Reduplicative Size-Segmentism Correlations as Root-Affix Asymmetries[1]

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Abstract

While a great deal of research on reduplication has focused on deriving shape invariance or segmental identity, as yet no study has investigated whether there is a correlation between reduplicative size and segmentism. This paper fills this gap and presents evidence that there is a correlation between size and segmental content, which standard theories cannot account for. In languages with multiple reduplicative morphemes, no language was found in which the smaller reduplicant had more marked structure than the larger reduplicant. Based on proposals by McCarthy and Prince (1994a, 1999), a model is developed which precisely captures this pattern. The central assumption is that reduplicative morphemes can be specified as root or affix. The larger size and more marked segments found in root reduplicants parallels findings in prespecified morphemes. A detailed analysis of Lushootseed reduplication illustrates the predictions of the model.

1. Introduction

Reduplicative morphemes have two characteristic properties: they have an invariant shape and their segmental content is dependent on the neighbouring base. Standard approaches to reduplication either address the issue of invariant shape (McCarthy 1979, 1981; Marantz 1982, McCarthy and Prince 1986, *et. seq.*; Steriade 1988) or address the issue of segmental identity (Munro and Benson 1973; Wilbur 1979; Broselow 1983; Clements 1985; Kiparsky 1986; Mester 1986; Uhrbach 1987; Shaw 1987; Steriade 1988; Yip 1992). In these approaches shape properties are independent of segmental identity. However, interesting correlations between the size of the reduplicant and its segmental content do occur: larger reduplicants allow more marked segments, while smaller reduplicants are often found to exhibit less marked segments. For example, take the phenomena of reduplicative 'fixed segments' discussed by McCarthy and Prince (1990), where

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two situations are said to occur: epenthesis and 'melodic over-writing'. A brief survey shows that default epenthetic segments overwhelmingly occur with monosyllabic reduplicants, as can be seen with the initial glottal stop in Nancowry (1a) and the non-base [i] in Lushootseed (1b).

(1) Default Segmentism

a. Nancowry (Radhakrishnan 1981)

cɯt	ʔit-cɯt	'to go, to come'
cuəc	ʔit-cuəc	'to massage'
rom	ʔum-rom	'to eat pandanus fruit'
ɲiak	ʔuk-ɲiak	'to bind'

b. Lushootseed Diminutive (Bates 1986)

tədᶻíl	tí-tədᶻil	'lie in bed/ lie down for a little while'
bəč	bí-bəč	'fall down/ drop in from time to time'
s-kʷəbšəd	s-kʷí-kʷəbšəd	'animal hide/ small hide'
s-qəlíkʷ	s-qí-qəlikʷ	'blanket/ small blanket'

The more marked segments characterized as 'melodic over-writing' tend to occur most with total or foot sized reduplicants, as can be seen in the echo-word formations found in English (2a) and Kolami (2b).

(2) Melodic Overwriting

a. English

table-schmable
Tolstoy-Schmolstoy
linguistic-schminguistic
abracadabra-schmabracadabra

b. Kolami (Emaneau 1955, cited in McCarthy and Prince 1990)

pal	pal-gil	'tooth/ tooth and the like'
kota	kota-gita	'bring it!/ bring it or the like'
iir	iir-giir	'water/ water and the like'
maasur	maasur-giisur	'men/ men and the like'

This paper argues that the relationship between size and segmentism is not spurious, and should follow from the architecture of Universal Grammar. A model is developed, within Generalized Template Theory (McCarthy and Prince 1994a, 1999), where size and segmentism are linked.

The central claim of the paper is that both size and segmental identity can be related to the morphological category of the reduplicative morpheme. While the range of reduplicative phenomena examined in the studies cited above has been varied and diverse, as yet no study has investigated whether or not there is a correlation between reduplicative size and segmentism. This study proposes to fill the gap by offering cross-linguistic evidence of a correlation between reduplicative size and segmentism. The central finding is that larger reduplicants permit more marked structure than smaller reduplicants. The size-segmentism correlation is analyzed as a case of a root-affix asymmetry in the reduplicative domain. There is a wide variety of synchronic and diachronic evidence that roots are larger than affixes and often have more marked segments in them. This phonological difference in size and segmental content will be called the root-affix asymmetry. A key finding is that the root-affix asymmetry is observed in the reduplicative domain.

The paper captures the root-affix asymmetry by extending proposals by McCarthy and Prince (1994a, 1999) that reduplicative morphemes can achieve shape-invariance by reference to morphological category alone - Generalized Template Theory. The extensions are twofold. First, while McCarthy and Prince propose that reduplicative morphemes can be either stem or affix, here it is proposed that they can be roots, thus extending the categories a reduplicative morpheme can be. Second, while McCarthy and Prince focused on shape, here it is proposed that a variety of phonological properties can be derived, one of which is the correlation between size and segmentism. The proposal is that size and segmental quality of reduplicative morphemes can be determined by reference to root or affix. Thus, the analysis of size-segmentism correlations reported on here provide further support for Generalized Template Theory. A consequence is that reduplicative templates are unnecessary, and we are one step closer to the goal of eliminating reduplicative-specific mechanisms from the grammar. Other work which supports the elimination of templates from Universal Grammar includes Spaelti (1997), Gafos (1998ab), and Walker (1999).

The paper is organized as follows. First, section 2 presents a discussion of the size-segmentism correlations that are found. This includes brief discussions of the typology of reduplicative size and segmental identity that have been discovered thus far. The correlation is restricted to languages which have more than one reduplicative morpheme. This is significant in establishing critiria for correlations. No language with multiple reduplicative morphemes has been found which eliminate marked structure from the large reduplicant, while maintaining marked structure in the smaller reduplicant. It is also shown that models of reduplication which have a separate copy mechanism (like those mentioned above) cannot account for the observed pattern. A formal discussion of the model is presented in section 3. The model is framed within Prince and Smolensky's (1993) Optimality Theory, with crucial reference to McCarthy and Prince's (1994a, 1995, 1999) Correspondence Theory. The central point is that reduplicative morphemes can be specified as roots. As such they exhibit canonical phonological pattern of roots of the language, which is manifest in size and segmental content. Section 3 also includes a detailed discussion of the predictions of the model. There are essentially two predictions. First, within a language, it is impossible to derive a system in which a large reduplicant has less marked segmental quality than the small reduplicant. Second, if a language has two reduplicative morphemes with the same morphological category, then they will exhibit similar size and segmental properties. The remainder of the paper (section 4) is dedicated to a detailed case study of three reduplicative morphemes in Lushootseed (Central Salish). Lushootseed was chosen because there is a correlation between size and segmental quality, where the larger reduplicant ('distributive') has more marked phonological structure. Some of the relevant data are presented below. Observe that the smaller 'diminutive' and 'out-of-control' morphemes both have the default *i* (3a and 3b), but the larger 'distributive' does not (3c).

(3) Lushootseed Reduplication Patterns (Bates, Hess and Hilbert 1994)

a. 'diminutive' (DIM)

ǰə́səd	ǰi-ǰəsəd	'foot/ little foot'
tədᶻíl	tí-tədᶻil	'lie in bed/ lie down for a little while'
bəč	bí-bəč	'fall down/ drop in from time to time'
s-kʷəbšəd	s-kʷí-kʷəbšəd	'animal hide/ small hide'

b. 'out-of-control' (OC)

ʔəx̌íd	ʔəx̌-íx̌-əd	'what happened/ What's he done?'
kʷ'əq	s-kʷ'əq-íq	'fall backwards/ robin (tilts head back)'

c. 'distributive' (DIST)

ǰə́səd	ǰə́s-ǰəsəd	'foot/ feet'
dᶻə́x̌	dᶻə́x̌-dᶻəx̌	'move/ move household'
s-čə́txʷəd	s-čə́t-čətxʷəd	'bear/ bears'

The analysis derives both the size and segmental quality of the three reduplicative morphemes above, by reference only to morphological category.

2. Size-Segmentism Correlations

In order to establish a correlation between size and segmental content, it is useful to first discuss the range of patterns independently observed about reduplicant size and segmentism. We first examine reduplicant size, establishing criteria for the set of reduplicative morphemes under investigation. Then we examine the typology of reduplicant segmentism, establishing the range of segmental identity observed in reduplication. Once the correlations are established, a few apparent counter-examples are discussed. These points are necessary prior to the analysis, because while some studies have focused on how to derive size or shape, and others have examined how to derive certain segmental properties, no study has investigated whether or not there is a correlation. Finally, before launching into the model, it will be shown that non-Correspondence models fail to capture the generalizations regarding size and segmentism.

2.1 Typology of Reduplicant Size

In the following discussion it is important to be clear about what is meant by the term reduplicant size and how this differs from reduplicant shape. By using the term size, it is possible to capture the generalization that CV- prefixes and -VC suffixes have the same phonological property: namely size. The term shape cannot capture the similarity, because CV- has an onset, while -VC lacks one. We will see below that being able to claim that these reduplicants have the same size is important in capturing a generalization.[2]

In determining the range of sizes, it is useful to establish how form and function match up in reduplication.[3] One possibility is that one meaning is associated with one size. Such languages only have one reduplicative morpheme and are not useful in establishing correlations. It is also possible that a language may associate one meaning to multiple shapes, which are often phonologically conditioned. Examples of these can be found in Nakanai and West Tarangon.

(4) Phonologically conditioned variation in shape/size

a. Nakanai (Carlson 1997; Spaelti 1997)

ligiligi	'hurting'
kaukau	'wearing lime on the face'
babeta	'wet'
ololi	'digging'

b. West Tarangon - Rebi dialect (Nivens 1992; Moore 1996; Spaelti 1997)

dɔ́am	dɔdɔ́am	'pound'
lɔpay	lɔplɔ́pay	'cold'
bitɛ́mna	bimtɛ́mna	'small-3sg'

Because the shape differences are the result of eliminating marked structure and are determined by the properties of the base (Moore 1996; Carlson 1997; Spaelti 1997), these patterns are only indirectly relevant in establishing a correlation between size and segmentism. A third condition is that one shape is associated with multiple meanings. This pattern is found in some of the Salish languages, including Nuxalk (Bella Coola - coastal language isolate), Halq'eméylem (Central Salish), and Mainland Comox (Northern Coast Salish). In all of these languages the 'diminutive' and 'continuative' morphemes are CV- reduplicants.[4]

[2] This discussion is intended to help clarify the difference between size and shape. There is no intention to make any claims regarding segment counting in reduplication, or to imply that schema like VCV, CVC, VCC form a natural class in terms of reduplicative shape.

[3] See Spaelti (1997) for a useful survey of the relationships found between reduplicant form and function, particularly phonologically determined shape/size differences.

[4] Nuxalk has the innovation that the reduplicant can also be CVC - only if C2 is a sonorant or fricative (Urbanczyk 1989; Carlson 1997). The data are not entirely regular and may involve an independent suffix (Bagemihl 1991).

(5) CV- multiple meanings - 'diminutive' (DIM) and 'continuative' (CONT)

a. Nuxalk (Bagemihl 1991)

kap'ay	kakp'ay	'humpback salmon/ DIM'
p'ɬa	p'ɬaɬa	'wink, bat the eyes/ CONT'

b. Halq'eméylem (Galloway 1993)

q'ɛ́:mi	q'ɛ́q'əmi	'adolescent girl/ DIM'
p'ɛ́tθ'	p'ɛ́p'ətθ'	'sew/ CONT'

c. Mainland Comox (Watanabe 1994)

supayu	suspayu	'ax/ DIM'
ʔuɬq^{w}u	ʔuʔuɬq^{w}u	'dig clams/ CONT'

Situations like this are often associated with a different phonological pattern for the base. For example, in Mainland Comox, all root vowels syncopate with 'diminutive', but not 'continuative' (Kroeber 1989; Blake 1992; Watanabe 1994). In Halq'eméylem, if the base begins with a sonorant-schwa sequence, the 'diminutive' is Cí-, while the 'continuative' is a non-reduplicative /hə́-/ sequence (Galloway 1993; Urbanczyk 1999a). Because the phonological differences are found in the stem as a whole and are not confined to the reduplicant, patterns like these are not useful in directly establishing a correlation. Finally, there are many languages with a more or less one-to-one relationship between form and function in which reduplicants have multiple meanings and multiple sizes. If there is more than one meaning and more than one size, then the only logical possibility is that one reduplicant will be larger than the other. It is these cases which will be of interest in establishing size-segmentism correlations. The other situations are not as useful because if a language has one form, the fact that it has marked segments in it will not reveal a direct correlation. A more useful test is to see what is correlated with both large and small sized reduplicants within a single language.

In terms of the range of possible sizes, the prosodic morphology research program has revealed the following possibilities: total reduplication, foot-size reduplication, syllable-size reduplication, and single segment reduplication. In total reduplication, the size of the reduplicant is maximal and varies with the size of the base. We will consider cases like these only in a superficial survey. For foot-size reduplicants, there are languages like Manam in which a reduplicant can be either CVCV or CVC (Lichtenberk 1985). Analyzing the reduplicant as a bimoraic foot makes it possible to be precise about what is meant by shape or prosodic size. However, syllabic size varies. Cases of single segment reduplication are not straight-forward either because analysts debate whether they are truly reduplicative or not. For example, the Yoruba Cí- morpheme has been analyzed as spreading a consonant (Pulleyblank 1988; Ola 1995) or as reduplication (McCarthy and Prince 1990; Alderete et. al. 1999). This leaves syllable-type reduplicants as the best case where size can truly vary. Syllable-shaped reduplicants can be CVC, CV, VC, or V.

