Morphological gemination and root augmentation in three Muskogean languages

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December 19, 2002

1. Introduction

It has long been known that Muskogean languages of the southern United States possess a range of radical morphological processes involving apparent internal modification of roots (Sapir 1921). In this paper, I will examine root weight alternations in three of those languages: Alabama, Choctaw, and Koasati.

A study of morphological gemination by Samek-Lodovici (1992) gave a treatment of the Alabama imperfective from a constraint-based perspective. However, the development and expansion of the optimality theory framework (Prince and Smolensky 1993), including the use of generalized alignment constraints (McCarthy and Prince 1993), allows for new insights into these morphological and prosodic issues in Muskogean. Because all three languages under examination are closely related, the phenomena I demonstrate throughout this paper will only differ in subtle ways. However, it is my working assumption that small changes in constraint sets or input specifications can handle these variations.

The discussion both assume and provide additional evidence for the generalization that morphological mora augmentation prefers consonantal gemination over vowel lengthening. Conversely, vowel lengthening is typically the result of prosodic processes (Davis and Ueda 2001). This could be viewed as a type of evidence for the idea of fixed or "universal" constraint rankings across languages. Indeed, other

authors have proposed universal rankings, often for phonetic constraints (cf. Boersma 1998; Dinnsen and O'Connor 2001).

The organization of this paper is as follows. In section 2, I examine the imperfective in Alabama where I establish the basic preference for consonant gemination over vowel lengthening in Muskogean morphological gemination. In section 3, I turn to the imperfective in Koasati, a language closely related to Alabama. However, given the limited data and conflicting generalizations on the Koasati imperfective, I will be unable to reach any conclusions concerning it. Section 4 examines one dialect of Choctaw in which the intensive form of a verb has two realizations – a g-grade and a y-grade. In section 5, I contrast my findings from section 4 with a second Choctaw dialect which only has one intensive form for each verb. For the sake of clarity, I will refer to the second Choctaw dialect as the "hybrid" dialect possessing a "hybrid" y-grade form. The comparison of the intensives in these two dialects presents an interesting contrastive illustration and raises issues of the exact nature of the input within optimality theory. Section 5 concludes the paper.

2. Alabama imperfectives

Alabama is currently spoken by several hundred inhabitants of the Alabama-Coushatta Indian Reservation in Polk County, Texas. Few linguists have actively studied the language, and a dissertation in 1982 (Lupardus) claimed that Alabama was the only Muskogean language not possessing productive stem-internal change. However, examples of radical morphology include gemination of consonants, lengthening of vowels, infixation of segments, affixation of high tone accent, nasalization, and subtraction of morphemes do in fact exist, according to Hardy and Montler (1988a;

1988b). The discussion of Alabama below contains many ideas from an earlier manuscript (Grimes 2002), though some facts have been reanalyzed and only relevant discussion is included.

2.1 Alabama Imperfective Data

The Alabama imperfective can be analyzed as mora augmentation in which either consonant gemination or vowel lengthening takes place. The present study constitutes a reanalysis of the morphophonology of the Alabama imperfective form, described in detail by Hardy and Montler (1988a) and also addressed in Lombardi and McCarthy(1991).

The imperfective aspect of an Alabama word is based on its perfective form and is obtained by adding both weight and prominence (high tone) to the stem. In the first group of examples in (1) from Hardy and Montler (1988a), the added syllable weight results in the gemination of the onset of the penultimate syllable. Periods indicate syllable boundaries.

