchor-BR, allowing free ranking of Left-Anchor-BR with respect to the other constraints. In §5.4, the nature of the coda's placelessness was examined and was argued to result from a TETU ranking containing the locally conjoined constraint NoCoda &$_{\text{Segment}}$ *Place.

The objective of this subsection is to present an OT analysis of Ulu Muar Malay Type III reduplication which successfully derives the fact that Type III reduplicants are maximal syllables which correspond with the segments at the edges of the base, preserve the initial vowel, and contain placeless codas.

Combining the rankings presented in §5.2 – §5.4, it is shown in *Tableau 31 & 32* that the following ranking in (47) yields Ulu Muar Malay Type III reduplicants.

(47) Ranking Schema for Ulu Muar Malay Type III Reduplication:

Corr-Σ-Role   Max-Initial-σ-BR   Max-IO   Max$_{[\text{Place}]}$-IO

All-σ-Left   NoCoda &$_{\text{Segment}}$ *Place

Max-BR

Contig-BR   NoCoda   Max$_{[\text{Place}]}$-BR

Left-Anchor-BR   *Place

As shown in *Tableau 31 & 32*, the ranking in (47) generates the discontiguous BR-correspondence relation exhibited in Ulu Muar Malay Type III reduplication. The optimal candidate in *Tableau 31* is gaʔ-galap, and the optimal candidate in *Tableau 32* is kaŋ-kawan. The reduplication pattern cannot be made contiguous by deleting the [la] or [wa] from the respective bases, as shown by candidates *31*:h and *32*:h's fatal violation of Max-IO. All-σ-Left specifies that the left edge of each syllable must coincide with the left edge of the PWd in which it is contained, limiting the reduplicant to a single syllable in length. Since Max-IO ≫ All-σ-Left, the base is nevertheless permitted to be polysyllabic. Thus, some segments in the base cannot have a correspondent in the reduplicant, as the reduplicant is reduced to one syllable, preventing total reduplication as exhibited in candidates *31*:a and *32*:a. At this point, only candidates with monosyllabic reduplicants remain. Corr-Σ-Role ensures that each segment in the reduplicant bears the same syllabic role as its correspondent in the base, excluding candidates *31*:d and *32*:d because [l] and [w] are codas in the reduplicant but onsets in the base. Now, all segments in the base and reduplicant bear the correct correspondence relations. NoCoda &$_{\text{Segment}}$ *Place prohibits codas that are specified for place, ruling out gap-galap and kan-kawan in candidates *31*:e and *32*:e, respectively. Finally, Max-BR ≫ Contig-BR ensures

	Red-/gɑlap/	Max-IO	All-σ-Left	Max-Initial-σ	Corr-Σ-Role	NoCoda &$_{Segment}$ *Place	Max-BR	Contig-BR
	a. $\underline{g_1ɑ_2l_3a_4p_5}$-$g_1ɑ_2l_3a_4p_5$		****!**			**		
	b. $\underline{g_1a_4p_5}$-$g_1ɑla_4p_5$		***	*!		**	**	**
	c. $\underline{l_3a_4p_5}$-$gɑl_3a_4p_5$		***	*!*		**	**	
	d. $\underline{g_1ɑ_2l_3}$-$g_1ɑ_2l_3ap$		***		*!	**	**	
	e. $\underline{g_1ɑ_2p_5}$-$g_1ɑ_2lap_5$		***			**!	**	**
	f. $\underline{g_1ɑ_2}$-$g_1ɑ_2lap$		***			*	***!	
☞	g. $\underline{g_1ɑ_2ʔ_5}$-$g_1ɑ_2lap_5$		***			*	**	**
	h. $\underline{g_1ɑ_2ʔ_3}$-$g_1ɑ_2ʔ_3$	*!*	*					

Tableau 31: Complete OT analysis of Ulu Muar Type III reduplication (base ending with a stop).

