THE RTR HARMONIC DOMAIN IN TWO DIALECTS OF YORÙBÁ

by

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Abstract

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In this thesis, a process of vowel harmony is explored in two dialects of Yorùbá where the tongue-root values of adjacent vowels generally agree. In Standard Yorùbá, this process of tongue-root harmony affects only vowels within the prosodic word. However, in Mọba Yorùbá, tongue-root harmony affects vowels in the class of proclitics in addition to those contained in the prosodic word. It is argued that this difference in the domain of application of tongue-root harmony is captured by defining constraints that refer to different harmonic domains in each dialect. A prosodic domain that dominates the prosodic word, the clitic group, is posited in order to capture this dialectal difference.

Three different optimality-theoretic accounts that deal with tongue-root harmony in Standard Yorùbá are presented. The ability of these analyses to capture patterns within four dialects of Yorùbá (Ekiti, Ifẹ, Mọba, and Standard Yorùbá) and their general theoretical relevance are the main criteria for evaluation. An account utilizing alignment constraints (Pulleyblank 1996) succeeds in capturing the cross-dialectal patterns of tongue-root harmony in all four dialects of Yorùbá, however it relies on the formulation of gradiently evaluated alignment constraints. This is a situation that is theoretically undesirable. An account enforcing stem-control (Baković 2000) succeeds in capturing the patterns seen in two of the four dialects. I argue against a basic assumption that this account relies on: that all VCV nouns are morphologically complex. It is shown that if at least some of these nouns are not analyzed as morphologically complex, the stem-control account cannot succeed in capturing the attested pattern of tongue-root harmony in any dialect of Yorùbá.

Finally, an account that utilizes markedness constraints prohibiting certain featural sequences (Pulleyblank 2002) can capture the pattern seen in Standard Yorùbá. An adaptation of this account that includes positional faithfulness is offered to account for Ifẹ, Ekiti and Mọba Yorùbá. This positional faithfulness account avoids the need to use gradiently evaluated constraints and it does not rely on morphological constituency. Instead, it uses prosodic constituents as domains of reference for OT constraints.

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Chapter 1 - Introduction

This thesis explores dialectal differences in tongue-root harmony based on a corpus of language data collected from a native speaker of both the Mọba dialect of Yorùbá and Standard Yorùbá. The main dialectal difference that is explored in this thesis concerns the size of the harmonic domains in RTR harmony. While in Mọba, the class of proclitics is included in the harmonic domain, it is not in Standard Yorùbá. This is illustrated below in (1). The vowel in the 3SG proclitic harmonizes with the vowel in the verbal base in Mọba but not in Standard Yorùbá.

(1) Proclitics in Mọba and Standard Yorùbá

	MB	SY	Gloss	Meaning
3SG	é se	ó ṣe	3SG='do'	's/he does/did'
	ẹ́ jẹ	ó jẹ	3SG='eat'	's/he eat/ate'

Assuming minimal differences in representations between Standard Yorùbá and Mọba, the domain-size difference could result either from a common prosodic domain that is mapped to different syntactic constituents in the two dialects or from a reference to two distinct prosodic domains. It is argued that the difference between the patterns seen in Mọba and Standard Yorùbá is only compatible with an account employing a reference to two distinct prosodic domains.

Three recent accounts of RTR harmony in Yorùbá utilize sets of OT-constraints that are unique to each account. One utilizes featural alignment constraints (Pulleyblank 1996), one utilizes constraints enforcing stem-control (Baković 2000), and a third utilizes prohibition constraints that ban featural sequences (Pulleyblank 2002). These accounts differ in subtle ways and the phonological and morphological behaviour of Yorùbá at the word level does not always provide a satisfactory testing ground. The subtleties of these accounts are evaluated in light of the difference in harmonic behaviour of clitics in Mọba and Standard Yorùbá. Of these accounts, the stem control account is unable to capture the Mọba pattern seen in the clitic domain with respect to RTR harmony. It also relies on morphological structure that is tenuously posited to hold across the board in all morphemes containing more than one vowel. This is contrary to the evidence in at least a few cases. I argue against an account utilizing stem-control as a result. Additionally, I argue against an alignment-based account for reasons independent of RTR harmony. Alignment of featural domains is problematic in general for an account that utilizes gradiently evaluated constraints, as is the case for Yorùbá. However, a categorical alignment constraint isn't able to account for RTR harmony in Yorùbá either.

Instead, a unique account that is based on the harmony-via-sequence-prohibition account is proposed. Rather than appeal to morphological constituency alone, as the stem-control account does, this account seeks to map prosodic structure onto morphological structure, and then use the prosodic categories defined as such, as domains of reference for OT constraints. This account captures not only the pattern of harmony in Mọba and Standard Yorùbá. It also extends typologically to the Ifẹ and Ekiti dialects of Yorùbá.

This thesis is organized as follows. Chapter 2 begins with an outline of the basic pattern of RTR vowel harmony in Yorùbá based on Archangeli and Pulleyblank (1989). Next, the three optimality-theoretic accounts of RTR harmony in Standard Yorùbá are summarized in detail. A critical analysis is offered in areas where these accounts succeed and where they do not. The harmony-via-prohibition account is then extended to account for Ifẹ and Ekiti Yorùbá. Chapter 3 presents the crucial data in Mọba Yorùbá and exemplifies the differences between Standard Yorùbá and Mọba with respect to the domain for RTR harmony. A detailed discussion on the implications of the patterns seen (or not seen) in enclitics follows this. Chapter 4 offers the arguments for prosodic structure in Yorùbá from Ọla (1995). OT constraints are posited that formally define prosodic constituents. Two basic hypotheses are stated that could account for the status of clitics within this prosodic constituency. These hypotheses are then evaluated based on evidence from the RTR and nasal harmonic domains. Some implications of this result on domains in other processes are discussed. Chapter 5 presents an analysis based on references to prosodic structure for Mọba RTR Harmony. This analysis is an extension of the harmony-via-prohibition account and is extendable to the other three dialects already considered (Ifẹ, Ekiti, and Standard Yorùbá). Chapter 6 is the conclusion.

Chapter 2 - RTR Harmony in Standard Yorùbá

Vowel harmony in Yorùbá is seen in all words.[1] The effect is that vowels are forced to agree with respect to their tongue-root orientation. Section 2.1 summarizes the RTR harmonic pattern in Standard Yorùbá. Archangeli and Pulleyblank (1989) provide a basic description of this pattern. OT analyses based on this description have been posited by Pulleyblank (1996), Baković (2000), and Pulleyblank (2002). Sections 2.2, 2.3, and 2.4 provide summaries of these analyses. Discussion is included that highlights the basic strengths and weaknesses of each account. The harmony-via-prohibition account fares better than the other two accounts. An account that is based on the ideas of the prohibition account can derive RTR harmony in three dialects of Yorùbá (Ifẹ, Ekiti, and Standard Yorùbá).

2.1 RTR Harmony: The Basic Pattern

Many accounts and discussions exist surrounding RTR harmony in Standard Yorùbá (Archangeli and Pulleyblank 1989, 1994; Baković 2000; Baković and Wilson 2000; Orie, 2001, 2003; Pulleyblank 1996). The basic pattern of Yorùbá vowel harmony (Archangeli and Pulleyblank 1989) indicates that the active harmonic value is RTR (or –ATR)[2] for reasons that will be outlined shortly. Standard Yorùbá exhibits an RTR contrast only in mid vowels. High vowels are always produced as ATR and low vowels are always produced as RTR. Additionally, there is a distinction between nasal and oral vowels. While high and low vowels contrast for nasality, the mid ATR vowels, e and o, and the mid RTR vowel ẹ (IPA ɛ) are invariably oral. The back RTR vowel ọ (IPA ɔ) can occur as nasal, but only following a labial sound: it is an allophone of the low nasal vowel, which occurs elsewhere.[3] The vowel inventory with respect to place of articulation for

[1] The lone monomorphemic exceptions are a limited class of CVCV nouns that are loan words. These loan words also do not conform to the VCV-templatic requirements of Yorùbá nouns. I assume that by virtue of being loan words, these words are not subject to the same set of constraints as are the vast majority of native Yorùbá lexical items.
[2] The ATR/RTR distinction is variously handled via privative features or a binary feature, +/- ATR in previous accounts. I assume privative features, although this choice is completely arbitrary for the purposes of this thesis.
[3] As will be discussed in section 3.1, Standard Yorùbá and Mọba differ in that no such allophonic variation is seen in Mọba Yorùbá.

Standard Yorùbá as illustrated in Archangeli and Pulleyblank (1989) is shown below (tone is not included here).[4]

(2) Yorùbá Vowel Inventory

Oral Vowels

	front	back	
ATR	i	u	high
	e	o	mid
RTR	ẹ	ọ	
	a		low

Nasal Vowels

	front	back	
ATR	in	un	high
			mid
RTR		(ọn)	
	an		low

2.1.1 Roots in Yorùbá

A root is generally defined as an element to which a morphological operation applies, such that that element cannot be analyzed further. The following two subsections explore tongue-root harmony in the class of nouns in Yorùbá, which generally conform to a VCV template, minimally.[5] Verbal roots, on the other hand, conform to a CV template. In this thesis, a distinction is made between VCV nouns that are analyzed as roots, and derived VCV nouns that consist of a prefix attached to a CV verbal root. In order for a VCV noun to be analyzed as morphologically complex, the following two criteria must be met: First, there must be a clear semantic relation between the CV verbal root and the VCV noun. Second, the CV verbal root must be independently attested as a bare root. When one of these two criteria is not met, I assume that the CVC noun in question is not morphologically complex and that it therefore constitutes a root. This results in a separation of VCV nominal roots and derived VCV nouns consisting of a prefix and a CV verbal base. This separation is illustrated in (3) below.

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[4] I will use Yorùbá orthographic conventions throughout: ẹ = IPA [ɛ], ọ = IPA [ɔ], p = IPA [k͡p], ṣ = IPA [ʃ]; nasalized vowels are conventionalized as sequences of Vn – i.e. an = IPA [ã] – there are no codas in Yorùbá; There is a three-way tonal contrast: high tone = á, low tone = à, mid (unmarked) tone = a. Phonetic transcriptions will be placed inside square brackets when needed.

[5] Cases of VCVCV nouns that are also analyzed as roots are discussed in section 2.1.5.

(3) Noun Complexity in Yorùbá

a. Morphologically Complex Deverbal nouns: V + CV

dẹ	'to hunt'
ọdẹ	'hunter'
kú	'to die'
òkú	'corpse of a person'

b. Morphologically Non-Complex Nominal Roots: VCV

ilé	'house'
lé	'pursue' or 'drive away' or 'accompany'... (Delano 1969)
ilẹ̀	'land' or 'ground'
lẹ̀	'to be flexible' or 'stuck' or 'gummed' or 'to patch'... (Delano 1969)

The alternative view, that all VCV nouns are morphologically complex, assumes that all VCV nouns consist of a CV verbal root with a prefix attached (Adetugbo 1967, Fresco 1970, Awoyale 1974, Akinkugbe 1978, Bakovic 2000). Under this view, the only kinds of roots are verbal CV roots. This assumes that language learners will generalize the pattern of V+CV derivation to form nouns, so that all nouns are composed this way, regardless of whether the CV verbal base is semantically related to an attested bare CV verb.

On the other hand, if language learners interpret morpheme boundaries based on paradigm uniformity, it can be argued that at least some VCV nouns are not morphologically complex. Under this view, VCV nouns that are clearly related semantically to a given CV verbal root, as in (3a) above, would constitute evidence for a morpheme boundary. The pairing of a CV verb and a derived noun whose base is that CV verb constitutes a learnable paradigm. However, the VCV nouns in (3b) are not semantically related to any CV verb that could be posited as the base in an affixed form. Since there is no available semantically related base in the Yorùbá lexicon, a learner must either posit an abstract base that is semantically related but that isn't attested elsewhere in the language, or a learner must simply conclude that the VCV noun constitutes an autonomous root. Under either of these two scenarios, one item must be introduced into the lexicon – either an abstract base or a VCV root. Since there is nothing to be gained by positing an otherwise unattested abstract base, I assume that a language learner would preferably analyze forms such as those in (3a) above as non-complex VCV roots.

2.1.2 Harmony in VCV Nouns

The basic harmonic pattern concerning mid vowels in VCV nouns is outlined in this section. Agreement with respect to RTR is obligatory between adjacent mid vowels.[6] This agreement is illustrated below in (4).

(4) Mid Vowels: Contrastive ATR/RTR, harmonic triggers[7]

a.	ewé	'leaf'	*ẹwé	*ewẹ́
	epo	'oil'	*ẹpo	*epọ
	olè	'thief'	*ọlè	*olẹ̀
	owó	'money'	*ọwó	*owọ́
b.	ẹsẹ̀	'foot'	*esẹ̀	*ẹsè
	ẹ̀kọ	'pap'	*èkọ	*ẹ̀ko
	ọbẹ̀	'soup'	*obẹ̀	*ọbè
	ọkọ̀	'vehicle'	*okọ̀	*ọkò

While mid vowels exhibit a contrast for the feature RTR, high vowels are obligatorily ATR. They do not participate in RTR harmony, therefore. With respect to mid vowels, any mid vowel (ATR or RTR) can occur either preceding or following a high vowel.[8] This results in both disharmonic sequences (5b and d), and in harmonic sequences (5a and c) of mid and high vowels. With respect to sequences of two or more high vowels, these are invariably ATR since Yorùbá does not allow RTR high vowels. Therefore, any sequence of high vowels is necessarily harmonic (see (5e) below).

(5) High Vowels: Obligatory ATR, no harmony

a.	ilé	'house'
	ìgò	'bottle'

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[6] Throughout I refer to vowels separated only by consonants as adjacent. While this adjacency is not a case of absolute segmental adjacency, Gafos (1999), for example, argues that vowel gestures are actually articulatorily adjacent, even when intervening consonants are present.

[7] The Standard Yorùbá data in (4), (5), (6) and (7) are from Archangeli & Pulleyblank, 1989.

[8] An independent constraint prohibiting word-initial u in Standard Yorùbá is responsible for the absence of u-initial nouns in Standard Yorùbá. This is used as an argument for prosodic structure in Ọla (1995).

b.	ilẹ̀	'ground'
	itọ́	'saliva'
c.	etí	'ear'
	orí	'head'
	eku	'bush rat'
	ojú	'eye'
d.	ẹ̀bi	'guilt'
	ọ̀kín	'egret'
	ẹ̀wù	'clothing'
	ọ̀run	'heaven'
e.	igi	'tree'
	inú	'stomach'
	iṣu	'yam'
	ìlú	'town/city'

As was the case for high vowels, there is no potential interaction between adjacent low vowels due to the obligatoriness of low vowels to also surface as RTR (see 6a below). In addition, there is no interaction between adjacent low and high vowels (in either order) with respect to RTR harmony (see (6b and c) below). This results in surface disharmonic sequences of low RTR vowels and high ATR vowels. Disharmony is tolerated in these cases in order to ensure that high vowels are invariably ATR and low vowels are invariably RTR. There are no ATR low vowels (represented below as ə), as can be seen by the ungrammatical forms in (6b and c) below.

(6) Low Vowels: Obligatory RTR

a.	àyà	'chest'
	ara	'body'
b.	atú	'a type of cassava'
	amì	'sign'
	*əmì	
c.	iyàn	'dispute'
	ìkà	'cruelty'
	*ìkə̀	

While these cases involving invariably ATR/RTR vowels do not exhibit harmony, the interaction of low vowels with mid vowels is one where harmony *is* seen. Low vowels are unique in that they are obligatorily RTR[9] and they act as triggers of leftward (but not rightward) harmony. This pattern is illustrated below:

(7) Low Vowels: Harmonic triggers

a.	ate	'hat'
	aró	'indigo'
b.	àjẹ̀	'paddle'
	aṣọ	'cloth'
c.	ẹ̀pà	'groundnut'
	ọ̀ràn	'trouble'
d.	*èpà	
	*òràn	

The above pattern exhibits the directionality of Yorùbá RTR harmony. Since mid vowels are allowed to contrast for RTR following a low vowel but not preceding a low vowel, Archangeli and Pulleyblank argue that RTR harmony is strictly leftward. Example (7a) above would be ungrammatical if harmony were rightward. This leftward directionality also explains the ungrammaticality of (7d).

In Archangeli and Pulleyblank (1989), RTR is seen as the active value because of the ban on ATR mid vowels preceding low vowels (7d). No such restriction exists on the distribution of ATR or RTR mid vowels with high vowels however. This indicates that while there is evidence for leftward spreading of RTR, there is no evidence for either leftward or rightward spreading of ATR.

2.1.3 Harmony in Derived V+CV Nouns

In the previous section, we saw that harmony applies within the root domain since it applies across adjacent vowels in a VCV root. However, harmony also applies across root-prefix boundaries in derived V+CV nouns. This is illustrated below for the agentive prefix in (8). This prefix is a mid, back, round vowel whose tongue-root value is determined via harmonic requirements. When this prefix attaches to a verbal base with an RTR vowel as in (8a), the prefix surfaces as RTR. However, when this prefix attaches to a verbal base with an ATR vowel as in (8b), the prefix surfaces as ATR.

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[9] One detail concerning the distribution of high and low vowels is not accounted for in the discussion in this thesis. No dialect of Yorùbá allows a low ATR vowel to surface. In fact, this is a general property of the language family as a whole. However, there are numerous examples of high RTR vowels in the family.

(8) Derived V+CV Nouns

a.	dẹ	'to hunt'
	ọdẹ	'hunter'
	*odẹ	
b.	kú	'to die'
	òkú	'corpse of a person'
	*ọ̀kú	

There are no cases where an ATR mid vowel prefix or an RTR mid vowel prefix can surface disharmonically. The tongue-root value of a prefix is determined completely as a result of vowel harmony, and not of faithfulness then: Therefore underlying values of mid-vowel prefixes are irrelevant.

2.1.4 Disharmony in Compounds

Compound words are composed of more than one root. In Yorùbá, compound words present disharmonic sequences of mid vowels. This is illustrated in (9) below. We find disharmonic sequences of both RTR mid vowels followed by ATR mid vowels and ATR mid vowels followed by RTR mid vowels.

(9) Compounds are Disharmonic

a.	ṣẹ́	'to change'
	owó	'money'
	ṣẹ́wó	'to change money'
b.	ewé	'leaf'
	ọbẹ̀	'soup'
	ewébẹ̀	'any pot herb used for making soup'

This disharmonic pattern in compounds is explained given that the domain for tongue root harmony is limited to either the root or the word. Since we have seen in the previous section that prefixes are included in the harmonic domain, this rules out the root. We can account for the lack of harmony across root-boundaries in compounds by positing that the root and word are aligned (via alignment constraints – this is discussed in more detail in chapter 4). By restricting the harmonic domain to the word, disharmony is allowed across root-root boundaries in compound words.

2.1.5 *Harmony in VCVCV Nouns*

Archangeli and Pulleyblank (1989) further argued for a lexical specification of RTR that is linked to the right edge of a morpheme. This association convention derives the asymmetric pattern seen in the class of trisyllabic monomorphemic roots with medial high vowels, an example of which is shown below:

(10) Harmonic in VCVCV Nouns

a. odídẹ 'Grey Parrot'

b. *ọdíde

c. *ọdídẹ

As exemplified in (10) above, RTR mid vowels are aligned with the right edge of the morpheme, when possible. There are no monomorphemic cases where a high vowel is flanked by *two* RTR mid vowels, one on either side as in (10c). This is a case of opacity in vowel harmony: High vowels are opaque to RTR harmony in Standard Yorùbá since they block transmission of the harmonic feature. Further, when a mid-high-mid root does carry an RTR value, it is realized only on the final mid vowel and never on the initial mid vowel, as is seen in (10b).

Cases of imperfect right-alignment occur when a final vowel (or a sequence of final vowels) is high. In these cases, the RTR feature associates with the rightmost mid vowel instead. This is exemplified in (11) below, where the rightmost mid vowel is the *only* mid vowel. This is essentially the same pattern as was seen in (5d) above (repeated as (11b)) with the exception that the final *two* vowels are high.

(11) Imperfect Right-Alignment of RTR

a. ẹwìrì 'bellows'

b. ẹbi 'guilt'

The above examples illustrate that the morpheme-level RTR feature is always associated with a non-high vowel, when present (Archangeli and Pulleyblank 1989). Additionally, there is a preference for orientation with the right edge rather than the left edge. The prediction is that RTR mid vowels that do not precede a low vowel bear root values of RTR. In Archangeli and Pulleyblank (1989), a distinction is made concerning two types of RTR association then. On the one hand, redundantly assigned RTR is found on low vowels (when they aren't associated with a root value of RTR) and on the other hand a root value for RTR is seen on rightmost non-high vowels in those roots whose lexical specification includes this RTR value. While both trigger harmony, only one of these is subject to right-alignment with the root – the root value for RTR. This root-value specific right-alignment allows redundantly assigned RTR values on low vowels to escape the restrictions of right-alignment according to Archangeli and Pulleyblank (1989). Since these redundant values are not root-values, they are not subject to this right-alignment requirement.

2.2 Harmony via Alignment

2.2.1 Basic Constraint Ranking for Alignment

Pulleyblank (1996) analyzes this alignment effect described in section 2.1 in Optimality Theory (Prince and Smolensky 1993) by using constraints of the form ALIGN(Cat1, Edge1, Cat2, Edge2) (McCarthy and Prince 1993).[10] In Pulleyblank's analysis, right-edge-alignment of RTR refers to the root domain, such that a single underlying root value of RTR aligns to the right edge of the root. This is accomplished via the constraint ALIGN(RTR, R, ROOT, R).

In order to drive leftward harmony, a similar alignment constraint must be active that refers to the left edge of the RTR harmonic domain. The category that the left-edge-alignment constraint refers to is not the ROOT, however. Pulleyblank (1996) proposes the prosodic word as the category for left-alignment. The harmonic behaviour of the prefixes in Standard Yorùbá as shown in section 2.1.3 suggests that the RTR-harmonic domain is the prosodic word and not the root. Recall from example (8) above, repeated as (12) below, that the agentive prefix harmonizes with the base it attaches to.

(12) Prefixes Harmonize With Base

a.	dẹ	'to hunt'
	ọdẹ	'hunter'
	*odẹ	
b.	kú	'to die'
	òkú	'corpse of a person'
	*ọ̀kú	

Left-edge-alignment of the RTR harmonic domain is relative to a category that includes this prefix then, the PrWd being one such category. The constraint, ALIGN(RTR, L, PrWd, L) enforces left-alignment of the RTR value with the prosodic word.

In order to drive harmony, both alignment constraints must dominate DEPLINK-RTR and MAX-ATR. Additionally, MAX-RTR must dominate DEPLINK-RTR, so that

[10] For formal definitions for all constraints used in this thesis, see Appendix A.

alignment isn't satisfied by simply deleting the RTR value altogether. This is captured by the ranking in (13) below.

(13) RTR Harmony via Alignment

ALIGN(RTR, R, ROOT, R), ALIGN(RTR, L, PrWd, L),
MAX-RTR >> DEPLINK-RTR , MAX-ATR

Tableau (14) below illustrates that this ranking enforces right-alignment of an RTR value. Candidate (14a) fatally violates ALIGN(RTR, R, ROOT, R) and candidate (14c) fatally violates MAX-RTR. Candidate (14d) fatally violates ALIGN(RTR, L, PrWd, L). The optimal candidate (14b) satisfies both alignment constraints and it retains the underlying RTR value.

(14) Right-Alignment Enforced in VCV Nouns

/ọbè/	ALIGN(RTR, R, ROOT, R)	ALIGN(RTR, L, PrWd, L)	MAX-RTR	DEPLINK-RTR	MAX-ATR
a. ọbè	*!				
☞ b. ọbẹ̀				*	*
c. obè			*!		
d. obẹ̀		*!		*	

This outcome is true regardless of where the RTR value is linked in the input. This is demonstrated in (15) below. Again, candidate (15b) is selected optimally for the same reasons as in (14) above. The alignment-based account posits a root-value of RTR that does not need to be linked anywhere in the input. Output constraints on alignment and faithfulness (and markedness in the case of low and high vowels) determine the location of the RTR value on the surface.

(15) Left-Alignment Enforced in VCV Nouns

/obẹ̀/	ALIGN(RTR, R, ROOT, R)	ALIGN(RTR, L, PrWd, L)	MAX-RTR	DEPLINK-RTR	MAX-ATR
a. ọbè	*!			*	
☞ b. ọbẹ̀				*	*
c. obè			*!		
d. obẹ̀		*!			

Finally, as mentioned above, low vowels are always RTR in Standard Yorùbá. This fact is captured by ranking another grounding constraint, LO/RTR[11] above DEP-RTR.

(16) Low Vowels are Invariably RTR

/əte/	LO/RTR	DEP-RTR
a. əte	*!	
☞ b. ate		*

This ranking forces low vowels to be produced as RTR, regardless of the underlying value for ATR/RTR. This ranking holds in all dialects of Yorùbá – there are no known cases where advanced low vowels can occur.[12]

2.2.2 *Dialectal Variation: High Vowels in Ekiti Yorùbá*

Pulleyblank's (1996) analysis is also able to account for other Yorùbá dialects that differ in their patterns of RTR harmony. For example, the Ekiti dialect[13] exhibits a harmonic system where high vowels are targeted in RTR harmony (Orie 2003). Pulleyblank accounts for high vowel opacity in Standard Yorùbá by ranking HI/ATR[14] above ALIGN(RTR, L, PrWd, L) so that high vowels are always produced with ATR regardless of the pressure to left-align the RTR feature. This is illustrated in (17) below.

(17) High Vowels are Invariably ATR

/ilẹ̀/	HI/ATR	ALIGN(RTR, L, PrWd, L)
☞ a. ilẹ̀		*
b. ịlẹ̀	*!	

The Ekiti grammar would reverse this ranking such that ALIGN(RTR, L, PrWd, L) dominates HI/ATR, resulting in perfect left-alignment at the expense of incurring violations of the grounding constraint, HI/ATR. Additionally, MAX-RTR must dominate HI/ATR in order to rule out a candidate that satisfies ALIGN(RTR, L, PrWd, L) by deleting the RTR value. This is illustrated in the ranking in (18) below.

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[11] The constraint, LO/RTR is grounded in acoustic and articulatory enhancement relations (Archangeli & Pulleyblank, 1994).

[12] This case is partially exhibited in Wolof, where short (but not long) low vowels can contrast for ATR/RTR (Pulleyblank, 1996).

[13] Mọba is actually a subdialect of Ekiti.

[14] The constraint, HI/ATR is grounded both articulatorily and acoustically by enhancement relations between ATR and +high (Archangeli & Pulleyblank, 1994).

(18) RTR Harmony in Ekiti Yorùbá

/odídẹ/	ALIGN(RTR, L, PrWd, L)	MAX-RTR	HI/ATR
a. odídẹ	*!*		
☞ b. ọdị́dẹ			*
c. ọdídẹ	*!*		
d. odíde		*!	

2.2.3 Dialectal Variation: Relative Alignment in Ekiti and Ifẹ Yorùbá

Another feature of Pulleyblank's analysis is that there are two types of alignment effects seen in the various dialects of Yorùbá. One type, absolute alignment, requires an underlying RTR feature to be aligned to the right edge of the root; otherwise, it will not surface at all. This case is exhibited in the Ifẹ and Ekiti dialects of Yorùbá (Orie 2001, 2003) as well as in Wolof (Pulleyblank 1996). On the other hand, relative alignment requires an underlying RTR feature to be aligned to the rightmost available segment. This is the case seen in Standard Yorùbá. In relative alignment, it is more important to retain the underlying RTR feature at the expense of imperfect alignment. On the other hand, in cases of absolute alignment, an underlying RTR feature is deleted if the edgemost vowel is not a potential anchor due to higher-ranking constraints (such as HI/ATR). This situation is illustrated by Orie (2003) using the following examples:

(19) Relative Alignment (SY) vs. Absolute Alignment (Ifẹ and Ekiti)

	SY	Ifẹ and Ekiti	
a.	ẹ̀bi	èbi	'guilt'
	ẹwìrì	ewìrì	'bellows'
b.	ebi	ebi	'hunger'
	èkuru	èkuru	'food made of beans'

The neutralization of an ATR/RTR contrast in mid vowels preceding a high vowel in dialects with absolute alignment is seen in (19a) above. On the other hand, this contrast is preserved in Standard Yorùbá, where relative alignment is exhibited. Pulleyblank's analysis accounts for absolute alignment by ranking ALIGN(RTR, R, ROOT, R) >> MAX-RTR. This ranking states that alignment of the RTR feature to the right edge must be satisfied even if it means deleting a lexically specified RTR feature. The reverse case, relative alignment, is captured by reversing this ranking such that MAX-RTR >>

ALIGN(RTR, R, ROOT, R). In this case, an underlying RTR feature is retained even though it might be impossible to align it perfectly with the right edge. The alignment violation is tolerated in order to preserve the underlying RTR feature.