2.2 Typology of Reduplicant Segmentism

In terms of reduplicant segmentism, two main patterns can be observed: total identity or lack of identity. Total identity can be of two basic types: over-application, where an alternation occurs without the phonological trigger and under-application, where an alternation fails to occur given the appropriate phonological trigger (Wilbur 1979). McCarthy and Prince (1995; 1999) have reanalyzed these identity preserving phenomena in Optimality Theory by making use of an explicit Correspondence Relation between reduplicant and base. Because identity is obeyed, it is not a straightforward issue to determine markedness.[5] A second situation is lack of identity. On the one hand, lack of identity can be the result of a phonological process applying to either reduplicant or base. This phenomena has been described by McCarthy and Prince as normal application. On the other hand, lack of identity can be due to what McCarthy and Prince (1994ab *et. seq.*) term 'emergence of the unmarked'. The reduplicant simply eliminates marked structure, without an overt trigger or context. This results in neutralization of a contrast or even wholesale insertion of a default segment. A third source of lack of identity is fixed segmentism, where the fixed segment cannot be equated with a default. Following McCarthy and Prince (1990) and Alderete et. al. (1999), this is analyzed as an input affix over-writing segments of the reduplicant. This latter source of markedness is morphological in nature and cannot be useful in establishing a phonological observation.

This brief overview reveals a key point of interest to the current study. The 'emergence of the unmarked' (or TETU) segmentism is the most useful in this survey. Because there is no obvious trigger, we can check whether there is marked or unmarked structure in the reduplicant with respect to the base. Thus, in terms of reduplicative segmentism, we confine our investigation to whether or not a reduplicant exhibits TETU effects.

2.3 Correlations

The correlations discussed here are based on examining languages with multiple reduplicants of more than one size and determining whether or not a reduplicant has marked structure or eliminates marked structure. Languages with two reduplicative morphemes will suffice. By examining large vs. small and marked vs. unmarked, there are four possible combinations. If there is no correlation between size and segmentism then all four patterns should be found. However, if there is a correlation, then there should be a gap. As the following tables illustrate, there is. The finding is that the larger size RED allows more marked segments, while the smaller size neutralizes contrasts. It is also possible that both reduplications neutralize a contrast. However, no language has been found which allows marked structure only in the smaller reduplicant, while eliminating it in the larger one.

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[5] Over- and under-application patterns maintain identity in several ways, which are not always equated with maintaining marked structure. It would be useful to conduct a further survey and determine whether identity preserving phonology is correlated with large size.

Controlling for syllable-sized reduplicants, the difference between large and small translates into CVC vs. CV.[6] Because it is difficult to find cases which are identical in terms of markedness, the markedness parameter varies across the languages. Thus the variables are: M for having a marked feature and U for being unmarked. Beside the language name, a schema of the markedness pattern is indicated. I have included two tables: one for featural markedness (laryngeal contrasts), the other for segmental markedness (default vowels).

(6) Featural Markedness - laryngeal contrasts

CVC-	CV-	Language	Base	Pattern
M	M	Halq'emeylem	C'VC...	C'VC- C'V-
M	U	Korean	C^hVC...	C^hVC- CV-
U	U	Shuswap	C'VC...	CVC- CV-
U	M	***	C^hVC...	CVC- C^hV-

(7) Segmental Markedness - default vowels

CVC-	CV-	Language		Pattern
M	M	Agta	CVC...	CVC- CV-
M	U	Lushootseed	CəC...	Cə́C- Cí-
U	U	Sawai	CVC...	CεC- Cε-
U	M	***	CVC...	CεC- CV-

Examples of the patterns are provided below in the order of their presentation in the tables. Mneumonics like MM and MU are included by each to facilitate discussion below. The convention used is that the first variable refers to the larger reduplicant. In terms of laryngeal features, Halq'eméylem (Coast Salish) allows ejectives in the onsets in both CVC- and CV- reduplicants. As pointed out by Kim (1996), in Korean, laryngeal neutralization occurs with the -CV reduplicant, but there is no laryngeal neutralization with the larger CVC- (analyzed as a stem by Kim). And in Shuswap (Northern Interior Salish), laryngeal neutralization occurs with both CVC- and CV- reduplicants. Reduplicants are underlined and are consistent with the source analyses.

[6] In my survey of reduplicative patterns, it was quite difficult to find CVC and CV size differences within one language. However, there are numerous languages in which the larger reduplicant is disyllabic or total and the smaller is CV. This is presumably a consequence of the canonical root shape of a language. Languages which have a disyllabic minimality requirement on roots would not be likely to mandate CVC root reduplication.

(8) Featural markedness - laryngeal contrasts

a. MM Halq'eméylem (Galloway 1993)

CVC	st'í:lə́m	st'əlt'í:lə́m	'song/ songs'
CV	t'í:ləm	t'ít'ələm	'sing/ singing'

b. MU Korean (Kim 1996)

CVC	tʰəlɨm	tʰəltʰəlɨm	'sour/ no gloss'
CV	pʰaŋ	pʰapaŋ	'a bang/ two bangs in one event'

c. UU Shuswap (Thompson and Thompson 1985: 136)

CVC	t'ək?-ém	x-tәkt'ək?-éχn	'support, prop up/ crutches'
CV	?s-t'il	tət'il-t	'to stop, quit/ keeping still'

In terms of default segmentism, in Agta (Malayo-Polynesian branch of Austronesian) both CVC- and CV- reduplicants have full vowels. In Lushootseed the default [í] occurs only with the CV reduplicant if the base contains marked structure - in order to avoid having a stressed schwa. This pattern will be analyzed in detail in §4.2 below. Finally, the Austronesian language Sawai has the default vowel in both CVC- and CV- reduplicants (Whisler 1992; Spaelti 1997). Evidence that the vowel is epenthetic comes from Whisler (1992: 25) who observes: '...if the final syllable is other than CV, /ɛ/ is added'. No language was found to have the UM pattern in terms of featural or segmental markedness.

(9) Default segmentism

a. MM Agta (Healey 1966)

CVC	takki	taktakki	'leg/ legs'
CV	dakal	dadakal	'big/ very big'

b. MU Lushootseed (Bates 1986; Urbanczyk 1996; Alderete et. al. 1999)

CVC	ǰə́səd	ǰə́sǰəsəd	'foot/ feet, legs'
CV	ǰə́səd	ǰíǰsəd	'foot/ little foot'

c. UU Sawai (Whisler 1992; Spaelti 1997)

CVC	tolɛn	tɛltolɛn	'to sit/ chair'
CV	dorɛm	dɛdorɛm	'dark/ night time'

Establishing a gap cross-linguistically is difficult, because it requires examining every language in detail. However, combing the literature on reduplication has failed to yield a true UM pattern. It is important to note that apparent UM patterns can be found. Further examination of the phonological systems reveals that they are not true cases of UM. There are (at least) two situations which would yield apparent counter-examples. However, for them to be considered true cases of UM, there must be no higher constraint compelling the pattern.

First, the loss of marked structure in the large reduplicant could be due to normal application. For example, in Salish, Halq'eméylem (Central Salish) and Mainland Comox (Northern Coast Salish) show segmental assymetries between 'plural' CVC- and 'diminutive' CV- reduplicants, where the vowel associated with the CVC reduplicant is schwa (the typical default in Salish) while the CV- redplicant has a full vowel. Vowel reduction is a case of loss of contrasts.

(10) Halq'eméylem (Galloway 1993)

a. CVC- 'plural'

sí:lə	səlsí:lə	'grandparent/ grandparents'
smɛ́:lt	sməlmɛ́:lt	'rock, mountain/ rocks, mountains'

b. CV- 'diminutive'

sí:lə	sísələ	'grandparent/ granny (pet name)'
χá:cɛ	χáχcɛ	'lake/ little lake'

Notice that the CVC- reduplicant is not stressed, while CV- is. Further examination of the phonology of Halq'eméylem reveals that unstressed vowels reduce to schwa (Galloway 1993; Urbanczyk 1999a). Thus the lack of identity is a case of normal application and is not a true TETU effect. Given the stress placement, it would actually go against the regular phonological pattern of the language to have an unstressed full vowel in CVC-. If it did, it would be analyzable as a case of under-application of vowel reduction. Examples of mismatches due to normal application are expected to occur and do not constitute true counter-examples.[7] Further investigations into stress and vowel reduction in Mainland Comox are needed before the pattern can be considered a true counter-example.

A second situation is when a morpheme-specific subcategorization requirement could compel marked structure in the smaller reduplicant. Again, the apparent counter-example comes from Salish. In St'at'imcets (Lillooet - Northern Interior Salish), the 'diminutive' contains stressed schwa (11a), while the plural (11b - cognate with DIST CVC) does not (van Eijk 1997; Shaw 1998).

(11) St'at'imcets (van Eijk 1997; Hewitt and Shaw 1995)

a. Cə́- 'diminutive'

s-yáqcaʔ	sy'ə́y'qcaʔ	'woman/ girl'
kʷtámc	kʷtə́tməc	'husband/ little husband'

[7] The loss of glottalization on ejectives in Shuswap is not a straight-forward TETU effect. Thompson and Thompson (1985) present evidence that there is a Grassman's Law for Salish in Shuswap, where the first of two ejectives in a root loses its glottal articulation. Just as in Sanskrit, the prohibition is actively enforced in reduplication. However, the existence of words like [tə-tə́-t'χ-t] 'taller', with multiple reduplicative morphemes provides support for analyzing it as TETU, because both reduplicants deglottalize the obstruent. If it were a case of normal application, we would expect the second reduplicant to maintain the glottal articulation. See Itô and Mester (1998) who analyze the Sanskrit pattern as an OCP-triggered TETU effect via self-conjoining two markedness constraints. See also MacEachern (1999) for a phonetically-based account of laryngeal dissimilation effects.

This is not a true counter-example, because the 'diminutive' is an infix which must be located at the stressed syllable, a common pattern in the Interior Salish languages (Broselow 1983). Its subcategorization requirement is to be infixed at the position of stress, and this requirement is always satisfied. Loss of featural contrast to schwa is typical of the loss of a contrast. Thus, the St'at'imcets pattern is most likely a case of UU. Stressing the 'diminutive' is a separate subcategorizational requirement that the 'plural' does not have.

In addition to these facts, a short survey of fixed segmentism typology was conducted. Recall that, in addition to default segmentism, melodic over-writing has been proposed to account for fixed segments that are marked e.g. forms like *table-schmable*. An Appendix contains the results of a survey of the literature on fixed segmentism. The type of segmentism is either TETU or MO (melodic over-writing). Size was classified as one of three categories - total, foot, or mono-syllabic. Details regarding the sources of information and how classifications were made are supplied in Appendix A.1. There were two central results, summarized in table format below.

(12) Summary - languages examined in Appendix A.1 (total = 26)

	Total	Foot	Mono-syllabic
TETU	ø	1	11
MO	9	3	2

The first result is that default segments are never found with poly-syllabic reduplicants. The only case of a foot-size reduplication with default segmentism was Bugis. Observe that the reduplicant ends with [k].

(13) Bugis (Uhrbach 1987: 165 - glosses not provided)

arawеŋ	arak-arawеŋ
cabberu	cabbek-cabberu
pattama	pattak-pattama

However, as Urbach (1987: 164) notes, Bugis is simply a case of normal application.

> '... only two consonantal phonemes are permitted in morpheme-final position: *k* and ŋ. Thus it is *k* which appears in final position in the affix, closing the syllable. [...] Thus these are not true cases of segment-changing reduplication per se.'

The second result is that melodic over-writing occured more frequently with total reduplication, but was evenly distributed between foot-size and monosyllabic reduplicants. If the marked segmentism is truly affixal in nature (as proposed by McCarthy and Prince 1990), then there should be no correlation with size. These results on the distribution of fixed segments are consistent with the claims about marked structure being correlated with larger reduplicants.[8]

To summarize the findings, no languages of the type UM have been found. This supports the claim that there is a correlation between size and segmentism. Within a language, larger reduplicants permit more marked structure than smaller reduplicants. It was also found that large and small reduplicants can both permit marked structure or both eliminate marked structure. This implies that segmental quality is not a *function* of size. That is to say, we cannot predict that a large reduplicant will be marked and a small reduplicant will be unmarked. We can only predict that when we examine them both, we will not find an unmarked large reduplicant and a marked small reduplicant. Therefore, the appropriate term to use is correlation.