(1)		Perfective	Imperfective	Gloss
	a.	ci.pii.la	cíp.pii.la	small
	b.	ho.co.ba	hóc.co.ba	big
	c.	mi.sii.li	mís.sii.li	close eyes
	d.	a.taa.nap.li	a.tán.nap.li[1]	rancid

The crucial generalization concerning the data in (1) is that the penultimate syllable is open. Note that in (1d) the vowel of the antepenultimate syllable is long, but this does

[1] This example is taken from personal communication between Samek-Lodovici and Montler, cited in Samek-Lodovici (1992).

not prevent gemination from taking place. A trimoraic syllable does not result, however – syllable weight is maintained by shortening the long vowel.[2]

In contrast, when a bimoraic antepenultimate syllable is closed by a consonant, gemination is blocked. The data in (2) show that when the antepenultimate syllable is closed or when the word is disyllabic, the result is the lengthening of the vowel of the penultimate syllable.

(2)

	Perfective	Imperfective	Gloss
a.	i.bak.pi.la	i.bak.píi.la	turn upside down
b.	i.si	íi.si	catch
c.	hof.na	hóof.na	smell
d.	is.ko	íis.ko	drink

Note that the example *ho.co.ba* (1b), which has the imperfective form *hóc.co.ba,* contains both an open antepenultimate syllable and a short penultimate vowel. This form crucially illustrates that onset gemination is preferred over vowel lengthening as a strategy for realizing the imperfective morpheme. I summarize the data in (1) and (2) by giving a descriptive generalization accounting for the observed alternations in (3).

(3) a. If the antepenultimate syllable is open, then the onset of the penultimate syllable is geminated.
b. If the antepenultimate syllable is closed (or the word has only two syllables), then the vowel of the penultimate syllable is lengthened.

In each of the cases in (1) and (2), the location of the accompanying high tone is predictable. Linked to the augmented mora, the high tone appears on the first vocalic peak to the left of the geminated segment.

[2] It may be the case that the example given in (1d) has an underlying short vowel in the penultimate syllable that has underwent iambic lengthening in the base/perfective form. It is not clear whether Alabama has underlyingly long vowels, or whether all surface long vowels are the result of lengthening, as in Choctaw.

2.2 Optimality theoretic analysis of Alabama imperfectives

This analysis will differ from previous analyses (Hardy and Montler 1988a; Samek-Lodovici 1992) in that I assume that in the input the imperfective mora (μ_i) is standing at the right edge of the word. In a previous paper (Grimes 2002), I formalized alignment constraints to predict exactly where the mora should be realized. I no longer view the exact details of that discussion as essential; furthermore there is evidence in Choctaw that other prosodic facts may be relevant. For now, I will only note that the imperfective form never realizes weight in the final syllable, and this is a result of a highly ranked constraint in Alabama requiring that the identity of segments standing in the final syllable be preserved[3], especially with regard to weight. A potential version of this constraint is articulated in (4).

(4) IDENT-(FINALσ) – Let α be a segment in the base, and β be a correspondent in the output form. If α is a segment in the final syllable of the base, then α and β must agree in their feature specifications.

The constraint in (4) predicts that the final vowel of a word is not subject to iambic lengthening, nor can the onset of the final syllable geminate[4]. The constraint is

[3] Research in the Muskogean language family shows that, historically, the final syllable of Alabama words was a suffix. This insight provides a diachronic explanation of why the mora surfaces close to the right edge, but never *at* the right edge of a word. However, child language learners are not familiar with the history of the Alabama language; hence, the learner must adopt some type of constraint in order to preserve the integrity of the final syllable. In section 4, however, I offer another explanation.

[4] In some ways, I view discussion of the exact details of the constraint in (5) as being outside the scope of the current paper. However, I briefly want to explain how I see the constraint working. Consider the tableau for the word for 'catch'.

/isi/ → [ii.si] 'catch'

Input: /isi + μ_i / Base: [i.si]	IDENT-(FINALσ)	ALIGN-R
a. i.sii	*!	
b. is.si	*!	
c. ☞ ii.si		*

IDENT-BA(FINALσ) >> ALIGN-R

(continued on next page)

reminiscent of a NON-FINALITY or extrametricality (Liberman and Prince 1977) constraint for metrical stress theory in which stress placement rules seem to disregard final segments or syllables. This topic will be taken up in greater detail in the Choctaw discussion, in part due to the fact that more is known about Choctaw phonology and stress.