2.2.4 Problems with Alignment: Gradient versus Categorical Constraints

An important side issue here concerns the nature of evaluation of alignment constraints. Alignment must be gradiently evaluated in order for this account to succeed. First, consider a categorically evaluated alignment constraint. In this case, it is impossible to enforce harmony if the leftmost vowel is high. This is illustrated in (20) below. An RTR root of the form high - mid - mid would surface with the RTR right-aligned to the root (to satisfy the root alignment). However, perfect left-alignment is impossible due to undominated HI/ATR. Candidate (20d) is ruled out as a result. Additionally, since a categorical ALIGN(RTR, L, PrWd, L) constraint cannot discern between misaligned candidates (20a) and (20b), the former would be selected for faithfulness reasons. This is because it incurs one fewer DEPLINK-RTR violation (Archangeli and Pulleyblank 1994). Note also that MAX-RTR must outrank ALIGN(RTR, L, PrWd, L) in order to rule out candidate (20c), where the RTR value is deleted.

(20) Categorical Alignment fails to Drive Harmony

/iCeCẹ/	HI/ATR	MAX-RTR	(CAT)ALIGN(RTR, L, PrWd, L)	DEPLINK-RTR	MAX-ATR
☞ a. iCeCẹ			*		
b. iCẹCẹ			*	*!	
c. iCeCe		*!			
d. ịCẹCẹ	*!			**	*

However, utilizing a gradient alignment constraint instead, it is possible to achieve leftward harmony without the requirement of perfect left-alignment. This is demonstrated in (21) below. Candidate (21a) fatally violates the gradient alignment constraint since the RTR value is misaligned by two segments. Candidate (21b) is selected optimally since the RTR value is misaligned by a single segment.

(21) Gradient Alignment Succeeds in Driving Harmony

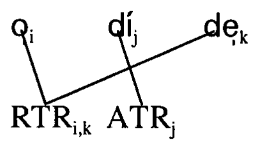
/iCeCẹ/	HI/ATR	MAX-RTR	(GRAD)ALIGN(RTR, L, PrWd, L)	DEPLINK-RTR	MAX-ATR
a. iCeCẹ			**!		
☞ b. iCẹCẹ			*	*	
c. iCeCe		*!			
d. ịCẹCẹ	*!			**	*

While a gradient constraint is able to capture the left-alignment effect, McCarthy (2003) offers arguments against gradient constraints based on cross-linguistic facts. McCarthy argues that all effects that have been analyzed using gradient constraints can be captured via some categorical alternative. Additionally, there are cases where gradient constraints are problematic. The proposal then, is to do away with gradient constraints completely, in favour of categorical alternatives. If we take McCarthy's point at face value, then this amounts to evidence against using left-alignment to drive RTR harmony in Yorùbá. Likewise, this amounts to evidence against a gradient alignment constraint that drives relative right-alignment in Standard Yorùbá. Since this alignment-based analysis relies on a gradiently evaluated constraint, it will be superceded by two analyses that will be presented in the following two sections that do not use gradiently evaluated constraints.

2.2.5 *Treatment of High Vowels: Opacity and Transparency*

Opacity of high vowels, as outlined above, is captured in Pulleyblank's account first by ruling out gapped configurations where a harmonic value can skip a potential linking site. Such a representation is argued to violate precedence relations because the medial vowel both follows and precedes an RTR mid-vowel (Archangeli and Pulleyblank 1994). This situation is illustrated in (22) below.

(22) Gapped Configurations Violate Precedence Relations



'i' precedes 'j' which also precedes 'k'

'j' and 'k' both precede 'i'

Since these mid vowels are linked to a single RTR feature, this would imply that the medial vowel ('j') both precedes ('k') and follows ('i') that RTR feature. This situation is argued to be phonetically uninterpretable and therefore linguistically ill formed. GEN would not provide structures such as these for EVAL, and therefore they are ruled out as possible representations of surface forms.[15]

Once gapped configurations are ruled out, the high-ranking of HI/ATR ensures that a medial high vowel flanked by two mid vowels surfaces as ATR. One situation that could result in an RTR feature appearing on the initial mid vowel involves a single underlying RTR feature that is right aligned with the root (as would be expected) and a second RTR feature that is inserted onto the initial mid vowel. This case is ruled out in Pulleyblank's analysis by ranking DEP-RTR >> ALIGN(RTR, L, PrWd, L), such that the insertion of an extra RTR feature incurs a violation of the higher-ranked DEP-RTR constraint. This ranking would be reversed in languages where 'transparency' of high vowels is observed, such that ALIGN(RTR, L, PrWd, L) >> DEP-RTR. This situation is exemplified in Ifẹ Yorùbá (Orie 2001, 2003) and in Wolof (Pulleyblank 1996).

However, given the formal definition of generalized alignment that is presented in McCarthy and Prince (1993), this ranking does not actually derive transparency since insertion of an RTR feature on the leftmost mid vowel does nothing to improve the alignment of the rightmost RTR feature with the left edge of the word. Both the opaque and the transparent forms would incur two violations (one for each of the two vowels that separates the rightmost RTR mid vowel from the left edge of the word). Therefore, ALIGN(RTR, L, PrWd, L) is unable to differentiate between these two candidates. DEP-RTR would then optimally select the opaque candidate since it incurs one less violation, regardless of its ranking with ALIGN. This situation is exemplified below for generalized alignment:

(23) Generalized Alignment Fails to Derive Transparency

/odide/, RTR	ALIGN(RTR, L, PrWd, L)	DEP-RTR
a. ọdidẹ	**	*!
☞ b. odidẹ	**	

Candidate (23b) would be selected optimally under either ranking of DEP-RTR and ALIGN(RTR, L, PrWd, L) since the rightmost mid vowel is misaligned by two syllables in both candidates (thus tying with respect to ALIGN(RTR, L, PrWd, L)). However, the insertion in candidate (23a) violates DEP-RTR fatally.

There is a sense in which candidate (23a) is better aligned with the left edge though through insertion of RTR on the initial mid vowel. Pulleyblank (1996) captures this via a slightly refined definition of alignment. The concept of local alignment is

[15] Although see Itô, Mester & Padgett (1995) where NO-GAP is assumed to be a violable constraint, and not a property of GEN.

defined as alignment of a feature over its own local domain. In this case, a local domain refers to the leftmost possible edge, assuming that other instances of RTR to the left of the RTR feature in question are not included in this local domain. Therefore, the rightmost mid vowel in candidate (23a) incurs only a single violation of local alignment (due to the medial high vowel) since the leftmost mid vowel is not included in the same local domain. With this definition of alignment, the typology of transparent and opaque neutral vowels is attainable.

(24) Local Alignment Derives Transparency

/odide/, RTR	LOCALIGN(RTR, L, PrWd, L)	DEP-RTR
☞a. ọdidẹ	*	*
b. odidẹ	**!	

On the other hand, re-ranking LOCALIGN(RTR, L, PrWd, L) and DEP-RTR so that DEP-RTR dominates LOCALIGN(RTR, L, PrWd, L), opacity of high vowels is captured, as is the case in Standard Yorùbá.

However, a second situation can result in a surface pattern of transparency with high vowels. Forms containing two underlying RTR values need to be considered given that the richness of the base holds as a property of Optimality Theory (Prince and Smolensky 1993). The richness of the base hypothesis states that every possible input representation should result in the optimal selection of some attested surface form. As it stands now, a form containing two underlying RTR values would actually result in the optimal selection of a transparent candidate like (24a) regardless of the ranking of LOCALIGN(RTR, L, PrWd, L) and DEP-RTR. This is because unlike the case where the leftmost RTR is inserted, there are two RTR features present underlyingly. There is now no DEP-RTR violation at all, and since DEP-RTR does not differentiate between candidates like (24a) and (24b), LOC-ALIGN(RTR, L, PrWd, L) will regardless of the mutual ranking. This situation is exemplified below in (25).

(25) Transparency via Multiple Underlying RTR Features

/odide/, RTR, RTR	LOC-ALIGN(RTR, L, PrWd, L)	DEP-RTR
☞a. ọdidẹ	*	
b. odidẹ	**!	

In order to overcome this potential roadblock, Pulleyblank utilizes a constraint that militates against having two RTR values present in the output: the OCP. However, this constraint potentially militates against attested trisyllabic forms that contain a lexically specified RTR feature and contain a sequence of an initial low vowel, a medial high vowel, and a final mid vowel (i.e.: a-i-e, RTR). Since the high-ranked constraint

LO/RTR requires that the low vowel be RTR, and the OCP requires that only one RTR feature be present in the output, the optimal surface form should straightforwardly associate this RTR feature onto the low vowel, leaving the final mid vowel ATR. However, forms that violate the OCP with the pattern a-i-ẹ are attested in Standard Yorùbá. The fact that these contrast with forms like a-i-e can only be explained by positing an underlying root-RTR value in the former case and no such root-RTR value in the latter case. Pulleyblank's solution then is to restrict the OCP to the root-domain. In doing so, the OCP only applies to underlying root-values of RTR and not to those values inserted on low vowels in order to satisfy LO/RTR.

2.2.6 *An Alternative Alignment-Based Account: Prosodic Licensing*

This alignment-based account is expanded upon and modified in Orie (2003) in her analysis of Ebira vowel harmony and three dialects of Yorùbá (Standard Yorùbá, Ekiti and Ifẹ). Orie adopts the basic account that Pulleyblank (1996) proposes with one notable exception: Right-edge alignment is replaced by a constraint that refers to prosodic licensing instead. The rightmost syllable is analyzed as the prosodic head in Standard Yorùbá (Ọla, 1995). A constraint is then formulated that licenses a single harmonic root value (an underlying RTR value) on the prosodic head. This constraint, LIC-PH, duplicates the effect of ALIGN(RTR, R, ROOT, R) since all roots have final vowels that are prosodic heads. However, it has the advantage that it is necessarily categorical, and it therefore avoids the problems that gradient constraints have. On the other hand, this account does use the gradient constraint, ALIGN(RTR, L, PrWd, L) and so it only partially addresses this issue. In conclusion, whether we use ALIGN(RTR, R, ROOT, R) or LIC-PH, we obtain the same result – the root value of RTR is at the right edge of the root. The account Orie proposes utilizes prosodic constituency instead of morphological constituency to capture the harmonic effects.

2.3 RTR Harmony via Stem-Control

2.3.1 *Basic Stem-Control in Standard Yorùbá*

An account of vowel harmony systems has been proposed by Baković (2000) that does not refer to featural alignment. In this account, harmony systems are of two types both of which are driven by a constraint[16] that incurs violations of adjacent disharmonic segments with no inherent directionality (AGREE). First, there are stem-controlled systems where the harmonic value in the vowel of the stem of affixation controls the harmonic values of an affixed form. This is enforced by setting up an output-output correspondence relation

[16] Here and elsewhere, see Appendix A for formal constraint definitions.

between the segments in a stem of affixation and those in its corresponding affixed form. Faithfulness constraints (SA-IDENT-F) that refer to this correspondence enforce identity between corresponding segments in the base and the affixed form. These are constraints enforcing identity between two related output forms (Benua 1995, McCarthy 1995, Burzio 1996). The second type of language is of the dominant-recessive type. In this type of language, the unmarked value of the feature is dominant in the sense that regardless of morphological constituency, this value is the trigger for harmony. This dominant-recessive type is not relevant in the discussion of Yorùbá RTR harmony, and will therefore not be discussed further.

Bakovič's account of Standard Yorùbá is based on identity between stems and their corresponding affixed forms, where it is assumed that all words with multiple vowels are morphologically complex. In these cases, only the final vowel is considered a stem vowel and all preceding vowels are assumed to be prefixal vowels. In this account, directionality is ultimately controlled by the stem vowel, resulting in leftward RTR harmony since there are prefixes but no suffixes in Yorùbá. Stem-affixed form identity is enforced more strictly than the AGREE(ATR) constraint. This ranking accounts for the attested disharmonic low-mid vowel sequences, as is seen in tableau (26) below.[17] Candidate (26a) is selected optimally since it satisfies the higher-ranking constraint, SA-IDENT(ATR). Candidate (26b) fatally violates SA-IDENT(ATR) even though it fares better with respect to the lower-ranked constraint, AGREE(ATR).

(26) Stem-Affixed Form Identity Dominates AGREE: Low-Mid Sequences

Stem: [Ce]

/aCe/	SA-ID(ATR)	AGREE(ATR)
☞ a. aCe		*
b. aCẹ	*!	

On the other hand, mid-low sequences differ in Yorùbá in that they must agree. This follows assuming the same ranking shown in tableau (26) above. Since the stem vowel is a low vowel, it is required to be RTR due to both high-ranking markedness constraints and SA-IDENT(ATR). However, AGREE(ATR) would always optimally select the harmonic candidate, regardless of input specifications. This is seen in tableau (27) below, where candidate (27b) is optimally selected since it satisfies both SA-IDENT(ATR) and AGREE(ATR). While candidate (27a) satisfies SA-IDENT(ATR), it incurs a single fatal violation of the lower-ranked constraint, AGREE(ATR).

[17] Note that low vowels are required to be RTR due to high-ranking markedness constraints. Therefore, I do not consider a candidate with an initial low, ATR vowel in tableau (26).

(27) Stem-Affixed Form Identity Dominates AGREE: Mid-Low Sequences

Stem: [Ca]

/eCa/	SA-ID(ATR)	AGREE(ATR)
a. eCa		*!
☞b. ẹCa		

The above tableaux (26) and (27) exhibit a system of harmony that is stem-controlled. The right-to-left direction of RTR harmony in Yorùbá results due to the morphological structure of VCV nouns in Yorùbá. The final vowel is the stem vowel and is therefore subject to the high-ranked faithfulness constraint, SA-IDENT(ATR), while initial 'prefixal' vowels are not subject to this constraint. AGREE forces 'prefixal vowels' to harmonize with 'stem vowels.' Note that if there were instances in Yorùbá where suffixes occurred, we would expect to see left-to-right tongue-root harmony triggered by the stem vowel onto the suffix vowel in these cases. However, since Yorùbá is a strictly prefixing language, harmony appears to be invariably right-to-left.

2.3.2 *Treatment of High Vowels: Sympathy Theory*

The constraints forcing low vowels to be RTR and high vowels to be ATR are undominated. This breaks down however when considering words with final high vowels (root high vowels) that can never be produced with RTR due to the high-ranking restriction on [+high] co-occurring with RTR. The data in (19) above demonstrate that vowels other than the root vowel can introduce RTR into a morpheme. It is possible for RTR to occur on a prefixal mid vowel that precedes the high root vowel in violation of the high-ranked constraints, SA-IDENT(ATR) and AGREE(ATR). Given an input with an RTR feature anywhere, Baković points out that the above ranking for stem-control would optimally select the fully harmonic ATR candidate over the actual surfacing form that preserves this input RTR. The following tableaux from Baković (2000) illustrate this problem (the stem referred to in the SA-ID(ATR) constraint is given in the line above the tableau).

(28) Stem-Control Fails to Allow Relative Alignment

Stem: [Ci]

/eCɪ/	HI/ATR	SA-ID(ATR)	AGREE(ATR)	IO-ID(ATR)
☞ a. eCi				*
💣b. ẹCi			*!	**
c. eCɪ	*!	*	*	

Stem: [Ci]

/ẹCɪ/	HI/ATR	SA-ID(ATR)	AGREE(ATR)	IO-ID(ATR)
☞ a. eCi				**
💣b. ẹCi			*!	*
c. eCɪ	*!	*	*	

No possible input could result in a surface form with relative alignment of the RTR feature (candidate 28b). However, this pattern is attested in Standard Yorùbá. In order to solve this problem, Bakovič uses constraints posited in McCarthy's (1999) sympathy theory. The general idea here is that candidate (28b) is more faithful to a sympathy candidate where the high vowel is actually specified as RTR.

This sympathy candidate is chosen by a single selector constraint, which is undominated only for the purposes of selecting a sympathy candidate. The selector constraint in this case is ROOT-IDENT(ATR). The sympathy candidate is defined as the optimal candidate with the additional requirement that it *must* satisfy the selector constraint. The following tableaux (179 and 189 from Bakovič 2000) illustrate how a sympathy candidate is selected.[18]

[18] Following McCarthy (1999), the sympathy candidate is denoted with the symbol, ❁. The selector constraint is denoted with the symbol, ★. Those candidates that obey the selector constraints are denoted by the symbol, ✓.

(29) Selection of the Sympathy Candidate (actual output = [ọmu])

Stem: [mu]

/ọmʊ/	IO-ID(HI)	HI/ATR[19]	SA-ID(ATR)	★RT-ID (ATR)	AGR(ATR)	IO-ID(ATR)
✿ a. ọmʊ		*	*	✓		
b. òmʊ		*	*	✓	*!	*
c. ọmọ	*!		*	✓		
d. òmu				*!		**
e. ọmu				*!	*	*

Stem: [mu]

/òmʊ/	IO-ID(HI)	HI/ATR	SA-ID(ATR)	★RT-ID (ATR)	AGR(ATR)	IO-ID(ATR)
✿ a. ọmʊ		*	*	✓		*
b. òmʊ		*	*	✓	*!	
c. ọmọ	*!		*	✓		*
d. òmu				*!		*
e. ọmu				*!	*	**

Note the ranking of IO-ID(HI) above HI/ATR. This ranking is crucial in preventing high vowels from satisfying the featural co-occurrence constraint, HI/ATR by changing the value of [+HI] rather than the ATR value. Thus, candidate (29c) which violates IO-ID(HI) is non-optimal as the sympathy candidate. Candidates (29d) and (29e) are only ruled out because of the role of the selector constraint, ★RT-ID(ATR). Candidate (29d) would otherwise be selected optimally since it does not incur any violations of the higher ranked constraints, IO-ID(HI), HI/ATR and SA-ID(ATR). However, since the sympathy candidate *must* satisfy the selector constraint (★RT-ID(ATR)), candidate (29d) is ruled out. The sympathetic candidate is then selected from those candidates that do satisfy ★RT-ID(ATR). Since candidate (29c) violates the high-ranked constraint, IO-ID(HI), it is ruled out. Candidates (29a) and (29b) tie on all of the higher-ranked constraints. It is AGREE(ATR) that militates against candidate (29b) in favour of the sympathy candidate (29a).

Having defined how a sympathy candidate is selected, a correspondence between the segments in the sympathy candidate and those in the actual output can be referred to. Baković uses the constraint ✿-IDENT(ATR) as the faithfulness constraint that enforces

[19] Baković (2000) denotes HI/ATR as *[+HI, -ATR] in his account.

identity between segments in the sympathy candidate and the actual output. Baković's ranking argument, shown in tableau (30) below, for ❁-IDENT(ATR) is as follows: The actual output, *ọ̀mu*, is unfaithful to the sympathetic candidate only in that the high vowel is ATR, and not RTR. Therefore, IO-ID(HI) must outrank ❁-IDENT(ATR) in order to rule out candidate (30b). The sympathetic candidate (30a) violates both HI/ATR and SA-IDENT(ATR). Therefore, at least one of these constraints must dominate ❁-IDENT(ATR), in order to rule out candidate (30a). On the other hand, AGREE(ATR) is violated in the optimal candidate (30c) in order to avoid a second violation of ❁-IDENT(ATR). Candidate (30d) satisfies AGREE(ATR), but incurs an extra violation of ❁-IDENT(ATR). ❁-IDENT(ATR) must then dominate AGREE(ATR). The extra violation of ❁-IDENT(ATR) in candidate (30d) is thus fatal, and candidate (30c) is selected optimally. This ranking results in the attested surface pattern in Standard Yorùbá as is shown in the tableaux below (from 181 and 182 in Baković 2000).

(30) Sympathetic Faithfulness Succeeds

Stem: [mu]

/ọ̀mʊ/	IO-ID(HI)	HI/ ATR	SA-ID(ATR)	★RT-ID (ATR)	❁-ID(ATR)	AGR (ATR)	IO-ID(ATR)
❁ a. ọ̀mʊ		*!	*	✓			
b. òmʊ		*!	*	✓	*	*	*
c. ọ̀mọ	*!		*	✓			
d. òmu				*	**!		**
☞ e. ọ̀mu				*	*	*	*

Stem: [mu]

/òmʊ/	IO-ID(HI)	HI/ ATR	SA-ID(ATR)	★RT-ID (ATR)	❁-ID(ATR)	AGR (ATR)	IO-ID(ATR)
❁ a. ọ̀mʊ		*!	*	✓			*
b. òmʊ		*!	*	✓	*	*	
c. ọ̀mọ	*!		*	✓			*
d. òmu				*	**!		*
☞ e. ọ̀mu				*	*	*	**

In both cases above, the correct candidate, (30e), is selected once sympathetic faithfulness is introduced. The stem-control theoretic account successfully captures the surface pattern seen in Standard Yorùbá RTR harmony (in disyllabic words).

2.3.3 Problems with Stem-Control Theory: Dialectal Variation in the Behaviour of High Vowels

While it can account for the facts of Standard Yorùbá RTR harmony, one major problem with stem-control theory is its inability to extend to accounts for the patterns in Ifẹ̀ and Ekiti Yorùbá. First, it is shown that opacity in Standard Yorùbá is captured by the ranking presented in the previous section. Second, it is demonstrated that a simple re-ranking can account for the difference between a language where absolute right-alignment is seen (i.e. Ifẹ̀ Yorùbá) and one where relative right-alignment is seen (i.e. Standard Yorùbá). Next, it is demonstrated that the ranking for absolute right-alignment results in neutralization of an ATR/RTR contrast non-finally, a situation that does not allow for transparency of high vowels. Further, it is demonstrated that there is no possible ranking that would result in transparency of high vowels. Additionally, in Ekiti Yorùbá where high vowels participate in RTR harmony, there are no cases where a high vowel actually triggers RTR harmony. Therefore, a successful analysis of these facts should not posit a high RTR vowel that triggers harmony in of Ekiti Yorùbá. The stem-control account, however, posits a sympathy candidate containing a final high RTR vowel that is responsible for 'triggering' leftward RTR harmony on the surface, thus predicting the presence of a dialect where a final high vowel can trigger RTR harmony. The fact that there is no such dialect remains unexplained then under a stem-control account.

Standard Yorùbá exemplifies a situation where high vowels are opaque. The stem-control account captures this effect given the above constraint ranking. Tableau (31) below illustrates this using a hypothetical input where all three vowels are underlyingly RTR. In this case, since the input contains a root with a single RTR vowel, the selector constraint, ★ROOT-IDENT(ATR) is only satisfied by a candidate that retains this RTR value. The sympathetic candidate is chosen from the four candidates (31a, 31b, 31c, and 31e) that satisfy the selector constraint. Two of these candidates (31a and 31e) violate the high-ranked markedness constraint, HI/ATR, and are thus ruled out in the selection of the sympathy candidate. Of the remaining two candidates, candidate (31c) fares better with respect to AGREE(ATR) and is thus selected as the sympathy candidate.

In the actual selection of an optimal candidate in (31) below, candidates (31a), (31d) and (31e) are ruled out due to fatal violations of the high-ranked constraints HI/ATR and SA-IDENT(ATR). The remaining two candidates, (31b) and (31c) differ in that (31c) satisfies ❁-IDENT(ATR) while (31b) incurs a single violation of ❁-IDENT(ATR). Therefore, the opaque candidate (31c) is selected optimally.

(31) Opacity of High Vowels: ❁-IDENT(ATR) >> AGREE(ATR)

Stem: [dídẹ]

/ọdídẹ/	IO-ID(HI)	HI/ATR	SA-ID(ATR)	★RT-ID (ATR)	❁-ID(ATR)	AGR (ATR)	IO-ID (ATR)
a. ọdídẹ		*!	*	✓	**		
b. ọdídẹ				✓	*!	**	*
☞ ❁ c. odídẹ				✓		*	**
d. odíde			*!	*	*		***
e. odídẹ		*!	*	✓	*	*	*

Note that re-ranking AGREE(ATR) above ❁-IDENT(ATR) does not affect the result in tableau (31) above. The same opaque candidate ((31c) and (32c)) is optimal regardless of the mutual ranking of AGREE(ATR) and ❁-IDENT(ATR). This is demonstrated in (32) below.

(32) Opacity of High Vowels: AGREE(ATR) >> ❁-IDENT(ATR)

Stem: [dídẹ]

/ọdídẹ/	IO-ID(HI)	HI/ATR	SA-ID(ATR)	★RT-ID (ATR)	AGR (ATR)	❁-ID(ATR)	IO-ID (ATR)
a. ọdídẹ		*!	*	✓		**	
b. ọdídẹ				✓	**!	*	*
☞ ❁ c. odídẹ				✓	*		**
d. odíde			*!	*		*	***
e. odídẹ		*!	*	✓	*	*	*

However, this ranking affects the pattern seen in disyllabic words. Recall that within the stem-control account, sympathy theory was invoked to account for disyllabic words where a final high vowel was preceded by an RTR mid-vowel (see (30) above). A sympathy candidate is posited where the high vowel triggers leftward RTR harmony and the faithfulness constraint, ❁-IDENT(ATR) enforces identity to this sympathy candidate. The high-ranked constraints ❁-IDENT(ATR) and HI/ATR then enforce the optimal selection of a candidate where an RTR mid vowel precedes an ATR high vowel. If, however, AGREE(ATR) is ranked above ❁-IDENT(ATR), the pressure to be faithful to the sympathy candidate with RTR harmony is replaced by the pressure to have perfect harmony. Since high vowels are invariably ATR due to the high-ranking of HI/ATR, the initial vowel is then forced to agree with the ATR value of a following high vowel. This is essentially a situation of neutralization of RTR non-finally. This situation is exemplified in (33) below.

(33) Neutralization of RTR Predicted Non-Finally: AGREE(ATR) >> ✿-IDENT(ATR)

Stem: [mu]

/ọmu/	IO-ID(HI)	HI/ATR	SA-ID(ATR)	★RT-ID (ATR)	AGR (ATR)	✿-ID(ATR)	IO-ID (ATR)
✿ a. ọmu		*!	*	✓			
b. ọmu				*	*!	*	*
c. omu		*!	*	✓	*	*	*
☞ d. omu				*		**	**

Candidates (33a) and (33c) are ruled out since they both violate the high-ranking constraint, HI/ATR. Candidate (33b) fatally violates AGREE(ATR) though, meaning the ATR harmonic candidate (33d) is selected optimally even though both vowels are underlyingly RTR. This is essentially a situation of positional neutralization where an ATR/RTR contrast can exist in a final non-high vowel. This situation is attested in Ifẹ Yorùbá (a situation of absolute alignment, where an underlying RTR feature is perfectly right-aligned or else it does not surface).

However, Ifẹ Yorùbá exhibits transparent high vowels rather than the opaque high vowels that were predicted in (32) above.[20] In order to allow transparency in Ifẹ Yorùbá, a constraint that favours candidate (32b) over candidate (32c) must dominate AGREE(ATR). The only constraint that does this in the stem-control account is IO-IDENT(ATR). However, we cannot rank this constraint above AGREE(ATR) without also preserving unattested non-harmonic sequences of mid-vowels. Therefore, the constraint set in the stem-control account is unable to extend to cases of transparent high vowels.[21]

The stem-control account then accounts for the situation of relative alignment with high-vowel opacity in Standard Yorùbá. However it predicts a situation that is unattested in any dialect of Yorùbá and fails to account for the pattern of transparency

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[20] The Ifẹ form, *ọdídẹ* (meaning 'Gray Parrot') corresponds to the Standard Yorùbá form, *odídẹ*. This exemplifies the difference between the two dialects: In Ifẹ the initial mid vowel in such a sequence agrees with the final mid vowel (transparency), whereas in Standard Yorùbá, the initial vowel agrees with the adjacent high vowel and is thus invariably ATR (opacity). However, note that in both cases the tongue-root value of the initial vowel is predictable, not contrastive.

[21] Baković & Wilson (2000) use a targeted constraint, →NO(+HI, -ATR) to derive transparency under a stem-control theoretic framework.

that is seen in Ifẹ Yorùbá. The unattested situation, represented by the ranking of AGREE(ATR) >> ❁-IDENT(ATR), is one where an ATR/RTR contrast can exist only in a final non-high vowel. In this situation, high vowels appear to be 'opaque' only because this contrast is neutralized elsewhere. While Ifẹ Yorùbá is similar in that it neutralizes an ATR/RTR contrast non-finally, it exhibits a pattern of transparency in high vowels. The stem-control account does not have the tools to enforce transparency however without the introduction of a targeted constraint (Baković and Wilson 2000). This is summarized in (34) below.