2.4 Non-Correspondence Models

Most models of reduplication do not posit an explicit relation between segments of the base and those of the reduplicant. Instead, the segmental identity between base and reduplicant is achieved by an explicit 'copy' mechanism (Marantz 1982; McCarthy and Prince 1986, 1991; Clements 1985; Mester 1986; Steriade 1988). It is useful at this point to determine the types of predictions that these models make with respect to size and segmentism correlations. In short, because there is short-lived copy mechanism, the relation between base and reduplicant is non-permanent and specific rules are needed to derive the lack of identity. When both reduplicants have the same phonological pattern, a rule applies equally to both. However, when there is an asymmetry, it will be necessary to posit morpheme-specific rules. Because size is determined independently of segmental quality, there is no link between them and thus no correlation is expected. The problem extends to OT approaches to reduplication in which size is determined by templatic constraints (Downing 1998) and in which there is no correspondence relation (Inkelas and Zoll 1999). However, in order to keep the discussion brief, we only discuss the non-OT approaches. In order to illustrate the conclusion, we present a generic 'copy' analysis of the Lushootseed pattern of default segmentism.

In Lushootseed, schwa vowelled stems preserve schwas in CVC- 'distributive reduplication (DIST), but eliminate them in CV- 'diminutive' reduplication. The following data illustrate the asymmetry.

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[8] An interesting pattern described by Uhrbach (1987) was Gayu, which shows variation between total reduplication and partial Cə- reduplication. This type of variation is difficult to capture with templatic models of reduplication. However, if speakers vary in their morphological classification of the reduplicative morpheme, the pattern can be analyzed as total identity preserving root vs. an unmarked minimal affix.

(14) Lushootseed - schwa-vowelled stems (Bates, Hess, and Hilbert 1994)

a.	DIST		
	ǰə́səd	ǰə́sǰəsəd	'foot/ feet, legs'
	d^{z}ə́χ	d^{z}ə́χd^{z}əχ	'move/ move household'
	sčə́tx^{w}əd	sčə́tčətx^{w}əd	'bear/ bears'
	bə́s	bə́sbəs	'thin/ thin (board)'
b.	DIM		
	ǰə́səd	ǰíǰsəd	'foot/ little foot'
	g^{w}ədíl	g^{w}íg^{w}ədil	'sit down/ sit down briefly'
	təd^{z}íl	títəd^{z}il	'lie in bed/ lie down for a little while'
	sqəlík^{w}	sqíqəlik^{w}	'blanket/ small blanket'

As Bates (1986) points out, the occurence of [i] with DIM is phonologically conditioned because it is predictable and does not occur with every stem. Following Urbanczyk (1996, 1999b) and Alderete et. al. (1999), the trigger for the [í] is assumed to be stress on schwa. The following DIM stems with non-initial stress verify this point - they are unstressed and retain schwa.

(15) Diminutives with non-initial stress (Bates, Hess, and Hilbert 1994)

qəqsíʔ	'favorite uncle'
ƛ'əƛ'əládiʔ	'little noise'

In order to obtain the pattern for the 'diminutive', it is necessary to derive an intermediate form like [ǰə́ǰəsəd]. This can be achieved via copying and associating to a template (McCarthy 1981; Marantz 1982; McCarthy and Prince 1986, 1990), paraffixation of a template to a base with subsequent linearization (Clements 1985; Mester 1986), or by copying and trimming (Steriade 1988). We abstract away from the specifics here in order to show how 'copy and associate', 'parafixation', and 'copy and trim' models are equivalent with respect to size-segmentism correlations. Stress is located on the first syllable and then a 'repair' rule applies to change the stressed schwa to [í]. We know that stress must be applied first because the forms above which are unstressed still retain the schwa. Alongside DIM is a DIST stem which is incorrectly repaired as well. This shows that the 'repair' rule must be specific to the DIM stem.

(16)			
	UR	/CV-ǰəsəd]	[CVC-ǰəsəd]
	post-reduplication	ǰəǰəsəd	ǰəsǰəsəd
	stress	ǰə́ǰəsəd	ǰə́sǰəsəd
	repair ə́ -> í	ǰíǰəsəd	ǰísǰəsəd
	syncope	ǰíǰsəd	d.n.a.
	SR	[ǰíǰsəd]	*[ǰísǰəsəd]

Once the rule is parochialized, the correlation between size and segmentism is lost. There is no *a priori* reason why the 'repair' is associated with DIM and not DIST. We could just as easily imagine a situation where [i] is found with CVC reduplicants and not CV.

Attempts to derive the default [i] by assuming that schwa is absent from URs fare no better. For example, Bates (1986) assumes that schwa is absent from the input and that [i] is inserted to supply a vocalic nucleus to the DIM reduplicant. The question then is: Why is [i] not inserted for DIST? To derive the asymmetry would require two separate vowel insertion rules - one inserting [i] for DIM and one inserting schwa for DIST. Furthermore, the forms in (15), which are not stressed would incorrectly be supplied with an [i]. That's because in Bates' analysis, [i] insertion is not related to the markedness of stressed schwa. In a similar vein, Czaykowska-Higgins (1993) proposes that schwas resist being stressed in Nxaʔamxcin (Moses-Columbia Salish) because they are not present underlyingly. Schwas are only inserted after metrical feet are constructed. If we extend this idea to Lushootseed, we are still faced with the same problem as above and would still require separate rules for DIST and DIM.

This discussion has shown that approaches which have separate mechanisms for determining segmental quality and size require morpheme-specific rules to derive asymmetries. Because morphological rules are assigned on an *ad hoc* basis, the prediction is that there should be languages yielding authentic cases of UM, where the larger reduplicant has unmarked structure and the smaller reduplicant has marked structure. These models over-generate the number of reduplicative systems. In order to capture the correlation, what is needed is a model in which the size and segmental quality are achieved via the same mechanism. McCarthy and Prince's (1995, 1999) Correspondence Model provides such a mechanism. The following section outlines the properties of the model, as well as the predictions it makes.

3. Morphological A-Templatic Reduplication

The model developed here relies entirely on proposals made by McCarthy and Prince (1994a) during their Utrecht talks. At that time, they made three innovative claims, summarized below.

(17)	RED=MCat	• the shape properties of reduplicative morphemes are derivable from their morphological classification
	Correspondence	• strings are related to each other via a Correspondence Relation
	Rt >> Afx	• roots are more marked than affixes

The combination of these three proposals derives the size-segmentism correlations. The goal of this section is to explicate each of these claims and develop a morphologically informed a-templatic model of reduplication. A final section outlines the predictions of the model.

3.1 Basic Assumptions

We begin by discussing each of the claims in brief, and providing explicit representations below. The first claim is that morphological classification is all that is needed to derive the shape and prosodic properties of reduplicants. For example, the prosodic word status of reduplicants can be derived by the interaction of general constraints on stems if RED is specified as a Stem. Evidence and explication is presented in McCarthy and Prince (1999). The model here differs slightly, where it is proposed that Root be among the class of MCats along with Stem and Affix.[9] A consequence of McCarthy and Prince's proposal is that templates can be dispensed with altogether, and reduplication is a-templatic.[10]

Regarding the second claim, reduplicative morphemes, like all morphemes, achieve their phonological content by a Correspondence relation.

(18) Correspondence (McCarthy and Prince 1995, 1999)
Given two strings, S_1 and S_2, **correspondence** is a relation $\Re$ from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as **correspondents** of one another when $\alpha\Re\beta$.

Pre-specified morphemes achieve their phonological content via an IO-Correspondence relation, while reduplicative morphemes achieve their phonological content via BR-Correspondence. In the first case S_1 is the input and S_2 is the output. In reduplication, S_1 is the base and S_2 is the reduplicant. Faithfulness constraints evaluate various aspects of the correspondence relation to determine identity. Because there are distinct correspondence relations, there are distinct Faithfulness constraints. Thus we have IO-Faith and BR-Faith.

Finally, the well-known observation that roots are more marked than affixes is translated into OT by assuming that correspondence is sensitive to morphological category. The assumption is that there is a correspondence relation specific to roots: Root-Correspondence. This special correspondence relation also has an attendant set of Faithfulness constraints: Root-Faith. Marked structure emerges on roots because Root-Faith is ranked above constraints against marked structure.

At this point we have the basic pieces to the model, and it is important to be more precise about their formal properties. In particular, we need to examine how marked structure emerges on roots and is eliminated from affixes. This is the key to capturing the size-segmentism correlation. As the reader may be anticipating, the larger more marked reduplicants will be analyzed as roots, while the smaller, less marked reduplicants will be analyzed as affixes. Reduplicative morphemes simply mirror what is phonologically possible with pre-specified morphemes. There are

[9] It is not clear whether Stem is derivable by other morphological considerations and can be dispensed with altogether. For example, while all stems are roots, not all roots are stems, so root is in some sense a more basic category than stem. I leave the issue open for further investigation.

[10] There exists a growing body of work supporting a-templaticism including Spaelti (1997), Gafos (1998ab), Walker (1999), and Urbanczyk (1999a).

two basic approaches to achieving the phonological asymmetry, with essentially the same empirical results. The following section outlines both approaches, showing their empirical equivalence. The section ends with a brief discussion of the pros and cons of each opting for the more general positional faithfulness approach of Beckman (1997).

3.2 Root-Faith

Steriade (1995) proposes that roots are just one of several prominent positions which license more contrasts than other non-prominent positions. Translating this insight into Correspondence Theory, Beckman (1997) develops a model with two types of Correspondence relations: general correspondence and special correspondence. The special correspondence refers to positions of prominence, hence the name of the model is positional faithfulness. She subsitutes any one of several prominent positions in the place of special correspondence and derives a wide variety of phonological patterns. The relevant component of the model to the pattern examined here is root-correspondence. Thus, there are Faith and Root-Faith. When roots and affixes have the same phonological patterns, the ranking between Faith and Rt-Faith cannot be determined. However, when roots are marked with respect to some constraint M, then Rt-Faith dominates M. If affixes are less marked, then M dominates Faith. We exemplify the model with a root-affix phonological asymmetry in Lushootseed.

In Lushootseed, schwa can be stressed when it occurs in a root, but not in an affix. An alternation exemplifying the pattern is presented below. The data in (19a) illustrate that schwa can be stressed when it occurs in a root. The data in column I are unreduplicated, morphologically simple stems. When they are reduplicated, stress stays in the initial position, as can be seen in column II. The phonologically similar polymorphic words in (19b) illustrate the same stress pattern, when they are not reduplicated (column I). However, these words differ morphologically because they contain a transitivizing suffix with the form [-əd]. When they are reduplicated, stress shifts to the final syllable (column II). Note that when stress falls on the affix vowel, the quality changes and the affix is realized as [-ád].[11]

(19) Stressed schwa asymmetries in Lushootseed

	I		II	
a.	lə́gʷəb	'young man'	lə́gʷləgʷəb	'youths, young men'
	ǰə́səd	'foot'	ǰə́sǰəsəd	'feet'
	sčə́txʷəd	'bear'	sčə́tčətxʷəd	'bears'

[11] The pattern of allomorphy for transitivizing suffixes is more complex than this. See Urbanczyk (1999c) for further details.

b.	də́šəd	'be on side'	dəšdəšád	'set many things on their side'
	g^wə́č'əd	'look for s.t.'	g^wəč'g^wəč'ád	'several search for it'
	yə́cəd	'report him, it'	yəcyəcád	'always talking about him'

Observe that affix vowels do not permit stressed schwa. In addition to the alternation, a search of the *Lushootseed Dictionary* does not reveal a single case of a stressed affix schwa. Thus there is a phonological asymmetry between roots and affixes, in which stressed schwa is only permitted with roots. The relevant markedness constraint is *ə́, and is informally represented as in (20). There are various proposals for why stressed schwa is marked, but we will not delve into its proper formulation.[12]

(20) *ə́ : stressed schwa is not permitted.

This pattern can be analyzed using Positional Faithfulness, and the constraints Rt-Faith, Faith, and *ə́. Because the language allows stressed schwas on roots, it must be the case that Rt-Faith dominates *ə́ and Faith. The following tableau verifies this. The input is indicated in the top left corner.[13] Root-Faith is violated if there is lack of identity in the root, and Faith is violated if there is a lack of identity anywhere in the word, providing two violations for candidate (b).

(21) Root-Faith >> *ə́ >> Faith

dəšəd	Root-Faith	*ə́	Faith
a. ☞ də́šəd		*	
b. dášəd	*!		*

The following tableau verifies that *ə́ must dominate Faith. This ranking is necessary because it is better to have non-identity in the affix than to have a stressed schwa. We abstract away from how the location of stress is determined and the

[12] The explanation for why stressed schwa is marked has occupied the attention of phonologists and Salishanists for a long time. For various proposals see Anderson (1974), van Oostendoorp (1995), Kenstowicz (1996), Kinkade (1992, 1997), Shaw (1996), Urbanczyk (1996, 1999d).

[13] Notice that the input contains schwas, which is contrary to the usual assumption about schwas in Salish (cf. Czaykowska-Higgins 1993; Kinkade 1997). Having schwas present in the input is consistent with Prince and Smolensky's (1993) principles of Richness of the Base and Lexicon Optimization as well as Inkelas's (1995) Archiphonemic underspecification.

reduplicative mechanism for now.[14] (See section 4.1 for the analysis of shape.)

