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Two is too much…in the phonology!

A phonological account of unfaithful multiple reduplication

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Abstract: A purely phonological account of reduplication based on the affixation of empty prosodic nodes predicts the attested typology of multiple reduplication. Languages that can combine more than one reduplication-triggering morpheme in a word differ in (1) whether all reduplicants surface faithfully, (2) whether they systematically avoid adjacent multiple reduplicants, or (3) whether one of the reduplicants is smaller than expected if another reduplicant is adjacent in multiple reduplication contexts. Morphological accounts of reduplication not only violate the modularity between phonology and morphology, they also fail to predict this attested typology.

Keywords: optimality theory; prosodic affixation; reduplication; subtraction

1 Introduction

Although reduplication is the most well-studied instance of non-concatenative morphology and analyses for reduplication phenomena are major empirical arguments for influential proposals inside theoretical phonology like Prosodic Morphology (McCarthy and Prince 1986 and subsequent work) or Correspondence Theory (McCarthy and Prince 1995 and subsequent work), there is no agreement on whether reduplication involves morphological doubling or phonological copying. Multiple reduplication (MR) is an interesting but largely overlooked area that puts the predictions of these different classes of accounts to the test. MR is defined as the coocurrence of at least two reduplicative morphemes in a word. An introductory example from Bikol is given in (1). As can be seen in (1a), full reduplication marks the plural and /CV/ reduplication marks imperfective aspect. A verb can now be marked for both plural (actor) and imperfective by combining both reduplicative

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morphemes; an instance of multiple reduplication. In Bikol, both expected reduplicants are faithfully concatenated (1b).[1]

(1) Reduplication in Bikol (Mattes 2007: 126)

a. *nag-du~duman* *siya* *bulan~bulan*
BEG.AV-IMPFV~ DEM.DIST 3.SG.AF PL~month
'S/he goes there every month'

b. *ini* *an* *ha~hanap~hanap-on*
DEM.PROX PB IMPFV~PL~look.for-UG
'here (they are) continuously searching'

Every theory of reduplication trivially predicts such concatenation of reduplicating morphemes. Whatever mechanism or structure underlies reduplication, there is no *a-priori* reason in any theory why reduplicative morphemes can't be present multiple times in a word. Interestingly enough, some languages show unexpected repair mechanisms in MR contexts and avoid or shorten one of the reduplicants (unfaithful MR). These strategies seem to perfectly illustrate two puzzling competing forces whereby "[t]he languages of the world frequently show evidence of conspiracies to avoid the 'accidental' repetition of phoneme strings across morphs. These conspiracies are intriguing, since many languages also use the contrary strategy of reduplication – which deliberately repeats material within morphs." (Menn and McWhinney 1984, 519). Unfaithful MR contexts can be understood as an instance where languages allow the repetition of material in order to express morphemes only to a certain degree: If a threshold of 'too much' copying is reached, more copying is avoided. As a first consequence, unfaithful MR thus seems to be an argument for ranked and violable constraints in a language: An operation is allowed in principle but might be avoided in special contexts.

The main claim of this paper is that a phonological account of reduplication straightforwardly predicts unfaithful MR using the same assumptions and mechanisms independently assumed to capture single reduplication. In contrast, alternative morphological accounts of reduplication based on cophonologies (Inkelas 2008; Inkelas and Zoll 2005) or BR-correspondence (McCarthy and Prince 1995 and subsequent work) cannot predict the attested typology of MR, or have to assume MR-specific mechanisms and constraints.

In a purely phonological account of reduplication based on prosodic affixation, morphemes that trigger reduplication consist of empty prosodic nodes such as moras or syllables (Bye and Svenonius 2012; Marantz 1982; Pulleyblank 2009;

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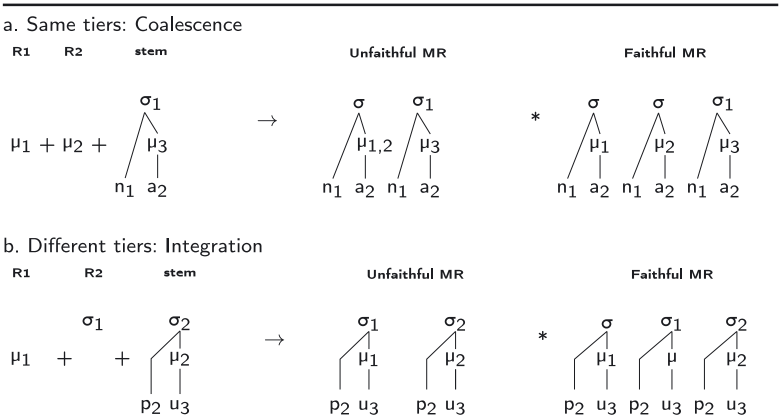
[1] List of glossing abbreviations used in the paper: av = actor voice, beg = begun, dem = demonstrative, dim = diminutive, dist = distal, distr = distributive, impfv = imperfective, pl = plural, rep = repetitive, sg = singular.

Saba Kirchner 2010, 2013a, 2013b). Reduplication then takes place to fill these otherwise segment-less prosodic affixes; standardly modeled as phonological fission where underlying elements are split into multiple output copies (McCarthy and Prince 1995, 1999; Spaelti 1997). Under this account, the avoidance of MR is triggered by the preference to keep the number of fissioned elements to a minimum (Saba Kirchner 2010). Multiple prosodic affix-nodes that are present in a MR context can then either undergo COALESCENCE if they are on the same prosodic tier (2a) or PROSODIC INTEGRATION if they are on different prosodic tiers (2b). It is shown below how these two simple phonological repair mechanisms correctly predict the typology of MR.

(2) Unfaithful MR



Under the phonological account presented here, unfaithful MR crucially falls out from a preference for avoiding unfaithful operations that creates copies. It is not based on a preference for avoiding too much identical output material. This account therefore does not appeal to general haplology (for overviews see Stemberger 1981; Nevins 2012), an approach that offers solutions often based on surface identity avoidance (e.g. Menn and McWhinney 1984; Plag 1998; Yip 1998). The argument in this paper is rather that unfaithful MR directly falls out from the mechanisms and standard constraints necessary in a phonological account of reduplication. It hence complements proposals accounting for haplology by adding to them the argument that the creation of too many identical elements can be blocked in the phonology. This argument is subtly but crucially different from banning the surface appearance of strings of identical material, which can result from either copying or the concatenation of strings that happen to be homophonous.

The paper is structured as follows: In Section 2, the typology of faithful and unfaithful MR is presented and the three relevant patterns of (1) Faithful MR, (2) Avoidance of MR, and (3) Subtracting MR are introduced. Section 3 shows how an existing phonological account of reduplication based on prosodic affixation predicts the typology of faithful and unfaithful MR. After the background assumptions of the phonological account and the copy-avoiding repair strategies of coalescence and prosodic integration are introduced in Section 3.1, Section 3.2 shows how the re-ranking of a basic set of faithfulness constraints predicts the typology of MR with six exemplifying cases studies. In Section 4, the problems of non-phonological alternative accounts are discussed, before I conclude in Section 5.

2 The typology of multiple reduplication

Though reduplication is an extremely frequent morphological pattern in the languages of the world[2] and many languages have more than one reduplicative morpheme, instances of MR are not as common as one might expect and have consequently not received the theoretical attention they deserve (exceptions are Broselow 1983; Nevins and Fitzpatrick 2002; Rose 1997; Shaw 2005; Stonham 2004, 2007). This paper aims to fill this gap further and discuss unfaithful MR as a challenge for theoretical accounts of reduplication. In order to investigate the attested patterns of MR and potential phonological effects observed in MR (but not in single reduplication contexts), I built a representative typological database for MR, based on the theory-neutral definition of the empirical phenomena in (3).

(3) Multiple reduplication (MR)
The presence of more than one productive reduplicative morpheme in a word.

All the data was gathered from descriptive materials.[3] Given the frequency of reduplication in the languages of the world, one could expect MR to be a very

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[2] Of the 368 languages in the WALS chapter on reduplication (Rubino 2013), only 55 do not employ productive reduplication. In addition, many languages employ more than one reduplicative process. Important here is the hypothesis that every language with partial reduplication also employs full reduplication (Moravcsik 1978; Rubino 2005).