Consider the two constraints in (5) governing segment weight.

(5) a. IDENT-WT-VOWEL – An output vowel segment has the same moraic weight as its input correspondent.
b. *GEM – An output consonant shall not be a geminate.

While I have formulated one as a markedness constraint and the other as a faithfulness constraint, the two constraints in (5) are intended to be viewed as parallel in some sense. The interaction between IDENT-WT-VOWEL and *GEM is crucial. To obtain the result that the imperfective mora prefers to be realized further to the left of the right edge of the word, IDENT-WT-VOWEL is ranked over *GEM, as demonstrated in the tableau in (6).

(6) /hocoba/ → [hoc.co.ba] 'big'

Input: /hocoba + μ_i/ Base: [ho.co.ba]	IDENT-WT-VOWEL	*GEM
a. ho.coo.ba	*!	
b. ☞ hoc.co.ba		*

IDENT-WT-VOWEL >> *GEM

The above tableau crucially shows that gemination is indeed preferred over vowel lengthening to realize the imperfective mora and hence account for predictions for the data in (1).

Both candidates (a) and (b) fatally violated the IDENT-(FINALσ) constraint because a mora has linked to a segment standing in the final syllable.

In order for vowel lengthening to occur, the base form must consist of two syllables or have its antepenultimate syllable closed by a consonant. In both cases, the two markedness constraints, *COMPLEX and *μμμ-σ, seem to be at odds with one another. These constraints are formulated in (7).

(7) a. *μμμ-σ – Trimoraic syllables are not permitted.
b. *COMPLEX – No tautosyllabic geminates or consonant clusters.

*COMPLEX prevents output containing either a complex onset or a complex coda, and, as evidenced by the lack of triconsonantal clusters, is undominated. The μμμ-σ constraint is violated at the expense of *COMPLEX, as shown in below.

(8) /hof.na/ → [hoof.na] 'smell'

Input: /hofna + μ_i / Base: [hof.na]	*COMPLEX	*μμμ-σ
a. hoff.na	*!	
b. ☞ hoof.na		*
c. hhof.na	*!	

* COMPLEX >> μμμ-σ

Even thought *μμμ-σ is dominated by *COMPLEX, it is very much active in Alabama. The tableau in (9) has a base form of the input in which the penultimate and antepenultimate syllables are bimoraic, thus making the realization of the imperfective mora "a bit more difficult." In this case, however, both *μμμ-σ and the imperfective mora realization constraint MAX-μ_i are respected. Instead, the vowel in the input is shortened. This is considered a violation of IDENT-WT-VOWEL.

(9) /ataanapli/ → [a.tan.nap.li] 'rancid'

Input: /ataanapli + μ_i / Base: [a.taa.nap.li]	MAX-μ_i	*μμμ-σ	IDENT-WT-VOWEL	*GEM
a a.taa.nap.li	*!			
b. a.taa.naap.li		*!	*	
c. a.taan.nap.li		*!		*
d. ☞ a.tan.nap.li			*	*

MAX-μ_i , *μμμ-σ >> IDENT-WT-VOWEL >> *GEM

It could be reasonable to assume that when onset gemination is prevented in the penultimate syllable, perhaps gemination of the antepenultimate onset would be possible. We see in (10), however, that this is not the case – vowel lengthening is preferred. This points to the fact that the imperfective mora seems to have a targeted point of realization. Whether this is due to a constraint such as Align-Right-μ_i or if the location of the mora is specified in the input is not clear. This discussion will be taken up again with respect to the Choctaw intensives.