(22) Root-Faith >> *ə́ >> Faith

DIST-dəšəd	Root-Faith	*ə́	Faith
a. dəšdəšə́d		*!	
b. ☞ dəšdəšád			*

Positional Faithfulness assumes that roots have two correspondence relations, one general and one specific to roots. Thus, a lack of identity in a root violates Faith and Root-Faith. This model differs formally from McCarthy and Prince's proposal, but has the same empirical coverage. McCarthy and Prince (1994a) propose that there is correspondence for roots distinct from correspondence for affixes. They derive the asymmetry by assuming that Root-Faith universally dominates Affix-Faith. A key difference between the models is that the correspondence relations are adjacent to each other, rather than nested (as in Positional Faithfulness). As a result, when a root has a lack of identity, it only violates Root-Faith and does not violate Afx-Faith. Using McCarthy and Prince's model, it is possible to obtain the same results by substituting Afx-Faith for Faith and recalculating the violations.

The following tableaux illustrate that the same candidate is selected as optimal. Notice that in the tableau in (23), candidate (b) only incurs a violation of Root-Faith, it does not violate the lower Afx-Faith.

(23) Root-Faith >> *ə́ >> Afx-Faith

dəšəd	Root-Faith	*ə́	Afx-Faith
a. ☞ də́šəd		*	
b. dášəd	*!		

[14] It is clear that a full analysis of the pattern above requires understanding why stress shifts and what the UR of the affix is. While the data has some complexities, it was chosen because it exemplifies an active alternation between unstressed schwa and a full vowel. The resultant ranking must be valid for the language as a whole because stressed schwa is not permitted in affixes at all. Evidence that the affix allomorphy is not a case of unstressed /a/ reduction comes from forms which have an unstressed [a] in the transitivizing affix, such as [tášad] 'massage it'.

(24) Root-Faith >> *ə́ >> Afx-Faith

DIST-dəšəd	Root-Faith	*ə́	Afx-Faith
a. dəšdəšə́d		*!	
b. ☞ dəšdəšád			*

Both approaches derive the asymmetry by interleaving a phonoconstraint between two Faith constraints. Such a ranking is dubbed 'emergence of the unmarked' by McCarthy and Prince. Here the unmarked structure emerges in affixes. Let us refer to the McCarthy and Prince approach as Rt >> Afx. The rankings for affixal TETU effects are repeated below. The asymmetries are in the IO domain, so in actuality, each Faith constraint should be prefaced by IO.

(25) Emergence of the Unmarked (TETU) in affixes
a. Positional Faithfulness: Faith-Rt >> M >> Faith
b. Rt >> Afx: Faith-Rt >> M >> Faith-Afx

Not only are these approaches empirically equivalent when there is a phonological asymmetry, they are equivalent when roots and affixes exhibit the same phonological pattern. If both allow the marked structure, then M is ranked below both Faith constraints. If bo b. CVC- 'plural'

mulx məlmúlx 'stick/ underbrush'

saq$^{w'}$ səq$^{w'}$sáq$^{w'}$ 'to fly/ plural things flying'

th eliminate the marked structure, then M is ranked above both Faith constraints. The sole difference in ranking is that with positional licensing no ranking can be determined for the two Faith constraints, but is fixed as Root >> Affix, for the other approach.

(26) Ranking for SAME phonological patterns
a. Positional Faithfulness: Faith-Rt, Faith >> M
M >> Faith-Rt, Faith
b. Rt >> Afx: Faith-Rt >> Faith-Afx >> M
M >> Faith-Rt >> Faith-Afx

It is now useful to consider whether or not one approach has conceptual advantages, outside of their empirical equivalence. A strength of Positional Faithfulness is that the special faithfulness constraint can be generalized to other prominent positions, such as initial syllable, stressed syllable, and onset. Whether or not this is warranted for reduplication is yet to be explored. A second strength is that Positional Licensing can derive the asymmetry without stipulating the ranking of Root-Faith >> Faith. Because the violations are in a subset relation (violations incurred by Root-Faith are a subset of those incurred by Faith), there will never be evidence for language learners to posit Faith >> Root-Faith. Even if a language learner did posit such a ranking, Faith would mask the effects of Root-Faith, and it would not result in a markedness reversal.[15] With Rt >> Afx, the ranking is proposed to follow from Univeral Grammar. Because Positional Faithfulness has more general applications, and no stipulated rankings, it will be adopted for the remainder of the paper. The following section presents the formal model of redupliation and extends this approach to the BR domain.

3.3 Formal Model - Morphological A-templatic Reduplication

Let us recast McCarthy and Prince's proposals to be consistent with the discussion in the preceding two sections. The model will be refered to as Morphological A-templatic Reduplication (MAR) to distinguish it from the original Generalized Template Theory.

(27) Morphological A-templatic Reduplication (MAR)

a. Morphological component: RED = MCat, MCat ∈ {Stem, Rt, Afx}

b. Correspondence: BR-Faith-Rt, BR-Faith

By condition (a), each reduplicative morpheme will be specified as Stem, Rt, or Afx. The condition in (b) states that reduplicative morphemes achieve achieve their segmentism and size via BR-Correspondence. A diagram illustrating the structure of reduplicated words is provided below. Note that reduplicative roots will be subject to BR-Root-Correspondence as well as BR-correspondence. Here, as below, the 'diminutive' morpheme is an affix, and the 'distributive' morpheme is a root. The reduplicant is the portion of the word that is underlined, and the base is the string immediately to the right for prefixes and immediately to the left for suffixes (not shown here). Note that when a morpheme has multiple BR-correspondence relations (as with reduplicative roots) such double relations will be indicated with double underlining.

(28) Morphological BR-Correspondence

INPUT	a. / BR-Afx + ǰəsəd /	b. / BR-Rt + ǰəsəd /	
	↕	↕	IO-Corr
OUTPUT	[<u>ǰí</u>ǰsəd]	[<u>ǰə́s</u>ǰəsəd]	
general BR-Corr	R ↔ B	R ↔ B	
special BR-Corr-Rt		R ↔ B	

The a-templaticism of the model follows because there are no templates necessary to derive the size or segmental properties of reduplicative morphemes. Markedness constraints interacting with Faith constraints are sufficient to derive size and segmentism. The model makes specific predictions, which are a consequence of the types of systems generated by permuting the ranking of constraints. The following section introduces the relevant constraints and how they interact.

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[15] Appendix A.2 illustrates this effect.

3.4 Predictions

Prince and Smolensky (1993) propose that Optimality Theory accounts for language universals by assuming that the set of constraints in Con is shared by all speakers. Individual grammars are determined by discovering the ranking of constraints. It follows then, that the number of possible systems that can be generated is equivalent to the number of possible rankings -- which is the factorial of the number of constraints in Con (n!). Therefore, in order to determine the predictions of the model, we need to first consider what the relevant constraints are. Then we need to determine all possible constraint rankings (the factorial typology) and the reduplicative systems that are generated by each ranking. It is important to note that two different rankings can generate the same system. We begin by introducing the constraints.

There are two types of Faith constraints: those which determine size and those which determine segmental quality. These constraints are Max and Ident[F], respectively.

(29) Faithfulness constraints (McCarthy and Prince 1995, 1999)

Max:	Every segment in S1 has a correspondent in S2.
Ident[F]:	Let α be a segment in S1 and β be any correspondent in S2. If α if [γF], then β is [γF].

Max ensures that there is no deletion in the IO domain, and that reduplication is total in the BR domain. Ident[F] ensures that featural specifications of correspondents are identical.[16]

There are also two types of phono-constraints to consider: those that restrict the size of morphemes and those which penalize segmental markedness. The size restrictors are of two general types. On the one hand, interface constraints, like those generated by McCarthy and Prince's (1994c) Generalized Alignment schema, can be used to restrict the size (see McCarthy and Prince 1994a, 1999; Spaelti 1997). For example, the constraint Align-L(Stem, PrWd) will ensure that reduplicants specified as stems will be initial in the prosodic word. On the other hand, constraints which ban structure altogether, such as Prince and Smolensky's (1993) *Struc can also be used to restrict the size (see Urbanczyk 1999a; Walker 1999). Whenever one of these constraints intervenes between IO-Faith and BR-Faith, the result will be partial reduplication. To make the discussion explicit, consider the constraint *Struc-σ, which is violated by every syllable in the output (discussed further in §4.1). If *Struc-σ intervenes between IO-Max and BR-Max, then reduplicants will be mono-syllabic. The following ranking schema illustrates this ranking. It is another instance of TETU and derives mono-syllabism in reduplication.

[16] This assumes that features are attributes of segments and not entities themselves. See Causely (1996), Walker (1997), Lombardi (1998) and Pulleyblank (1998) for arguments that features are entities. It makes no difference to the analysis here, so for convenience I adopt the Ident[F] approach.

(30) SIZE TETU: Mono-syllabic reduplicants
IO-Max >> *Struc-σ >> BR-Max

The other constraints are general markedness constraints, like *F which penalize marked features. TETU effects can also be obtained if constraints of the form *F intervene between IO-Ident[F] and BR-Ident[F]. The result is the neutralization of a featural contrast in reduplication as in (a). If *F intervenes between IO-Max and BR-Max, the result is a default segment (or reduction in size).[17]

(31) SEGMENTISM TETU
a. FEATURAL TETU: Neutralization of featural contrast in reduplication
IO-Ident[F] >> *F >> BR-Ident[F]
b. DEFAULT SEGMENTISM: Loss of segment in reduplication
IO-Max >> *F >> BR-Max

This brief illustration shows that shape and segmentism can be correlated because the Correspondence relation is effective in deriving the size of reduplicative morphemes as well as their segmental properties. Size is obtained via Max, and segmentism via Max and Ident[F]. We now need to examine the factorial typology by considering the full range of Faith constraints. Recall that the number of possible systems will be the factorial of the number of constraints. Any predictions that the model makes are a result of the factorial typology. Attested systems must be derived by the factorial and gaps must be excluded by the factorial.

There are two basic dimensions in terms of the Faith constraints: Max and Ident[F].[18] In order to keep the discussion to a reasonable situation, we will only consider one markedness constraint per dimension. Because there are two types of Faith per dimension, this means that there are six constraints, resulting in 720 different rankings (6! = 6x5x4x3x2x1 = 720). Fortunately we will not be going through each ranking. Instead, we can investigate each dimension separately because structural and markedness constraints will not conflict and the two different types of Faith constraints will not conflict either. It turns out that each dimension converges on only three possible systems -- precisely the patterns attested in terms

[17] I am grateful to Philip Spaelti for pointing out that reduplicative default segmentism can be obtained without reference to BR-Dep, which penalizes non-correspondent segments in the reduplicant. Having a default in the reduplicant entails that BR-Max is violated, so BR-Dep is superfluous.

[18] A third Faithfulness constraint is not considered here: Dep. Dep is violated when there is material in S2 that is not in S1. It penalizes epenthetic or default segments. I have not included it in the typology because to do so would introduce a pathology in which epenthesis could be used to avoid marked structure in affixes, but not roots. I am grateful to an anonymous reviewer for pointing out the pathologies. See Bernhardt and Stemberger (1998) who point out that Dep and *Struc frequently have similar consequences. Further research may reveal that Dep can be eliminated from Con altogether.

of size-segmentism correlations: MM, UU, MU. Because there are two dimensions, the total number of different systems generated is nine (3x3).

Let us start by keeping the shape constant and confine the factorial typology to Ident[F], Rt-Ident[F], and *F. The result is 6 possible permutations (3!=3x2x1). The following summarizes how the different rankings map onto differences in segmentism patterns for languages which have a root and an affix reduplicant. The following rankings do not have IO or BR prefixes in order to emphasize that there are parallel phonological systems.

(32)	Segmentism	
i.	MM	Ident[F] >> Rt-Ident[F] >> *F
ii.		Rt-Ident[F] >> Ident[F] >> *F
iii.		Ident[F] >> *F >> Rt-Ident[F]
iv.	UU	*F >> Ident[F] >> Rt-Ident[F]
v.		*F >> Rt-Ident[F] >> Ident[F]
vi.	MU	Rt-Ident[F] >> *F >> Ident[F]

Because we have considered all possible rankings, we have shown that no permutation of constraints will derive the UM pattern. See Appendix A.2 for tableaux verifying these results.

We can do the same for the size dimension, including Max, Rt-Max, and *Struc-σ. Because the discussion is confined to the constraint *Struc-σ, the two possible shapes are greater than a syllable (>σ) and less than or equal to a syllable (≤σ). Again we only derive three possible situations.

(33)	Size	
i.	(>σ)(>σ)	Max >> Rt-Max >> *Struc-σ
ii.		Rt-Max >> Max >> *Struc-σ
iii.		Max >> *Struc-σ >> Rt-Max
iv.	(≤σ)(≤σ)	*Struc-σ >> Max >> Rt-Max
v.		*Struc-σ >> Rt-Max >> Max
vi.	(>σ)(≤σ)	Rt-Max >> *Struc-σ >> Max

Because we have considered all possible permutations, we have established that Universal Grammar would never create a mono-syllabic root and poly-syllabic affix. See Appendix A.2 for tableaux verifying these results.