	Red-/kawan/	Max-IO	All-σ-Left	Max-Initial-σ	Corr-Σ-Role	NoCoda &$_{Segment}$ *Place	Max-BR	Contig-BR
	a. $\underline{k_1a_2w_3a_4n_5}$-$k_1a_2w_3a_4n_5$		****!**			**		
	b. $\underline{k_1a_4n_5}$-$k_1awa_4n_5$		***	*!		**	**	**
	c. $\underline{w_3a_4n_5}$-$kaw_3a_4n_5$		***	*!*		**	**	
	d. $\underline{k_1a_2w_3}$-$k_1a_2w_3an$		***		*!	**	**	
	e. $\underline{k_1a_2n_5}$-$k_1a_2wan_5$		***			**!	**	**
	f. $\underline{k_1a_2}$-k_1a_2wan		***			*	***!	
☞	g. $\underline{k_1a_2ŋ_5}$-$k_1a_2wan_5$		***			*	**	**
	h. $\underline{k_1a_2ŋ_3}$-$k_1a_2ŋ_3$	*!*	*					

Tableau 32: Complete OT analysis of Ulu Muar Type III reduplication (base ending with a nasal).[35]

[35] In candidate *32*:g-h, the [ŋ] in the reduplicant is itself not linked to its own place specification. Instead, this nasal assimilates to the following onset [k], which is velar. This pattern can be observed with all the bases ending in nasals in (44). I assume that this [ŋ] does not violate *Place, and thus cannot violate NoCoda &$_{Segment}$ *Place.

that the reduplicant is as large as possible even at the expense of contiguity, ruling out candidates *31*:f and *32*:f which contain reduplicants that are smaller than they could be, cf. candidates *31*:g and *32*:g, which are the winners of *Tableau 31 & 32*, respectively.

The three components for a successful Reduction Model analysis of discontiguous reduplication have now been established for Ulu Muar Type III reduplication. In §5.2, the set of constraints that must outrank MAX-BR to permit partial reduplication was singleton: the simple TETU ranking of MAX-IO ≫ ALL-σ-LEFT ≫ MAX-BR yields maximal syllables, which is just the right size for Type III reduplicants. In §5.3, the set of constraints that must outrank CONTIG-BR to permit discontiguity in the base-reduplicant correspondence relation was presented in (46). In §5.4, the nature of the placelessness of the codas in Type III reduplicants was discussed and was shown to result from the conjoined constraint NOCODA $\&_{\text{Segment}}$ *PLACE, again in a TETU ranking. In this subsection, these rankings were combined to show how an analysis of Type III reduplication could be constructed in Optimality Theory that explained the nature of the edge anchoring, initial vowel faithfulness, and placelessness of the coda.

6 Theoretical Implications

6.1 Some Interesting Emergence of the Unmarked Effects

The analyses presented in §3 – §5 have several implications for various aspects of phonological theory. In all three of these analyses, several interesting TETU effects contributed to the generation of what appeared to be somewhat unfamiliar-looking reduplicants. The ranking MAX-IO ≫ $\mathbb{C}$ ≫ MAX-BR obtained to yield TETU effects relating to the relative markedness of various candidates with respect to the constraint(s) $\mathbb{C}$.

In §3, it was shown that Nakanai Type V and Type VI reduplicants were reduced from a foot-sized base to a syllable-sized reduplicant due to a constraint on multiple obstruents within a morpheme, expressed in OT as *2-$\text{OBS}_{\mathbb{M}}$, defined in (27). In the Reduction Model analysis of Type V and Type VI reduplication, this constraint was shown to dominate MAX-BR and CONTIG-BR, but not MAX-IO, yielding the TETU ranking of the ranking MAX-IO ≫ *2-$\text{OBS}_{\mathbb{M}}$ ≫ MAX-BR. This ranking created a natural class division between Type I and Type V/VI reduplicants: Type I reduplicants were derived from bases which contained less than two obstruents and could therefore undergo total reduplication, whereas Type V and Type VI reduplicants were derived from bases that contained two obstruents, and therefore had to be reduced in size. The result was a TETU OCP effect on obstruents.

A second kind of TETU effect in Nakanai Type V and Type VI reduplication was shown to result from a slightly different ranking: *LHDIPH, LINEARITY-BR ≫ MAX-BR. When the base-final vowel was the more sonorous of the two vowels in the base foot, only this vowel was licensed as the peak of the reduplicant syllable, producing a Type VI reduplicant. The other vowel was deleted since its preservation would have incurred a violation of *LHDIPH — or LINEARITY-BR if metathesis is invoked to repair the sonority sequence — which were ranked above MAX-BR. However, when the first of the two vowels was the more sonorous, both vowels were licensed because *LHDIPH was satisfied, yielding a Type V reduplicant.[36] As such, maximality of the reduplicant was obtained to

[36] While it is possible to syllabify the first vowel in nucleus position and the second as an off-glide (as suggested by Spaelti 1997: 86) to prevent unnecessary *P violations, such an analysis is not crucial because MAX-BR is ranked above

prevent unnecessary violations of MAX-BR.