(34) Summary of Predictions of Stem-Control Theory

Language-Type	/ọmu/	/ọdídẹ/
Stem-Control: ❁-ID[ATR] >> AGREE(ATR) (Standard Yorùbá)	ọmu	odídẹ
Stem-Control: AGREE(ATR) >> ❁-ID[ATR]	omu	odídẹ
Ifẹ Yorùbá	omu	ọdídẹ

One further dialectal issue is raised by Orie (2003), who argued for an alignment-based account as opposed to a stem-theoretic account. Of the problems raised by Orie with the stem-theoretic account in Baković (2000), the most relevant argument in the current discussion concerns the fact that *no* dialect of Yorùbá allows RTR high vowels in root-final position. Even in Ekiti Yorùbá, where high vowels can occur as RTR, this can only happen preceding an RTR mid or low vowel.[22] In other words, high vowels never act as harmonic triggers of RTR harmony in any dialect even when they can occur as RTR, implying that high vowels only ever are retracted by harmonic requirements, and not because of faithfulness. If we were to posit a candidate that has a final RTR high vowel that triggers harmony at any level (opaque levels included) in Standard Yorùbá, we would expect that this candidate should surface in some dialect. The fact that Ekiti avoids this suggests that there is no level at which a high RTR vowel can trigger harmony. The cases in Standard Yorùbá presented by Baković as evidence for underlying RTR high vowels (cases like *ọ̀mu* above where sympathy theory is invoked) are, however, consistent with the alternative analysis, where an RTR feature (wherever it is found on the input) cannot right-align due to the general ban on high RTR vowels.

Imperfect or relative alignment as derived by Pulleyblank (1996) via ALIGN constraints would not have this problem. The constraint MAX-RTR is high-ranked

[22] That high vowels harmonize *preceding* RTR vowels, but not *following* them in Ekiti, lends further evidence to the fact that RTR harmony in Yorùbá is strictly regressive.

enough in this account to prevent deletion of an underlying RTR feature.[23] Rather than appeal to derivational opacity and sympathy theory to solve this problem, the surface form of ọ̀mu is simply avoiding a MAX-RTR violation. In fact, this account allows for an underlying RTR feature that is associated with a high vowel (it can either delete completely, yielding *òmu*, or it can re-associate yielding *ọ̀mu*). This is actually independently necessary due to cases of derived VCV forms where the final root vowel is a high vowel, and yet the initial prefixal vowel surfaces as RTR. This is illustrated in (35) below.

(35) Disharmony in Derived VCV Forms with Final Vowels

a.	kú	'to die'
	òkú	'corpse of a person'
b.	mu	'to drink'
	ọ̀mu	'drinker'

In (35a), we see a harmonic sequence of an ATR prefixal vowel and ATR root vowel. However, in (35b), a disharmonic sequence of an RTR prefixal vowel and an ATR root vowel is seen. In both of these cases, it is clear that the VCV noun is a derived noun with the agentive prefix. However, recall from section 5.1.3 that prefixal vowels are only ever allowed to vary via harmonic requirements – they cannot contrast for ATR/RTR. The variation of the ATR/RTR value in (35) can be viewed as a variation not in the underlying values of the prefixes, but instead in the underlying values of the verbal roots. Since the verbal roots are high vowels, an underlying RTR feature cannot surface due the highly ranked markedness constraint, HI/ATR. If MAX-RTR dominates ALIGN(RTR, R, ROOT, R) though, it is possible to satisfy MAX-RTR by re-associating the RTR value onto the prefixal vowel.

The main point here is that accounts that use MAX-RTR need not posit that RTR high vowels trigger harmony at some opaque level while the stem-theoretic account must. The cross-dialectal facts of Yorùbá suggest that no high vowel triggers harmony, regardless of its underlying ATR value, thus suggesting that MAX-RTR is more appropriate in this case than a constraint enforcing identity with an unattested sympathy candidate.

[23] This assumes that there is only *one* RTR feature for MAX-RTR to preserve. Pulleyblank (1996) uses a version of the OCP, which outranks MAX-RTR in order to rule out surface forms with two distinct RTR features.

2.3.4 *Problems with Stem-Control Theory: Morphological Structure*

An additional problem with the stem-control theoretic account is that it relies on the assumption that *all* VCV nouns are morphologically complex. Bakovic argues that since Yorùbá is strictly prefixing, the initial V in these words is seen as a prefix and the stem-value of the rightmost vowel is dominant and triggers leftward harmony. The apparent leftward directionality follows from the morphological character of Yorùbá rather than some arbitrary setting of a left/right directionality parameter. A strong argument can be made that there is no such *morphological* complexity to at least *some* nouns. Once a separation is established between derived VCV nouns and non-complex VCV nouns, it is impossible to account for the harmonic pattern seen in the latter case.

As outlined in section 2.1.1, there are clear cases of morphologically complex agentive forms where an agentive prefix modifies a CV verbal base resulting in a derived noun (see (12) above). These cases are clearly applicable in the stem-theoretic framework. However, there is a clear division between this subset of derived nouns and the general class of VCV nouns in Yorùbá. This division is illustrated in (36) below.

(36) Noun Complexity in Yorùbá

a. Deverbal nouns: V + CV (repeated from (12) above)

dẹ	'to hunt'
ọdẹ	'hunter'
kú	'to die'
òkú	'corpse of a person'

b. Nouns (general case): VCV

ilé	'house'
lé	'pursue' or 'drive away' or 'accompany'... (Delano 1969)
ilẹ̀	'land' or 'ground'
lẹ̀	'to be flexible' or 'stuck' or 'gummed' or 'to patch'... (Delano 1969)

If we are to posit that both the nouns in (36a) and (36b) are complex, we must also posit a high vowel prefix i- in (36b) that derives 'house' from a verb to which it seems to have no semantic relation to. The differences between (36a) and (36b) are straightforwardly accounted for if we assume that forms in (36a) are morphologically complex, involving a prefix that derives an agentive form from a CV verb. On the other hand, I assume that forms in (36b) are not morphologically complex since there is no semantic relationship between the CV verbal base and a potentially derived noun with the hypothetical prefix 'i-'.

Additionally, the situation in (36b) introduces a major problem with respect to learnability. An output-output correspondence is capitalized on in order for a language learner to use a constraint like SA-IDENT in the first place. In cases such as (36a), there is language data available for both independently occurring stems and their corresponding affixed forms. The language learner simply pairs the stem with the affixed form and an output-output correspondence is set up so that SA-IDENT can now apply. However, there is no such data available in cases such as (36b) since there is no semantically related stem that is available for an output-output correspondence to be set up. In order to set such a correspondence up, a language learner must posit an abstract stem that does not actually occur independently.

This is a problem since in formulations of output-output correspondence, the stem must be an independently occurring output form in order to enable a language learner to extract the necessary morphological pieces to set up the correspondence in the first place (Benua 1995, McCarthy 1995, Burzio 1996). Contrary to this, the stem-control account must posit that learners can set up correspondence relations between unattested stems and hypothetical affixed forms. This is a dangerous situation since it affords the language learner a large amount of freedom to posit abstract morphemes without overt evidence. Even if these arguments are ignored, stem-control theory would still not be distinguishing between the cases in (36a) and (36b). Moreover, at the very least, *some* distinction must exist between these types of nouns.[24]

The above discussion argues against morphological complexity in the VCV nouns in (36b). Taken seriously, this would amount to counter-evidence to the stem-control account in Yorùbá. The pattern where an ATR/RTR contrast is permitted *following* a low vowel but only RTR vowels are found *preceding* a low vowel (see (7) above: *ate*, **eta*) relies on this morphological complexity that is assumed in Bakovic̈ (2000). Since the harmony-driving constraint, AGREE is non-directional, it is impossible to account for this directional effect with the stem-control-theoretic constraint set, once morphological constituency is removed. The prediction is that roots with a low vowel should not contain any ATR vowels as this would violate AGREE (if we are to have harmony at all

[24] There are, however, cases where the prefix vowel is not predictable but the semantic relation is clear. For example, the word *ẹ̀rọ*, which means 'machine' is semantically related to the verb *rọ*, which means 'to make or manufacture.' The prefix, *ẹ*-, has the same derivational function as the *ọ*- / *o*- prefix in (36a) above: it is a nominalizing prefix that gives the reading 'one who/that Xs,' where X is the verbal base.

within a root). Once we do away with the morphological complexity, we are left with a dominant-recessive type system, where low vowels are essentially the dominant RTR harmonic triggers due to markedness considerations. However, this predicts that directionality should follow from this dominant/recessive relationship. This is clearly not the case, as was seen in (7) above: Directionality is fixed and is leftward (for whatever reason). Additionally, there is nothing guaranteeing the rightward orientation of RTR in mid-high-mid trisyllabic forms (as outlined in section 2.1.5 above, only the rightmost mid vowel exhibits an ATR/RTR contrast; the initial mid vowel in this configuration is invariably ATR). Therefore, if not all nouns in Yorùbá are morphologically complex, we cannot maintain either a stem-control account or a dominant/recessive account of the facts of RTR harmony in Yorùbá.

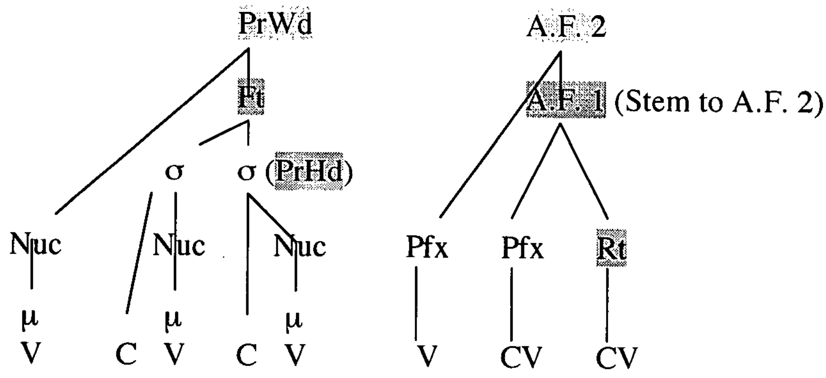
2.3.5 Towards a Prosodic Alternative

One possible solution that 'repairs' this potential problem that stem theory encounters is to replace the reference to morphological constituency in favour of prosodic constituency. Ọla (1995) argues for prosodic structure where patterns of deletion, truncation and reduplication are sensitive to prosodic constituents including syllables, feet and prosodic words. Rather than appeal to morphological structure, it would not be surprising for speakers to capitalize on independently defined prosodic constituents in processes like vowel harmony.

The findings of Ọla (1995) suggest that Standard Yorùbá words are parsed into binary iambic feet. Additionally, it is concluded that onset-less vowels are not actually syllabified. Instead, these vowels are represented as nuclear moras that are licensed directly by the PrWd (they are not parsed into feet or syllables). This type of structure results in exactly the same type of right-headed inside-out structure that Baković proposed for the morphology. Therefore, given the problems stated in the previous section with the morphological approach, and given the inherent similarity between the morphological and prosodic structures in Yorùbá, the natural solution for a language learner might be to capitalize on prosodic constituency instead.

(37) Parallelism of Morphological and Prosodic Structure in Yorùbá

Prosodic Structure (Ọla 1995) Morphological Structure (Baković 2000)



The fact that Yorùbá is strictly prefixing was argued as evidence for analyzing all VCV nouns in Yorùbá as containing a root and a prefix (Adetugbo 1967, Fresco 1970, Awoyale 1974, Akinkugbe 1978, Baković 2000). However, given that prosodic constituency is enforcing binary feet with a prosodic head on the right, and given that a root CV verb would tend to occupy this prosodic head position rather than an affix, we might expect Yorùbá to be prefixing and not suffixing for prosodic reasons. Adding a prefix would fit the independent requirements of right-headed binary feet, whereas adding a suffix would either shift the prosodic head from the vowel onto the suffix or violate the binary footing requirement. A language learner might capitalize on prosodic constituency rather than morphological constituency in VCVCV words (and any word with more than one vowel). The rightmost vowel is analyzed as the prosodic head and could therefore be singled out in an OT analysis by a constraint referring to this position. An alternative account that utilizes prosodic domains is superior to the stem-control theoretic account. This is true because the morphological constituency that the stem-control account relies on must be posited at an abstract level for at least some nouns. However, prosodic constituency, of which there is independent evidence, would not involve any abstraction. The learnability issue can thus be addressed by focusing on prosodic constituency rather than morphological constituency. The possibility of an account using prosodic domains will be revisited in chapters four and five.

2.4 RTR Harmony via Prohibition

2.4.1 RTR Harmony via Prohibition in Standard Yorùbá

There is however another account based on agreement-type constraints proposed by Pulleyblank (2002). This account utilizes constraints of the form *FG. Recall that AGREE(F) as posited by Baković (2000) is inherently symmetric. Any sequence of segments that do not agree for the feature F, incurs a violation. By postulating a constraint that takes into account the ordering of the features, on the other hand, a separation can be made between two types of AGREE violations: *FG and *GF.[25] This allows for a potential directionality effect depending on interactions with faithfulness and markedness constraints: Sequences of FG can be avoided, whereas sequences of GF might be maintained, if need be. The directionality can then be defined by the relative rankings of markedness constraints and faithfulness constraints. With respect to Yorùbá RTR harmony, this is good news since the pattern seen in low vowels can now be accounted for without referring to morphological structure. The following ranking (from Pulleyblank 2002) is offered to account for RTR harmony in Standard Yorùbá:

(38) RTR Harmony via Prohibition

LO/RTR, HI/ATR >> $[\text{MAX-RTR}]_{RT}$ >> *RTR-C_0-<u>ATR</u> >> *<u>ATR</u>[26]-C_0-RTR >> $[\text{MAX-ATR}]_{RT}$

This ranking will preserve RTR root values whenever possible (when there is a non-high vowel present) since $[\text{MAX-RTR}]_{RT}$ is highly ranked. As in the Alignment-based account (Pulleyblank 1996), this account utilizes MAX-F to ensure the preservation of a root RTR value.[27] This is illustrated in (39) below. Candidate (39c) is ruled out because it violates the high-ranked constraint, HI/ATR. Candidate (39b) is ruled out because the root RTR feature is deleted in violation of $[\text{MAX-RTR}]_{RT}$. The disharmonic candidate, (39a) is optimally selected then. Note that there is no need to specify the location of the underlying root RTR value.

(39) $[\text{MAX-RTR}]_{RT}$ Preserves Root RTR Values

/èbi/, [RTR]	HI/ATR	$[\text{MAX-RTR}]_{RT}$	*RTR-C_0-<u>ATR</u>	*<u>ATR</u>-C_0-RTR
☞a. ẹ̀bi			*	
b. èbi		*!		
c. èbɪ	*!			*

[25] Constraints are formally defined in Appendix A.
[26] Underlined features denote which feature is the locus of evaluation for the given prohibition constraint. One violation is incurred for every occurrence of the underlined feature value that meets the constraint's sequence condition. For example, the hypothetical sequence, ẹ-e-e, incurs two violations of *RTR-∞-<u>ATR</u>, one for each ATR vowel. However, the constraint, *<u>RTR</u>-∞-ATR would only result in a single violation in an ẹ-e-e sequence, since there is only a single RTR vowel.
[27] MAX-F enforces retention of an underlying autosegment, F, in the output, but not necessarily retention of an underlying *link* to F in the output. It allows for re-association of an autosegment.

By ranking [MAX-RTR]$_{RT}$ and *ATR-C_0-RTR above [MAX-ATR]$_{RT}$, this enables leftward RTR harmony (as opposed to rightward ATR harmony, which is unattested since high vowels do not trigger spreading). In fact, the only way a root ATR value could surface on a mid vowel in a disyllabic word is if there is no root RTR value underlyingly.

Recall that in Standard Yorùbá there is a pattern of relative right-alignment of RTR values that is enforced. Sequences of mid vowels separated by a medial high vowel only allow an ATR/RTR contrast to occur in the final mid vowel. Since high vowels are opaque to harmony, the initial mid vowel must be ATR. This pattern of relative alignment is captured by ranking *RTR-C_0-ATR above *ATR-C_0-RTR and [MAX-ATR]$_{RT}$. This is illustrated in (40) below. Candidate (40a) fatally violates the constraint *RTR-C_0-ATR. The optimal candidate (40b) re-associates the underlying RTR value to the right-edge in order to avoid a violation of *RTR-C_0-ATR. This introduces violations of both *ATR-C_0-RTR and [MAX-ATR]$_{RT}$, but violations are tolerated since these constraints are lower ranked than *RTR-C_0-ATR.

(40) Relative Right-Alignment of RTR

/ọdíde/	*RTR-C_0-ATR	*ATR-C_0-RTR	[MAX-ATR]$_{RT}$
a. ọdíde	*!		
☞ b. odídẹ		*	*

In order to account for the asymmetric pattern concerning low vowels, an additional condition needs to be introduced. The constraint *RTR-C_0-ATR would drive rightward harmony from low vowels onto mid vowels if the ranking in (38) were left as is. As shown in (41) below, the harmonic candidate, (41b), is incorrectly selected as the optimal candidate since the constraint, *RTR-C_0-ATR militates against the attested disharmonic candidate, (41a). Candidate (41c) is straightforwardly ruled out by the high-ranking LO/RTR constraint.

(41) Low Vowels Incorrectly Predicted to Trigger Rightward RTR Harmony

/aCe/	LO/RTR	*RTR-C_0-ATR	[MAX-ATR]$_{RT}$
💣 a. aCe		*!	
☞ b. aCẹ			*
c. əCe	*!		

This situation is repaired by adding the condition that *RTR-C_0-ATR only applies to pairs of non-low vowels. This is motivated insofar as the class of vowels that can occur as ATR is exactly the class of non-low vowels. Additionally, Pulleyblank notes that two parameters seem to determine which segments are targeted both in OCP effects and in harmony, cross-linguistically. These two parameters are proximity and similarity. Proximity is built into the above constraint by allowing only intervening consonants (C_0; i.e. – adjacent vowels are targeted). The condition added to *RTR-C_0-ATR is just one of similarity. The new constraint, *[RTR, NONLO]-C_0-[ATR, NONLO] would replace *RTR-C_0-ATR in the above ranking and this would ensure that low vowels do not trigger rightward spreading of RTR. This is illustrated in tableau (42) below.

(42) Low vowels prevented from triggering rightward RTR harmony

/aCe/	LO/RTR	*[RTR, NONLO]-C_0-[ATR, NONLO]	[MAX-ATR]$_{RT}$
☞ a. aCe			
b. aCẹ			*!

Another familiar problem concerns an input trisyllabic form with a medial high vowel flanked by mid vowels with two RTR root values. As in the alignment-based account, a form like this is ruled out by referring to the OCP. In the prohibition account, the OCP is unified with a *FG constraint, the only difference being that in an OCP-version, F=G. The constraint *RTR-∞-RTR[28] is invoked to prevent these OCP violations. As is illustrated in (43) below, the ranking, *RTR-∞-RTR >> [MAX-RTR]$_{RT}$ is needed to rule out candidate (43a) from surfacing faithfully. Recall from (41) above that the ranking of *[RTR, NONLO]-C_0-[ATR, NONLO] >> *ATR-C_0-RTR is needed to enforce right-alignment of the RTR feature, as in candidate (43b). Candidate (43c) is ruled out since the medial high vowel is preceded by an RTR mid vowel, thus fatally violating *[RTR, NONLO]-C_0-[ATR, NONLO].

(43) OCP Prevents Multiple RTR Features From Surfacing

/ọdídẹ/	HI/ATR	*RTR-∞-RTR	[MAX-RTR]$_{RT}$	*[RTR, NONLO]-C_0-[ATR, NONLO]	*ATR-C_0-RTR
a. ọdídẹ		*!		*	*
☞ b. odídẹ			*		*
c. ọdíde			*	*!	

It is worth noting that this is the first point of departure from the stem-control account offered by Baković (2000), where the constraint set used, did not refer to autosegmental representations. The decision not to use MAX-F type constraints is what

[28] As in section 2.2, the OCP must refer to root-RTR values only, so that a-i-ẹ sequences (for example) are allowed to surface.

buys stem-control this broader theoretical compatibility. AGREE refers to segmental adjacency and requires only that adjacent segments agree with respect to feature, F. There is no reference to any level of autosegmental representation. However, *$\underline{\text{RTR}}$-∞-RTR crucially refers to RTR autosegments. If the OCP constraint were to apply segmentally, it would actually *militate* against RTR harmony (by virtue of its dominance of [MAX-RTR]$_{RT}$).

Taking this argument to its logical conclusion, we find in Yorùbá a case where we need to refer to an autosegmental version of a non-local OCP. The constraint *$\underline{X}$-∞-X is ranked above [MAX-RTR]$_{RT}$ to enforce opacity of high vowels in Standard Yorùbá and Mọba. This prevents forms with two RTR root values from surfacing on two mid vowels that flank a medial high vowel (i.e. – *òwúrọ̀*, **ọ̀wúrọ̀*). However, it must not apply to adjacent RTR vowels since this would militate against RTR harmony. In order to avoid this, it must be the case that *$\underline{X}$-∞-X (at least in Yorùbá) refers only to autosegmental occurrences of X. By allowing *$\underline{X}$-∞-X to evaluate segmental occurrences of X, this essentially becomes a segmental markedness constraint with the proviso that one value of X is allowed (in whatever domain *$\underline{X}$-∞-X applies over). By ranking this markedness constraint above [MAX -RTR]$_{RT}$, there is no motivation for harmony to occur. The proviso that one value of X can occur rescues us though if we refer to an autosegmental evaluation of *$\underline{X}$-∞-X. This would allow a *single* autosegment (required to be as right-aligned as possible via other constraints) to spread onto adjacent non-high vowels, thus achieving harmony. As soon as a high vowel is reached, opacity is enforced since it is not possible to spread over this high vowel due to a NO-GAP condition that is either enforced in GEN (Archangeli and Pulleyblank 1994, Pulleyblank 1996, Gafos 1996; Ní Chiosáin and Padgett 2001) or in CON (Itô et al. 1995).

Therefore, it is necessary to refer to an autosegmentally defined OCP constraint in Yorùbá. While there is no problem with either a segmentally defined or an autosegmentally-defined version of the OCP per se, it is worth noting that the spirit of the stem-control account (to be autosegmentally-free) is violated by the autosegmental version of the OCP that is needed in the prohibition account. The segmentally enforced OCP would be more in line with stem-control, but would fail in doing its intended job in Yorùbá. Stem-control does not need to refer to any OCP-type constraint since the job of preventing forms like ọ̀wúrọ from surfacing is handled instead by virtue of the fact that the constraints SA-IDENT and AGREE dominate all of the IO-IDENT constraints.

2.4.2 *RTR Harmony via Prohibition in Ifẹ Yorùbá*

While the prohibition account can explain the pattern of RTR harmony seen in Standard Yorùbá, it remains to be seen how it would account for the patterns seen in other dialects. The following accounts are based on Pulleyblank (2002) with one exception concerning the formulation of the general constraints enforcing faithfulness. I utilize MAXLINK-F rather than MAX-F constraints as the general constraints enforcing faithfulness in the analysis here and elsewhere. MAXLINK-F is posited to incur violations for every segment that has an underlying link to F but that does not surface with such a link. Evaluation of this constraint requires the learner to set up a correspondence between the segments in an abstract underlying form and the surface form. It does not require the learner to set up any autosegmental representation at all.

MAX-F, on the other hand, requires both an abstract underlying form and an autosegmental representation, since MAX-F incurs violations of every underlying autosegment, F that is deleted from the surface representation. Note that MAX-F is satisfied by candidates that re-associate the F feature. Therefore, the language learner must track each autosegmental occurrence of F independent of the segmental tier, in order to evaluate this constraint. This constraint adds one more layer of complexity in terms of processing then. I assume that the kind of added complexity such as the type needed to evaluate the constraint MAX-F is avoided by language learners, if possible. In cases where MAXLINK-F will suffice to enforce faithfulness, then, I assume it is the active faithfulness constraint. However, it will become apparent that in some cases it is necessary to refer to the autosegmental tier in order to capture the attested surface pattern. Only in these cases must the added complexity introduced with MAX-F be tolerated by a language learner.

Turning now to the analysis for Ifẹ Yorùbá, transparency of high vowels is attested and the prohibition account should be able to explain this. In order to allow transparency in the first place, it is necessary to demote the OCP constraint, *<u>RTR</u>-∞-RTR, so that at the very least, it is ranked below [MAX-RTR]$_{RT}$. This would allow the faithful candidate, (43a) to surface in tableau (43) above. While this in itself does not drive transparency, it is essential to lower the ranking of any constraint, such as the OCP, which would militate against transparency.

In order to actually drive transparency, it is necessary to introduce a constraint that is able to actually enforce harmony across a disharmonic high vowel. Unlike the underlying form in (43) above, where the initial vowel is already RTR before harmony has applied, underlying forms with an initial ATR vowel must be forced to surface with an initial RTR vowel. The constraint I propose is *[<u>ATR, NONHI</u>]-∞-[RTR, NONHI]. Every non-high ATR vowel that precedes a non-high RTR vowel anywhere in the word incurs a violation of this constraint. The non-high condition is introduced so that the neutral high vowels do not incur violations of *[<u>ATR, NONHI</u>]-∞-[RTR, NONHI]. Otherwise, this constraint would always favour deletion of the final RTR vowel and not the initial ATR vowel in mid, ATR - high, ATR - mid, RTR sequences. Given the non-high condition, two solutions would satisfy this constraint. One solution would involve deletion of the initial ATR feature, so that it could be replaced by an RTR feature (this is the attested pattern of transparency in Ifẹ). The other solution would involve deletion of the final RTR feature, so that it could be replaced by an ATR feature (this is an unattested pattern of neutralization).

In order to ensure that transparency and not neutralization is optimal, another constraint that militates against deletion of RTR must dominate a constraint that militates against deletion of ATR. This can be achieved by ranking *[ATR, NONHI]-∞-[RTR, NONHI] and MAXLINK-RTR above MAXLINK-ATR. As in Standard Yorùbá, HI/ATR is assumed to be undominated since there are no RTR high vowels in either dialect (this is not shown in the tableau below). Tableau (44) below illustrates how transparency is enforced in Ifẹ Yorùbá.

(44) Transparency Enforced in Ifẹ Yorùbá: *[ATR, NONHI]-∞-[RTR, NONHI], MAXLINK-RTR >> MAXLINK-ATR

/odídẹ/	*[ATR, NONHI]-∞-[RTR, NONHI]	MAXLINK-RTR	MAXLINK-ATR
a. odídẹ	*!		
☞ b. ọdídẹ			*
c. odíde		*!	

However, another feature of Ifẹ Yorùbá, absolute alignment, must also be accounted for. Recall that non-final RTR is neutralized in Ifẹ Yorùbá; the only occurrences of non-final RTR are in fact due to harmonic requirements. This can be alternatively viewed as leftward ATR harmony, triggered by a final ATR vowel, affecting all preceding vowels. The constraint, *[RTR, NONLO]-∞-[ATR, NONLO] would incur violations for every RTR non-low vowel that is followed by an ATR vowel anywhere in a word. Note that this constraint could enforce either rightward RTR harmony or leftward ATR harmony (both of which are attested, in principle).[29]

An additional concern in enforcing transparency of high vowels must be dealt with though. The constraint, *[RTR, NONLO]-∞-[ATR, NONLO] can potentially drive leftward ATR harmony, a situation that must be avoided in Ifẹ, where high vowels are transparent. Since the effect of leftward RTR harmony at a distance overrides local leftward ATR harmony, *[RTR, NONLO]-∞-[ATR, NONLO] must be outranked by *[ATR, NONHI]-∞-[RTR, NONHI]. The reverse ranking would derive opacity and not

[29] The non-low condition is necessary in order to allow low vowels to precede ATR vowels. Otherwise, the incorrect prediction is made that low vowels should trigger rightward RTR harmony. Additionally, it is assumed that LO/RTR and MAX-LO dominate *[ATR, NONHI]-∞-[RTR, NONHI] in order to force all underlyingly low vowels to surface as low RTR vowels. Likewise, high vowels are forced to surface as ATR via the undominated constraints, HI/ATR and MAX-HI.

transparency. This is illustrated in (45) below. The candidate with an opaque high vowel (45a) fatally violates *[ATR, NONHI]-∞-[RTR, NONHI]. The optimal candidate (45b) satisfies this constraint by inserting an RTR value onto the initial mid vowel. This results in a pattern of high vowel transparency.

(45) Transparency Enforced in Ifẹ Yorùbá:

*[ATR, NONHI]-∞-[RTR, NONHI] >> *[RTR, NONLO]-∞-[ATR, NONLO]

/odídẹ/	*[ATR, NONHI]-∞-[RTR, NONHI]	*[RTR, NONLO]-∞-[ATR, NONLO]
a. odídẹ	*!	
☞ b. ọdídẹ		*!

Since RTR is neutralized non-finally though in Ifẹ, MAXLINK-RTR must in turn be outranked by *[RTR, NONLO]-∞-[ATR, NONLO]. This is demonstrated in tableau (46) below. The faithful candidate (46a) fatally violates *[RTR, NONLO]-∞-[ATR, NONLO]. In order to satisfy *[RTR, NONLO]-∞-[ATR, NONLO], the optimal candidate (46b) deletes the underlying RTR value at the expense of violating MAXLINK-RTR.