The predictive force of the model is that correspondence is tied to morphological classification and reduplicants can belong to different morphological categories. Therefore it will be impossible to reverse the size and segmentism properties associated with a particular morpheme. It will always be the case that if there is a MU pattern regarding segmental properties, the root will be more marked, *mutatis mutandis* with size. Combining the segmentism and size dimensions we have the following typology of size and segmentism systems.

(34) Possible size-segmentism relationships

	MM	UU	MU
(>σ)(>σ)	(>σ)(>σ) M M	(>σ)(>σ) U U	(>σ)(>σ) M U
(≤σ)(≤σ)	(≤σ)(≤σ) M M	(≤σ)(≤σ) U U	(≤σ)(≤σ) M U
(>σ)(≤σ)	(>σ)(≤σ) M M	(>σ)(≤σ) U U	(>σ)(≤σ) M U

Of course the total number of reduplicative systems is much larger because there are many size restrictors and markedness constraints in Con.

A final question raised by this model regards languages with more than two reduplicative morphemes.[19] The problem arises because if there are two similar reduplicative morphemes (such as two affixes), then one might expect them to be homophonous. There are (at least) two analytic avenues to pursue in these cases.

One avenue is to supply a separate special correspondence relation to the third reduplicative morpheme. For example, if a reduplicative morpheme is always stressed it could achieve its content via a BR relation with the head of the prosodic word. This special correspondence could be ranked separately from the others, providing a unique phonological pattern to all three reduplicative morphemes. I leave this open for further research.

A second avenue is to assume that two reduplicative morphemes have the same morphological classification, but differ in their subcategorizational requirements. This has been suggested for Tagalog by McCarthy and Prince (1994a) to derive the difference between CV and CV: reduplicants, where the only difference is short vs. long vowel. They propose that the difference in vowel length follows from prosodic subcategorization: the short vowel is internal to the prosodic word, while the long vowel is external to the prosodic word. This approach is appealing because it makes use of information that is independently needed for morphemes. The following section pursues this line of explanation in analyzing three reduplicative morphemes in Lushootseed, which have the shapes CVC, CV, and VC. A strong prediction of this approach is that the two smaller reduplicants will exhibit the same phonological patterns. Because all morphemes of a particular MCat are subject to the same Faith constraints, they will exhibit the same phonological patterns. Thus, a detailed study of Lushootseed reduplication would provide strong confirmation of the model presented here.

[19] Languages with only one reduplicative morpheme presumably do not make use of the special corresondence relation. There would only be one type of correspondence. In this case the morpheme could either be classified as an affix or a stem with no pathological consequences.

4. Case Study: Lushootseed

Lushootseed is a Central Coast Salish language, originally spoken in the area around Puget Sound in Washington state. Like other Salish languages, reduplication is used in several word-formation processes (Hess 1966; Hess and Hilbert 1977; Bates, Hess, and Hilbert 1994). The three most common are presented below, where the 'diminutive' morpheme is a CV- prefix (35a), the 'out-of-control' morpheme is a -VC suffix, located after C2 of the root (35b), and the 'distributive' morpheme is a CVC-prefix (35c). Unless otherwise stated, all data are from Bates, Hess, and Hilbert's (1994) *Lushootseed Dictionary*, and are of the Northern Lushootseed dialect group.[20]

(35) Lushootseed Reduplicative Patterns

a. DIM

ʔálʔal	'house'	ʔá-ʔalʔal	'hut'
ʔuqʷ'ud	'pull out'	ʔú-ʔuqʷ'ud	'pull part way out'
hiw-il	'go ahead'	hí-hiw-il	'go on ahead a bit'
q'íxʷ	'upstream'	q'í-q'ixʷ	'a little upstream'

b. OC

ʔáɬ	'fast; quickly'	ʔáɬ-aɬ	'hurry up!'
dᶻáq'	'fall; topple'	dᶻáq-aq	'totter; stagger'
čə́x̌	'split'	sčə́x̌-əx̌	'cracked to pieces'
yúb-il	'starve'	yúb-ub-il	'tired out; not feeling well'

c. DIST

saqʷ'	'fly'	sáqʷ'-saqʷ'	'fly here and there'
gəlk'	'entangle'	ʔəs-gə́l-gəlk'	'all tangled up'
čəgʷás	'wife'	čəgʷ-čəgʷás	'seeking a woman to marry'
pástəd	'Caucasian'	pás-pastəd	'many white folks'

Observe that all reduplicants are mono-syllabic. However, they differ in their sizes. DIST, being CVC- always adds a coda to the reduplicated word. On the other hand, DIM, having CV- shape, doesn't add a coda. A comparison of [dᶻáq'] 'fall; topple' with [dᶻáq-aq] 'totter; stagger' reveals that no additional codas are added in

[20] This study is based on the corpus of reduplicated words contained in the *Lushootseed Dictionary*. There were 247 DIST stems, 270 DIM stems, and 56 OC stems. The lower number of OC stems is most likely due to semantic restrictions, rather than phonological ones. See Kroeber (1988) for discussion that the cognate morpheme only occurs on stative verbs in Mainland Comox. The actual number of reduplicated stems was 612, which is greater than the sum of the three because it includes reduplicative forms that indicate different functions. Thanks to Dawn Bates for providing printouts of the reduplicated material, which greatly assisted in organizing the data.

the OC form. Thus, the crucial difference in size between the morphemes is the addition of a coda consonant. DIST reduplicants add a coda, while DIM and OC reduplicants do not.

The analysis proposes that DIST is a root, while DIM and OC are affixes. The difference between the two affixes is their subcategorization properties, where DIM is a prefix and OC is a suffix. This subcategorization information is formally expressed by McCarthy and Prince's (1994c) Generalized Alignment schema, which allows for the alignment of specific morphemes to morphological categories. Prefixes are aligned at the left edge of a stem, while suffixes are aligned at the right edge of a stem. The lexical information for each reduplicative morpheme is represented below. Notice that only minimal information is included: morphological category, exponence (formally realized as a correspondence relation), subcategorization, and meaning.

(36) Lexical Entries for REDs

	MCat	Corr	SubCat	Align	Meaning
a. DIM	Afx	BR	prefix	≈ Align(DIM, L, Stem, L)	'diminutive'
b. OC	Afx	BR	suffix	≈ Align(OC, R, Stem, R)	'out-of-control'
c. DIST	Rt	BR-Rt	prefix	≈ Align(DIST, L, Stem, L)	'distributed'

While it is uncontroversial to assume that reduplicative morphemes are affixes, specifying them as roots requires independant motivation. There are three pieces of evidence that support analyzing DIST as a root. First, the canonical root shape in Lushootseed (and Salish more generally) is CVC. Snyder (1968) reports that 68% of Southern Lushootseed roots are CVC. Second, like prespecified roots, the DIST morpheme permits stressed schwa. And third, there are two sets of affixes which exhibit root-like properties in Lushootseed. There are nine CVC-shaped prefixes with semantic content. The CV- shaped prefixes encode grammatical functions, not semantic content. There is also a large set of lexical suffixes which are often transparently related to roots. These lexical suffixes have semantic content and more marked segmentism than grammatical affixes (Urbanczyk 1996: 46). The existence of segmentally specified root-prefixes (the CVC- prefixes) and root-suffixes (lexical suffixes) provides support for proposing a reduplicative root-prefix. Finally, there should be further effects of morphological category that are not explicitly discussed here. In fact, the DIST morpheme patterns with other roots in being the base of reduplication for the OC suffix (Urbanczyk 1996: Chapt. 5).

Based on these morphological classifications, the MAR model of reduplication is able to derive the size and segmental properties of all three morphemes. Recall that there are two key predictions. First, if there are *any* phonological differences, the root (DIST) will be more marked. Second, the two affixes should exhibit the same phonological properties. These predictions are borne out: phonological differences in size and segmentism are both found. Detailed analyses of the size differences is presented in section 4.1, and the segmental differences in section 4.2. A brief excursus into double reduplications in section 4.3 also shows that some surprising identity effects can be explained with no further assumptions or theoretical machinery.

4.1 Shape

Mono-syllabic bases straightforwardly show how size differences between reduplicative morphemes are derived. As noted above, the crucial difference between DIST and DIM/OC is the addition of a coda consonant. This can be achieved by referring to the familiar NoCoda constraint. NoCoda is a typical markedness constraint, where marked structures are penalized. Languages are known to ban codas or to allow codas, but no language is known to require codas of every syllable.

(37) NoCoda : Codas are prohibited.

The difference between DIST and DIM/OC then is that NoCoda is violated for DIST, a root, and obeyed by DIM/OC, which are both affixes. By this reasoning, NoCoda must intervene between BR-Max-Rt and BR-Max. This ranking is the TETU ranking which derives the MU difference between roots and affixes, as proposed in §3.4 above.

(38) TETU Shape Differences: BR-Max-Rt >> NoCoda >> BR-Max

The tableau below verifies this ranking. The optimal (a) candidates for DIM and OC contain only one violation of NoCoda. The closest competitors (b) fare better on reduplicative identity, but at the expense of having an additional coda consonant. Notice that both affixes are derived by the same constraint interaction. Also, NoCoda, being a global constraint on the entire representation, incurs violations equally for both DIM and OC stems, even though the coda is in the base for DIM and in the reduplicant for OC. DIST, on the other hand, being a root allows the marked extra coda consonant, because BR-Max-Rt is ranked higher than NoCoda.

(39) BR-Max-Rt >> NoCoda >> BR-Max

	BR-Max-Rt	NoCoda	BR-Max
DIM- q'ixʷ			
a. ☞ q'íq'ixʷ		*	xʷ
b. q'íxʷq'ixʷ		**!	
ʔaɬ -OC			
a. ☞ ʔáɬaɬ		*	ʔ
b. ʔáɬʔaɬ		**!	
DIST- pastəd			
a.. sasaqʷ'	qʷ'!	*	qʷ'
b☞ saqʷ'saqʷ'		**	

Because the language allows codas in roots, we also know that IO-Max-Rt dominates NoCoda, as verified in the following tableau.

(40) IO-Max-Rt >> NoCoda

ʔaɬ	IO-Max-Rt	NoCoda
a. ʔa	ɬ!	
b. ☞ ʔaɬ		*

Monosyllabicity can be observed in polysyllabic bases. Domination of BR-Max-Rt and BR-Max by some higher ranked constraint yields mono-syllabicity. As proposed in section 3.3, the relevant structural constraint is *Struc-σ. Motivation for this constraint comes from languages in which all morphemes are monosyllabic. In fact, many Salish languages prefer to have lengthy strings of consonants rather than canonical CV(C) syllables, suggesting that *Struc-σ is operative elsewhere in the language family.[21]

(41) *Struc-σ Syllable structure is not permitted.

[21] In terms of the patterns within Salish, it may be more accurate to think of this constraint as *V-Feature, which is a more specific version of the *Struc family. Either constraint will serve the same function here.

Because all reduplicants are mono-syllabic, *Struc-σ must dominate BR-Max-Rt and BR-Max. We cannot determine the ranking between the two BR-Max constraints by these data, but recall that the ranking was determined above. The ranking is thus a case of all reduplicants exhibiting unmarked structure (UU) from §3.4 above.

(42) Mono-Syllabicity: *Struc-σ >> BR-Max-Rt >> BR-Max

The following tableau verifies the ranking. For all reduplicative morphemes, the optimal candidate is the one which has the fewest number of syllables. All the (a) candidates below violate *Struc-σ minimally. Even though being disyllabic means that the reduplicant is more faithful, this is sub-optimal because of high-ranking *Struc-σ, as shown by the (b) candidates.[22]

(43) *Struc-σ >> BR-Max-Rt, BR-Max

	*Struc-σ	BR-Max-Rt	BR-Max
DIM- hiw-il			
a. ☞ híhiwil	***		wil
b. híwilhiwil	****!		
yub-il -OC			
a. ☞ yúbubil	***		y
b. yúbilyubil	****!		
DIST- pastəd			
a ☞ páspastəd	***	təd	təd
b. pástədpastəd	****!		

Again, because the language has poly-syllabic roots, we know that IO-Max-Rt must dominate *Struc-σ. The following tableau verifies this.

[22] The question arises as to why the reduplicant must be a syllable at all. As others, I assume that there is a high ranking constraint requiring morphemes to be realized (Rose 1997; Gafos 1998; Walker 1999; Urbanczyk 1999a). The question then is why vowel lengthening cannot be used to express the morpheme. As we will see in section 4.2 below, no reduplicant ever has a long vowel, so this option is also ruled out.

(44) IO-Max-Rt >> *Struc-σ

pastəd	IO-Max-Rt	*Struc-σ
a. pas	t!əd	*
b. ☞ pastəd		**

The two key shape properties of these three reduplicative morphemes are derived by the following constraint heirarchy, thus confirming the prediction that morphologically distinct reduplicants can be derived by a single constraint hierarchy. Of particular significance is the fact that the shape properties of both DIM and OC can be derived in tandem. Thus, no special mechanism is necessary to derive the previously problematic -VC shape reduplicant. Because a strict ranking has been determined, the summary ranking is represented as follows:

(45) IO-Max-Rt >> Struc-σ >> BR-Max-Rt >> NoCoda >> BR-Max

While not crucial to the model and its predictions, a brief digression regarding OC is useful because it will allow a more equitable comparison with previous analyses of Lushootseed. Other approaches have required special mechanisms to achieve the correct shape and position, such as suspending the condition of phoneme-driven association for infixation. Previous analyses of Lushootseed OC include: Broselow and McCarthy (1983), Ter Mors (1984), Clements (1985), Kiparsky (1986), Davis (1988), Kirkham (1992), and Urbanczyk (1993). Because OC has played a role in shaping reduplicative models it is worthwhile to see whether extra mechanisms are needed with this model.