[3] I only relied data that could be verified with at least one primary source for the language in question. This meant that the MR pattern of reinforced continuity in Shipibo for which three examples are given in Key (1965) (recited in Moravcsik 1978) does not occur in the list since I could not verify the intensification MR pattern in Loriot et al. (1993), Valenzula (1997, 2003), or Cardenas and Zeman (2019). I also excluded pattern where MR can only be found for ideophones (as in, for example, Upper Necaxa Totonac; Beck 2004).

common pattern. It turns out, however, that it is in fact rather difficult to find examples for MR and only 40 convincing examples of productive MR could be found. All of them are listed in Appendix together with their language affiliation and main source. There are two non-surprising clusters of MR languages in Austronesia and the American NW Coast – two areas where languages are well-known for their complex reduplication patterns.

There are several possible reasons for the relatively small sample of MR patterns. One is of course that, in a given language with multiple reduplicating morphemes, their combination might simply be excluded for semantic reasons. On the other hand, not every case of MR might be explicitly mentioned in a description. If combinations of reduplicating morphemes are as frequent as combinations of other segmental morphemes in a certain language, MR might simply not be a very noteworthy fact. If this is the case, a far more in-depth empirical study is necessary. Crucially however, the present paper does not propose a theory of MR: as was already emphasized above, every theory of reduplication is in principle a theory of MR. The crucial patterns this paper is interested in are unfaithful MR.

Instances of MR can be divided into at least three different types based on their morphological properties. The majority of the MR instances in my data sample (17) are of the same type as the Bikol pattern in (1), where two independently attested reduplicative morphemes with their own respective meanings are combined. Apart from this 'concatenating' MR (CR), there are also nine instances where the same reduplicative morpheme is added more than once, usually to enhance or intensify meaning (IR). An example would be the reinforcement of continuity in Pingelapese (e.g. /pei/ 'float'; /pei~pei/ 'floating', /pei~pei~pei/ 'still floating' [Rehg 1981: 11]). And finally, there are 5 instances where the meaning of the MR form is clearly distinct from its single-reduplication counterpart, but where the second reduplicative morpheme does not occur on its own and hence crucially relies on attaching to an already reduplicated form (SR).[4] An example is Taiwanese reduplication: Whereas single reduplication of a monosyllabic adjective intensifies its meaning, double reduplication diminishes it (e.g. /sin^{55}/ 'new', /sin^{33}~sin^{55}/ 'very new', /sin^{51}~sin^{51}~sin^{2}/ 'somewhat new' [Zhang and Lai 2007: 43]).[5] For the present theoretical discussion, these differences are not relevant and the only important fact is that all these cases involve the presence of two reduplicative morphemes (same or different; context-dependent or not).

The list in Appendix also notates whether at least one of the involved reduplicative morphemes (in at least some MR instances) triggers full reduplication (F);

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[4] Helong has both CR and IR MR patterns, the total of CR, IR, and SR patterns is therefore 41.

[5] There is an interesting additional tonal change in the reduplicated forms that is phonologically predictable given the tone specification of the base form (cf. Zhang and Lai 2007).

in contrast to cases where all reduplicative processes are partial (P). This classification can in principle become relevant for the theoretical account since there are claims that full reduplication should be accounted for by morpho-syntactic doubling, and only partial reduplication involves phonological copying (e.g. Pulleyblank 2009; Saba Kirchner 2010). Most importantly for the present argumentation, all instances of unfaithful MR that are the focus of this paper involve partial reduplication and are hence clear instances of a word-formation process that copies a prosodically delimitated portion of a base. The present proposal strengthens the existing arguments for analyzing partial reduplication as prosodic affixation and makes no claim about the theoretical account of full reduplication.

A close look at this typology reveals that there are three different MR types that differ in whether the multiple reduplicants in an MR context are the same or different from their shape outside of MR contexts. The most common type is Faithful MR (4A) but two unfaithful patterns can also be found; Avoidance (4B) and Subtraction (4C). All three patterns are discussed in more detail and with exemplifying data below. The numbers listed with each pattern represent the number of languages employing this MR type that I found in my dataset (cf. Appendix). Given that the sample is so small, it is hard to draw any definite conclusions about the rarity of the two unfaithful patterns from it. In the phonological account of reduplication presented in Section 3, the relative ranking of two faithfulness constraints simply determines whether a language employs faithful or unfaithful MR and no prediction about the relative frequency of either pattern is implied.

(4) Typology of MR
A. Faithful MR 32
Both reduplicants surface in exactly the form in which they surface in isolation.
B. Avoidance of MR 6
Only a single reduplicant surfaces although two reduplication-triggering morphemes are present.
C. Subtracting MR 2
One of the reduplicants is smaller than its form in isolation.

In the following, the term ‘reduplicant’ is often used for simplicity to refer to the copied string that surfaces if certain reduplication-triggering morphemes are present. No theoretical assumption is implied with this term; the view of an abstract ‘reduplicant’ is explicitly rejected in Section 4.

Faithful MR is the expected MR pattern where two reduplicants are simply concatenated in an MR context and have exactly the shape we would expect from their behaviour and shape in single reduplication contexts. An abstract example (based on the Bikol data) is given in (5). ‘R1’ and ‘R2’ are simply abbreviations for two different reduplication-triggering morphemes.

(5) A. Faithful MR, abstract

tu∼turoga	R1∼stem
turo∼turoga	R2∼stem
tu∼turo∼turoga	R1∼R2∼stem

Thompson Salish is one of the many examples of Faithful MR in the typology. Like most Salishan languages, it employs a wide variety of different reduplicative morphemes. Examples of two differently-sized reduplicants are the diminutive, marked by a prefixing /CV/ reduplicant (6R1), and the distributive, marked by a prefixing /CVC/ reduplicant (6R2). As (6R1+R2) shows, both these reduplicative morphemes can be combined and two reduplicants surface; both in exactly the shape and size we expect from the single reduplication contexts.

(6) A. Faithful MR in Thompson (Broselow 1983, 162)

R1. sí∼sil’
DIM-calico
‘a little piece of calico’

R2. sil∼síl
DISTR-calico
‘patches of calico’

R1+R2. sil∼sí∼sil’
DIM-DISTR-calico
‘small patches of calico’

Another example for Faithful MR can be found in Fox (7) where a bisyllabic reduplicant expressing iterativity (7R1) can co-occur with a monosyllabic reduplicant expressing continuativity that copies the initial stem consonant and realizes a fixed vowel /a/ (7R2) (Burkhardt 2001; Dahlstrom 1997).[6]

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[6] MR in Fox is theoretically very interesting for an independent reason, namely the fact that the outermost reduplicant copies the adjacent phonological string that involves another reduplicant. Another commonly found pattern is one where the outermost reduplicant copies from the embedded stem across potential other reduplicants or affixes (Shaw 2005; Urbanczyk 2000). This interesting additional parameter of what the base for reduplication is and how this is theoretically derived is a question that is for most parts orthogonal to the discussion in this paper. In Zimmermann (2018), it was argued that the choice of copying the stem or the adjacent phonological string can be analyzed as an epiphenomenon from Contiguity and Linearity in a phonological model. But in principle, the account presented here is also compatible with alternative views of how the base of reduplication is determined (Shaw 2005; Urbanczyk 2000).

(7) A. Faithful MR in Fox (Dahlstrom 1997, 207)

	wiːtamaw-eːwa	'he tells him'
R1.	wiːta∼wiːtamaw-eːwa	'he tells him over and over'
R2.	waː∼wiːtamaw-eːwa	'he is telling him'
R1+R2.	waːwi∼waː∼wiːtamaw-eːwa	'he keeps telling him over and over'

The first type of unfaithful MR pattern is the Avoidance of multiple reduplicants. More concretely, only a single reduplicant surfaces in MR contexts, as is abstractly shown in (8).

(8) B. Avoidance of MR, abstract

tu∼turoga	R1∼stem
turo∼turoga	R2∼stem
turo∼turoga	R1∼R2∼stem

Convincing evidence for an Avoidance pattern of course relies on independent evidence that two reduplicative morphemes are indeed present in the MR context if only one has a visible surface exponent. In the Wakashan language family where the Avoidance pattern is abundant, such independent evidence is luckily very straightforward and goes beyond the presence of the added meaning. In all Southern Wakashan languages, there are certain lexically idiosyncratic classes of suffixes that trigger prefixing reduplication (Kim 2003b, 2008; Stonham 2004). Examples are given in (9R) for Kyuquot. The underlying forms are given in the left column where triggering suffixes are underlined and the resulting surface forms are given in the right column. One type of easily determinable MR context is thus one where two of those reduplication-triggering suffixes are present (9R+R). As can be seen, only a single reduplicant surfaces in these contexts.[7]

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[7] This is a simplification. MR is only avoided if the two reduplication-triggers are inflectional or derivational respectively. Multiple reduplicants are hence observed if one reduplication-triggering morpheme is inflectional and the other derivational. As is argued convincingly in Stonham (2008), this is a strong argument for a stratal model of phonology. This is perfectly in line with the approach presented here: The Avoidance strategy that is introduced below is only possible within one stratum and hence between reduplication-triggering affixes whose phonological output is evaluated in parallel.

