

# Prosodic identity in copy epenthesis and reduplication: towards a unified model of transitive correspondence\*

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## ABSTRACT

The term *copy epenthesis* refers to patterns of vowel epenthesis in which the featural value of the inserted vowel co-varies with context, “copying” the features of a neighboring vowel (e.g. /pra/ → [p̥ra], /pri/ → [p̥iri]). This paper focuses on a class of cases in which the similarity between copy vowels and their hosts extends beyond featural resemblance to prosodic/suprasegmental resemblance, and how the existence of these effects informs the analysis of copy epenthesis – and by extension, the analysis of copying phenomena more generally. In particular, we show that copy vowels and their hosts strive for identity not only in all segmental features, but in all prosodic properties as well – and that this drive for prosodic identity can cause the misapplication of prosodic properties (i.e. stress, pitch, length). To explain these effects, we propose that copy vowels and their hosts stand in correspondence with each other (Kitto & de Lacy 1999). We show that this correspondence-based approach naturally extends to a class of similar misapplication effects in reduplication, and argue that the empirical overlap between the phenomena signals a formal similarity. In this way, the paper develops Kitto & de Lacy’s (1999) suggestion that copying, phonological and morphological, is mediated by correspondence constraints (cf. Kawahara 2007).

KEYWORDS: phonology, correspondence, copy epenthesis, reduplication

## 1 Introduction

The term *copy epenthesis* is used to describe a class of patterns in which the quality of an epenthetic vowel depends on the quality of one of its vocalic neighbors. In a language where underlying /pra/ is realized as [p̥ra], for example, and /pri/ is realized as [p̥iri], the vowels appearing in the unexpected positions (the *copies*) are identical to the vowels appearing in the expected positions (the *hosts*).

What mechanism ensures that copy vowels and their hosts share a featural resemblance? A number of answers to this question have been proposed in the literature. Traditional autosegmental analyses of copy epenthesis treat the resemblance between the copy and the host as a byproduct of featural spreading: the copy epenthetic vowel, lacking features of its own, obtains them from a nearby vocalic host (see, e.g., Clements 1986, 1991; Gafos & Lombardi 1999; Halle et al. 2000; Shademan 2002; Kawahara 2007). Analyses in the framework of Articulatory Phonology (Browman

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& Goldstein 1986) claim that some cases of copy epenthesis are the result of gestural misalignment: in the mapping from underlying /bro/ to surface [boro], the constellation of gestures that yield an [r] migrate to the middle of the nucleus, allowing the underlying /o/ to be heard on both sides of the consonant (Steriade 1990, Hall 2003). Analyses invoking extensions of Correspondence Theory (McCarthy & Prince 1995) claim that copy vowels and their hosts stand in correspondence with one another; faithfulness constraints then act on the corresponding pair to yield featural identity (Kitto & de Lacy 1999, Yu 2005b, Kim 2008).

In this paper, we present previously unrecognized evidence that argues in favor of the correspondence model. In Section 2, we discuss and analyze a number of cases in which the similarity between copy vowels and their hosts extends beyond featural resemblance, showing that copy vowels and their hosts strive for identity in prosodic/suprasegmental properties. We show that this drive for identity causes blocking effects as well as misapplication of prominence in Scottish Gaelic (Section 2.2), Selayarese (Section 2.3), and Ho-Chunk (Winnebago; Section 2.4). These misapplication effects receive a simple and unified analysis only under a theory in which copy vowels and their hosts stand in correspondence (following Kitto & de Lacy 1999; cf. Kawahara 2007).

In Section 3, we expand the empirical domain of the study. If copy epenthesis involves a correspondence relation, as argued here, we might expect to see similarities between copy epenthesis and reduplication, which is often believed to involve a correspondence relation (McCarthy & Prince 1995, *et seq.*; *pace* Inkelas & Zoll 2005, *a.o.*). In addition to the numerous well-known cases of length transfer in reduplication (see, e.g., McCarthy & Prince 1988), we show that several cases of reduplication display the same sorts of prosodic misapplication effects as copy epenthesis, especially relating to stress and stress degree. We show that these effects are easily analyzed under a theory in which bases and reduplicants stand in correspondence with one another. In this way, the present paper provides further evidence for Kitto & de Lacy's (1999) claim that copying, both phonological and morphological, is mediated by correspondence constraints (see also Yu 2005b).

In Section 4, we consider what the source of the correspondence relation which obtains between copy and host might be. We suggest that the correspondence relation stems from the structural properties of the phonological representation of copy epenthesis. Namely, correspondence arises via *transitivity* of independent correspondence relations – in this case, dual linkage of the copy and the host to the input. This same structural configuration obtains vis-à-vis Base-Reduplicant correspondence in reduplication (cf. McCarthy & Prince's (1995) "Full Model" of reduplication, *a.o.*). Therefore, we can view both of these types of surface correspondence relations as arising from the same property of the phonological system. Adopting the transitive correspondence model furthermore allows a straightforward explanation of an interesting property of morphological palatalization in Chaha (Rose 1994, *a.o.*): when it targets a consonant which is split for purposes of template satisfaction, palatalization overapplies, affecting both exponents of the consonant. However, we will also consider evidence from CV palatal agreement in Scottish Gaelic which poses a problem for such an account, as this process applies differently to copy vowels than to regular underlying vowels, something not directly predicted by this system. We present a tentative solution to this problem using "existential faithfulness" (Struijke 2002), and ultimately adopt the transitive correspondence approach, as it provides the least stipulative answer regarding the source of surface correspondence.

Lastly, in Section 5, we address Kawahara's (2007) typological arguments that copy epenthesis is better viewed as being driven by featural spreading than by correspondence. One of the arguments is based on an incomplete view of the data: while Kawahara argues that correspondence-based approaches (but not spreading-based approaches) incorrectly predict prosodic identity among

copy-host pairs, these are exactly the sorts of effects we demonstrate in Section 2. While some of Kawahara’s remaining generalizations do appear to favor a spreading-based analysis, we suggest ways in which these generalizations can be integrated into an analysis involving correspondence.

## 2 Copy epenthesis

In this section, we describe and analyze three cases of prosodic misapplication in copy epenthesis. Our focus here is limited to cases of prosodic misapplication that do not receive a straightforward analysis based on the avoidance of stressing epenthetic vowels (see, e.g., McCarthy & Prince 1994, McCarthy 1998 on Makassarese), or faithfulness to the source stress in the case of loanwords (see, e.g., Kenstowicz 2007 on Fijian). In other words, this section focuses on complex patterns of misapplication that are not easily derived with standard-issue markedness and faithfulness constraints. The three languages under discussion were identified from a survey of 51 languages, drawn primarily from Kawahara’s (2007) survey of copy epenthesis (see the Appendix for a summary).

In Section 2.2, we discuss evidence from both categorical and gradient phenomena that copy-host pairs in Scottish Gaelic (Børgstrom 1937, Bosch & de Jong 1997, Hall 2003, Hammond et al. 2014, *a.o.*) must match in length. In Section 2.3, we show that the location of prominence in Selayarese (Mithun & Basri 1986, Piggott 1995, Kitto & de Lacy 1999, Broselow 2008) depends on the presence and location of an epenthetic copy vowel. And finally, in Section 2.4, we argue that the stress misapplication patterns induced by the copy epenthesis process known as Dorsey’s Law in Ho-Chunk (Miner 1979, *et seq.*, Hale & White Eagle 1980, Halle & Vergnaud 1987, Alderete 1995, Hayes 1995, Hall 2003, *a.o.*) result from a drive for identity between copy vowels and their hosts, and that this approach extends beyond stress to additional misapplication phenomena.

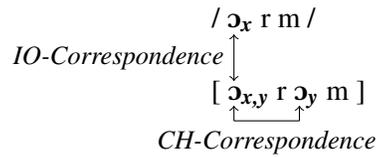
The primary goal of this section is to show that positing a correspondence relation between copy vowels and their hosts allows for a unified analysis of these three cases. In Section 2.5, we compare our correspondence-based analysis to other analyses of copy epenthesis that do not posit a correspondence relation. We argue that the attested facts are best-predicted under a theory in which copy vowels and their hosts stand in correspondence with one another, *contra* Kawahara (2007). (See also Sections 4 and 5 for further discussion on these points.)

### 2.1 Representational Assumptions

Before turning to the focus of this section, we will first lay out our assumptions regarding the phonological representation of copy epenthesis. As previewed above, following Kitto & de Lacy (1999), we will argue that copy vowels and their hosts stand in correspondence with one another. Beyond this, the only correspondence relation that we will assume to hold over this structure is the one between the surface host vowel and its underlying correspondent. In Section 4, we will consider whether it is necessary and/or appropriate to additionally posit a correspondence relation between the copy vowel and its host’s underlying correspondent. (Compare the distinction between the “basic” model and the “full” model of reduplication discussed by McCarthy & Prince 1995).

The representational structure we adopt in this section is thus the one schematized in (1). The host vowel stands in Input-Output (IO) correspondence with an underlying vowel, as well as Copy-Host (CH) correspondence with its copy. The only correspondence relation which the copy vowel stands in is CH-correspondence, with its host.

(1) Representation of copy epenthesis



## 2.2 Scottish Gaelic

Across the dialects of Scottish Gaelic (Celtic), heterorganic falling sonority clusters are broken up by epenthesis. In the Barra dialect (among others), as described by Børgstrom (1937) (also Clements 1986, Bosch & de Jong 1997, and Hammond et al. 2014), the epenthetic vowel is identical to the preceding vowel, *modulo* predictable effects of palatal-agreement (discussed in Section 4.3 below; see Børgstrom 1940 on differences in other dialects). The pattern is illustrated below in (2). Here and in all examples that follow, the epenthetic vowel is underlined (following Hall 2003). (In the transcriptions of Scottish Gaelic, [L,R,N,M] refer to a special series of sonorant consonants, described by Børgstrom 1937:112 as “non-lenited”. )

(2) Copy epenthesis in Scottish Gaelic (from Clements 1986:328)

- a. /ɔrm/ → [ɔrɔm] ‘dead’
- b. /aLpə/ → [aLapə] ‘Scotland’
- c. /urpəL/ → [urupəL] ‘tail’
- d. /faRk’ə/ → [faRak’ə] ‘rough sea’
- e. /æmjir’/ → [æmæ’ir’] ‘time’
- f. /duNxəy/ → [duNuxəy] ‘Duncan’

### 2.2.1 Interactions between copy epenthesis and vowel length

There are two major ways in which the pattern of copy epenthesis in Scottish Gaelic interacts with length/duration. The first type of evidence comes from a class of cases where copy epenthesis fails to apply, even though the cluster type typically repaired by copy epenthesis is present. Notice that, in the forms in (2), the copy vowel is featurally identical to a *short* host vowel. When the potential host vowel is a long vowel or a diphthong, however, copy epenthesis fails to apply (3).<sup>1</sup>

(3) Copy epenthesis fails with a potential long host vowel (Hammond et al. 2014:126)

- a. /mi:rvəɫʲəx/ → [mi:rvəɫʲəx] ‘marvelous’
- b. /duɔxəs/ → [duɔxəs] ‘tradition’
- c. /niəlvər/ → [niəlvər] ‘cloudy’
- d. /i:rməɫʲ/ → [i:rməɫʲ] ‘firmament’

The claim that copy epenthesis interacts with vowel length receives further support from a sub-categorical effect of duration matching, active in the cases where copy epenthesis does apply (i.e. when the host vowel is short). The results of Bosch & de Jong’s (1997) phonetic study indicate that, in disyllabic (CV<sub>1</sub>CV<sub>2</sub>) forms, the relative duration of the vowels depends on whether or not V<sub>2</sub> is

<sup>1</sup>The transcriptions provided by Hammond et al. (2014) do not resemble the transcriptions provided by Børgstrom (1937) and Clements (1986). We do not attempt to remedy this here, as the point of interest in (3) is not segmental phonetic detail but rather that copy epenthesis fails to apply after a long host.

epenthetic. In disyllabic forms where  $V_2$  is not epenthetic (i.e., it is underlying),  $V_1$  is longer than  $V_2$ . Bosch & de Jong (1997) note that this is the expected state of affairs, as  $V_1$  is stressed and is (we assume) subphonemically lengthened as a cue to that prominence.

In disyllabic forms with an epenthetic  $V_2$ , the duration facts are different.  $V_1$  is *shorter* in the epenthetic than in the non-epenthetic context, while  $V_2$  is *longer* in the epenthetic than in the non-epenthetic context. The result is that  $V_1$  and  $V_2$  approach durational equivalence in Scottish Gaelic disyllables, but only when the sequence is a copy-host pair.<sup>2</sup> Notice also that this means that an epenthetic vowel is longer than an underlying short vowel in the same position. This is unexpected, as an epenthetic vowel is frequently shorter than an underlying counterpart cross-linguistically (Stearns 2009; see also Section 2.4.5 below on effects of this sort in Ho-Chunk).

The differing durational patterns are sketched, in a schematized way (dashes indicate duration), in (4); for reference, the graphs provided by Bosch & de Jong (1997) are provided in Figures 1 and 2. In Figures 1 and 2, dots above the line correspond to tokens where  $V_1$  is longer than  $V_2$ ; dots below the line correspond to tokens where  $V_2$  is longer than  $V_1$ ; and dots on the line correspond to tokens where  $V_1$  and  $V_2$  are equal. Note that only the circular dots in Figure 2 correspond to tokens in which  $V_2$  is epenthetic; the stars correspond to tokens in which  $V_2$  is non-epenthetic.

- (4) Subcategorical length matching in Scottish Gaelic (dashes indicate vowel durations)
- a.  $CV_1CV_2$ ,  $V_2$  is not epenthetic:  $V_1 > V_2$   
 [C]  $V_1$  ----- [C]  $V_2$  -----
  - b.  $CV_1CV_2$ ,  $V_2$  is epenthetic:  $V_1 \approx V_2$   
 [C]  $V_1$  ----- [C]  $V_2$  -----

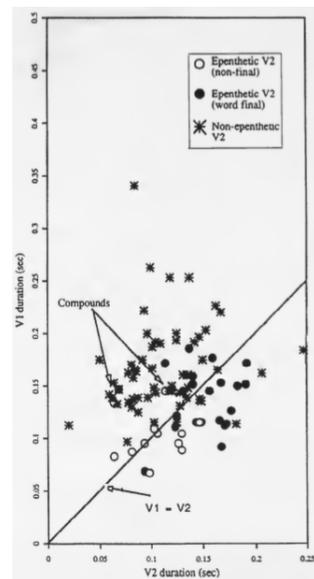
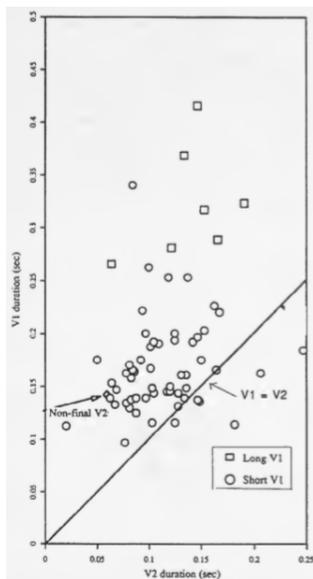


Figure 1:  $V_1V_2$  duration patterns: no epenthesis    Figure 2:  $V_1V_2$  duration patterns:  $V_2$  epenthesis

<sup>2</sup>Bosch & de Jong (1997) do not provide absolute duration measurements, and the only visualization provided is a graph that overlays the epenthetic and non-epenthetic contexts. Our claim that copy-host pairs match in duration is motivated by Bosch & de Jong's (1997) description of the data and the visualization that they provide (Figures 1 & 2).

In sum, copy epenthesis interacts with length in two otherwise unexpected ways. First, copy epenthesis only applies when the host vowel is short. And second, in cases where copy epenthesis does apply, copy vowels and their hosts seek durational equivalence with each other.

### 2.2.2 Durational categories in Scottish Gaelic

To analyze the patterns summarized above, we propose that vowels in Scottish Gaelic belong to one of four durational categories, depending on their categorical length, stress position, and status as a copy or a host, as outlined in (5). Unstressed vowels that do not belong to a copy-host pair are the shortest, with a baseline durational value of 1x (type 5a). Stressed and stressless vowels in a copy-host pair have a value of 1.25x (type 5b). Short stressed vowels that are neither copy nor host have a value of 1.5x (type 5c); these always appear in initial position. Lastly, long vowels have a value of 2x (type 5d); these also only appear in initial position (on this, see more below). For evidence that these categories bear resemblance to the actual phonetics, see Bosch & de Jong (1997).

(5) Assumed vowel lengths in Scottish Gaelic

<i>Duration values</i>	a. <b>1x</b>	b. <b>1.25x</b>	c. <b>1.5x</b>	d. <b>2x</b>
<i>Vowel types</i>	Short unstressed V	Copy and Host Vs	Short stressed V (always initial)	Long V

We argue that the intermediate durational values (1.25x and 1.5x) result from an interplay of several constraints imposing fine-grained durational thresholds for stressed and unstressed vowels. First, following Børgstrom (1937) and others, we assume that primary stress is assigned to the word-initial syllable. Short vowels in this position lengthen due to a requirement that stressed vowels meet a minimum durational threshold; this is a variety of the STRESS-TO-WEIGHT Principle (SWP; Myers 1987, Riad 1992). For the purposes of this analysis, we will assume that there are two such constraints operative in Scottish Gaelic: STRESS-TO-WEIGHT<sub>≥1.5x</sub> (SWP<sub>≥1.5x</sub>) and STRESS-TO-WEIGHT<sub>≥1.25x</sub> (SWP<sub>≥1.25x</sub>), which require stressed vowels to have a minimum durational value of 1.5x and 1.25x, respectively. These two constraints are defined in (6).

- (6) STRESS-TO-WEIGHT constraints active in Scottish Gaelic
- a. STRESS-TO-WEIGHT<sub>≥1.5x</sub> (SWP<sub>≥1.5x</sub>): Assign one violation mark \* if the vowel bearing primary stress does not have at least a duration of 1.5x.
  - b. STRESS-TO-WEIGHT<sub>≥1.25x</sub> (SWP<sub>≥1.25x</sub>): Assign one violation mark \* if the vowel bearing primary stress does not have at least a duration of 1.25x.

There are also constraints on the possible length of unstressed vowels. Specifically, in Scottish Gaelic, it is impossible for unstressed vowels to be longer than 1.25x. That is to say, they are permitted to lengthen to some value slightly above the baseline, but not to the extent that a stressed vowel is able to lengthen. We formalize this as the markedness constraint \*STRESSLESS<sub>>1.25x</sub> (7).

- (7) \*STRESSLESS<sub>>1.25x</sub> (\* $\check{V}$ <sub>>1.25x</sub>): Assign one violation mark \* for each stressless vowel that has a durational value of more than 1.25x.

The crucial piece of the analysis that generates distinct behavior based on whether or not the vowels are members of a copy-host pair is the Copy-Host (CH) correspondence constraint CH-IDENT[duration], defined in (8). As shown below, this constraint conspires with the fine-grained

durational markedness constraints in (6) and (7) to yield the complex durational distributions, including the subcategorical length-matching effect, described above.

- (8) CH-IDENT[duration]: Assign one violation \* for each copy-host pair that has mismatching durational values (e.g.  $1x \leftrightarrow 2x$  or  $1.25x \leftrightarrow 1x$ ).

### 2.2.3 Analysis of interactions between copy epenthesis and duration

The basic case for the distribution of vowel durations is that in which both  $V_1$  and  $V_2$  are present in the underlying representation (i.e. non-epenthetic) and are both underlyingly short; for example,  $/xuNik'/ \rightarrow [xuNik']$  ‘saw (v.)’ (Børgstrom 1937:142). In such cases, the durations of the vowels are controlled completely by the markedness constraints in (6–7). Since  $V_1$  is stressed, the SWP constraints promote lengthening it to  $1.5x$ . As long as these constraints outrank the faithfulness constraint militating against changing a vowel’s durational specification – which we will call IO-IDENT[duration] – lengthening  $V_1$  to  $1.5x$  will be optimal. Since  $V_2$  is unstressed, it has no motivation to lengthen, and thus remains at its underlying duration of  $1x$ .

The analysis for this basic case is presented in (9). In the following tableaux, vowel durations are subscripted. We assume that stress must fall on the first syllable due to undominated STRESSL, a constraint that penalizes forms in which the initial syllable is not stressed (see Gordon 2002).<sup>3</sup>

- (9) Tableau for  $[xuNik']$  (both vowels underlyingly present)

$/xu_{1x}Ni_{1x}k'/$	CH-IDENT [duration]	$SWP_{\geq 1.25x}$	$*\check{V}_{>1.25x}$	$SWP_{\geq 1.5x}$	IO-IDENT [duration]
a. $[xú_{1x}Ni_{1x}k']$		*!		*!	
b. $[xú_{1.25x}Ni_{1x}k']$				*!	*
c. $[xú_{1.25x}Ni_{1.25x}k']$				*!	**
d. $[xú_{1.5x}Ni_{1x}k']$					*
e. $[xú_{1.5x}Ni_{1.25x}k']$					**!
f. $[xú_{1.5x}Ni_{1.5x}k']$			*!		**

Candidates (9a–c) are eliminated by  $SWP_{\geq 1.5x}$ , as the stressed initial vowel does not have a durational value of at least  $1.5x$ . (Candidate (9a) does not even lengthen to the lower threshold of  $1.25x$ , so it violates  $SWP_{\geq 1.25x}$  as well.) Candidate (9f) is eliminated by a fatal violation of  $*\check{V}_{>1.25x}$ , as the second vowel, which is unstressed, has a duration longer than  $1.25x$ . The choice between (9d) and (9e) is made by IO-IDENT[duration], which penalizes (9d) once (because the stressed vowel lengthens) and (9e) twice (because both vowels lengthen). The second violation eliminates (9e) and selects (9d). (We assume that a candidate like  $[xú_{2x}Ni_{1x}k']$ , in which the stressed vowel lengthens to  $2x$ , is ruled out by a faithfulness constraint preserving a categorical length distinction in initial position; see below for further discussion.)