When the stem has initial stress, the OC morpheme is located after the first CVC sequence of the root, regardless of its size, as can be seen in (46a) and (46b). As the data in (46c) and (46d) illustrate, the first CVC does not always correspond to the location of stress, so infixal position is not related to stress (as it frequently is cross-linguistically). However, there are two forms with non-initial stress which are not infixed maximally (46d), showing that there is some uncertainty about whether the infixal position is related to metrical structure. Alternatively, because these forms both begin with [ʔə], it may be the case that speakers are not sure of the morphological boundary. Until further data becomes available, let us assume that OC is infixed after the first CVC of the root.

(46) OC Infixal Status

a. Rt = CVC

ʔáɬ	ʔáɬ-aɬ	'fast; quickly/ hurry up!'
dzáq'	dzáq-aq	'fall; topple/ totter; stagger'
čə́x̌	sčə́x̌-əx̌	'split/ cracked to pieces'
yúb-il	yúb-ub-il	'starve/tired out; not feeling well'

b. Rt > CVC

ʔúluɬ	ʔúl-ul-uɬ	'travel by water/ boat riding'
s-ɬádəyʔ	s-ɬád-ad-əyʔ	'woman/ woman living alone'
ʔíbəš	ʔíb-ib-əš	'walk/ pace back and forth'
x̌ʷúdx̌ʷud	x̌ʷúd-ud-x̌ʷud	'converse/ come to converse'
háʔkʷ	háʔ-aʔ-kʷ	'for a long time/ a little while ago'
kaw'ɬ-əd	káw'-aw'-ɬ-əd	'improvise/ improvise'

c. Non-initial Stress and Maximal Infixation

wəlíʔ	wələl-íʔ-il	'be visible/ become visible'
ʔəx̌íd	ʔu-ʔəx̌-íx̌-əd	'what happened/ What's he done?'

d. Non-initial Stress and Non-Maximal Infixation

dxʷ-ʔəhad	dxʷ-ʔəhád-ad	'talk/ discuss'
ɬu-ʔəkʷyíqʷ	ɬu-ʔəkʷíqʷ-iqʷ-əb	'great-great-grandparent/child/ will have great-great-grandchilren'

A key assumption in analyzing the infixal status is that the base of reduplication is the adjacent string, which is anchored at the tropic edge (i.e. the edge of affixation): left for a prefix and right for a suffix. (For formal details see McCarthy and Prince 1993; Urbanczyk 1996.) As the position of the infix varies, so does the size of the base. In the following forms the base is double-underlined. In case the base is mono-syllabic and ends in a cluster (as in a), infixation has the effect of eliminating a coda consonant, in accordance with NoCoda. In the case of poly-syllabic bases (as in b), infixation results in greater identity between base and reduplicant by minimizing BR-Max violations.

(47) Adjacent String Hypothesis

	Actual form	Competing Candidates
a.	háʔ-aʔ-kʷ	háʔkʷ-aʔkʷ
b.	sɬád-ad-əyʔ	sɬádəyʔ-əyʔ sɬádəy-əy-ʔ

Infixation is compelled by the need to obey markedness and faithfulness constraints. However, it comes at a cost. Following Prince and Smolensky (1993) and McCarthy and Prince (1995; 1999), infixation violates a constraint requiring the affix be edgemost in the stem. Let us adopt the subcategorizational Alignment constraint from above.

(48) Align-R-OC Align(OC, R, Stem, R) The right edge of every OC morpheme coincides with the right edge of the stem.

The following tableau illustrates the effect of having NoCoda and Max dominate Align-R-OC.

(49) NoCoda >> BR-Max >> Align-R-OC

	NoCoda	BR-Max	Align-R-OC
a. ☞ há?-a?-kʷ	*	h	*
b. há?kʷ-a?kʷ	**!	h	
a. ☞ sɬád-ad-əy?	*	s	*
b. sɬádəy-əy-?	*	sɬ!ad	*
c. sɬádəy?-əy?	**!	sɬad	

Maximal infixation does not occur because it would violate a constraint which requires all roots to end in a consonant. A survey of roots contained in the *Lushootseed Dictionary* reveals that less than one percent of native Lushootseed roots end in a vowel, indicating a very strong preference for consonant-finality.[23] The relevant constraint is formulated below. We assume that it is undominated in the grammar, and do not provide a tableau.

(50) C-Final-Root
Align(Root, R, C, R) — The right edge of every root coincides with the right edge of a consonant.

This brief digression serves to show that MAR has an edge over other models because no special provisos need be said about the different morphemes. The only lexical information required is morphological category and subcategorization, which are needed in all models of reduplication. The analysis captures differences between DIM and OC as a consequence of subcategorization as prefix or suffix. In MAR, the same ranking (NoCoda >> BR-Max-Afx) that derives a CV- prefix, also derives a -VC suffix. If we compare this to previous analyses of OC reduplication, we find a number of special provisions need to be made. For example, while skeletal theory can straight-forwardly specify the shape of OC as a VC template, there has been much debate as to the nature of the copy mechanism, being either phoneme-driven (stipulating first vowel - Broselow and McCarthy 1983) or template-driven (Clements 1985; internal reduplication only- Davis 1988), as well as whether infixation is best explained in terms of the nature of the base (Ter Mors 1984). Prosodic Circumscription accounts fare no better in terms of explanatory power, where *ad hoc* mechanisms (like circumscribing the onset) are required to explain VC shape (Kirkham 1992; Urbanczyk 1993). While

[23] See Urbanczyk (1996: 84-86) for further details. There are a number of recent loans which are vowel-final, like *kəlisi* 'crazy', *santus pli* 'Holy Spirit'. Notice that the latter contains a nasal sound. Because Lushootseed words do not usually contain nasals, the recent loans were excluded from the survey.

the mechanics of each model can derive the correct results, the conceptual downfall comes because the principles for determining shape and segmental content are distinct. Thus, there is no relationship between the position and shape of OC. In MAR, vowel-initiality of OC follows because of C-Final-Rt, which is independently needed in the grammar. The -VC shape (not -VCC) is straightforwardly explained as an affix, obeying NoCoda. By Occam's Razor, this model of reduplication represents an advancement in its simplicity.

To summarize, CV-, -VC, and CVC- shapes can be derived from the following ranking of constraints. Observe that templatic constraints are not needed to derive the correct shape. Indeed, to introduce one would render the following ranking superfluous and would mask the fact that each type of reduplicative morpheme has its own phonological properties.

(51) C-Final-Rt
|
IO-Max-Rt
|
*Struc-σ
|
BR-Max-Rt
|
NoCoda
|
BR-Max
|
Align(OC, R, Stem, R)

4.2 Default Segmentism

A second prediction of MAR is that root reduplicants will be more marked segmentally than affixal reduplicants. To be explicit, a predicted system is one in which affixal reduplicants have phonological defaults, while root reduplicants do not. The presence of a predictable default consonant with DIM was originally proposed by Bates (1986). Bates shows that the choice of Cí- vs. CV- DIM reduplicant is phonologically predictable, based on the shape of the base. Default [i] occurs with schwa-vowelled, cluster-initial, and long-vowelled roots. The data below illustrate the basic pattern analyzed by Bates.

(52) DIM Default Segmentism
a. Schwa-Vowel

tədᶻíl	'lie in bed'	t͟í-tədᶻil	'lie down for a little while'
bəč	'fall down'	b͟í-bəč	'drop in from time to time'
s-kʷəbšəd	'animal hide'	s-k͟ʷ͟í-kʷəbšəd	'small hide'

b. CC-Initial Roots

č'ƛ'á?	'rock'	č'i-č'ƛ'á?	'little rock'
c'kʷ'úsəd	'cane'	c'í-c'kw'usəd	'little walking stick'
ɬčil	'arrive, get there'	ɬí-ɬčil	'arrive occasionally'
qʷɬay?	'log'	qʷi-qʷɬay?	'stick'

c. Long-Vowel Roots

s-duukʷ	'knife'	s-dí-duukʷ	'small knife'
buus	'four'	bí?-buus	'four little items'
luud	'hear s.t.'	lí?-luud	'hear s.t. a little'

The analysis here builds on Bates (1986) by extending the investigation to the DIST and OC morphemes. Because the data are complex, the section starts by providing an overview of the distribution of the default with all three reduplicative morphemes, under all three conditions. Section 4.2.2 provides the analysis and section 4.2.3 extends the analysis to words with more than one reduplicative morpheme. This last section is relevant because it illustrates that patterns which were previously analyzed with cyclic application of reduplication (Broselow 1983) or morphemic circumscription (Hammond 1992) can be accounted for without further machinery.

4.2.1 Distribution of the default

The key to understanding the occurance of default [i] in these stems is that, with a few exceptions, DIM always receives primary stress. Motivating [i] as a default is important because schwa is the usual default vowel in Salish (Kinkade 1997). However, as mentioned above, stress is the conditioning factor, as the following irregularly stressed DIM stems show. Observe that schwa shows up under lack of stress in the cluster and schwa-initial bases in (a). The (b) examples show other cases of irregularly stressed DIM.[24]

(53) Diminutives with non-initial stress

a.	qsí?	'uncle'	qəqsí?	'favourite uncle'
	ƛ'ládi?	'sound, noise'	ƛ'əƛ'əl=ádi?	'little noise'
	t'əqʷ'	'snaps in two'	t'ət'qʷ'=áči?	'hand(s) broken off'
			t'ət'qʷ'=əldí?	'ears broken off'
			t'ət'qʷ'=qíd	'head(s) broken off'

[24] Virtually all of the irregularly stressed 'diminutive' forms have [a] as the base vowel. The preference to reduce unstressed low vowels has been investigated further in Urbanczyk (1996). Reduction of the DIM vowel over the root vowel can be analyzed as a case of IO-Ident-Rt dominating BR-Ident. Once again the root prefers to maintain its identity.

b.	gwad	'talk'	gʷəgʷádəd	'reply'
	kʷ'ałəb	'examine'	kʷ'əkʷ'áłəb	'nearsighted'
	táləł	'nephew/niece'	tətáləł	'little nephew/niece'
	tadᶻ	'dance'	tətádᶻəd	'what a mother bird does to attract attention away from her babies'

As predicted by the model, OC also shows the default under the same conditions (54). There is not a great deal of data due to the fewer number of OC stems and the preference for initial stress in Lushootseed. The following are the only stems which have schwa in the base and stress on the OC affix. While the data are not very robust, there are no counter-examples.

(54) Default Segmentism with OC

ʔəx̌íd	'what happened'	ʔəx̌-íx̌-əd	'What's he done?'
kʷ'əq	'fall backwards'	s-kʷ'əq-íq	'robin (tilts head back)'

Also as predicted, the DIST morpheme does not exhibit the default, as the following data show. The one exception is a long-vowelled stem, with two forms: one with a short vowel, and one with a different default. Note that there is a slight difference in meaning. This is significant below where these words are examined more closely.

(55) No Default with DIST

a. Schwa Vowels

ǰə́səd	'foot'	ǰə́s-ǰəsəd	'feet'
dᶻə́x̌	'move'	dᶻə́x̌-dᶻəx̌	'move household'
s-čə́txʷəd	'bear'	s-čə́t-čətxʷəd	'bears'

b. Cluster-Initial Roots

č'ƛ'áʔ	'rock'	č'ƛ'-č'ƛ'áʔ	'rocks'
qʷłayʔ	'log'	qʷł-qʷłayʔ	'logs'

c. Long-Vowel Root (Hess and Hilbert 1977: Vol. 2, p. 163)

s-duukʷ	'knife'	s-dú-duukʷ	'any chance assortment of knives'
		s-dá-duukʷ	'knives'

These data support the claims of MAR where affixes are found with defaults, but roots are not. Further discussion of the data in (55c) will be presented below.

4.2.2 Deriving Default-Segmentism

The analysis focuses on schwa-vowelled roots, because these have the most robust empirical data.[25] Default segments violate Max, which requires every segment of the base to be in the reduplicant. As noted above, the conditioning factor is stress, with default [i] occuring in order to avoid a stressed schwa. As discussed above, the relevant constraint is *ə́.

(56) *ə́ schwa is marked as a metrical peak

*ə́ has the distributional hallmarks of a markedness constraint because there are languages which never stress schwa, languages which avoid stressing schwa, and languages which permit stressed schwa, but no language enforces a stressed schwa. Specific cross-linguistic motivation for this constraint is not hard to find, because many languages resist stressing schwa. Virtually every Salish language shows evidence of this.[26] The widespread emergence of *ə́ in Salish in the IO domain, makes it unremarkable to find it emerging in the BR-domain as well. Recall from §3.3 that Lushootseed does not allow stressed schwas in segmentally specified affixes, but does permit stressed schwa in roots. Finding a parallel in the BR-domain is expected.

