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Comparing Hiatus Resolution in Karanga and Nambya: An Optimality Theory Account

Calisto MUDZINGWA
University of British Columbia, Canada
and
Maxwell KADENGE
University of the Witwatersrand, South Africa

ABSTRACT

This article compares three hiatus resolution strategies, viz., glide formation, secondary articulation and vowel elision in Karanga and Nambya, two southern Bantu languages spoken in Zimbabwe. The overall analysis is couched in Optimality Theory (hereafter OT). The strategies operate across a prefix and a stem as well as across a nominal stem and a diminutive suffix. In both languages, glide formation is the default strategy and when blocked by phonotactic constraints, secondary articulation kicks in. In turn, when secondary articulation is blocked by OCP-driven constraints, V_1 elision occurs. The main inter-language difference occurs when V_1 is a coronal vowel and is preceded by a consonant; Karanga deletes V_1 regardless of the quality of the preceding consonant because it does not allow palatalized consonants. In contrast, Nambya which allows some palatalized consonants employs secondary articulation with all other consonants except when the preceding consonant is palatal–where V_1 is elided. In sum, in Karanga and Nambya, the quality of V_1 and whether it is preceded by a consonant or not as well as the type of consonant preceding it determine which strategy between glide formation, secondary articulation and elision repairs the dispreferred configuration-hiatus.

Keywords: *Shona, Nambya, hiatus resolution, OT, constraint.*

1. INTRODUCTION

The study of hiatus resolution has been a subject of considerable theoretical and empirical discussion and it has generally been observed that hiatus is a dispreferred configuration in many languages of the world. There are cross-linguistic variations on when and how hiatus is resolved and the most common repair strategies are glide formation, vowel coalescence, secondary articulation, consonant epenthesis and vowel deletion (Myers 1987; Casali 1996; Rosenthall 1997; Mtenje 2007; Sibanda 2009).

The goal of this article is to compare three hiatus resolution strategies in two southern Bantu languages, namely Karanga, a dialect of Shona and Nambya. The paper describes and provides a formal analysis of glide formation, secondary articulation and elision, examining when and why one hiatus resolution strategy is chosen over the others. Glide formation, secondary articulation and elision operate in the same morphological environment-within nominals. By nominals, we refer to nouns, adjectives, quantitatives and pronominal possessives. Specifically, glide-formation, secondary articulation and elision operate in two contexts: across a class prefix and a nominal stem, and across a noun or adjectival stem and a diminutive suffix. It is noteworthy that although glide formation, vowel elision, secondary articulation, consonant epenthesis and vowel coalescence are robust and productive in Karanga and Nambya, they do not apply in every construction. For example, in Shona, in verbs and across a host-clitic boundary hiatus is resolved through spreading and vowel coalescence respectively (Mudzingwa 2010). It is beyond the scope of this article to examine all the morphosyntatic domains and hiatus resolution strategies used in Karanga and Nambya, hence our focus on glide formation, secondary articulation and elision

Examples (1)–(3) and (4)–(6) show hiatus across a prefix and a nominal stem in Karanga and Nambya respectively. Example (1) shows hiatus across a noun class prefix and a noun stem; (2) across a quantitative prefix and a quantitative stem; (3) across a possessive prefix and a possessive pronominal stem. Henceforth, in examples with two words, the word in italics is the one that contains hiatus. All the Karanga and Nambya examples that are presented in this article are taken from Mudzingwa (2010) and Kadenge (2008) respectively.

- **Karanga**

(1) /rù-ánà/ [r^{w}ánà]
CL11.SG.DEROG-child
'sickly child'

(2) /mù-tí *ù-òsè*/ [mùtí *wòsè*]
CL3SG.-tree CL3.SG-whole
'the whole tree'

(3) /mù-tí *ù-á^{ŋ}gú*/ [mùtí *wá^{ŋ}gú*]
CL3SG.-tree CL3.SG-mine
'my tree'

Examples (4), (5) and (6) show hiatus in Nambya. Example (4) shows hiatus across a noun class prefix and a noun stem; (5) across a quantitative prefix and a quantitative stem; (6) across a possessive prefix and a possessive pronominal stem; (7) and (8) across a noun stem and a diminutive suffix and (9), (10), (11) and (12) show how hiatus is resolved differently in Karanga and Nambya in the same morphosyntatic contexts.

- **Nambya**

(4) /mù-ánà / [mʷánà]
CL1.SG-child
‘ child’

(5) /ì-wì *ù-òg̤à*/ [ìwì *wòg̤à*]
STAB-2SG PRON CL2.SG-alone
‘you alone’

(6) /ìᵐpʷé *ì-éḓ̤ù*/ [ìᵐpʷé *jéḓ̤ù*]
CL9.SG-sweet reed CL9.SG.-ours
‘our sweet reed’

In nominals, hiatus occurs across a noun stem and a diminutive suffix /-àná/. In the class of nominals, only nouns can be suffixed with the diminutive suffix /-àná/. Examples 7(b) shows suffixation of the diminutive suffix /-àná/ to a noun in Karanga, and 8(b) in Nambya.

- **Karanga**

(7) a. /Ø-ᵐbúdᶻí/ [ᵐbúdᶻí]
CL9.SG-goat
‘goats’

b. /Ø-ᵐbúdᶻí-àná/ [ᵐbúdᶻáná]
CL9.SG-goat-DIMIN.
‘kid’

- **Nambya**

(8) a. /ìᵐbúḓ̤ʒí / [ìᵐbúḓ̤ʒí]
CL9.SG-goat
‘goat’

b. /ìᵐbúḓ̤ʒí-àná/ [ìᵐbúḓ̤ʒàná]
CL9.SG-goat-DIMIN.
‘kid’

Examples (9) and (10) below show that Karanga deletes [i] when it is V_1 and is preceded by a consonant and examples (11) and (12) show that in the same morphosyntatic and phonological contexts Nambya palatalizes the [i].

- **Karanga**

(9) /mì-òjò/ [mòjò]
CL4.SG-heart
'hearts'

(10) /rì-á^{ŋ}gù/ [rá^{ŋ}gù]
'CL5.SG-mine'
'mine'

- **Nambya**

(11) /mì-òjò/ [m^{j}òjò]
CL4.SG-heart
'hearts'

(12) /lì-á^{ŋ}gù/ [l^{j}á^{ŋ}gù]
'CL5.SG-mine'
'mine'

In OT terms, this typological variation is a consequence of different rankings of constraints (Rosenthal 1997; Prince and Smolensky 2004). This article, therefore, seeks to demonstrate the effects of the different constraint rankings in Karanga and Nambya. This paper is organized as follows: §2 provides the Karanga and Nambya phonemic inventories as background to the analysis; §3 describes and provides a formal analysis of glide formation, secondary articulation and elision; §4 is the conclusion.

2. KARANGA AND NAMBYA PHONEMIC INVENTORIES

This section presents Karanga and Nambya phonemic inventories as background to the analysis. The first major section describes the Karanga and Nambya vowels. The second major section that describes the Karanga and Nambya consonants is divided into two sub-sections, viz., simple consonants and complex consonants.

2.1 KARANGA AND NAMBYA VOWELS

Karanga and Nambya share a simple vowel system comprising five short oral vowels, /i e a u o/. All Karanga and Nambya vowels are produced with modal voice. In Table 1, we provide the Karanga and Nambya vowels and the features we assume for each of the vowels.

	/i/	/e/	/u/	/o/	/a/
[coronal]	✓	✓			
[labial]			✓	✓	
[pharyngeal]					✓
[open]		✓		✓	✓

Table 1. *Karanga and Nambya vowel features*.

We adopt Clements and Hume's (1995) feature system from their Unified Feature Geometry (henceforth UFG). In this feature system, front vowels [i] and [e] are [coronal]; back rounded vowels [o] and [u] are [labial]; the low vowel [a] is [pharyngeal]. Following Hayward and Hayward (1989), McCarthy (1988), Lombardi (2002) among others, we use the feature [pharyngeal] for the low vowel [a], and this is crucial for our analysis. We employ Clements' (1989) privative feature [open], for the aperture. The high vowels [i] and [u] lack the feature [open] and the vowels traditionally considered [-high], namely, [a e o], are [open].