In both §4 and §5, Expressive reduplicants and Type III reduplicants were also reduced from PWd-sized bases to syllable sized reduplicants. I argued that this was a TETU effect emerging from the ranking MAX-IO ≫ ALL-σ-LEFT ≫ MAX-BR. With this ranking, reduplicants were limited to a syllable so as to satisfy REALIZEMORPHEME. A reduplicant syllable of any size incurs the same number of violations of ALL-σ-LEFT, so MAX-BR is activated to ensure that the syllable is maximal, producing another TETU maximality effect.

This maximality is never actually realized in Semai Expressive reduplicants, however, as there is another TETU effect that prevents it: the phenomenon of vowel reduction/deletion in unstressed syllables. The ranking MAX-IO ≫ *UNSTRESSED[low] ≫ *UNSTRESSED[mid] ≫ *UNSTRESSED[high] ≫ *UNSTRESSED[ə] ≫ MAX-BR prohibits any sort of vowel from surfacing in the reduplicant because the reduplicant is never stressed. However, vowels are permitted to remain in the base to satisfy MAX-IO, as this constraint outranks the *UNSTRESSED hierarchy. The outcome is a TETU vowel reduction effect.

Finally, an extremely interesting TETU effect emerged in §5 in Ulu Muar Type III reduplicant codas. It was observed that reduplicant codas had to be placeless, whereas codas in the base were permitted to be specified for place. This result was shown to arise from the local conjunction of NOCODA $\&_{\text{Segment}}$ *PLACE. As this conjunction was at the segmental level, NOCODA $\&_{\text{Segment}}$ *PLACE was only violated if a single segment was both syllabified as a coda and specified for place. The ranking MAX-IO, $\text{MAX}_{\text{[Place]}}$-IO ≫ NOCODA $\&_{\text{Segment}}$ *PLACE ≫ MAX-BR, $\text{MAX}_{\text{[Place]}}$-BR permitted place-specified codas in the base, but not in the reduplicant. Depending on the ranking of MAX-BR with respect to $\text{MAX}_{\text{[Place]}}$-BR, reduplicant codas specified for place may either become placeless or delete. It was shown that the ranking for Ulu Muar Malay must be MAX-BR ≫ $\text{MAX}_{\text{[Place]}}$-BR, as reduplicant codas are realized without place rather than deleted. This ranking resulted in a TETU restriction on codas specified for place in the base but not in the reduplicant.

One interesting aspect of the TETU effects in this paper is that several of them involve TETU unmarkedness with respect to faithfulness constraints, rather than markedness constraints. The TETU OCP effect exhibited Nakanai reduplicants yields reduplicant maximality when MAX-BR is activated through satisfaction of the higher ranked *2-$\text{OBS}_{\mathbb{M}}$. Similarly, when the Generalized Alignment constraint ALL-σ-LEFT is satisfied in Semai Expressive Reduplication and Ulu Muar Malay Type III reduplication to the greatest extent it can be given its position in the ranking, MAX-BR is likewise activated to drive syllable maximality.

The other effects on vowel reduction and coda placelessness are more familiar in that they license marked structures in certain environments but not others, depending on constraint ranking. However, they yield structures that do not manifest themselves frequently in more familiar languages that tend to rank faithfulness constraints above constraints on vowel reduction and placelessness.

6.2 An Extension of Prosodic Correspondence

In §4 & §5, the notion of prosodic correspondence was extended from OO-correspondence to BR-correspondence. In §2.3, it was observed that prosodic correspondence motivates diminutive suffix

the *P constraints. *LHDIPH is what conditions the Type V/VI alternation, regardless of whether V_1 and V_2 in a CV_1V_2 Type V reduplicant share a nucleus position or V_2 is treated as a coda.

choice in Spanish. The relevant prosodic correspondence constraint, Corr-Σ-Role, penalized candidates in which the diminutive suffixation altered the syllabic roles of the segments in the stem. In McCarthy & Prince (1993a), a version of this constraint accounts for a similar case in which reduplicant placement in Kamaiurá and Chamorro alternates between suffixation and infixation depending on whether syllabic roles in the stem are preserved post-affixation. Compare the (a) and (b) examples of the Kamaiurá data in (48) and the Chamorro data in (49).