(46) Absolute Alignment in Ifẹ Yorùbá

/ẹwìrì/	*[ATR, NONHI]-∞-[RTR, NONHI]	*[RTR, NONLO]-∞-[ATR, NONLO]	MAXLINK-RTR	MAXLINK-ATR
a. ẹwìrì		*!		*
☞ b. ewìrì			*	

While absolute alignment is achieved by the ranking in (46) above, this ranking actually yields neutralization of RTR and not harmony with transparency in words with final RTR vowels. This is demonstrated in (47) below.

(47) Neutralization of RTR Predicted

/odídẹ/	*[ATR, NONHI]-∞-[RTR, NONHI]	*[RTR, NONLO]-∞-[ATR, NONLO]	MAXLINK-RTR	MAXLINK-ATR
a. odídẹ	*!			
💣 b. ọdídẹ		*!		*
☞ c. odíde			*	

The constraint, *[RTR, NONLO]-∞-[ATR, NONLO] militates against the transparent candidate, (47b), in favour of candidate (47c), which neutralizes the RTR contrast completely. In fact, this neutralization does not occur word-finally though.

In order to preserve an ATR/RTR contrast word-finally, a positional faithfulness constraint that refers to the final vowel in a root must be introduced. This constraint, which will be left unformalised until Chapter 5, is [MAX-RTR]$_{\text{RtFinal}}$.[30] By ranking this positional faithfulness constraint above the harmony driving constraint, *[RTR, NONLO]-∞-[ATR, NONLO], it is possible to ensure that a root-final RTR vowel surfaces faithfully, while ensuring that an ATR/RTR contrast is neutralized elsewhere. Importantly, [MAX-RTR]$_{\text{RtFinal}}$ cannot dominate HI/ATR, otherwise this would preserve RTR values on high vowels root-finally, a situation that is not attested. The ranking shown in (48) below captures the RTR harmonic pattern in Ifẹ Yorùbá.

(48) RTR Harmony in Ifẹ Yorùbá:

HI/ATR >> [MAX-RTR]$_{\text{RtFinal}}$, *[ATR, NONHI]-∞-[RTR, NONHI] >> *[RTR, NONLO]-∞-[ATR, NONLO] >> MAXLINK-RTR >> MAXLINK-ATR

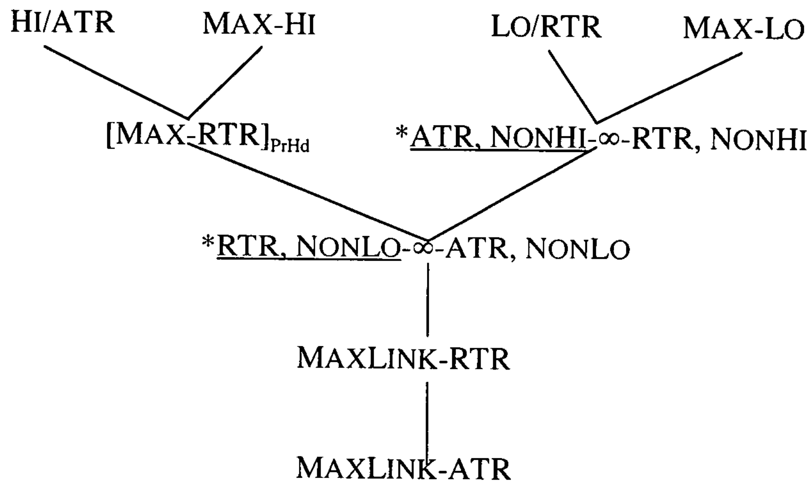
/odídẹ/	[MAX-RTR]$_{\text{RtFinal}}$	*[ATR, NONHI]-∞-[RTR, NONHI]	*[RTR, NONLO]-∞-[ATR, NONLO]	MAXLINK-RTR	MAXLINK-ATR
a. odídẹ		*!			
☞ b. ọdídẹ			*		*
c. odíde	*!			*	
d. ọdíde			*	*!	*

Candidate (48c) fatally violates the positional faithfulness constraint, [MAX-RTR]$_{\text{RtFinal}}$, allowing the transparent candidate, (48b) to surface instead. Candidate (48d) satisfies [MAX-RTR]$_{\text{RtFinal}}$ by re-associating the root-final RTR value. However, it fatally violates MAXLINK-RTR. Note that it is necessary for at least one of these RTR-faithfulness constraints to be of the MAXLINK-F type in order to rule out candidate (48d).

A summary of the ranking proposed for RTR harmony in Ifẹ Yorùbá is given in (49) below.

[30] MAX-RTR$_{\text{RT}}$, the constraint used in Pulleyblank (2002), is replaced by this reference to root-final position. What was originally viewed as a root-value RTR feature, is now viewed as a segment-level RTR feature. The reference to root-final position will be expanded upon and a formal constraint will be built in the following chapters.

(49) Final Constraint Ranking for Ifẹ Yorùbá RTR Harmony



2.4.3 RTR Harmony via Prohibition in Ekiti Yorùbá

A second test of the constraint set used in the prohibition account can be conducted with the pattern attested in Ekiti Yorùbá. In this dialect, high vowels are not only transparent to RTR harmony, they also actively participate in it. This is illustrated below in (50). In order to allow high vowels to participate in harmony, the constraint, HI/ATR must be ranked below the harmony-driving constraint, *ATR-C_0-RTR.[31] This rules out candidate (50a). Additionally, the constraint, $[\text{MAX-RTR}]_{\text{RtFinal}}$ must dominate HI/ATR in order to prevent high - mid, RTR vowel sequences from satisfying *ATR-C_0-RTR by changing the root-final RTR value to ATR. This rules out candidate (50b). The optimal candidate (50c)is one where the root-final RTR value is retained and the initial high vowel is changed to RTR.

[31] Note that the non-high condition that was present in the account for Ifẹ Yorùbá has been removed. Since both high and mid ATR vowels are targeted in leftward RTR harmony, this condition needs to be removed to allow ATR high vowels to be targeted in RTR harmony. Note also that the proximity relation for this constraint is set to adjacent vowels (C_0). It could also conceivably be set to non-local (∞) without any negative effects on the analysis. However, since there are no neutral vowels in this dialect, there is no reason to use non-local relations; local relations will suffice.

(50) High Vowels Participate in RTR Harmony

/iCẹ/	*<u>ATR</u>-C_0-RTR	$[\text{MAX-RTR}]_{\text{RtFinal}}$	HI/ATR
a. iCẹ	*!		
b. iCe		*!	
☞ c. ɪCẹ			*

However, while high vowels participate in RTR harmony, they do not actually act as triggers of it. Specifically, there are no occurrences of root-final high RTR vowels; all final high vowels are ATR. Given the ranking in (50) above, however, an underlying form with a final high RTR vowel will remain RTR and will trigger leftward RTR harmony. In order to prevent this from happening, it is necessary to rank the constraint $[\text{HI/ATR}]_{\text{RtFinal}}$[32] above $[\text{MAX-RTR}]_{\text{RtFinal}}$. This will ensure that all root-final high vowels surface as ATR. This is illustrated in tableau (51) below.

(51) Neutralization of ATR/RTR Contrast in Root-Final High Vowels

/ẹCɪ/	*<u>ATR</u>-C_0-RTR	$[\text{HI/ATR}]_{\text{RtFinal}}$	$[\text{MAX-RTR}]_{\text{RtFinal}}$
a. ẹCɪ		*!	
☞ b. eCi			*

In fact, by ranking HI/ATR above MAXLINK-RTR generally, we account for the fact that there is no ATR/RTR contrast in high vowels: Their tongue-root values are predictable either due to harmonic requirements or due to the markedness constraint, HI/ATR (as in (51) above). One final consideration is that we must rule out a candidate like ẹCi in tableau (51) above; like Ifẹ Yorùbá, Ekiti exhibits absolute alignment of RTR with the right edge of the root. This candidate fares as well as the optimal candidate on the constraint ranking that has been put forward so far. However, by ranking *<u>[RTR, NONLO]</u>[33]-C_0-[ATR, NONLO] above MAXLINK-RTR, leftward ATR harmony is enforced. This rules out the disharmonic candidate in question and the pattern of RTR harmony seen in Ekiti Yorùbá is achieved. Tableau (52) below illustrates this.

[32] This is essentially a positional markedness constraint. Given that certain privileged positions allow a greater degree of variation to occur (positional faithfulness), this type of positional markedness constraint would effectively undo positional faithfulness constraints. This is an undesirable situation.

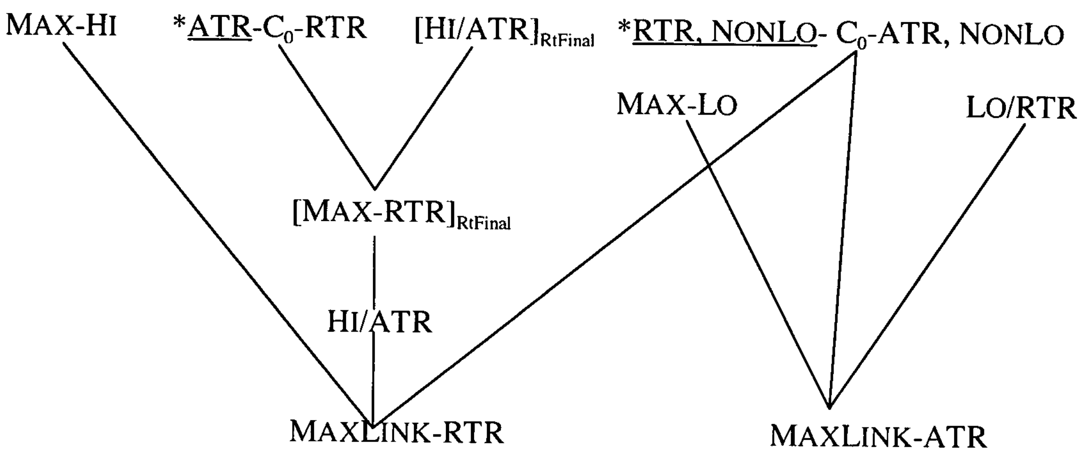
[33] The non-low condition is necessary in order to allow low vowels to precede ATR mid vowels without triggering rightward harmony. LO/RTR and MAX-LO are assumed to dominate MAX-ATR in order to ensure that all underlying low vowels surface as low, RTR vowels.

(52) Leftward ATR Harmony Neutralizes Non-Final RTR in Non-Low Vowels

/ẹCɪ/	[HI/ATR] $_{RtFinal}$	[MAX-RTR] $_{RtFinal}$	HI/ATR	*[RTR, NONLO]-C_0-[ATR, NONLO]	MAXLINK-RTR
a. ẹCɪ	*!		*		
☞ b. eCi		*			**
c. ẹCi		*		*!	*

The final ranking for Ekiti Yorùbá is given below in (53).

(53) Final Constraint Ranking for Ekiti Yorùbá RTR Harmony



With the addition of positional faithfulness and positional markedness, the prohibition account can account for three dialects of Yorùbá. It fares better than the stem-control account in terms of its ability to extend typologically and account for dialectal variation with respect to the transparency in Ifẹ Yorùbá and does not need to refer to any gradiently evaluated constraints as the alignment-based account does. It does however fail to offer a satisfactory solution to account for the pattern where final high vowels cannot surface as RTR in Ekiti, despite the fact that they can participate in RTR harmony. A positional markedness constraint must be posited to account for this.

2.5 Summary

The basic pattern of RTR harmony has been outlined for Standard Yorùbá. First, the distinction between morphologically complex VCV nouns and non-complex VCV roots is made. VCV nouns with mid vowels exhibit complete harmony for ATR/RTR. High vowels were shown to be invariably ATR and to be opaque to harmony. This provided evidence on the right-alignment effect where root values of RTR are right aligned with the root, whenever possible. In cases where high vowels occur at the right-edge of the root, a root RTR value is as right aligned as possible. Low vowels differ in that they are invariably RTR and trigger strictly leftward RTR harmony. A featural contrast for tongue-root value in mid vowels can occur following a low vowel, but not preceding it – only RTR mid vowels can occur preceding a low vowel. This pattern was shown to extend to prefixes, in the cases of agentive nominalized forms. This implies that the domain of harmony extends beyond the root to the word. Compound words exhibit disharmonic sequences of mid vowels in some cases. This is explained by restricting the domain of RTR harmony to the domain of the prosodic word.

This pattern is accounted for in three optimality-theoretic accounts that use different sets of constraints. These three accounts were summarized and discussed in comparison with each other. Of these three accounts, various problems with an alignment-based account and with a stem-control based account were raised. The alignment-based account succeeds in deriving the patterns seen in three dialects of Yorùbá, but it relies on a gradiently evaluated version of alignment. This is undesirable for theoretical reasons external to the facts of Yorùbá. Stem-control is also able to account for the pattern in two of the three dialects of Yorùbá that were explored here, but it relies on the assumption that all VCV nouns are morphologically complex. Given evidence that in at least some cases, VCV nouns are morphologically non-complex, this stem-control account cannot hold up. An account utilizing prohibition-type constraints is superior in its ability to account for the harmonic patterns that are seen in three dialects of Yorùbá. There is no need to refer to gradient constraints in an account utilizing prohibition-type constraints. Additionally, there is no need to rely on the fact that all VCV nouns are morphologically complex. Instead, it is suggested that a reference to prosodic categories might provide an alternative way to capture the facts of RTR harmony in Yorùbá. In Yorùbá, morphological structure and prosodic structure are often co-extensive and therefore it can be difficult to tell which kind of constituency is being referenced in processes that are domain-restricted. The next chapter illustrates the pattern of RTR harmony seen in a fourth dialect, Mọba Yorùbá, where tongue root harmony extends over a larger domain than in Standard Yorùbá.

Chapter 3 - RTR Harmony in Mọba Yorùbá

Up until this point, we have dealt almost exclusively with Standard Yorùbá. This dialect is the standardized dialect that is taught in schools. It is most closely related to the Oyo dialect of Yorùbá and therefore the Yorùbá orthography is based on this dialect. Oyo Yorùbá is spoken in the region around Oyo, Ogbomosho, and Ibadan. Of the other two dialects that we have seen, Ekiti is spoken in and around Ado Ekiti and Ifaki while Ifẹ Yorùbá is spoken in the town of Ifẹ. The dialect that is featured in this chapter, Mọba Yorùbá, is spoken in a region north of the Niger delta on the west side of the Niger River. The villages it is spoken in are Ulale, Ekan, Ayedun, Ilofa, Odo-owa, Obo Erimope, Otun and Igogo (Ajiboye p.c.).

Mọba Yorùbá exhibits a similar pattern of RTR harmony as is seen in Standard Yorùbá, with one notable exception concerning the apparent size of the domain. Mọba RTR harmony appears to also affect proclitics while in Standard Yorùbá proclitics are clearly outside the domain for RTR harmony. This chapter lays out the crucial Mọba data, which, when compared to the corresponding data in Standard Yorùbá, point towards an analysis for Mọba that is identical to Standard Yorùbá except for the size of the harmonic domain.

3.1 Mọba Yorùbá – Phonological Background

Mọba Yorùbá differs from Standard Yorùbá with respect to the general segmental inventory as well as the distributional facts of certain phonemes.

With respect to the consonantal inventory, the contrast that exists in Standard Yorùbá between /s/ and /ṣ/ (phonetically [ʃ]) is neutralized to /s/ in Mọba. This is illustrated below in (54). While there is a contrast in Standard Yorùbá between the words in (54a) and (54b) with respect to the s / ṣ distinction, there is no such contrast existing in Mọba Yorùbá.

(54) Neutralization of the /s/ - /ṣ/ Contrast in Mọba Yorùbá

	MB	SY	Gloss
a.	se	ṣe	'to do'
	usẹ́	iṣẹ́	'message'
	asọ	aṣọ	'cloth'

	òsi	òṣì	'poverty'
	sù	ṣù	'to make into a ball'
	osùnàn	òṣùnwọ̀n	'measuring container'
b.	sọ	sọ	'to speak'
	èsúró	èsúó	'Redflanked Duiker'
	ẹsẹ̀	ẹsẹ̀	'foot'
	ẹ̀gúsí	ẹ̀gúnsí	'melon / a food made from melon seeds'

With respect to vowels, the first difference between Mọba and Standard Yorùbá is regarding the neutralization of word-initial /u/ in Standard Yorùbá. As can be seen in (54a) above in the word for 'message', an initial /u/ in Mọba corresponds to an initial /i/ in Standard Yorùbá. This neutralization is only seen in word-initial position however, since /u/ does occur elsewhere in Standard Yorùbá. This is illustrated in (55) below. While in Mọba, (55a) and (55b) exhibit a contrast between initial /u/ and initial /i/, this contrast is neutralized in Standard Yorùbá, where only /i/ and not /u/ can occur word-initially. In (55c), we have examples where the Standard Yorùbá forms neutralize the initial /u/, but a non-initial /u/ is allowed to surface faithfully. Finally, in (55d), we see that the initial neutralization is strictly word-initial. /u/ is allowed to surface in Standard Yorùbá words where it is the first vowel as long as a consonant precedes it (as long as it is not the initial segment).

(55) Neutralization of initial /u/ in Standard Yorùbá

	MB	SY	Gloss
a.	usẹ́	iṣẹ́	'message'
	urọ́	irọ́	'falsehood'
	ulé	ilé	'house'
b.	itọ́	itọ́	'saliva'
	iyè	iyè	'intelligence'
	ilẹ̀	ilẹ̀	'land/ground'
c.	ùlú	ìlú	'town/city'
	usu	iṣu	'yam'

d.	kú	kú	'to die'
	mu	mu	'to drink'
	rù	rù	'to carry a load'

Ọla (1995) uses this pattern of neutralization in initial position as evidence supporting the hypothesis that onsetless vowels are not syllabified (as will be discussed in more detail in section 4.2). This amounts to requiring that all syllables must contain onsets; otherwise, the vowel is not a syllable head. This neutralization then could refer to the vowel's prosodic status as a syllable head. The /i/-/u/ contrast might then only occur in syllabic nuclei in Standard Yorùbá. This difference between the dialects could then depend on whether or not onsetless vowels are well-formed syllable nuclei. In Mọba, on the other hand, if onsetless vowels could constitute well-formed syllable nuclei, this would explain the fact that the /i/-/u/ contrast can occur in any position. This would follow since any vowel is a well-formed syllable nucleus in Mọba. Alternatively, if the requirement for a well-formed syllable to contain an onset were in place in *both* dialects, it could be attributed directly to a difference in the positions that this contrast can exist: in Mọba, /u/ could occur in any position; in Standard Yorùbá, it can only occur in syllable nuclei.

There is one final difference between Mọba and Standard Yorùbá, concerning the distribution of the nasal vowels, [ã] and [ɔ̃]. In both dialects, only high and low vowels exhibit a contrast for the nasal/oral distinction. However, while Mọba does not allow any mid nasal vowels, Standard Yorùbá exhibits an allophonic variation between the mid nasal vowel, [ɔ̃] and the low nasal vowel, [ã]. This variation is conditioned by an immediately preceding labial consonant, which triggers progressive labial harmony. This is illustrated below in (56).

(56) Allophonic Variation of Low Nasal Vowel in Standard Yorùbá

	MB	SY	Gloss
a.	mã́tò	mɔ̃́tò	'car'[34]
	ɔg͡bã̀	ɔg͡bɔ̃̀	'thirty'[35]
	ɔk͡pã́	ɔk͡pɔ̃́	'tray'
	k͡pã	k͡pɔ̃	'to draw water'
	g͡bã́	g͡bɔ̃́	'to be wise'
b.	tã̀	tã̀	'to deceive'
	kã̀	kã̀	'to hammer'

The pattern above illustrates that the low nasal vowel, /ã/ surfaces as [ɔ̃] when it is preceded by a labial consonant in Standard Yorùbá, as is seen in (56a). However, the low nasal vowel, [ã] surfaces faithfully elsewhere as is seen in (56b).

This section has summarized the differences between the segmental inventories and their contextual behaviour. The most important difference for the purposes of this thesis, tongue-root harmony, is examined in the next section.

3.2 RTR Harmony in Mọba Yorùbá: The Basic Pattern

3.2.1 Harmony in VCV Nouns

Within roots, we find that both Mọba and Standard Yorùbá exhibit the same pattern of RTR harmony. Mid vowels in disyllabic words are required to have identical tongue-root values. This pattern was illustrated in (4) above for Standard Yorùbá; it is illustrated for Mọba below in (57); Standard Yorùbá forms are given to allow comparison.

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[34] Disharmony is tolerated in monomorphemic loan words in Yorùbá, such as this one.

[35] In Standard Yorùbá, *ɔg͡bɔ̃̀* can also be produced with an initial low tone (*ɔ̀g͡bɔ̃̀*). In Mọba, however, the initial vowel must be produced with a mid tone and not with a low tone.

(57) Mid Vowels in Mọba

	MB	SY	Gloss		
a.	ewé	ewé	'leaf'	*ẹwé	*ewẹ́
	epo	epo	'oil'	*ẹpo	*epọ
	olè	olè	'thief'	*ọlè	*olẹ̀
	eó / ewó	owó	'money'	*ọwó	*owọ́
b.	ẹsẹ̀	ẹsẹ̀	'foot'	*esẹ̀	*ẹse̍
	ẹ̀kọ	ẹ̀kọ	'pap'	*èkọ	*ẹ̀ko
	ọbẹ̀	ọbẹ̀	'soup'	*obẹ̀	*ọbè
	ọkọ̀	ọkọ̀	'vehicle'	*okọ̀	*ọkò

With respect to disyllabic words, we find that high vowels do not participate in RTR harmony and are invariably ATR. This is seen in (58) below.

(58) High Vowels in Mọba

	MB	SY	Gloss
a.	ulé	ilé	'house'
	ìgò	ìgò	'bottle'
b.	ilẹ̀	ilẹ̀	'ground'
	itọ́	itọ́	'saliva'
c.	etí	etí	'ear'
	erí	orí	'head'
	eku	eku	'bush rat'
	ojú	ojú	'eye'
d.	ẹ̀bi	ẹ̀bi	'guilt'
	ọ̀kín	ọ̀kín	'egret'
	ẹ̀wù	ẹ̀wù	'clothing'
	ọ̀run	ọ̀run	'heaven'

e.	igi	igi	'tree'
	inú	inú	'stomach'
	usu	iṣu	'yam'
	ùlú	ìlú	'town/city'
	ùndín	àdí	'palm nut oil'

Again, low vowels pattern similarly in both Mọba and Standard Yorùbá, they are invariably RTR and they allow an RTR contrast in mid vowels following a low vowel (59a and b), but this contrast is neutralized preceding a low vowel (59c and d). Roots with two low vowels (59e) or a low vowel and a high vowel (59f and g) are attested as well; low vowels and high vowels have predictable tongue-root values regardless of their position in the word, RTR for the former and ATR for the latter.

(59) Low Vowels in Mọba

	MB	SY	Gloss
a.	ate	ate	'hat'
	aró	aró	'indigo'
b.	àjẹ̀	àjẹ̀	'paddle'
	asọ	aṣọ	'cloth'
c.	ẹ̀pà	ẹ̀pà	'groundnut'
	ọ̀ràn	ọ̀ràn	'trouble'
d.	*èpa	*èpà	
	*òràn	*òràn	
e.	àyà	àyà	'chest'
	ara	ara	'body'
f.	atú	atú	'type of cassava'
	àmì	àmì	'sign'
g.	inyàn	iyàn	'dispute'
	ìkà	ìkà	'cruelty'
	ùyà	ìyà	'punishment'
	ùjà	ìjà	'fight'
	uná	iná	'fire'
	ìntàn	ìtàn	'story'
	ilá	ilá	'okra'

3.2.2 *Harmony in VCVCV Nouns*

Trisyllabic words also pattern similarly in Mọba and Standard Yorùbá. As was outlined above in chapter 2, the pattern seen in disyllabic roots can be extended to trisyllabic roots that contain only low and/or mid vowels, however high vowels exhibit opaque harmonic behaviour.[36] Trisyllabic roots with a high medial vowel flanked by two mid vowels illustrate the opaque status of high vowels. This opacity is seen in Mọba as well as in Standard Yorùbá.

(60) Opaque High Vowels in Mọba

	MB	SY	Gloss
a.	erìpẹ̀	erùpẹ̀	'earth'
	ewúrẹ́	ewúrẹ́	'she-goat'
	ènìbọ́	èlùbọ́	'yam flour'
	èkùrọ́	èkùrọ́	'palm kernel'[37]
	odídẹ	odídẹ	'Grey Parrot'
	òwúrọ̀	òwúrọ̀	'morning'
	orúkọ	orúkọ	'name'
b.	*ọrúkọ	*ọrúkọ	
	*ọrúko	*ọrúko	

In all of the trisyllabic forms in (60a) above, the final mid vowel is RTR. Crucially, the initial mid vowel could never be RTR regardless of the RTR value of the final mid vowel as is seen in (60b).

This opacity of high vowels in both Mọba and Standard Yorùbá is not simply a case where the ATR feature of the high vowel is triggering leftward spreading of ATR since we have seen that an ATR/RTR contrast exists both preceding and following high vowels in (58) above. This pattern is true in Mọba in trisyllabic forms with mid-high-

[36] Regarding the harmonic status of high vowels in Mọba, it appears that they do not harmonize. However, given that in other dialects (Ekiti, for example) we have evidence of high vowel participation in tongue-root harmony, phonetic testing should be done to confirm that these high vowels do not in fact show (phonetic or phonological) retraction effects in Mọba.

[37] The Standard Yorùbá form offered here for 'palm kernel' differs from the Standard Yorùbá form in Archangeli & Pulleyblank (1989) which is *òkùrọ́*.

high vowel sequences as well. In (61a), we find that RTR can surface on a mid vowel preceding two high vowels. In (61b), we find that ATR mid vowels can also surface in this same position.

(61) Mid-High-High Trisyllabic Sequences in Mọba

	MB	SY	Gloss
a.	ẹ̀lírí	ẹ̀lírí	'a type of rat'
	ẹ̀wiri	ẹ̀wiri	'bellows'
	ẹ̀bùrú	ẹ̀bùrú	'shortcut'
b.	èkuru	èkuru	'food made of beans'
	obùnrin	obìnrin	'woman'

3.2.3 Disharmony in Compounds

As was the case in Standard Yorùbá, we find disharmonic sequences of both RTR mid vowels followed by ATR mid vowels and ATR mid vowels followed by RTR mid vowels in compounds.

(62) Disharmony in Compounds

	MB	SY	Gloss
a.	sẹ́	ṣẹ́	'to change'
	e(w)ó	owó	'money'
	sẹ́(w)ó	ṣẹ́wó	'to change money'
b.	ewé	ewé	'leaf'
	ọbẹ̀	ọbẹ̀	'soup'
	ewébẹ̀	ewébẹ̀	'any pot herb used for making soup'

This disharmonic sequence is tolerated if we restrict the domain of leftward RTR harmony to the prosodic word. Each root in the above compounds would constitute a separate occurrence of a prosodic word. This would allow disharmony to exist in compounds such as the ones in (62) above.

3.2.4 *Consonant-Deletion in VCVCV Nouns*

There are processes of consonant-deletion that occur in Standard Yorùbá and Mọba Yorùbá that potentially interact with tongue-root harmony. When a consonant is deleted intervocalically, it is usually accompanied by a process of assimilation in order to repair the vowel hiatus that results. With trisyllabic words, we find that the first consonant (C1) deletes in Standard Yorùbá, but this is not the case in Mọba Yorùbá, where consonant deletion is avoided altogether.[38] The fact that the initial consonant (rather than the final consonant) deletes in Standard Yorùbá, is cited by Ọla (1995) as evidence that the final syllable is the prosodic head (this is discussed further in section 4.2.1). Faithfulness constraints referring to the final position are then able to prohibit deletion of material in this final head syllable.

(63) C1-Deletion in Standard Yorùbá

	MB	SY	Gloss
a.	erìpẹ̀ ~ *eèpẹ̀	erùpẹ̀ ~ eèpẹ̀	'earth'
	odídẹ ~ *oódẹ	odídẹ ~ oódẹ	'Grey Parrot'
	òrùjọ́ ~ *òòjọ́	*òrùjọ́ ~ òòjọ́	'daily / same day'[39]
b.	ewúrẹ́ ~ *eérẹ́	ewúrẹ́ ~ *eérẹ́	'she-goat'
	ènìbọ́ ~ *èèbọ́	èlùbọ́ ~ *èèbọ́	'yam flour'
	èkùrọ́ ~ *èèrọ́	èkùrọ́ ~ *èèrọ́	'palm kernel'

In (63a) above, it is apparent that C1-deletion is active in Standard Yorùbá but not in Mọba Yorùbá. (63b) shows that this process of C1-deletion is not allowed in some cases though. Instead, it applies idiosyncratically to some words and not to others. After C1-deletion has occurred in the Standard Yorùbá forms, progressive vowel assimilation follows. For example, the medial high back round vowel in *erùpẹ̀* assimilates to the preceding mid front vowel, e (with the retention of the low-tone). This yields the form eèpẹ̀. This form is disharmonic on the surface. The same disharmony is seen in all of the other forms with C1-deletion and assimilation in (63a). If this assimilation were to be occurring at the same level of derivation as the harmony rule, then we would expect that these forms with C1-deletion should exhibit RTR-harmony. In derivational terms, the

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[38] An exception to this rule of C1-deletion is *òwúrọ̀* which means 'morning.' In Mọba, the first consonant can be deleted, yielding either *òórọ̀* or *òúrọ̀*. In Standard Yorùbá, only *òórọ̀* is licit; **òúrò* is illicit in Standard Yorùbá.