(9) B. Avoidance of MR in Kyuquot (Rose 1981)

R.	/tɬuk-'as/	tɬuː∼tɬuk'^{W}as	'He has wide wrists'	**p.312**
	/mitx^{W}-ʃi(tɬ)-apa/	miː∼miːtxʃitɬap	'He turned too much'	**p.325**
	/ʔu-ħw'aɬ-apa/	ʔuː∼ʔuːħw'aɬap	'He used it too much'	**p.340**
R+R.	/m'aɬ-'as-apa/	m'aː∼m'aːɬʔasap	'He has really cold wrists'	**p.341**
		*m'aː∼m'aː∼m'aːɬʔasap		
	/tɬ'uk-aːn'uɬ-apa/	tɬ'uː∼tɬ'uːk^{W}an'ɬap	'His legs are really big'	**p.341**
	/pumaɬ-suɬ-apa/	puːc-puːmaɬ-suɬ-ap	'He has really itchy eyes'	**p.341**

Avoidance of MR is pervasive in Southern Wakashan languages and the data in (9) is representative for Ditidaht (Stonham 1994), Makah (Davidson 2002), Tsishaaht (Davidson 2002; Stonham 2003, 2004, 2007), and Ahousaht (Kim 2003a, 2003c). Reduplication in these languages is very complex and many different reduplicants with slightly different phonological shapes co-exist within each language. Most notably, monosyllabic prefixing reduplicants differ in whether they copy a coda or not, whether they copy the vowel length of their base or have a consistently long or short vowel, and whether they trigger lengthening or shortening of the copied base vowel (Davidson 2002; Kim 2003a, 2003c; Stonham 2003, 2004, 2007). The existence of the Avoidance pattern in basically all Southern Wakashan languages hence raises the question of which form the one surfacing reduplicant has if each reduplication-triggering morpheme requires a reduplicant of a different shape. Stonham (2004) notes that "the effects on the final form are those that are required by *all* the triggers, with the proviso that only a single copy occurs" (p. 137); an effect I'll term the 'Superset Effect of the Survivor'. This is illustrated in (10) with data from Tsishaat. The shape requirements for the reduplicants are abbreviated as 'R' (reduplicant copies vowel length of the base), 'RL' (reduplicant has a long vowel), and '+L' (reduplicant triggers lengthening of the copied base vowel). The consonant 'c' is a fixed segment that is always part of certain reduplicants. In (10c), for example, the first reduplicative morpheme demands a reduplicant that is unspecified for vowel length but contains the fixed coda consonant /c/ whereas the second reduplicative morpheme demands a reduplicant with a long vowel and both also demand vowel lengthening in the base. The resulting one reduplicant form conforms to all these requirements in containing a long vowel in reduplicant and base and also the fixed consonant /c/ in the reduplicant. It will be shown below that this Superset Effect of the Survivor straightforwardly follows from the phonological account proposed in this paper but remains challenging under alternative models.

(10) Superset Effect of the Survivor: Tsishaat (Stonham 2004: 137)

a.	/t͡ɬ’uk-aːn’uɬ-apa/	R+L & RL+L	t͡ɬ’uː-t͡ɬ’uːk^{w}an’ɬap	RL+L
b.	/m’aɬ-’as-apa/	RL & RL+L	m’aː-m’aːɬʔasap	RL+L
c.	/pumaɬ-suɬ-apa/	Rc+L & RL+L	puːc-puːmaɬ-suɬ-ap	RLc+L
d.	/hin-’as-ʧ’ap-ajuk/	RL & R	hiː∼hinʔasʧpajk	RL

In contrast to Avoidance of MR, the second pattern of unfaithful MR involves the realization of as many reduplicants as there are reduplication-triggering morphemes. But the shape of one of the involved reduplicants is smaller than is expected from its shape in single reduplication contexts. This Subtraction pattern is abstractedly shown in (11).

(11) C. Subtracting MR, abstract

tu∼turoga	R1∼stem
turo∼turoga	R2∼stem
tu∼tu∼turoga	R1∼R2∼stem

An example for Subtracting MR can be found in Lushootseed, a Salishan language (Urbanczyk 2001). As can be seen in (12R1+R2), the distributive is marked by a prefixing /CVC/ reduplicant and the diminutive by a /CV/ reduplicant. In a context where both reduplication-triggering morphemes are present (12R1+R2), the outermost distributive reduplicant is unexpectedly coda-less.[8]

(12) C. Subtracting MR in Lushootseed (Urbanczyk 1999, 2001)

R1.	bədáʔ	‘child’	bəd∼bədáʔ	‘children’	9: 209
	júbil	‘die, starve’	júb∼jubil	‘they are starving’	9: 221
R2.	χáhəb	‘cry’	χá∼χahəb	‘an infant crying’	9: 205
	s-túbʃ	‘man’	s-tú∼tubʃ	‘boy’	9: 204
R1+R2.	pástəd	‘white person’	pá∼pa∼pstəd *pás∼pa∼pstəd	‘many white children’	9: 226
	píʃpis	‘cat’	pí∼pi∼pʃpis	‘kittens’	9: 226
	bədáʔ	‘child’	bí∼bi∼bədaʔ	‘small children’	9: 225

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[8] Lushootseed is in fact famous for having an MR pattern where both orders of reduplicants exist with contrasting meaning: In the reverse order of reduplicants Dim≫Dist, no subtracting effect can be observed (Broselow 1983; Urbanczyk 2001). Cf. footnote 3.2.1 that the present account can predict this asymmetry.

Another example of Subtracting MR can be found in Sikaiana, an Austronesian language (Donner 2012). Repetitive action is marked with bisyllabic reduplication (13R1) and plural is marked by /CV/ reduplication that can optionally be reduced to /C/ reduplication (13R2). In forms that are marked for both repetetive and plural (13R1+R2), this optionality vanishes and the plural reduplicant is obligatorily /C/ and cannot be /CV/.

(13) C. Subtracting MR in Sikaiana (Donner 2012: 23)

R1.	sopo	sopo∼sopo		REP∼'jump'
	sepu	sepu∼sepu		REP∼'dive'
R2.	sopo	so∼sopo	s∼sopo	PL∼'jump'
	sepu	se∼sepu	s∼sepu	PL∼'dive'
R1+R2.	sopo	*sopo∼so∼sopo	sopo∼s∼sopo	PL∼REP∼'jump'
	sepu	*sepu∼se∼sepu	sepu∼s∼sepu	PL∼REP∼'dive'

Languages employing the two unfaithful MR patterns are summarized in (14). I argued above that unfaithful MR is a repair that is crucially bound to the presence of two reduplicating morphemes: It cannot be understood as the result of a general phonological process nor a process that always applies in reduplication contexts. The explanation for unfaithful MR hence has to be found in the theory of reduplication. In the next section, I argue that a phonological account based on prosodic affixation can predict unfaithful MR as a phonological repair that avoids too much copying.

(14) Summary: The Unfaithful Patterns

B.	Avoidance of MR			
	Kyuoquot	Wakashan	S. Wakashan	**(Rose 1981)**
	Makah	Wakashan	S. Wakashan	**(Davidson 2002)**
	Ditidaht	Wakashan	S. Wakashan	**(Stonham 1994)**
	Tsishaath	Wakashan	S. Wakashan	**(Stonham 2004)**
	Ahousaht	Wakashan	S. Wakashan	**(Kim 2003b)**
	Toqabaqita	Austronesian	Malayo-Polynesian	**(Lichtenberk 2008)**
C.	Subtracting MR			
	Sikaiana	Austronesian	Malayo-Polynesian	**(Donner 2012)**
	Lushootseed	Salishan	Central Salish	**(Urbanczyk 2001)**

3 A phonological account of multiple reduplication

3.1 Reduplication as prosodic affixation

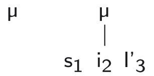
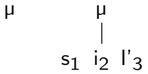
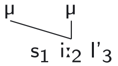
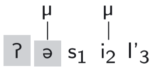
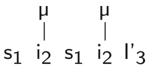
The reduplication theory advocated here is based on the assumption that reduplication is the consequence of a phonological copy operation that applies to fill otherwise segmentally empty prosodic nodes. It is argued that this theory straightforwardly predicts the typology of MR from standard phonological repairs that apply to avoid too many unfaithful operations.