(10) /ibakpila / → [i.bak.pi.la] 'turn upside down'

Input: /ibakpila + μ_i / Base: [i.bak.pi.la]	*COMPLEX	ALIGN-R?	IDENT-WT-VOWEL	*GEM
a i.bakp.pi.la	*!	*		*
b. ib.bak.pi.la		**!		*
d. ☞ i.bak.pii.la		*	*	

*COMPLEX, ALIGN-R >> IDENT-WT-VOWEL >> *GEM

2.3 Summary of Alabama imperfectives

Relatively few key constraints seem to be involved in producing the observed alternations, making this analysis rather straightforward and natural. The ranking of IDENT-WT-VOWEL over *GEM was able to account for preference for the Alabama imperfective mora to attach to a consonantal segment. In the following sections, this analysis will need to be refined slightly and some new constraints will be added.

However, the alternations in Alabama serve as a good basis for comparing other mora augmentation processes in Muskogean languages.

3. Koasati imperfectives

The Koasati (Louisiana Coushatta) language is very closely related to Alabama and according to Haas (1941) they were at that time "to some extent mutually intelligible."

The data on the Koasati imperfective are from Kimball (1986; 1991) and are nearly the same as the Alabama imperfectives. The only difference appear to be that there is always prosodically conditioned vowel lengthening in the penultimate syllable of the root, as long as that would not create a trimoraic syllable. However, Kimball (1991, p.296) makes the following problematic statement concerning the imperfective form[5]:

(11) "If the consonant beginning the penultimate syllable is word-initial or the member of a consonant cluster, the vowel of the penultimate syllable is lengthened, if it is not already long. If the syllable is already long, then the initial consonant of the penultimate syllable is geminated."

This statement is certainly problematic to interpret, and we are only left guessing what he intended to say. Geminates do not co-occur with other consonants nor are there word-initial geminates. Unfortunately, the representative data that is given is limited to what I show below in (12), so the mystery remains unsolved. The example in (12a) is the only example we have of an imperfective form in which only the vowel lengthens.

(12)

	Base	Imperfective	Gloss
a.	cipli	ciipli	'she's now stripping cane'
b.	hoponi	hoppooni	'she's now cooking'
c.	atakka	attakka	'they are hanging'

[5] Kimball (1986) does not address the imperfect form.

Kimball goes on to make another intriguing statement. "Verbs with basic geminate or heterogeneous clusters at the boundary of the penultimate syllable lengthen the antepenultimate vowel." Unfortunately, no data is given to exemplify this statement, which if it turned out to be true would be quite interesting, given the lack of antepenultimate vowel lengthening found in Alabama and Choctaw stem-internal processes.

Setting aside Kimball's comments and only examining the data, it appears as though the Koasati imperfective is identical to the Choctaw g-grade discussed in the following section. As such, I will defer any attempt at an analysis until later in the paper, when the analysis I believe to be correct will be better motivated. For the moment, the Koasati imperfective remains a mystery, but I present it here to exemplify a process that is cognate to Alabama's imperfective and yet also similar to the Choctaw g-grade.

4. Choctaw intensives: g-grade and y-grade

Verbs in Choctaw are subject to radical morphological operations that include infixation, gemination, and stem truncation. In one Choctaw dialect, as described by Ulrich (1986; 1994), intensives can have two forms: a g-grade ('g' means geminate) and y-grade (y-glide insertion). Nicklas (1974; 1975) describes another dialect of Choctaw in which an intensive has only one realization – he calls this the y-grade also, but his "hybrid" version of the y-grade can be seen as more of a collapsing of Ulrich's g- and y-grades. Note that while the g-grade and y-grade forms in Choctaw have identical "intensive" meanings, in

the related language of Chickasaw[6], the meanings are similar but remain distinct (Ulrich 1994). I will discuss each dialect in turn and present an analysis for each.