Note that candidate (9d) is optimal in part because  $V_1$  and  $V_2$  are not required to be durationally identical: in forms where both vowels are underlying, CH-IDENT[duration] is vacuously satisfied.

<sup>3</sup>Note that under the current ranking, a hypothetical input  $/xu_{1x}Ni_{1.25x}k'/$  (which must be considered, given richness of the base; Prince & Smolensky 2004) would be realized as  $[xu_{1.5x}Ni_{1.25x}k']$ , with extra length accorded to the stressless syllable. Our assumption that all stressless syllables have a durational value of  $1x$  can be derived by assuming that an additional low-ranked constraint,  $STRESSLESS_{>1x}$  penalizes this form, and that  $*STRESSLESS_{>1x}$  dominates IO-IDENT[duration]. To keep the analysis compact, we do not include this constraint in the tableaux.

For forms in which a prohibited cluster is repaired with copy epenthesis (e.g. /ɔrm/ → [ɔrɔm]), however, CH-IDENT[length] must be actively satisfied. Recall from the earlier discussion that  $V_1$  is shorter in words where  $V_2$  is epenthetic than in words where it is not. This observation can be captured in a system where CH-IDENT[duration] is undominated, and  $*\check{V}_{>1.25x} \gg \text{SWP}_{\geq 1.5x}$ .

(10) Tableau for [ɔrɔm] ( $V_1$  is underlying,  $V_2$  is epenthetic)

/ɔ <sub>1x</sub> rm/	CH-ID[dur]	$\text{SWP}_{\geq 1.25x}$	$*\check{V}_{>1.25x}$	$\text{SWP}_{\geq 1.5x}$	IO-ID[dur]
a. [ɔ <sub>1x</sub> rɔ <sub>1x</sub> m]		*!		*	
b. [ɔ <sub>1.25x</sub> rɔ <sub>1x</sub> m]	*!			*	*
c. [ɔ <sub>1.25x</sub> rɔ <sub>1.25x</sub> m]				*	*
d. [ɔ <sub>1.5x</sub> rɔ <sub>1x</sub> m]	*!				*
e. [ɔ <sub>1.5x</sub> rɔ <sub>1.25x</sub> m]	*!				*
f. [ɔ <sub>1.5x</sub> rɔ <sub>1.5x</sub> m]			*!		*

As shown in (10), the resulting disyllabic form is, in effect, a compromise. The stressed vowel (the host) would prefer to lengthen to 1.5x (via  $\text{SWP}_{\geq 1.5x}$ ), and the unstressed vowel (the copy) would prefer not to lengthen at all; however, neither of these values is compatible with the other position. Since CH-IDENT[duration] is undominated, the two positions must meet at an intermediate length, if such a value is licensed in both positions. The value 1.25x is indeed licensed for both positions.  $\text{SWP}_{\geq 1.25x}$  dominates IO-IDENT[duration], allowing for a stressed vowel to lengthen to 1.25x. And CH-IDENT[duration] dominates both  $*\check{V}_{>1.25x}$  and IO-IDENT[duration], allowing for unstressed vowels to lengthen to 1.25x in order to match their host. Thus, 1.25x is the only length which is simultaneously permissible for both stressed and unstressed vowels, and so it is selected (as in (10c)) when a stressed and unstressed vowel must match in length. (Note that we do not assign IO-IDENT[duration] violations for copy vowels, as our current assumption is that they lack input correspondents; see Section 4 for further discussion.)

The blocking facts discussed in Section 2.2.1 can be accounted for by this analysis with few revisions, and provide additional evidence in favor of the correspondence-based analysis. Recall that when a normally disallowed cluster follows a long vowel (or diphthong) in the first syllable, copy epenthesis fails and the cluster is tolerated, as repeated in (11) below.

(11) Copy epenthesis fails with a potential long host vowel (Hammond et al. 2014:126)

- a. /mi:rvəɫʰəx/ → [mi:rvəɫʰəx] ‘marvelous’
- b. /duɔlxəs/ → [duɔlxəs] ‘tradition’
- c. /niɔlvər/ → [niɔlvər] ‘cloudy’
- d. /i:rmɛɫf/ → [i:rmɛɫf] ‘firmament’

This blocking pattern is explained by many of the length considerations that generate the length matching effects when copy epenthesis does apply as expected. The major difference between the length matching case and the blocking case is that, in the length matching case, an acceptable compromise value (1.25x) could be found. Here, on the other hand, there is no acceptable compromise.

To account for this pattern, we appeal to the more general observation that contrasts in vocalic length in Scottish Gaelic are licensed only in word-initial position (Børgstrom 1937:78). This preferential licensing of vowel length under stress can be formalized with reference to an undominated positional faithfulness constraint, IO-IDENT[length]<sub>stress</sub>, defined in (12) below. For concreteness, we assume that possible durational values for short vowels are 1x, 1.25x, and 1.5x; the only possible

durational values for a long vowel is 2x. IO-IDENT[length]<sub>stress</sub> prohibits changes from any one of {1x, 1.25x, 1.5x} to 2x, or vice versa.

- (12) IO-IDENT[length]<sub>stress</sub>: Assign one violation mark \* for changes in categorical vowel length (i.e. 2x ↔ {1x, 1.25x, 1.5x} or {1x, 1.25x, 1.5x} ↔ 2x).

Given that (12) only protects vowel length contrasts in stressed position, the markedness constraints introduced above prohibit long vowels from surfacing in non-initial position, as shown in (13). Candidate (13b) is ruled out due to a violation of IO-IDENT[length]<sub>stress</sub>, as the stressed vowel is underlyingly long, but mapped to a short vowel; candidate (13c) is ruled out by a violation of \* $\check{V}_{>1.25x}$ , due to the length of the unstressed vowel. This leaves (13a) as the optimal candidate.

- (13) Richness of the base tableau for [t<sup>h</sup>a<sub>2x</sub>Lœ<sub>1x</sub>r'] 'a tailor' (Børgstrom 1937:235)

	/t <sup>h</sup> a <sub>2x</sub> Lœ <sub>2x</sub> r'/	IO-IDENT[length] <sub>stress</sub>	* $\check{V}_{>1.25x}$	IO-IDENT[duration]
☞	a. [t <sup>h</sup> a <sub>2x</sub> Lœ <sub>1x</sub> r']			*
	b. [t <sup>h</sup> a <sub>1.5x</sub> Lœ <sub>1x</sub> r']	*!		**
	c. [t <sup>h</sup> a <sub>2x</sub> Lœ <sub>2x</sub> r']		*!	

Thus, for the forms in (11), if the underlying long initial vowel were to surface faithfully and serve as a host for a copy which successfully matches its length (2x), this would result in an impermissible stressless long vowel. The inability of the long stressed vowel to shorten (due to IO-IDENT[length]<sub>stress</sub>) and the inability of the copy vowel to lengthen (due to \* $\check{V}_{>1.25x}$ ) means that, when the host is long, obtaining copy-host durational identity is impossible.

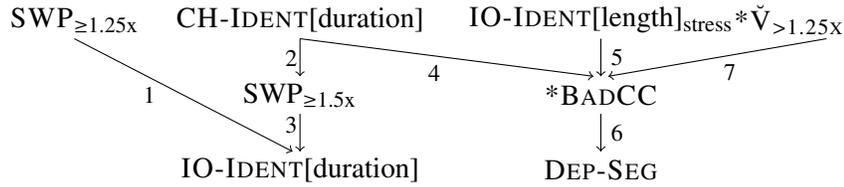
A tableau demonstrating this follows. Candidate (14a), in which the members of the copy-host pair are not durationally equivalent, violates CH-IDENT[duration]. Candidate (14b), in which the copy vowel lengthens to a value of 2x to match the host, is eliminated by \* $\check{V}_{>1.25x}$ . Candidate (14c), in which the host vowel shortens from 2x to 1.25x, violates IO-IDENT[length]<sub>stress</sub>, as 1.25x is a durational value associated with a short vowel. Therefore, as long as these three constraints – IO-IDENT[length]<sub>stress</sub>, CH-IDENT[duration], and \* $\check{V}_{>1.25x}$  – dominate \*BADCC (a cover constraint for whatever markedness conditions force copy epenthesis), the optimal strategy is to leave the cluster unrepaired (14d). (For clarity, in (14) we omit the STRESS-TO-WEIGHT constraints and IO-IDENT[duration], and candidates that violate them, as they do not play a crucial role here.)

- (14) Tableau for [í:rmɛltʃ] (no epenthesis following a long vowel)

	/í <sub>2x</sub> rmɛltʃ/	IO-ID[length] <sub>stress</sub>	CH-ID[dur]	* $\check{V}_{>1.25x}$	*BADCC
	a. [í <sub>2x</sub> ri <sub>1x</sub> mɛltʃ]		*!		
	b. [í <sub>2x</sub> ri <sub>2x</sub> mɛltʃ]			*!	
	c. [í <sub>1.25x</sub> ri <sub>1.25x</sub> mɛltʃ]	*!			
☞	d. [í <sub>2x</sub> rmɛltʃ]				*

The Hasse diagram provided in (15) summarizes the analysis of duration in Scottish Gaelic as it interacts with copy epenthesis. Each crucial ranking is annotated with a ranking argument.

(15) Summary of Scottish Gaelic analysis



- <sup>1</sup> [ɔ<sub>1.25x</sub>rɔ<sub>1.25x</sub>m] > \*[ɔ<sub>1x</sub>rɔ<sub>1x</sub>m]      <sup>2</sup> [ɔ<sub>1.25x</sub>rɔ<sub>1.25x</sub>m] > \*[ɔ<sub>1.5x</sub>rɔ<sub>1x</sub>m]  
<sup>3</sup> [xu<sub>1.5x</sub>Ni<sub>1x</sub>k'] > \*[xu<sub>1x</sub>Ni<sub>1x</sub>k']      <sup>4</sup> [i<sub>2x</sub>rmɛltf] > \*[i<sub>2x</sub>ri<sub>1x</sub>mɛltf]  
<sup>5</sup> [i<sub>2x</sub>rmɛltf] > \*[i<sub>1.25x</sub>ri<sub>1.25x</sub>mɛltf]      <sup>6</sup> [ɔ<sub>1.5x</sub>rɔ<sub>1x</sub>m] > \*[ɔ<sub>1.5x</sub>rm]  
<sup>7</sup> [i<sub>2x</sub>rmɛltf] > \*[i<sub>2x</sub>ri<sub>2x</sub>mɛltf]

### 2.2.4 Additional support for CH-Correspondence in Scottish Gaelic

Beyond duration and its interaction with copy epenthesis, evidence consistent with the existence of a Copy-Host correspondence relation in Scottish Gaelic comes from several other empirical domains. Here, we discuss two: (i) positional licensing of unstressed vowels, and (ii) inflectional mutation patterns that unexpectedly target both the copy and the host.<sup>4</sup>

**Positional licensing of unstressed vowels.** While all vowels in Scottish Gaelic are permitted to occur in stressed position, not all are permitted to occur in stressless position. Our discussion here will focus on positional asymmetries involving vowel quality of short vowels. In stressed position, Scottish Gaelic has a large vowel inventory. In stressless position, however, the vowel inventory is smaller: only certain vowel qualities are permitted to appear. These divergences between the inventories present in stressed and unstressed position are summarized in Figures 3 and 4 (these figures are adapted from Børgstrom 1937:144, 146; we follow Oftedal 1956, Hall 2003 and others in transcribing Børgstrom’s /k/ as /w/, and Clements 1986 in transcribing Børgstrom’s /œ/ as /æ/).

i	ɯ	u
e	ø	o
æ	a	ɔ

i	u
	ə
æ	ɔ

Figure 3: Scottish Gaelic short stressed vowels      Figure 4: Scottish Gaelic short stressless vowels

The vowels /e/, /o/, and /u/ are able to appear in stressed position: for example, [jési] *no gloss*, [ópir] ‘work’, [t<sup>h</sup>úrəɣ] *no gloss* (Børgstrom 1937:234, 85, 236); but words in which these vowel qualities surface in stressless position (i.e. non-initially) are generally forbidden: i.e., \*[jise], \*[ípor], \*[t<sup>h</sup>óruɣ]. These restrictions on the distribution of stressless vowels, however, do not affect the realization of copy vowels. As is evident in (16), [e] and [u] are permitted to appear in stressless

<sup>4</sup>There are other ways in which copy epenthesis interacts in unexpected ways with aspects of Scottish Gaelic phonology that we do not address here. In some cases, this is because it is not clear that the data are relevant: the glottal epenthesis process described by Hall (2003:99), for example, occurs in the Argyllshire dialects of Scottish Gaelic, which exhibit default – not copy – epenthesis. In other cases, this is because the data do not provide evidence for the activity of a correspondence relationship between copy and host, as is true for the syncope facts discussed by Hall (2003:102–104). And in other cases still, there is not enough data available to be able to make sound generalizations: Bosch & de Jong (1997) provide one spectrogram of pitch patterns in Scottish Gaelic and note that many of the other tokens behave differently, but they provide no sense of the structure of the overall dataset.

position, but only when it is a member of a copy-host pair.<sup>5</sup> (The front-back disagreement between copy and host in (16a–b) is due to the process of palatal agreement; see Section 4.3.)

- (16) Stressless copy [e] and [u] permitted to surface
- |    |       |   |        |                 |                   |
|----|-------|---|--------|-----------------|-------------------|
| a. | mør'v | → | mør'ev | 'the dead'      | Clements 1986:328 |
| b. | dør'v | → | dør'ev | 'difficult'     | Clements 1986:328 |
| c. | suiðj | → | suiðuj | 'to court, woo' | Oftedal 1956:143  |

Previous analysts (e.g. Bosch & de Jong 1997:8) have argued that the larger vowel inventory accorded to copy vowels (relative to non-copy vowels in the same position) is evidence that second-syllable copy vowels, not first-syllable host vowels, bear stress. We note, however, that there is an alternative interpretation of these facts made available by the present proposal: the copy's faithfulness to the height of the host vowel (enforced by CH-IDENT[±low]) overrides the inventory restrictions that normally constrain the inventory of stressless vowels.

**Copy-host identity under inflectional mutation.** A second example of unexpected segmental identity between copy vowels and their hosts comes from cases of inflectional mutation.<sup>6</sup> For example, the plural of some nouns is formed by palatalizing the final consonant. As demonstrated in (17), palatalization of the final consonant often results in a change in the final vowel, as well. The vowel that undergoes mutation is bolded. The data discussed here come from the Barra dialect; see Børgstrom (1940:87) on similar mutation patterns in the Bernera dialect.

- (17) Palatalization mutation affects final vowels (Børgstrom 1937:161)
- |    |                     |   |                     |                                 |
|----|---------------------|---|---------------------|---------------------------------|
| a. | æx                  | → | eç                  | 'horse / horses'                |
| b. | t <sup>h</sup> røsk | → | t <sup>h</sup> rujk | 'codfish (sg.) / codfish (pl.)' |
| c. | fœr                 | → | fir                 | 'man / men'                     |

When the final vowel affected by mutation is one half of a copy-host pair, however, both the copy and the host vowels (as well as the medial consonant) are affected, as demonstrated in (18) (see also Hall 2003:100–102). Note that in the plural forms, the copy and host vowels do not match; this is an effect of palatal agreement, which is discussed further in Section 4.3.

- (18) Palatalization mutation affects both halves of copy-host pair (Børgstrom 1937:161)
- |    |                     |   |                      |  |
|----|---------------------|---|----------------------|--|
| a. | t <sup>h</sup> arav | → | t <sup>h</sup> ør'ev | 'bull / bulls'                         |
| b. | skarav              | → | skør'ev              | 'cormorant / cormorants'               |
| c. | baLak               | → | bul'ik               | 'side of the boat / sides of the boat' |

We do not provide an analysis of mutations here, as it is not our main focus, the conditioning factors are complex, and the changes induced by mutation are lexically idiosyncratic. Nevertheless, the mutation patterns observed here are consistent with the hypothesis that copy vowels and their hosts strive for identity in all properties. See Section 2.4.5 for discussion and analysis of a similar ablaut phenomenon in Ho-Chunk.

<sup>5</sup>We were unable to locate examples in which [o] appears as a copy vowel, but we assume from Børgstrom's (1937:96) description that these are possible words. Note also that (16c) is from the Leurbost dialect, which we believe is equivalent to the Barra dialect in all ways relevant to this particular example.

<sup>6</sup>Note that this type of 'inflectional mutation' is a different process than the well-known processes of 'initial consonant mutation' that affect the initial segments of words in particular (morpho)syntactic contexts.

### 2.2.5 Summary of Scottish Gaelic

To summarize, we have shown that copy epenthesis interacts in a number of interesting ways with Scottish Gaelic phonology. Principle among these are the two ways in which copy epenthesis interacts with length. First, whether or not copy epenthesis applies depends on the length of the host vowel: it applies if the host is short, it is blocked if the host is long. Second, a desire for fine-grained durational identity between copy vowels and their hosts causes both stressed and unstressed vowels to deviate from their normal durational targets. We have demonstrated that both effects can be captured in a single analysis, with the inclusion of a faithfulness constraint that enforces durational identity between copy vowels and their hosts, CH-IDENT[duration]. Furthermore, we have shown that a correspondence-based analysis has the potential to explain additional facts regarding the interaction between copy epenthesis and segmental phonology.

## 2.3 Selayarese

The second case of prosodic misapplication we discuss comes from Selayarese (Malayo-Polynesian), where stress misapplies when a copy vowel is present at certain positions within the word. The analysis presented in this section closely resembles Kitto & de Lacy's (1999) analysis in many ways, but takes into account a correction to the data from Broselow (2008:22) (that epenthetic vowels can lengthen, *contra* Piggott 1995, Kitto & de Lacy 1999, *a.o.*). While the misapplication could be attributed either to stress or to length, as the two are directly correlated, in either case the driving force is CH-faithfulness. For the sake of consistency and compatibility with the literature, we pursue stress as the motivation for the pattern of misapplication.

### 2.3.1 The basic stress pattern

In Selayarese, stress normally falls on the penultimate syllable (cf. Mithun & Basri 1986, *a.o.*). As shown in (19), all stressed syllables are heavy. If the stressed syllable is open, the vowel lengthens (19a–b); if the stressed syllable is closed (by a geminate or a glottal stop), the vowel is short (19c–d). Vowel length is not contrastive, and long vowels are found only under stress.

- (19) Penultimate stress in Selayarese
- |    |                         |                                    |                         |
|----|-------------------------|------------------------------------|-------------------------|
| a. | [kasú: <sup>m</sup> ba] | ‘dye for coloring clothes or cake’ | Mithun & Basri 1986:219 |
| b. | [sá:sa]                 | ‘cut (grass)’                      | Mithun & Basri 1986:226 |
| c. | [sás:a]                 | ‘wash’                             | Mithun & Basri 1986:226 |
| d. | [séʔla]                 | ‘salt’                             | Mithun & Basri 1986:217 |

We model this pattern with the (foot-free) constraints \*LAPSER (20a) and NONFINALITY (20b) (Gordon 2002).<sup>7</sup> These two constraints together require that stress fall on the penult, as demonstrated in (21). For simplicity, we only entertain candidates in which the stressed syllable is heavy.

- (20) Constraints to generate penultimate stress (Gordon 2002)
- |    |   |
|----|---|
| a. | *LAPSER: Assign one violation mark * if neither of the final two syllables is stressed. |
| b. | NONFINALITY: Assign one violation mark * if the final syllable is stressed.             |

---

<sup>7</sup>In foot-based terms, the pattern can be described with constraints preferring the placement of a single syllabic trochee at the right edge of the word.

## (21) Deriving penultimate stress

/kasu <sup>m</sup> ba/	*LAPSER	NONFINALITY
a. [ká:su <sup>m</sup> ba]	*!	
b. [kasú: <sup>m</sup> ba]		
c. [kasu <sup>m</sup> bá:]		*!

## 2.3.2 Copy epenthesis and stress misapplication

There is, however, a class of words that has exceptional antepenultimate stress, as illustrated in (22). These words all have certain properties in common (Mithun & Basri 1986:237). In the antepenultimate stress words in (22), the last two vowels are identical, and they are separated by a coronal continuant (/s/, /r/, or /l/). In addition, the final vowel present in the isolation forms of (22) and other equivalent forms are absent when a vowel-initial suffix is added; for example, [lá:<sup>m</sup>bere] ‘long’ → [la<sup>m</sup>bé:r-əŋ] ‘longer’ (Mithun & Basri 1986:238).<sup>8</sup> This is significant because deletion under hiatus is not a normal phonological process in Selayarese. Word-final vowels are permitted to surface before vowel-initial suffixes more generally; for example, [túnro] ‘sleep’ → [pa-tinró-əŋ] ‘bed, bedroom’ (Mithun & Basri 1986:238).<sup>9</sup>

## (22) Examples of antepenultimate stress in Selayarese (Mithun &amp; Basri 1986:237)

- |                            |          |                            |              |
|----------------------------|----------|----------------------------|--------------|
| a. [só: <sup>m</sup> bala] | ‘a sail’ | d. [kí:kiri]               | ‘metal file’ |
| b. [ká:tala]               | ‘itch’   | e. [hál:asa]               | ‘suffer’     |
| c. [bó:tolo]               | ‘bottle’ | f. [lá: <sup>m</sup> bere] | ‘long’       |

One possible analysis of these facts (advocated by Mithun & Basri 1986) is that the word-final vowel is epenthetic, and that epenthetic vowels are invisible for the purposes of stress assignment; that is to say, these forms have antepenultimate stress because that is the second non-epenthetic vowel from the right. When we consider more data, however, it becomes clear that epenthetic vowels are not always invisible to stress. In the words in (23–24) (mostly Indonesian loanwords; Broselow 2008), stress lands on the penultimate syllable despite the presence of an epenthetic vowel (underlined) in the penult (23), or in both the antepenultimate and final syllables (24).