(48) Kamaiurá Infixing Reduplication, Red=Ft (McCarthy & Prince 1993a: 139)
  a. o-huka ➪ ohuka-huka "he laughed/kept laughing"
  b. o-ekɨj ➪ oekɨ-ekɨ-j "he pulls/repeatedly"

(49) Chamorro Infixing Reduplication, Red=σ (McCarthy & Prince 1993b: 139)
  a. buníta ➪ buníta-ta "pretty/very pretty"
  b. métgot ➪ métgo-go-t "strong/very strong"

Even though this functionality of Corr-Σ-Role is instantiated by reduplication, the constraint is still on OO-correspondence, as the relevant correspondence relation holds between stem consonants in different words, rather than between segments in a base and its corresponding reduplicant within a single word (despite the fact that such correspondence obtains in these examples, anyway). It appears necessary to posit a related constraint, Corr-Σ-Role-BR, which holds for segments that correspond via the base-reduplicant relation. The only modification necessary to the original Corr-Σ-Role definition in (21) is that $\mathfrak{R}$ = base-reduplicant correspondence rather than output-output correspondence.[37]

(50) Corr-Σ-Role-BR: Let $\mathfrak{R}$ be a base-reduplicant correspondence relation. ∀x and ∀y such that x and y are segments and x$\mathfrak{R}$y, assess a violation if x and y have different syllabic roles (onset, nucleus, or coda).

Unlike Corr-Σ-Role, Corr-Σ-Role-BR penalizes segments in the reduplicant that bear a different syllabic role than their correspondents in the base. This constraint differs from the constraint in (21) in that it does not apply transderivationally, but assesses violations on the base-reduplicant correspondence relation holding within a single prosodic word. This constraint on BR-correspondence is violated by reduplicants like those in the Doka Timur dialect of West Tarangan (Nivens 1993), in which the reduplicant's coda corresponds with an onset in the base, shown in (51), yielding contiguous maximal syllable reduplicants. It is satisfied by Type III reduplicants in Ulu Muar Malay (Hendon 1966, §5.3), repeated below in (52), in which the reduplicant's coda corresponds with a coda in the base, yielding discontiguous maximal syllable reduplicants.

(51) Doka Timur West Tarangan (Nivens 1993)
  a. jaban ➪ jip$_3$-jab$_3$an "dry"
  b. kudam ➪ kit$_3$-kud$_3$am "cloud"

(52) Ulu Muar Malay (Hendon 1966)
  a. sieʔ ➪ sɪʔ$_4$-sieʔ$_4$ "is torn repeatedly"
  b. tarɪʔ ➪ taʔ$_5$-tarɪʔ$_5$ "accordion"

[37]Thanks to Jesse Kirchner for helping me come up with this particular formulation of the related BR-correspondence constraint.

The transderivational functionality of CORR-Σ-ROLE exhibited in Spanish, Kamaiurá, and Chamorro would not be applicable in distinguishing reduplicant coda choice in Doka Timur West Tarangan vs. Ulu Muar Malay, but the version in (50) would successfully distinguish between the two reduplicant patterns in (51) & (52).

6.3 A (Possible) Improvement on Asymmetric Anchoring Theory

Positional Anchoring was used in all three analyses in §3 – §5 to account for the preservation of material at the left edge of the base in the reduplicant. Each analysis used some form of left-edge anchoring, either in the form of LEFT-ANCHOR-BR — essentially a form of FAITH-INITIAL-BR applying at the segmental level — in §3 & §4, or in the form of MAX-INITIAL-σ-BR — a form of FAITH-INITIAL-BR applying at the syllabic level — in §5 (which subsumed the utility of LEFT-ANCHOR-BR in this analysis). Apparent right-edge anchoring was accounted for via other means, such as sonority sequencing in §3.3 and prosodic correspondence in §4.3 & 5.3. With these elements combined, edge anchoring resulted.

Previous literature, e.g. the *Compression Model* of Hendricks (2001) and the *Asymmetric Anchoring* theory of Nelson (2003), accounts for such edge anchoring reduplication patterns by generating minimal reduplicants with both edges anchored. Partial reduplication is explained by root alignment or place markedness: a constraint such as ALIGN-ROOT-LEFT penalizes every segment intervening between the left edge of the root and the left edge of the prosodic word, and PLACE-MARKEDNESS penalizes every segment that is linked to a place feature. Both of these constraints favor reduplicant minimality. ALIGN-ROOT-LEFT prefers the smallest possible reduplicant since every segment in a reduplicant prefix will intervene between the left edge of the root and the left edge of the PWd, and PLACEMARKEDNESS prefers the smallest possible reduplicant since every segment in a reduplicant will be linked to a place feature.[38] To derive edge anchoring, Hendricks (2001) ranks LEFT-ANCHOR-BR and RIGHT-ANCHOR above ALIGN-ROOT-LEFT, while Nelson (2003) equivalently ranks EDGE-ANCHOR-BR (essentially a constraint disjunction of LEFT-ANCHOR-BR and RIGHT-ANCHOR-BR) above PLACEMARKEDNESS. With these rankings, the left and right edges survive minimality by virtue of their position at the edges, and all other material is deleted because it does not lie at an edge. This effect can be seen below in *Tableau 33 & 34*.