4.1 Dialect of Choctaw with two intensive forms

The data in (13) below are from Ulrich (1986; 1987). The y-grade form of the intensive always involves the gemination of an inserted glide followed by a lengthened penultimate vowel if the syllable is not closed by a consonant. The g-grade form of the intensive is rather more similar to the Alabama and Koasati imperfectives.

		shape	UR	g-grade	y-grade	gloss
(13)	a.	LLL	/kobafa/	kobbaafa	kobayyaafa	'to break'
	b.	LHL	/talakči/	tallakči	talayyakči	'to be tied'
	c.	LL	/ona/	oona	oyyoona	'to arrive there'
	d.	HL	/tahli/	taahli	tayyahli	'to finish'
	e.	HLL	/toksali/	toksaali	toksayyaali	'to work'
	f.	HHL	/oktabli/	oktaabli	oktayyabli	'to dam up'

The only difference between the Alabama imperfective and the Choctaw g-grade involves the length of the penultimate vowel in words of the form given in (13a), and presumably the Koasati imperfective and Choctaw g-grade are identical. In Choctaw, the intensive is always followed by a lengthened vowel in the penultimate syllable if that syllable is not closed by a consonant.

4.2 Metrical Stress in Choctaw

Understanding the role of foot structure and iambic lengthening is crucial to interpreting the alternations exhibited in the Choctaw intensive. The following discussion of stress and iambic lengthening applies to both Choctaw dialects described in this paper[7]. In the

[6] Choctaw and Chickasaw constitute one branch of Muskogean, while Alabama and Koasati constitute a separate branch.

[7] It would be interesting to find out what the situations are in Alabama and Koasati concerning alternate lengthening, but I know of no description of stress given for these languages.

framework of Hayes (1995), metrical stress in Choctaw can be described as parsing iambic feet from left to right. The final syllable is always extrametrical, and the degenerate feet are apparently allowed.

Choctaw has an interesting rule of iambic lengthening (Nicklas 1974, 1975; Munro and Urlich 1984; Ulrich 1986). Iambic lengthening serves to make the second syllable of a foot more perceptually salient. Iambic lengthening of the final syllable is blocked, likely due either to extraprosodicity of the final syllable or a constraint against long final vowels. Data showing the full effect of iambic lengthening are given in (14), where every non-final even numbered syllable is lengthened.

(14)

habiina	pisa[8]
čihaabina	čipiisa
habiinali	pisaali
čihaabinaali	čipiisali
habiinači	pisaači
čihaabinaači	čipiisači
habiinačiili	pisaačili
	čipiisačiili

Iambic lengthening does not apply to monosyllabic degenerate feet, as this would not have the intended result of iambic lengthening, which is to make the second syllable more salient. Also, closed syllables are heavy and can form monosyllabic iambs, and hence they interrupt the parity count. The typical environment for iambic lengthening converts feet of the form LL to LH.

The following constraints govern metrical structure and iambic lengthening:

[8] Note that in Choctaw word-level prominence is assigned independent of the foot structure. Hence it is not problematic for a word to not undergo any lengthening; this does not mean it is not a prosodic word.

(15) NON-FINALITY: No foot is final in the prosodic word.
NON-INITIAL: Do not lengthen the initial syllable of an iamb.
PARSE-SYLL: Every syllable is dominated by some foot.
FT-BIN: Feet are binary.
*CLASH: No two heavy syllables are adjacent[9].
GRWD=PRWD: A grammatical word must be a prosodic word.

The metrical constraints interact to produce the following representations for base (non intensive) forms.

(16) Prosodic representation of a base (non y-grade) form (data from 13e)

/toksali/	NON-FINALITY	*CLASH	FT-BIN	PARSE-SYLL
a.(tok)(sali)	*!			
b.(tok)(sa)li			*!	*
c.(tok)(saa)li		*!		*
☞ d.(tok)sali				**!

In shorter forms of words, FT-BIN is violated to create a degenerate syllable, as the following tableau in (17) demonstrates.