## (23) Internal epenthesis in loanwords (Broselow 2008:3)

- |                       |         |                         |                              |
|-----------------------|---------|-------------------------|------------------------------|
| a. [kará: <u>tu</u> ] | ‘card’  | not *[ká:r <u>atu</u> ] | (source: Indonesian [kártu]) |
| b. [surú: <u>ga</u> ] | ‘sugar’ | not *[sú:r <u>uga</u> ] | (source: Indonesian [súrga]) |

## (24) Internal and external epenthesis in loanwords (Broselow 2008:4)

- |                         |          |                  |                               |
|-------------------------|----------|------------------|-------------------------------|
| a. [solodé: <u>re</u> ] | ‘weld’   | not *[só:lodere] | (source: Indonesian [sólder]) |
| b. [karatí: <u>si</u> ] | ‘ticket’ | not *[ká:ratisi] | (source: Indonesian [kárcis]) |

Under an analysis in which epenthetic vowels are invisible to stress assignment, we would expect a different outcome. The forms in (23) would have antepenultimate stress (\*[ká:ratu]), because the penultimate epenthetic vowel would be ignored. The forms in (24) would have pre-antepenultimate stress (\*[ká:ratisi]), as the antepenultimate and final epenthetic vowels would be

<sup>8</sup>Note also that stress shifts to the penult, the expected position for stress, in the suffixed form. This clearly indicates that the antepenultimate stress pattern is not due to lexical specification.

<sup>9</sup>A similar pattern is attested in Tahitian, where exceptional antepenultimate stress is found when the final two vowels are identical, and separated by a glottal stop (Bickmore 1995, Kitto & de Lacy 1999). We do not discuss this case further here, as there is no direct evidence that any of the vowels are epenthetic.

ignored. Thus, an analysis appealing to the invisibility of epenthetic vowels is not appropriate here.

Instead, we propose that CH-correspondence can jointly explain the cases of misapplication (i.e. antepenultimate stress) and normal application (i.e. penultimate stress) involving copy epenthesis. Namely, the constraint CH-IDENT[stress], defined in (25), instantiates a drive for copy and host vowels to agree in stress, and induces misapplication only when it can be satisfied without violating high-ranked metrical constraints.

- (25) CH-IDENT[stress]: Assign one violation mark \* for each pair of vowels standing in CH-correspondence that do not have identical values for stress (i.e. [stressed] ↔ [stressless] or [stressless] ↔ [stressed]).

To derive stress misapplication, both CH-IDENT[stress] and \*CLASH (= Assign one \* for each sequence of two adjacent stressed syllables) must dominate \*LAPSER.<sup>10</sup> In (26) and the tableaux that follow, we analyze only the assignment of stress; the candidate set is limited to those outputs with epenthesis in the appropriate position(s) (i.e. whenever a coronal continuant is underlyingly non-prevocalic).

- (26) Misapplication of stress to satisfy CH-IDENT[stress]: [tí:kiri] (22d)

	/tikir/	NONFIN	*CLASH	CH-IDENT[stress]	*LAPSER
☞ a.	[tí:kiri]				*
b.	[tikí:ri]			*!	
c.	[tikirí:]	*!		*	
d.	[tikí:ri:]	*!	*!		

The tableau in (26) shows that stress can be retracted to the antepenult (violating \*LAPSER) in service of the drive for copy-host stress identity (CH-IDENT[stress]). It is not permissible, however, to stress the final syllable (violating NONFINALITY) and/or stress both copy and host (violating \*CLASH) in order to satisfy CH-IDENT[stress]. This is the motivation for normal application in the cases like (23–24). That is to say, CH-IDENT[stress] could only be satisfied by violating a higher-ranked metrical constraint; so, under violation, defaulting to the penult is the optimal solution.

This is seen most clearly in the forms from (23) where a single epenthetic vowel surfaces in the penult, and it receives stress. To derive this pattern, all that is required is for NONFINALITY and \*CLASH to dominate CH-IDENT[stress]. Stressing the final syllable alone would satisfy CH-IDENT[stress] (as both copy and host would be stressless), but incurs a fatal violation of NONFINALITY (candidate (27a)). Stressing both the copy and the host (candidate (27b)), would also satisfy CH-IDENT[stress], but fatally violates \*CLASH. A candidate with stress retraction to the antepenult (27d) here does no better on CH-IDENT[stress] than one with default penultimate stress (27c), since both candidates stress exactly one member of the copy-host pair. The evaluation thus passes to low-ranked \*LAPSER, which selects the candidate with default penultimate stress.

<sup>10</sup>The role of \*CLASH in this analysis could also be played by CULMINATIVITY (cf. Prince 1983, Hyman 2006), a constraint which bans the presence of multiple stresses within a word. This may be appropriate for Selayarese, since all words have exactly one stress.

(27) Default stress with medial epenthesis: [kará:tu]

/kartu/	NONFINALITY	*CLASH	CH-ID[stress]	*LAPSER
a. [karatú:]	*!			
b. [ká:rá:tu]		*!		
☞ c. [kará:tu]			*	
d. [ká:r <u>at</u> u]			*	*!

This same interaction yields default penultimate stress in the double-epenthesis forms in (24), as demonstrated in (28). As stressing any single position within the word will result in a violation of CH-IDENT[stress] (and stressing both members of a copy-host pair would result in the violation of higher-ranked \*CLASH), stress defaults to penultimate position.

(28) Default penultimate stress with medial and final epenthesis: [solodére:re]

/solder/	NONFINALITY	*CLASH	CH-IDENT[stress]	*LAPSER
a. [solodé:r <u>e</u> :re:]	*!	*!		
b. [só:ló:dere]		*!		
☞ c. [solodé:re]			*	
d. [soló:dere]			*	*!

While the data are scarce, it appears as though default stress also applies when the copy-host pair comprises the second and third syllables of a four-syllable word: [potolók:u] ‘my pencil’ (Mithun & Basri 1986:231), not \*[pó:tolók:(:u)], is the attested form.<sup>11</sup> This is easily explicable under the current analysis if we assume that \*EXTENDED LAPSER (= Assign a violation \* if no stress falls on any of the final three syllables) dominates CH-IDENT[stress] in Selayarese; in other words, it is more important to keep stress within the trisyllabic right-edge window (satisfying \*EXT LAPSER) and to avoid clashes (satisfying \*CLASH) than it is to achieve stress-matching. An analysis of this form is provided in (29). (An additional, sub-optimal candidate with final stress, [potolók:ú:], is ruled out by high-ranking NONFINALITY).

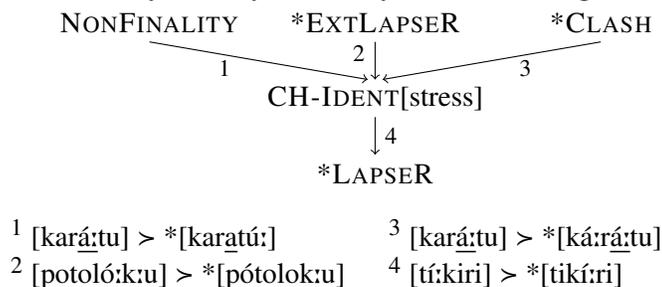
(29) Default penultimate stress with medial copy

/potol/ + /ku/	*EXT LAPSER	*CLASH	CH-IDENT[stress]	*LAPSER
a. [pó:tolók:u]	*!			*
b. [potó:lók:u]		*!		
☞ c. [potolók:u]			*	
d. [potó:l <u>o</u> k:u]			*	*!

A summary of the rankings necessary to analyze the Selayarese data, annotated with forms showing each crucial ranking argument, is provided in (30).

<sup>11</sup>The suffix /ku/ has two forms when it follows vowel-final words, depending on whether or not that final vowel is epenthetic (Broselow 2008:22). If the final vowel is not epenthetic, it lengthens (e.g. [sahalá:-ku] ‘my sea cucumber’); if the final vowel is epenthetic, the suffixal consonant geminates instead (e.g. [sahalá:ku], ‘my profit’). This fact could be explained in a number of ways. One possible analysis is that the suffix /ku/ has two listed allomorphs, [-ku] and [-ku] (for discussion see Broselow 2008:22). [-ku] is the default allomorph, employed in the majority of cases (e.g. [sahalá:-ku]). But when the base ends in an epenthetic vowel, selection of the geminate allomorph [-ku] allows the epenthetic vowel to carry stress without lengthening (e.g. [sahalá:ku]), desirable under the assumption that shorter epenthetic vowels are less marked (e.g. Steriade 2009). Fuller explication of this point is beyond the scope of the present analysis.

(30) Summary of Selayarese analysis (transitive arguments omitted)



### 2.3.3 The nature of correspondence in Selayarese copy epenthesis

Before moving on, we would like to emphasize that the correspondence relationship under discussion here is one that holds among copy vowels and their hosts, not among segments that are accidentally identical. Evidence for this comes from the near-minimal pair in (31), and others like it.<sup>12</sup> The forms in (31a) and (31b) both have final [uru] strings, but only (31a), where the final vowel is epenthetic, shows stress misapplication.

- (31) Stress difference in near-minimal pair (Mithun & Basri 1986:217, 238)
- a. Antepenultimate stress      já:guru      ‘to box, punch’
  - b. Penultimate stress              kaʔmú:ru      ‘nose’

These data show that the correspondence relation that holds between copy vowels and their hosts cannot just be sensitive to surface similarity. The near-minimal pair in (31) aside, a potential proposal for the data discussed in this subsection could have been that pairs of identical vowels that span [r], [l], or [s] must correspond. (On similarity-driven surface correspondence, see Rose & Walker 2004, Hansson 2010, *a.o.*) Stress would then misapply in such forms for the same reason it misapplies under the analysis proposed here – to render the corresponding vowels prosodically identical. This approach would, however, wrongly predict that we should see misapplication in both (31a) and (31b), as both contain final [uru] strings.

The fact that stress misapplication depends on the epenthetic vs. underlying status of the final vowel – not just its similarity to the preceding vowel – shows that the correspondence relation under discussion here is not similarity-driven. Rather, correspondence targets a structural relation, namely the one between the copy vowel and its host. We will return to the question of why correspondence targets this structural relation in Section 4.

## 2.4 Ho-Chunk

Ho-Chunk (Siouan; also referred to as Winnebago) has a process of copy epenthesis commonly known as *Dorsey’s Law* (Miner 1979 *et seq.*, Hale & White Eagle 1980, Halle & Vergnaud 1987, Alderete 1995, Hayes 1995, Hall 2003, *a.o.*). The existence within a word of a Dorsey’s Law sequence (a language-specific term we will use here to denote *copy-host pair*) often causes stress to misapply, though in complex and descriptively non-uniform ways. In this subsection, we claim

<sup>12</sup>There is also at least one perfect minimal pair of this sort: [sá:hala] ‘profit’ vs. [sahá:la] ‘sea cucumber’ (Mithun & Basri 1986:239–240), but the accidental identity between the first and other vowels obscures the relevant point.

that misapplication of stress in Dorsey’s Law (DL) words results from a drive for identity in stress between copy vowels and their hosts, of the same sort just demonstrated for Selayarese. We show that, given an amendment to the interpretation of the data (motivated by acoustic evidence and our readings of the early sources), the complicated stress facts receive a simple analysis based on Copy-Host correspondence. Finally, we show that our analysis extends beyond the stress facts to explain unexpected, phonotactically deviant patterns of vowel duration and nasalization in DL words.

#### 2.4.1 Transcription of stress in Ho-Chunk

In Ho-Chunk, *voiceless obstruent + sonorant* clusters are broken up by epenthetic copy vowels. As shown in (32a–b), words containing a DL sequence can often be identified by the fact that they bear a different stress pattern than otherwise equivalent non-DL words.

(32) Dorsey’s Law in Ho-Chunk (examples from Miner 1989; stress marks in i-ii ours)

- a. DL words: stress on 1st and 2nd syllable
  - i. /kre/ → [k<sup>́</sup>é<sup>́</sup>r<sup>́</sup>é] ‘to leave returning’
  - ii. /sretʃ/ → [s<sup>́</sup>é<sup>́</sup>r<sup>́</sup>étʃ] ‘long, tall’
- b. cf. non-DL words: stress on 2nd syllable only
  - iii. /hiwāx/ → [hiw<sup>́</sup>áx] ‘to ask’
  - iv. /raǰox/ → [raǰ<sup>́</sup>óx] ‘to break in the mouth’

Here and throughout, we assume that stress is shared between the members of a copy-host pair; that is to say, whenever either the copy or host bears a stress, so does the other (see also Susman 1943, Miner 1979, and others discussed below). This is not what many recent sources and analyses assume. Our primary motivation for this assumption comes from pitch tracking evidence provided by Hall (2003:172–173). Figures 5–7 below illustrate the pitch patterns for bimoraic words. For disyllabic words in which the two vowels comprise a DL sequence (Figure 5), both vowels bear high pitch. These DL words are unlike other disyllabic words (Figure 6), which bear high pitch only on their second vowel(/mora). They are also unlike monosyllabic words with a long vowel (Figure 7), as long vowels bear high pitch on only their first constituent mora. As pitch is the primary (and perhaps only) cue to stress in Ho-Chunk (see Miner 1989, Hall 2003), Figure 5 is consistent with a view in which both vowels in a DL sequence bear stress.

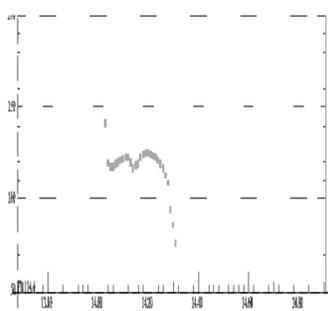


Figure 5: [s<sup>́</sup>é<sup>́</sup>r<sup>́</sup>étʃ]

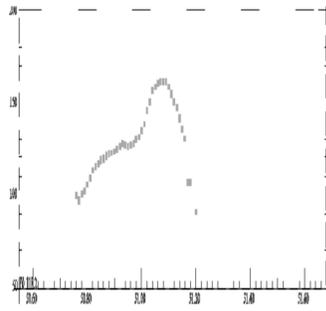


Figure 6: war<sup>́</sup>utʃ

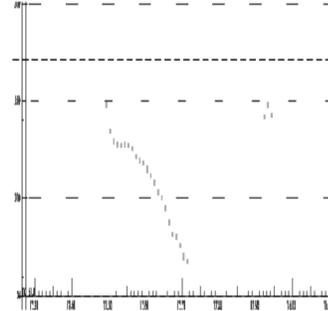


Figure 7: se:<sup>́</sup>p

Our secondary motivation for the assumption that both vowels in a DL sequence bear stress

comes from our readings of the early sources. All sources on Ho-Chunk stress agree that, when stress falls in particular positions within the word, some part of a DL sequence must carry stress. The transcription of stress in such DL sequences has, however, varied significantly across descriptions. Starting with Hale & White Eagle (1980), work on stress in Ho-Chunk has assumed that only one member of the copy-host pair bears stress. But in work prior to Hale & White Eagle (1980), there is consistent acknowledgment of prominence on both members of the DL sequence. Susman (1943: 13) writes that, in DL sequences “secondary stress seems to attach equally to both syllables”. Miner (1979) transcribes secondary stress on the copy and primary stress on the host (e.g. [hip̀érés] ‘know’), but notes that often “the secondarily accented syllable has almost as much accent as, or even as much as (but never more than) the primarily accented one”. Miner’s move in later work (1981, 1989) to transcribe stress on only one portion of the DL sequence is made without comment.

As we have not obtained access to high-quality recordings, we refrain from speculation as to the source of the difference in stress transcription between the pre-1980 and post-1980 sources. But, based on these descriptions, as well as the pitch-tracking data available in Hall (2003), we believe there is sufficient motivation to assert that, in stressed DL sequences, both members bear a stress.

#### 2.4.2 Copy epenthesis and misapplication of stress

As summarized in Table 1, whether or not (and how) DL sequences influence the assignment of stress depends on their position within the word, as well as the word’s length. As can be seen from the non-DL words in Table 1, the default position for stress in Ho-Chunk is the third syllable from the left (i.e. the post-peninitial syllable).<sup>13</sup> In what follows, we abstract away from effects involving syllable weight and focus on words containing only light syllables, as these issues are orthogonal and do not bear on the analysis of stress misapplication. In addition, we focus only on the assignment of primary stress; see Miner (1979), Hale & White Eagle (1980) on patterns of secondary stress. The forms we consider here range from two to five syllables. Short monosyllabic words appear to be absent due to a minimal word requirement (see, e.g., Miner 1989:152, where all monosyllabic words contain a long vowel).<sup>14</sup>

#### 2.4.3 Stress in four-syllable words

We focus first on patterns of stress assignment in four-syllable words, as these demonstrate many of the crucial rankings necessary for the analysis. These forms are extracted from Table 1 in (33). In the forms in (33a–b), stress applies normally, falling on the post-peninitial syllable. In (33c), stress misapplies: it falls on the fourth syllable, rather than the default third. And in (33d), stress also misapplies, this time by appearing on both the third and the fourth syllables.

<sup>13</sup>While systems displaying post-peninitial stress are rare, they are not unattested: Kager (2012) notes that post-peninitial position is a possible position for stress in Azkoitia Basque (Hualde 1998) and Choguita Rarámuri (Caballero 2008, 2011). It is also worth noting here that full consideration of the Ho-Chunk data reveals that it is likely a mora-counting, weight-sensitive system in which stress prefers to fall on the third mora, rather than the third syllable. As we limit our discussion to words composed of all light syllables, the difference between moras and syllables is irrelevant, and we refer to syllables for simplicity.

<sup>14</sup>All data in this section come from Miner (1989), except for *hi̯owíre* and *hokiwároke* in Table 1, which are from Miner (1979). Note also that *hokiwároke* is transcribed with a final secondary stress, which we omit.

Table 1: Summary of stress differences in Ho-Chunk DL vs. non-DL words

Shape	Non-DL word	Dorsey's Law word (DL sequence(s) in [ ])
$\sigma_1\sigma_2$	$\acute{\sigma}_1\sigma_2$ ex. <i>hiwáx</i> 'to ask'	$[\acute{\sigma}_1\acute{\sigma}_2]$ ex. [ <i>kéré</i> ] (← /kre/) 'to leave returning'
$\sigma_1\sigma_2\sigma_3$	$\sigma_1\sigma_2\acute{\sigma}_3$ ex. <i>hipirák</i> 'belt'	$[\sigma_1\sigma_2]\acute{\sigma}_3$ [ <i>xere</i> ] <i>hí</i> (← /xrehi/) 'to boil'
		$\sigma_1[\acute{\sigma}_2\acute{\sigma}_3]$ ex. <i>hi</i> [ <i>pérés</i> ] (← /hipres/) 'to know'
$\sigma_1\sigma_2\sigma_3\sigma_4$	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$ ex. <i>hiǰowíre</i> 'fall in'	$[\sigma_1\sigma_2]\acute{\sigma}_3\sigma_4$ ex. [ <i>xoro</i> ] <i>ǰíke</i> (← /xroǰíke/) 'hollow'
		$\sigma_1[\sigma_2\sigma_3]\acute{\sigma}_4$ ex. <i>hi</i> [ <i>koro</i> ] <i>hó</i> (← /hikroho/) 'to prepare'
		$\sigma_1\sigma_2[\acute{\sigma}_3\acute{\sigma}_4]$ ex. <i>hiru</i> [ <i>píní</i> ] (← /hirupni/) 'to twist')
		$[\sigma_1\sigma_2][\acute{\sigma}_3\acute{\sigma}_4]$ ex. [ <i>kere</i> ][ <i>páná</i> ] (← /krepna/) 'unit of ten'
$\sigma_1\sigma_2\sigma_3\sigma_4\sigma_5$	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4\sigma_5$ ex. <i>hokiwároke</i> 'swing'	$\sigma_1[\sigma_2\sigma_3][\acute{\sigma}_4\acute{\sigma}_5]$ ex. <i>wa</i> [ <i>kiri</i> ][ <i>párás</i> ] (← /wakripras/) 'flat insect'

(33) Stress in four-syllable words

Word type	Stress pattern	Example	Stress application type
a. Non-DL word	$\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$	<i>hiǰowíre</i>	Normal application: Stress on $\sigma_3$
b. DL in $[\sigma_1\sigma_2]$	$[\sigma_1\sigma_2]\acute{\sigma}_3\sigma_4$	[ <i>xoro</i> ] <i>ǰíke</i>	Normal application: Stress on $\sigma_3$
c. DL in $[\sigma_2\sigma_3]$	$\sigma_1[\sigma_2\sigma_3]\acute{\sigma}_4$	<i>hi</i> [ <i>koro</i> ] <i>hó</i>	Misapplication: Stress on $\sigma_4$
d. DL in $[\sigma_3\sigma_4]$	$\sigma_1\sigma_2[\acute{\sigma}_3\acute{\sigma}_4]$	<i>hiru</i> [ <i>píní</i> ]	Misapplication: Stress on $\sigma_3$ & $\sigma_4$

We first model the analysis of the normal application pattern, and then show that both types of misapplication occur in order to render the two vowels in the DL sequence identical with respect to stress; that is to say, both (33c) and (33d) can be explained if CH-IDENT[stress] (the same constraint employed in the analysis of Selayarese in Section 2.3) dominates certain metrical constraints. The normal application pattern observed for the non-DL word in (33a) *hiǰowíre*, where stress falls on the third syllable ( $\sigma_1\sigma_2\acute{\sigma}_3\sigma_4$ ), can be modeled by the foot-free constraints in (34).

- (34) Constraints for post-peninitial stress (following Gordon 2002, also Garrett 1994 for (34a))
- NONINITIALITY (NONINIT): Assign one violation mark \* if stress falls on the first syllable of the word.
  - EXTENDEDNONINITIALITY (EXTNONINIT): Assign one violation mark \* if stress falls on one of the first two syllables of the word.
  - \*EXTENDEDLAPSEL (\*EXTLAPSEL): Assign one violation mark \* if no stress falls within the first three syllables of the word.