2.2 KARANGA AND NAMBYA CONSONANT INVENTORIES

Based on their articulation, Karanga and Nambya consonant phonemes are divided into simple and complex segments (Fortune 1984; Mkanganwi 1995; Pongweni 1990; Kadenge 2008): simple consonants are articulated with a constriction at one point in the oral cavity whereas complex consonants are produced with more than one constriction in the oral cavity.

2.2.1 Karanga Simple Consonants

Table 2 below contains the simple consonants in Karanga.

	Labial	Alveolar	Palatal	Velar	Glottal
voiceless stops	p	t		k	
breathy voiced stops	b̤	d̤		g̤	
implosives	ɓ	ɗ			
voiced nasals	m	n	ɲ	ŋ	
breathy voiced nasals	m̤	n̤			
voiceless fricatives	f	s	ʃ		
voiced fricatives		z	ʒ		
breathy voiced fricatives	v̤				ɦ̤
voiceless 'whistling' fricative		s̫			
voiced 'whistling' fricative		z̫			
approximants	ʋ		j	w	
trill		r			

Table 2. *Karanga simple consonants* (Fortune 1984: 128).

Karanga, like all the other Shona dialects, makes use of a three-way laryngeal distinction amongst obstruents: modal voice, voicelessness and breathy voice. Among nasals, it employs a two-way distinction: modal voice versus breathy voice. Phonologically, all the simply articulated segments are realized as single consonant onsets, giving rise to the consonant vowel (CV) syllable type.

2.2.2 Karanga Complex Consonants

We adopt Sommerstein's (1977: 104) definition of complexity, which says, 'a complex segment is a segment which, for at least one feature [type], has two or more specifications.' Table 3 below provides complex consonants in Karanga.

	Labial	Alveolar	Palatal	Velar
affricates	p^{f} b^{v}	t^{s} d^{z}	ʧ $d̤^{ʒ}$	
labialized affricates		$t^{ȿ}$ $d^{ɀ}$		
prenasalised plosives	^{m}b	^{n}d		^{ŋ}g
prenasalized fricatives	m^{v}	n^{z}		
labialized prenasalized fricatives	$^{n}ɀ$			
velarized plosives	p^{w} b^{w}	t^{w}		k^{w} g^{w}
velarized trill		r^{w}		
velarized fricative				$ɦ^{w}$
velarized nasals	m^{w}	n^{w}		
prenasalized velarized plosives	$^{m}b^{w}$			$^{ŋ}g^{w}$
prenasalized velarized fricative		$^{n}z^{w}$		

Table 3. *Karanga complex consonants* (Mkanganwi 1995: 28).

We consider the labialized fricatives /ȿ/ and /ɀ/, and the labial-velar glide /w/ as complex segments because their production involves more than a single point of constriction in the oral cavity; the rounding of the lips and the alveolar ridge. In Karanga and in other Shona dialects, affricates and prenasalized consonants are treated as unitary segments (Mkanganwi 1995; Chimhundu 2002). These consonants are complex at the phonetic level but not at the phonological level, where they function as single segments or simple onsets, namely, C. They occur morpheme internally and are contrastive (Mkanganwi 1995).

Velarized consonants (C^{w}s) are of direct relevance to this study, particularly regarding glide formation. While scholars such as Myers (1987), Maddieson (1990, 2003) and Downing (2003) argue that C^{w}s are best treated as consonant clusters where each segment enjoys full segmental status, we follow phonetic studies by Doke (1931), Mkanganwi (1995), Mathangwane (1999), and Rogers, Mudzingwa and Vatikiotis-Bateson (2008) in proposing that the C^{w}s are complex segments, that is, the /w/ articulation is not an independent segment but is realized as secondary articulation on the preceding consonant. More recently, Rogers (2009: 22) conducted an ultrasound and audiovisual analysis of some speech samples collected from a Karanga native speaker and concluded that her articulatory and acoustic analysis 'provides evidence in support of phonological analysis which argues that C^{w} segments are single, complex segments rather than clusters'. Phonologically, the C^{w}s are simple onsets. Minimal pairs such as /g^{w}àrá/ 'way forward' versus /gàrá/ 'sit', /màrí/ 'money' versus /m^{w}àrí/ 'God' and /ì^{m}bá/ 'house' versus /ì$^{m}b^{w}$á/ 'dog' show that velarization, like prenasalization, is a contrastive feature in Shona (Kadenge, 2010: 404). Following Kadenge (2008), we treat Nambya's C^{j}s as unit segments.

We follow Clements and Hume (1995) in assuming that secondary place on consonants is dependent on V-Place (Vowel Place) node, which in turn is dependent on a C-Place (Consonant Place) node. As an illustration, we provide the structure of [t^w].

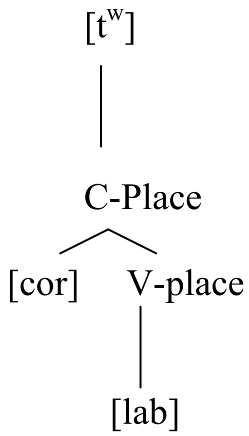

Figure 1. *Representation of [t^w].*

2.2.3 Nambya Simple Consonants

Table 4 below presents simple consonants in Nambya.

	Labial	Alveolar	Palatal	Velar	Glottal
voiceless stops	p	t		k	
breathy voiced stops	b̤	d̤		g̤	
voiced nasals	m	n	ɲ	ŋ	
breathy voiced nasals	m̤	n̤			
voiceless fricatives	f	s		x	
voiced fricative	β				
breathy voiced fricatives	v̤	z̤	ʒ̤		ɦ̤
voiced palatal glide			j		
voiced lateral		l			

Table 4. *Nambya simple consonant phonemes* (Kadenge 2008: 295).

Like Karanga, Nambya makes use of a three-way laryngeal distinction amongst obstruents: modal voice, voicelessness and breathy voice. Among nasals, it employs a two-way distinction: modal voice versus breathy voice. Phonologically, all the simply articulated segments are realized as single consonant onsets, giving rise to the consonant vowel (CV) syllable type.

2.2.4 Nambya Complex Consonants

	Labial	Alveolar	Palatal	Velar
affricates			ʧ d̤^{ʒ}	
prenasalized plosives	^{m}p ^{m}b	^{n}t ^{n}d		^{ŋ}k ^{ŋ}g
prenasalized fricatives		n^{s} n^{z}		
velarized plosives	p^{w} b^{w}	t^{w} d^{w}		k^{w} g^{w}
velarized nasals	m^{w}	n^{w}		$ŋ^{w}$
velarized lateral		l^{w}		
velarized prenasalized plosives	$^{m}p^{w}$ $^{m}b^{w}$	$^{n}t^{w}$ $^{n}d^{w}$		$^{ŋ}k^{w}$ $^{ŋ}g^{w}$
palatalized plosives	p^{j} b^{j}	t^{j} d^{j}		
palatalized nasals	m^{j}	n^{j}		
palatalized lateral		l^{j}		
palatalized prenasalized plosives	$^{m}p^{j}$ $^{m}b^{j}$			
labiovelar glides				w w̤

Table 5. *Nambya complex consonant phonemes* (Kadenge 2008: 295).

3. Glide Formation, Secondary Articulation and Elision

This section compares glide formation, secondary articulation and elision in Karanga and Nambya, and provides a formal analysis. In Karanga and Nambya, glide formation, secondary articulation and elision operate in nominals to repair hiatus. Below, (13) illustrates the dispreferred configuration, viz., hiatus.

```
*σ     σ
 |     |
 μ     μ
 |     |
Rt    Rt
```

(Orie and Pulleyblank 2002: 110)

(13) above shows that a sequence of two vocalic root nodes is banned, and in order to repair this dispreferred structure or configuration, glide-formation, secondary articulation and elision are employed. The driving constraint that bans hiatus is the requirement that all syllables begin with a consonant, namely, Onset.