Reduplication-triggering affixes in this model contain ‘prosodic affixes’ or empty prosodic nodes that lack any segmental content. Apart from this representational peculiarity, there is nothing special about them: Phonology alone is left to deal with those empty prosodic nodes and no special morphology or phonology applies in reduplication contexts. The influential theoretical proposal in Marantz (1982) can be understood as a first argument for such a phonological account of reduplication based on segmentally empty prosodic affixes. It was reintroduced into optimality-theoretic phonology in the work of Saba Kirchner (2010) and can also be found in Bermúdez-Otero (2012), Bye and Svenonius (2012), McCarthy et al. (2012), and Pulleyblank (2009). This work emphasizes that, for example, the existence of phonologically predictable allomorphy between reduplication and other non-concatenative strategies like vowel lengthening is a strong argument for a prosodic affixation account of reduplication (Saba Kirchner 2010, 2013a, 2013b; Zimmermann 2013). Prosodic affixation can thus not only result in reduplication, it can also result in other non-concatenative strategies to realize a morpheme, most notably vowel lengthening or gemination. The constraints that ensure the realization and prosodic integration of a prosodic affix are hence by no means specific to reduplication (e.g. Bye and Svenonius 2012; Davis and Ueda 2002; van Oostendorp 2005; Samek-Lodovici 1992; Wolf 2007; Zimmermann 2017a).

The ‘copying’ process that fills the otherwise empty prosodic nodes in reduplicative contexts is standardly taken to be fission: Underlying elements are split into multiple output instances under violation of INTEGRITY (15a) (Gafos 2003; Nelson 2003; Raimy and Idsardi 1997; Spaelti 1997; Struijke 2000). The basic logic of this account is illustrated in tableau (16), which shows the derivation of the Thompson diminutive reduplication in (6). The input contains a stem preceded by a prefix that consists only of an empty mora. Deletion of this mora is impossible due to undominated MAX$_\mu$ that demands preservation of every underlying mora. Neither MAX$_\mu$ nor this deletion candidate is shown in (16). If the mora is realized, however, it needs to dominate some segments due to (15a) ensuring proper integration of all prosodic nodes. Two obvious possibilities to fill this mora with segmental content are to link it to the following vowel of its base, resulting in vowel lengthening (16b), to insert an epenthetic vowel (16c), or to split up the underlying initial vowel into two output instances (16d). Given that Onset! is ranked high in Thompson, both vowel epenthesis and vowel fission are accompanied by epenthesis and fission of a preceding consonant to create a coda. That fission has applied in (16d) is easily determinable from the indices that mark the IO-correspondence relations. Both underlying /s_1/ and /i_2/ have two output correspondents with the same index. Given that Dep$_\text{S}$ (15b) is ranked above Int$_\text{S}$ (15c) in this language, segment fission becomes optimal. This repair is often termed 'copying' in the following but it should be clear that it is simply the double realization of input elements. Epenthetic elements are marked with a grey background to ease readability. Crucially, the candidates (16b) and (16c) represent strategies that become optimal in other languages to realize an empty mora – strategies which can even alternate in a phonologically predictable way in reduplication (Saba Kirchner 2010).

(15) a. μ>S
Assign * to every μ not dominating a segment.
b. Dep$_\text{S}$
Assign * to every output-segment without an input correspondent.
c. Int$_\text{S}$
Assign * to every pair of output segments that correspond to the same input segment.

(16) Copying as fission: The basic mechanism

	Onset!	μ>S	Dep$_\text{S}$	*V:	Int$_\text{S}$
a. 		*!			
b. 				*!	
c. 			*!*		
☞ d. 					**

Two additional background assumptions are adopted here: morphological colours as indicators of morphological affiliation (Revithiadou 2007; van Oostendorp 2003, 2006, 2007, 2008) and a stratal organization of phonology (Bermúdez-Otero in preparation; Kiparsky 2011). Morphological colours are an explicit formalization of the assumption implicit in many theoretical accounts that the phonology is able to distinguish whether two elements belong to the same or to different morphemes (or to none). This assumption is mainly relevant for the constraint definitions in (17b), (23), and (24). In a stratal OT system, stems, words, and phrases are subject to different optimizations with potentially different constraint rankings. This assumption is crucial since it predicts that certain repairs are only possible between affix elements but not between affix material and stem material. This will be discussed in more detail in Section 3.2.1.

With these background assumptions in place, we can now turn to the predictions the phonological account makes for MR contexts. Under the phonological account of reduplication adopted here, every copy operation is penalized by the standard faithfulness constraint $\text{I}\textsc{nt}_\text{S}$. The motivation for Avoidance of MR and Subtracting MR is hence simply the preference to keep $\text{I}\textsc{nt}_\text{S}$ violations to a minimum and to avoid 'too much' output that is due to unfaithful copy operations.[9] The interesting challenge under this account is that all the unfaithful MR languages do employ faithful reduplication if only a single reduplicative morpheme is present. The phonological account presented here predicts that this apparent threshold where a certain amount of copying is possible but 'too much' copying is avoided is in fact an epiphenomenon and falls out from the simple fact that certain repair operations are only possible between affix material and not between stem and affix material. Only if multiple affix-triggers for copying are present do we expect avoidance of copying.

More concretely, in an MR context, at least two different prosodic affixes are present that are in principle filled with segmental material when they occur as the only empty prosodic affix in a word. When two empty prosodic affixes are adjacent, two general strategies are possible to avoid too much copying: Coalescence of prosodic nodes (18a) or integration of prosodic nodes on different tiers (18b). Which strategy is possible in a certain context primarily depends on the nature and size of the prosodic nodes: If they are on the same tier, they can undergo coalescence and if they are on different prosodic tiers, they can prosodically integrate. The former operation violates UNIFORMITY (UNF), the standard constraint penalizing element coalescence, and the latter DEPAL, a constraint that penalizes new

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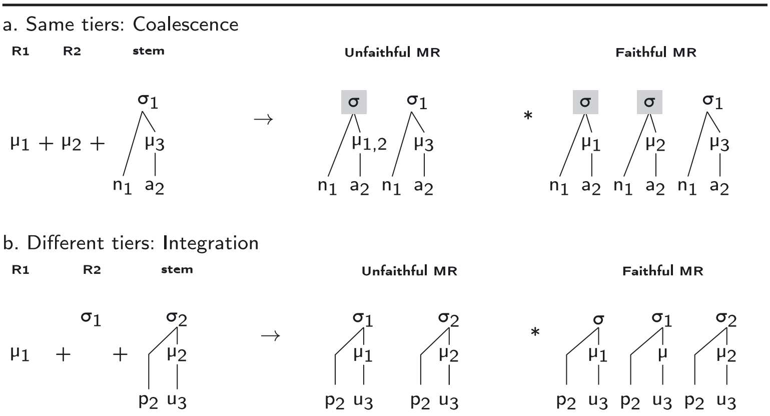
[9] This account is in spirit similar to the account based on unified indexation in Buckley (1997); Rose (1997) but crucially different since it does not rely on BR faithfulness and hence morpheme-specific constraints (cf. the discussion in Section 4).

association lines between underlying elements.[10] Both constraints are given in (17) with their formulation for moras.

(17) a. Unf-μ
Assign * to every pair of input μ's corresponding to the same output μ.
b. Dep(σ–μ)
Assign * for every colourless association line between a coloured σ and a coloured μ.

The two general strategies of unfaithful MR are illustrated in (18) which is repeated from (2). Two reduplicative-triggering affixes each consisting of an empty mora can undergo coalescence into a single mora that is filled with copied segments (18a), avoiding double copying. Segment fission is again detectable by comparing IO-correspondence indices: If one output element has more than one input index, it will induce a violation of Unf. An affixed empty syllable node can simply dominate the affixed empty mora of another reduplication-triggering morpheme, resulting in only a single-syllable copy rather than of a two-syllable copy (18b).

(18) Unfaithful MR



It is clear that coalescence and prosodic integration as strategies to avoid 'too much' copying are bound to the presence of at least two prosodic affixes and hence to MR contexts. In these contexts, unfaithful MR can emerge if the preference for avoiding copying is sufficiently highly-ranked in a grammar. Crucially, the account here does not rely upon a surface-ban on identical material (e.g. Menn and McWhinney 1984; Plag 1998; Yip 1998) but upon a ban on applying the operation

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[10] For a discussion that DepAL is only sensitive to underlying elements cf, for example, Trommer and Zimmermann (2014).

that creates identical surface material too often. The argument is thus that the mechanisms needed in a phonological account of reduplication already predict unfaithful MR; it is by no means a general account of haplology.