[39] The Standard Yorùbá word, *òòjọ́*, is exceptional in that the full form, **òrùjọ́*, is illicit.

fact that they don't, implies that the harmony rule must apply before assimilation does. In an optimality-theoretic framework, this derivational opacity is usually dealt with via faithfulness, much in the same way sympathy theory dealt with misaligned RTR-values in the stem-control theoretic account above. In this case, there must be a pressure to be faithful to the corresponding full form (before C1-deletion has applied). This would ensure that the initial and medial vowels in *eèpẹ̀*, for example, remain ATR, in agreement with their ATR values in the full form, *erùpẹ̀*.

An interesting twist to the pattern mentioned above concerns a pattern of optional w-deletion that is seen in Mọba Yorùbá, and not in Standard Yorùbá. Unlike the C1-deletion pattern mentioned above, this deletion process applies to any 'w', including those occupying the onset of the head syllable. In addition, unlike the C1-deletion pattern mentioned above, this w-deletion does not apply with progressive vowel assimilation following it. Therefore, there is no potential interaction with RTR-harmony, since all underlying vowels are preserved, including opaque medial high vowels. This pattern is illustrated in (64) below.

(64) w-Deletion in Mọba Yorùbá

	MB	SY	Gloss
a.	ewó ~ eó	owó ~ *oó	'money'
	owú ~ oú	owú ~ *oú	'jealousy'
	wàn ~ àn	wọ̀n ~ *ọ̀n	'to measure'
b.	*unrínwó ~ unrínó	irínwó ~ *irínó	'four-hundred'
	*ìyàwó ~ ìyàó	ìyàwó ~ *ìyàó	'wife'
	*àwo ~ ào	àwo ~ *ào	'plate'
	*àdáwọ́lé ~ àdáọ́lé	àdáwọ́lé ~ *àdáọ́lé	'a beginning'
c.	ìwé ~ *ìé	ìwé ~ *ìé	'book'
	ẹwìrì ~ *ẹìrì	ẹwìrì ~ *ẹìrì	'bellows'
	wẹ̀ ~ *ẹ̀	wẹ̀ ~ *ẹ̀	'swim'

In (64a) above, free variation exists in Mọba between the full forms on the left and the forms with w-deletion on the right. In (64b), the full form is ungrammatical, while the form with w-deletion is grammatical. In (64c), only the full form is grammatical, while the form with w-deletion is ungrammatical. However, the forms with w-deletion are ungrammatical in Standard Yorùbá in all of the cases in (64). This pattern of w-deletion does not interact with RTR harmony, since there is no vowel assimilation accompanying it.

3.3 RTR Harmony in Prefixes

In section 2.2 above, we saw that the agentive prefix in Standard Yorùbá is included in the harmonic domain as was shown in (12), where the tongue-root value of the prefix was a function of the tongue-root value of the root to which it was attached. This situation is also found in Mọba.

(65) Harmonic Behaviour of Prefixes in Mọba

	MB	SY	Gloss
a.	dẹ	dẹ	'to hunt'
	ọdẹ	ọdẹ	'hunter'
	*odẹ	*odẹ	
b.	joú	jowú	'to be jealous'
	òjòú	òjòwú	'a jealous person'
	*ọ̀jòú	*ọ̀jòwú	

The agentive prefix is included in the RTR harmonic domain in both Mọba and Standard Yorùbá, then. This harmonic behaviour is used as a diagnostic in defining a prefix as such. Prefixes are those elements that are automatically forced to harmonize with the tongue-root values of the base to which they attach.

As it was shown in section 2.3.3, the agentive prefix can contrast for ATR/RTR when it is added onto a high-vowel verbal base. In this case, the prefix can contrast for ATR/RTR. This is repeated in (66) below.

(66) Harmonic Behaviour of Prefixes with a High-Vowel Verbal Base

	MB	SY	Gloss
a.	kú	kú	'to die'
	òkú	òkú	'corpse of a person'
b.	mu	mu	'to drink'
	ọ̀mu	ọ̀mu	'drinker'

The RTR feature that shows up in the nominalizing prefix in (66b) is assumed to be due to a root RTR feature that is associated with the verbal base, mu, 'to drink.' Since the verbal base has a high vowel, this RTR feature cannot surface without violating the undominated constraint militating against high RTR vowels. However, once a mid-vowel is added on as a prefix, this RTR feature can surface on the prefix. According to this hypothesis, the difference between the verbal bases in (66a) and (66b) is that the base in (66a) does not contain an underlying RTR value, while the base in (66b) does.

3.4 RTR Harmony in Proclitics

3.4.1 RTR Harmony with Single Proclitics

The crucial data that show differences in domain size between Standard Yorùbá and Mọba are in the class of proclitics, which attach to verbal hosts. Since RTR harmonic behaviour is restricted to mid vowels, only those clitics with mid vowels could potentially exhibit harmonic behaviour in (67) below. The clitics are attached in turn to a pair of verbs, one with an ATR vowel, and the other with an RTR vowel.[40]

(67) Proclitics – Differences in Domain-Size in Mọba and Standard Yorùbá

Clitic	MB	SY	Gloss	Meaning
1SG	mě / mǐ dé	mo dé	1SG='arrive'	'I arrive(d)'
	mẹ̌ / mǐ lọ	mo lọ	1SG='go'	'I go/went'
1PL	a dé	a dé	1PL='arrive'	'we arrive(d)'
	a lọ	ǎ lọ	1PL='go'	'we go/went'
2SG	ọ̌ dé	o dé	2SG='arrive'	'you(sg.) arrive(d)'
	ọ̌ lọ	o lọ	2SG='go'	'you(sg.) go/went'
2PL	in dé	ẹ dé	2PL='arrive'	'you(pl.) arrive(d)'
	in lọ	ẹ lọ	2PL='go'	'you(pl.) go/went'
3SG	é dé	ó dé	3SG='arrive'	's/he arrive(s/d)'
	ẹ́ lọ	ó lọ	3SG='go'	's/he goes/went'

[40] For a complete paradigm of proclitics with verbal root vowels varying for both tongue-root value and tone, see appendix B.

3PL	ǎn dé	wọ́n dé	3PL='arrive'	'they arrive(d)'
	ǎn lọ	wọ́n lọ	3PL='go'	'they go/went
NEG	kè dé	kò dé	(3SG)=NEG='arrive'	's/he didn't arrive'
	kẹ̀ lọ	kò lọ	(3SG)=NEG='go'	's/he didn't go'
FUT	è dé	máa dé	FUT='arrive'	'will arrive'
	ẹ̀ lọ	máa lọ	FUT='go'	'will go'

A summary of the complete subject proclitic paradigm (including the NEG and FUT proclitics) is given below in (68).

(68) Summary: Harmonic Behaviour of Proclitics

Clitic	MB	SY
1SG	harmonic alternation	invariably ATR
1PL	N/A (low V)	N/A (low V)
2SG	invariably RTR	invariably ATR
2PL	N/A (high V)	invariably RTR
3SG	harmonic alternation	invariably ATR
3PL	N/A (low V)	invariably RTR
NEG	harmonic alternation	invariably ATR
FUT	harmonic alternation	N/A (low V)

While all Standard Yorùbá proclitics surface invariably as ATR or RTR, all but one of the Mọba mid-vowel proclitics exhibits harmonic alternation with the host verb. The four clitics that do harmonize in Mọba correspond to Standard Yorùbá cognates that are invariably ATR. The lone non-harmonic clitic in Mọba is invariably RTR (despite its Standard Yorùbá cognate being invariably ATR). Crucially, there is no evidence of an ATR clitic in Mọba that is non-harmonic. I will assume then that an underlying ATR clitic is subject to harmony,[41] while an underlying RTR clitic is not, as expected assuming right-to-left RTR harmony.

In the above presentation of the clitics in Yorùbá, I am assuming that the negative and future auxiliaries are in fact clitics. Their harmonic behaviour itself provides

[41] Assuming the richness of the base hypothesis, an underlyingly unspecified proclitic must be considered. Such an unspecified clitic would be predicted to participate in harmony as well.

evidence for this. I am defining the class of clitics as those particles that participate in leftward RTR harmony, but not leftward ATR harmony. A distinction can be made between clitics and prefixes then. While prefixes never exhibit contrastive behaviour for ATR/RTR, clitics that are underlyingly RTR will surface as such, even though a disharmonic sequence will be introduced. Additionally, the phonological shape of the FUT marker (V) matches the shape of five of the six proclitics. A verbal root on the other hand, must minimally contain at least a CV syllable (an onset is obligatory). Finally, a distinction can be made concerning the grammatical functions of clitics and prefixes. While the clitics listed above are all inflectional morphemes, the agentive prefix (and, it is assumed, other prefixes) have a derivational function. These facts are all consistent with a treatment of the subject proclitics, negative, and future markers as clitics and of the agentive marker as a prefix.

3.4.2 *RTR Harmony with Multiple Proclitics*

While single clitics were shown to be included in the harmonic domain in Mọba, it remains to be seen whether sequences of clitics can occur, and if so, whether the outermost clitic is included in the harmonic domain. The answer to both of these questions turns out to be 'yes.'[42] In (67) above, it was shown that the Mọba negative marker, *ke / kẹ* can occur attached to a verbal base. This results in a third person reading, perhaps due to a null 3SG marker (the 3SG clitic *é / ẹ́* cannot precede the negative marker in either dialect). However, it is possible to get sequences of the NEG marker with the other subject clitics. Since we cannot force the 3SG morpheme to surface with the NEG marker, we have only two mid vowel candidates that are testable; of these two, only the 1SG form is potentially harmonic, since the 2SG is invariably RTR without the negative marker (and we wouldn't expect it to suddenly exhibit harmonic behaviour with the NEG marker). Standard Yorùbá data is included for completeness.

(69) Harmony With Two Clitics: SUBJECT + NEG

Subj. Clitic	MB	SY	Gloss	Meaning
1SG	mi kè dé	n̄ kò dé	1SG=NEG='arrive'	'I don't/didn't arrive'
	mi kẹ̀ jẹ	n̄ kò jẹ	1SG=NEG='eat'	'I don't/didn't eat'
	*mẹ kẹ̀ jẹ			
	*me kẹ̀ jẹ			

[42] A complete paradigm of three auxiliaries, the NEG, FUT and PROG markers, with all six subject proclitics, is given in appendix B. The vowel in the verbal base is allowed to vary with respect to its tone and tongue-root value.

2SG	ọ kè dé	o kè dé	2SG=NEG='arrive'	'You don't/didn't arrive'
	ọ kẹ̀ lọ	o kò lọ	2SG=NEG='go'	'You don't/didn't go'

As expected, the 2SG form is invariably RTR in Mọba and invariably ATR in Standard Yorùbá. However, the 1SG form in Mọba, which alternated between a high and mid vowel in (67) above, does not alternate when the negative marker is present. Instead, the form with the high vowel is grammatical, and the form with the mid vowel is ungrammatical.

However, the future marker *è* / *ẹ̀* comes to the rescue here. Combining future and subject marking, we have another opportunity to test whether multiple clitics exhibit harmonic behaviour. This time, the 3SG form turns up overtly and the 1SG form surfaces with the mid vowel.

(70) Harmony With Two Clitics: SUBJECT + FUT

Subj. Clitic	MB	SY[43]	Gloss	Meaning
1SG	mè è dé	màá dé	1SG=FUT='arrive'	'I will arrive'
	mẹ̀ ẹ̀ lọ	màá lọ	1SG=FUT='go'	'I will go'
2SG	ọ̀ è dé	wàá dé	2SG=FUT='arrive'	'You will arrive'[44]
	ọ̀ ẹ̀ lọ	wàá lọ	2SG=FUT='go'	'You will go'
3SG	é è dé	ó máa dé	3SG=FUT='arrive'	'S/he will arrive'
	ẹ́ ẹ̀ lọ	ó máa lọ	3SG=FUT='go'	'S/he will go'

It is apparent that the FUT marker harmonizes completely with its verbal host. Additionally, the 1SG and 3SG forms harmonize as well. On the other hand, the 2SG form does not harmonize. As expected, it is invariably produced as RTR. Note, however, that the FUT marker could conceivably have agreed with the RTR value of the

[43] Future marking in Mọba and Standard Yorùbá bear little resemblance to each other both morphologically and phonologically. Therefore, these Standard Yorùbá forms should not be viewed as direct cognates. However, note that there is no harmony in these Standard Yorùbá future forms, as expected.

[44] The 2SG future form is included to show that the future clitic is not simply a copy of the preceding vowel in Mọba.

preceding 2SG clitic, but instead chooses to agree with the verbal root's tongue-root value, whatever it is.

Finally, (71) illustrates that the combination of three clitics (a subject-marking proclitic, a NEG proclitic and a FUT proclitic) in Mọba do in fact result in a harmonic surface form (I omit Standard Yorùbá forms here).[45]

(71) Harmony With Three Clitics: SUBJECT + NEG + FUT

MB	Gloss	Meaning
a kè è dé	1PL=NEG=FUT='arrive'	'We will not arrive'
a kẹ̀ ẹ̀ jẹ	1PL=NEG=FUT='eat'	'We will not eat'

This is illustrated using the 1PL proclitic. Note that for the same reason as in (69) above, there will not be any harmonic interaction between the subject proclitic and the negative proclitic. The subject forms of the 1SG and 3SG clitics occur with a high vowel and with no vowel respectively since the negative clitic is present. Therefore, there is no way to test whether three consecutive clitics would harmonize across the board. However, there is no reason to suspect that they should not if such data were possible to elicit.

3.5 RTR Harmony in Enclitics

3.5.1 RTR Harmony in Enclitics

Another area of consideration is the enclitic domain. Both Mọba and Standard Yorùbá have a small set of enclitics. Of these, we find object-marking enclitics that attach following transitive verbs. Their phonological form is very similar to their corresponding subject markers in (67) above. What we find is that the same forms used with the negative markers occur as enclitics in Mọba, meaning we have a null 3SG object marker and a 1SG object marker with a high vowel. The 2SG marker is invariably RTR as it was in all of the preceding cases as well. This is interesting in itself, and it will figure prominently in the analysis in chapters four and five. The plural markers all contain low or high vowels and are thus unable to participate in RTR harmony.

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45 See appendix B for sequences of four clitics where the progressive marker is inserted as the fourth clitic.

(72) Enclitics: Object Markers with High-Tone Verbs[46]

Obj. Clitic	MB	SY	Gloss	Meaning
1SG	adé lé mi	adé lé mi	'Ade' 'pursue'=1SG	'A. pursue(s/d) me'
	adé kọ́ mi	adé kọ́ mi	'Ade' 'teach'=1SG	'A. teaches/taught me'
1PL	adé lé a	adé lé wa	'Ade' 'pursue'=1PL	'A. pursue(s/d) us'
	adé kọ́ a	adé kọ́ wa	'Ade' 'teach'=1PL	'A. teaches/taught us'
2SG	adé lé ọ	adé lé ẹ	'Ade' 'pursue'=2SG	'A. pursue(s/d) you'
	adé kọ́ ọ	adé kọ́ ẹ	'Ade' 'teach'=2SG	'A. teaches/taught you'
2PL	adé lé in	adé lée yín	'Ade' 'pursue'=2PL	'A. pursue(s/d) you all'
	adé kọ́ in	adé kọ́ọ yín	'Ade' 'teach'=2PL	'A. teaches/taught you all'
3SG	adé le	adé l(é) e	'Ade' 'pursue'=3SG	'A. pursue(s/d) him/her'
	adé kọ	adé k(ọ́) ọ	'Ade' 'teach'=3SG	'A. teaches/taught him/her'
3PL	adé lé an	adé lé wọn	'Ade' 'pursue'=3PL	'A. pursue(s/d) them'
	adé kọ an	adé kọ wọn	'Ade' 'teach'=3PL	'A. teaches/taught them'

As was the case in (69) above, there is no direct evidence available to test whether underlyingly ATR (or unspecified) enclitics are included in the harmonic domain for RTR harmony or not. This indeterminacy is becoming very familiar; Yorùbá is a language with a relatively small morphological arsenal. Therefore, it is unsurprising that it might be difficult to find evidence for the domain-size of phonological processes (that are already phonologically limited) across a limited class of morphemes. Because of these morphological limitations, indeterminacy results.

3.5.2 Tonal OCP in Enclitics

There is, however, one interesting observation concerning the tone of the enclitics. The data in (72) contain high-tone verbal hosts (*lé* and *kọ́*). When considering the pattern with low-tone or mid-tone verbs, we find that these enclitics surface with high tone (with

[46] See appendix B for a complete paradigm of these object enclitics combined with three auxiliaries and verbal hosts that vary for tone and tongue-root value.

the exception of the 3SG form – this discrepancy will be addressed shortly). This pattern is exemplified using two low-tone verbs (*pè* and *kọ̀*) in (73) below.

(73) Enclitics: Object Markers with Low-Tone Verbs

Subj. Clitic	MB	SY	Gloss	Meaning
1SG	adé pè mí	adé pè mí	'Ade' 'call'=1SG	'A. call(s/ed) me'
	adé kọ̀ mí	adé kọ̀ mí	'Ade' 'reject'=1SG	'A. reject(s/ed) me'
2SG	adé pè ọ́	adé pè ẹ́	'Ade' 'call'=2SG	'A. call(s/ed) you'
	adé kọ̀ ọ́	adé kọ̀ ẹ́	'Ade' 'reject'=2SG	'A. reject(s/ed) you'
3SG	adé pē	adé pè é	'Ade' 'call'=3SG	'A. call(s/ed) him/her'
	adé kọ̄	adé kọ̀ ọ́	'Ade' 'teach'=3SG	'A. teaches/taught him/her'

As can be seen in (73) above, the enclitics are underlyingly specified as high-tone. This high tone surfaces in tact when the enclitics follow a low- or mid-tone vowel in the verbal base. However, when they follow a high-tone vowel as they do in (72), all the enclitics except the 2PL marker surface with mid-tone instead. This is presumably due to an OCP constraint that prohibits adjacent high tones between the vowel in the verbal base and the enclitic. This is resolved normally via high-tone drop, such that the enclitic surfaces with mid tone (recall that mid tone is analyzed as the lack of tone in Yorùbá). In the case of the 2PL marker, the high tone is preserved on the enclitic and a mid-tone copy of the vowel in the verbal base is inserted to prevent the OCP violation.

Akinlabi and Liberman (2000) noted this OCP effect seen in (72) where adjacent high tones across a stem-enclitic boundary are prohibited. One proposal they have to account for the presence of adjacent high-tones within roots is that tonal spreading applies only within a word (tonal spreading cannot apply across the verb-enclitic boundary then). However, the OCP holds over a domain that spans the verb-enclitic boundary, and thus in order to prevent a violation of the tonal OCP, the clitic high tone deletes. Under this analysis, a low-tone or mid-tone verb would allow an underlying high-tone to surface on the enclitic, since the OCP is only violated by adjacent high tones. However, when the same enclitic is attached to a high-tone verb, the high-tone on the enclitic is deleted.

The lone exception of course is the 3SG form, which is aberrant with respect to its vowel quality in both dialects. In Standard Yorùbá, it appears to be a copy of the vowel in the verbal host, with high tone specified. This high tone drops when it attaches to a high-tone verb, however, in compliance with the general solution to overcome the OCP violation that would be incurred by adjacent high-tones. In Mọba, the entire enclitic is apparently deleted.[47] On its own this would be fine, since this is simply another solution to resolve the OCP, albeit non-minimal. What is interesting about the 3SG object form in Mọba is that the tone on the verb is altered, suggesting a phonetic conflation of two tones, such that a single 'derived' mid-tone is produced. Although, there is no instrumental analysis available of either the length or tone of the vowel in the verb in the 3SG form in Mọba, it appears that this derived 'mid' tone (marked with a level bar over the vowel in (73): *adé pē*) is actually mid-way between a low and mid tone. This can be contrasted with the vowel in the 3SG form in the high-tone verb paradigm where a true mid tone is found (i.e. *adé le* in (72)).

3.5.3 Implications for Domains

Object enclitics, then, provide no direct insight into their status in the RTR harmonic domain. While it is clear that they do not trigger leftward RTR harmony, it is not clear if they would participate in rightward RTR harmony since there are no underlyingly ATR enclitics. Direct evidence for the harmonic status of the enclitics is lacking, however it is still possible to make certain claims regarding the RTR harmonic domain by considering the domain for the tonal OCP. This section begins by illustrating the right-branching structure that must be present based on the tonal OCP facts. There are two possibilities regarding the type of constituency referred to in the RTR harmonic domain. Either both RTR harmony and the tonal OCP apply over domains in the same type of constituency or they do not. The first possibility (that the domains for the tonal OCP and RTR harmony are of the same type of constituency) would necessarily imply that the enclitics are included in the harmonic domain. The second possibility (that the domains for the tonal OCP and RTR harmony are of different constituency types) would be consistent with enclitics that are or are not included in the domain of RTR harmony. This discussion will be expanded upon in section 4.4, where a stronger case is made that the enclitics are in fact included in the harmonic domain.

First, whatever the relationship is between the enclitic and verb, this morpheme boundary is clearly contained within a domain that enforces the tonal OCP. However, this same tonal OCP is not enforced across the proclitic-verb boundary. Examples abound of high-tone clitics that surface with their high-tone intact preceding high tone verbs (i.e. Mọba: *é dé* ; Standard Yorùbá: *ó dé* 'S/he arrived'). This OCP violation is tolerated across the proclitic-verb boundary.

[47] This deletion is optional in Standard Yorùbá.

(74) Domain for Tonal OCP (D-TN OCP) – Both Dialects

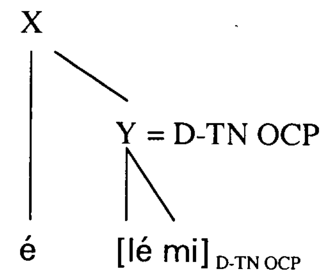
a. Proclitics excluded

é $[\text{dé}]_{\text{D-TN OCP}}$
3SG='arrive'
'S/he arrive(s/d)'

b. Enclitics included

é $[\text{lé mi}]_{\text{D-TN OCP}}$
3SG='pursue'=1SG
'S/he pursue(s/d) me'

c. Structure Implied based on Tonal OCP

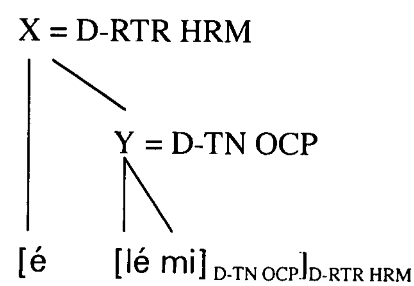


Let us assume that this difference can be attributed to a tonal OCP constraint that applies over some domain that contains the verb-enclitic pair but not the proclitic-verb pair as shown in (74c) above. Then, assuming this domain also refers to the same *type* of constituent as the RTR-harmonic domain, whether it is syntactic or prosodic, the implication is that the enclitic must be part of the RTR harmonic domain in Mọba.

The fact that RTR harmony *does* apply across the proclitic-verb boundary and the tonal OCP *does not*, implies that the RTR domain is a superset of the tonal OCP domain in Mọba. The only constituent in (74c) above that contains both the proclitic and the verbal base is X, which also necessarily contains the enclitic domain. This is summarized in (75) below.

(75) Interaction of RTR-Harmonic Domain (D-RTR HRM) with Tonal-OCP Domain Assuming Domains Refer to Same Type of Constituency

a. Only Possibility: Enclitics Included in D-RTR HRM

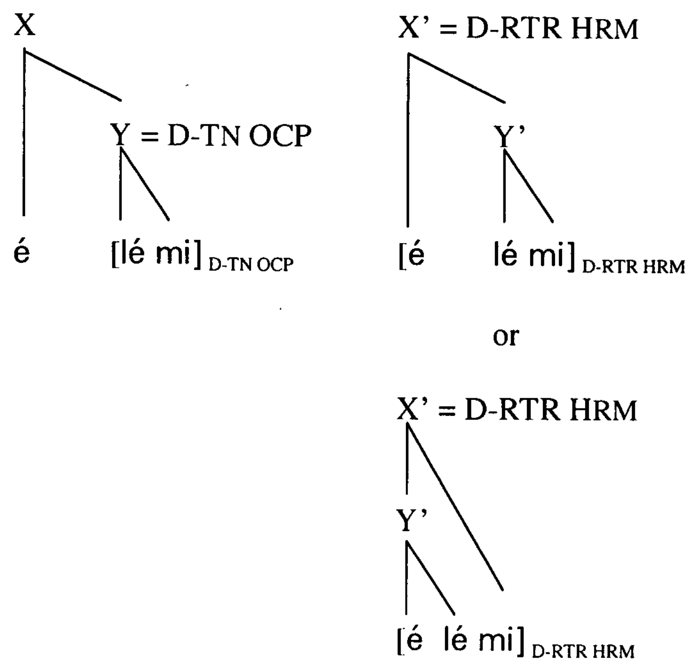


The structure in (75) above would imply that the enclitics are included in the RTR harmonic domain. Evidence that the enclitics do not harmonize would not be consistent with the structure in (75), necessarily implying that the RTR domain is not defined via the same constituency-type.

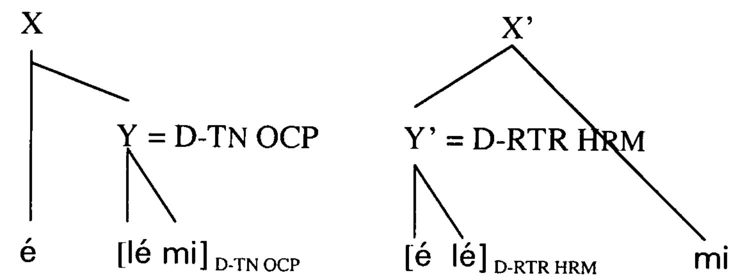
Instead, a different *type* of constituent must be referred to by the RTR-harmonic domain. For example, given evidence against harmony in enclitics, and also, given evidence that the RTR domain refers to some prosodic constituent, together this would amount to evidence that the tonal OCP does not refer to any prosodic constituent (possibly implying a direct reference to syntax). This is summarized in (76) below where it is assumed that the tonal-OCP domain refers to a different type of constituency (constituents, X and Y on the left) than the RTR-harmonic domain (constituents X' and Y' on the right).

(76) Interaction of RTR-Harmonic Domain with Tonal-OCP Domain Assuming Domains Refer to Different Type of Constituency

a. Possibility 1: Enclitics Included in RTR harmonic domain (D-RTR HRM)



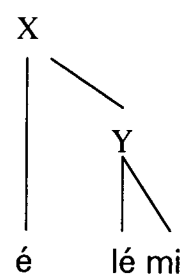
b. Possibility 2: Enclitics Not Included in D-RTR HRM



In (76a) above, we see that if it could be shown that enclitics were included in the RTR-harmonic domain, there are two possibilities: There is either a reference to two distinct domains in the same constituency type (as in (75)) or a reference to two domains in different constituency types (as in (76a)). However, if it could be shown that enclitics were excluded from the RTR-harmonic domain, then this is only consistent with possibility two (76b), implying that different constituency types are referred to by the RTR-harmonic domain and the tonal-OCP.

A second point concerns the syntactic asymmetry between the enclitic position and the proclitic position. Syntactic structure is right branching in Yorùbá, meaning that the enclitic is a sister to the verbal head. The proclitic will then necessarily occupy a syntactic position that is less closely related to the verbal head. Regardless of where we analyze the proclitic in syntax, it cannot possibly be in a closer relationship with the verb than the enclitic.