	RED-/pita/	LEFT-ANCHOR-BR	RIGHT-ANCHOR-BR	ALIGN-ROOT-LEFT	MAX-BR	CONTIG-BR
	a. $\underline{p_1i_2t_3a_4}$-$p_1i_2t_3a_4$			***!*		
☞	b. $\underline{p_1a_4}$-p_1ita_4			**	**	**
	c. $\underline{p_1i_2}$-p_1i_2ta		*!	**	**	
	d. $\underline{t_3a_4}$-pit_3a_4	*!		**	**	

Tableau 33: Hendricks's Compression Model derives Nakanai Type VI reduplicants.

[38] None of the candidates in *Tableau 33 & 34* contain reduplicants with only placeless segments. I assume that in adopting an analysis where PLACEMARKEDNESS acts as a size restrictor, higher ranked IDENT-F constraints would be necessary to preserve place.

		Edge-Anchor-BR	Place Markedness	Max-BR	Contig-BR
	Red-/taʔəh/				
	a. $\underline{\text{t}_1\text{a}_2\text{ʔ}_3\text{ə}_4\text{h}_4}$-$\text{t}_1\text{a}_2\text{ʔ}_3\text{ə}_4\text{h}_4$		********!**		
☞	b. $\underline{\text{t}_1\text{h}_4}$-$\text{t}_1$aʔə$\text{h}_4$		*******	***	***
	c. $\underline{\text{t}_1\text{a}_2}$-$\text{t}_1\text{a}_2$ʔəh	*!	*******	***	
	d. $\underline{\text{ʔ}_3\text{h}_5}$-ta$\text{ʔ}_3$ə$\text{h}_5$	*!	*******	***	*

Tableau 34: Nelson's Asymmetric Anchoring Theory derives Semai Expressive reduplicants.[39]

While the analyses presented in *Tableau 33 & 34* "work," they do little more than state the phenomenon at issue in Optimality-Theoretic terminology: reduplicants should be as small as possible (the Align-Root-Left/PlaceMarkedness component), but the edges need to be preserved (the Anchor component). Both of these analyses miss several observations that the Reduction Model analyses presented in §3 – §5 capture without stipulating anchoring of both edges. The fact that explanations of the apparent edge anchoring in the data presented in §3-5 do not need constraints like Edge-Anchor-BR raises the question of the status of these constraints in Universal Grammar. If these constraints are not needed for anchoring of both edges, what is their utility? I bring up this question in more detail in the following subsection.

6.4 Support for Positional Faithfulness Theory

Positional Faithfulness Theory (Beckman 1998/1999) was introduced in §2.1, and proved its utility in the Reduction Model analyses of Nakanai, Semai, and Ulu Muar Malay discontiguous reduplication. Each reduplication phenomenon examined in this paper provides support for Positional Faithfulness Theory.

In Nakanai Type V/VI reduplication, it was shown that the partiality of the reduplication pattern was the result of an OCP-like constraint on multiple obstruents in the reduplicant. Whenever there were multiple obstruents in the head foot, one of them could not have a correspondent in the reduplicant. When the question of which obstruent should be preserved in the reduplicant arose, it was shown that the obstruent at the left edge of the base was always preserved in both Type V and Type VI reduplicants. This is unsurprising for Type V reduplicants: preservation of the second obstruent in a form like $\underline{C_3V_2V_4}$-$CV_2C_3V_4$ would satisfy Contig-BR, but would violate Linearity-BR, which is ranked higher than Contig-BR. However, the selection of the leftmost obstruent in Type VI reduplicants would not be predicted were it not for Positional Faithfulness Theory: $\underline{C_3V_4}$-CVC_3V_4 would yield a completely contiguous reduplicant syllable. It is due to the high ranking of Left-Anchor-BR that the leftmost obstruent is selected as the onset of the reduplicant, even at the expense of Contig-BR violations.