3.2 Deriving the typology of multiple reduplication

The overview in (18) already introduced the important distinction that multiple prosodic affixes in a language can be either on the same or on different phonological tiers after morpheme concatenation. Since the repair to avoid too much copying is different in these two cases, a six-fold typology of relevant MR contexts arises for the three patterns of Faithful MR, Avoidance of MR, and Subtracting MR, summarized in (19). At least one actual example of each of the six possible types was found in the database.

(19)

Prosodic affix nodes on the same tier	Prosodic affix nodes on different tiers
A. Faithful MR	
Thompson	Fox
B. Avoidance of MR	
Ahousaht	Kyuoqot
C. Subtracting MR	
Lushootseed	Sikaiana

In the following subsections, it is shown how the theoretical model presented above can predict these six possible types of MR. Tableaux illustrating all the patterns are given that show that simple re-rankings of the relevant constraint(s) types(s) Int$_S$, Unf, and DepAL predict the full typology straightforwardly. The discussion is divided between patterns where the relevant prosodic affixes in MR contexts are on the same tier (Section 3.2.1) and those where they are on different tiers (Section 3.2.2). An important consequence of the model presented here is that the mechanisms that predict Subtracting MR are exactly the same that are relevant for Avoidance of MR: Coalescence and prosodic integration as in (18). Both Subtraction and Avoidance involve situations in which not every prosodic affix is filled with its own copied segmental strings. We will see below that the fact that no reduplicant surfaces in Avoidance patterns and that a smaller reduplicant surfaces in Subtraction patterns is in fact an epiphenomenon that falls out from independent phonological constraints.

3.2.1 Prosodic affixes on the same tier

This subsection investigates languages where the relevant reduplication-triggering morphemes in an MR context contain prosodic nodes on the same tier. The discussion starts with Faithful MR. An example is Thompson Salish that was already given in (6) and has both /CVC/ and /CV/ reduplicative affixes. The distributive and the diminutive reduplicative morphemes are taken to contain empty prosodic moras; the former contains two empty moras resulting in a heavy syllable reduplicant and the latter in a single mora resulting in a light syllable reduplicant.[11] Tableau (20) optimizes a context where both these reduplication-triggering morphemes are present. In candidate (20b), the affix moras undergo coalescence resulting in a single heavy reduplicant. This strategy is excluded in Thompson Salish by high-ranked Unf-μ. The Faithful MR candidate (20a) hence becomes optimal although it induces far more Int$_S$ violations. It has to be noted that multiple copying increases the number of Int$_S$ violations quite dramatically since every pair of output segments corresponding to the same input segment induces a violation. In (20a), for example, there are three output instances of input /s_1/ and /i_2/ and hence three pairs of output segments with the same input index each resulting in six Int$_S$ violations. In addition, there is one other pair of output segments /l_3/ with the same input correspondent that adds another violation. In this first tableau, the respective output pairs are marked with gray lines to ease the calculation of the Int$_S$ violations.

(20) A. Faithful MR in Thompson: Prosodic affix nodes on the same tier

$\mu_1\ \mu_2 + \mu_3 + \mu_4\ \mu_5$ $s_1\ i_2\ l'_3$	μ>S	Deps	Unf-μ	Ints
☞ a. $\mu_1\ \mu_2$ μ_3 $\mu_4\ \mu_5$ $s_1\ i_2\ l_3$ $s_1\ i_2$ $s_1\ i_2\ l'_3$				7*
b. $\mu_1\ \mu_{2,3}$ $\mu_4\ \mu_5$ $s_1\ i_2\ l'_3$ $s_1\ i_2\ l'_3$			1*!	3*

---

[11] The assumption of certain prosodic nodes triggering a certain reduplicant of course requires detailed phonological arguments from the phonology of a language and its inventory of reduplicative morphemes. Since the focus in this paper is on deriving the attested typology of MR patterns, such detailed arguments are not given for each language. Even if it turns out that a specific pattern can be reanalysed as involving different prosodic affixes, the general argument that coalescence and prosodic integration can predict unfaithful MR would not be challenged.

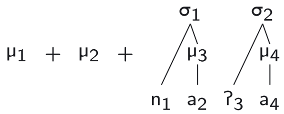
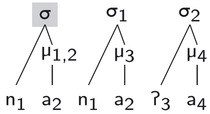
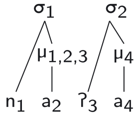
The counterpart to the Faithful MR in Thompson is Ahousaht (cf. (9) for closely related Kyuquot) where the affixation of two reduplicative morphemes each consisting of empty moras results in only a single reduplicant. As can be seen in (21), a simple re-ranking of Int$_S$ and Unf-μ predicts that affix moras undergo coalescence and only a single reduplicant surfaces in a MR context.

(21) B. Avoidance in Ahousaht: Prosodic affix nodes on the same tier

	$\begin{array}{cccccccc} \mu_1 & + & \mu_2 & + & & \mu_3 & & \mu_4 \\ & & & & & \vert & & \vert \\ & & & & n_1 & a_2 & \text{ʔ}_3 & a_4 \end{array}$	μ>S	Dep$_S$	Int$_S$	Unf-μ
a.	$\begin{array}{cccccccc} & \mu_1 & & \mu_2 & & \mu_3 & & \mu_4 \\ & \vert & & \vert & & \vert & & \vert \\ n_1 & a_2 & n_1 & a_2 & n_1 & a_2 & \text{ʔ}_3 & a_4 \end{array}$			6*!	
☞ b.	$\begin{array}{cccccc} & \mu_{1,2} & & \mu_3 & & \mu_4 \\ & \vert & & \vert & & \vert \\ n_1 & a_2 & n_1 & a_2 & \text{ʔ}_3 & a_4 \end{array}$			2*	1*

The tableau in (21) raises the immediate question of why reduplication takes place at all in a language where Int$_S$ is ranked above Unf-μ: Wouldn't we expect complete absence of any copying if empty prosodic moras can simply fuse with existing moras? The relevant candidate is (22b) where all affixed moras simply undergo coalescence with the initial base mora and no segment has to undergo fission; no violation of Int$_S$ arises. That this over-repair is impossible follows from Dep(σ–μ) penalizing epenthetic association lines between moras and syllables (17b). The stem-mora is crucially already integrated under a syllable; coalescence with the affix moras hence adds an epenthetic association line between the stem-syllable and these affix moras. More concretely, both the association of σ_1 to μ_1 and of σ_1 to μ_2 causes a Dep(σ–μ) violation since both pairs of syllable and mora were present underlyingly but were not associated. Integration of the coalesced affix mora under an epenthetic syllable as in optimal (22a) does not induce a violation of Dep(σ–μ) since this syllable was not present underlyingly. An important background assumption is thus that stems are fully prosodified at the point where affixes are added. This follows in a stratal model (Bermúdez-Otero in preparation; Kiparsky 2011) with an evaluation of the base of affixation prior to concatenation (Trommer 2011). All stems undergo a pre-optimization that ensures that they are properly prosodically integrated. This pre-prosodification of stems can make them immune to certain repairs that manipulate prosodic structure (like coalescence or prosodic integration). Such repairs are available, however, for affix material which is added in a later stratum and is not yet prosodified.[12] The factorial typology of course predicts that languages can rank Dep(σ–μ) low enough to allow the repair in (22b). Such languages would simply never employ reduplication (for affixed empty moras) and a prosodic affix would have no surface effect.

(22) B. Ahousaht: Avoidance of MR but not of single reduplication

		μ>S	Dep$_S$	Dep(σ-μ)	Int$_S$	Unf-μ
☞ a.					2*	1*
b.				2*!		2*

The existence of coalescence as repair to avoid too much copying also raises the question of why coalescence doesn't apply to avoid reduplicants that are 'too' large. If a reduplicative morpheme consists of two empty moras in Ahoushat, parallel to the distributive affix in Thompson, wouldn't we expect that such a reduplicant is always shortened to a monomoraic one?[13] This could be expected if those two moras underwent coalescence in order to avoid a long vowel in the reduplicant; arguably a marked structure. That coalescence is not possible between the portions of one reduplicative morpheme follows from (23), a constraint penalizing input elements with an identical morphemic affiliation that correspond to the same output elements. Such a constraint thus predicts a Derived Environment Effect of the type that repair operations are only possible across morpheme boundaries but not within one morpheme (cf. discussion of a similar constraint in van Oostendorp [2007, 2012]).