(77) Syntactic Constituency is Right-Branching



Therefore, any reference by the RTR domain to syntactic structure (direct or indirect) will necessarily include the enclitic position as well. On the other hand, if the RTR domain does not reference syntax in any way, it is fathomable that in Mọba, the enclitic might not be included in the RTR domain, while the proclitic might be.[48]

[48] This is possible but unlikely. It would involve separate domains for proclitics and enclitics. At this point in the analysis, it is possible that the proclitics could be parsed in the PrWd and enclitics in some prosodic category dominating the PrWd. This would

Therefore, an underlyingly ATR enclitic that definitively does not harmonize with the verbal host is consistent only with an RTR-harmonic domain that crucially does not refer to syntactic structure. An underlying ATR enclitic that does harmonize with the verbal host is consistent with either a reference to syntactic structure or a lack of such a reference. The most interesting outcome would be one where Standard Yorùbá and Mọba differ in that Standard Yorùbá enclitics harmonize with the verb and Mọba enclitics do not (recall that the opposite is true for proclitics). This outcome would strongly suggest that the dialects differ with respect to a reference to syntax: Standard Yorùbá has a harmonic domain that refers to syntax somehow (right-branching structure), while Mọba has one that does not (left-branching structure).

The conclusion that can be drawn from the above discussion is that if it can be shown that enclitics are not included in the harmonic domain in Mọba, an argument can be made for a reference to a prosodic domain that does not refer to syntactic structure in any way. Likewise, we would then argue against that same type of structure as a possible domain for the tonal OCP by invoking the reasoning in the first argument above – implying a syntactically defined domain for the tonal-OCP. The other possible scenario, where evidence was found implying that the enclitic *was* part of the harmonic domain in Mọba, would not say much at all about the nature of the *type* of domain that is being referred to in either dialect based on this alone.

3.5.4 Implications for OT Accounts

Alignment-based accounts are compatible with the Mọba pattern. All that is needed, in fact, is to redefine ALIGN(RTR, L, PrWd, L) in Pulleyblank's (1996) account to align with the left edge of the ClGp in Mọba rather than the word. The difference between Mọba and Standard Yorùbá is exactly that: ALIGN(RTR, L, ClGp, L) is active in Mọba, while ALIGN(RTR, L, PrWd, L) is active in Standard Yorùbá. Additionally, the ALIGN(RTR, L, ClGp, L) must be further subdivided into constraints governing left-alignment of ATR and left-alignment of RTR. Specifically, ALIGN(RTR, L, X, L) must left-align with the ClGp, while ALIGN(ATR, L, X, L) must left-align with the PrWd. This is true because while RTR is found to spread leftward from roots to proclitics, thus overwriting underlying ATR values on proclitics, ATR does not extend into the clitic domain, thus allowing underlying RTR values on proclitics. The difference then would be encoded directly in the left-alignment constraint and all other facts of the analysis would remain the same. However, alignment as a harmony-driver in Yorùbá has other problems, which have already been raised already.

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imply two levels of prosodic structure above the level of the PrWd, one for proclitics, one for enclitics. I will argue against this in section 4.4 however.

One final issue with an alignment-based account is that it needs to be adjusted to be extendable to other dialects of Yorùbá. For example, Ifẹ allows harmony across high vowels and Ekiti allows high vowels to undergo active retraction. Recall that these effects were captured in an alignment-based approach (Pulleyblank 1996) by defining local alignment, which is satisfied by inserting features. Thus, in a form like *ọdịdẹ*, the final RTR vowel only incurs one violation of left-alignment by virtue of the inserted feature, while in *odidẹ*, left-alignment incurs the usual two violations.

Of these issues raised above, one involves a well-motivated interpretation of the basic alignment family. The need to adopt local alignment is motivated in order to capture the dialectal variation in Yorùbá. It is motivated by any harmony system where transparency is attested. This would appear to be the escape hatch for ALIGN in these cases. If, however we do not want to use gradient alignment constraints, as McCarthy (2003) suggests, then we are at a crossroads. This is true because we cannot adopt a categorical alignment constraint that captures the facts of Yorùbá RTR harmony. Instead, Chapter 5 presents an account that utilizes alignment not as a harmony-driving constraint, but as a method to map prosodic structure onto morphological structure. The constraints ALIGN(PrHd, R, PrWd, R) and ALIGN(PrWd, R, ROOT, R) will enforce that the prosodic head is right-aligned with the morphological root, so that this root-final vowel can be referred to formally via OT constraints.

As in the alignment-based account, a stem-control-based account would handle the difference between the domain sizes for RTR harmony in Mọba and Standard Yorùbá by setting the domain of application for the active constraints. For example, the AGREE(ATR) constraint would apply over the PrWd in Standard Yorùbá. This would exclude the clitics from the harmonic domain and they would thus be allowed to contrast freely for ATR/RTR. However, the facts of Mọba Yorùbá are less clearly accounted for in the stem-control account. The constraint set used by Baković (2000) is unable to account for the pattern seen in the clitics. AGREE(ATR) does not distinguish between ATR and RTR, and therefore there is no way to simultaneously enforce harmony targeting the ATR proclitics and to prevent harmony targeting the RTR proclitics. If we set the domain for AGREE(ATR) to a domain, X, that includes proclitics, this would correctly predict that the ATR proclitics harmonize with their verbal hosts, but it would incorrectly predict that the RTR proclitics should do the same. This is illustrated below in (78) and (79).[49]

[49] It is assumed here that an output-output correspondence is established between a 'stem' consisting of the verbal host of cliticization and an 'affixed form' that is essentially a cliticized form. SA-IDENT(ATR) can then refer to this correspondence in the same way it did with true affixed forms. If this assumption is not made, the facts of the clitics must be explained via some independent method in the stem-control account.

(78) ATR Proclitics Harmonize in Mọba Yorùbá

Stem: [jẹ]

/é jẹ/	SA-IDENT(ATR)	AGREE(ATR)	IO-IDENT(ATR)
a. é jẹ		*!	
☞ b. ẹ́ jẹ			*

(79) RTR Proclitics Incorrectly Predicted to Harmonize in Mọba Yorùbá

Stem: [se]

/ọ̌ se/	SA-IDENT(ATR)	AGREE(ATR)	IO-IDENT(ATR)
💣 a. ọ̌ se		*!	
☞ b. ǒ se			*
c. ọ̌ sẹ	*!		*

The enclitic environment provides us with the only definitive test where we might actually expect rightward harmony in a stem-control account. Note that the enclitic facts might be consistent with stem-control theory, in that at least there is no leftward harmony triggered by the 2SG enclitic when it is attached to a verb with a mid ATR vowel. However, stem-control theory makes the incorrect prediction that an RTR enclitic should not be able to surface faithfully following an ATR verbal base. This is illustrated in (80) below.

(80) RTR Enclitics Incorrectly Predicted to Harmonize

Stem: [lé]

/adé lé ọ/	SA-IDENT(ATR)	AGREE(ATR)	IO-IDENT(ATR)
💣 a. adé lé ọ		*!	
☞ b. adé lé o			*
c. adé lẹ́ ọ	*!		*

It is impossible within the stem-control account to both allow ATR proclitics to harmonize and to disallow RTR proclitics and enclitics to harmonize. If we restrict the domain of AGREE(ATR) to exclude the clitic domain, we need some other mechanism to enforce harmony in ATR clitics, as can be seen in (78) above. If we allow the domain to include the clitics, then we need an additional mechanism to disallow harmony in the RTR clitics, as can be seen above in (79) and (80).

On the other hand, the alignment-based account taken strictly does not necessarily allow for spreading onto an enclitic. If right-alignment to the root means perfect alignment such that spreading one vowel beyond the edge of the root incurs a single violation of right-alignment (if over-alignment is worse than perfect alignment, in other words), then this account predicts that mid ATR enclitics should not harmonically alter to agree with their verbal hosts. Unfortunately, the lack of ATR mid vowel enclitics in Mọba does not allow us to test these predictions.

One final point concerning the enclitics is in order. If the 3SG enclitic in Standard Yorùbá is assumed to exhibit RTR harmony (which it does only by virtue of the fact that it is apparently a total copy of the vowel quality of the verbal root) then we have apparent evidence against the right-alignment-with-the-root account. However, even if no extra violation of alignment is incurred by an over-aligned domain, those RTR and ATR feature values that fall outside the usual domain for harmony are protected via faithfulness constraints in any case. Therefore, an over-aligned candidate could never win because it would incur an extra faithfulness violation (assuming faithfulness is ranked high enough).

The only way the 3SG enclitic (or any enclitic or proclitic in Standard Yorùbá) could be targeted in this position at the exclusion of all other clitics, ATR and RTR alike, is if it were underspecified for featural content. Faithfulness would still be relevant in preventing insertion of featural material and in preserving the high-tone mora. However, by ranking DEPLINK-ATR and DEPLINK-RTR sufficiently low, there is nothing to stop spreading of the root node of the preceding root vowel. In fact, progressive assimilation is a well-attested phenomenon in Yorùbá when two vowels come into hiatus (as was seen in the pattern of C1-deletion in section 3.2.4). Therefore, it is not surprising that progressive assimilation might be called on to fill in the values of this featurally unspecified morpheme.

An account utilizing prohibition-type constraints is more successful than a stem-control account in its ability to capture cross-dialectal variation typologically and it does not come with the problems that an alignment-based account does concerning gradient evaluation. This account is presented in Chapter 5. It posits MAXLINK-type faithfulness constraints that apply over different prosodic domains ranked with *FG-type sequence prohibition constraints that also apply over these same prosodic domains. By ranking constraints that apply over a tighter prosodic domain above those that apply over a wider prosodic domain, the pattern seen in Mọba Yorùbá can be accounted for.

3.6 RTR Harmony Outside the Verbal Domain

3.6.1 RTR Harmony and Adverbials

While the above data show that RTR harmony is triggered by verbal hosts on proclitics in Mọba, it turns out that this is not strictly a property of verbs. Adverbials that occur preceding verbs but following the proclitics are examined in this section. We fully expect that any class of lexical items that constitutes a morphological root should act as a potential trigger of RTR harmony under any of the OT accounts we have seen. This prediction is borne out as can be seen by attaching the 1SG, 3SG, NEG, and FUT proclitics to these adverbials. I do not offer Standard Yorùbá versions for 1SG FUT forms since they do not parallel the Mọba future structure in question.

(81) Adverbials: RTR Harmonic Triggers

MB	(SY)	Gloss	Meaning
é tètè dé	ó tètè dé	3SG= 'early' 'arrive'	'S/he arrived early'
ẹ́ pàpà dé	ó pàpà dé	3SG= 'in the end' 'arrive'	'S/he arrived in the end'
é tètè lọ	ó tètè lọ	3SG= 'early' 'go'	'S/he went early'
ẹ́ pàpà lọ	ó pàpà lọ	3SG= 'in the end' 'go'	'S/he went in the end'
kè tètè dé	kò tètè dé	NEG= 'early' 'arrive'	'S/he didn't arrive early'
kẹ̀ pàpà dé	kò pàpà dé	NEG= 'in the end' 'arrive'	'S/he didn't arrive in the end'
kè tètè lọ	kò tètè lọ	NEG= 'early' ' go'	'S/he didn't go early'
kẹ̀ pàpà lọ	kò pàpà lọ	NEG= 'in the end' 'go'	'S/he didn't go in the end'
mè è tètè dé		1SG=FUT= 'early' 'arrive'	'I will arrive early'
mẹ̀ ẹ̀ pàpà dé		1SG=FUT= 'in the end' 'arrive'	'I will arrive in the end'
mè è tètè lọ		1SG=FUT= 'early' 'go'	'I will go early'
mẹ̀ ẹ̀ pàpà lọ		1SG=FUT= 'in the end' 'go'	'I will go in the end'

In the above Mọba forms, the clitics harmonize with the tongue root values of the adverbials, *tètè* and *pàpà*. As expected, no such harmony is seen in Standard Yorùbá. Again, this harmony extends across sequences of two clitics in Mọba. The RTR-value of the verb is inconsequential. This result follows if we assume that the adverbials are morphological roots. A stem-control account would posit that the 'prefixal' material must agree with the root (the final vowel in the adverbial). In an alignment-based account, the RTR value of the adverbial root must align with the right edge of the adverbial, since it is a root. This right-alignment overrules any left-alignment in Pulleyblank's (1996) account since ALIGN(RTR, R, ROOT, R) >> ALIGN(RTR, L, PrWd, L). Therefore, it is more important to align a root value of RTR with the right edge of a root than it is to left-align to whatever domain left-alignment refers to. Each occurrence of a root signifies a 'reset' for RTR harmony then.

3.6.2 Root versus Non-Root Status

The question that arises next, is what exactly gives a lexical item status as a morphological root. In Yorùbá, verbs, nouns and adverbials act as roots, while affixes do not. Clitics are interesting in that when they contain ATR mid vowels, they act like affixes in Mọba since they undergo harmony. However, the 2SG form, which contains an RTR mid vowel, superficially acts like a root in that it 'resets' the harmonic domain. The fact that there is a split where ATR clitics are targeted in harmony but not RTR clitics, suggests that in fact there is another explanation. By splitting the harmonic driver into separate constraints, one referring to ATR, the other referring to RTR (by splitting AGREE into two separate constraints, *<u>ATR</u>-RTR and *RTR-<u>ATR</u> for example or alternatively by splitting ALIGN into ALIGN(ATR) and ALIGN(RTR)) we can specify different domains for two separate harmony-driving constraints. This split is necessary since it is clear that RTR harmony can apply in the clitic domain (see tableau (78) above) but that ATR harmony cannot (see tableaux (79) and (80) above). Under this view, there is nothing particularly special about the 2SG marker other than it is specified underlyingly RTR and the harmony driver over the clitic group only enforces RTR harmony and not ATR harmony. By splitting the harmony-driving constraint in this way, it is possible to capture this pattern seen in the clitic domain in Mọba (this will be demonstrated in section 5.1).

Assuming clitics and affixes are not roots, we still can ask what it is about them that prevents them from being analyzed as roots. Prosodically speaking, Yorùbá has a strict templatic requirement for verbs to be minimally (and maximally in most cases) CV. Many of the subject proclitics are CV, however and this has not elevated them to root-like status. However, subject proclitics are not generated in the same syntactic positions as verbs. Therefore, they should not be subject to the same minimal requirements as verbs are. Instead, they occupy nominal positions, and therefore, they are subject to the prosodic requirements that the Yorùbá noun must meet: They must be minimally VCV. Since the clitics do not meet this VCV requirement, they are not roots.

Additionally, by considering the strong subject pronoun forms in Yorùbá, which do meet the minimal VCV requirement, we can see a clear example of a contrast between roots and non-roots. The following data is from Pulleyblank (1986:46).

(82) NP Coordination in Standard Yorùbá

[táíwò àti kẹ́hìndé] lọ kí i
Taiwo and Kehinde go greet her
'Taiwo and Kehinde went to greet her'
[èmi àti kẹ́hìndé] lọ kí i
I and Kehinde go greet her
'Kehinde and I went to greet her.'
*[mo àti kẹ́hìndé]...
I and Kehinde...
*[kẹ́hìndé àti mo]...
Kehinde and I...
*[mo àti ó]...
I and he...
*[ó àti mo]...
he and I...

It is possible to co-ordinate the full VCV form of the pronoun, but it is not possible to co-ordinate the weak form of the pronoun (the clitic). This is the basis for an analysis of these weak pronouns as clitics rather than as full NP's (Bamgboṣe 1966, 1967; Pulleyblank 1986). This provides another aspect where root and non-root morphemes differ. [50]

We have seen evidence, both within phonology and in syntax, that non-root morphemes like clitics and affixes are treated differently than root morphemes are. This motivates a split between roots and non-roots that is crucial in terms of defining the harmonic domain of RTR. While non-roots seem to act as targets in leftward RTR harmony, the right edges of roots seem to align with the right-edge of an RTR harmonic domain. In cases where a non-root also resists being targeted in RTR harmony, such as the 2SG form noted above in Mọba, this will be analyzed as following from interactions of violable constraints in an OT account. In the analysis presented in chapters 4 and 5, it is assumed that roots project well-formed prosodic words, while non-roots do not. This will be instantiated via an ALIGN constraint that aligns the right-edge of a root with the right edge of a PrWd. On the other hand, non-roots will not be subject to alignment

[50] These strong forms could be contrasted in terms of their harmonic status ideally. In this situation, we would expect that the strong pronouns with a final ATR mid vowel would not harmonize with a following verb, by virtue of their root status. However, there are no such ATR-mid-vowel final forms. The 2SG form contains a final mid RTR vowel (just as the corresponding clitic form does), however we would not expect to find harmony here for the same reasons we do not find it with the clitic form – only ATR mid vowels are targeted by tongue-root harmony in this position.

constraints such as these. Independently motivated prosodic constraints will then handle other aspects of the prosodic structure, such as where to parse non-roots and what constraints are placed on the minimal and maximal PrWd, foot or syllable. These topics are discussed in detail in the next chapter.

The discussion above is compatible with a system where prosody rather than morphology is crucial in determining the RTR-domain. We have seen that prosodic categories and morphological categories have tended to coincide in Yorùbá. To the extent that evidence for morphological or syntactic constituency is lacking in some cases in Yorùbá, a speaker might be forced into referring directly to emergent prosodic domains in order to build the kinds of generalizations that result in systematic phonological patterns like RTR harmony. We have seen many examples where the harmonic domain cannot be determined. With a lack of morphological cues, a speaker is forced to refer to an emergent prosodic constituent that is consistent with the language data they are hearing. Such constituents are shown to exist in the following chapter. Ọla (1995) argues for prosodic structure in Standard Yorùbá based on a number of phenomena. These arguments will motivate an account that uses prosodic structure rather than morphological structure in accounting for the differences between the RTR harmonic domain in Mọba and Standard Yorùbá.

Chapter 4 - Analysis of Domain Size

4.1 Introduction

The basic pattern of RTR harmony exhibited above in Mọba differs from Standard Yorùbá in that its domain includes the class of proclitics, while in Standard Yorùbá these proclitics fall outside the harmonic domain. This difference regarding the clitics is a result of the presence of a prosodic category, 'clitic-group' (ClGp), that dominates the PrWd. This can be accounted for in two conceivable ways.

Hypothesis one states that the PrWd includes clitics in Mọba but not in Standard Yorùbá. RTR harmony refers to the PrWd in both Mọba and Standard Yorùbá in this account (the ClGp is redundant and possibly absent in this hypothesis). This would involve a difference in what syntactic category is mapped onto the PrWd in each dialect.

Hypothesis two states that the PrWd does not include clitics in Mọba or Standard Yorùbá. The RTR-harmonic domain would then refer to the ClGp in Mọba, and the PrWd in Standard Yorùbá. Under this hypothesis, the domain difference is not a result of a difference between the syntax-prosody mapping. Instead, different prosodic categories are referred to in each dialect and this underlies the difference in domain-size.

In order to evaluate which of these two hypotheses is correct, independent processes showing similar domain effects (at the word-level) need to be evaluated in Standard Yorùbá and Mọba. One possible candidate is nasal harmony. The prediction under hypothesis one is that if nasal harmony refers to the PrWd in each dialect (as it does for RTR harmony), a similar split should be seen where proclitics are included in the nasal domain in Mọba, but not in Standard Yorùbá. Under hypothesis two, however, there is no reason to expect that the two dialects are referring to the same prosodic category to begin with. The nasal harmonic domain might refer to any prosodic constituent in this account. Although, nasal harmony is used as an example here, the general expectation under hypothesis one is that *any* process that also refers to the PrWd in both Mọba and Standard Yorùbá should show the same split where proclitics are included in the domain for that process in Mọba but not in Standard Yorùbá. The goal is then to find such processes that fit this description.

4.2 Prosodic Structure in Standard Yorùbá

Before testing the above hypotheses, an outline of the arguments for prosodic constituency in Yorùbá is presented. The prosodic status of clitics can only be analyzed once this basic picture is presented. Ọla (1995) has highlighted evidence for syllable-structure, foot-structure, and word-structure in Yorùbá. These arguments are outlined below. Constraints in OT are posited to uphold this prosodic structure and to map it onto morphological structure so that prosodic domains can be defined. These prosodic domains must be defined so that they can be properly referenced by the constraints that will be used in an OT account of RTR harmony in Mọba Yorùbá.

4.2.1 *Syllable Structure in Standard Yorùbá*

Consider the process of C1-deletion in Standard Yorùbá that was described in section 3.2.4 above. In VCVCV nouns, C1 can optionally (and sometimes obligatorily) be deleted to render VVCV nouns. This is shown again in (83) below, for two of the examples that were presented in (63) above.

(83) C1-Deletion in VCVCV nouns in Standard Yorùbá

Full Form	After C1-deletion	Gloss
erùpẹ̀	eèpẹ̀	'earth'
òwúrọ̀	òórọ̀	'morning'

However, when we consider VCV nouns with a medial 'r,' we find that in this context, C1-deletion is not an option.

(84) C1-Deletion Blocked in VCV nouns in Standard Yorùbá (from Ọla 1995)

Full form	After C1-deletion	Gloss
orí	*oí	'head'
àrá	*àá	'thunder'
oró	*oó	'pain'
ọrọ̀	*ọọ̀	'wealth'

This ban on C1-deletion in VCV forms (but not VCVCV forms) seems to rest on the fact that the surface form must retain at least one consonant. Notice that both the full form and the unattested form with C1-deletion both have two vowels (or two moras). Ọla (1995) sees this ban as evidence that all syllables must contain onsets in Yorùbá and that all words must minimally contain one syllable. The constraint, ONSET is undominated in Standard Yorùbá under this view, and is ranked above PARSE(μ, σ), which forces moraic elements to be parsed under a syllable. Onset-less syllables are analyzed as being nuclear moras licensed not by the syllable but directly by the word. Therefore, the distinction between onsetless vowels (which are moraic but not syllabic) and onset-full vowels (which are syllabic) is captured.[51]

4.2.2 *Foot and PrWd Structure in Standard Yorùbá*

Concerning foot structure in Standard Yorùbá, Ọla (1995) demonstrates the relevance of binary feet in reduplicative templates. One such reduplicative template is the ideophone reduplication signifying 'disorderliness'. A tonal melody of HMLM is mapped onto a reduplicated CVCV base. This reduplication is illustrated below.

(85) Standard Yorùbá Ideophone Reduplication signifying "disorderliness" (from Ọla 1995)

Base	Reduplicated Form	Gloss
jàlà	jálajàla	'moving shabbily'
bàlù	bálubàlu	'unsteady movement'
yẹ̀lẹ̀	yẹ́lẹyẹ̀lẹ	'carelessly'
wùrù	wúruwùru	'disorderly'
ràdà	rádaràda	'sluggish'
bòrò	bóroboro	'open and drippy'

As can be seen above, a CVCV base undergoes total reduplication and the tonal melody of the reduplicative process is mapped onto the resulting form.

This reduplicative process does not extend, however, to bases with more than two syllables.

[51] Ọla (1995) presents evidence in addition to that shown here that are consistent with obligatory CV structure in Standard Yorùbá syllables. Among this evidence, she cites loan verb truncation, word-initial morpheme structure conditions on high tone, nasality and high back vowels, distributive reduplication and vowel hiatus resolution.

(86) Standard Yorùbá Ideophone Reduplication – Unattested Forms (from Ọla 1995)

Base	Reduplicated Form	Gloss
rẹ̀pẹ̀tẹ̀	*rẹ́pẹtẹrẹ̀pẹtẹ	'bulky (soft)'
gbàràgàdà	*gbárágádagbàràgada	'falling'

We find that only disyllabic bases are possible candidates for this type of reduplication. Ọla argues that this process is governed by a requirement on the reduplicant to be a well-formed foot. Since feet can be at most two syllables, this explains the data in (86). The constraint, BINARY(Ft, σ) must dominate PARSE(σ, Ft) in order to militate against feet with more than two syllables. [52]

Ọla further argues for right-headed feet (as opposed to non-headed morphological feet). The pattern of C1-deletion is again central to this hypothesis. In VCVCV nouns containing two 'r's, it is the first 'r' that deletes and not the second 'r'.

(87) C1-Deletion in Standard Yorùbá: VCVCV Nouns with two r's

Full Form	After C1-deletion	Gloss
orórì	oórì *oóì *oróì	'mausoleum'

From this pattern, Ọla deduces that C1-deletion is allowed only in the case that it can still preserve a right-headed foot. Under this hypothesis, feet must obligatorily be iambic. Additionally, parse constraints enforce that syllables are preferentially parsed in feet and that feet are preferentially parsed under a PrWd. The constraints PARSE(Ft, PrWd) and PARSE(σ, Ft) enforce this. As for the size of the PrWd in Standard Yorùbá, Ọla provides arguments (that I will not include here) that it is minimally a single foot and maximally a pair of binary feet. A CV verb then constitutes that minimal PrWd, since feet must minimally contain one head syllable and a PrWd must minimally contain one foot. The upper limit of a PrWd containing maximally two binary feet is supported by the fact that Standard Yorùbá roots can be four syllables in length at most.

[52] Additional arguments in Ọla (1995) for the presence of foot-structure in Standard Yorùbá include agentive reduplication, numeral distributive reduplication and back harmony.

4.2.3 *Prosodic Constituency in Mọba Yorùbá*

It remains to be shown where Mọba fits into this prosodic picture. The data in (64) above demonstrate that Mọba allows glide deletion in VCV nouns to yield a VV form. In Standard Yorùbá, this would violate minimality requirements since there is no way to syllabify an onsetless vowel (Ọla 1995). However, if PARSE(μ, σ) were ranked above ONSET in Mọba, so that onsetless vowels are possible syllable nuclei, we can account for this. In the account following, therefore, it is assumed that Mọba and Standard Yorùbá differ only in that Mọba allows onsetless syllables. The relative ranking of ONSET and PARSE(μ, σ) would handle this straightforwardly as explained above: In Mọba, the ranking PARSE(μ, σ) >> ONSET is found, thus allowing onsetless syllables. In Standard Yorùbá, the reverse ranking, ONSET >> PARSE(μ, σ) holds, thus preventing onsetless moras from being syllabified. This would account for the pattern of w-deletion seen in Mọba and not in Standard Yorùbá straightforwardly. However the fact that Mọba does not exhibit the pattern of C1-deletion and assimilation that is seen in Standard Yorùbá remains unexplained.

In order to capture the domain effects seen in RTR harmony in Mọba using prosodic constituency, it is necessary to formally define the prosodic categories. The prosodic head (PrHd) is central to the OT analysis offered in the next chapter. It is assumed that every PrWd contains a head foot and that every foot contains a head syllable. The constraints, HEAD(PrWd)=Ft and HEAD(Ft)=σ force every PrWd to contain a head foot and every foot to contain a head syllable. This, in turn, forces every PrWd to contain a single prosodic head that is the head syllable in the head foot of that PrWd.

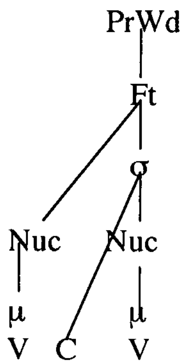
In order to enforce right-alignment of the prosodic head with the PrWd, the constraints, RIGHTMOST and RHTYPE=I are posited. RIGHTMOST is essentially a special kind of alignment constraint that says that the head foot of a PrWd is right aligned with the right-edge of that PrWd (Prince and Smolensky 1993). RHTYPE=I forces feet to be iambic, or right-headed. Together these two constraints enforce right-alignment of the PrHd with the PrWd. This set of constraints then defines a position, the PrHd, as the rightmost syllable in the PrWd. Finally, this prosodic constituency just described is mapped onto morphological structure via the constraint ALIGN(PrWd, R, ROOT, R).

This set of constraints allows an OT account to refer to the root-final vowel by referring to the PrHd. Constraints that refer to this position (such as those posited for Ifẹ and Ekiti Yorùbá in section 2.4) can now be formalized as constraints referring to the prosodic head position. Recall that the harmony-via-prohibition account for Standard Yorùbá utilized $[\text{MAX-RTR}]_{\text{ROOT}}$ in order to preserve root values of RTR. An account is proposed in chapter 5 that utilizes a similar constraint that refers to the PrHd, rather than the root. This positional faithfulness constraint, $[\text{MAX-RTR}]_{\text{PrHd}}$ does not require any version of an OCP constraint though in order to rule out multiple root values on the surface. In the prosodic account, there is exactly one PrHd per PrWd and so the job of the OCP in the root domain is accomplished via constraints on prosodic structure.

4.2.4 *On the Prosodic Status of Clitics*

Under this prosodic framework described above, a VCV noun in Yorùbá (both Mọba and Standard Yorùbá presumably) would consist of a single binary foot.

(88) Prosodic Constituency for VCV nouns in Yorùbá (Ọla 1995).



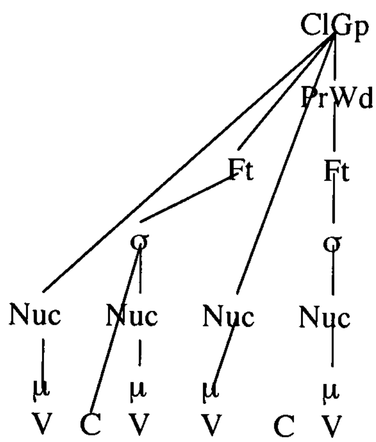
This representation holds of lexical items that contain one single root and possibly also of forms with prefixes (prefixes might instead constitute instances of nuclear moras linking directly to the PrWd). However, in Standard Yorùbá the domain for RTR harmony must be the PrWd. It could not be the foot, since there are trisyllabic roots with harmony across all three syllables in both dialects and since feet are binary. If the domain exceeded the PrWd in Standard Yorùbá, then we would expect the proclitics to harmonize with their verbal hosts; but they do not.