As is evident from the tableau in (35), placing stress on the post-peninitial syllable (35c) satisfies all of the metrical constraints in (34). By contrast, placing stress on the second syllable

(35b) violates EXTNONINIT; placing stress on the first syllable (35a) violates both NONINIT and EXTNONINIT; and placing stress on the final (fourth) syllable (35d) violates \*EXTLAPSEL.

(35) Third syllable (post-peninital) stress in 3+ syllable words

/hijowire/	NONINIT	EXTNONINIT	*EXTLAPSEL
a. hĭjowire	*!	*!	
b. hiĵówire		*!	
☞ c. hiĵowíre			
d. hiĵowiré			*!

The forms in (33c–d), however, do not display default third-syllable stress (or, at least, not exclusively third syllable stress). We claim that the two different misapplication patterns in (33c–d) occur because there are two ways to satisfy CH-IDENT[stress]: (i) the constraint is satisfied when *neither* the copy nor the host bear stress (as in *hi[koro]hó* (33c)), and (ii) the constraint is satisfied when *both* the copy and the host bear stress (as in *hiru[pínĭ]* (33d)). Misapplication occurs in words of these shapes because the position targeted for default stress assignment,  $\sigma_3$ , contains a member of a DL sequence. Due to the activity of CH-IDENT[stress], applying normal  $\sigma_3$  stress would trigger the need for stress on the other member of the DL sequence. The pattern that results is determined by the position of the other member of the DL sequence, and whether or not the metrical constraints permit that position to bear a stress.

The first strategy we will analyze is stressing both vowels in the DL sequence, as is found in *hiru[pínĭ]* ( $\sigma_1\sigma_2[\sigma_3\sigma_4]$ , (33d)). If stress applied normally in a word of this shape, to  $\sigma_3$  alone, CH-IDENT[stress] would be violated (36a). Stressing the other DL vowel in order to satisfy CH-IDENT[stress] places the additional stress on  $\sigma_4$  (36c); this option violates \*CLASH<sup>15</sup>, but no other metrical constraints. If instead CH-IDENT[stress] were satisfied by moving stress off the DL sequence entirely, this would place stress on  $\sigma_2$ , incurring a violation of EXTNONINITIALITY (36b). The fact that (36c) is the preferred outcome demonstrates that, in Ho-Chunk, both CH-IDENT[stress] and EXTNONINITIALITY dominate \*CLASH. Candidate (36d) descriptively corresponds to the alternative misapplication strategy, namely stressing  $\sigma_4$ . Given this configuration of DL, however, this strategy is massively suboptimal, as it has pushed stress outside of the three-syllable window (violating \*EXTLAPSEL)<sup>16</sup> and still not satisfied CH-IDENT[stress].

(36) Misapplication: 3rd and 4th syllable stress with DL in [ $\sigma_3\sigma_4$ ] (*hiru[pínĭ]*)

/hirupni/	CH-ID[stress]	EXTNONINIT	*EXTLAPSEL	*CLASH
a. hirupĭnĭ	*!			
b. hirúpĭnĭ		*!		
☞ c. hirupĭnĭ				*
d. hirupĭnĭ	*!		*	

The second strategy we analyze is stressing neither vowel in the DL sequence, as is found in *hi[koro]hó* ( $\sigma_1[\sigma_2\sigma_3]\sigma_4$ , (33c)). Application of normal stress to  $\sigma_3$  alone results in a violation of CH-IDENT[stress] (37a). If stress remained on  $\sigma_3$ , CH-IDENT[stress] could be satisfied by

<sup>15</sup>In Ho-Chunk, recall that pitch is the primary (if not only) cue to stress (see Miner 1989, Hall 2003), so what we call \*CLASH could just as well be defined as a constraint that disprefers high pitch plateaus. The exact definition of the constraint is not crucial; all that matters is that the constraint disprefer sequences of prominent syllables.

<sup>16</sup>On the low ranking of \*EXTLAPSEL, see the following tableau.

additionally stressing  $\sigma_2$  (37b), but this option incurs a violation of EXTNONINITIALITY. Pushing stress off the DL sequence to  $\sigma_4$ , incurring a violation of \*EXTLAPSEL, is the attested option. The fact that (37c) is preferred to (37b) shows us that EXTNONINITIALITY dominates \*EXTLAPSEL. Candidate (37d) corresponds descriptively to the previous type of misapplication, placing a stress on both  $\sigma_3$  and  $\sigma_4$ . Again, given this particular configuration of DL, this strategy is harmonically bounded, as it has created a clash without even satisfying CH-IDENT[stress].

(37) Misapplication: 4th syllable stress with DL in [ $\sigma_2\sigma_3$ ] (hi[koro]hó)

/hikruni/	CH-IDENT[stress]	EXTNONINIT	*EXTLAPSEL	*CLASH
a. hikurúni	*!			
b. hikúrúni		*!		*
☞ c. hikuruní			*	
d. hikurúní	*!			*

In forms with the DL sequence in the first two syllables (e.g. [xoro]jike), stress applies normally: when the DL sequence is not targeted for default stress assignment, there is no reason for stress to misapply. As shown in (38), stressing the third syllable of [xoro]jike results in satisfaction of CH-IDENT[stress], as well as the full set of metrical constraints (NONINIT is excluded for space).

(38) Stress applies normally in [xoro]jike

/xorjike/	CH-IDENT[stress]	EXTNONINIT	*EXTLAPSEL	*CLASH
☞ a. xorojike				
b. xorojiké			*!	
c. xórojike		*!		*
d. xorójike	*!	*!		

Thus, the two types of misapplication we observe in four-syllable words share a common cause: CH-IDENT[stress] must always be satisfied, even at the expense of \*EXTLAPSEL (as in (36)) and \*CLASH (as in (37)).

#### 2.4.4 Stress in other word shapes

The other patterns found in Table 1 are consistent with the rankings demonstrated in four-syllable words and, in addition, reveal several others. We will focus first on two-syllable words. In two-syllable words without a DL sequence, stress applies to the second syllable, as in *hiwáx*. This outcome follows from any ranking of the metrical constraints, as shown in (39).

(39) 2nd syllable (peninitial) stress in two-syllable words

/hiwáx/	NONINIT	EXTNONINIT	*EXTLAPSEL
a. híwáx	*!	*	
☞ b. hiwáx		*	

In two-syllable words that do consist (entirely) of a DL sequence, both vowels are stressed, as in [kére]. This double-stress pattern violates both NONINITIALITY and \*CLASH, as well as EXTNONINIT. This can only be explained if CH-IDENT[stress] dominates these constraints (40).<sup>17</sup>

<sup>17</sup>To ensure that some stress surfaces in [kére] (as opposed to the alternative [kere], with no stress), we assume that

- (40) 1st and 2nd syllable stress in two-syllable DL words ([*kéré*] ‘to leave returning’)

/kre/	CH-IDENT[stress]	NONINIT	*CLASH
a. <i>kéré</i>		*	*
b. <i>kére</i>	*!	*	
c. <i>keré</i>	*!		

We move on now to trisyllabic words. Trisyllabic words where  $\sigma_2$  and  $\sigma_3$  comprise a DL sequence ( $\sigma_1[\sigma_2\sigma_3]$ ) reveal that NONINITIALITY dominates \*CLASH, as demonstrated in (41). (Trisyllabic words in which  $\sigma_1$  and  $\sigma_2$  comprise a DL sequence, like [*xere*]*hí*, display normal application. In these cases, as with the  $[\sigma_1\sigma_2]\sigma_3\sigma_4$  cases, there is no motivation for stress to misapply.)

- (41) 2nd & 3rd syllable stress in three-syllable words with DL in  $[\sigma_2\sigma_3]$  (*hi*[*pérés*] ‘to know’)

/hipres/	CH-IDENT[stress]	NONINIT	EXTNONINIT	*CLASH
a. <i>hipérés</i>			*	*
b. <i>hiperes</i>		*!	*	
c. <i>hiperés</i>	*!			

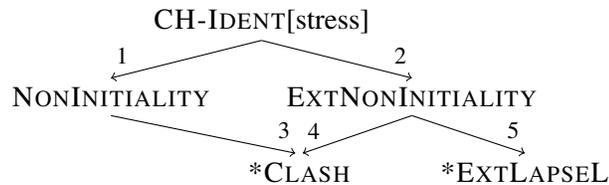
And finally, in four- or five-syllable words that contain two adjacent DL sequences (as in four-syllable [*kere*][*páná*] and five-syllable *wa*[*kiri*][*párás*]), the fact that stress targets the second DL sequences follows from the rankings established above. This is illustrated in (42) for five-syllable *wa*[*kiri*][*párás*].

- (42) Second DL receives stress (*wa*[*kiri*][*párás*] ‘flat insect’)

/wakripras/	CH-IDENT[stress]	EXTNONINIT	*EXTLAPSEL	*CLASH
a. <i>wakiripárás</i>			*	*
b. <i>wakiríparas</i>		*!		*
c. <i>wakiríparas</i>	*!			
d. <i>wakiripárás</i>	*!		*	
e. <i>wákiriparas</i>		*!		

This concludes the analysis of the Ho-Chunk data presented in Table 1. A ranking summary of the analysis, annotated with forms demonstrating each crucial ranking, is provided in (43).

- (43) Ranking hierarchy for Ho-Chunk stress (transitive arguments omitted)



- 1 [*kéré*] > \* [*keré*]
- 2 [*hipérés*] > \* [*hiperes*]
- 3 [*hipérés*] > \* [*híperes*]
- 4 [*hirupíní*] > \* [*hirúpīnī*]
- 5 [*hikuruní*] > \* [*hikúrúnī*]

culminativity holds in Ho-Chunk (see Prince 1983), i.e. that all Ho-Chunk words must have some stress.

### 2.4.5 Other evidence for CH-faithfulness in Ho-Chunk

Beyond stress misapplication, evidence consistent with an active correspondence relation between copy vowels and their hosts in Ho-Chunk comes from several other empirical domains. In this subsection, we will focus on three: (i) abnormal vowel duration patterns, (ii) overapplication of vowel nasalization, and (iii) overapplication of ablaut. These phenomena provide additional indication that copy vowels and their hosts must be identical in all derived phonological properties.<sup>18</sup>

**Unexpected patterns of vowel length.** Many authors working with primary Ho-Chunk data have reported that one or both vowels in the DL sequences are noticeably short. For example, Susman (1943:9–10) writes that “[DL sequences] can be identified [...] usually by the fact that the vowels are very short; Miner (1979:26) notes that “the sequences are spoken [...] faster than other CVCV sequences”; and Hale & White Eagle (1980:117) note that the epenthetic vowel exhibits “extra brevity” (they do not remark on the length of the host vowel).

From these descriptions, we infer that both the copy and the host vowel are shorter than the target duration of a normal short vowel (that is, one not involved in a DL sequence). We interpret this pattern as backcopying of sub-categorical length (i.e. shortness) induced by CH-correspondence. We propose that, in Ho-Chunk, epenthetic vowels must be very short (cf. Steriade 2009). As we did in Scottish Gaelic, we take the baseline durational value for a short vowel to be 1x. Unlike in Scottish Gaelic, we assert that there is a pressure for epenthetic vowels to be of a duration lesser than 1x; we will (arbitrarily) identify this durational target as 0.5x. This can be formalized with the constraints in (44): (44a) requires short vowels to have a durational value of no less than 1x, and (44b) prevents epenthesis of a vowel with a value greater than or equal to 1x.

- (44) Constraints necessary to analyze Ho-Chunk length matching
- a.  $*V_{<1x}$ : Assign one violation mark \* for each vowel that has a durational value less than 1x.
  - b.  $DEP_{\geq 1x}$ : Assign one violation mark \* for each output vowel with a durational value greater than or equal to 1x that lacks an input correspondent.

If both  $DEP_{\geq 1x}$  and CH-IDENT[length] (copy-host pairs must match in length; see Section 2.2) dominate  $*V_{<1x}$ , the following situation arises. The epenthetic copy vowel is prevented from achieving a durational value of 1x, as a candidate in which it does so incurs a fatal violation of  $DEP_{\geq 1x}$  (candidate (45a)). It is also impossible for the copy vowel to shorten to a durational value of 0.5x while the host vowel remains at 1x, as a fatal violation of CH-IDENT[length] results (candidate (45b)). Thus, the optimal choice in this situation is to shorten both vowels to 0.5x, despite the two violations of low-ranked  $*V_{<1x}$  (candidate (45c)).<sup>19</sup> (Stress marks are omitted from tableaux from this point forward, to keep the analyses maximally simple.)

---

<sup>18</sup>An additional fact about Dorsey’s Law sequences often cited in this context has to do with their reduplicative properties. Reduplicants in Ho-Chunk are generally monosyllabic, e.g. *gihu* ‘to swing’ → *gihuhu* ‘to wag its tail’ (Miner 1989:149). However, DL sequences, unlike other disyllabic sequences, reduplicate in full, e.g. *fara* ‘bald’ → *fara fara* ‘bald in spots’ (Miner 1989:146). Copy-Host correspondence does not directly explain these facts, but does not seem to be inconsistent with them.

<sup>19</sup>Additional, more specific constraints must also be involved in order to pinpoint the exact value below 1x that these vowels achieve. However, since we do not have sufficient data to determine exactly what this value is (recall that 0.5x was an arbitrary value), we refrain from more detailed analysis.

## (45) Length-matching in Ho-Chunk

/kre <sub>1x</sub> /	CH-IDENT[length]	DEP <sub>≥1x</sub>	*V <sub>&lt;1x</sub>
a. ke <sub>1x</sub> re <sub>1x</sub>		*!	
b. ke <sub>0.5x</sub> re <sub>1x</sub>	*!		*
c. ke <sub>0.5x</sub> re <sub>0.5x</sub>			**

This pattern is similar to the subcategorical duration matching attested in Scottish Gaelic (Section 2.2): restrictions on the maximum length of the copy cause the length of the host to be altered.

**Overapplication of vowel nasalization.** In Ho-Chunk, vowel nasality is contrastive for [+low] and [+high] vowels, as illustrated in (46). In post-nasal position, however, the contrast in vocalic nasality is neutralized, and only nasal vowels are permitted to follow nasal consonants, as in (47).

## (46) Vocalic nasality contrast in Ho-Chunk (Miner 1989:149)

- a. sí: ‘foot’      sí: ‘liver’  
 b. há:k ‘rear part’      há:k ‘woodchuck’  
 c. gisú ‘to husk’      gisú ‘upset’

## (47) Post-N neutralization of vocalic nasality contrasts (Miner 1989:149)

- a. má: ‘earth, ground’ (\*ma:)  
 b. ní: ‘water’ (\*ni:)  
 c. wamānūke ‘thief’ (\*wamanuke)

The distribution of nasalized vowels, therefore, is the following: in post-nasal position, only nasal vowels may occur (49); elsewhere, both oral and nasal vowels may occur (50). This standard pattern of contextual neutralization can be modeled with the constraints in (48a–c), ranked as (48d).

## (48) Constraints for vowel nasality

- a. \*NV: Assign a violation \* for each oral vowel which follows a nasal consonant.  
 b. \*Ṽ: Assign a violation \* for each nasal vowel.  
 c. IO-IDENT[±nasal]: Assign one violation mark \* for each input-output pair that disagrees for [±nasal].  
 d. **Ranking:** \*NV >> IO-IDENT[±nasal] >> \*Ṽ

## (49) Nasal neutralization post-nasally

i.	/ma:/	*NV	IO-IDENT[±nasal]	*Ṽ
a.	[mã:]		*	*
b.	[ma:]	*!		
ii.	/mã:/	*NV	IO-IDENT[±nasal]	*Ṽ
a.	[mã:]			*
b.	[ma:]	*!	*	

## (50) Nasal contrast non-post-nasally

i.	/gisu/	*NV	IO-IDENT[±nasal]	* $\tilde{V}$
	a. [gisũ]		*!	*
	b. [gisu]			
ii.	/gisũ/	*NV	IO-IDENT[±nasal]	* $\tilde{V}$
	a. [gisũ]			*
	b. [gisu]		*!	

The one place where this distribution is not observed is in DL sequences. As demonstrated in (51), copy vowels always agree for [±nasal] with their hosts. If the host vowel follows a nasal consonant, both copy and host are always nasal, despite the fact that the copy vowel resides in an environment in which both oral and nasal vowels are generally possible.

## (51) Neutralization of nasality contrasts for copy vowels (Miner 1989:149)

- a. /knak/ → [k $\tilde{a}$ n $\tilde{a}$ k] (\*[k $\tilde{a}$ n $\tilde{a}$ k]) ‘to marry’  
 b. /sni/ → [s $\tilde{i}$ n $\tilde{i}$ ] (\*[s $\tilde{i}$ n $\tilde{i}$ ]) ‘cold’  
 c. /bo:p $\tilde{u}$ nu/ → [bo:p $\tilde{u}$ n $\tilde{u}$ s] (\*[bo:p $\tilde{u}$ n $\tilde{u}$ s]) ‘to hit at random’

In the general case, the nasality contrast is preserved non-post-nasally because the context-free markedness constraint \* $\tilde{V}$  is outranked by the IO-faithfulness constraint IO-IDENT[±nasal]. However, since the epenthetic copy vowel lacks an input correspondent, IO-faithfulness should not be able to protect it from \* $\tilde{V}$ , and it should be forced to surface with the unmarked value, [-nasal]. If, however, Copy-Host faithfulness for nasality – enforced by CH-IDENT[±nasal], defined in (52) – also outranks \* $\tilde{V}$ , the unexpected distribution is explained.<sup>20</sup>

## (52) CH-IDENT[±nasal]: Assign one violation mark \* for each copy-host pair that disagrees for [±nasal].

## (53) Insertion of a nasal copy vowel, to satisfy \*NV and CH-IDENT[±nasal]

	/knak/	*NV	CH-IDENT[±nasal]	IO-IDENT[±nasal]	* $\tilde{V}$
	a. [k $\tilde{a}$ nak]	*!			
	b. [k $\tilde{a}$ n $\tilde{a}$ k]		*!	*	*
	c. [k $\tilde{a}$ n $\tilde{a}$ k]			*	**

**Overapplication of ablaut.** Ho-Chunk has a process of final vowel ablaut, in which roots that end in [e] change this vowel to [a] when immediately followed by a certain class of suffixes. This process is demonstrated in (54), where the vowel that undergoes ablaut is bolded (data from Miner 1989:50). Stress marks are omitted here.

- (54) Final [e] → [a] ablaut in Ho-Chunk  
 a. ware → warare ‘work / imperative’  
 b. te: → ta:nã ‘I go / I could go’

When the word-final [e] belongs to a DL sequence, however, both the copy and the host undergo

<sup>20</sup>Under the model discussed in Section 4, in which copy vowels stand in correspondence with an underlying vowel, IO-faithfulness has the potential to protect nasalization on the copy vowel. However, in the absence of CH-IDENT[±nasal], richness of the base (Prince & Smolensky 2004) would predict that a nasalization contrast should re-emerge in the copy. Thus under either model, this stands as an argument for CH-correspondence.

ablaut, as demonstrated in (55) (data from Miner 1989:150).

- (55) DL [e] → [a] ablaut in Ho-Chunk
- a. kere → karaire ‘to leave returning / they leave returning’
  - b. gisewe → gisawanāk ‘to calm down / to calm down sitting’

An analysis of these facts in sketch form follows. Let us assume that there is some constraint, ABLAUT, which requires word-final [e] to lower to [a] in certain morphological contexts. (We will not attempt to offer an analysis of the ablaut pattern itself.) In order to take effect, ABLAUT must dominate IO-IDENT[±low]. In words that do not contain a DL sequence, the result is that only the final vowel lowers as a result of ablaut (candidate (56b)). Lowering any other vowels (as in the hypothetical<sup>21</sup> [xexe] → [xaxawi] (56c)) results in unnecessary violations of IO-IDENT[±low].

- (56) Ablaut affects only the final vowel in non-DL words

	/xexe/ + /wi/	ABLAUT	IO-IDENT[±low]
a.	[xexewi]	*!	
b.	[xexawi]		*
c.	[xaxawi]		**!

In words where the final [e] belongs to a DL sequence, however, both the final vowel (the host) and the penultimate vowel (the copy) lower. This pattern shows us that a faithfulness constraint enforcing identity for [±low] among copy-host pairs, CH-IDENT[±low], is active.<sup>22</sup>

- (57) Ablaut affects the penult and the final in DL words

	/giswe/ + /nak/	ABLAUT	CH-IDENT[±low]	IO-IDENT[±low]
a.	[gisewenak]	*!		
b.	[gisewanak]		*!	
c.	[gisewanak]			*

#### 2.4.6 Summary of Ho-Chunk

These vowel duration, nasality, and ablaut effects, taken together with the stress misapplication patterns described and analyzed above, provide significant support for the existence of a correspondence relationship between copy vowels and their hosts in Ho-Chunk. We conclude by noting that, while the patterns attested in Ho-Chunk may seem complex, they resemble the patterns attested in Scottish Gaelic and Selayarese in several ways. As in Selayarese, the need for stress identity between copy-host pairs can force misapplication of stress (i.e. exclusive placement outside of the normal stress domain), when misapplication is permitted by the metrical constraints. And as in Scottish Gaelic, copy-host pairs exhibit a drive for durational identity; in Ho-Chunk, this drive is in part what leads to an abnormally short duration of both members of a DL sequence.

<sup>21</sup>Although actual Ho-Chunk forms equivalent to [xexe] are attested (e.g. [xete] ‘big, large’, Helmbrecht & Lehmann 2010a:219), forms in which these stems have undergone ablaut are apparently unattested in the work on Ho-Chunk available to us (in addition to the resources cited in this section: Lipkind 1945, Helmbrecht & Lehmann 2010a,b). We assume from the more general descriptions of ablaut that only the final vowel would lower in these forms.

<sup>22</sup>Note that, given our current assumptions about the phonological representation of copy epenthesis, lowering of the copy vowel does not incur a second violation of IO-IDENT[±low], as we assume that copy vowels do not stand in correspondence with an input segment. Nothing about this derivation would change if we assumed the opposite. See Section 4 for further discussion.