(17) Prosodic representation of a base (non y-grade) form (data from 13c)

/toksali/	NON-FINALITY	GRWD=PRWD	NON-INITIAL	FT-BIN	PARSE-SYLL
a. ona		*!			**
b.(ona)	*!				
c. (oo)na			*!		*
☞ d. (o)na				*	*

The prosodic representations of the base forms of the intensives will be crucial in understanding the y-grade and g-grade alternations.

3.3 Analysis of y-grade and g-grade intensives

Several previous analyses (Lombardi and McCarthy 1991; Hammond 1993; Ulrich 1994) of the y-grade alternations have been couched in the theory of Prosodic Circumscription (McCarthy and Prince 1990). Prosodic Circumscription is absent from current

[9] Other researchers have proposed a constraint called Rhythm to ensure syllables alternate in weight.

phonological frameworks, in part due to excessive power in predicting morphological operations that are not attested crosslinguistically. Previous analyses also suffered from the need to appeal to unique morphological foot structures otherwise not attested in the metrical foot structure of the language.

In this analysis, we find that a constraint is active in Choctaw that was not observed in Alabama. This constraint, in (18), requires that a foot is aligned with the left edge of the intensive mora. The alignment of a degenerate foot does not suffice.

(18) ALIGN(μ_I,L,Ft,L): Align the left edge of the intensive mora with a binary foot.

Some may question the need for or the motivation of such a constraint. This constraint simply requires that the intensive form be located in some prosodic foot of the word[10]. This then offers an alternative reason for why the intensive never results in the gemination of the onset of the final syllable – the final syllable is always extrametrical, so under that scenario the intensive mora would not be realized in a prosodic foot. In words with closed penultimate syllables, vowel lengthening is not necessary to satisfy ALIGN-μ_I, as the syllable would already be heavy and hence constitute a permissible iamb.
The tableau in (19) shows the interaction of ALIGN-μ_I.

(19) Vowel lengthening always takes place in the penultimate syllable.

/kobafa + μ_I/	NON-FINALITY	ALIGN-μ_I	FT-BIN	PARSE-SYLL
☞ a. (kob)(baa)fa				*
b. (kob)(ba)fa		*!	*	*
c. (kob)(bafa)	*!			

[10] The intensive can be said to be located in the penultimate syllable if we assume the geminate occupies a single root node in the onset.

To complete the story of the g-grade and y-grade, something must be said about what exactly the input to the y-grade is. I will assume that the input to the y-grade in this dialect is a geminate glide, which we can consider to be aligned at the right edge of the word (it doesn't really matter, so for consistency with other stem alternations I will continue this assumption). The following realizations would thus be possible for the input /kobofa + y-μ_I/ → [koboyyoofa]:

(20) a. koboyyfa
b. kobyyoofa
c. kobyoofa
d. koyyoofa

The form in (20c) would seem possible, since the typical resolution of a sequence of three consonants is the deletion of the medial consonant. This, however, is bad, given that it deletes part of the morpheme that we are attempting to realize. I will consider the constraint prohibiting this to be called MAX-INTENSIVE. The forms in (20a) and (20b) are impermissible as they violate the phonotactics of the language. The last option, in (20d) is presumably less faithful than the winning candidate in which a harmonic vowel is inserted.

The following candidate sets presented in a single tableau in (21) give "minimal pairs" accounting for the difference between the y-grade and g-grade forms.

(21)

	MAX-INTENSIVE	ALIGN-μ_I	IDENT-WT-VOWEL[11]	*GEM	DEP-V
/kobofa + y-μ_I/					
a. kobyoofa	*!				
b. koboyoofa	*!		*		*
c. koboyyofa		*!		*	*
☞ d. koboyyoofa				*	*
/kobofa + μ_I/					
e. kobbofa		*!		*	
f. koboofa			*!		
☞ g. kobboofa					

As desired, one constraint ranking accounts for both the g-grade and y-grade forms. The only difference between the two, which have identical meaning, is what the speaker takes to be the underlying form. This is an important result that supports the notion richness of the base within optimality theory. Furthermore, it demonstrates that variation in grammar can arise not only through equally-ranked or variably-ranked constraints (Anttila 1997), but also through situations where the input is ambiguous.