---

[12] Another prediction of the stratal architecture is that unfaithful MR is only possible between reduplicative affixes that are added at the same stratum. This prediction is borne out in Southern Wakashan where avoidance of MR can only be observed between reduplicative affixes added at the same stratum (cf. the discussion and references in footnote 2).

[13] It is in fact almost certain that a complete account of the multitude of reduplicative morphemes in Ahousaht requires a reduplicative morpheme containing two moras (Kim 2003a, 2003c; Zimmermann 2017b).

(23) Unf-μ(Ma)
Assign * to every pair of input μ's with the same morphological colour that correspond to the same output μ.

Finally, we turn to Subtracting MR, which is also attested for prosodic affixes on the same tier. The Subtracting MR in Lushootseed (12) is an example. As was already emphasized above, the main phonological repair mechanism is the same in Avoidance and Subtraction patterns, namely coalescence for prosodic affixes on the same tier. The only additional constraint that ensures that Lushootseed shows Subtraction and not complete Avoidance of MR is (24), demanding morpheme contiguity for prosodic dominance relations (Zimmermann 2017a). This constraint penalizes any syllable that dominates moras which are affiliated to different morphemes and hence effectively bans too much prosodic integration. Several related concepts and constraints demanding morphemic contiguity across tiers can be found in the literature. Examples are MorphologicalSyllableIntegrity demanding that all elements integrated under a syllable node should be in the morphological domain of that syllable (van Oostendorp 2004) or tautomorphemicity demanding that morpheme and syllable boundaries should coincide (Bickel 1998; Crowhurst 1994).

(24) $*[\mu_A\mu_B]\sigma$:
Assign * to every coloured σ dominating μ's of different morphological colours.

Its main effect for Lushootseed is that a complete subsumption of the affix prosody under the same syllable is impossible. Though the usually bimoraic distributive /CVC/ reduplicant can be shortened to a monomoraic one via coalescence with the one mora of the diminutive reduplicant (25b), coalescence of both reduplicants into a single syllable is excluded by $*[\mu_A\mu_B]\sigma$ (25c).[14]

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[14] There are additional complexities in the Lushootseed reduplication pattern which are orthogonal to the MR pattern discussed here. For one, there is the additional complexity that a fixed segment /i/ surfaces in some context. I analyze this as an Emergence of the Unmarked Effect that avoids open /ə/-syllables (Kurisu 2001; Urbanczyk 1998). On the other hand, no Subtracting MR can be observed if both reduplicants surface in the reverse order Dim-Distr (e.g. *bí~bəd~bədaʔ* 'dolls, litter', Urbanczyk 2001: 225). This is assumed to follow from a simple positional faithfulness effect (Beckman 1998; Lombardi 1999) and more specifically from a constraint Unf-μ (Initial) that prevents the initial mora from undergoing coalescence in the context /μ + μ μ + stem/.

(25) C. Subtracting MR in Lushootseed: Prosodic affix nodes on the same tier

	$\mu_1\ \mu_2 + \mu_3 + \mu_4\ \mu_5\ \mu_6\ \mu_7$ p$_1$ a$_2$ s$_3$ t$_4$ ə$_5$ d$_6$	μ>S	*$[\mu_A\mu_B]_\sigma$	Dep$_C$	Int$_S$	Unf-μ
a.	$\mu_1\ \mu_2\ \mu_3\ \mu_4\ \mu_5\ \mu_6\ \mu_7$ p$_1$ a$_2$ s$_3$ p$_1$ a$_2$ p$_1$ a$_2$ s$_3$ t$_4$ ə$_5$ d$_6$				7*!	
☞ b.	$\mu_1\ \mu_{2,3}\ \mu_4\ \mu_5\ \mu_6\ \mu_7$ p$_1$ a$_2$ p$_1$ a$_2$ p$_1$ a$_2$ s$_3$ t$_4$ ə$_5$ d$_6$				6*	1*
c.	$\mu_1\ \mu_{2,3}\ \mu_4\ \mu_5\ \mu_6\ \mu_7$ p$_1$ a$_2$ s$_3$ p$_1$ a$_2$ s$_3$ t$_4$ ə$_5$ d$_6$		1*!		3*	1*

3.2.2 Prosodic affixes on different tiers

Now we will turn to the same patterns of Faithful MR, Avoidance of MR, and Subtracting MR for languages where the relevant prosodic affix nodes are on different tiers. The relevant repair operation that is either excluded or results in Avoidance or Subtraction is therefore prosodic integration.

MR in Fox that was given in (7) is an example of a Faithful MR pattern with prosodic affix nodes on different tiers. The continuative morpheme contains an empty syllable and a fixed vowel /ał/ that surfaces in all continuative reduplicants. The iterative, on the other hand, is an empty prosodic word node dominating a foot node.[15] These two reduplicants must now both be 'filled' with segmental material, resulting in multiple violations of Int$_S$ (26a). Some of these copies could be avoided if the affix foot node simply dominated the affix syllable node as in candidate (26b). This, however, induces a violation of Dep(φ–σ) since a new association between a foot and a syllable is added and both were present in the input. Since Dep(φ–σ) is ranked higher than Int$_S$, this unfaithful MR candidate is sub-optimal. It is again crucial to recall that DepAL constraints are only sensitive to underlying elements: Association to epenthetic prosodic elements comes for free. The structures in (26) all contain a right-aligned iambic foot that explains the final shortening of vowels (cf., for example, Hayes (1995) for a discussion of iambic reduction effects in Central Algonquian).

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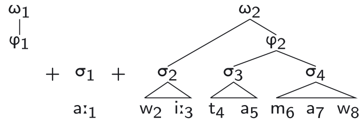
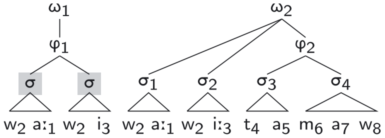
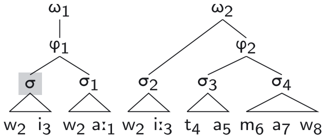
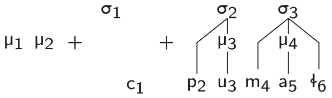
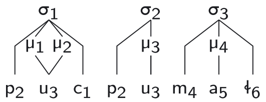
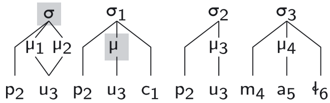
[15] That the iterative reduplicant is indeed a minimal prosodic word (and not only a φ) is apparent from phonological restrictions found in minimal prosodic words that are mirrored in the iterative reduplicant (e.g. the lack of long vowels in the second syllable [Dahlstrom 1997]).

(26) A. Faithful MR in Fox: Prosodic affix nodes on different tiers

	$\varphi{>}S$	$\sigma{>}S$	Dep$_S$	Dep(φ-σ)	Int$_S$
					
☞ a. 					8*
b. 				1*!	4*

In Fox, Faithful MR follows since the high ranking of DepAL excludes the repair strategy of 'prosodic integration' where prosodic affix nodes on different tiers dominate each other. For the Avoidance language Kyuquot, the ranking of DepAL and Int$_S$ is taken to be reversed and therefore the 'prosodic integration' repair strategy is available. Recall that the suffix /-suɬ/ 'at eye' triggers prefixing /CVc/ reduplication with the fixed segment /c/ as its coda and the suffix /-apa/ 'really' triggers prefixing /CVː/ reduplication with a long vowel. If both suffixes cooccur, only a single /CVːc/ reduplicant with a long vowel and the fixed segment /c/ as its coda surfaces. In (27), the former affix is assumed to be an empty syllable node and the consonant /c/ and the latter affix is assumed to consist of two empty moras.[16] Since Int$_S$ is ranked above DepAL, the Avoidance strategy in candidate (27a) becomes optimal and the Faithful copying in candidate (27a) is excluded in Kyuquot.

(27) B. Avoidance in Kyuquot: Prosodic affix nodes on different tiers

	$\sigma{>}\mu$	$\mu{>}S$	Dep$_S$	Int$_S$	Dep(σ-μ)
					
☞ a. 				2*	2*
b. 				6*!	

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[16] This tableau is a simplification that only shows the stem and the portion of the affix that triggers reduplication.

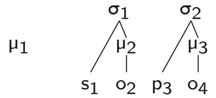
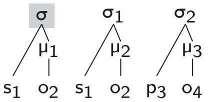
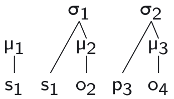
Under this phonological approach to reduplication and Avoidance of MR as coalescence or prosodic integration, the Superset Effect of the Survivor identified for Southern Wakashan in (10) follows automatically. Under coalescence, only identical elements from different morphemes can be subsumed and under prosodic integration, only prosodic nodes that are smaller than another node can be subsumed: No prosodic information is lost; only prosodic elements of the same ‘size’ can be subsumed.