## 2.5 Misapplication in copy epenthesis: summary and discussion

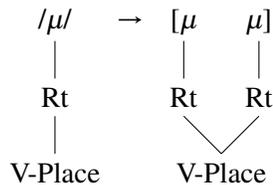
In this section, we have shown that positing a correspondence relation between copy vowels and their hosts allows for a natural, unified treatment of prosodic misapplication effects in copy epenthesis. We have shown how faithfulness constraints demanding identity between a copy and its host are capable of explaining otherwise unexpected prosodic patterns in three languages: Scottish Gaelic, Selayarese, and Ho-Chunk. In this way, our results provide further support for Kitto & de Lacy's (1999) claim that a correspondence relationship holds between copy vowels and their hosts.

There is, however, a question remaining: is there an alternative, non-correspondence-based analysis that could do just as well? In the remainder of this section, we consider two alternative theories of copy epenthesis – copying as feature spreading, and copying as gestural realignment – and we argue that neither of these predicts the drive for identity exhibited above.

### 2.5.1 Feature spreading

As previewed in the introduction, under theories of copy epenthesis that make reference to *feature spreading* (e.g. Clements 1986, 1991; Gafos & Lombardi 1999; Halle et al. 2000; Shademan 2002; Kawahara 2007), the copy lacks features of its own, and so obtains them from a nearby host. This analysis of copying-as-spreading is schematized in (58), following Kawahara (2007).

(58) Copying as spreading (from Kawahara 2007:5)



A copying-as-spreading analysis is capable of accounting for some of the facts presented in this section; specifically, it provides a natural account of why features of the host are often (if not always) transferred to the copy. The spreading-based analysis, however, has a harder time accounting for cases in which properties of the copy are transferred to the host. Take, for example, the cases of length-matching attested in Scottish Gaelic and Ho-Chunk, where the host vowel shortens in response to durational constraints placed on its copy. Such instances of backcopying – where restrictions on the copy have a noticeable effect on the host vowel, as well – are difficult for a spreading-based analysis to account for, as there is no mechanism in such an analysis for properties of the copy to be transferred to the host. The presence of an additional correspondence relation, on the other hand, would predict back-copying effects of exactly this sort.

We note that it may be possible to account for these effects under an analysis that involves both spreading and correspondence. No such analysis has been proposed, however, and we do not develop one here. The point is that an analysis of copy epenthesis that appeals to spreading alone is not sufficient to account for the full range of facts presented in this section.

### 2.5.2 Gestural realignment

A related analysis of copy epenthesis holds that it results from *gestural realignment*. Under such analyses (e.g. Steriade 1990, Hall 2003), the appearance of the copy vowel in forms like Scottish

Gaelic [ɔ̃rɔ̃m] ‘dead’ (Clements 1986:328) is not due to the insertion of an additional timing slot, but rather movement of the tongue tip gesture within the gestural score. The appearance of copy epenthesis is derived when /r/ moves into the middle of the vowel gesture, allowing the vocalic gestures of [ɔ] to be heard on both sides of the consonantal gestures of [r]. Under the analysis in (59), the twin [ɔ]’s in [ɔ̃rɔ̃m] are not distinct exponents of the same input segment; rather, they are two halves of the same exponent.

(59) Copy epenthesis as gestural reorganization (based on Steriade 1990)

Tongue body (/ɔ/):	[- - - <sup>ɔ</sup> - - - - - <sup>r</sup> - - - - - <sup>m</sup> - -]	Tongue body (/ɔ/):	[- - <sup>ɔ</sup> - - - - - <sup>r</sup> - - <sup>ɔ</sup> - - - - - <sup>m</sup> - -]
Tongue tip (/r/):	[- - -]	Tongue tip (/r/):	[- - -] ←
Lips (/m/):	[- - -]	Lips (/m/):	[- - -]

While a copying-as-realignment analysis is capable of accounting for many of the facts presented in this section (see esp. Hall 2003 for alternative analyses of the Scottish Gaelic and Ho-Chunk phenomena discussed above), it does not suffice as a general theory of prosodic misapplication in copy epenthesis. Copy epenthesis in Selayarese, for example, cannot be treated as an example of gestural realignment in Hall’s (2003) theory, as the resulting copy vowels do not satisfy the criteria for intrusive vowels. To give one example, Hall (2003:1) claims that intrusive vowels are universally triggered by a consonant cluster that includes a sonorant. Yet, copying in Selayarese can occur across the single obstruent [s], and in word-final position, failing both these conditions. Even in the languages for which Hall (2003) argues that realignment is an appropriate analysis, the observed prosodic identity between copy vowels and their hosts is treated as accidental, and each dimension of identity requires its own set of assumptions.

Consider the identity effects in Ho-Chunk (Section 2.4). In the gestural realignment analysis, to derive the fact that Ho-Chunk copy-host pairs always agree for [±nasal], it is necessary to assume that pieces of a single vowel may not have different gestural specifications, i.e., it is impossible for one half of the vowel to be [+nasal] and the other half [-nasal]. The fact that Ho-Chunk copy-host pairs resemble each other in terms of pitch (i.e. both copy and host bear high pitch) is explained by assuming that a high tone is distributed evenly over the vowel it is linked to. (There is also a question of explanatory adequacy here: it is not clear how the pitch patterns of long syllables are derived under this analysis. Unlike copy-host sequences, in long vowels, high pitch does not spread itself evenly; on the contrary, pitch steadily falls throughout. Consult again Figures 5–7.) And finally, the patterns of Ho-Chunk stress misapplication are derived by assuming that copy-host pairs require tone to be realized later than do other heavy syllables.

Our point here is not that a gestural realignment analysis is incapable of deriving prosodic identity; as demonstrated by Hall (2003), it can. Rather, our point is that the gestural realignment analysis misses the more general observation that copy-host pairs strive for identity in all properties, including prosodic properties, regardless of whether or not they can be plausibly analyzed as intrusive vowels. In Hall’s (2003) analysis, there is no fundamental component of the analysis which directly encodes that two halves of the same vowel must be identical, and the fact that prosodic identity often arises is dealt with through local, auxiliary assumptions. A simpler explanation for the observed identity between copy vowels and their hosts is that it is actively enforced by faithfulness constraints over a surface correspondence relation.

### 3 Prosodic Misapplication in Reduplication

In the previous section, we argued that invoking faithfulness constraints over a surface correspondence relation between copy and host in processes of copy epenthesis generates a wide range of complex misapplication effects, particularly with respect to the assignment of prosodic and suprasegmental properties. If such faithfulness constraints exist, we should expect to find similar sorts of effects in other domains that require a surface correspondence relation. One domain which is frequently believed to employ such a surface correspondence relation is reduplication.<sup>23</sup>

Since McCarthy & Prince (1995), Correspondence Theoretic approaches to reduplication have appealed to faithfulness between the Base (B) and the Reduplicant (R) to explain numerous properties of reduplication, including the emergence of the unmarked effects and over- and under-application. In the realm of identity for prosodic properties, BR-correspondence has also frequently been invoked to account for “length transfer” effects (see Downing 2000, Gouskova 2007, *a.o.*; cf. Levin 1985, McCarthy & Prince 1988), where vowels standing in BR-correspondence are required to match in length (thus [short]<sub>R</sub> ↔ [short]<sub>B</sub> or [long]<sub>R</sub> ↔ [long]<sub>B</sub>). Other than those involving length, however, BR-correspondence effects involving suprasegmental properties have not been very frequently reported in the literature.

In this section, we examine several cases where the drive for BR-identity induces misapplication of stress. These fall into two types: (i) placement of additional stresses, found in the verbal reduplication pattern of Ngan’gityemerri (Reid 2011); and (ii) unexpected distributions of stress degree, found in Ngan’gityemerri (Reid 2011) nominal reduplication, Diyari (Austin 1981 [2010], *et seq.*), and Indonesian (Kenstowicz 1995, McCarthy & Cohn 1998). Having analyzed these cases using BR-faithfulness constraints of the same sort as employed in the analysis of copy epenthesis, we provide external support for the implication of correspondence in the analysis of copy epenthesis.

#### 3.1 Stress matching in Ngan’gityemerri verbal reduplication

In Ngan’gityemerri (Daly, Reid 2011), serial (“complex”) verbs are composed of an auxiliary stem (light verb + agreement affixes) plus a verbal stem (lexical verb + valence/aspect affixes). This is schematized in (60).<sup>24</sup> In the normal case, such a word has two and only two stresses: one primary stress on the leftmost syllable of the auxiliary stem (which also the leftmost syllable of the word), and one secondary stress on the leftmost syllable of the verbal stem. This is exemplified in (61).

(60) Ngan’gityemerri complex verb: [ [ *ó* *σ*... ]<sub>AUX STEM</sub> = [ *ò* *σ*... ]<sub>VERBAL STEM</sub> ] “COMPLEX” VERB

(61) Basic stress in the complex verb (examples from Reid 2011:97–99)<sup>25</sup>

- |    |                           |                                  |
|----|---------------------------|----------------------------------|
| a. | yénim=mì-wap-nyine        | ‘She’s married now’              |
| b. | yéniny=pà                 | ‘He climbed up’                  |
| c. | ngárim=fì-tyat            | ‘I built it’                     |
| d. | yú=tyèrr-dum              | ‘Shut the door!’                 |
| e. | wárrangiti=fì-pal-endi-pe | ‘They’ll come back for me later’ |

<sup>23</sup>A number of recent proposals have pursued analyses along different lines; cf. Raimy (2000), Inkelas & Zoll (2005), Saba Kirchner (2010), McCarthy et al. (2012).

<sup>24</sup>The symbol “=” indicates the stem-stem boundary; “-” indicates a morpheme boundary.

<sup>25</sup>Following Reid (2011:§3), we omit morphological boundaries within the auxiliary stem. The auxiliary stem is always treated as a single unit with respect to stress marking in the complex verbal construction.

This basic pattern can be captured with the constraints in (62a–b), ranked as in (62c). This is demonstrated for *wárrangiti=fì-pal-endi-pe* in (63). \*LAPSE (= Assign one violation \* for each sequence of two unstressed syllables) is included for completeness.

- (62) Stress constraints for the Ngan’gityemerri complex verb
- STRESSL-STEM: Assign one violation \* for each stem (i.e. auxiliary stem and verbal stem) whose leftmost syllable does not bear a stress.
  - ONESTRESS(complex verb): The complex verb (i.e. auxiliary stem and verbal stem) should have exactly one stress. Assign one violation \* for each additional stress. (cf. CULMINATIVITY; Prince 1983, Hyman 2006)
  - Ranking:** STRESSL-STEM » ONESTRESS(complex verb)
- (63) Basic stress pattern for complex verbs: *wárrangiti=fì-pal-endi-pe* (61b)

warrangiti=fì-pal-endi-pe	STRESSL-STEM	ONESTRESS	*LAPSE
a. wárrangiti=fì-pal-endi-pe	*!		*****
b. wárrangiti=fì-pal-endi-pe		*	*****
c. wárrangiti=fì-pal-èndi-pe		**!*	*

There is exactly one case in which additional stresses arise: when the syllable at the left edge of the verbal stem stands in BR-correspondence with another syllable.<sup>26</sup> When this occurs, both correspondents bear a (secondary) stress, as shown in (64). Note that this behavior cannot be due to some more general desire for reduplicated forms to bear stress: when both base and reduplicant are stem-medial, neither bears a stress, as shown in (65).

- (64) Additional stresses (pp. 97-99; R is underlined, B+R in { })
- |  |                               |                                       |
|--|-------------------------------|---------------------------------------|
| i. <i>Leftward partial reduplication</i> |                               |                                       |
| a.                                       | ngíni={ <u>kù</u> -kùluk}-tye | ‘I was coughing’                      |
| b.                                       | yémingiti={fì-fìtyi}-pagu-pe  | ‘Roll me some (smokes)!’              |
| ii. <i>Rightward total reduplication</i> |                               |                                       |
| c.                                       | wíringgu={dà-dà}              | ‘They (dl.) are singing’              |
| d.                                       | ngúdum={fìrrkity-fìrrkity}    | ‘I swung (the goanna) round ‘n round’ |
| e.                                       | ngúdum={bàt-bìt}              | ‘I whacked it on the ground’          |
| f.                                       | wáddi={wà-wù}-tye             | ‘They used to collect (rations)’      |
| g.                                       | wíribem={mìrr-mìrr}-nyine     | ‘(The car) is running now’            |
- (65) No additional stresses (a. from p. 186<sup>27</sup>, b. from p. 98<sup>28</sup>)
- |  |                              |                                      |
|--|------------------------------|--------------------------------------|
| i. <i>Leftward partial reduplication</i> |                              |                                      |
| a.                                       | yérrmigi=mì-{fà-fala}-pe     | ‘Keep showing it!’                   |
| ii. <i>Rightward total reduplication</i> |                              |                                      |
| b.                                       | wánningi=fì-mi-{tyat-ìt}-tye | ‘They used to show me how to do it.’ |

<sup>26</sup>There appear to be two distinct types of reduplication: (i) a leftward monosyllabic reduplication pattern, and (ii) a rightward “total” reduplication pattern, which copies the full root (but no affixes), often with a change in the vowel (see Reid 2011:98, 151–153 for further discussion). The arguments developed in this section apply equally to both types.

<sup>27</sup>Reid does not provide stress marking on the forms in Section 3 of his grammar. Stress marks in example (65a) are inferred, based on Reid’s detailed description of stress in Section 2.

<sup>28</sup>Reduplicant-initial consonants are often absent/deleted, as in this case, when their presence would result in phonotactic ill-formedness; see Reid (2011:153).

The combined facts of (64) and (65) can be straightforwardly explained using BR-faithfulness to stress. If STRESSL-STEM requires a stress on either the base or the reduplicant, BR-IDENT[stress] (defined in (66)) requires a stress on the other correspondent. Note that this constraint is the Base-Reduplicant version of the CH-IDENT[stress] constraint proposed and utilized for Selayarese and Ho-Chunk stress misapplication in copy epenthesis in Section 2 (cf. (25)).

- (66) BR-IDENT[stress]: Assign one violation \* for each pair of vowels standing in BR-correspondence which do not have identical values for stress (values: *primary*, *secondary*, *unstressed*).<sup>29</sup>

The effect of this constraint in generating the additional stress is illustrated in the tableau in (67). The tableau in (68) confirms that this analysis predicts that neither the base nor the reduplicant will bear a stress when both are stem-medial.

- (67) Additional stress with stem-initial BR: *yémingiti=fì-fityi-pagu-pe* (64b)

ye...= <u>RED</u> -fityi...	STRESSL-STEM	BR-IDENT[stress]	ONESTRESS
☞ a. yé...= <u>fì</u> -fityi...			**
b. yé...= <u>fì</u> -fityi...		*!	*
c. yé...= <u>fì</u> -fityi...	*!		

- (68) No additional stress with stem-medial BR: *yérrmi=mì-fa-fala-pe* (65a)

ye...= <u>mi-RED</u> -fala...	STRESSL-STEM	BR-IDENT[stress]	ONESTRESS
a. yé...= <u>mì</u> -fà-fàla...			**!*
b. yé...= <u>mì</u> -fà-fàla...	*!		**
c. yé...= <u>mì</u> -fà-fala...		*!	**
☞ d. yé...= <u>mì</u> -fà-fala...			*

Finally, note that stress and featural identity are independent. This again bears on the discussion of the source of surface correspondence, raised earlier in reference to Selayarese (Section 2.3.3). Recall that, in Selayarese, a stress contrast exists between string identical forms depending on whether or not the final two vowels stand in copy-host correspondence: e.g., [já:guru] ‘to box, punch’ with an epenthetic final [u] vs. [ka?mú:ru] ‘nose’ with an underlying final [u]. The data from Ngan’gityemerri point in the same direction, namely, that surface correspondence (in this case BR-correspondence) is brought about by a structural relationship rather than surface similarity.

The extra stress compelled by BR-IDENT[stress] is found even when the reduplicant imperfectly copies the base, as in *ngúdum={bàt-bìt}* (64e) and *wáddi={wà-wù}-tye* (64f). Given this featural mismatch, surface similarity is a non-starter as a potential source of correspondence. Conversely, if surface similarity were the driving force in this stress misapplication pattern, we would expect it to apply whether or not the relevant vowels were involved in reduplication. This is clearly not the case. This is seen, for example, in (65b) *wánningi=fì-mi-{tyat-it}-tye*, where the first two vowels of the right-hand stem are identical [i], yet stress appears only in the expected position, stem-initially.<sup>30</sup>

<sup>29</sup>This definition collapses two potentially independent notions: (i) matching for presence/absence of stress, and (ii) matching for degree of stress. The processes discussed here do not differentiate between (i) and (ii), so we proceed with the unified version for simplicity.

<sup>30</sup>An even more convincing example would be one like *ya=fì-firr-tyat* ‘Put it down at the foot of the tree!’ (Reid 2011:187, ex. 3-259a), with two accidentally identical CV syllables in stem-initial position. Reid does not mark stress on

These data confirm that this stress misapplication pattern is connected to a particular phonological representation, namely reduplication, not any surface property. In Section 4, we will explore this idea further, and propose that the structure of the phonological representation is directly responsible for creating the surface correspondence relation, both in reduplication and in copy epenthesis.

### 3.2 Stress degree matching in Ngan’gityemerri nominal reduplication

In addition to the pattern of verbal reduplication, Ngan’gityemerri also displays reduplication in its nominal system. Like the pattern of verbal reduplication, this pattern of nominal reduplication also displays stress matching, but with an additional feature: matching of stress degree.<sup>31</sup> As shown in (69) below, reduplicated nominals display two *primary* stresses: one on the first syllable of the base, and one on the first syllable of the reduplicant. In monosyllabic bases, a stress clash results (69a).

- (69) Stress in Ngan’gityemerri nominal reduplication (Reid 2011:91, ex. 2-96)
- |    |             |                   |    |                 |                 |
|----|-------------|-------------------|----|-----------------|-----------------|
| a. | mák-mák     | ‘white sea eagle’ | d. | tyúngut-tyúngut | ‘frogmouth owl’ |
| b. | wílik-wílik | ‘galah’           | e. | bárra-bárra     | ‘placenta’      |
| c. | wátwátku    | ‘frog (gen.)’     | f. | mágu-mágu       | ‘left handed’   |

Neither of these properties are found in simplex nouns. Simplex nouns show primary stress on the initial syllable, and secondary stress on the third syllable, as long as it is not word final (70b–c).

- (70) Stress in Ngan’gityemerri non-reduplicated nouns (Reid 2011:90, ex. 2-95)
- |    |              |   |
|----|--------------|---|
| a. | 2 syllables: | fépi ‘rock, hill’, mípurr ‘man’, dágum ‘dew’, gánggi ‘high’ |
| b. | 3 syllables: | détyengi ‘today’, mínati ‘big’                              |
| c. | 4 syllables: | ápudèrri ‘pubescent girl’, ánemùni ‘sweetheart’             |

Nominal compounds also behave differently than the reduplicative forms in (69). In these forms, the two compound members essentially form separate stress domains, much like the two stems in the complex verbal construction. (For this reason, we represent the compound-internal boundary with the stem boundary symbol “=”, rather than the morpheme boundary symbol “-”.) Like both other types of nominals (and indeed also all types of verbs in the language), nominal compounds show primary stress on the leftmost syllable, which is the first syllable of the first compound member. Similar to the reduplicated nominals, they also show stress on the first syllable of their second member; however, unlike reduplicated nominals, this stress is a secondary stress. This is expected, given the more general accentual phonotactics of the language: in the verbal system, all stresses appearing to the right of the leftmost syllable are secondary, as they are also in simplex nominals.

- (71) Stress in Ngan’gityemerri nominal compounds (Reid 2011:91, ex. 2-98)
- |    |              |           |    |               |                |
|----|--------------|-----------|----|---------------|----------------|
| a. | pí=pìri      | ‘brain’   | d. | fírr=ngàri    | ‘toenail’      |
| b. | yénggi=dàwan | ‘smoke’   | e. | wántyirr=fíny | ‘armpit sweat’ |
| c. | tyéri=wùndi  | ‘ear wax’ |    |               |                |

The surprising fact that reduplicated nominals bear double primary stress follows directly from

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this form, yet there is nothing about its description which would lead us to believe stress misapplies here. We assume it to be stressed as *yá=fì-fírr-tyat*.

<sup>31</sup>The reduplicated nominals tend not to have independently occurring bases, and frequently refer to types of animals (Reid 2011:90–91, 151–152). (These are hallmarks of “inherent reduplication”, a type common to Australian languages.) They are all total reduplication, so we cannot distinguish which member is the base and which is the reduplicant.

the operation of BR-IDENT[stress], as long as we assume that the constraint is sensitive not only to presence/absence of stress, but also stress degree (primary vs. secondary) (as formulated in (66)). When this constraint interacts with the constraints governing the distribution of primary stress (defined in (72)) according to the ranking in (72c), we generate the double primary stress pattern, as demonstrated in (73). (\*CLASH is included for completeness.) Since the analysis of primary stress is not our primary concern, we will adopt the descriptive constraints in (72), and make no claim regarding their general applicability in the analysis of primary stress cross-linguistically.

(72) Constraints on primary stress

- a. PRIMARYSTRESSL [PRIMSTRESSL]: Assign one violation \* if the leftmost syllable of the word does not bear primary stress.
- b. ONEPRIMARYSTRESS [1PRIMSTRESS]: Assign one violation \* to any word which bears more than one primary stress.
- c. **Ranking:** PRIMARYSTRESSL, BR-IDENT[stress] >> ONEPRIMARYSTRESS

(73) Double primary stress in Ngan’gityemerri nominal reduplication

	/mak-mak/	PRIMSTRESSL	BR-ID[stress]	1PRIMSTRESS	*CLASH
a.	mák-màk		*!		*
b.	mák-mák			*	*
c.	màk-mák	*!	*!		*
d.	mák-mak		*!		