4 Choctaw intensive: the hybrid y-grade

Given that we have seen the Choctaw dialect in which two forms of the intensive exist with the same meaning, it is not surprising to see that in one dialect the two forms have collapsed into a single form. While in Chickasaw the g-grade and y-grade had different meanings, in Choctaw this distinction was lost. It was only natural that the next stage of the evolutionary process would be reduction to a single form. However, neither the g-grade nor the y-grade was selected, but rather a hybrid combination of the two resulted.

[11] Presumably IDENT-WT-VOWEL assesses violations only to those candidates in which the vowel has lengthened due to the additional of a morphological mora, such as the intensive. Vowel lengthening that occurs in candidates as a result of prosody in (25a,b,d,g) presumably does not violate this constraint. A separate WT-IDENT-VOWEL and *GEM pair of constraints presumably are active in prosodic lengthening, where the preference is for vowel lengthening.

4.1 Hybrid y-grade data

The data below are from Nicklas (1974; 1975).

		UR	base	y-grade	Gloss	Form of base
(22)	a.	/talakči/	ta.lak.či	tál.lak.či	'to be tied'	LHL
	b.	/binili/	bi.nii.li	bín.nii.li	'to sit'	LLL
	c.	/takči/	tak.či	táy.yak.či	'to tie'	HL
	d.	/pisa/	pi.sa	píy.yii.sa	'to see'	LL
	e.	/oktabli/	ok.tab.li	ok.táy.yab.li	'to dam up'	HHL
	f.	/toksali/	tok.sa.li	tok.sáy.yaa.li	'to work'	HLL

The generalizations concerning the formation of the (hybrid) y-grade in (22) are as follows. If the antepenultimate syllable is light (22a-b), an existing consonant, the penultimate onset, is geminated. This is similar to the g-grade in the first dialect. Otherwise (22c-f) a geminate glide is inserted, similar to the y-grade of the first dialect. In both dialects, the output of the y-grade always consists of a heavy antepenultimate, heavy penultimate sequence. A high tone associated with the y-grade always appears on the vocalic nucleus of the antepenultimate syllable. The placement of the high tone is the same as in Alabama and is not discussed further in this paper.

4.2 Analysis of hybrid y-grade

The point of departure for this present analysis will be that y-grade gemination in this dialect results from the augmentation of a single mora at the right edge of the word. I will be assuming that the mora is prespecified as consonantal. We make the observation here that the hybrid y-grade is in fact an optimal alternative combining the best features of the g-grade and y-grade. The y-grade of the first dialect was good because the intensive aspect mora was always realized on a consonant; this is something that we project should be the default preference cross-linguistically. However, the y-grade from

the first dialect introduced unnecessary violations of faithfulness constraints through insertion. In that respect, the g-grade was always more faithful to the base form, yet did not respect the generalization concerning consonant gemination because it used vowel lengthening as an alternation. Seen in this light, the resolution of the ambiguity in the input was quite elegant, with each member of the paradigm being as optimal as possible with respect to the constraint ranking.

I would like to note there is an alternative analysis available here that I will choose not to pursue. Suppose momentarily that the mora is not specified as consonantal. Without a reranking of constraints, this would simply result in the Choctaw g-grade form from the other dialect. However, because we are dealing with a separate dialect, speakers presumably have a slightly different ranking of relevant constraints. However we might not be dealing with two entirely different dialects, but rather variation amongst communities in intensive forms. It may not be wise to alter constraint rankings when not motivated to do so by independent phenomena; there could be unintended side-effects elsewhere in the language.