(14) Onset
*[$_σ$ V (syllables must have onsets)
(Itô 1989; Prince and Smolensky, 2004)

In both Karanga and Nambya, the constraint ONSET undominated since every repair strategy is aimed at ensuring that every syllable begins with an onset. In both dialects, glide formation, secondary articulation and elision form a conspiracy (a term originally due to Haj Ross): they are all mobilized to eliminate a single configuration viz., onsetless syllables. Kisseberth (1970) describes a phonological 'conspiracy' as a set of distinct rules (processes) that serve the same purpose: to rid the surface forms of the language of certain undesirable (marked) configurations. McCarthy (2002: 93) calls this 'homogeneity of target/heterogeneity of processes.' This is where an output target is achieved in different ways across contexts in the same language or across languages. The challenge in both languages is to determine when one strategy is chosen over the others and to determine whether what happens in Karanga applies to Nambya and vice versa. First, we assume that glide formation is the default or preferred strategy: turn the first vowel (V_1) in hiatus into a glide, if not preserve its V-Place features by passing the whole V-Place node on to the preceding consonant where it is realized as secondary articulation, if secondary articulation is not possible, then elide the vowel (V_1). These repair strategies result in the loss of a mora but we consider glide formation as the default strategy because it preserves the root node and the V-Place features of V_1. Although secondary articulation results in the loss of a mora and the deletion of the root node, we consider it the second best strategy because it preserves the V-Place node of V_1 and elision is regarded as the least preferred strategy because it results in the loss of all the features of V_1, that is, its root node, mora and V-Place node. Second, we assume that the different phonotactics of Karanga and Nambya result in inter-language differences with respect to which hiatus resolution strategy will apply.

3.1 GLIDE FORMATION

Glide formation, which we assume to be the preferred strategy, is 'restricted' to the high vowels /u/ and /i/ when they each of them is V_1 and when it is not immediately preceded by a consonant. In both Karanga and Nambya, there are no right contexts to test whether /e/ and /o/ would participate in glide formation. Examples 15(b) and (c) illustrate glide formation in Karanga, involving /u/, and 16(b) and (c), involving /i/.

- **Karanga** **/u+V/ → [wV]**

(15) a. /mù-tí ù-ʧá-kúr-á/ [mùtí ùʧákúrá]
CL3.SG-tree CL3.SG-FUT-grow-FV
'the tree will grow'

b. /mù-tí *ù-ósé*/ [mùtí *wósé*]
CL3.SG-tree CL3.SG-all
'the whole tree'.

c. /mù-tí *ù-éɗŭ* / [mùtí *wéɗŭ*]
CL3.SG-tree CL3.SG-1PL-POSS CL3.SG
'our tree'

- **Karanga** **/i+V/ → [jV]**

(16) a. /mì-tí ì-ʧá-kúr-á/ [mìtí ìʧákúrá]
CL4.PL-tree CL4.PL-FUT-grow-FV
'the trees will grow.'

b. /mì-tí *ì-ósé*/ [mìtí *jòsé*]
CL4.PL-tree CL4.PL-all
'all the trees'

c. / mì-tí *ì-áᵑgù*/ [mì-tí *jáᵑgù*]
CL4.PL-mine CL4.PL-mine
'my trees'

Examples 17(b) and (c) illustrate glide formation in Nambya, involving /u/, and 18(b) and (c), involving /i/.

- **Nambya** **/ u+V/ → [wV]**

(17) a. /mù-tólò ù-nòlèmà / [mù-tólò ùnòlèmà]
CL3.SG-load CL3.SG- is heavy
'the load is heavy'

b. /mù-òjò *ù-áᵑgù*/ [mojo *wáᵑgù*]
CL3.SG- heart CL3.SG--mine
'my heart'

c.	/mù-ónó *ù-óg̤à*/	[mónó *wóg̤à*]
	CL3.SG-fish trap CL3.SG- one	
	'one fish trap'	
	/mù-ónó *ù-áβò*/	[mónó *wáβò*]
	CL3.SG-fish trap CL3.SG-theirs	
	'their fish trap'	

- **Nambya** **/i+V/ → [jV]**

(18) a.	/mì-tóló ì-nòlèmà/	[mìtóló ì-nòlèmà]
	CL4.SG-loads CL4.SG-heavy loads	
	'the loads are heavy'	
b.	/ìɲúní *ì-éḍ̤ù*/	[ìɲúní *jéḍ̤ù*]
	CL9.SG-bird CL9.SG-our	
	'our bird'	
c.	/ìɲíkà *ì-áᵑgù*/	[ìɲíkà *jáᵑgù*]
	CL9.SG-country CL3.SG-mine	
	'my country'	

We make the following generalizations from the Karanga and Nambya examples: (i) the high vowels /u/ and /i/ are glided when there is no consonant immediately preceding either vowel; (ii) the opportunity for us to see whether /e/ or /o/ are glided never arises because these vowels do not occur in prefixes where there is no consonant immediately preceding them; (iii) glide formation does not result in compensatory lengthening of the following vowel-this results in the loss of a mora. Figure 2 below illustrates glide formation where V_1 is turned into a glide.

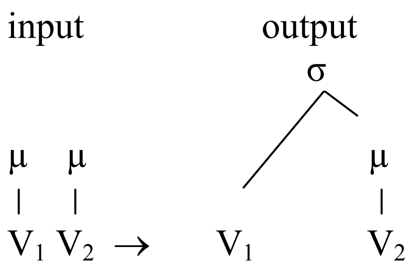

Figure 2. *Glide formation.*

Turning V_1 into a glide, that is, syllabifying V_1 in onset position, results in the loss of a mora. In both Karanga and Nambya, there is no lengthening of the following vowel to compensate for the lost mora. A constraint that militates against losing a mora is MAX μ. This constraint is ranked below ONSET to allow glide formation to repair hiatus since glide formation repairs hiatus by turning V_1 into a glide.

(19) MAX μ
A mora in the input must have a correspondent in the output.
(Rosenthall 1997: 146)

In glide formation, the loss of a mora does not trigger compensatory lengthening in both Karanga and Nambya since the languages' phonemic inventories do not have contrastive long vowels (see Table 1). In both Karanga and Nambya, a constraint that bans long vowels is undominated, together with the constraint that requires every syllable to have an onset, viz., ONSET. The constraint *Vː is defined as:

(20) *Vː
No long vowels
(McCarthy and Prince 1995; Rosenthall 1997: 147)

In both Karanga and Nambya, the constraint *Vː is undominated: both languages do not long vowels in their inventory. This means that *Vː and ONSET are undominated in both languages.

Tableau 21 provides a formal analysis of glide formation in Karanga. Throughout this article, the period indicates a syllable boundary.

(21) Glide Formation: Karanga

/ $\grave{\imath}_1$-$\acute{o}_2$sé/	ONSET	*Vː	MAX μ
a. $\grave{\imath}_1$.$\acute{o}_2$.sé	*!*		
b. ☞j$\acute{o}_2$.sé			*
c. jóː$_2$.sé		*!	

Candidate (a) which does not resolve hiatus violates the undominated constraint, ONSET. In fact, the constraint is violated twice. Candidate (b) which forms a glide and consequently elides a mora violates the lowly ranked MAX μ, and is the optimal candidate. Candidate (c) which resolves hiatus through glide formation and lengthens the following vowel (in compensation for the lost mora) is disqualified for violating *Vː. Henceforth, candidates that violate *Vː will not be considered since they never win, and will not add any new information. Tableau 22 provides a formal analysis of glide formation in Nambya.

(22) Glide Formation: Nambya

/i₁-á₂ᵑgù/	ONSET	*V:	MAX μ
a. i₁.á₂.ᵑgù	*!*		
b. ☞já₂.ᵑgù			*
c. já:₂.ᵑgù		*!	

In Nambya, as in Karanga, candidate (a) which does not resolve hiatus is ruled out for violating the undominated constraint ONSET. Candidate (b) which turns the high vowel /i/ into a glide is the optimal candidate, it violates the lowly ranked constraint MAX μ-turning /i/ into a glide results in the loss of a mora. Karanga and Nambya, behave in the same way, a high vowel, either /i/ or /u/ is turned into a glide when it is not immediately preceded by the consonant. The formal analysis given for turning /i/ into a glide can be applied *mutatis mutandis* for gliding /u/ to [w].