The same is true in Semai Expressive reduplication. The reduplicant is limited to one syllable in size, and the base must therefore be reduced to conform to this syllable. Because of the relatively high-ranking Corr-Σ-Role, segments in the reduplicant must match their correspondents in the base in syllabic role. Since vowels are prohibited in the reduplicant (as it is unstressed), there is no question of which vowel must be selected because neither of them will be. The selection of the coda is trivial, as there is only one coda in each base. However, the choice of onset is not trivial: there are two possible options, namely the onset at the left edge of the base or a medial onset. Contig-BR

[39] On Nelson's behalf, I assume that schwa [ə] is specified for place in Semai since it occurs in the input. If schwa is placeless, then it would be predicted to surface in the reduplicant as this would not violate PlaceMarkedness.

would predict that the closest onset to the coda would be selected so as to minimize violations, but this is not what happens: the leftmost onset is selected, even though extra CONTIG-BR violations are incurred.

In Ulu Muar Malay Type III reduplication, the situation is slightly different. Like Semai Expressive reduplication, the base is reduced to a syllable to form the reduplicant, but unlike Semai Expressive reduplication, there is no restriction on vowels and the syllable can surface as maximal. By CORR-Σ-ROLE, the lone coda consonant in each base is selected as the correspondent of the coda in the reduplicant. Again, CONTIG-BR would ideally select the closest onset and nucleus to this coda as the correspondents of the onset and nucleus in the reduplicant, as such selection would produce a contiguous maximal syllable incurring no CONTIG-BR violations. Again, the attested outputs are not of this shape: instead, the initial CV syllable in the base corresponds with the initial CV in the reduplicant. I treated this as anchoring of the leftmost syllable — formalized as MAX-INITIAL-σ-BR, as this syllable is a privileged position (Beckman 1998/1999, Nelson 2003) — rather than relying on LEFT-ANCHOR-BR and FAITH-V_1: I do not find the French evidence for FAITH-V_1 compelling. However, a treatment using LEFT-ANCHOR-BR and FAITH-V_1 would yield the same result. In fact, if FAITH-V_1 is well-motivated in the grammar, a related analysis might be constructed using only this constraint and LINEARITY-BR: the selection of the leftmost onset would fall out from the fact that selecting a medial onset would violate LINEARITY-BR, as in $\underline{C_3V_2C_5}$-$CV_2C_3VC_5$.

One aspect that all three analyses share is that no constraint used makes reference to the right edge in any constraint *definition*. Instead, right-edge preservation is explained in the Reduction Model analyses with more fundamental properties of each language's phonology via constraint *interaction*. This result is desirable for Positional Faithfulness Theory, as the left edge is included as a prominent position, but the right edge is not. Both RIGHT-ANCHOR-BR in the Compression Model and EDGE-ANCHOR-BR in Asymmetric Anchoring Theory refer to the right edge as a target for preservation in the reduplicant, which is undesirable for Positional Faithfulness Theory.

Nevertheless, the Reduction Model analyses presented in this paper might not be the way to go. Each analysis makes very clear, testable predictions which might not be borne out empirically. If such is the case, then there is additional evidence for an account that targets both edges of the base as targets for anchoring, along the lines of Hendricks (2001) and Nelson (2003), and evidence against the Reduction Model. As it stands now, however, the analyses presented in this paper have equivalent descriptive coverage to those advanced by Hendricks (2001) and Nelson (2003), with the additional benefit of using constraints that are empirically-motivated — such as the Peak Prominence hierarchy, CORR-Σ-ROLE, the *UNSTRESSED hierarchy, and Generalized Alignment — rather than constraints that are simply theoretically-motivated — such as EDGE-ANCHOR-BR. If the Reduction Model analyses presented in this paper survive the tests of time and cross-linguistic robustness (and if they are robust enough to account for new data from the languages examined in this paper that will hopefully be collected in the near future), then they will prove valuable for Positional Faithfulness Theory. It will not be necessary to refer to the right edge as a target for anchoring, and constraints like RIGHT-ANCHOR and EDGE-ANCHOR can be safely eliminated from the grammar.

7 Conclusion

7.1 Summary

In §1, the phenomenon of reduplication was introduced, and a brief history of its treatment in the generative phonology literature was presented. Optimality Theory (Prince & Smolensky 1993/2004) was shown to be an attractive theory in which to account for discontiguous reduplication because the nature of the discontiguity exhibited could be attributable to a reranking of the constraint Contig-BR. Discontiguous reduplication was shown to be an worthwhile issue to attempt to account for in OT, as it is not predicted by Marantz's Generalization (Marantz 1982). I presented the Reduction Model as a means for successful analysis of discontiguous reduplication in OT. This model contains three components, given in (7): a set of constraints that must outrank Max-BR to yield partial reduplication, a set of constraints that must outrank Contig-BR to yield a potentially discontiguous BR-correspondence relation, and a ranking of these two sets of constraints that yields reduplicants of the correct size and shape. This model proved successful in analyzing Nakanai Type V & Type VI reduplication in §3, Semai Expressive reduplication in §4, and Ulu Muar Malay Type III reduplication in §5.