An alternative explanation for the stress properties of nominal reduplicants that one might consider here (which was not available for the verbal forms) is a two-prosodic-word analysis, viewing them as a sort of compound where each prosodic word bears its own primary stress. Reid (2011:91) argues against this approach in favor of a single-prosodic-word analysis, based on the fact that the two parts “cannot sustain a pause between them” and act like a single word with respect to clitics. Regardless, their behavior with respect to stress degree differs from non-reduplicative compounds, as demonstrated above. An analysis based on compounding or multiple prosodic words will therefore require recourse to additional assumptions which are not independently motivated for the language, i.e. that reduplicative forms but not compounds are composed of separated prosodic words. By contrast, the approach based on BR-identity is externally motivated: it is required to explain the verbal system.

Lastly, nominal reduplicants can also participate in compounding. When this occurs, stress-degree identity is again maintained. When the reduplicated nominal is the first compound member, it bears double primary stress (74a). When the reduplicated nominal is the second compound member, it bears double secondary stress (74b). This is exactly what we expect based on the interaction of the independent properties that govern reduplication and compounding. In (74a–b), the corresponding base-reduplicant vowels match for stress degree (be it primary or secondary); in (74a–b), only the first member of the compound (be it a reduplicated form or a simplex form) bears primary stress.

(74) Nominal reduplicants in compounding (Reid 2011:92, exx. 2-99 & 2-100)

- a. *Reduplicated nominal as first member* → *double primary stress*  
[[míl-míl]=mà] ‘cosmetic stick (for scraping skin etc.)’
- b. *Reduplicated nominal as second member* → *double secondary stress*  
[múy=[fìntyí-fìntyí]] ‘a crook (stick with a barbed fork)’

### 3.3 Stress degree matching in Diyari reduplication

The same principles that generate reduplicative stress matching in Ngan’gityemerri also affect stress assignment in reduplicative constructions in Diyari (Pama-Nyungan, Austin 1981 [2010]), as well as Indonesian (see below). Like Ngan’gityemerri reduplication, Diyari reduplication shows an unexpected pattern of double primary stress, as shown in (75). Both the first syllable of the reduplicant and the first syllable of the base bear primary stress. This characterization is supported by the fact that prestopped allophones of nasals and laterals (as in [wíd<sub>ṽ</sub>l<sub>ṽ</sub>Λ-wíd<sub>ṽ</sub>l<sub>ṽ</sub>Λ], (75a)), which are licensed only under primary stress (see Austin 1981 [2010]:29), appear in both the base and the reduplicant.

(75) Reduplication in Diyari (Austin 1981 [2010]:38–40)

	Non-reduplicated stem	Reduplicated stem	[IPA transcription]
a. ‘woman’	<i>wílha</i>	<i>wílha-wílha</i>	[wíd <sub>ṽ</sub> l <sub>ṽ</sub> Λ-wíd <sub>ṽ</sub> l <sub>ṽ</sub> Λ]
b. ‘boy’	<i>kánku</i>	<i>kánku -kánku</i>	[kánkánku]
c. ‘to talk’	<i>yátha</i>	<i>yátha-yátha</i>	[jét <sub>ṽ</sub> Λ-jét <sub>ṽ</sub> Λ]
d. ‘father’	<i>ngápiri</i>	<i>ngápi-ngápiri</i>	[ŋápi-ŋápiri]
e. bird type	<i>tyílparku</i>	<i>tyílpa-tyílparku</i>	[tʰílp <sub>ṽ</sub> Λ-tʰílp <sub>ṽ</sub> Λrku]
f. ‘cat fish’	<i>ngánkanthi</i>	<i>ngánka-ngánkanthi</i>	[ŋánka-ŋánka <sub>ṽ</sub> nti]

This pattern contrasts with the normal stress pattern of the language, which is to have a single primary stress on the leftmost syllable, with subsequent alternating secondary stresses (identical to the pattern in Ngan’gityemerri simplex nominals in (70)), as shown in (76).

(76) Basic stress in Diyari (Austin 1981 [2010], Poser 1989)

a. ‘man’	<i>kárna</i>	[kán <sub>ṽ</sub> Λ]
b. ‘old man’	<i>pínarru</i>	[pín <sub>ṽ</sub> Λru]
c. ‘to close’	<i>ngándrawàlka</i>	[ŋán <sub>ṽ</sub> dr <sub>ṽ</sub> Λwòlka]
d. ‘old woman-PL’	<i>wílhapìna-wàra</i>	[wíd <sub>ṽ</sub> l <sub>ṽ</sub> Apìna-wò <sub>ṽ</sub> Λ]

While the double primary stress could be explained in other ways,<sup>32</sup> this behavior is easily explicable if BR-IDENT[stress] is active. The facts can be generated using the same constraints and ranking employed above for Ngan’gityemerri nominal reduplication.

(77) Double primary stress in Diyari through BR-IDENT[stress]

/yatha-yatha/	PRIMSTRESSL	BR-IDENT[stress]	ONEPRIMSTRESS
a. yátha-yàtha		*!	
b. yátha-yátha			*
c. yàtha-yátha	*!	*!	

### 3.4 Stress degree matching in Indonesian reduplication

The last reduplication pattern we will consider is found in Indonesian (Malayo-Polynesian; as described by Cohn 1989, Kenstowicz 1995, McCarthy & Cohn 1998), which displays an interaction between stress, compounding, and reduplication similar to the one described for Ngan’gityemerri.

<sup>32</sup>For example, it has been claimed that the reduplicated forms contain separate prosodic words (Austin 1981 [2010], Poser 1989, McCarthy & Prince 1994), each of which carries a primary stress.

First consider the stress pattern typically found in compounds in Indonesian, shown in (78). Putting aside the complexities of the basic stress system (see McCarthy & Cohn 1998), we can make the following generalizations about stress in compounds: (i) primary stress generally falls on the penultimate syllable of the word (78c–e); (ii) in compounds, primary stress always falls within the *second member + suffix(es)* domain, even when that domain consists only of a single syllable, i.e. a bare monosyllabic second member (78a–b); (iii) first compound members bear secondary stress, assigned as if it were an independent prosodic word; and (iv) clash is permitted across compound boundaries (78a,d), but nowhere else in the language. (Prefixes fall outside of the stress domain.)

(78) Stress in Compound Forms (McCarthy & Cohn 1998:51; cf. Cohn 1989:188)<sup>33</sup>

- a. [càp][pós] ‘postmark’ (McCarthy & Cohn, p.32)<sup>34</sup>
- b. [tùka][cát] ‘printer’
- c. [polùsi][udára] ‘air pollution’
- d. [bòm][átom] ‘atom bomb’
  - i. pəm-[bòm]{[atóm]-an} ‘bombing’
  - ii. pəm-[bòm]{[àtom]-án-ña} ‘the bombing’
- e. [anèka][rágam] ‘varied’
  - i. kə-[anèka]{[ragám]-an} ‘variety’
  - ii. kə-[anèka]{[ràgam]-án-ña} ‘the variety’

The stress of reduplicated words is similar to that of compounds. However, there is one difference with respect to the distribution of stress degree. If the normal application of stress placement happens to place stress on vowels standing in BR-correspondence, and the base correspondent bears primary stress, then the reduplicant also bears primary stress (79i), rather than the expected secondary stress. If, on the other hand, normal application of stress would place stress on non-corresponding vowels, which happens when the base contains a suffix that is not copied into the reduplicant, we find the expected secondary stress (79ii), just as is found in compounds.

(79) Stress in reduplicated forms (McCarthy & Cohn 1998:52; cf. Cohn 1989:185)

i. <i>Matching</i>	ii. <i>Non-matching</i>
a. [búku][búku] ‘books’	[bùku]{[bukú]-ña} ‘the books’
b. [waníta][waníta] ‘women’	[waníta]{[wanitá]-an} ‘womanly’ (adj.)
c. [màsarákat][màsarákat] ‘societies’	[màsarákat]{[màsarakát]-ña} ‘the societies’
d. {[minúm]-an}{[minúm]-an} ‘drinks’	{[minùm]-an}{[mìnum]-án-ña} ‘the drinks’
e. [hák][hák] ‘rights’ (M&C, p.32)	di-[pàs]{[pás]-kan} ‘tried on repeatedly’

McCarthy & Cohn (1998:52–58) develop an early Base-Reduplicant Correspondence Theory analysis of this pattern, using a cover constraint “MAX” to enforce identity between base and reduplicant for stress degree. Their “MAX” is almost entirely equivalent to our BR-IDENT[stress]. If BR-IDENT[stress] is ranked below the constraints which determine placement of stress – which we will represent with a cover constraint STRESS – but dominates ONEPRIMARYSTRESS, then we

<sup>33</sup>McCarthy & Cohn’s analysis of stress is foot-based. We report here the position and degree of stress, and remain agnostic as to whether a foot-free analysis can fit the data. Square brackets represent root boundaries; curly brackets represent root-suffix constituents.

<sup>34</sup>This is reported with a variant *cáppos*, as if a simplex (McCarthy & Cohn 1998:32f.)

immediately generate (most of) the unexpected distribution of stress degree.<sup>35</sup>

(80) Stress matching in Indonesian reduplication: the matching case

	/[buku][buku]/	STRESS	BR-IDENT[stress]	ONEPRIMARYSTRESS
a.	[bùku][búku]		*!	
b.	[búku][búku]			*

(81) Stress matching in Indonesian reduplication: the non-matching case

	/[buku]{[buku]-ña}/	STRESS	BR-IDENT[stress]	ONEPRIMSTRESS
a.	[bùku]{[bukú]-ña}		**	
b.	[búku]{[bukú]-ña}		**	*!
c.	[bukú]{[bukú]-ña}	*!		*
d.	[bùkú]{[bukú]-ña}	*!	*	*
e.	[búku]{[búku]-ña}	*!		*

If stress is independently placed on vowels that stand in BR-correspondence, as in (80), then the ranking BR-IDENT[stress]  $\gg$  ONEPRIMARYSTRESS bleeds stress demotion, resulting in double primary stress. However, when stress must be placed on non-corresponding vowels, as in (81), there is no way to satisfy BR-IDENT[stress], so the normal application pattern results. While more details remain to be worked out (see fn. 35), this pattern provides an additional example of stress misapplication in reduplication.

### 3.5 Local Summary

In this section, we have shown that prosodic misapplication effects of the sort found in copy epenthesis are also found in reduplication. In Ngan'gityemerri verbal reduplication, a drive for stress identity between vowels standing in BR-correspondence forces the placement of additional, otherwise unexpected stresses. In Ngan'gityemerri nominal reduplication, as well as in Diyari and Indonesian, a drive for stress identity between vowels standing in BR-correspondence causes the appearance of multiple primary stresses, contrary to the stress pattern found in similar constructions in the languages. As in copy epenthesis, these effects receive a simple analysis in a correspondence-based approach. In the following section, we suggest that shared structural factors are the source of the copy-host and base-reduplicant surface correspondence relations.

## 4 The representation of copy epenthesis and reduplication

In the previous sections, we have argued that copy epenthesis and reduplication both involve correspondence relations among surface segments. This raises an obvious question: why do these processes involve surface correspondence? In this section, we develop a proposal in which the motivation for these surface correspondence relations is based upon the structure of the phonological representations involved in these processes. For copy epenthesis, if we assume not only that the host stands in Input-Output correspondence with the underlying representation, but that the copy

<sup>35</sup>BR-IDENT[stress] as currently formulated is not sufficient to explain the non-matching behavior of (79e.ii) *di-pàs-pàs-kan*. Forms of this sort might indicate that something more complicated than a vowel-based BR-IDENT[stress] is at play. McCarthy & Cohn imply that foot-structure may play an important role. Some sort of desire for total morphological identity could also be involved. We leave this as a question for future investigation.

also stands in IO-correspondence with the same underlying segment, then we can pursue an explanation based on *transitivity of correspondence*. This explanation also derives the Base-Reduplicant correspondence relation in reduplication, if we assume, following McCarthy & Prince’s (1995) “Full Model” of reduplication (see also Spaelti 1997, Struijke 2002), that both the output base and the reduplicant stand in correspondence with the input root. After introducing our proposal, we discuss evidence from templatic morphology in Chaha that further supports a generalized “triangle model” of correspondence. However, in Section 4.3, we consider data from Scottish Gaelic palatal agreement in copy epenthesis that poses a problem for this model. We provide some tentative solutions to this problem, but leave it as a problematic case. Nonetheless, we believe that the potential explanatory power of the model makes it worth adopting.

#### 4.1 The triangle model and transitive correspondence

There is a very clear way in which copy epenthesis is distinct from default epenthesis. A default epenthetic segment necessarily has no relation to the underlying form. This uncontroversially violates the faithfulness constraint IO-DEP (McCarthy & Prince 1995; cf. Prince & Smolensky 2004). On the other hand, a copy epenthetic segment could be viewed in a different way, as it bears relation to underlying material. For example, in Scottish Gaelic /ɔrm/ → [ɔrɔ̃m] ‘dead’ (Clements 1986:328), the copy vowel is identical to its host, as well as the underlying /ɔ/. In Section 2, we assumed that this relationship was indirect, mediated first by IO-correspondence between input and host, and then by CH-correspondence between host and copy. However, there is another possibility: correspondence between input and copy is direct. If this were the case, there would be a sense in which copy epenthesis does not violate IO-DEP, since the copy epenthetic vowel does have an input correspondent.<sup>36</sup> The faithfulness constraint violated by copy epenthesis would instead be IO-INTEGRITY (McCarthy & Prince 1995:124):

- (82) IO-INTEGRITY: Assign one violation \* for each segment in the input with multiple correspondents in the output.

Under this approach, the choice between default epenthesis and copy epenthesis is controlled by the relative ranking of IO-DEP and IO-INTEGRITY. Given a high-ranked markedness constraint against consonant clusters (\*BADCC), and high-ranked IO-MAX, which prevents deletion as a viable repair, the ranking IO-INTEGRITY ≫ IO-DEP yields default epenthesis as the optimal repair (83), whereas the ranking IO-DEP ≫ IO-INTEGRITY yields copy epenthesis (84). Input-Output correspondences with respect to the underlying vowel are notated with subscript *i*.

- (83) The two types of “epenthesis”: default epenthesis

/ɔ <sub>i</sub> rm/	*BADCC	IO-MAX	IO-INTEGRITY	IO-DEP
a. ɔ <sub>i</sub> rm	*!			
b. ɔ <sub>i</sub> rɛm				*
c. ɔ <sub>i</sub> rɔ̃ <sub>i</sub> m			*!	
d. ɔ <sub>i</sub> r		*!		

<sup>36</sup>Such a structure would perhaps violate some sort of DEP constraint, perhaps IO-DEP-*timing slot*, since there is structure in the output which is not directly reflected in the input.

(84) The two types of “epenthesis”: copy epenthesis

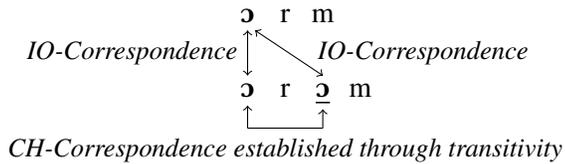
/ɔ <sub>i</sub> rm/	*BADCC	IO-MAX	IO-DEP	IO-INTEGRITY
a. ɔ <sub>i</sub> rm	*!			
b. ɔ <sub>i</sub> rəm			*!	
c. ɔ <sub>i</sub> r <sub>ɔ<sub>i</sub></sub> m				*
d. ɔ <sub>i</sub> r		*!		

When we use splitting with INTEGRITY violation as the representation of copy epenthesis, we immediately see that the copy and the host are inherently co-indexed. The copy epenthesis candidate (c) in the above tableaux shows that the host is indexed to the input vowel, and the copy is indexed to that same vowel. If we assume that all output segments which bear the same index relative to the input also stand in correspondence with one another, then we have *derived* the Copy-Host correspondence relation from independent principles. We propose that this assumption is an inherent component of the phonological grammar. We refer to this as the *Principle of Transitive Correspondence*, defined in (85) and illustrated for copy epenthesis in (86). Similar proposals have been made on independent grounds by Struijke (2002) and McCarthy (2002).

(85) The Principle of Transitive Correspondence:

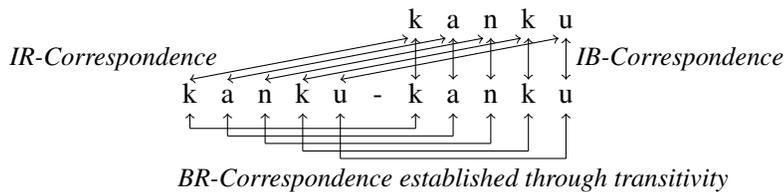
If *x* corresponds to *y*, and *x* corresponds to *z*, then *y* corresponds to *z*.

(86) Transitive correspondence in copy epenthesis



This model of copy epenthesis is virtually equivalent to McCarthy & Prince (1995) “Full Model” of reduplication (see also Spaelti 1997, Struijke 2002), where the input root stands in Input-Base (IB) correspondence with the output base, as well as Input-Reduplicant (IR) correspondence with the reduplicant, while the base and reduplicant themselves stand in Base-Reduplicant (BR) correspondence. Under this proposal, Base-Reduplicant correspondence does not come about based on any special property of reduplication, but rather it exists because of the nature of reduplication’s phonological structure and the transitivity of correspondence.

(87) Transitive correspondence in reduplication (Diyari *kanku-kanku*, Austin 1981 [2010]:39)



Indeed, reduplication can be and has been viewed as incurring an INTEGRITY violation (Spaelti 1997; Kurisu 2001; Yu 2005a; Saba Kirchner 2010, 2013) in exactly the same way that copy epenthesis does in (83ii). In this way, we can further unify copy epenthesis and reduplication:



palatalization morpheme. Rose (1994) states them as follows:

- (89) Conditions for palatalization in Chaha (Rose 1994:104–105)
- a. The final consonant is palatalized if palatalizable [i.e., not a labial];
    - i. [kift] → [kifč] ‘open!’ (2sg. masc. → 2sg. fem.)
    - ii. [dirg] → [dirg<sup>y</sup>] ‘hit!’ (2sg. masc. → 2sg. fem.)
  - b. Otherwise, the rightmost velar consonant is palatalized as long as no coronals or front vowel follow it (both block palatalization);
    - i. [nixəβ] → [nix<sup>y</sup>əβ] ‘find!’ (2sg. masc. → 2sg. fem.)
    - ii. [qifif] → [q<sup>y</sup>ifif] ‘cut the edges!’ (2sg. masc. → 2sg. fem.)
  - c. Otherwise, the vowel to the left of the final consonant is fronted.
    - i. [nixəβ] → [nizeβ] ‘be flexible!’ (2sg. masc. → 2sg. fem.)
    - ii. [kitif] → [kitif] ‘chop (meat)!’ (2sg. masc. → 2sg. fem.)

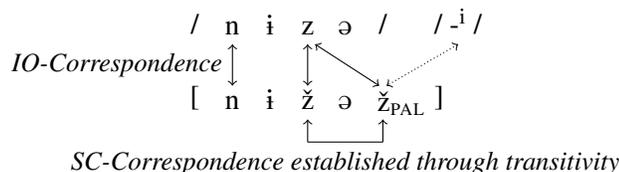
Two pieces of this complex conditioning are important for our purposes. First, palatalization targets only a single segment. Second, palatalization preferentially affects the rightmost segment. There is one case where these conditions are not exhaustively upheld: when the final two consonants are the result of splitting due to template satisfaction (McCarthy 1986, Rose 1994, *a.o.*). In just this case, palatalization affects not only the rightmost consonant, but also the penultimate consonant. These data are shown in (90):

- (90) Palatalization of doubly-linked obstruents (Rose 1994:105)<sup>38</sup>

Root	2sg. masc.	2sg. fem.		
a. /nz/	nizəz	nižəž	*nizəž	‘dream!’
b. /sk/	sikik	sik <sup>y</sup> ik <sup>y</sup>	*sikik <sup>y</sup>	‘stick in/up!’
c. /bt/	bətit	bəčič	*bətič	‘be wide!’
d. /Tq/	Tiqəq	Tiq <sup>y</sup> əq <sup>y</sup>	*Tiqəq <sup>y</sup>	‘be weak!’

This instance of overapplication is predicted by the triangle model. Splitting of the underlying consonant is driven by template satisfaction (however that is to be analyzed). Once splitting occurs, a surface correspondence relation is instantiated. This is schematized in (91). A constraint IDENT[PAL] (*vel sim.*) over this correspondence relation then ensures that both surface correspondents surface with palatalization, even though only one of them is in the environment where it normally applies.

- (91) Transitive correspondence in templatic multiple association (vowel relations omitted)



Without correspondence, one must impose serial ordering of operations vis-à-vis tier separation and tier conflation (e.g. McCarthy 1986), or make specific assumptions about feature geometry and how it operates vis-à-vis tier separation/conflation (Rose 1994). Using surface correspondence

<sup>38</sup> <ž> = [ʒ], <č> = [tʃ], <T> = [tʰ]

under the triangle model, the distribution follows with no additional assumptions.

Furthermore, using surface correspondence in a parallel approach, we predict cases of non-identity to be possible under the same and similar conditions. Both such cases exist. In Chaha, the coronal sonorants /r/ and /n/ behave differently than the other consonants with respect to palatalization (Rose 1994). The palatalized variant of /r/ is [y] (= IPA [j]). In coda, [y] (whatever its origin) coalesces with a preceding central vowel to yield a front vowel: /ər/ + (palatalization) → ər<sup>y</sup> → əy → [e]. In these cases, the leftmost output correspondent of the underlying /r/ surfaces as [r], not [y], as would be expected based on the over-application of palatalization found for other consonants.

(92) Non-palatalization of doubly-linked /r/ (Rose 1994:106)

<i>Root</i>	<i>2sg. masc.</i>	<i>2sg. fem.</i>		
a. /qr/	qirər	qirəy → qire	*qiye	'be flexible!'
b. /br/	birər	birəy → bire	*biye	'fly (away)!'
c. /zr/	zərir	zəriy → zəri	*zəyi	'block the view with a curtain!'