3.2 SECONDARY ARTICULATION

In Karanga, glide formation is blocked when V_1 is /u/ or /o/ and is immediately preceded by a consonant and secondary articulation operates. In Nambya, we only have instances involving /u/ and none having /o/. However, similar to Karanga, glide formation is blocked when /u/ is immediately preceded by a consonant and consequently secondary articulation operates. However, in both Karanga and Nambya, the consonant immediately preceding V_1 has to be a consonant that allows secondary articulation. The issue of the high vowel /i/, when it is immediately preceded by a consonant is discussed in the next section; the two languages exhibit variation; Karanga elides the vowel but Nambya employs secondary articulation.

In the Karanga examples (23) and (24), V_1 is /u/, and in 25(b), V_1 is /o/ and secondary articulation is employed to resolve hiatus.

- **Karanga** **/Cu+V/ → [C^wV]**

(23) a. /Ø-ɦ̤úkú-rúmé/ [ɦ̤úkúrùmè]
CL9.SG-chicken-male
'rooster'

b. /Ø-ɦ̤úkú-àná/ [ɦ̤úk^{w}áná] *[ɦ̤úkwáná]
CL9.SG-chicken-child
'chick'

(24) a. /mù-tí / [mùtí]
CL3.SG-tree
'tree'

b. /mù-àná/ [m^{w}àná] *[mwàná]
CL1.SG-child
'child'

- **Karanga** **/Co + V/ → [C^{w}V]**

(25) a. /Ø-^{n}díró/ [^{n}díró]
CL9.SG-plate
'plate'

b. /Ø-^{n}díró-àná/ [^{n}dír^{w}áná] *[^{n}dírwáná]
CL9.SG.-plate- DIMIN.
'small plate'

In the Nambya examples (26) and (27), V_1 is /u/, and secondary articulation is employed to resolve hiatus.

- **Nambya** **/Cu+V/ → [C^{w}V]**

(26) a. /mù-làbàlàbà/ [mù-làbàlàbà]
CL3.SG-traditional game
'traditional game'

b. /mù-ánà/ [m^{w}ánà] *[mwánà]
CL1.SG-child
'child'

(27) a. /lù-dó/ [lùdó]
CL11.SG-love
'love'

b. /lù-é^{n}dò/ [l^{w}é^{n}dò] *[lwé^{n}dò]
CL11.SG-journey
'journey'

The generalizations drawn from the examples above are as follows: (i) glide formation is banned when a labial vowel is immediately preceded by a consonant; (ii) secondary articulation occurs when V_1 is a labial vowel, and is immediately preceded by a consonant that can be labialized (C^w); (iii) similar to glide formation, secondary articulation does not result in the lengthening of the following vowel. In both Karanga and Nambya, when there is a consonant immediately preceding V_1 /u/ or /o/, glide formation is blocked because the languages do not allow consonant clusters. Forming a glide would create a cluster. A constraint that bans the formation of clusters is *COMPLEX. *COMPLEX is undominated in both languages, and is defined as:

(28) *Complex
Complex onsets are prohibited.
(McCarthy 2008: 261)

When glide formation is blocked by the constraint *COMPLEX, the next best strategy is secondary articulation. Secondary articulation is preferred over elision because it preserves some of the features of V_1 whereas elision would result in the total loss of the features of V_1 including the root node. Specifically, secondary articulation preserves the V-Place features of the V_1, the vowel that could not be turned into a glide. Figure 3 illustrates secondary articulation.

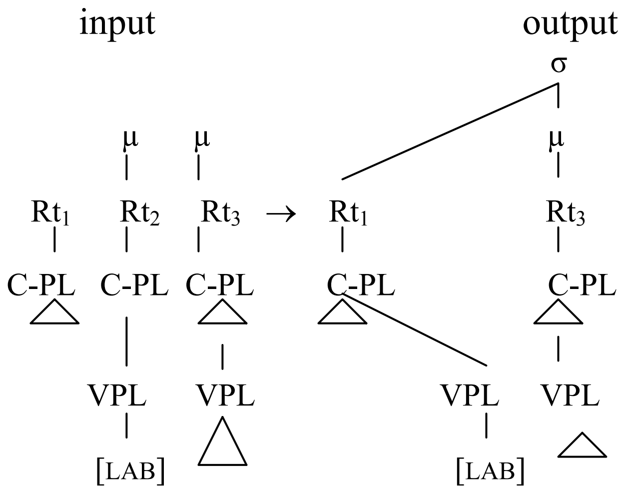

Figure 3. *Secondary articulation* (Mudzingwa 2010: 6).

Secondary articulation preserves the [labial] and [coronal] features by passing on the whole V-Place node of V_1 onto the preceding consonant, where it is realized as secondary articulation. Constraints that prohibit the loss of labial and coronal features are MAX [labial] and MAX [coronal] respectively:

(29) MAX [labial]
Any [labial] feature in the input must have a correspondent in the output.
(Mudzingwa 2010: 131)

(30) MAX [coronal]
Any [coronal] feature in the input must have a correspondent in the output.
(Mudzingwa 2010: 136)

Secondary articulation, however, involves the elision of the root node of V_1. Since secondary articulation is employed to repair hiatus, ONSET must outrank both MAX [labial] and MAX [coronal], and a constraint that penalizes the loss of a root node, MAX Rt.

(31) MAX Rt
Every root node of the input has a correspondent root node in the output.
(Mudzingwa 2010: 140)

Similar to glide formation, secondary articulation involves the loss of a mora since in both Karanga and Nambya; there is no compensatory lengthening for the lost mora. The constraint that penalizes the loss of a mora, and the one that prohibits long vowels were given in (19) and (20), respectively. Tableau 32 provides a formal analysis in which a candidate that employs secondary articulation is optimal.

(32) Secondary articulation: Karanga/Nambya

/mù$_1$-á$_2$nà/	ONSET	*COMPLEX	MAX [labial]	MAX Rt	MAX µ
a. mù$_1$.á$_2$.nà	*!				
b. mwá$_2$.nà		*!			*
c. ☞ m^{w}á$_2$.nà				*	*
d. má$_2$. nà			*!	*	*

Candidate (a), which does not resolve hiatus, fatally violates the undominated constraint ONSET. Candidate (b) which forms a glide is disqualified for violating the highly ranked *COMPLEX. The constraint *COMPLEX which bans clusters effectively blocks glide formation. The candidate also violates MAX µ. Candidate (c), which employs secondary articulation, wins. It violates the lowly ranked MAX Rt and MAX µ, which ban the deletion of a root node and a mora, respectively. Candidate (d) which elides the vowel /u/ and consequently does not preserve the labial features of V_1 is ruled out by the constraint MAX [labial]. In addition, it violates the lowly ranked MAX Rt and MAX µ. In sum, when glide formation is blocked, secondary articulation operates. Secondary articulation is better than elision in that it preserves some of the features of V_1, namely, the V-Place features.

3.3 INTER-LANGUAGE DIFFERENCES: SECONDARY ARTICULATION AND ELISION

Across a class prefix and a noun stem, we observe some inter-language differences. In instances where V_1 is a coronal vowel and is immediately preceded by a consonant, Karanga elides V_1 regardless of the quality of the preceding consonant. In contrast, Nambya employs secondary articulation with all other consonants except when the preceding consonant is a palatal consonant, where it elides V_1.

3.3.1 Elision: Karanga

When V_1 is a coronal vowel, (/i/ or /e/) and is immediately preceded by any consonant, both glide formation and secondary articulation are not possible. In order to make the comparison with Nambya, more transparent, this section examines elision in cases where the consonant immediately preceding a coronal V_1 is a labial or a coronal consonant. In the Karanga example in (33) the consonant immediately preceding a coronal /i/ is the labial nasal [m], and in (34) it is the coronal trill [r]. In both examples, V_1 is elided.

- **Karanga** **/ Ci1+V2/ → [CV2]**

(33) a.	/mì-kókó/ CL3.PL-bee hive 'bee hives'	[mìkókó]	
b.	/mì-ótò/ CL4.PL-fire 'fires'	[mótò]	*[mjótò]
(34)	/rì-áᵑgù/ CL5.SG-mine 'mine'	[ráᵑgù]	*[rjángù]

The reason for the elision of V_1 is that both glide formation and secondary articulation are not possible. Forming a glide would create a cluster (*Cj cluster), and this is banned by the constraint *COMPLEX. Secondary articulation, which would involve passing the V-Place node on to the preceding consonant, would create palatalized consonants (C^js). This is prohibited because such segments are not part of the Karanga consonant inventory (cf. Table 3). The constraint that bans palatalized segments (*C^j) is undominated in the language, and is defined as follows:

(35) $*C^j$
No palatalized segments
(Sibanda 2009: 48)

In both Karanga and Nambya, elision only becomes the optimal hiatus resolution strategy when glide formation and secondary articulation are blocked. Figure 4 illustrates elision.