In stating that I intend to assume that the input contains a mora specified as consonantal, I have all but sketched out the analysis I intend to give. It proceeds as follows. Recall that when the antepenultimate syllable is open/light[12] in the (hybrid) y-grade, gemination of the penultimate onset takes place. The tableau demonstrates how the appropriate candidate would be selected.

(23) /binili + $\mu_{I\text{-}C}$/ → [binniili]

/binili + $\mu_{I\text{-}C}$/	*Complex	Align-μ_I	Dep-C	Dep-V	*Gem
☞ a. binniili					*
b. biniyyiili			*!	*	*

[12] There do not appear to be any underlyingly long vowels in Choctaw.

Note that a candidate such as [biniili] is not considered, as the consonantal mora here is realized on the vowel, violating a (likely very high ranked) constraint preventing consonantal moras from being realized on vowels.

In the tableau in (24), we see why forms with a disyllabic base or heavy antepenultimate syllable insert a glide – to avoid a violation of *Complex.

(24) /pisa + $\mu_{I\text{-}C}$/ → [piyyiisa]

/pisa + $\mu_{I\text{-}C}$/	*Complex	Align-μ_I	Dep-C	Dep-V	*Gem
a. ppiisa	*!				*
☞ b. piyyiisa			*	*	*

At this point, the careful reader might realize that I have not considered a potential candidate in (24). Why would a candidate such as [ippiisa] not be selected? It apparently violates a subset of constraints that the winning candidate violates because it does not insert a consonant, just a vowel. I have a potential answers to this. First, vowel insertion at prominent positions in the word, such as word-initially, is generally undesirable. However, this is not an adequate answer because it doesn't explain why [oktabli + $\mu_{I\text{-}C}$/ is realized as [oktayyabli] and not [okattabli]. What may also be true is that insertion at prominent places within a foot, that is, at the left or right edge of a foot, may also be bad. This schematized in (25).

(25)

Base	Winning Candidate	Failed Candidate
(pi)sa	(piy)(yii)sa	(ip)(pii)sa
(ok)(tab)li	(ok)(tay)(yab)li	(ok)(at)(tab)li

The failed candidates all have vowel insertion at the left edge of a foot. The winning candidates have vowel and consonant insertion, but foot internally.

5. Conclusion

I have examined morphological mora augmentation processes in three different Muskogean languages. The facts concerning Koasati were not clear and I was not able to present any cogent analysis of the imperfective in that language. However, if the facts are as I assume, that is, that the Koasati imperfective is the same as the Choctaw g-grade, in some sense this would provide a link between the two alternations examined in Alabama and Choctaw.

The analysis given for the Choctaw data accomplishes a goal of prosodic morphology, which is the elimination of stipulative constraints. I was able to propose an analysis in which vowel lengthening in Choctaw (and presumably Koasati) results not directly from the intensive morpheme (or imperfective morpheme), but rather as a result of independently motivated constraints on foot and prosodic structure. By proposing that the hybrid y-grade morpheme in the second Choctaw dialect is a single consonantal mora, I have given a unified account of when glide insertion is predicted. I have shown that secondary vowel lengthening is not in fact part of the y-grade morpheme, but instead results from general language constraints on metrical parsing, similar to the findings of Lombardi and McCarthy (1991).

I have by no means looked at all stem internal modifications present in these three languages, nor have I examined all mora augmentations processes in Muskogean. If I were to examine other, more varied languages, I might be able to find further support for the claim of Davis and Ueda concerning the preference for gemination morphological mora augmentation versus prosodic lengthening. However, by focusing on related

processes in Muskogean, I have shown that slight nuances in constraint rankings and input can produce interesting alternations.

Perhaps most interestingly, I gave a unified treatment of two dialects of Choctaw intensives. I proposed that the historical convergence of the g-grade and y-grade into a single intensive meaning motivated the merging of two forms into a single morpheme. The resulting morpheme respected the existing constraint ranking so as to be optimized with respect to it.

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