Exactly how to analyze this case is uncertain, and beyond the scope of this paper. What is clear, though, is that the faithfulness constraints which are active over this correspondence relation are violable in Chaha, under certain circumstances. The violability of these constraints are even more evident in data adduced by Rose (1994:114) from the equivalent construction in the related language Amharic. The correspondent of Chaha's floating palatalization morpheme in Amharic is segmental /i/, which surfaces as a suffix; this suffix induces palatalization on the root-final consonant. When this is a doubly-linked consonant, only the second instantiation bears palatalization.

(93) Non-palatalization of doubly-linked obstruents in Amharic (Rose 1994:114)

Amharic	/əziz-i/	→	əziži	'order!'
cf. Chaha	/əziz- <sup>i</sup> /	→	əžiž	'order!'

The difference between Chaha and Amharic comes down to the ranking of (i) the Input-Output faithfulness constraint against palatalizing an underlyingly non-palatal consonant and (ii) the equivalent faithfulness constraint over the Surface Correspondents (SC) correspondence relation. Employing a cover constraint PAL for the factors that govern the docking of the palatalization morpheme, the ranking PAL ≫ SC-IDENT[pal] ≫ IO-IDENT[pal] generates the overapplication of palatalization in Chaha (94i), while the reverse faithfulness ranking PAL ≫ IO-IDENT[pal] ≫ SC-IDENT[pal] generates normal application in Amharic (94ii):

(94) Palatalization in doubly-linked consonants in Chaha and Amharic

i. Chaha	/əziz- <sup>i</sup> /	PAL	SC-IDENT[pal]	IO-IDENT[pal]
a.	əziž	*!		
b.	əziž		*!	*
☞	əžiž			**
d.	əžiž	*!	*	*
ii. Amharic	/əziz-i/	PAL	IO-IDENT[pal]	SC-IDENT[pal]
a.	əzizi	*!		
☞	əziži		*	*
c.	əžiži		**!	
d.	əžiži	*!	*	*

### 4.3 Palatal Agreement in Scottish Gaelic

The transitive correspondence model of copy epenthesis proposed above has the potential to explain why copy vowels and their hosts should stand in correspondence with one another, and links the correspondence relationship proposed for copy epenthesis to other forms of surface correspondence. There is, however, a problem with the model that is not yet resolved: it predicts that copy vowels and underlying vowels should behave the same with respect to Input-Output faithfulness, since both types of vowels stand in IO-correspondence with the input. The process of palatal agreement in Scottish Gaelic suggests that this prediction is not completely correct.<sup>39</sup>

#### 4.3.1 Palatal agreement: copy epenthesis vs. the lexicon

As demonstrated in (95), there are contexts in which copy vowels in Scottish Gaelic disagree for the feature [ $\pm$ back] with their hosts. These mismatches occur due to a near-exceptionless phonotactic generalization: following a palatalized coronal sonorant (marked with an apostrophe: [C']), copy vowels are always [-back]; following a non-palatalized coronal sonorant, copy vowels are always [+back]. This holds regardless of the underlying [ $\pm$ back] specification of the host vowel. Thus, if a back host vowel precedes a palatalized coronal sonorant, or a front host vowel precedes a non-palatalized coronal sonorant, the result is partial copy-host agreement (i.e. agreement for all vowel features except [ $\pm$ back]). Clements (1986) finds that, in 70 of the 72 relevant forms in Børgstrom's (1937) description, palatal agreement holds (see Clements 1986:329, 335 on the exceptions).

- (95) Imperfect copy in Scottish Gaelic (Clements 1986:328)
- |    |              |   |               |              |
|----|--------------|---|---------------|--------------|
| a. | /Lur'k'N'ən/ | → | [Lur'ik'N'ən] | 'the dead'   |
| b. | /skør'v/     | → | [skør'ev]     | 'cormorants' |
| c. | /d'ærmət/    | → | [d'æramət]    | 'omission'   |

This process of palatal agreement, which is virtually exceptionless for copy vowels, is paralleled by trends in the lexicon; however, the trends are not categorical. An investigation of the 1174 forms in Børgstrom's (1937) Barra Gaelic lexicon found 437 *coronal sonorant + vowel* sequences; this count excludes those sequences that involve the obligatorily stressless, contextually-variable /ə/.<sup>40</sup> Of the 133 sequences containing a palatal sonorant (/N', /l', /L', or /r'/), in 122 the consonant is followed by a front vowel; of the 306 sequences containing a non-palatal sonorant (/n/, /N/, /L/, /r/, or /R/), in 245 the consonant is followed by a back vowel. Within each category, some consonants (e.g. /N/) enforce palatal agreement more consistently than others (e.g. /n/). These results are presented graphically in Figure 8. It should be noted that sonorant-vowel sequences resulting from copy epenthesis are included in these counts. Thus the counts presented in Figure 8 over-estimate the amount of palatal agreement found in the lexicon, as they include a subset of forms in which palatal agreement is near-exceptionless.

It is evident from Figure 8 that non-palatal consonants are more likely to be followed by back vowels, while palatal consonants are more likely to be followed by front vowels. A linear regression revealed that this asymmetry is significant ( $p < .001$ ). But the trends observed for sonorant-vowel

<sup>39</sup>See Section 2.2 on Scottish Gaelic copy epenthesis more generally.

<sup>40</sup>While Børgstrom does not explicitly state that /ə/ (and its allophone [ɔ̃]) is contextually variable, he notes that its articulation is "rather loose" (p. 99), which we interpret as an indication that it has no fixed target. In addition, /m/ was excluded from this small corpus study, as it does not participate in palatal agreement in copy epenthesis.

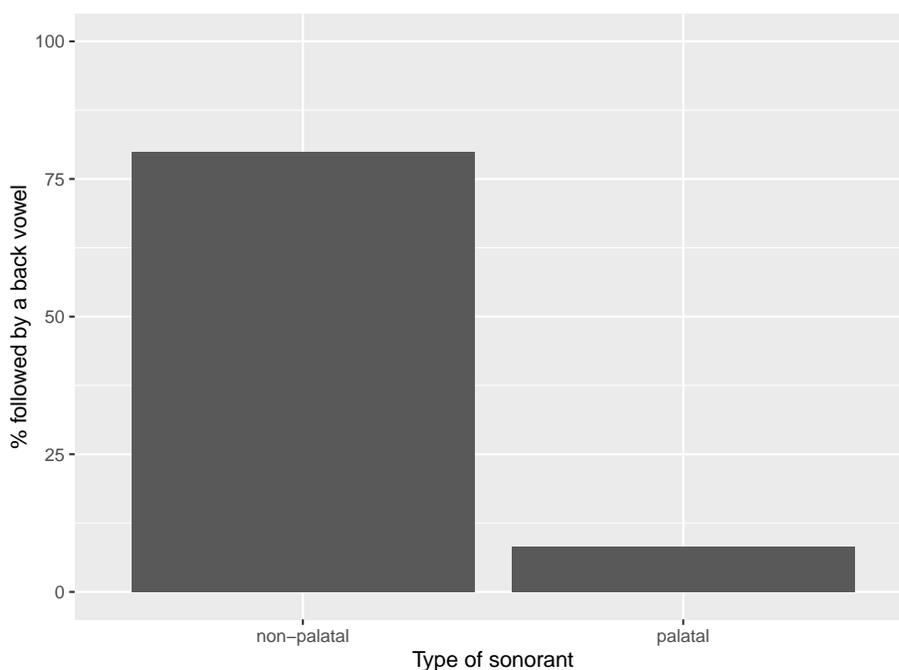


Figure 8: Palatal agreement trends in the lexicon

sequences in the broader lexicon do not exactly match the trends observed for sonorant-vowel sequences in which the vowel is a copy. As is evident from (96), sonorant-vowel sequences are far more likely to exhibit palatal agreement when the vowel is epenthetic than when it is not. This asymmetry is also significant ( $p < .001$ , Fisher’s Exact test).

(96) Asymmetries in palatal agreement

	All RV sequences	Copy RV sequences (Clements 1986)
Palatal-agreement	367	70
No palatal-agreement	72	2

**4.3.2 Analysis of palatal agreement in the triangle model**

The difference between the virtually exceptionless application of palatal agreement for copy vowels and its gradient application in the lexicon poses a challenge for the triangle model of correspondence for copy epenthesis. The triangle model asserts that copy vowels should be subject to the same IO-faithfulness conditions as any other vowels. In the palatal agreement context, a copy vowel diverges from its underlying form in order to match the backness of the consonant which precedes it. We take this divergence to be motivated by a markedness constraint  $AGREE[\pm back]-RV$  (defined in (97a)) demanding agreement for the feature  $[\pm back]$  between a sonorant and a following vowel. In order for the divergence to be licensed, this constraint must dominate both the Input-Output faithfulness constraint to backness for vowels ( $IO-IDENT[\pm back]-V$ , defined in (97b)), and the Copy-Host faithfulness constraint to backness for vowels ( $CH-IDENT[\pm back]-V$ , defined in (97c)), since it results in mismatches along both dimensions. (The faithfulness constraints must be ranked below the

epenthesis-motivating constraint \*BADCC in order for palatal mismatches to not result in blocking of copy epenthesis altogether.) This ranking derives palatal agreement in copy epenthesis, as demonstrated in (98).

- (97) Constraints necessary to generate palatal agreement, for transitive correspondence model
- AGREE[±back]-RV: Assign one violation \* for each [αback] sonorant consonant followed by a [βback] vowel.
  - IO-IDENT[±back]-V: Assign one violation \* for each [αback] output vowel whose input correspondent is [βback].
  - CH-IDENT[±back]-V: Assign one violation \* for each [αback] copy vowel whose host correspondent is [βback].

(98) Palatal agreement in the triangle model ([Lur'uk'N'ən] 'the dead', Clements 1986:328)

/Lu <sub>i</sub> r'k'N'ən/	AGREE[±back]-RV	IO-ID[±back]-V	CH-ID[±back]-V
a. [Lu <sub>i</sub> r'u <sub>i</sub> k'N'ən]	*!		
b. [Lu <sub>i</sub> r'i <sub>i</sub> k'N'ən]		*	*
c. [Li <sub>i</sub> r'i <sub>i</sub> k'N'ən]	*!	*	

The ranking AGREE[±back]-RV >> IO-IDENT[±back]-V, while necessary to account for the consistent pattern of palatal agreement observed in copy epenthesis, predicts that palatal agreement should hold universally across the lexicon, as well. That is to say, backness contrasts in vowels should be neutralized across-the-board following coronal sonorants. While the lexicon displays trends in this direction, as demonstrated above in Section 4.3.1, it does not rise to the level of total neutralization. Therefore, this analysis makes the wrong predictions for forms like [nift] 'now' (Børgstrom 1937:232), which show palatal disagreement:

(99) Palatal agreement not obligatory outside copy epenthesis

/nift/	AGREE[±back]-RV	IO-IDENT[±back]-V	CH-IDENT[±back]-V
☹ a. [nift]	*!		
☹ b. [nuft]		*	

Under a theory like the triangle model in which a copy vowel is expected to be just as faithful to its underlying representation as is any other vowel, a markedness constraint that consistently influences the featural content of a copy vowel in a given environment should consistently influence the featural content of any other non-copy vowel in that same environment. However, as just demonstrated, this is not the case in Scottish Gaelic: palatal agreement holds consistently when the vowel is epenthetic, but less consistently when it is not. In effect, the problem these data pose for the transitive correspondence model is that copy vowels appear to be more prone to palatal agreement, or simply less faithful to their underlying representations than are other vowels.

### 4.3.3 Alternative analyses

The difference between copy vowels and other vowels can, however, be straightforwardly captured under a model in which copy vowels have no input correspondent, and instead derive their featural content solely from their host vowel (as we assumed in Section 2). Under this model, the fact that palatal agreement causes a mismatch in quality between copy vowels and their hosts requires only that AGREE[±back]-RV dominate CH-IDENT[±back]-V, as shown in (100i). Since the copy

does not correspond with the input, the IO-faithfulness constraint can remain high-enough ranked to license the contrast in the lexicon, as shown in (100ii).

(100) Palatal (dis)agreement without the triangle model

i.	/Lur <sup>h</sup> k <sup>h</sup> N <sup>h</sup> ən/	IO-ID[±back]-V	AGREE[±back]-RV	CH-ID[±back]-V
a.	[Lu <sub>h</sub> r <sup>h</sup> u <sub>c</sub> k <sup>h</sup> N <sup>h</sup> ən]		*!	
☞ b.	[Lu <sub>h</sub> r <sup>h</sup> i <sub>c</sub> k <sup>h</sup> N <sup>h</sup> ən]			*
c.	[Li <sub>h</sub> r <sup>h</sup> i <sub>c</sub> k <sup>h</sup> N <sup>h</sup> ən]	*!	*	
ii.	/niʃt/	IO-ID[±back]-V	AGREE[±back]-RV	CH-ID[±back]-V
☞ a.	[niʃt]		*	
b.	[nuʃt]	*!		

The Scottish Gaelic data are thus easily explained under a model in which host vowels stand in correspondence with an input segment, but copy vowels do not (following Kitto & de Lacy 1999, *contra* Section 4.1). It is, however, possible to render the pattern described here consistent with the transitive correspondence model by appealing to *existential faithfulness*.

Based on evidence from, among other things, reduplication and other splitting processes, Struijke (2002) proposes that CON includes faithfulness constraints that are existentially quantified (as opposed to / in addition to faithfulness constraints that are universally quantified). In this framework, if an input segment with a feature [F] has multiple output correspondents, an existential faithfulness constraint  $\exists$ -IO-IDENT[F] is satisfied as long as that feature surfaces faithfully on one of the output correspondents, even if it surfaces unfaithfully on the others.

Under the previous attempt to explain the distribution of palatal agreement under the triangle model in (98), a candidate in which the copy displayed palatal agreement (98b) incurred a violation of the IO-faithfulness constraint. This required the IO-faithfulness constraint to be crucially ranked below the markedness constraint AGREE[±back]-RV. If, however, we assumed that the IO-faithfulness constraint for vowel backness in Scottish Gaelic were existentially quantified –  $\exists$ -IO-IDENT[±back]-V – this violation disappears (as shown in candidate (101ii.b)). This is because the [+back] feature of the input /u/ is faithfully realized on the host [u], freeing up the copy to be unfaithful if lower-ranked markedness constraints dictate (which, in this case, they do). Because of this property of existential faithfulness constraints, we can now rank the markedness constraint AGREE[±back]-RV below the IO-faithfulness constraint, as shown in (101). This is the ranking required in order to retain the contrast in the lexicon: when an input vowel is not split through copy epenthesis, it only has one opportunity to satisfy the IO-faithfulness constraint, and thus does so at the expense of the (lower-ranked) markedness constraint AGREE[±back]-RV (101ii).

(101) Palatal (dis)agreement with existential faithfulness

i.	/Lu <sub>i</sub> r <sup>h</sup> k <sup>h</sup> N <sup>h</sup> ən/	$\exists$ -IO-ID[±back]-V	AGREE[±back]-RV	CH-ID[±back]-V
a.	[Lu <sub>i</sub> r <sup>h</sup> u <sub>j</sub> k <sup>h</sup> N <sup>h</sup> ən]		*!	
☞ b.	[Lu <sub>i</sub> r <sup>h</sup> i <sub>j</sub> k <sup>h</sup> N <sup>h</sup> ən]			*
c.	[Li <sub>i</sub> r <sup>h</sup> i <sub>j</sub> k <sup>h</sup> N <sup>h</sup> ən]	*!	*	
ii.	/niʃt/	$\exists$ -IO-ID[±back]-V	AGREE[±back]-RV	CH-ID[±back]-V
☞ a.	[niʃt]		*	
b.	[nuʃt]	*!		

Further work is necessary to fully incorporate Struijke's (2002) proposal into the model of copy epenthesis proposed here, and determine and evaluate its full range of typological predictions. Nonetheless, this demonstrates that the greater propensity of Scottish Gaelic copy vowels to undergo palatal agreement is not irreconcilable with the transitive correspondence model introduced in Section 4.1, and may in fact be entirely consistent with it.<sup>41</sup>

## 5 Correspondence and the typology of copy epenthesis

While the claim that copy vowels and their hosts are linked by a correspondence relation is not unprecedented (Kitto & de Lacy 1999, Yu 2005b, Kim 2008), it is not uncontroversial. In a paper on the similarities and differences between copy epenthesis and reduplication, Kawahara (2007) argues that a number of typological generalizations about copy epenthesis can only be captured if copy epenthesis is treated as a phenomenon driven by featural spreading, i.e. that it crucially does not involve a correspondence relation. In this section, we discuss in turn each of Kawahara's four arguments: (i) copy epenthesis does not attest length transfer effects (Section 5.1); (ii) copy epenthesis of consonants is not attested (Section 5.2); (iii) copy epenthesis is always local (Section 5.3); and (iv) copy epenthesis preferentially occurs across sonorants (Section 5.4). We show that, in some cases, Kawahara's generalizations and arguments are based on incorrect assumptions regarding the typology of copy epenthesis; in others, while we concur with the generalizations, we show that his interpretation of the facts as categorically supporting a spreading analysis does not hold up.

We conclude that, while the analysis proposed in this paper is not yet capable of accounting for the full range of generalizations regarding the typology of copy epenthesis, Kawahara is incorrect in asserting that copy epenthesis does not involve a correspondence relation. We believe that any complete analysis of copy epenthesis must involve a correspondence relation, but further work is necessary to develop the correspondence-based analysis proposed here into a theory that is capable of accounting for all of the observed typological generalizations.

### 5.1 Length transfer

One of Kawahara's arguments that copy epenthesis should be treated as spreading rather than correspondence has to do with prosodic identity effects. Length transfer effects, where a short vowel is copied as short and a long vowel is copied as long, are well-attested in the typology of reduplication. Kihehe reduplication, for example, clearly exhibits length transfer (Odden & Odden 1985, via McCarthy & Prince 1988), as shown in (102).

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<sup>41</sup>We note, however, that an approach appealing to existential faithfulness faces some challenges as well. Consider the form [d'aL<sub>av</sub>] 'picture' (Clements 1986:328), in which the host mismatches in [ $\pm$ back] with the preceding consonant. Under an analysis in which only one of copy or host must be faithful to the underlying /a/, we might expect the host vowel to undergo palatal agreement in this form, yielding [d'æL<sub>av</sub>]. We do not know, however, whether copy vowels agree for [ $\pm$ back] with a preceding obstruent, as copy vowels in Scottish Gaelic always follow a sonorant. Thus, the fact that palatal agreement is not observed in [d'aL<sub>av</sub>] is not necessarily unexpected. Forms like hypothetical /r'aLv/, which under an existential faithfulness account would be expected to surface as [r'æL<sub>av</sub>], appear to be unattested. However, since copy epenthesis does not involve alternations in Scottish Gaelic, there would be no way to distinguish such a derivation from one with an underlying representation /r'æLv/, rendering this discussion partially moot.

- (102) Length transfer in Kihehe reduplication
- a. ceeng-a → ceenga-ceenga, \*cenga-ceenga ‘build/a bit’
  - b. ceeng-el-a → ceengela-ceengela, \*ceengeela-ceengela ‘build for/a bit’

However, as Kawahara notes, parallel patterns in copy epenthesis – such as the one in (103), where a short host begets a short copy and a long host begets a long copy – are completely unattested.

- (103) Length transfer in copy epenthesis is unattested
- a. /takt/ → [takat]
  - b. /taakt/ → [taakaat]

While it is true that no pattern with the exact profile of (103) is attested – there is no language we are aware of where short vowels are copied as short and long vowels are copied as long – we have shown, in Section 2, that there are languages in which length transfer occurs in copy epenthesis in more subtle ways. In the case of Scottish Gaelic, length transfer occurs in the form of subcategorical duration matching; in Ho-Chunk, it occurs in the form of extra shortness in both the copy and the host. It is true that length transfer in copy epenthesis is rarely reported, but we suspect that this is due primarily to the subtlety of these effects: in the case of Scottish Gaelic, for example, detailed phonetic study was necessary to document the duration-matching pattern. Most descriptions of copy epenthesis do not include this level of detail.

Furthermore, the blocking pattern in Scottish Gaelic, where short vowels permit copy epenthesis but long vowels do not, approaches the character of the unattested case in (103). We believe that the absence of the specific pattern in (103), where copy and host vowels match for categorical length, may be attributable to a general cross-linguistic dispreference for long epenthetic vowels. (For a possible explanation behind this dispreference, see Steriade 2009.) In other words, the fact that length-matching patterns like (103) do not surface tells us nothing about the nature of the relationship between copy vowels and their hosts; rather, it reflects more general cross-linguistic preferences regarding the form of epenthetic vowels. The more likely instantiation of a length-based distinction in copy epenthesis would then be the blocking pattern attested in Scottish Gaelic, in which short vowels copy but long vowels do not.

## 5.2 Consonant copy

Kawahara (2007:8) asserts that one characteristic of copy epenthesis is that only vowels can be copied. For example, while copy epenthesis of a vowel often occurs to break up an illicit consonant cluster (as in the Scottish Gaelic and Ho-Chunk cases discussed above), patterns in which a consonant is copied to satisfy some other phonotactic requirement are unattested. To illustrate, Kawahara (2007:9) provides the unattested pattern in (104), where a word-initial syllable gains an onset by copying the onset of the second syllable.

- (104) Consonant copy in epenthesis: unattested (example from Kawahara 2007:9)
- a. /apa/ → [papa]
  - b. /ata/ → [tata]
  - c. /aka/ → [kaka]

Patterns with the appearance of (104), are, however, found in reduplication. In Washo (Bell 1983, Broselow & McCarthy 1983:45–53, Yu 2005a), for example, reduplicants can consist of

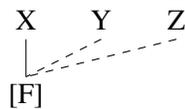
a single consonant, identical to the onset of the following syllable. When a vowel-initial word undergoes reduplication, what results is a form in which the onset of the initial syllable appears to be a copy of a following consonant, as shown in (105). Notice especially (105b), where consonant copy is non-local.