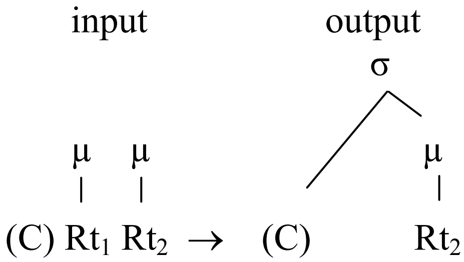

Figure 4. *Elision*.

In vowel elision, a root node and all the features of the vowel are elided. MAX Rt which bans the elision of a root node was given in (31). Elision also involves the loss of a mora. The constraint that penalizes the loss of a mora, viz., MAX μ was given in (19). Tableau 36 provides a formal analysis in which a candidate that elides is optimal. However, we have a tie between candidates that elide – the one that elides V_1 and the other that elides V_2.

(36) Elision in Karanga: Tie between candidates that elide (d) and (e)

/mì$_1$-ò$_2$tò/	ONSET	*COMPLEX	$*C^j$	MAX Rt	MAX μ
a. mì$_1$.ò$_2$.tò	*!				
b. mjò$_2$.tò		*!			*
c. m^{j}ò$_2$.tò			*!	*	*
d. ☞mì$_1$.tò				*	*
e. ☞mò$_2$.tò				*	*

Candidate (a), which does not resolve hiatus, is disqualified for violating the undominated constraint ONSET. Candidate (b) which does glide formation is disqualified for violating the undominated *COMPLEX, which bans consonant clusters. Candidate (c) employs secondary articulation; it deletes V_1, and passes on the palatal feature onto the preceding consonant where the feature is realized as palatalization. The candidate fatally violates the undominated $*C^j$. Palatalized consonants are inadmissible in Karanga. Candidates (d) and (e), employ elision to resolve hiatus. There is a tie between these two candidates: both candidates violate the lowly ranked MAX Rt and MAX μ. However, in all instances where elision is the optimal hiatus resolution strategy, V_1 is consistently elided. Evidence for this claim is provided in the next section, where we examine elision in both Karanga and Nambya. In order to break the tie in Tableau 36, we invoke a constraint that takes into account this detail, namely, ANCHOR L.

(37) ANCHOR L
Any root node at the left edge of a morpheme in the input has a correspondent root node in the output.
(Casali 1996)

ANCHOR L must be ranked below ONSET, but above MAX Rt, in order to allow elision, but at the same time, disqualify any candidate that elides V_2. The inclusion of this constraint breaks the tie as illustrated in Tableau 38 below. Candidate (b), which elides $V_{2,}$ loses to candidate (a), which elides V_1. Candidate (b) is ruled out by the constraint ANCHOR L.

(38) Elision (Candidate that elides V_1 wins)

/mì$_1$-ò$_2$tò/	ONSET	*COMPLEX	*C^j	ANCHOR L	MAX Rt	MAX μ
a. ☞ mò$_2$.tò					*	*
b. mì$_1$.tò				*!	*	*

3.3.2 Secondary Articulation: Nambya

In exactly the same morphological and phonological context, Nambya allows secondary articulation, whilst Karanga employs elision (cf. examples 9–12). In the Nambya examples in 39(a) and (b) and 40(a) and (b), the consonant immediately preceding V_1 is a labial nasal [m], and a coronal lateral [l] respectively.

- **Nambya** **/Ci+V/ → [C^{j}V]**

(39) a. /mì-ʃólò/ [mì-ʃólò]
CL4.SG-head
'heads'

b. /mì-ónó/ [m^{j}ónó] *[mjónó]
CL4.SG-fish traps
'fish traps'

c. /mì-òjò/ [m^{j}òjò] *[mjòjò]
CL4.SG -heart
'hearts'

d.	/lì-ópò/ CL.6.SG-eye lid 'eye lids	[l^jópò]	*[ljópò]

- **Nambya** **/Cu+V/ → [C^wV]**

(40) a.	/lù-kándà/ CL5.SG-skin skin	[lùkándà]	
b.	/lù-é^{n}dò/ CL5.SG-visit 'visit'	[l^wé^{n}dò]	*[lwé^{n}dò]
c.	/lù-í^{m}bò/ CL5.SG-song 'song'	[l^wí^{m}bò]	*[lwí^{m}bò]

Unlike Karanga, which has a blanket ban on palatalized segments, (*C^j,) Nambya allows palatalization with some consonants but not others (see Table 5). The labial nasal [m] and the coronal lateral [l] are amongst those consonants that allow palatalization. With glide formation blocked, the hiatus resolution strategy employed to resolve hiatus is secondary articulation - the high vowel /i/ is deleted and its V-Place features are passed on to the preceding consonant. This is similar to the secondary articulation involving the high vowel /u/ (see examples 40a–40c).

(41) Secondary articulation involving /i/: Nambya

/mì$_1$-ò$_2$jò/	ONSET	*COMPLEX	ANCHOR L	MAX [coronal]	*C^j	MAX Rt	MAX µ
a. mì$_1$.ò$_2$.jò	*!						
b. mjò$_2$.jò		*!					*
c. ☞ m^jò$_2$.jò					*	*	*
d. mò$_2$.jò				*!		*	*
e. mì$_1$.jò			*!			*	*

Candidate (a), which does not resolve hiatus, fatally violates the undominated constraint ONSET. Candidate (b) which forms a glide is disqualified for violating the highly ranked *COMPLEX. The constraint *COMPLEX which bans clusters effectively blocks glide formation. The candidate also violates the lowly ranked

MAX μ. Candidate (c), which employs secondary articulation, wins. It violates the lowly ranked MAX Rt and MAX μ, which ban the deletion of a root node and a mora, respectively. Candidate (d) which elides the first vowel and consequently does not preserve the coronal features of V_1 is ruled out by the constraint MAX [coronal]. In addition, it violates the lowly ranked MAX Rt and MAX μ. Candidate (e) is unacceptable because it violates the high ranked ANCHOR L.

We observe that due to the different phonotactic constraints between Karanga and Nambya, the two languages employ different hiatus resolution strategies in the same morphological and phonological context. In Karanga, there is a complete ban on palatalization, whereas in Nambya palatalization is allowed with some consonants but not others. This is the source of the inter-language variation-where Karanga employs elision, Nambya employs secondary articulation, (palatalization) with the compatible consonants. In short, while $*C^j$ is undominated in Karanga, it is lowly ranked in Nambya.

3.4 ELISION: KARANGA AND NAMBYA

In instances where a coronal vowel is immediately preceded by a palatal or alveopalatal consonant, both Karanga and Nambya employ elision. In addition, instances where V_1 is a pharyngeal vowel /a/, both Karanga and Nambya elide the vowel. First, we examine instances where the first vowel is a coronal vowel immediately preceded by a palatal or alveopalatal consonant.

3.4.1 Coronal Vowel Elision: Karanga and Nambya

In both Karanga and Nambya, glide formation is blocked when V_1 is a coronal vowel /i/ or /e/ and is preceded by a palatal consonant. The Karanga examples in (42)–(44) illustrate /i/ elision when it is V_1.

- **/i/ elision: Karanga** **/ Ci_1+V_2/ → [CV_2]**

(42) a. /ʧì-kómáná/ [ʧìkómáná]
CL7.SG.DIMIN.-boy
'small boy'

b. /ʧì-àná/ [ʧàná] *[ʧʲàná]
CL7.SG-DIMIN.-child
'small child'

(43) a.	/Ø-ᵐbúdᶻí/ CL9.SG-goat 'goats'	[ᵐbúdᶻí]	
b.	/Ø-ᵐbúdᶻí-àná/ CL9.SG-goat-DIMIN. 'kid'	[ᵐbúdᶻáná]	*[ᵐbúdᶻʲáná]
(44)	/tʃì-ṇ̈ú tʃì-òsé/ CL7.SG-thing CL7.SG-all 'the whole'	[tʃìṇ̈ú *tʃòsé*]	*[tʃìṇ̈ú *tʃʲòsé*]

In hiatus, when V_1 is a coronal vowel (/i/), and is immediately preceded by either an alveolar or palatal consonant, in both Karanga and Nambya, both glide formation and secondary articulation are not possible. In Karanga, forming a glide would create a cluster (Cj cluster), and this is banned by the constraint *COMPLEX. Secondary articulation, which would involve passing the V-Place node on to the preceding consonant, would create palatalized consonants, namely *C^j. These are banned by the constraint *C^j since the Karanga phonemic inventory does not have palatalized consonants. In Tableau 45, we provide a formal analysis of elision of the coronal vowel /i/, in Karanga, where it is immediately preceded by a palatal consonant.