Subtracting MR with prosodic affixes on different tiers was illustrated above with Sikaiana. Recall from (13) that the Subtracting MR in Sikaiana involved the realization of a reduplicative morpheme as either /C/ or /CV/ in single reduplication contexts but as only /C/ in MR contexts. The optionality is analysed here as the result of a global tie between two constraints (Müller 2001) and hence a situation where both rankings of these two constraints result in a possible grammar. However, nothing hinges on this concrete implementation. Bisyllabic reduplication in Sikaiana follows from affixing two empty syllable nodes, each already dominating a mora. The monosyllabic/consonantal reduplicant is taken to be only one mora. The surface effect of this reduplication-triggering morpheme is shown in isolation in (29) before we turn to the MR contexts. The shortened reduplicant results in an initial geminate which is taken to be a moraic consonant that is not dominated by a syllable but directly integrated into the higher prosodic structure (Davis 1999; Hayes 1989). The structure hence violates the additional prosodic markedness constraint (28) penalizing extrasyllabic moras. Copying of only a single consonant (29a) is hence preferred for Int$_S$ but results in a marked extrasyllabic mora that is directly integrated into the higher prosodic structure. Copying of an additional vowel (29b) avoids this violation but increases the number of Int$_S$ violations. Since both constraints are taken to be tied, optionality arises.

(28) μ<σ

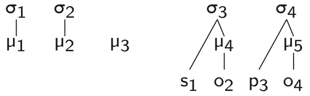
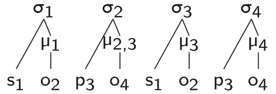
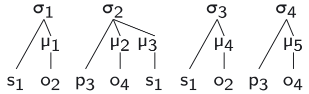
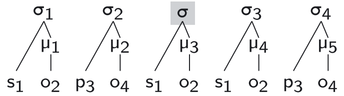
Assign * to every μ not dominated by a σ.

(29) Sikaiana: Optionality between reduplication and gemination

	μ>S	Unf-μ	μ<σ	Int$_S$
☞ a. 				**
☞ b. 			*	*

In the MR context, this optionality vanishes, simply because the empty affix-mora can be prosodically integrated under the affixed syllable-node. Simple consonant copying as in (30b) can hence be achieved without violating μ<σ. Additional copying of consonant and vowel in (30c) is worse than (30b) under both ranking options of Int$_S$ and μ<σ.

(30) C. Subtracting MR in Sikaiana: Prosodic affix nodes on different tiers

		μ>S	Unf-μ	μ<σ	Int$_S$
					
a.			1*!		4*
☞ b.					6*
c.					8*!

3.3 Summary

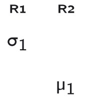
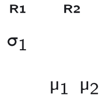
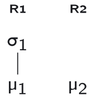
The theoretical account illustrated in the last subsections can be summarized with the two general ranking arguments in (31). Too much copying can be avoided by either coalescence (31a) or by prosodic integration (31b). Both violate a different faithfulness constraint but allow the avoidance of more violations of Int$_S$.

(31) Summary: Avoidance of too much copying

Prosodic affixes...	Faithful MR	Unfaithful MR
...on the same tier	Unf ≫ Int$_S$ (20)	**Coalescence** Int$_S$ ≫ Unf (21), (25)
...on different tiers	DepAL ≫ Int$_S$ (26)	**Prosodic integration** Int$_S$ ≫ DepAL (27), (30)

The discussion of Lushootseed and Sikaiana above already emphasized that the general mechanisms underlying Avoidance and Subtraction of MR are the same. The distinction between these two types is hence primarily a descriptive one. This is shown in (32) with three examples of prosodic integration, all involving a prosodic syllable affix and a prosodic mora affix. The surface effect of the patterns in (32a) and (32b) instantiates Avoidance given the definitions in (4). It has to be noted that (32b) illustrates the Superset Effect of the Survivor from (10). The third pattern is an abstract summary of Sikaiana, which we described as Subtracting MR above. It can be seen that the mechanism of prosodic integration is identical in all three cases.

(32) Prosodic integration: The gradience between Avoidance and Subtraction

			Surface		
	Input	Output	Single reduplication		MR
a.			R1 CV	R2 CV	R1+R2 CV
b.			R1 CV	R2 CVC	R1+R2 CVC
c.			R1 CV	R2 CV/C	R1+R2 CVC

An important prediction made by this phonological account is that unfaithful MR is only possible, or at least strongly preferred, under adjacency. This follows since coalescence and prosodic integration are only possible under phonological adjacency. In an MR context where two reduplicative morphemes are present in one word but separated by other segmental morphemes – as is attested in, for example, Arapaho (Cowell and Moss 2008) or Javanese (Miyake 2011; Noske et al. 1982) – coalescence and prosodic integration would involve another violation of LINEARITY in order to metathesize the prosodic nodes into the correct position. This is of course possible in OT but at least makes the predictions that languages should prefer local unfaithful MR over non-local unfaithful MR. The representative dataset of MR (cf. Appendix) confirms this insofar as all unfaithful MR patterns involve adjacent reduplicative morphemes.

In an account where the presence of two reduplicative exponents is penalized by a specific constraint (cf. Section 4), such a locality effect is unexpected and all local and non-local MR patterns should be equally marked.

4 Alternative accounts

The phonological account based on prosodic affixation presented in Section 3 predicts the existence of unfaithful MR. MR is due to highly-ranked constraints demanding the avoidance of too much copying: If coalescence or prosodic integration repairs are available, they will apply. Also, the architecture of the system implies that these repairs will only be possible between adjacent prosodic affixes. In this section, we will consider whether two prominent alternative accounts of reduplication can also predict unfaithful MR. The two options considered are the standard optimality-theoretical account based on Base-Reduplicant Faithfulness (BRCT; McCarthy and Prince 1995, and subsequent work) and Morphological Doubling Theory (MDT; Inkelas 2008; Inkelas and Zoll 2005).

Under the former account, an empty RED-morpheme in the input is the trigger for reduplication that establishes a Base-Reduplicant (BR) faithfulness relation between the input-base and a to-be-filled reduplicant. Faithfulness constraints then ensure that the reduplicant is as similar as possible to its base. It is crucial in this account that every reduplicative morpheme establishes its own BR-relations. Therefore this type of theory requires a set of BR-faithfulness constraints indexed to each reduplicative morpheme in the relevant language. These morpheme-specific BR-relations are essential given that different reduplicative morphemes in a language can have different shapes/sizes. In BRCT, this follows since the different BR-faithfulness constraints are ranked differently with respect to general markedness constraints. This is briefly illustrated in (33) for the two reduplicative morphemes of Thompson Salish we saw before: The distributive is marked by a /CV/-reduplicant and the diminutive by a /CVC/-reduplicant.

(33) Morpheme-specific BR-faithfulness constraints for Thompson Salish

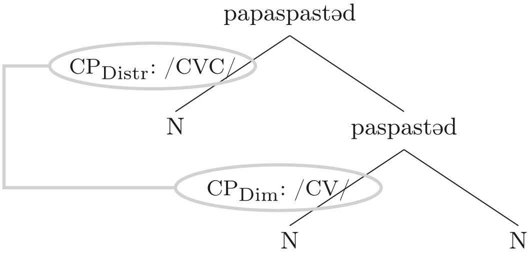
	MAX-BR$_{\text{DIM}}$	*CODA	MAX-BR$_{\text{DIS}}$
RED$_{\text{Dis}}$-sil’			
a. sil		*	**!*
☞ b. si∼sil’		*	*
c. sil∼sil’		**!	
RED$_{\text{Dim}}$-sil’			
a. sil	*!**	*	
b. si∼sil’	*!	*	
☞ c. sil∼sil’		**	

Under MDT, on the other hand, reduplication follows if certain morpho-syntactic features are realized more than once. Reduplication is hence in principle compounding. Partial reduplication is acheived under this view by associating morphological nodes with different cophonologies (Anttila 2002; Inkelas and Zoll 2005, 2007; Inkelas et al. 2004; Orgun 1996) which can potentially be subtracting and thus reduce the phonological representation of a morpheme to a fixed prosodic shape.