Because DIST allows stressed schwa, but DIM and OC do not, we expect *ə́ to intervene between BR-Max-Rt and BR-Max, providing us with the following ranking. The phonological asymmetry is another TETU effect in the reduplicative domain: the MU pattern discussed in section 3.4 above.

(57) TETU: default segment: BR-Max-Rt >> *ə́ >> BR-Max

As the following tableau illustrates, the difference in segmentism follows from the preceding ranking. The DIM and OC morphemes do not allow stressed schwa. The cost of obeying the markedness constraint is lack of segmental identy as can be seen in the first two (a) examples. The DIST morpheme, which is a root, allows stressed schwa.[27]

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[25] Details about deriving the segmental quality of the fixed [i] as well as its occurence with long-vowelled and cluster-initial diminutive stems are presented in Alderete et. al. (1999).

[26] The languages for which this has been explicitly investigated include: Cowichan: Bianco (1996); Lushootseed: Hess (1977), Urbanczyk (1996); Upper Chehalis: Kinkade (1997); Squamish: Bar-El (1997) and Bar-El and Watt (1998); Mainland Comox: Urbanczyk (1999d); St'at'imcets: Roberts (1994), Shaw (1996); Moses-Columbian: Czaykowska-Higgins (1993).

[27] To show the effect of the ranking, the data in the tableau are restricted to forms which retain schwa in the base.

(58) BR-Max-Rt >> *ə́ >> BR-Max

	BR-Max-Rt	*ə́	BR-Max
DIM-təd^{z}il			
a. ☞ tí-təd^{z}il			əd^{z}il
b. tə́-təd^{z}il		*!	d^{z}il
sk^{w}'əq-OC			
a. ☞ sk^{w}'əq-íq			sk^{w}'ə
b. sk^{w}'əq-ə́q		*!	sk^{w}'
DIST-ǰəsəd			
a. ǰís-ǰəsəd	əəd !		əəd
b. ☞ ǰə́s-ǰəsəd	əd	*	əd

An alternative explanation for why DIST retains schwa is that inserting material between the consonants of the root may be disallowed by the language on the whole. Insertion or deletion of medial segments violates the faithfulness constraint Contiguity. Thus, perhaps *[ǰís-ǰəsəd] is ill-formed because high-ranking Contiguity forbids insertion. This is an important point to visit, because if the explanation for why DIST retains schwa comes from elsewhere, the entire analysis is undermined. It turns out to be an impossible task to determine the ranking between Contiguity and Max because they do not conflict. However, the following data show that Contiguity can be violated by the DIST morpheme in two ways: having a vowel in DIST that is not in the base (intrusion) and by having a vowel in the base that is not in DIST (skipping).

(59) Contiguity violations

a. Intrusion into DIST

t'əq'əd	t'əq'-t'q'ád	'patch it/ patch it up'
pk^{w}	ləpək^{w}-pk^{w}ax^{w}	'break off a piece/ it flaked off'
χəɬ	χəɬ-χɬil	'sick/ very sick'
ptidg^{w}əs	pət-ptidg^{w}əs	'think about/ thinking'

b. Skipping base material

sax^{w}əb	sáʔ-sx^{w}-sax^{w}əb	'jump, leap/ hopping'
q'is	q'i-q's-q'isšəd	'expose/ legs partly covered'

The preceding data would provide speakers with positive evidence that Contiguity can be violated. According to theories of learnability in OT, (Tesar and Smolensky 1996; Hayes 1999), language learners start with high-ranking constraints and demote constraints that are violated. Thus Contiguity would be demoted. On the other hand, there are no items in which the DIST has a non-base vowel. The only potential counter-example is *dá-duukʷ* 'knives', which will be discussed below. Thus, an alternative analysis where Contiguity is seen to be the driving constraint behind schwa retention encounters negative evidence, while the BR-Max-Rt constraint does not.[28] The Contiguity analysis also does not offer a cross-linguistic explanation because there are languages like Sawai (discussed in §2.3) which have the default in both CVC and CV shaped reduplicants.

A further question regarding the analysis is whether [i] is truly epenthetic or simply an unfaithful copy. Evidence for the epenthetic nature of [i] comes from long-vowelled DIM stems. Recall that long vowelled stems also have the default. These stems provide the crucial evidence that the default is not a bad copy of the base vowel.

The default occurs in order to avoid a long vowel and to avoid a bad copy. The avoidance of long vowels is well-established cross-linguistically (Selkirk 1984; Rosenthall 1996). So, the relevant phonological constraint is *VV. The interesting feature about Lushootseed is that a shortened version of the long vowel is not found. Following Bates (1986), the failure to copy a long vowel as short is analyzed as an instance of length transfer in reduplication (Levin 1983; Clements 1985), where long vowels are copied as long and short vowels are copied as short. The second interesting feature about Lushootseed, is that these Transfer effects are obeyed by failing to copy at all.[29] A short vowel would be a bad copy of the long vowel and is ruled out. The relevant constraints are presented below.

(60)	*VV	No long vowels
	Ident-μ	If a segment is dominated by *i* moras in S1, it's correspondent is dominated by *i* moras in S2.

The optimal candidate eliminates a marked long vowel in the base by having an epenthetic vowel in the nucleus (a). A totally faithful candidate is ill-formed

[28] If Contiguity were used to explain why there is no insertion with CVC reduplicants, then one would wonder why more languages do not violate it to avoid marked structure. In addition to the Sawai pattern presented in §2, there seem to be two other situations where Contiguity is violated in achieving shape or segmental invariance. One is onset simplification as exemplified by the Sanskrit perfective [pa-prath-a] 'spread'. The other is discontiguous copying as exemplified by Ulu Muar Malay [bu?-buda?] 'children' (Kroeger 1989). Both situations involve skipping where the reduplicant size/shape is monosyllabic. While Contiguity violations seem to be linked to monosyllabicity, to investigate the phenomenon more fully here would take us too far afield.

[29] This type of transfer effect cannot be obtained in the Full Copy and Trim model of reduplication (Steriade 1988). Because markedness is checked after the copy stage, Full Copy cannot straightforwardly account for this unmarked situation by failing to copy.

because it contains a long vowel (b). Failure to copy the long vowel as short is suboptimal as well, in violation of Ident-μ (c). Notice that if [i] is a bad copy of the base vowel, as indicated by subscripting in candidate (d), then it also violates Ident-μ. It is in fact worse than (c) because it would also violate BR-Ident-VFeature. Candidate (c) harmonically binds (d).

(61) *VV, BR-Ident-μ >> BR-Max

		*VV	BR-Ident-μ	BR-Max
a.	☞ s-$\underline{\text{dí}}_j$-duu$_i$k^w	*		uuk^w
b.	s-$\underline{\text{dúu}}$-duuk^w	**!		k^w
c.	s-$\underline{\text{dú}}$-duuk^w	*	*!	k^w
d.	s-$\underline{\text{dí}}_i$-duu$_i$k^w	*	*!	k^w

Having analysed DIM long-vowelled stems and seen that BR-Ident-μ is obeyed, the question arises as to the status of long-vowelled DIST stems. The rarity of long-vowelled stems does not help to establish a robust pattern, as only one DIST long-vowelled stem was found: 'knives'. Interestingly, two forms are attested. In one the vowel is short, in violation of BR-Ident-μ (*dú$_i$-duu$_i$k^w*), and the other has a different default (*dá$_j$-duu$_i$k^w*). It is important to point out a meaning difference between the forms. Hess and Hilbert (1977: Vol. 2, p. 163) are careful to point out that the shortened vowel is a 'distributive', while the form with [a] "is used to represent a homogenous collection".

(62) Long-vowel stems (Hess and Hilbert 1977: Vol. 2, p. 163)

s-duuk^w	'knife'	s-dú-duuk^w	'any chance assortment of knives'
		s-dá-duuk^w	'knives'

Evidence that the fixed vowel [a] is not part of the distributive morpheme comes from the following pairs of words, where 'homogenous collection' and DIST can be formed from the same root (Hess and Hilbert 1977: *ibid*).[30]

(63)

Stem	homogenous collection	distributive
sax^{w}əb	sa-sax^{w}əb	$\underline{\text{sax}^w}$-sax^{w}əb
'jump, run'	'many run away…'	'running, jumping all over'
saq^w	sa-saq^w	$\underline{\text{saq}^w}$-saq^w
'fly'	'flock flies away abruptly'	'flying all over'

Because the [a] seems to be associated with a different meaning, it will not be analyzed as DIST.

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30 Except for 'knives', in all the data provided by Hess and Hilbert (1977), the root vowel is [a]. Therefore it is difficult to establish a strong generalization that the vowel is a fixed [a].

At first the existence of a short vowel reduplicant seems to be problematic for the analysis. However, it must be the case that *VV is obeyed by all reduplicants. This pattern is expected, given the findings about shape above. All reduplicative morphemes are mono-syllabic. So we can also expect all reduplicants to obey a markedness constraint. Because the language as a whole allows long vowels, *VV must be ranked below IO-Ident-μ-Rt.

(64) IO-Ident-μ-Rt >> *VV, BR-Max-Rt >> BR-Ident-μ

	IO-Ident-μ-Rt	*VV	BR-Max-Rt	BR-Ident-μ
a. ☞ s-dú-duuk^w		*	k^w	*
b. s-dúu-duuk^w		**!	k^w	
c. s-dí-duuk^w		*	uk^w!	
d. s-dú-duk^w	*!		k^w	

The CV shape is also problematic. While it seems to support the Contiguity approach to the phenomenon, the suboptimal [s-duk^w-duuk^w] would obey Contiguity because corresponding segments are contiguous in both the reduplicant and base. Until more long-vowelled stems are found, it is not possible to say whether copying C2 is part of the phonology of long-vowelled distributives. Thus the CV shape will not be analyzed.

To summarize, the default vowel has been shown to occur with DIM and OC, but not with DIST. This is consistent with the analysis, because DIM and OC are affixes, while DIST is a root, exhibiting more marked phonological properties characteristic of roots. Of particular interest to the model developed here is that DIM and OC pattern together phonologically. The following lattice illustrates the constraint rankings established thus far.

(65)
```
        C-Final-Rt
            |
        IO-Max-Rt
            |                   IO-Ident-μ-Rt
        *Struc-σ                      |
            |                         |
        BR-Max-Rt                    *VV
         /   |   \                    /
  NoCoda   *ə́   BR-Ident-μ
        \    |    /
          BR-Max
            |
    Align(OC, R, Stem, R)
```

The next section shows how this analysis extends straightforwardly to double reduplications.

4.2.3 Double Reduplications and Default Segmentism

Doubly reduplicated stems provide further support for this analysis. First, they are relevant in establishing that BR-Max-Rt is the relevant constraint in maintaining vocalic identity in DIST stems. Second, what seems like exceptional phonological behaviour can be derived with the rankings established thus far.

As first pointed out by Broselow (1983), Lushootseed has an interesting pattern of double reduplications, where in DIM-DIST stems, the reduplicative patterning is as expected (66), but in DIST-DIM stems, two unexpected properties are noticeable. First, DIST has CV shape, rather than CVC. Second, DIST has the default, unexpectedly, and DIM has the default without the trigger. Default segmentism in (67b) over-applies, forcing 'back-copying' onto the adjacent base. We restrict our discussion to segmental identity here.[31]

(66) DIM-DIST

bəda?	'child'	bí-bəd-bəda?	'dolls; litter [of animals]'
sáxʷəb	'jump, run'	sá-?-sxʷ-saxʷəb	'hopping'
qis	'expose'	qí-qs-qisšəd	'legs partly uncovered'

(67) DIST-DIM stems

a. Full-vowelled Stems

pástəd	'Caucasian'	pá-pa-pstəd	'many white children'
píšpiš	'cat'	pí-pi-pšpš	'kittens'
yúb-il	'starve'	yú-yu-yəbil	'children are starving'

b. 'Default' Stems

bəda?	'child'	bí-bi-bəda?	'small children'
s-dúukʷ	'knife'	s-dí-di-duukʷ	'small knives'
čƛ'a?	'rock'	č'í-č'i-čƛ'a?	'gravel'

These forms are relevant because the identity effects in the DIST-DIM stems can be captured as a consequence of high-ranking BR-Max-Rt. Secondly, these data have been used to provide evidence for the cycle and subjacency in reduplication (Broselow 1983), and so provide a good test for the approach to domains presented here.

The first point to make is that these forms establish that the base of

[31] See Urbanczyk (1999b) for a detailed analysis of double reduplications. The CV- shape of the DIST is analyzed as a consequence of the OCP (contra Broselow 1983), where evidence for an OCP-type degemination strategy is based on a more recent and expanded corpus of stems.

reduplication must be the string immediately adjacent to the reduplicant.[32] The following representation makes the assumptions about the base clear, where the DIM reduplicant-base relation is indicated by subscripting letters and the DIST reduplicant-base relation is indicated by subscripting numbers.