(45) Coronal vowel elision: Karanga

/tʃì$_1$-á$_2$nà/	ONSET	*COMPLEX	*C^j	ANCHOR L	MAX [coronal]	MAX Rt	MAX μ
a. tʃì$_1$.á$_2$.nà	*!						
b. tʃjá$_2$.nà		*!					*
c. tʃʲá$_2$.nà			*!			*	*
d. ☞ tʃá$_2$.nà					*	*	*
e. tʃì$_1$.nà				*!		*	*

Candidate (a), which does not resolve hiatus, is disqualified for violating the undominated constraint ONSET. Candidate (b) which does glide formation is disqualified for violating the undominated *COMPLEX, which bans consonant clusters. Candidate (c) employs secondary articulation. It deletes V_1, and passes on the palatal feature onto the preceding consonant where the feature is realized as palatalization. The candidate fatally violates the undominated *C^j. It also violates the lowly ranked MAX Rt and MAX μ. Candidates (d) and (e), employ elision to resolve hiatus. However, as pointed earlier, it is V_1 that is consistently eliminated, and candidate (e) which elides V_2 is ruled out for violating ANCHOR L.

3.4.2 Coronal Vowel Elision: Nambya

In Nambya, when V_1 is a coronal vowel and is immediately preceded by a palatal or alveopalatal consonant, elision is employed rather than secondary articulation. This is in contrast to instances where Nambya employed secondary articulation, palatalizing the labial nasal [mʲ] and the coronal lateral [lʲ]. In the Nambya examples, in example 46 (b) and 47(b), the coronal vowel is elided.

- **/i/ elision: Nambya** $/C_{palatal}i_1+V_2/ \rightarrow [CV_2]$

(46) a. /ʧì-pó/ [ʧìpó]

b. /ʧì-ólò/ [ʧólò]
CL7.SG-bag
'bag'

(47) a. /iᵐbúd̤ʒì/ [iᵐbúd̤ʒì]
CL9.SG-goat
'kid'

b. /iᵐbúd̤ʒì-àná/ [ìᵐbúd̤ʒàná]
CL9.SG-goat-DIMIN
'kid'

Unlike in Karanga where there is a general ban on palatalized consonants, in Nambya, a ban on palatalization only applies to palatal consonants (palatal and alveopalatal). This is because these consonants are already palatal and cannot be palatalized; consequently the coronal vowel which can neither be glided nor turned into secondary articulation is elided. The palatalization of palatal segments is banned by an Obligatory Contour Principle (OCP)-driven constraint, namely $*C_{palatal}^{j}$.

(48) $*C_{palatal}^{j}$
A palatal consonant cannot be palatalized.

Similar to Karanga, the vowel that could neither be glided nor turned into secondary articulation is elided. In Tableau 49, we provide a formal analysis involving the elision of a vowel that is immediately preceded by a palatal consonant.

(49) Elision: Nambya

/ʧî₁-ó₂lò/	ONSET	*COMPLEX	$*C_{palatal}^{j}$	ANCHOR L	MAX [coronal]	*CJ	MAX μ
a. ʧî₁.ó₂.lò	*!						
b. ʧjó₂.lò		*!				*	*
c. ʧʲó₂.lò			*!			*	*
d. ☞ʧó₂.lò					*	*	*
e. ʧî₁.lò				*!	*	*	*

Candidate (a), which is the fully faithful candidate and does not resolve hiatus, violates the undominated constraint ONSET. Candidate (b) which employs glide formation by turning V_1 into a glide, is ruled out for violating one of the undominated constraints in the language viz., *COMPLEX. Consonant clusters are inadmissible in the language. The candidate also violates *Cj and MAX μ. Candidate (c) which employs secondary articulation, fatally violates the constraint, $*C_{palatal}^{j}$. This constraint bans the palatalization of palatal consonants. In addition, the candidate violates, MAX Rt and MAX μ. Candidate (d) is the optimal candidate; it violates the lowly ranked MAX Rt and MAX μ. In addition, it violates MAX [coronal] in order to satisfy the undominated $*C_{palatal}^{j}$. The candidate elides V_1. Candidate (e) which resolves hiatus through the elision of V_2 fatally violates the undominated constraint ANCHOR L. In addition, the candidate violates MAX Rt and MAX μ.

3.4.3 Pharyngeal Vowel Elision: Karanga and Nambya

Karanga and Nambya use the same hiatus resolution strategy when V_1 is a pharyngeal vowel: both elide the pharyngeal vowel. In Karanga, in examples 50(b) and 51(b), V_1, which is /a/, is elided.

- **/a/ elision: Karanga** **/(C) a_1 + V_2 / → [(C) V_2]**

(50) a. /ʋà-kómáná/ [ʋàkómáná]
CL2.PL-boy
'boys'

b. /ʋà-énì/ [ʋénì]
CL2.PL-visitor
'visitor'

(51) a. /Ø-^{m}bùfùrá/ [^{m}bùfùrá]
CL9.SG-young child
'young child'

b. /Ø-^{m}bùfùrá-àná/ [^{m}bùfùràná]
CL9.SG-young-DIMIN.
'very young child'

In Nambya, in examples (52) and 53(b), V_1 is the pharyngeal vowel /a/ and it is deleted.

- **/a/ elision: Nambya** **/(C) a_1 + V_2 / → [(C) V_2]**

(52) /βà-á^{ŋ}gù/ [βá^{ŋ}gù]
CL2.SG-mine
'mine'

(53) a. /ì^{m}b^{w}à/ [ì^{m}b^{w}à]
CL9.SG-dog
'dog'

b. /ì^{m}b^{w}á-ànànà/ [ì^{m}b^{w}ánànà]
CL9.SG-dog-DIMIN
'puppy'

When a pharyngeal vowel is immediately preceded by a consonant, both glide formation and secondary articulation are blocked. First, trying to parse /a/ in onset position would create clusters banned by the undominated constraint *COMPLEX. Second, secondary articulation, which would involve the deletion of the vowel /a/ and passing its pharyngeal V-Place node onto the preceding consonant, would also result in an illicit segment, namely a pharyngealized segment. Both Karanga and Nambya do not have such segments. A constraint that bans pharyngealization is the undominated constraint *C^{ʕ}:

(54) *C^{ʕ}
No pharyngealized segments
(Mudzingwa 2010: 150)

Using the example, /ʋà-énì/ realized as [ʋènì], we provide a formal analysis of elision of the pharyngeal vowel /a/ in Tableau 55.

(55) Pharyngeal vowel elision: Karanga

/ʋà$_1$-é$_2$nì/	ONSET	*C^ʕ	ANCHOR L	MAX Rt	MAX μ
a. ʋà$_1$.è$_2$.nì	*!				
b. ʋà$_1$.nì			*!	*	*
c. ʋ^{ʕ}è$_2$.nì		*!		*	*
d.☞ʋè$_2$.nì				*	*

Candidates (a), (b) and (c) fatally violate the inviolable constraints Onset, Anchor L and *C^ʕ respectively. Candidate (d), which elides V$_1$, is the optimal candidate. It violates the lowly ranked MAX Rt and MAX μ.

Tableau 56 provides a formal analysis of pharyngeal vowel elision in Nambya.