Unlike the other prosodic categories, the ClGp is not necessarily binary-branching. The fact that we can stack multiple clitics, one on top of the other, implies either an iterative domain or a non-binary domain. Iterativity is only useful in that it can uphold a binary branching structure. There is nothing forcing the ClGp to be a binary-branching category though. In other cases, the maximum size of a prosodic category is binary: PrWd can contain at most two feet and feet can contain at most two moras (or syllables).[53] These properties are defined via violable constraints. I assume that the

[53] Feet are assumed to be binary either with respect to moras or syllables. I make no claims as to which of these categories are referred to, as this does not effect the analysis presented.

constraints, BINARY(PrWd, Ft)[54] and BINARY(Ft, μ(/σ)) dominate PARSE(Ft, PrWd) and PARSE(σ, Ft) respectively and that this delimits the maximum size of the PrWd and Foot respectively. However, in the case of the ClGp, there is no evidence for an upper limit since multiple clitics can stack one on top of the other. In this case, PARSE(PrWd, ClGp) dominates any constraint that delimits the maximum size of the ClGp (such as BINARY(ClGp, PrWd) for example), allowing the ClGp to branch more than twice. This is illustrated in (89) below.

(89) ClGp is not Subject to Binary-Branching Requirements



a k ẹ̀ ẹ̀ j ẹ

1PL=NEG FUT 'eat'

'We will not eat'

Of note in the structure in (89) above is the fact that the negative proclitic constitutes a well-formed syllable, since it has an onset. Given the prosodic analysis above, the undominated constraints PARSE(σ, Ft) and PARSE(Ft, PrWd) would imply that this proclitic should project a PrWd category of its own. However, non-roots such as the negative proclitic do not constitute well-formed prosodic words in Yorùbá as was outlined in section 3.6.2.[55] In order to prevent non-roots from projecting a PrWd category, some constraint must dominate PARSE(Ft, PrWd) that militates against non-roots that project a PrWd category. We have seen one constraint that can do exactly this: ALIGN(PrWd, R, ROOT, R). By ranking ALIGN(PrWd, R, ROOT, R) above PARSE(Ft, PrWd), non-roots are prevented from projecting a PrWd category. Any PrWd that is not right aligned with the right-edge of a root would incur a violation of this constraint. Since the negative marker is not a root, the structure in (89) is selected optimally ahead of

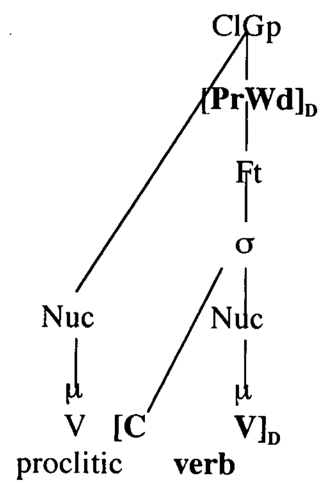
[54] Note that this two-foot restriction applies only to roots. Affixed forms can exceed two feet.

[55] Whether or not they constitute well-formed feet is also debatable. In (89) above, I assume they do, although there is nothing to say that a non-root should constitute a well-formed foot. The main point is that it cannot constitute a well-formed PrWd.

a structure where the negative marker projects a PrWd. A foot would only be required to project a PrWd if this PrWd can be right aligned to a root, as is the case with the verbal root in (89).

Now turning to the RTR-harmonic domain, in Standard Yorùbá, it maps onto prosodic structure as shown in (90) below.

(90) Standard Yorùbá: Prosodic Constituency of Clitics

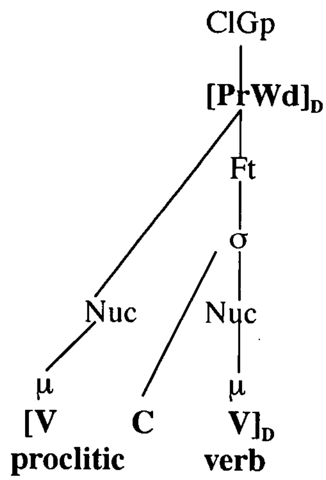


On the other hand, we have two possible mappings of the harmonic domain onto prosodic structure in Mọba. These correspond to the two hypotheses set forward at the outset of this chapter.

(91) Mọba Yorùbá: Prosodic Constituency of Clitics

Hyp. 1: Domain=PrWd

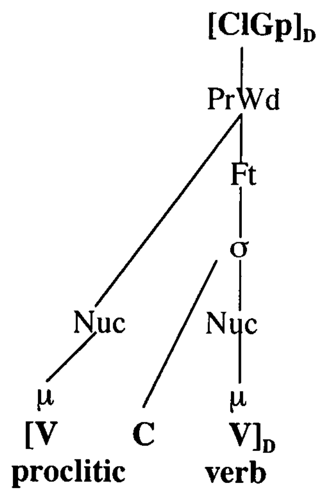
Same domain as SY; Parsing of Clitics different



(92) Mọba Yorùbá: Prosodic Constituency of Clitics

Hyp. 2: Domain=ClGp

Same parsing of clitics as SY; Domain different



As was previously noted above, these two hypotheses make different predictions concerning the difference in the size of domains of other processes that also refer to the PrWd. Namely, hypothesis one predicts that other processes that refer to the same prosodic domain in Mọba and Standard Yorùbá, should exhibit exactly the same dialectal split that is seen in the RTR harmonic behaviour of the proclitics. Under hypothesis two, we can expect harmonic domains to coincide only by chance. With each process that is attested to exhibit the dialectal proclitic split, this can be taken as positive evidence for hypothesis one. This is first tested on the domain for nasal harmony in the next section.

4.3 Nasal Harmony

Nasal harmony is another instance of harmony that occurs in both Mọba and Standard Yorùbá. Unfortunately, it is not ideal for our purposes however, because in Standard Yorùbá nasal harmony is syllable-bound, but in Mọba Yorùbá, it extends beyond the syllable. Since the PrWd is not a possible domain for nasal harmony in Standard Yorùbá, it does not meet the requirement that the domain be the PrWd in both dialects. This requirement is needed in order to test hypothesis one for nasal harmony. However, it is a separate question, interesting in itself, to ask if the harmonic domain of RTR harmony and nasal harmony in Mọba coincide. If it can be shown that nasal harmony does not extend to the proclitic domain but that it nonetheless applies minimally over the PrWd, then this, in itself, would argue against hypothesis one. Under this hypothesis, the proclitics are included in the PrWd by virtue of their being included in the RTR harmonic domain. However, if nasal harmony can independently be shown to apply over the PrWd, a contradiction emerges. How could the proclitics simultaneously occur in the PrWd but not be included within a nasal harmonic domain that is minimally the PrWd? If, on the other hand, it is found that the proclitics are contained in the nasal harmonic domain, this is consistent with either hypothesis above.

4.3.1 Syllable-bound Nasal Harmony

Roots in both Mọba and Standard Yorùbá exhibit nasal harmony that is triggered by nasal vowels. Recall that only high and low vowels have nasalized counterparts in Mọba and that in Standard Yorùbá the mid vowel, ọ̃ can occur as an allophone of a. Nasal harmony is thus restricted phonologically much as RTR harmony is. Unlike RTR harmony, consonants play a more central role in this system. Liquids and glides are nasalized when preceding a nasal vowel in both dialects. This behaviour is shown below (phonetic transcriptions are given for nasal harmony).

(93) Syllable-bound Nasal Harmony in Mọba and Standard Yorùbá

MB	SY	Gloss
ogṹ	ogṹ	‘twenty’
amĩ̀	amĩ̀	‘sign’
ìbàdã̀	ìbàdã̀	the city – Ibadan
ɔ̀r̃ã̀	ɔ̀r̃ã̀	‘trouble’
er̃ĩ	er̃ĩ	‘elephant’
w̃ã̀ / ã̀	wɔ̃̀ / *ɔ̃̀	‘measure’
òɲĩ̀g͡bò	òɲĩ̀g͡bò	a place in Lagos[56]

As can be seen in the final three examples above, the glides /y/ and /w/ and the liquid, /r/ are nasalized when they precede a nasal vowel. The liquid /l/ is in complementary distribution with the phoneme /n/. /l/ is never found to occur preceding a nasal vowel and likewise /n/ is never found to occur preceding an oral vowel.

4.3.2 Nasal Harmony across Syllable Boundaries in Mọba

The data in (93) are consistent with a pattern of syllable-bound nasal harmony (or merely assimilation) since preceding vowels apparently are not targeted in nasal harmony. When considering high vowels, however, we can see the first signs of vowel harmony.

(94) Nasal Harmony Targets High Vowels in Mọba

MB	SY	Gloss
àgũ̀tã̀	àgùtã̀	‘sheep’
òk͡pĩ̀tã̀	òk͡pìtã̀	‘historian’
ĩnṹ	inṹ	‘stomach’
r̃ĩ́r̃ĩ	rír̃ĩ	‘grating’ (gerundive reduplicant)
ũrĩ́ó	ir̃ĩ́wó	‘four hundred’

The data in (94) show that nasal harmony is strictly syllable-bound (and therefore strictly local) in Standard Yorùbá. While any nasal vowel is a potential trigger, only high vowels

[56] The phoneme /y/ (IPA glide /j/) has a palatal nasal allophone, [ɲ] when it precedes a nasal vowel in both Mọba and Standard Yorùbá.

are potential targets. Low and mid vowels are not targeted in nasal harmony, on the other hand. Another feature of Mọba nasal harmony is that obstruents are transparent. This is seen in the first two examples of (94) where nasal harmony occurs across a voiceless obstruent.

4.3.3 Nasal Harmony Beyond the Root

Concerning proclitics, we find again that Yorùbá does not provide us with the relevant context for checking the harmonic status of the proclitic position in nasal harmony. This problem is not surprising, however; we are limited to underlying high oral vowels preceding verbs with nasal vowels. This is a highly restricted environment and unfortunately, there are no examples of proclitics in Yorùbá that contain high oral vowels (see (67) and (68) above – the 2PL proclitic is high but underlyingly nasal: *in*). Since nasal harmony is strictly leftward (as can be seen in Mọba: *ɛ̀gũ̌sí*, **ɛ̀gũ̌sĩ́* 'melon / a food made from seeds of melon'), we would not expect nasal clitics to trigger rightward nasal harmony onto their verbal hosts anyway.

However, one potential test concerning clitics can be conducted. Given leftward nasal harmony onto high oral vowels, can high nasal vowels in an enclitic spread leftward onto a verbal host? If enclitics were to trigger harmony onto their verbal hosts, then this would be consistent with a common reference for nasal and RTR domains (whether it be the ClGp or the PrWd). This, of course, presupposes that the enclitics and proclitics are parsed in the same prosodic domain in Mọba.

(95) Enclitics and Nasal Harmony

MB	SY	Gloss	Meaning
é si mĩ́	ɔ́ sĩ mĩ́	3SG='bury'=1SG	's/he buried me'
é si ɔ́	ɔ́ sĩ ɛ́	3SG='bury'=2SG	's/he buried you'
é si ĩ́	ɔ́ sĩ ɲĩ́	3SG='bury'=2PL	's/he buried you all'
é si ã́	ɔ́ sĩ wɔ̃́	3SG='bury'=3PL	's/he buried them'

The data in (95) above illustrate that the nasal/oral quality of an enclitic does not spread leftward onto the host verb. The vowel in the verb, *si*, is invariably oral in Mọba and is invariably nasal in Standard Yorùbá (the 2SG oral enclitic was included to show that it is not the case that nasal harmony is applying in Standard Yorùbá – the verb is invariably nasal in this dialect). If root-faithfulness (or something else that protects the nasal/oral quality of the root-final vowel) protects the nasal/oral quality of the verbal base, then given the leftward direction of harmony, this is unsurprising. The nasal harmonic domain might still be any possible constituent, ClGp or PrWd included.

There are other morpheme boundaries where an oral high vowel-nasal vowel sequence might arise. This situation is found in WH-constructions.

(96) WH-words: Evidence of Nasal Harmony across Word Boundaries

MB:	ɔ̃̌	rí	ki	nĩ̀
SY:	o	rí	ki	nĩ̀
Gloss:	2SG	'see'	WH	FOC
Meaning:	'You saw what?'			

This piece of evidence implies that in Mọba, there is nasal harmony across a clitic-boundary. Déchaine (2002) has argued that the FOC particle is a phrasal enclitic. This then amounts to an enclitic triggering harmony onto a morpheme. Regardless of the status of the morpheme targeted, the very fact that a clitic is triggering nasal harmony implies that nasal harmony is attested in the clitic domain, whether this is the PrWd, the ClGp, or even some higher P-Cat.

A second context where nasal harmony is triggered by a clitic is found in the proclitic domain.

(97) 2PL Subject Proclitic Triggers Nasal Harmony

a.

MB:	baí	ni	ki	i	se	é
SY:	báji	ni	ki	ɛ	ʃe	é
Gloss:	'like this'	FOC	COMP	2PL=	'do'	=3SG
Meaning:	'Do it like this!'					

b.

MB:	ɛ	bɛ̀wɛ̀	wi	ki	a	nã	ǎ	sɛ nã
Gloss:	1SG=	'ask for'	say	COMP	1PL=	'beat X'	=1PL	'then' 'beat X'
Meaning:	'He asked his comrades to flog him and he was flogged'							

Example (97a) provides an example where the aforementioned 2PL enclitic actually triggers nasal harmony on a preceding complementizer. The complementizer appears with an oral vowel normally as is seen in (97b). Again, regardless of the prosodic status of the complementizer, this is an example of nasal harmony triggered in the clitic domain, whether this is the PrWd or the ClGp.

One final example illustrates that nasal harmony can actually occur in a rightward direction in the clitic domain in Mọba Yorùbá. This is seen in the progressive marker, ḭ́, which is normally analyzed as an auxiliary. When this progressive marker occurs following a nasal vowel in a subject proclitic, it is nasalized. This is in stark contrast to the pattern seen in the clitic domain in RTR harmony, where proclitics always agree with the tongue-root value of a following root vowel. The evidence for rightward nasal harmony is shown below in (98). The progressive marker surfaces as oral normally, as can be seen when in the 3SG form below in (98d). However, when it is preceded by a nasal vowel in a proclitic, as it is in (98a, b, and c) it surfaces with a nasal vowel.

(98) Rightward Nasal Harmony in the Clitic Domain

a. MB: mĩ̀ ĩ́ dé
SY: mo ń dé
Gloss: 1SG=PROG 'arrive'
Meaning: 'I am arriving'

b. MB: ĩ̀ ĩ́ dé
SY: ɛ ń dé
Gloss: 2PL=PROG 'arrive'
Meaning: 'You all are arriving'

c. MB: ã̀ ĩ́ dé
SY: w̃ɔ̃́ ń dé
Gloss: 3PL=PROG 'arrive'
Meaning: 'They are arriving'

d. MB: í í dé
SY: ó ń dé
Gloss: 3SG=PROG 'arrive'
Meaning: 'S/he is arriving'

It appears, then, that nasal harmony does apply in the clitic domain. Clitic-to-root nasal spreading is not allowed due to high-ranking constraints enforcing root-identity (or possibly PrHd identity) with respect to nasal/oral quality. This would imply that the difference between the WH-marker, *kĩ́* in (96) above (and also the complementizer in (97) above) and a CV verb is that the former is not a root, while the latter is. Root faithfulness prevents the verbal bases in (95) above from harmonizing with a nasal enclitic. However, if *kĩ́* is not analyzed as a root, then as long as it is within the nasal harmonic domain (which it apparently is), it will participate in harmony. These same arguments hold for the progressive marker, *ĩ́*, which is not also not a root.

4.3.4 Summary of Nasal Harmony – Implications for Domain-Size

Nasal harmony in Mọba differs from its syllable-bound Standard Yorùbá cousin in that it extends beyond morpheme-boundaries and it can be triggered in the clitic domain. This amounts to positive evidence that at least in Mọba, the nasal domain and the RTR domain both include clitics, while in Standard Yorùbá they do not. Unfortunately, Standard Yorùbá does not provide a test for the main hypotheses that were posited at the beginning of this chapter, since nasal harmony does not apply in the PrWd.

4.4 Clitics and Prefixes in Mọba: Implications of a Domain Mismatch

The 2SG proclitic form in Mọba is exceptional in that it provides a single exception to the rule that proclitics harmonize in this dialect. This is repeated below in (99).

(99) RTR Proclitics Surface Faithfully in Mọba Yorùbá

ọ̌ se	2SG='do'	'you(sg.) do/did'
ọ̌ jẹ	2SG='eat'	'you(sg.) eat/ate'

ATR Proclitics Harmonize in Mọba Yorùbá

é se	3SG='do'	's/he does/did'
ẹ́ jẹ	3SG='eat'	's/he eat/ate'

As was discussed previously, this can be analyzed by viewing the 2SG form as just another clitic that happens to be specified as RTR.

However, when considering the class of prefixes in Yorùbá, even though there is a relatively large variety available, not one of these demonstrates non-harmonic behaviour.

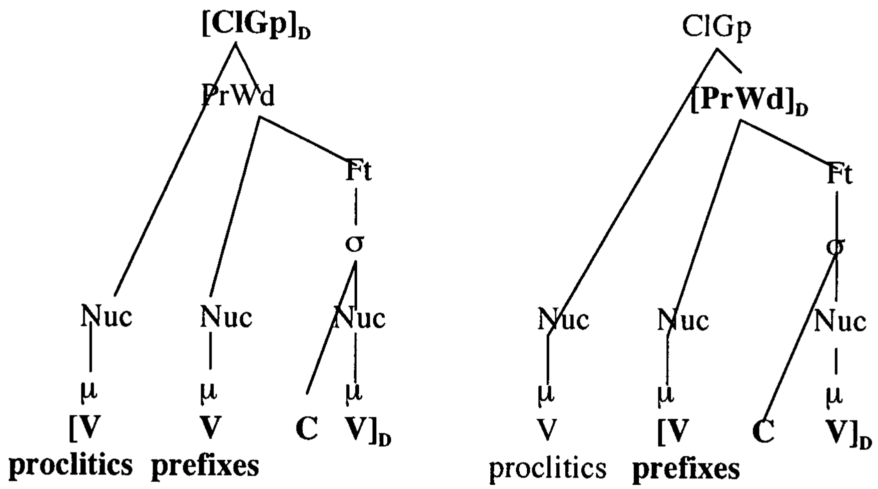
(100) RTR and ATR Prefixes Harmonize in Mọba Yorùbá

a.	dẹ	dẹ	'to hunt'
	ọdẹ	ọdẹ	'hunter'
	*odẹ	*odẹ	
b.	joú	jowú	'to be jealous'
	òjòú	òjòwú	'a jealous person'
	*ọ̀jòú	*ọ̀jòwú	

Assuming the Richness of the Base hypothesis, this implies that prefixes, no matter what underlying tongue-root value they may have, are always targeted in RTR harmony. This same statement cannot be applied to the proclitics however. The fact that the 2SG form surfaces with RTR, while the other mid-vowel clitics behave harmonically (presumably because they are underlyingly ATR) implies that the clitics cannot be in the same domain as the prefixes. These prefixes must be parsed into the PrWd rather than the foot since there are numerous cases where they are attached to disyllabic roots. Feet are maximally binary in Yorùbá and therefore, this prefix must be parsed directly to the PrWd. This implies that the proclitics are not included in the PrWd in Mọba. Hypothesis 1 is thus disproved in favour of hypothesis two by this argument and the ClGp is therefore the domain for RTR harmony. This is consistent with what was found in the case of nasal harmony in Mọba, coincidentally, that the ClGp is the domain for nasal harmony as well.

(101) RTR Harmonic Domain Mapped onto Prosodic Structure in Mọba and Standard Yorùbá

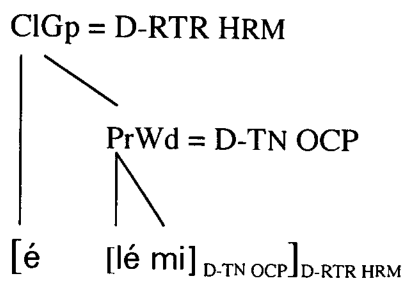
Mọba Yorùbá **Standard Yorùbá**



Regarding the prosodic status of enclitics, it is not entirely clear where they are parsed in the structure in (101) above. Since harmony is strictly leftward and root-final values of RTR and ATR are protected, there is no evidence of their RTR harmonic status. However, recall from section 3.5.2 that the tonal OCP effect was observed to apply in some domain that includes verbs and enclitics, to the exclusion of proclitics. This amounts to evidence that whatever type of constituency is referred to by the domain for the tonal OCP, it is one where the verb-enclitic pair forms a constituent to the exclusion of the proclitic-verb pair. The only way that the tonal OCP could refer to a prosodic domain would be if the enclitics were included in the PrWd. This corresponds to the structure in (75) above, repeated in (102) below with prosodic categories filled in this time (X in (75) is the ClGp, Y is the PrWd).

(102) Interaction of RTR-Harmonic Domain with Tonal-OCP Domain Assuming Domains Refer to Same Type of Constituency

a. Enclitics Included in D-RTR HRM (Unlikely)



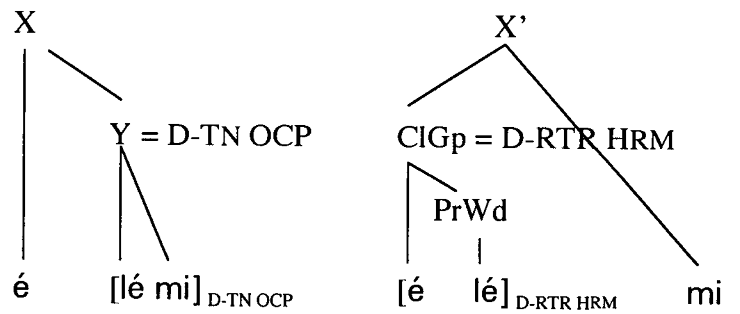
On the other hand, if the enclitic was parsed in the ClGp and not the PrWd, no prosodic category could refer solely to the verb-enclitic pair, so that the proclitic is excluded from that constituent. The tonal OCP must in this case refer to a non-prosodic domain. However, this directly contradicts the prosodic analysis in section 4.2.2, where it was stated that the prosodic head is right-aligned with the edge of the PrWd. In this case, the enclitic would constitute the prosodic head, and therefore, we would expect it to trigger harmony leftward onto the verbal base. If we accept the arguments in section 4.2.2 pertaining to right-alignment of the prosodic head with the PrWd, and we accept that the PrWd is right-aligned with the morphological root, then we must exclude the enclitics from the PrWd domain. Instead, they should be parsed in the ClGp, implying a distinct type of domain for the tonal OCP.

Given that the tonal OCP must refer to a non-prosodic domain, then, of the two possibilities afforded it in (76) (from section 3.5.3 above), possibility two (76b) is very unlikely because it states that the enclitics are not included in the RTR-harmonic domain. This would imply an extra level of prosodic structure above the ClGp with no added gain – this is not a likely scenario. There is no reason to add a level of prosodic structure without any evidence of empirical gains. This is illustrated in (103a) below. Possibility one ((76a) from section 3.5.3 above repeated as (103b) below) is a more likely scenario – one where it is assumed that the enclitics are contained in the RTR harmonic domain.[57] Without any evidence to the contrary, we must assume that (103b) is the correct representation for these domains in Mọba.

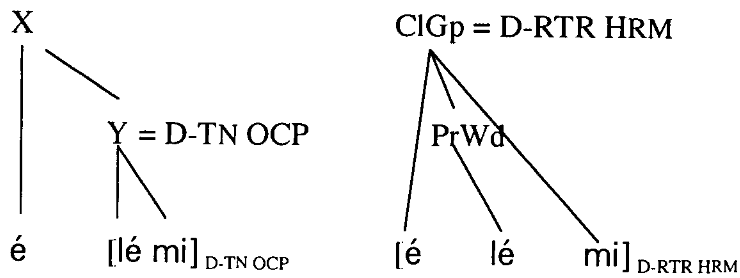
[57] Note that the alternative structure for the RTR Harmonic Domain in (76a) (where the PrWd contains the verb and enclitic and not the proclitic) is not appropriate. This is because we have already established that the prosodic structure of Yorùbá designates the vowel in the verb as the prosodic head of a right-headed PrWd by right-aligning the PrWd with the root and then by right-aligning the PrHd with the PrWd.

(103) Interaction of RTR-Harmonic Domain with Tonal-OCP Domain
Assuming Domains Refer to Different Type of Constituency

a. Assuming Enclitics Not Included in D-RTR HRM (Unlikely)



b. Assuming Enclitics Included in D-RTR HRM (Likely)



One possibility afforded the tonal OCP domain that is consistent with the structure illustrated in (103b) above, is a direct reference to syntax. This would allow the enclitic to be parsed in any given prosodic domain. Tonal processes are often grammatically conditioned in any case. Therefore, a direct reference to a syntactic domain might be appropriate here anyway.

4.5 Summary

In order to account for the fact that proclitics were included in the RTR harmonic domain in Mọba, but not in Standard Yorùbá, there were two hypotheses put forward. In the first, a common prosodic domain was referred to, but this domain in turn referred to different syntactic constituents. In the second hypothesis, this difference was attributed to the fact that the dialects refer to different prosodic constituents that were mapped to a common syntactic constituent. An outline of the prosodic structure of Standard Yorùbá was presented based on Ọla (1995). The ClGp was posited as the prosodic category dominating the PrWd in Standard Yorùbá, and therefore the clitics were necessarily parsed in the ClGp. Assuming that the harmonic domain is the PrWd in Standard Yorùbá, this explained why prefixes were included in the domain and clitics were not.

In order to test the hypotheses concerning domain references, nasal harmony was considered. The pattern seen in Standard Yorùbá is syllable-bound, however, and therefore it was not possible to discern between the two hypotheses. It was possible to demonstrate that the ClGp operates as the active harmonic domain in Mọba, however.

Finally, based on evidence internal to Mọba, it was possible to rule out hypothesis one. The fact that clitics can occur invariably as RTR on the surface, but that prefixes cannot implied that only an analysis where proclitics in Mọba are not in the same domain as the prefixes is possible. Since the first hypothesis posited the PrWd as the common domain in each dialect (by virtue of the clitics being parsed in the PrWd in Mọba but not in Standard Yorùbá), this could no longer be the case. Otherwise, we would have expected symmetric behaviour between clitics and prefixes in Mọba. The harmonic domain is thus the ClGp in both RTR harmony and nasal harmony in Mọba.

This had implications for the tonal OCP domain, since it interacts with the domain for RTR harmony. It was not possible for the tonal OCP domain to be prosodically defined, since this would have implied that the enclitics should be included in the PrWd domain. This was not compatible with the view that the PrWd is right aligned with the right-edge of the root. Further, it was more likely that the enclitic is parsed in the ClGp, and is thus contained in the RTR-harmonic domain. This was true since there is no evidence that the enclitics are excluded from the harmonic domain; and this does not constitute any motivation for a prosodic category dominating the ClGp that is otherwise unmotivated.

Chapter 5 – An OT Account for RTR Harmony in Mọba Yorùbá

This chapter posits an OT analysis that accounts for the pattern seen in RTR harmony in Mọba Yorùbá. It utilizes the basic idea of the harmony-via-prohibition account in that constraints militating against certain feature sequences are utilized to drive harmony. It capitalizes on prosodic constituency as defined in chapter four in order to enforce constraints more rigorously in certain prosodic domains. This account is extended to account for Ifẹ, Ekiti, and Standard Yorùbá in section 5.2. These accounts given for Ifẹ and Ekiti were actually proposed in section 2.4. The only missing piece to the puzzle was the formalization of the root-final position as the prosodic head.

5.1 An OT Account for RTR Harmony in Mọba Yorùbá

In order to capture the pattern of Mọba RTR harmony, faithfulness and harmony-driving constraints are split into constraints holding in separate domains. Among these are the PrWd domain, the ClGp domain and the prosodic head (denoted the PrHd from this point on). This account adapts the constraint set used in the harmony via prohibition account in Pulleyblank (2002). This is done in the same way as the analyses of Ekiti and Ifẹ Yorùbá in section 2.4. These accounts utilized constraints that referred to the root-final vowel, $[\text{MAX-RTR}]_{\text{RtFinal}}$ and $[\text{HI/ATR}]_{\text{RtFinal}}$. These constraints can now be formally defined since the PrHd has been defined as the right-aligned head syllable of the PrWd, which is in turn right aligned with the morphological root. The domains of the constraints, MAX-RTR and HI/ATR can be set to apply only in the PrHd position. $[\text{MAX-RTR}]_{\text{PrHd}}$ and $[\text{HI/ATR}]_{\text{PrHd}}$ are restricted to the PrHd domain. By ranking these domain-restricted constraints above the general constraints, HI/ATR and MAX-RTR, we can capture positional effects and domain-specific effects that were seen in Ifẹ and Ekiti Yorùbá.