(68)	a. [<u>bí</u>-<u>bi</u>-bəda?] DIST-DIM			b.[<u>bí</u>-<u>bəd</u>-bəda?] DIM-DIST	
	reduplicant	base		reduplicant	base
DIST	b$_1$í$_2$-	b$_1$i$_2$b$_3$ə$_4$d$_5$a$_6$?$_7$	DIM	b$_a$í-	b$_a$ə$_b$d$_c$b$_d$ə$_e$d$_f$a$_g$?$_h$
DIM	b$_a$i-	b$_a$ə$_b$d$_c$a$_d$?$_e$	DIST	b$_1$ə$_2$d$_3$-	b$_1$ə$_2$d$_3$a$_4$?$_5$

The second point is that DIST maintains identity between base and reduplicant vowels, while DIM does not. This is consistent with the patterns examined thus far, where DIST is always identity-enforcing while DIM is not. In fact, in DIST-DIM stems, the outermost DIST forces the default in the DIM even under the lack of a trigger. Thus the exceptional occurence of [i] without a trigger is an example of over-application. Given that DIST-DIM stems are those that seem exceptional, and that these are the ones where identity is actively enforced, the analysis will focus on these.

By varying the two reduplicants (DIST and DIM) and two possible vowels ([i] and [ə]), there are four candidates of interest to the analysis. The following tableau shows that the overapplication facts can be derived with the same ranking that derives the difference between the reduplicants. DIST maintains identity with its neighbouring base, so having a default in the DIM is more optimal than not, as can be seen in candidate (a). Because BR-Max is low-ranking, a default in DIM (which is the DIST base) is better than no default, even though this results in lack of identity for the DIM reduplicant-base relation. Violations for individual morphemes are indicated here for ease of exposition.

[32] See Rose (to appear) and Buckley (1997) for analyses of double reduplications where the base of both reduplicants is the innermost stem, not the adjacent string.

(69) BR-Max-Rt >> *ə́ >> BR-Max

DIST-DIM-bədaʔ	BR-Max-Rt	*ə́	BR-Max	
a. ☞ bí-bi-bədaʔ	bədaʔ		DIST DIM	bədaʔ ədaʔ
b. bí-bə-bədaʔ	əbədaʔ!		DIST DIM	əbədaʔ daʔ
c. bə́-bi-bədaʔ	ibədaʔ!	*	DIST DIM	ibədaʔ ədaʔ
d. bə́-bə-bədaʔ	bədaʔ	*!	DIST DIM	bədaʔ daʔ

These double reduplications provide further support that Contiguity is not the relevant constraint in eliminating a stressed schwa from the DIST in simple reduplications. Contiguity would not be violated by the default here because the DIST has CV-shape. Selection of the optimal candidate falls to BR-Max-Rt.

4.4 Summary

This analysis of Lushootseed supports the two central predictions of the MAR model of reduplication. The first prediction regards the root-affix asymmetry. The larger DIST reduplicant exhibits marked phonological patterns, characteristic of roots. Permitting marked structure is achieved by preserving reduplicative identity. This is manifest in both the size and segmental content. DIST retains stressed schwa and adds a coda consonant to the reduplicated word. By having CVC shape and maintaining stressed schwa it exhibits canonical root phonology. Stressed schwa is eliminated in the DIST reduplicant only in DIST-DIM double reduplications. When the base is an adjacent reduplicant, identity can be enforced by over-application of the fixed vowel [i]. The second set of predictions pertain to the patterning of the affixal reduplicant phonology. The smaller DIM and OC reduplicants eliminate marked phonological structure, by having a default vowel. They also exhibit canonical affixal phonology by being smaller and not permitting stressed schwa. A significant result of this study is that both the shape and segmental properties of DIM and OC can be determined by the same constraint ranking. The fact that these reduplicative morphemes have the same phonology is captured by the model. The only assumption needed to derive the range of phonological patterns in Lushootseed reduplication is that DIST is classified as a root, while DIM and OC are affixes.

5. Conclusion

This study has pointed out a new observation about reduplicative phonology: that there is a correlation between size and segmental content. Larger reduplicants tend to have more marked structure, while smaller reduplicants tend to have less marked structure. This correlation is claimed to be analagous to the root-affix asymmetry observed in pre-specified morphemes. In order to derive this pattern, a model was developed, based on McCarthy and Prince's Generalized Template Theory (1994a, 1999). The key to capturing the correlation is the proposal that reduplicative morphemes can be specified as root and affix. The same general mechanism that explains the root-affix asymmetry for pre-specified morphemes can also capture the pattern in the reduplicative domain. By permuting all the rankings of the relevant constraints, it was shown that no ranking will derive a pattern where a large reduplicant has less marked structure than a small reduplicant. Because each ranking of constraints is a different grammar in OT, this model is shown to only generate the attested pattern and does not over-generate the unattested pattern. Therefore, the correlation is explained by the model.

A second point worth emphasizing is that the relationship between size and segmentism is described as a correlation, not a function. In other words, if there is a large reduplicant, we cannot predict that it will have marked segmental content. Likewise, with smaller reduplicants, we cannot predict that they will be composed of unmarked segments. However, in languages with more than one reduplicative morpheme, the prediction is that no genuine case will be found in which the smaller reduplicant is more marked than the larger reduplicant. Apparent counter-examples to this claim were discussed in section 2.2 in order to be more explicit about the properties of a true counter-example.

In terms of empirical adequacy, this model of reduplication can straightforwardly derive both size and segmental content of a range of reduplicative patterns in Lushootseed. Many aspects of Lushootseed reduplication have been proposed to offer evidence for additional theoretical machinery in the literature on reduplication. Therefore the corpus of data analyzed here is a good test case for any model of reduplication. Considering that the goal of any linguistic model is to derive a linguistic system, the fact that virtually the entire set of reduplicated stems has been analyzed implies that the model developed here comes close to modeling a speakers linguistic competence.

Finally, in terms of simplicity, the model developed here does not propose to offer any new theoretical machinery. On the contrary, it extends proposals that are independently needed to derive the phonological patterns of pre-specified roots and affixes to the reduplicative domain. By Occam's Razor, the minimal amount of information that a lexical entry for a morpheme must contain includes: morphological classification, subcategorization, meaning, and a means by which it achieves its phonological exponence. This model of reduplication claims that reduplicative morphemes are specified as roots and affixes, they can be either prefixes or suffixes, internal or external to the prosodic word, they have their own meaning, and they achieve their exponence by a BR-Correspondence relation. The only difference between prespecified and reduplicative morphemes is which string can can occupy the position of S1 - the input or the base. There are no templates necessary to derive the shape, nor are there templatic constraints. Introducing templatic constraints to the grammar here would result in over-generation of reduplicative systems, because shape could be determined independently of morphological category. Therefore, the morphological a-templatic model developed here brings phonological theory one step closer to the goal of deriving a complex range of patterns by using the simplest mechanisms possible.

Appendix A.1 Informal Survey of Fixed Melodic Material

Sources checked: Alderete *et. al.* (1999); Uhrbach (1987); Yip (1992)

There were two types of segmentism:
TETU = unmarked structure in RED,
MO = marked affixal segmental material in RED

If a language is known to have mono-syllabic roots, the decision was made to classify the reduplicant size as total. In these cases, the size of the root is indicated to the right. Also, the quality of the fixed segment is indicated to the right of the classification. In all cases, choice of TETU or MO is consistent with the source analyses.

#	Language	Size	Type of Segmentism	
1.	Acehnese	CV-	TETU	[i]
2.	Balinese	CV	TETU	[ə]
3.	Besemah	CV	TETU	[ə]
4.	Bolaang Mongondow	CV-	MO	[-o]
5.	Bugis	Ft	TETU	[-k]
6.	Cebuano	Ft	MO	[-ulu], if Base >Foot; ø, if Base = Foot
7.	English	Total	MO	[schm-]
8.	Gayu	CV ~ total	TETU	[ə] ~ No TETU
9.	Hindi	total	MO	[w-]
10.	Igbo	CV-	TETU	[high] & labial attraction
11.	Javanese	CV-	TETU	[ə]
12.	Kamrupi	total	MO	[s-]
13.	Kannada	total	MO	[gi-]
14.	Kolami	total	MO	[gi-]
15.	Lushootseed	CV-	TETU	[i]
16.	Nancowry	CV(C)-	TETU	[ʔ]
17.	Nias	Foot	MO	[voice] if base is trisyllabic
18.	Palauan	CV-	MO	[e]
19.	Sasak	CV	TETU	[ə]
20.	Teluggu	Foot	MO	[-ṭṭa]
21.	Thai	total	MO	[schwa replaces final vowel - long or short]

22.	Tübatulabal	CV(C)-	TETU	[ʔ]
23.	Tzeltal	total (-CVC)	MO	[-n]
24.	Vietnamese	total (C)	MO	[-aŋ]
25.		total (CVC)	MO	[-a-]
26.	Yoruba	CV-	TETU	[i]

Appendix A.2 Verification of Segmentism and Size Factorials

In order to verify the results of the rankings, we use the hypothetical root [p'atad] which is polysyllabic and contains a marked segment initially. We only consider candidates which obey IO-Faith. In each tableau, the root is derived first, and the affix second. Affix reduplicants are underlined and root reduplicants are double underlined.

1. Segmentism systems: F=[constricted glottis]

1.1 MM : both reduplicants allow the marked structure

a) Ident[F] >> Rt-Ident[F] >> *F

p'atad	Ident[F]	Rt-Ident[F]	*F
a. ☞ p'a-p'atad			**
b. pa-p'atad	*!	*!	*
a. ☞ p'a-p'atad			**
b. pa-p'atad	*!		*

b) Rt-Ident[F] >> Ident[F] >> *F

p'atad	Rt-Ident[F]	Ident[F]	*F
a. ☞ p'a-p'atad			**
b. pa-p'atad	*!	*!	*
a. ☞ p'a-p'atad			**
b. pa-p'atad		*!	*

c) Ident[F] >> *F >> Rt-Ident[F]

p'atad	Ident[F]	*F	Rt-Ident[F]
a. ☞ p'a-p'atad		**	
b. pa-p'atad	*!	*	*
a. ☞ p'a-p'atad		**	
b. pa-p'atad	*!	*	

1.2 UU : both reduplicants eliminate marked structure

a) *F >> Ident[F] >> Rt-Ident[F]

p'atad	*F	Ident[F]	Rt-Ident[F]
a. p'a-p'atad	**!		
b. ☞ pa-p'atad	*	*	*
a. p'a-p'atad	**!		
b. ☞ pa-p'atad	*	*	

b) *F >> Rt-Ident[F] >> Ident[F]

p'atad	*F	Rt-Ident[F]	Ident[F]
a. p'a-p'atad	**!		
b. ☞ pa-p'atad	*	*	*
a. p'a-p'atad	**!		
b. ☞ pa-p'atad	*		*

1.3 MU ˋ : the affix eliminates marked structure while the root retains it

a) Rt-Ident[F] >> *F >> Ident[F]

p'atad	Rt-Ident[F]	*F	Ident[F]
a. ☞ p'a-p'atad		**	
b. pa-p'atad	*!	*	*
a. p'a-p'atad		**!	
b. ☞ pa-p'atad		*	*

2. Size systems

Max and Rt-Max violations are indicated with each segment that is not in the reduplicant.

2.1 (>σ)(>σ) : both reduplicants are polysyllabic

a) Max >> Rt-Max >> *Struc-σ

p'atad	Max	Rt-Max	*Struc-σ
a. ☞ p'atad-p'atad			****
b. p'a-p'atad	t!ad	t!ad	***
a. ☞ p'atad-p'atad			****
b. p'a-p'atad	t!ad		***

b) Rt-Max >> Max >> *Struc-σ

p'atad	Rt-Max	Max	*Struc-σ
a. ☞ p'atad-p'atad			****
b. p'a-p'atad	t!ad	t!ad	***
a. ☞ p'atad-p'atad			****
b. p'a-p'atad		t!ad	***

c) Max >> *Struc-σ >> Rt-Max

p'atad	Max	*Struc-σ	Rt-Max
a. ☞ p'atad-p'atad		****	
b. p'a-p'atad	t!ad	***	tad
a. ☞ p'atad-p'atad		****	
b. p'a-p'atad	t!ad	***	

2.2 (≤σ)(≤σ) : both reduplicants are monosyllabic

a) *Struc-σ >> Max >> Rt-Max

p'atad	*Struc-σ	Max	Rt-Max
a. p'atad-p'atad	****!		
b. ☞ p'a-p'atad	***	tad	tad
a. p'atad-p'atad	****!		
b. ☞ p'a-p'atad	***	tad	

b) *Struc-σ >> Rt-Max >> Max

p'atad	*Struc-σ	Rt-Max	Max
a. p'atad-p'atad	****!		
b. ☞ p'a-p'atad	***	tad	tad
a. p'atad-p'atad	****!		
b. ☞ p'a-p'atad	***		tad

2.3 (>σ)(≤σ) : root reduplicant is polysyllabic and affix is monosyllabic

a) Rt-Max >> *Struc-σ >> Max

p'atad	Rt-Max	*Struc-σ	Max
a. ☞ p'atad-p'atad		****	
b. p'a-p'atad	t!ad	***	tad
a. p'atad-p'atad		****!	
b. ☞ p'a-p'atad		***	tad

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