Though both approaches are fundamentally different in assuming reduplication to result from either phonological copying or morphological doubling, both can be classified as morphological since they rely on morpheme-specific constraints or constraint rankings. In the BRCT account, the BR-faithfulness relations are morpheme-specific and in MDT, morphological constructions are associated with different (co)phonologies. The phonological account presented here thus has an apparent advantage in that it allows a modular view of grammar where the phonology has no access to morphological information. Furthermore, the phonological account correctly predicts the attested typology of MR without any additional assumptions.

In contrast, under MDT, both Avoidance of MR and Subtracting MR are apparently impossible to predict without further modifying the system. Both unfaithful MR strategies imply that realization of a morpho-syntactic node depends on the exponence type of either an embedded morpheme or a morpheme that is not yet in the structure. The former situation would be anticyclic and the latter an instance of look-ahead: Two configurations which are inherently impossible in the standard MDT system. This is illustrated in (34) for MR in Lushootseed where the stem combines first with the diminutive and then the distributive morpheme. Both are realized via inserting the phonological string of the noun root they embed but are associated with special cophonologies that trigger truncation of the stem into a CV and CVC portion respectively. To predict the Subtracting MR in Lushootseed where the inner diminutive reduplicant unexpectedly surfaces as only CV, the diminutive cophonology apparently has to be different in case another morpheme is also realized by additional spell-out of the root. On the one hand, this context-sensitivity involves meta-information about exponence-type, and on the other hand, it represents a look-ahead problem since structures are built cyclically in MDT and the distributive is not present in the structure when the diminutive cophonology applies. This look-ahead problem could be avoided if it is the distributive that triggers a phonological manipulation of the diminutive exponent. Under this alternative, it would still be a special exponence type that triggers a change in a cophonology. This problem would be even worse since the structure of the embedded elements should not be visible anymore at the point where the distributive is added: There is simply no good way of knowing that morphological doubling applied earlier.

(34) (Simplified) MDT account of MR in Lushootseed



Within BRCT, there is in fact an existing account that derives Avoidance of MR. It is based on the specific constraint *DupDup (or *RedRed) that 'disallow[s] multiple copies' (Stonham 2004, 172). This constraint is not only specific to the MR context, it is also not a purely phonological constraint since it refers to the exponence type of morphemes. Apart from this further violation of modularity, such an account is unable to predict the Superset Effect of the Survivor since one reduplicative morpheme has to remain unrealized to avoid a violation of *DupDup. There is no way for the one surfacing reduplicant to change its shape and incorporate the prosodic requirements of the unrealized RED. More crucially, Subtracting MR remains unexplained under the BRCT account with *DupDup. Having a shorter reduplicant with fewer copied elements only increases the violations of Faith_{BR} but does not avoid a violation of *DupDup, only complete Avoidance does. Subtraction in MR contexts should therefore even be harmonically bounded in a BRCT account.

In contrast, the phonological account where every copy operation induces faithfulness violations predicts exactly the threshold effects we observed above. A reduplicant is either avoided altogether, or a smaller reduplicant minimizes Int_S violations.

5 Conclusion

This paper showed that the typology of MR and the phonological patterns found within MR are an ideal testing ground for teasing apart the predictions of phonological and morphological accounts of reduplication. Three general patterns are argued to exist in the languages of the world if two or more reduplicative morphemes are present in a word: (1) Faithful surfacing of all reduplicants, (2) Avoidance of MR, and (3) Subtraction of one of the reduplicants. It was shown that a purely phonological account of reduplication based on prosodic affixation predicts all attested types of faithful and unfaithful MR from ranking basic faithfulness constraints that are independently motivated. Most importantly, every copy operation induces a violation of the constraint against segmental fission: Every strategy that reduces copying is hence welcome. That languages employ reduplication in principle but show avoidance of copying in MR contexts falls out since stem material is immune to certain prosodic operations that are possible between affix material. This asymmetry is an independent prediction within a stratal architecture of phonology, where stem material is already fully prosodified prior to affix concatenation and this existing prosody makes it more prone to withstanding further prosodic manipulation.

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Appendix: Languages with MR

1.	Tigre Rose (2003)	FMR	IR	P	Afro-Asiatic	Semitic
2.	Arapaho Cowell and Moss (2008)	FMR	CR	P	Algic	Algonquian
3.	Fox Dahlstrom (1997)	FMR	CR	P	Algic	Algonquian
4.	Plains Cree Ahenakew and Wolfart (1983)	FMR	CR	P	Algic	Algonquian
5.	Fungwa Akinbo (2018, 2019)	FMR	IR	P	Atlantic-Congo	Volta-Congo
6.	Siraya Adelaar (2000)	FMR	CR	P	Austronesian	East Formosan
7.	Bikol Donner (2012)	FMR	CR	P	Austronesian	Malayo-Polynesian
8.	Helong Balle (2017)	FMR	CR, IR	P	Austronesian	Malayo-Polynesian
9.	Javanese Miyake (2011), Noske et al. (1982)	FMR	CR	F	Austronesian	Malayo-Polynesian
10.	Mokilese Harrison (1974)	FMR	SR	P	Austronesian	Malayo-Polynesian

11.	Palauan Finer (1990), Zuraw (2003)	FMR	CR	P	Austronesian	Malayo-Polynesian
12.	Papapana Smith (2016)	FMR	CR	P	Austronesian	Malayo-Polynesian
13.	Pingelapese (Hattori 2012; Rehg 1981)	FMR	IR	F	Austronesian	Malayo-Polynesian
14.	Rotuman Blenkiron (2007)	FMR	IR	P	Austronesian	Malayo-Polynesian
15.	Sikaiana Donner (2012)	SMR	CR	P	Austronesian	Malayo-Polynesian
16.	Tagalog Blake (1917)	FMR	CR	P	Austronesian	Malayo-Polynesian
17.	Toqabaqita Lichtenberk (2008)	AMR	IR	P	Austronesian	Malayo-Polynesian
18.	Tuvaluan Besnier (2000)	FMR	CR	F	Austronesian	Malayo-Polynesian
19.	Vaeakau-Tamako Næss and Hovdhaugen (2011)	FMR	IR	P	Austronesian	Malayo-Polynesian
20.	Yami Rau (2005)	FMR	CR	P	Austronesian	Malayo-Polynesian
21.	Southern Paiwan Blust (2013)	FMR	CR	P	Austronesian	Malayo-Polynesian
22.	Thao Blust (2001)	FMR	IR	P	Austronesian	Western Plains
23.	Klamath Barker (1964), Zoll (2002)	FMR	CR	F	Klamath-Modoc	
24.	Lushootseed Urbanczyk (2001)	SMR	CR	P	Salishan	Central Salish
25.	Mainland Comox Blake (2000), Watanabe (1994)	FMR	CR	P	Salishan	Central Salish
26.	Musqueam Suttles (2004)	FMR	CR	P	Salishan	Central Salish
27.	Saanich Montler (1986)	FMR	CR	P	Salishan	Central Salish
28.	Upriver Halkomelem Galloway (1993)	FMR	CR	P	Salishan	Central Salish
29.	Colville Mattina (1973)	FMR	CR	P	Salishan	Interior Salish
30.	Lillooet van Eijk (1997)	FMR	CR	P	Salishan	Interior Salish
31.	Shuswap Broselow (1983), Kuipers (1974)	FMR	CR	P	Salishan	Interior Salish
32.	Spokane Carlsen (1989)	FMR	CR	P	Salishan	Interior Salish
33.	Thompson Thompson and Thompson (1992)	FMR	CR	P	Salishan	Interior Salish

34.	Stau Gates (2017)	FMR	SR	P	Sino-Tibetan	Burmo-Qiangic
35.	Taiwanese Zhang and Lai (2007)	FMR	SR	F	Sino-Tibetan	Sinitic
36.	Ahousaht Kim (2003b)	AMR	CR	P	Wakashan	S. Wakashan
37.	Ditidaht Stonham (1994)	AMR	CR	P	Wakashan	S. Wakashan
38.	Kyuoquot Rose (1981)	AMR	CR	P	Wakashan	S. Wakashan
39.	Makah Davidson (2002)	AMR	CR	P	Wakashan	S. Wakashan
40.	Tsishaath Stonham (2004)	AMR	CR	P	Wakashan	S. Wakashan

CR = concatenative MR/IT = iterative MR/S = MR where one reduplicative morpheme does not occur on its own (cf. Section 2). P = only partial reduplication is involved in MR/F = at least one reduplicative morpheme in MR contexts involves full reduplication. FMR = Faithful MR/AMR = unfaithful MR with Avoidance/SMR = unfaithful MR with subtraction.

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