Before my exposition of these analyses, several aspects of phonological theory were summarized in §2, as they would play a recurring role in each analysis. These included Positional Faithfulness Theory (Beckman 1998/1999) in §2.1, Asymmetric Anchoring Theory (Nelson 2003) in §2.2, Prosodic Correspondence (McCarthy & Prince 1993a, Benua 1995, Ito, Kitagawa, and Mester 1996, Aguero-Bautista 1998, Kenstowicz 2005) in §2.3, and the Emergence of the Unmarked (McCarthy & Prince 1994) in §2.4.

My analysis of Nakanai Type V & VI reduplication, which drew heavily from the analyses laid out in Chapter 3 of Spaelti (1997) and in Carlson (1997), was presented in §3. Type V/VI reduplicants, which are partial, were shown to differ from Type I reduplicants, which are total, as a result of whether their correspondent bases contained multiple obstruents. An apparent restriction on multiple obstruents in the reduplicant was identified, and analyzed in OT with the constraint *2-$\text{Obs}_{\mathbb{M}}$. Taking the question into consideration of which of the two obstruents should be preserved in the reduplicant, positional faithfulness was called into play by the constraint Left-Anchor-BR. These two constraints were shown to crucially outrank Max-BR, forming the first component of the Reduction Model. Next, the choice of vowels and the difference in reduplicant shape between Type V and Type VI reduplicants was shown to be an effect of sonority sequencing, conditioned by *LHDiph and Linearity-BR, both of which must also dominate Max-BR. The choice of which of the two vowels to preserve in Type VI reduplicants follows from sonority maximization, which I accounted for by means of the Peak Prominence hierarchy of constraints. These constraints, along with Max-BR, were shown to crucially outrank Contig-BR, forming the second component of the Reduction Model. Finally, a ranking of these two sets of constraints successfully derived both Type V and Type VI reduplicants, completing the Reduction Model of Nakanai Type V and Type VI reduplication.

Next, I presented an analysis of Semai Expressive reduplication in §4. It was shown that although the base of Semai Expressive reduplicants is the entire prosodic word to which they attach, the reduplicant is exactly one minor syllable in length, of the form CC. The restriction of reduplicant size to one syllable was achieved with a TETU ranking of the Generalized Alignment constraint All-σ-Left. This ranking derives maximal syllables, but Semai Expressive reduplicants are minor syllables. Since Semai Expressive reduplicant syllables contain no nuclei and are never stressed, these facts were connected by means of ranking the entire *UNSTRESSED hierarchy of constraints on vowels over MAX-BR. The first component of the Reduction Model, a set of constraints outranking MAX-BR was then complete. To account for the discontiguity in preserving the two edge consonants in this minor syllable, positional faithfulness in the form of LEFT-ANCHOR-BR and prosodic correspondence in the form of CORR-Σ-ROLE were shown to account for edge anchoring. These constraints, along with MAX-BR crucially outrank CONTIG-BR, completing the second component of a Reduction Model analysis. Finally, a ranking of these two sets of constraints yielded Expressive reduplicants successfully, completing the Reduction Model of Semai Expressive reduplication.

The third analysis was of Ulu Muar Malay Type III reduplication, which was presented in §5. Type III reduplicants are maximal syllables, which were derived in a similar fashion to those in Semai, namely with a TETU ranking of ALL-σ-LEFT. As no futher reduction of reduplicant size was required, this was the only constraint crucially outranking MAX-BR, forming a singleton constraint set. This set served as the first component of the Reduction Model. Next, the nature of the discontiguity exhibited in Type III reduplicants was argued to result from a constraint on initial syllable positional faithfulness, MAX-INITIAL-σ-BR, as well as the same constraint on prosodic correspondence used in the analysis of Semai in §4, CORR-Σ-ROLE. These two constraints proved sufficient to account for the discontiguity of the correspondence relation, and they — along with MAX-BR — were shown to crucially outrank CONTIG-BR, forming the set of constraints that serves as the second component of the Reduction Model. One peripheral issue was then discussed briefly, namely the placelessness of the reduplicant codas. Such placelessness was shown to be an interesting sort of TETU effect, resulting from a locally conjoined constraint NOCODA $\&_{\text{Segment}}$ *PLACE. Finally, the two sets of constraints identified before were ranked with respect to each other, completing the Reduction Model of Ulu Muar Malay Type III reduplication.