(56) Pharyngeal vowel elision: Nambya

/βà$_1$-á$_2$ᵑgù/	ONSET	*C^ʕ	ANCHOR L	MAXRt	MAX μ
a.βà$_1$.á$_2$.ᵑgù	*!				
b.βá$_1$.ᵑgù			*!	*	*
c.β^{ʕ}á$_2$.ᵑgù		*!		*	*
d.☞βá$_2$.ᵑgù				*	*

Candidates (a), (b) and (c) fatally violate the inviolable constraints Onset, AnchorL and *C^ʕ, respectively. Candidate (d), which elides V$_1$, is the optimal candidate. It violates the lowly ranked MAX Rt and MAX μ.

As promised earlier, we now provide evidence for the claim that V$_1$ is consistently elided. In the examples in (57)-(58), V$_1$ is deleted regardless of its quality (whether it is /u/ or /i/), and the nature of the morphemes in which it is found -whether it is part of the stem or affix (prefix or suffix). In 57(a) and (b), the deleted first vowels belong to the prefix, and they are /u/ and /i/, respectively. In 58(a) and (b), the elided vowels belong to the stem, and they are coronal and pharyngeal vowels, /i/ and /a/, respectively.

- **Karanga**

(57) a. /mù-òtò/ [mòtò]
CL3.SG-fire
'fire'

b. /ʧì-àná/ [ʧàná]
CL7.SG-child
'child'

(58) a. /Ø-^{m}búd^{z}í-àná/ [^{m}búd^{z}áná]
CL9.SG-goat-DIMIN.
'kid

b. /Ø-^{m}bùfùrá-àná/ [^{m}bùfùràná]
CL9.SG-young-DIMIN.
'very young child'

Similar to Karanga, in Nambya, in all instances where elision is employed it is V_1 that is elided. Evidence to this effect is adduced from instances where hiatus occurs with V_1 belonging to different morphemes, prefix or stem. In examples (59), the vowel that is elided belongs to the noun class prefix, and it is /u/. In 60(a) and (b), the elided vowels /i/ and /a/ respectively belong to the noun stem.

- **Nambya**

(59) /mù-òjò/ [mòjò]
CL3.SG -heart
'heart'

(60) a. /ì^{m}búd̤^{ʒ}ì-ànà/ [ì^{m}búd̤^{ʒ}ànà]
CL9.SG -goat-DIMIN
'kid'

b. /ì^{m}b^{w}à-ànànà/ [ì^{m}b^{w}ànànà]
CL9.SG -dog-DIMIN
'puppy'

What is common to the elision cases in (59)–(60), is that the vowel that is elided is V_1-whether V_1 is part of the prefix or part of the stem and regardless of its quality. Example (59) is repeated in the next section where we discuss labial vowel elision.

In both Karanga and Nambya neither the quality of the vowel nor the nature of the morpheme in which the vowel is found matters: what is crucial is the position of the vowel in the hiatus context -whether it is V_1 or V_2. This observation is in harmony with the findings of Casali (1996). Casali carried out a comprehensive cross-linguistic investigation in order to establish the factors that determine which of two vowels in a potential hiatus sequence is deleted. His findings were that there is a strong cross-linguistic preference for deleting V_1

rather than V_2 (Casali 1996). Based on evidence from Karanga and Nambya, we can safely conclude that in Karanga and Nambya, what is crucial is the position of the vowel in the hiatus context -whether it is V_1 or V_2 and not the type of morpheme to which the vowel belongs. In sum, Karanga and Nambya are V_1 deleting grammars.

3.4.4 Labial Vowel Elision: Karanga and Nambya

In both Karanga and Nambya, when the consonant preceding a labial V_1 is a labial consonant, and V_2 is a labial vowel, secondary articulation is blocked, and elision operates. In Karanga, in examples 61(b)–(c), illustrate elision of a labial V_1, and in Nambya, examples 62(b)–(c).

- **Labial vowel elision: Karanga** **/C_{lab} u +o / → [C_{lab} o]**

(61) a.	/mù-tí/ CL3.SG-tree ‘tree’	[mùtí]	[mùtí]
b.	/mù-òjò/ CL3.SG-heart ‘heart’	[mòjò]	*[m^{w}òjò]
c.	/mù-òtó/ CL3.SG-fire ‘fire’	[mòtó]	*[m^{w}òtó]

- **Labial vowel elision: Nambya** **/C_{lab} u +o / → [C_{lab} o]**

(62) a.	/mù-ᵑkód̤òd̤ò/ CL3.SG-hangover ‘hangover’	[mùᵑkód̤òd̤ò]
b.	/mù-ótò/ CL3.SG-fire ‘fire’	[mótò]
c.	/mù-òjò/ CL3.SG-heart ‘heart’	[mòjò]

The observations from the examples above are as follows: (i) secondary articulation is blocked in instances where doing so would violate the phonotactic constraints of the language: where it would create a labialized labial consonant (secondary articulation) followed by a labial vowel, (ii) V_1 is the vowel that is consistently elided and (iii) similar to glide formation and secondary articulation, elision of V_1 does not trigger the lengthening of the following vowel.

First, in both Karanga and Nambya, C^ws are allowed, and precisely, the phoneme /m^w/ occurs in both inventories (see Table 3, Karanga; Table 5, Nambya). In both Karanga and Nambya, [m^w] occurs with all other vowels except the labial vowels. This means that in both Karanga and Nambya, what is banned must not be the segment [m^w] but the sequence [m^w V_{labial}], that is, [m^w] followed by a labial vowel.

The following examples illustrate the occurrence of [m^w] with pharyngeal and coronal vowels. In 63(a), [m^w] occurs with a pharyngeal vowel and in 63(b) and 63(c), with coronal vowels, [e] and [i], respectively.

- **Karanga**

(63) a. /mù-àná/ [m^wàná]
CL1.SG-child
'child'

b. /mù-èné/ [m^wèné]
CL1.SG-owner
'owner'

c. /mù-ìsé/ [m^wìsé]
CL3.SG-tail
'tails'

Similar to the Karanga examples, in the Nambya examples in 64(a), the [m^w] occurs with a pharyngeal vowel [a], and in 64(b) and 64(c), with the coronal vowels [e] and [i] respectively.

- **Nambya**

(64) a /mù-ànà/ [m^wànà]
CL1.SG-child
'child'

b. /mù-ézì/ [m^wézì]
CL1.SG-foreigner
'foreigner'

c.	/mù-ísí/ CL3.SG-pestle 'pestle'	[m^{w}ísí]

In both Karanga and Nambya, there are no occurrences of [m^w] and a labial vowel. In Hannan's (1987) *Standard Shona Dictionary,* for example, there are no lexical entries with [m^{w}o] sequences for Karanga. In the dictionary, the lexical entries listed as having [m^{w}o] sequences in Zezuru -another dialect of Shona, are entered as /mo/ in Karanga. The examples in 65(c)–(d) are adapted from Hannan (1987); we have included morpheme boundaries.

		Karanga	**Zezuru**
(65) a.	/mù-tí/ CL3.SG-tree 'a tree'	[mùtí]	[mùtí]
b.	/mù-ò^{n}dò/ CL3.SG-shaft of spear 'shaft of spear'	[mò^{n}dò]	[m^{w}ò^{n}dò]
c.	/mù-òní/ CL3.SG-malice 'malice'	[mòní]	[m^{w}òní]
d.	/mù-òtò/ CL3.SG-fire 'fire'	[mòtò]	[m^{w}òtò]

In Moreno's (1988) *Nambya Dictionary* there are no lexical entries with [m^{w}o] or [m^{w}u]. We take this as evidence that these sequences are banned in the language. Furthermore, where we expect hiatus to be resolved through secondary articulation, resulting in [m^{w}o] sequences, Nambya avoids these sequences by deleting V_1 as illustrated in 66(a)–(c).

- **Nambya**

(66) a	/mù-ótò/ CL3.SG-fire 'fire'	[mótò]
b.	/mù-ójò/ CL3.SG -heart 'heart'	[mójò]

c. /mù-ónó/ [mónó]
CL3.SG -fish trap
'fish trap'

Considering the evidence from both Karanga and Nambya, it is safe to conclude that in both languages, there is a ban on having a labialized labial consonant followed by a labial vowel. In Karanga and Nambya, a constraint that bans [m^wo] and [m^wu] sequences is the general OCP-driven constraint, *[$C_{Lab}{}^wV_{Lab}$]:

(67) *[$C_{Lab}{}^wV_{Lab}$]
The sequence labialized labial consonant and a labial (round) vowel is prohibited
(Mudzingwa 2010: 153)

Tableau 68 provides a formal analysis of elision in Karanga and Nambya in the word /mù-òjò/ realized as [mòjò] 'heart'.