- (105) Consonant copy reduplication in Washo (Yu 2005a:442)
- a. [áhad] → [h<sub>RED</sub>-áhad] ‘across’
  - b. [ájkaʃ] → [k<sub>RED</sub>-ájkaʃ] ‘hollow’
  - c. [ákd] → [k<sub>RED</sub>-ákd] ‘slowly’
  - d. [á:m] → [m<sub>RED</sub>-á:m] ‘to hit with body part’

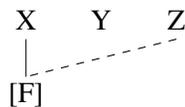
Kawahara argues that this apparent difference between copy epenthesis and reduplication – that consonant copy can be morphologically motivated, but not phonologically motivated – is predicted if copy epenthesis is established via spreading but reduplication is established via correspondence. The absence of patterns exhibiting phonologically-driven consonant copy, like (104), would then be easily explained by the independently motivated claim that consonant major place features (i.e. [labial], [coronal], [dorsal]) cannot spread across vowels.

The claim that consonantal major place features are incapable of spreading across a vowel stems from the fact that major consonant place harmony is unattested in the typology of adult languages.<sup>42</sup> The absence of such patterns has been explained by the widely-held assumption that all instances of feature spreading must be strictly local (e.g. Gafos 1996, 1998; Ní Chiosáin & Padgett 2001; *a.o.*): in a sequence of segments [XYZ], if some feature [F] is to spread from [X] to [Z], it must first spread to [Y] (106). In other words, the gapped configuration in (107) is banned.

- (106) Local spreading: possible



- (107) Non-local spreading: impossible



If all spreading must be local, then the inability of major consonant place features to spread across a vowel can be attributed to the inability of a vowel to host major consonant place features. If, for example, satisfaction of ONSET for an underlying form /apa/ (104a) were achieved by spreading all features of [p] into the onset of the initial syllable, then all features of [p] would have to spread through [a] in order to reach the position of the epenthetic [p]. This would result in the sequence [pppa], as spreading all features of [p] to [a] would turn it into a consonant (Ní Chiosáin & Padgett 2001, Kawahara 2007:12). Thus Kawahara’s observation that consonant copy is unattested is predicted if copy epenthesis is established via spreading, and major place features cannot spread.

But the typology of copy epenthesis is not just limited to cases in which a vowel is inserted to satisfy a phonotactic requirement. Yu (2005b) discusses several cases of phonologically-motivated copying in which a consonant, or an entire syllable rime, is inserted to satisfy some phonotactic

<sup>42</sup>On consonant harmony in child languages, see, e.g., Pater & Werle (2003).

constraint. In Cantonese, for example, certain obstruent-liquid clusters present in English loans are broken up with a copy of the following syllable rime (108). This loanword adaptation strategy mirrors a strategy used to augment native sequi-syllabic forms through duplication of the final rime (109) (Inkelas & Zoll 2005, via Yu 2005b:399).

(108) Final rime copy to repair initial obstruent-liquid clusters (Yu 2005b:399)

- a. [p<sup>h</sup>ɪk<sup>ˀ</sup>ɪk<sup>ˀ</sup>] ‘break’
- b. [kɪk<sup>ˀ</sup>ɪk<sup>ˀ</sup>tsi] ‘clutch’
- c. [si:tɪk<sup>ˀ</sup>ɪk<sup>ˀ</sup>] ‘straight’
- d. [pɪt<sup>ˀ</sup>ɪt<sup>ˀ</sup>] ‘blood’

(109) Final rime copy to repair sesquisyllabic forms

	<i>Sesquisyllabic form</i>	<i>Full form</i>	<i>Gloss</i>
a.	[kə <u>ɔk</u> <sup>ˀ</sup> ]	[k <u>ɔk</u> <sup>ˀ</sup> ɔk <sup>ˀ</sup> ]	‘corner’
b.	[kəkak <sup>ˀ</sup> taj]	[k <u>ak</u> <sup>ˀ</sup> kak <sup>ˀ</sup> taj]	‘armpit’
c.	[hambə <u>ɲaŋ</u> ]	[hamb <u>aŋ</u> aŋ]	‘everything’

This pattern is completely unexpected under the view that all phonologically-driven copying is due to feature spreading, for two reasons. First is the obvious point that the epenthetic material here is composed of an entire syllable rime, not just a single vowel. In addition, a spreading-based analysis of the copying in (108–109) would have to posit that all the features of a consonant (the final syllable coda) are capable of spreading across the features of a vowel (the final nucleus), an option argued to be impossible by the authors referenced above.

Thus, in order to maintain a spreading-based analysis of copy epenthesis, it would be necessary to say that a consonant is capable of spreading all of its features across an intervening vowel, a move which is unwarranted elsewhere. In short, the fact that phonologically-driven copying can target consonants (or constituents involving consonants), *contra* Kawahara (2007), provides evidence that phonological copying is unlike other processes commonly thought to arise due to featural spreading.

### 5.3 Locality

Another dimension of dissimilarity between copy epenthesis and reduplication has to do with differing locality requirements imposed on the two processes. Kawahara (2007:14) notes that reduplicative processes are frequently capable of skipping over possible targets in order to find one that is more harmonic in some way. For example, Nakanai reduplicants are, in certain cases, composed of the root-initial consonant plus the most sonorous vowel from the base, as shown in (110) (data from Johnston 1980, Spaelti 1997; via Kawahara 2007:14).

(110) Sonority-sensitive reduplication in Nakanai

- a. /RED-taro/ → [ta-taro] ‘away’
- b. /RED-buli/ → [bu-buli] ‘roll’
- c. /RED-mota/ → [ma-mota] ‘vines’
- d. /RED-kusa/ → [ka-kusa] ‘wet’
- e. /RED-biso/ → [bo-biso] ‘two by two’

Parallel patterns are, however, completely unattested in the typology of copy epenthesis. For illustration, patterns like the one in (111) (after Kawahara 2007:14), in which an illicit word-final cluster is broken up by a copy of the most sonorous vowel in the word, do not exist.

- (111) Unattested pattern of sonority-sensitive copy epenthesis
- a. /tematk/ → [temataak]
  - b. /tametk/ → [tametaak]
  - c. /temitk/ → [temitek]

The more general point Kawahara raises is that copy epenthesis is always local in a way that reduplication is not: while segments that emerge through phonologically driven copying always resemble a local target (e.g., a vowel always inherits its features from one of the neighboring vowels), segments that emerge through morphologically driven copying have the capability of resembling segments that are further afield. Kawahara argues that the restricted possibilities accorded to copy epenthesis are easily accounted for under the assumption that copy epenthesis arises through spreading, and that spreading is always local.

Our investigations have led us to believe that Kawahara (2007) is correct on this count, and that copy epenthesis is indeed always local. There may, however, be another explanation for why this situation arises. The fact that copy epenthesis is always local does not necessarily have to be treated as a symptom of featural spreading; it could instead be treated as evidence regarding the historical source of these processes. We believe that the spreading / gestural realignment accounts (cf. Section 2.5) are conceptually on the right track, not necessarily in describing the facts of full-fledged copy epenthesis processes, but rather in describing a *phonetic precursor* stage that ultimately results in the phonological patterns of copy epenthesis. We envision a diachronic trajectory like the following.

In copy epenthesis patterns like those described for Scottish Gaelic and Ho-Chunk, there is some prior stage at which the language-specific phonetics of consonant clusters of the relevant type begins to change. This may take the form of gestural migration of the sort advocated by Hall (2003), or perhaps of increased vocalic coarticulation on an open consonantal transition. Whatever the details, at some point in the development of this process, learners receive a significant enough percept of vocalic acoustics within the consonantal sequence to posit the existence of a vowel in surface phonological representation (see also Steriade 1990).<sup>43</sup> If that vowel is perceived as being identical to the adjacent vowel (which is indeed the phonetic source of its features), then learners identify it as an instance of splitting, and thus infer a pattern of copy epenthesis. If, on the other hand, these vowels are not consistently identical to a neighboring vowel, learners will instead construct this as a case of default epenthesis, perhaps with some degree of phonetic coarticulation.

If this line of thinking is on the right track, then an alternative explanation for the absence of non-local copying patterns is that they have no historical precedent: if patterns of copy epenthesis arise via gestural realignment, then there is no possible historical precedent for a sonority-sensitive pattern like (111) or others like it to arise. That is to say, learners may well be capable of fitting a phonological grammar to the sort of data presented in (111), but learners are never presented with such data in the learning process, as it lacks phonetic precursors.

## 5.4 The role of interveners

Kawahara's final argument that copy epenthesis should be treated as spreading comes from the fact that many languages that allow copy epenthesis license it in only a limited number of contexts. In Japanese loanword epenthesis, for example, whether a word-final vowel copies the preceding vowel,

<sup>43</sup>There could well be an intermediate stage with an "intrusive vowel" (see Hall 2003) that, in some way or another, is not a full-fledged vowel in phonological representation.

or instead takes on a default value, depends on the quality of the preceding consonant (Kawahara 2007:19). When a vowel is inserted after [h] or one of its allophones, the vowel is a copy of the preceding vowel (e.g. [bahh<sub>h</sub>] ‘Bach’, [mazohh<sub>o</sub>] ‘Masoch’); when the vowel is inserted after a supralaryngeal consonant, however, the vowel inserted is the default [u] (e.g. [bazu] ‘buzz’, [supururaito] ‘Sprite’). In most cases, languages that limit vowel copy to certain contexts tend to only allow copying across a sonorant or across a laryngeal segment (see Kawahara 2007:20 for a summary, also Hall 2003).

This preference to copy across a more sonorant element can also cause a language to change the directionality of copying according to the identity of the targeted segment or cluster (this discussion is based on data provided by Kumagai 2016). In Fijian loanword adaptation, for example, the behavior of word-initial and word-final copying shows us that copy epenthesis can apply in either direction. Word-initial copy vowels copy the vowel that follows them (112), while word-final vowels copy the vowel that precedes them (113).

- (112) Word-initial copy in Fijian (Kumagai 2016:4)
- a. [berédi] ‘brandy’
  - b. [kilía] ‘clear’
  - c. [kolósi] ‘cross’

- (113) Word-final copy in Fijian (Kumagai 2016:4)
- a. [tíki] ‘tick’
  - b. [bulóko] ‘block’
  - c. [sitába] ‘stamp’

Word-internally, when there is both a preceding and a following vowel, the directionality of copying depends on the composition of the cluster. If the sonorant is the first member of the cluster (114a–b), or if neither member of the cluster is a sonorant (114c–d), then the epenthetic vowel copies the preceding vowel.<sup>44</sup>

- (114) Copy of preceding vowel in word-medial contexts (Kumagai 2016:4)
- a. [dòlofíni] ‘dolphin’
  - b. [bè:letí] ‘belt’
  - c. [tèkesi] ‘taxi’
  - d. [ò:kòsiβóte] ‘Oxford’

When the first member of the consonant cluster is an obstruent and the second is a sonorant, however, the epenthetic vowel inserted into this cluster copies the vowel that follows it, i.e. the vowel on the other side of the sonorant (115).

- (115) Copy of following vowel in word-medial contexts (Kumagai 2016:4)
- a. [kònitaráki] ‘contract’
  - b. [tʃò:karáβi] ‘geography’
  - c. [tàlekaráβu] ‘telegraph’
  - d. [mè:tòropólo] ‘Metropole’

<sup>44</sup>In (114d), note that the additional non-underlined vowels do not copy either the preceding or following vowel: after coronal consonants, a default vowel is always epenthesized. For more on this point, see Kenstowicz (2007).

Our interpretation of these facts is as follows.<sup>45</sup> Generally speaking, in Fijian there is a default preference for epenthetic vowels to be featurally identical to the vowels that precede them. This default preference can be overridden, however, in one of two situations. The first is when copying the following vowel is necessary, i.e. in initial position where there is no preceding vowel (113). The second is when copying the following vowel is desirable, i.e. when the following vowel is separated from the epenthetic vowel by a sonorant (115). The important point here is that a preference to copy across more sonorous material can determine the directionality of copying: the copy is effectively shopping for the most optimal host.

Kawahara (2007:20–21) argues that the preference to copy across more sonorous material can be analyzed in a theory in which copy epenthesis derives from spreading, but not in a theory in which copy epenthesis is regulated by a correspondence relationship. But while it is true that the correspondence-based account developed here does not inherently extend to explain the Fijian data, it is not clear to us what inherent property of the spreading-based account explains the preferential copying facts, both in Fijian and more generally. To prevent copying across non-laryngeal consonants in Japanese, for example, Kawahara proposes the markedness constraint \*SUPRALARYNGEALCWITHV-PLACE – “V-Place is not associated with superlaryngeal consonants.” This analysis does not explain why it is bad for the place features of a vowel to be associated with a superlaryngeal consonant; it essentially just restates the descriptive generalization. As far as we are aware, it has not been shown more generally that a spreading-based analysis of copy epenthesis can derive the typology of blocking effects without resorting to stipulation.

In short, we agree with Kawahara that correspondence-based approaches to copy epenthesis currently lack a satisfactory explanation for the fact that copy epenthesis preferentially occurs across laryngeals or sonorant consonants. But rather than uniquely posing a problem for correspondence-based approaches to copy epenthesis, we believe that this is an open question for theories of copy epenthesis more generally, whether they invoke a correspondence relation or not.

## 5.5 Local summary

This section has reviewed four arguments, provided by Kawahara (2007), that copy epenthesis and reduplication are typologically different from one another. Based on these arguments, Kawahara (2007) concludes that the two processes are also analytically unlike one another: while reduplication involves a correspondence relationship, copy epenthesis is mediated only by spreading.

We have acknowledged that several generalizations discussed by Kawahara are problematic for the approach we have developed in the previous sections: the generalization that copying preferentially applies across more sonorous material seems, in particular, difficult to capture. But we have also shown that, in several cases, Kawahara’s statements regarding the typology of copy epenthesis do not reflect it in its entirety. We have shown that two of Kawahara’s arguments that copy epenthesis must not involve a correspondence relationship – that only vowel copy is attested as a repair to phonotactic constraints, and that length transfer is unattested – are false, and that the existence of these effects thus provides support for the existence of a correspondence relation in copy epenthesis.

Thus we believe that there is sufficient evidence to reject Kawahara’s overall conclusion, and to claim that a correspondence relationship is a necessary part of any successful theory of copy epenthesis. How such a theory will ultimately be able to account for the preferential copy facts discussed in Section 5.4 is a matter we leave for future work.

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<sup>45</sup>See Kumagai (2016) for an alternative analysis that derives directionality from metrical structure.

## 6 Conclusion

This paper has shown that similar classes of prosodic misapplication effects are attested in the domains of both copy epenthesis and reduplication. A summary of the effects discussed in this paper is provided in Table 2 below. These effects provide strong evidence that copy epenthesis must involve a correspondence relation, as argued for by Kitto & de Lacy (1999), and not (or not exclusively) spreading, as argued for by Kawahara (2007). Kawahara’s arguments against a correspondence-based approach to copy epenthesis are, in short, that it overgenerates: one such argument is that a correspondence-based approach to copy epenthesis predicts identity between copy-host pairs for prosodic properties, a class of effects that Kawahara’s survey of copy epenthesis did not uncover. In Section 2, we showed that these effects are attested. Thus, Kawahara’s overgeneration argument, at least on this point, is moot, and indeed reversed, as the spreading-based analysis now undergenerates. As it is difficult to imagine how an analysis that only makes use of spreading could account for the effects observed here, notably including back-copying effects in Scottish Gaelic and Ho-Chunk, their existence stands as an argument strongly in favor of the correspondence-based analysis.

Table 2: Summary of effects observed

<i>Language</i>	<i>Source(s)</i>	<i>Effect</i>	<i>Type of prominence</i>
§2.2: Scottish Gaelic (Barra dialect)	Børgstrom 1937, 1940	blocking duration matching	duration
	Clements 1986		
	Bosch & de Jong 1997		
	Hall 2003		
	Hammond et al. 2014		
§2.3: Selayarese	Mithun & Basri 1986	misapplication of stress	stress/length
	Kitto & de Lacy 1999		
	Broselow 2008		
§2.4: Ho-Chunk	Miner 1979 <i>et seq.</i>	misapplication of stress duration matching nasality matching	stress/pitch duration nasality
	Hale & White Eagle 1980		
	Hall 2003		
§3.1–§3.2: Ngan’gityemerri	Reid 2011	misapplication of stress stress-degree matching	stress stress
§3.3: Diyari	Austin 1981		
§3.4: Indonesian	McCarthy & Cohn 1998	stress-degree matching stress-degree matching	stress stress
	Kenstowicz 1995		

In addition, the proposed structural similarity between copy epenthesis and reduplication (discussed in Section 4, and anticipated by Kitto & de Lacy (1999) and others) helps us understand why the two processes display many of the same effects. We have shown that similar prosodic misapplication effects occur in both copy epenthesis (Section 2) and reduplication (Section 3). If copy epenthesis and reduplication both involve a correspondence relation, then their similarity in this domain is predicted, and it’s also what’s attested. Furthermore, as discussed in Section 4, the similarity between these two processes suggests a motivation for the existence of these correspondence relations: transitive correspondence is a property of the phonological grammar.

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### Appendix: Copy Epenthesis Survey

The table below summarizes the survey of copy epenthesis processes described in Section 2. The survey includes those languages cited in Kawahara's (2007) survey whose sources were available either online or at MIT's Hayden Library, as well as assorted other cases available online. Kawahara distinguishes between cases of "diachronic" and "synchronic" copy epenthesis, and that distinction is recorded here. (The term "Complex Misapplication" refers to instances of misapplication that cannot be explained by standard-issue markedness and faithfulness constraints; see the beginning of Section 2 for discussion.)

<i>Language</i>	<i>Type</i>	<i>Complex Misapplication?</i>	<i>Source(s)</i>
Ho-Chunk	Synchronic	Yes (§2.4)	Miner (1979) <i>et seq.</i> Hale & White Eagle (1980) Hall (2003)
Selayarese	Synchronic	Yes (§2.3)	Mithun & Basri (1986) Kitto & de Lacy (1999) Broselow (2008)
Scottish Gaelic (Barra dialect)	Synchronic	Yes (§2.2)	Børgstrom (1937, 1940) Clements (1986) Bosch & de Jong (1997) Hall (2003) Hammond et al. (2014)
Arabic, Bedouin	Synchronic	None mentioned	McCarthy (1994)
Bardi	Synchronic	None mentioned	Metcalfe (1975) Bowerman (2012)
Capanahua	Synchronic	None mentioned	Safir (1979)
Chamicuro	Synchronic	None mentioned	Parker (2001)
Desano	Synchronic	None mentioned	Miller (1999) de Lima Silva (2012)
East Cushitic	Diachronic	None mentioned	Blevins (2003)
Farsi	Synchronic	None mentioned	Shademan (2002)
Fijian	Synchronic	None mentioned	Kenstowicz (2007) Kumagai (2016)
Finnish, Eastern	Diachronic	None mentioned	Campbell (2013)
Fula	Synchronic	None mentioned	Paradis (1996) Paradis & Prunet (1989)
Futankoo	Synchronic	None mentioned	Paradis & Prunet (1989)
Gadaba	Synchronic	None mentioned	Bhaskararao (1998)
Hebrew	Synchronic	None mentioned	McCarthy (1994)
Hawaiian	Synchronic	None mentioned	Kitto (1997) Kitto & de Lacy (1999)
Iraqw	Synchronic	None mentioned	Rose (1996) Mous (2004)
Japanese	Synchronic	None mentioned	Kawahara (2007)

<i>Language</i>	<i>Type</i>	<i>Complex Misapplication?</i>	<i>Source(s)</i>
Kekchi	Synchronic	None mentioned	Campbell (1974) Hall (2003)
Kinyarwanda	Synchronic	None mentioned	Uffmann (2003)
Kolami	Synchronic	None mentioned	Clements (1991)
Latin, Late	Diachronic	None mentioned	Steriade (1990)
Lenakel	Synchronic	None mentioned	Lynch (1978)
Lettinese	Diachronic	None mentioned	Mills & Grima (1980)
Maga Rukai	Synchronic	None mentioned	de Lacy (2002)
Makah	Synchronic	None mentioned	Werle (2002)
Makassarese	Synchronic	None mentioned	McCarthy & Prince (1994) McCarthy (1998)
Maori	Synchronic	None mentioned	Kitto (1997) Kitto & de Lacy (1999)
Marshallese	Synchronic	None mentioned	Bender (1968)
Mawu	Synchronic	None mentioned	Kenstowicz (2001)
Moa	Diachronic	None mentioned	Mills & Grima (1980)
Mohawk	Synchronic	None mentioned	Postal (1969)
Mono	Synchronic	None mentioned	Olson (2005)
Northern Tiwa (Picuris, Taos)	Synchronic	None mentioned	Nichols (1994)
Ponapean	Synchronic	None mentioned	Rehg & Sohl (1981)
Rennallese	Synchronic	None mentioned	Brasington (1978)
Sardinian	Diachronic	None mentioned	Steriade (1990)
Shona	Synchronic	None mentioned	Uffmann (2003)
Samoaan	Synchronic	None mentioned	Uffmann (2003)
Slavic, Eastern	Diachronic	None mentioned	Steriade (1990)
Somali	Synchronic	None mentioned	Kenstowicz (1994)
Sranan	Synchronic	None mentioned	Uffmann (2003) Alber & Plag (2001)
Tigre	Synchronic	None mentioned	McCarthy (1994) Rose (1996)
Tojolobal	Synchronic	None mentioned	Furbee-Losee (1974) Steriade (1987)
Tunica	Synchronic	None mentioned	Haas (1940)
Welsh	Synchronic	None mentioned	Awbery (2009)
Wolof	Synchronic	None mentioned	Ka (1994)
Yapese	Synchronic	None mentioned	Jensen (1977)
Yoruba	Synchronic	None mentioned	Akinlabi (1993) Nelson (2003)
Yuhup	Synchronic	None mentioned	Lopes & Parker (1999)