In §6, several implications made by these analyses for various aspects of phonological theory were discussed. First, each analysis relied on emergence of the unmarked rankings to generate reduplicant-specific effects, and these rankings and their corresponding effects were showcased in §6.1. In §6.2, the type of prosodic correspondence used in the Semai and Ulu Muar Malay analyses was discussed and was shown to hold for the BR-relation rather than for the OO-relation. The analyses presented in this paper provided evidence for a division of CORR-Σ-ROLE into an OO and a BR version. In §6.3, a comparison was drawn between the argumentation style of the Reduction Model advanced in this paper and previous work on edge anchoring reduplication. It was shown that each analysis makes different empirical predictions, and that with further fieldwork, the choice between them will be reduced to an empirical question. Finally, the fact that each analysis in §3-5 supported Positional Faithfulness Theory was discussed explicitly. Furthermore, it was shown that if the Reduction Model analyses presented in the previous sections proved robust, the phenomena discussed in this paper would provide empirical support for Positional Faithfulness Theory.

7.2 Remarks

I have argued that the Reduction Model of discontiguous reduplication is theoretically superior to those advanced by Hendricks (2001) and Nelson (2002) in that no constraint definition specifically refers to the right-edge, which is desirable under Positional Faithfulness Theory (Beckman 1998/1999). Under these analyses, the need for extraneous parochial constraints such as EDGE-ANCHOR, which guarantees that both edges of the base correspond with the same edges of the reduplicant, are shown to be unneccesary to account for the types of discontiguous reduplication discussed in this paper. Instead, right-edge anchoring is derived via constraint interaction, yielding strong empirical predictions that can easily be verified by conducting future fieldwork.

To conclude, I aim to place the Reduction Model into the larger context of research on reduplication. In OT terms, one of the main regards in which discontiguous reduplication differs from contiguous reduplication is the relative ranking of CONTIG-BR with respect to markedness constraints and other constraints on the base-reduplicant correspondence relation. In OT analyses of contiguous reduplication, CONTIG-BR is often undominated, or at least very highly ranked, whereas in the analyses presented in §3-5, CONTIG-BR was the lowest-ranked constraint.

Notwithstanding, the analyses presented in this paper are very similar to OT analyses of contiguous reduplication in several regards. First, the data containing discontiguous reduplicants presented in (22), (23), (35), and (44) can be argued to conform to Marantz's Generalization, in a somewhat loose sense, anyway. The reduplicant affixes in each form prefix to the bases (or infixes to the left edge base if the base is not a full prosodic word, as in Nakanai). Marantz's Generalization would therefore predict a left-to-right directionality of the base-reduplicant correspondence relation. However, this prediction was formulated on the basis of patterns of contiguous reduplication, and since the reduplicants examined in this paper stand in correspondence with segments at both edges of the base, it is not immediately obvious that a left-to-right directionality of the correspondence relation can be determined.

Lunden (2003) sheds some light on this issue. Her reformulation of Marantz's Generalization in OT derives left-to-right and right-to-left directionality as a combination of high ranking LEFT-ANCHOR-BR or RIGHT-ANCHOR-BR with CONTIG-BR. As such, either the left or the right edge of the base is anchored in the reduplicant, and the rest of the segmental material in the reduplicant must stand in correspondence with a contiguous string of segments in the base.

As is expected in OT, "Marantz's Generalization" as reformulated by Lunden may become violable, which is exactly what happens in the types of discontiguous reduplicants seen here. That is, when CONTIG-BR is ranked lower in the grammar, higher ranking constraints may induce discontiguity. Nevertheless, in the analyses presented in §3-5, LEFT-ANCHOR-BR is still highly ranked with respect to the other constraints on base-reduplicant correspondence, in particular MAX-BR and CONTIG-BR. Thus, the left edge of the base is still anchored in the reduplicant, and what would be a left-to-right directionality of correspondence is interrupted by further constraints that also outrank CONTIG-BR, precluding contiguity.[40] In this sense, Nakanai, Semai, and Ulu Muar Malay discontiguous reduplication can be argued to conform to Marantz's Generalization by virtue of the fact that reduplicants are prefixed and anchor segment(s) standing at the left edge of the base at the left edge of the reduplicant.

[40] It should be noted that this scenario is compatible with the observation captured by McCarthy & Prince's (1993b) formulation of ANCHOR in (14).

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