(68) Labial vowel elision: Karanga/Nambya

/mù$_1$-ò$_2$jò/	ONSET	*COMPLEX	*[$C_{Lab}{}^wV_{Lab}$]	ANCHOR L	MAX [lab]	MAX Rt
a. mù$_1$.ò$_2$.jò	*!					
b. mwò$_2$.jò		*!				
c. mù$_1$.jò				*!		*
d. m^wò$_2$.jò			*!			*
e.☞ mò$_2$.jò					*	*

Candidates (a) and (b) are disqualified for violating the highly ranked constraints, ONSET, and *COMPLEX, respectively. Candidate (c) which elides V_2 is disqualified for violating the undominated ANCHOR L, which bans elision of any segment that is at the left edge of a morpheme. Candidate (d), which employs secondary articulation is disqualified for violating *[$C_{Lab}{}^wV_{Lab}$], the constraint that bans the sequence of a labialized labial consonant and a labial vowel. This constraint effectively blocks secondary articulation. Candidate (e) is the optimal candidate; it elides V_1, and violates the lowly ranked MAX [labial] and MAX Rt. Elision, which involves deleting the root node, all the features of the vowel and the mora, only operates when glide formation and secondary articulation are blocked by OCP constraints.

All things being equal, a candidate that elides will never win over a candidate that employs either glide formation or secondary articulation. In glide formation, all the features of the vowel are preserved and what is only lost is the mora. In secondary articulation, although a mora and the root node are lost, the V-Place features are preserved. However, in elision both the mora and not only the V-Place features, but all features are lost. More importantly, the constraints that penalize glide formation, secondary articulation and elision form a subset relationship, such that a candidate that elides will invariably violate the constraints that penalize secondary articulation and elision – excluding those that block these strategies (glide formation and secondary articulation).

3.4.5 Labial Vowel Elision: Nambya

There is need for us to clarify the position regarding how in Nambya hiatus is resolved in /mì-òjò/ and /mù-ójò/, in our analysis. The examples are repeated below for convenience.

(69) a. /mì-òjò/ [m^jòjò] *[mjòjò]
CL4.SG -heart
'hearts'

b. /mù-ójò/ [mójò] *[m^wojo]
CL3.SG -heart
'heart'

(70) Secondary articulation involving /i/: Nambya

/mì$_1$-ò$_2$jò/	ONSET	*COMPLEX	ANCHOR L	MAX [coronal]	MAX Rt	MAX µ
a. mì$_1$.ò$_2$.jò	*!					
b. mjò$_2$.jò		*!				*
c. ☞ m^jò$_2$.jò					*	*
d. mò$_2$.jò				*!	*	*
e. mì$_1$.jò			*!		*	*

In Nambya, /mì-òjò/ 'hearts' and /mù-ójò/ 'heart' have different inputs and also different surface realizations, which are captured by our analysis, repeated here for clarity. In Tableau 70, where the input is /mì-òjò/ 'hearts', [mòjò] is ruled out by MAX [coronal]. The surface form [mòjò] is singular. In this context, the winner is [m^jòjò], 'hearts' the plural form of 'heart'. In contrast, the underlying form for the singular form is /mù-ójò/, 'heart', given as example (69b) above. As shown in Tableau 71, secondary articulation is blocked by the constrained *[$C_{Lab}{}^wV_{Lab}$] and elision is preferred resulting in the form [mòjò], 'heart', candidate (e). The differences between the two tableaux is that in Tableau 70, the constraint MAX [coronal] rules out candidate [mòjò], whereas in Tableau 71, the constraint *[$C_{Lab}{}^wV_{Lab}$] blocks glide formation and the winner is [mòjò]. The differences in the outputs [m^jòjò] and [mòjò] help make the plural/singular distinction, with the former being plural and the latter singular.

(71) Labial vowel elision: Nambya

/mù$_1$-ò$_2$jò/	ONSET	*COMPLEX	ANCHOR L	*[$C_{Lab}{}^{w}V_{Lab}$]	MAX Rt	MAX μ
a. mù$_1$.ò$_2$.jò	*!					
b. mwò$_2$.jò		*!				
c. mù$_1$.jò			*!		*	
d. m^{w}ò$_2$.jò				*!	*	
e.☞ mò$_2$.jò					*	

The seemingly contradictory analysis of /mì-òjò/ realized as [m^{j}òjò] 'hearts' and /mù-ójò/ realized as 'heart' is understood better when we juxtapose the words /mì-òjò/ 'hearts' and /mù-ójò/ 'heart'. The underlying forms are different in that one is singular and the other is plural and the surface forms have to conform to this aspect.

In (72) and (73), we provide a summary of the constraint ranking for Karanga and Nambya respectively. The constraints that are ranked differently in the two languages is italicized and is in bold.

- **Karanga constraint ranking**

(72) ONSET, *COMPLEX, ANCHORL, *$C_{palatal}{}^{j}$, *[$C_{Lab}{}^{w}V_{Lab}$], ***C^j,*** *$C^ʕ$ >> MAX [labial] >> ***MAX [coronal]***, MAX Rt, MAX μ

- **Nambya constraint ranking**

(73) ONSET, *COMPLEX, ANCHORL, *$C_{palatal}{}^{j}$, *[$C_{Lab}{}^{w}V_{Lab}$], *$C^ʕ$ >> MAX [labial], ***MAX [coronal]*** >> ***C^j,*** MAX Rt, MAX μ

4. CONCLUSION

In Karanga and Nambya, glide formation, secondary articulation and elision conspire to ensure that hiatus never surfaces. The three strategies operate in nominals. Precisely, they occur across a prefix and a stem as well as across a noun stem and a diminutive suffix /-àná/. Glide formation is the default or preferred strategy, and when it is blocked by the constraint that bans complex onsets (*COMPLEX), secondary articulation, the second best strategy kicks in. In turn, when secondary articulation is blocked by phonotactic constraints, viz., constraints that ban palatalized consonants (*C^j) and pharyngealized consonants (*$C^ʕ$) as well as the OCP-driven constraints that ban labialized labial consonants followed by labial vowels (*[$C_{Lab}{}^{w}V_{Lab}$]) and palatalized palatal consonants

($*C_{palatal}{}^{j}$), elision occurs. In elision, V_1 is consistently eliminated: this is the vowel that could not be turned either into a glide or into secondary articulation. The differences between Karanga and Nambya are due to phonotactic differences, Karanga which does not have palatalized consonants consistently elides a coronal V_1, in all instances where it is preceded by a consonant. In contrast, Nambya which allows palatalization with all consonants except with palatal consonants employs secondary articulation. In sum, the fact that Karanga and Nambya pattern so closely with respect to their phonemic inventories, lexical items as well as hiatus resolution strategies explored in this article are some of the reasons why some scholars such as Doke (1931) suggest that Nambya is a dialect of Shona.

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About the authors: *Calisto Mudzingwa* holds a doctorate (Linguistics) from The University of British Columbia. He has published on Shona phonology and morphosyntax. His research interests include, Phonological Theory, phonology-morphology interface and language typology.

Maxwell Kadenge holds a doctorate (Linguistics) from the University of Zimbabwe and teaches undergraduate and postgraduate Phonetics and Phonology in the Department of Linguistics, School of Literature and Language Studies at the University of the Witwatersrand. His main research interests are in Phonological Theory, African linguistics and World Englishes.

APPENDIX A

List of Abbreviations

CV	consonant-vowel sequence (syllable)
C	consonant
V	vowel
OCP	obligatory contour principle
OT	Optimality Theory
Cw	consonant-[w] sequence (cluster)
Cj	consonant-[j] sequence (cluster)
C^w	labialization
C^j	palatalization
$C^ʕ$	pharyngealization
FV	final-vowel
CL	class
PL	plural
fut	future
DEM	demonstrative
DIMIN	diminutive
Ø	zero
DEROG	derogatory
STAB	stabilizer
POSS	possessive
QUANT	quantitative
V_1	first vowel
V_2	second vowel
V-Place	Vowel-Place
C-Place	Consonant Place