In the present account for Mọba Yorùbá, the faithfulness constraints, MAXLINK-ATR and MAXLINK-RTR are used instead of MAX-F (see section 2.4.2 for an explanation). While MAX-F does not incur any violation for the re-association of an underlying feature, F, MAXLINK-F does. There will be one crucial case where it is necessary to allow re-association between underlying RTR values that occur in the PrHd. In this case, $[\text{MAX-RTR}]_{\text{PrHd}}$ is used in addition to the MAXLINK constraints. The basic faithfulness constraints that will be used in this account are $[\text{MAXLINK-ATR}]_{\text{ClGp}}$ and $[\text{MAXLINK-RTR}]_{\text{ClGp}}$. Since they apply over the largest prosodic domain, the ClGp, these constraints necessarily also enforce faithfulness over tighter prosodic domains such as the PrWd and the PrHd since these are both contained in the ClGp. Therefore, constraints will only be split into domain-specific pairs when it is necessary to enforce a constraint in a tighter domain. Otherwise, the constraint will simply apply over the ClGp.

Low vowels are obligatorily RTR. This is captured by ranking LO/RTR and MAX-LO above $[\text{MAXLINK-ATR}]_{\text{ClGp}}$. This is illustrated below in tableau (104). A form with an underlying ATR low vowel (ə) is given to show that such a form could never surface. Candidate (104a) is ruled out since the ATR low vowel surfaces faithfully. This incurs a fatal violation of LO/RTR. Candidate (104c) is ruled out since the underlying +low value of the initial vowel is deleted. This incurs a fatal violation of MAX-LO.

(104) Low Vowels are RTR

/ədé/	LO/RTR	MAX-LO	$[\text{MAXLINK-ATR}]_{\text{ClGp}}$
a. ədé	*!		
☞ b. adé			*
c. edé		*!	

Similarly, high vowels are obligatorily ATR. This is captured by ranking HI/ATR and MAX-HI above $[\text{MAXLINK-RTR}]_{\text{ClGp}}$. This is illustrated in tableau (105) below. A form with an underlying RTR high vowel (ɪ) is given to show that such a form could never surface. Candidate (105a) is ruled out since the RTR high vowel surfaces faithfully. This incurs a fatal violation of HI/ATR. Candidate (105c) is ruled out since the underlying +high feature of the initial vowel is deleted. This incurs a fatal violation of MAX-HI.

(105) High Vowels are ATR

/àtɪ/	HI/ATR	MAX-HI	$[\text{MAXLINK-RTR}]_{\text{ClGp}}$
a. àtɪ	*!		
☞ b. àti			*
c. àtẹ		*!	

The pattern of leftward RTR harmony can be accounted for by ranking the sequence prohibition constraint, *<u>ATR</u>-C_0-RTR above the faithfulness constraint, MAXLINK-ATR but below MAXLINK-RTR. Since leftward RTR harmony applies across proclitics as well as within the root, the domain for these constraints is the ClGp. Therefore, the ranking in (106) below will enforce leftward RTR harmony within the entire ClGp domain. This is demonstrated below in tableau (106) with a hypothetical underlying ATR proclitic (Proclitics are marked as such in tableaux as PCl). The faithful candidate (106a) is ruled out because it incurs a fatal violation of $[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$. Since $[\text{MAXLINK-RTR}]_{\text{ClGp}}$ outranks $[\text{MAXLINK-ATR}]_{\text{ClGp}}$, it is optimal to delete the ATR feature on the clitic rather than the RTR feature on the root-vowel. Candidate (106c) exhibits rightward ATR harmony and is therefore ruled out because of a fatal violation of $[\text{MAXLINK-RTR}]_{\text{ClGp}}$. This allows the RTR harmonic candidate (106b) to surface optimally.

(106) Leftward RTR Harmony in the ClGp Domain:

$[\text{MAXLINK-RTR}]_{\text{ClGp}}$, $[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$ >> $[\text{MAXLINK-ATR}]_{\text{ClGp}}$

/é (PCl) jẹ/	$[\text{MAXLINK-RTR}]_{\text{ClGp}}$	$[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$	$[\text{MAXLINK-ATR}]_{\text{ClGp}}$
a. é jẹ		*!	
☞ b. ẹ́ jẹ			*
c. é je	*!		

There is a potential problem with the above ranking concerning the pattern seen with RTR enclitics. Recall that RTR enclitics surface faithfully and that they do not trigger harmony onto root ATR vowels (i.e. *adé lé ọ* 'Ade pursued you (sg.)'). However, given the ranking in (106) above, we might expect leftward ATR harmony triggered by the enclitic onto the ATR root vowel. This can be ruled out by ranking the domain-specific faithfulness constraint, $[\text{MAXLINK-ATR}]_{\text{PrWd}}$ above the harmony driving constraint, $[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$. This would allow leftward RTR harmony onto ATR proclitics as in (106), but it would not allow leftward RTR harmony onto root ATR vowels. This is illustrated in (107) below. Candidate (107b) fatally violates $[\text{MAXLINK-ATR}]_{\text{PrWd}}$. Candidate (107c) fatally violates $[\text{MAXLINK-RTR}]_{\text{ClGp}}$. The optimal candidate is the faithful candidate (107a). The violation of $[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$ is tolerated since faithfulness constraints outrank the harmony-driver.

(107) Disharmony Tolerated with RTR Enclitics Following ATR Root Vowels: ($[\text{MAXLINK-ATR}]_{\text{PrWd}}$ Needed)

$[\text{MAXLINK-ATR}]_{\text{PrWd}}$, $[\text{MAXLINK-RTR}]_{\text{ClGp}}$ >> $[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$

/lé ọ (EnCl)/	$[\text{MAXLINK-ATR}]_{\text{PrWd}}$	$[\text{MAXLINK-RTR}]_{\text{ClGp}}$	$[*\underline{\text{ATR}}\text{-}C_0\text{-RTR}]_{\text{ClGp}}$
☞ a. lé ọ			*
b. lẹ́ ọ	*!		
c. lé o		*!	

However, this is not the complete story. By protecting ATR vowels in the PrWd to such an extent, leftward RTR harmony within the PrWd domain is blocked. Tableau (108) below illustrates this. The harmonic candidates (108b) and (108c) fatally violate the faithfulness constraints, [MAXLINK-ATR]$_{PrWd}$ and [MAXLINK-RTR]$_{ClGp}$ respectively. This predicts that sequences of ATR mid vowels followed by RTR mid vowels should be attested since candidate (108a) is optimally selected under the ranking offered thus far.

(108) Leftward RTR Harmony Blocked in PrWd

/ebọ/	[MAXLINK-ATR]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$	[*ATR-C$_0$-RTR]$_{ClGp}$
💣 a. ebọ			*
b. ẹbọ	*!		
c. ebo		*!	

This effect can be undone though by ranking the domain-specific constraint, [*ATR-C$_0$-RTR]$_{PrWd}$ above [MAXLINK-ATR]$_{PrWd}$. This would essentially enforce rightward ATR harmony in the PrWd. Again, this is potentially problematic since high vowels do not trigger rightward harmony. This problem is repaired by introducing a non-high condition on the constraint, [*ATR, NONHI-C$_0$-RTR, NONHI], so that sequences of high vowels followed by RTR vowels do not incur violations of this constraint. This is exactly analogous to the proposition in Pulleyblank (2002) where the non-low condition was introduced into the *RTR-C$_0$-ATR constraint in order to allow sequences of low vowels followed by mid ATR vowels.

By introducing the non-high condition, rightward ATR harmony is only exhibited in sequences of mid vowels and not high-mid vowel sequences. The non-high condition on the harmony driving constraint, [*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$ allows sequences of high vowels followed by RTR vowels to surface faithfully. This is illustrated in (109) below. Candidate (109a) is disharmonic and would fatally violate the [*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$ constraint if it weren't for the non-high condition. Instead, this faithful candidate surfaces as is and the harmonic candidates (109b) and (109c) incur fatal violations of [MAXLINK-ATR]$_{PrWd}$ and [MAXLINK-RTR]$_{ClGp}$.

(109) High Vowels do not Trigger Rightward ATR Harmony: (Non-high condition Needed in *ATR-C$_0$-RTR)

/ilẹ̀/	[*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$	[MAXLINK-ATR]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$
☞ a. ilẹ̀			
b. ilè			*!
c. ɪlẹ̀		*!	

The ranking established thus far actually enforces leftward RTR harmony triggered by low vowels. An underlying form with a sequence of a high vowel, mid ATR vowel and low vowel (i.e. i-e-a) would be problematic without the non-high condition.

This is illustrated in (110) below. Recall that in (104) above, it was demonstrated that LO/RTR and MAX-LO dominated [MAXLINK -ATR]$_{ClGp}$. Since the ClGp is a domain that spans the entire PrWd, this implies that LO/RTR and MAX-LO also dominate the constraint, [MAXLINK -ATR]$_{PrWd}$. This rules out the harmonic candidates (110c) and (110d) below, which satisfy [*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$, but fatally violate LO/RTR and MAX-LO respectively. Candidate (110a) is ruled out due to a fatal violation of [*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$ due to the sequence of the mid ATR vowel and low vowel. Note that if the non-high condition were not introduced, the optimal candidate (110b) would also have violated this sequence prohibition constraint. The non-high condition allows leftward harmony triggered by low vowels then since candidate (110a) would have been selected optimally since it incurs one fewer violation of [MAXLINK-ATR]$_{PrWd}$.

(110) Leftward RTR Harmony Triggered by Low Vowels

/i-e-a/	[*ATR, NONHI-C$_0$-RTR, NONHI]$_{PrWd}$	LO/RTR	MAX-LO	[MAXLINK - ATR]$_{PrWd}$
a. i-e-a	*!			
☞ b. i-ẹ-a				*
c. i-e-ə		*!		
d. i-e-e			*!	

Returning to the clitics now, recall that RTR mid vowel proclitics can surface preceding an ATR mid vowel in the root. This disharmony is tolerated presumably because leftward ATR harmony only applies in the PrWd and not in the ClGp. Within the PrWd (in prefixes and root-internally), however, this disharmony is not tolerated. The constraint, *RTR-C$_0$-ATR militates against such mid vowel sequences.[58] Leftward ATR harmony must be blocked in the ClGp but must be allowed in the PrWd. This is enforced by splitting *RTR-C$_0$-ATR into two constraints, one applying over the PrWd and the other applying over the ClGp. By ranking [*RTR-C$_0$-ATR]$_{PrWd}$ above [MAXLINK-RTR]$_{ClGp}$, we can allow leftward ATR harmony in the PrWd domain. By ranking [*RTR-C$_0$-ATR]$_{ClGp}$ below [MAXLINK-RTR]$_{ClGp}$, leftward ATR harmony is blocked in the proclitic domain, allowing RTR proclitics to surface faithfully. Additionally, note that [MAXLINK-ATR]$_{PrWd}$ must also dominate [*RTR-C$_0$-ATR]$_{ClGp}$ in order to rule out rightward RTR harmony from the proclitic onto the root vowel. In fact,

[58] Recall from section 2.4 that this constraint was formulated with a non-low condition in Pulleyblank (2002) so that sequences of low vowels followed by mid ATR vowels were allowed, but not sequences of mid RTR vowels followed by mid ATR vowels (*[RTR, NONLO]-C$_0$-[ATR, NONLO]). This condition is not needed in this account. In fact, this non-low condition would actually make incorrect predictions concerning certain trisyllabic sequences. Therefore, while a non-high condition is necessary in this account, a non-low condition is not used.

by ranking [MAXLINK-ATR]$_{PrWd}$ above [*RTR-C_0-ATR]$_{PrWd}$, this ranking will prevent low vowels from triggering rightward RTR harmony generally.

This ranking is illustrated in (111) below. Candidate (111b) incurs a fatal violation of [MAXLINK-ATR]$_{PrWd}$. The candidate with leftward ATR harmony (111c) is ruled out because of a fatal violation of [MAXLINK-RTR]$_{ClGp}$. This allows the faithful disharmonic candidate (111a) to be optimally selected. Note that this optimal candidate escapes a potentially fatal violation of [*RTR-C_0-ATR]$_{PrWd}$ since the RTR-ATR sequence is external to the PrWd domain.[59]

(111) Leftward ATR Harmony Blocked in the ClGp

/ọ̌ (PCl) de/	[MAXLINK-ATR]$_{PrWd}$	[*RTR-C_0-ATR]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$	[*RTR-C_0-ATR]$_{ClGp}$
☞ a. ọ̌ de				*
b. ọ̌ dẹ	*!			
c. ǒ de			*!	

Within the PrWd, this ranking enforces leftward ATR harmony so that RTR mid vowel – ATR mid vowel sequences are disallowed. This is illustrated in (112) below. The harmonic candidate that exhibits rightward RTR harmony (112b) fatally violates [MAXLINK-ATR]$_{PrWd}$. The faithful candidate (112a) fatally violates [*RTR-C_0-ATR]$_{PrWd}$. The ranking of [*RTR-C_0-ATR]$_{PrWd}$ above [MAXLINK-RTR]$_{ClGp}$ allows candidate (112c) to optimally surface.

(112) Leftward ATR Harmony Enforced in the PrWd

/ẹ̀je/	[MAXLINK-ATR]$_{PrWd}$	[*RTR-C_0-ATR]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$	[*RTR-C_0-ATR]$_{ClGp}$
a. ẹ̀je		*!		*
b. ẹ̀jẹ	*!			
☞ c. èje			*	

Low vowels are prevented from triggering rightward RTR harmony via the ranking already established. This is illustrated in (113) below. Candidates (113b) and (113c) are ruled out due to fatal violations of LO/RTR and MAX-LO. The RTR-

[59] However, note that this crucially relies on the root vowel being specified as ATR. If the root were unspecified, it would actually satisfy [MAXLINK-ATR]$_{PrWd}$ and would be targeted in rightward RTR harmony that is triggered by the proclitic. Therefore, this account relies on the assumption that all root vowels are underlyingly specified either ATR or RTR.

harmonic candidate (113d) is ruled out due to a fatal violation of $[\text{MAXLINK-ATR}]_{PrWd}$. This allows candidate (113a) to be selected optimally, despite the disharmony. This illustrates that there is no need for a non-low condition on the constraint, $[\text{*RTR-C}_0\text{-ATR}]_{PrWd}$.

(113) Low Vowel-Mid ATR Sequences are Allowed

/ate/	LO/RTR	MAX-LO	$[\text{MAXLINK-ATR}]_{PrWd}$	$[\text{*RTR-C}_0\text{-ATR}]_{PrWd}$
☞ a. ate				*
b. əte	*!			
c. ete		*!		
d. atẹ			*!	

One major problem concerns the pattern of relative alignment seen in both Mọba and Standard Yorùbá. Recall from section 3.2.1 that an ATR/RTR contrast can exist either following or preceding a high vowel. While there is a pressure for a 'root RTR feature' to be 'right-aligned', this requirement is not absolute. When a rightmost high vowel prevents an underlying RTR feature from being perfectly right aligned with the root, it can still surface, as long as it is as right aligned as possible. This pattern of relative alignment is in jeopardy given the ranking in (112) above, where any ATR vowel will trigger leftward ATR spreading in the PrWd. How could an ATR/RTR contrast ever exist preceding a high vowel (which is necessarily ATR) within the PrWd?

A solution is proposed that utilizes the constraint $[\text{MAX-RTR}]_{PrHd}$. By protecting an RTR feature that occurs underlyingly on the rightmost vowel (the PrHd vowel), and allowing this RTR feature to re-associate freely on the next available anchor, relative alignment, and not absolute alignment, is enforced. $[\text{MAX-RTR}]_{PrHd}$ must be ranked above $[\text{*RTR-C}_0\text{-ATR}]_{PrWd}$ in order to enforce re-association in cases where a final high vowel is underlyingly RTR. This would still enforce neutralization of an ATR/RTR contrast preceding a high vowel – the contrast will only exist in the PrHd. Disyllabic sequences where an RTR mid vowel precedes a high vowel then, are essentially cases where the high vowel, and not the mid vowel, was actually underlyingly RTR[60] and this RTR feature is preserved to avoid a fatal violation of $[\text{MAX-RTR}]_{PrHd}$. Since high RTR

[60] Note that the stem-control account also assumes that the high vowel is underlyingly RTR in these cases. While it relies on positing an opaque level of representation to enforce this, the present account simply utilizes the flexibility of the MAX-F type constraint in allowing re-association of an underlying RTR feature. No opaque level of representation is needed in the present account. This comes at the cost of relying on autosegmental representations though, something the stem-control account did not need to do.

vowels are not allowed in any position, including the PrHd, HI/ATR, and MAX-HI must dominate [MAX-RTR]$_{PrHd}$. Given this, the only way to avoid such a violation is to re-associate the RTR feature onto the preceding vowel. By ranking [MAX-RTR]$_{PrHd}$ above [*RTR-C_0-<u>ATR</u>]$_{PrWd}$, the disharmonic sequence of a mid-RTR vowel followed by a high vowel must be tolerated in order to avoid a fatal violation of [MAX-RTR]$_{PrHd}$.

This is illustrated below in (114) (subscripts are used to show correspondences between linking sites for underlying RTR segments and their surface correspondents). The faithful candidate (114a) incurs a fatal violation of HI/ATR. Candidate (114d) likewise incurs a fatal violation of MAX-HI. The ATR-harmonic candidate (114c) satisfies these constraints but deletes the underlying RTR value in the prosodic head. This incurs a fatal violation of [MAX-RTR]$_{PrHd}$. Candidate (114b) re-associates the underlying RTR feature of the PrHd so that it avoids a violation of [MAX-RTR]$_{PrHd}$ and is thus selected optimally.

(114) RTR Mid Vowels Preceding High Vowels

/ẹ̀$_i$bɪ$_j$/	HI/ATR	MAX-HI	[MAX-RTR]$_{PrHd}$	[*RTR-C_0-<u>ATR</u>]$_{PrWd}$
a. ẹ̀$_i$bɪ$_j$	*!			
☞ b. ẹ̀$_j$bi				*
c. èbi			*!	
d. ẹ̀$_{ij}$be		*!		*

It should be noted that this account relies on an underlying form where both vowels are RTR. An underlying form with a single RTR vowel followed by a high vowel would actually surface with two ATR vowels in violation of [MAX-RTR]$_{PrHd}$. Tableau (115) below demonstrates this.

(115) A Single Underlying RTR Feature is Deleted in a Mid-High Sequence

/ẹ̀$_i$bi/	HI/ATR	MAX-HI	[MAX-RTR]$_{PrHd}$	[MAXLINK-ATR]$_{PrWd}$	[*RTR-C_0 -<u>ATR</u>]$_{PrWd}$
a. ẹ̀$_i$bɪ	*!			*	
b. ẹ̀$_i$bi					*!
☞ c. èbi					
d. ẹ̀$_i$be		*!			*

An underlying form with a sequence of a mid ATR (or unspecified) prefix followed by a high RTR vowel provides crucial evidence in the relative ranking of [MAX-RTR]$_{PrHd}$ and [MAXLINK-ATR]$_{PrWd}$. In this case, an RTR feature in the prosodic head is either re-associated or deleted, depending on the mutual ranking of [MAX-RTR]$_{PrHd}$ and [MAXLINK-ATR]$_{PrWd}$. However, recall in section 2.3.3 that it was shown that prefixal vowels preceding high root vowels can contrast for ATR/RTR. This was argued to be a result of a re-association of an underlying RTR value that was present in the high root vowel. This situation can only exist if [MAX-RTR]$_{PrHd}$ dominates [MAXLINK-ATR]$_{PrWd}$. Tableau (116) below illustrates this. Candidates (116a) and (116d) are ruled out due to fatal violations of HI/ATR and MAX-HI respectively. Candidate (116c) is ruled out due to a fatal violation of [MAX-RTR]$_{PrHd}$. Therefore, the disharmonic candidate, (116b) is selected optimally even though it violates [MAXLINK-ATR]$_{PrWd}$.

(116) Re-Association of RTR onto a Mid-Vowel Prefix:

[MAX-RTR]$_{PrHd}$ >> [MAXLINK-ATR]$_{PrWd}$

/ò (Pfx) mʊ$_i$/	HI/ATR	MAX-HI	[MAX-RTR]$_{PrHd}$	[MAXLINK-ATR]$_{PrWd}$	[*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$
a. ò̩bʊ$_i$	*!			*	
☞ b. ò̩$_i$mu				*	*
c. òmu			*!		
d. ò̩$_i$mo		*!		*	*

Recall that the constraint, [*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$ was originally posited with a non-low condition. The present account does not need to posit this non-low condition, however. In fact, this condition *must* be left off this constraint. If it were included, it would not allow an ATR/RTR contrast to exist on a medial mid vowel that is flanked by a low vowel on the left and a high vowel on the right. While [MAX-RTR]$_{PrHd}$ allows re-association of an underlying RTR feature, it does not specify which vowel it should dock onto. When an underlying RTR feature from a final high vowel is given a choice between docking onto an initial low vowel or a medial high vowel, other constraints will decide which of these vowels is a better potential linking site. In the constraint ranking that has been built so far in this analysis, a trisyllabic form with a low-mid-high sequence of three underlying RTR vowels would surface with an RTR mid vowel. This is the only case where an actual underlying RTR feature is preserved non-finally.

This is illustrated in (117) below. Both candidates in (117) preserve the underlying RTR from the PrHd by re-associating it onto the initial low vowel rather than the medial mid vowel. However, since both candidates necessarily incur a single violation of [*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$, the lower ranked faithfulness constraint, [MAXLINK-RTR]$_{ClGp}$ plays an active role. The optimal candidate (117a) incurs one less violation of [MAXLINK-RTR]$_{ClGp}$ and is thus selected optimally.

(117) RTR Contrast Preserved Medially in Low-Mid-High Sequences

/a$_i$-e̞$_j$-ɪ$_k$/	[MAX-RTR]$_{PrHd}$	[MAXLINK-ATR]$_{PrWd}$	[*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$
☞ a. a$_k$-e̞$_j$-i			*	*
b. a$_k$-e-i			*	**!

However, if the constraint, [*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$ were to include the non-low condition, it would actually select candidate (117b) instead. This is illustrated in (118) below. While candidate (118a) still incurs a violation of the sequence prohibition constraint due to an e̞-i sequence (both non-low), candidate (118b) does not since an a-e sequence is allowed. The initial vowel is low thus allowing candidate (118b) to surface. Since all three vowels are underlyingly RTR, there is no way to force the medial vowel to ever surface with an RTR feature (without raising [MAXLINK-RTR]$_{ClGp}$, that is). This situation is essentially neutralization of an ATR/RTR contrast in a position where in fact, one should exist. Therefore, the non-low condition cannot be included on the constraint, [*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$ if we are enforcing relative alignment. However, note that in languages where absolute alignment is enforced, this non-low condition is essential in enforcing non-final neutralization of an ATR/RTR contrast.

(118) Non-Low Condition Predicts Neutralization of ATR/RTR Contrast Medially in Low-Mid-High Sequences

/a$_i$-e̞$_j$-ɪ$_k$/	[MAX-RTR]$_{PrHd}$	[MAXLINK-ATR]$_{PrWd}$	[*RTR, NONLO-C$_0$-<u>ATR, NONLO</u>]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$
a. a$_k$-e̞$_j$-i			*!	*
☞ b. a$_k$-e-i				**

Finally, the account must be able to account for opacity of high vowels that are flanked by two mid vowels. This effect falls out of the ranking offered thus far, as is shown in (119) below. The RTR-harmonic candidate (119a) fatally violates HI/ATR. Candidate (119d) fatally violates [MAX-RTR]$_{PrHd}$. The other candidates all retain at least one RTR feature, and it is assumed that the PrHd value is one of these (it doesn't matter which). Candidate (119b) attempts to preserve the RTR feature of the initial vowel. This candidate is ruled out though by [*RTR-C$_0$-<u>ATR</u>]$_{PrWd}$. The opaque candidate (119c) is correctly selected.

(119) Opacity of High Vowels

/ẹwúrẹ́/	HI/ATR	[MAX-RTR]$_{PrHd}$	[*RTR-C_0-$\underline{ATR}$]$_{PrWd}$	[MAXLINK-RTR]$_{ClGp}$
a. ẹwúrẹ́	*!			
b. ẹwúrẹ́			*!	*
☞ c. ewúrẹ́				**
d. ewúré		*!		***

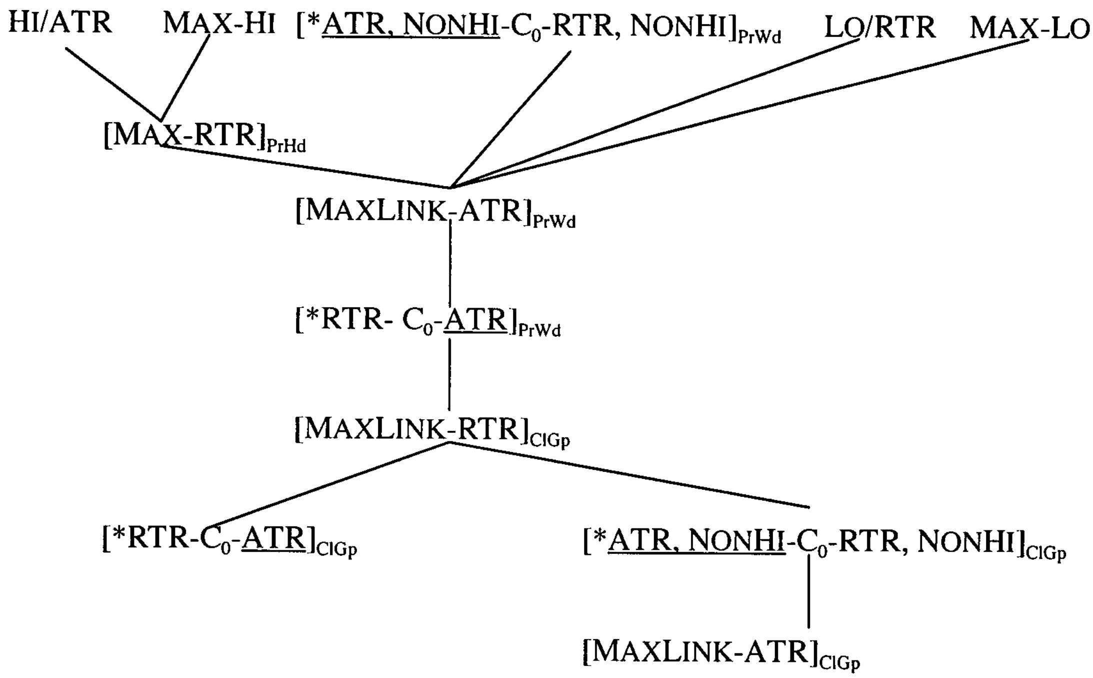
An interesting question concerns the implications of the above analysis regarding a hypothetical enclitic with a mid ATR vowel. Recall from section 3.5 that there are no examples of ATR enclitics in either dialect, and so it was not possible to test whether or not rightward RTR harmony would spread onto ATR enclitics. In the account above, we find a case of indeterminacy. The constraints, [*RTR-C_0-$\underline{ATR}$]$_{ClGp}$ and [MAXLINK-ATR]$_{ClGp}$ could not be ranked based on the language data evidence. However, their mutual ranking would decide whether rightward RTR harmony should proceed in the clitic domain. The constraint, [*RTR-C_0-$\underline{ATR}$]$_{ClGp}$, could actually be satisfied via leftward ATR harmony, but recall that since RTR proclitics resist ATR harmony, it was necessary to rank [MAXLINK-RTR]$_{ClGp}$ above [*RTR-C_0-$\underline{ATR}$]$_{ClGp}$ and leftward ATR harmony is thus blocked in the clitic domain. Rightward harmony could only occur from root to enclitic then if [*RTR- C_0-$\underline{ATR}$]$_{ClGp}$ were to dominate [MAXLINK-ATR]$_{ClGp}$. This is illustrated in (120) below.

(120) Indeterminacy of Participation of ATR Enclitics

/jẹ e (EnCl)/	[MAXLINK-RTR]$_{ClGp}$	[*RTR-C_0-$\underline{ATR}$]$_{ClGp}$	[MAXLINK-ATR]$_{ClGp}$
?☞ a. jẹ e		*	
b. je e	*!		
?☞ c. jẹ ẹ			*

The final ranking for Mọba Yorùbá is illustrated schematically below in (121).

(121) Final Constraint Ranking for Mọba Yorùbá RTR Harmony



5.2 Dialectal Variation: Ifẹ, Ekiti, and Standard Yorùbá

In the previous section, an OT analysis was presented for Mọba Yorùbá that accounted for the pattern of harmony seen in that dialect. This analysis is extendable to three other dialects.

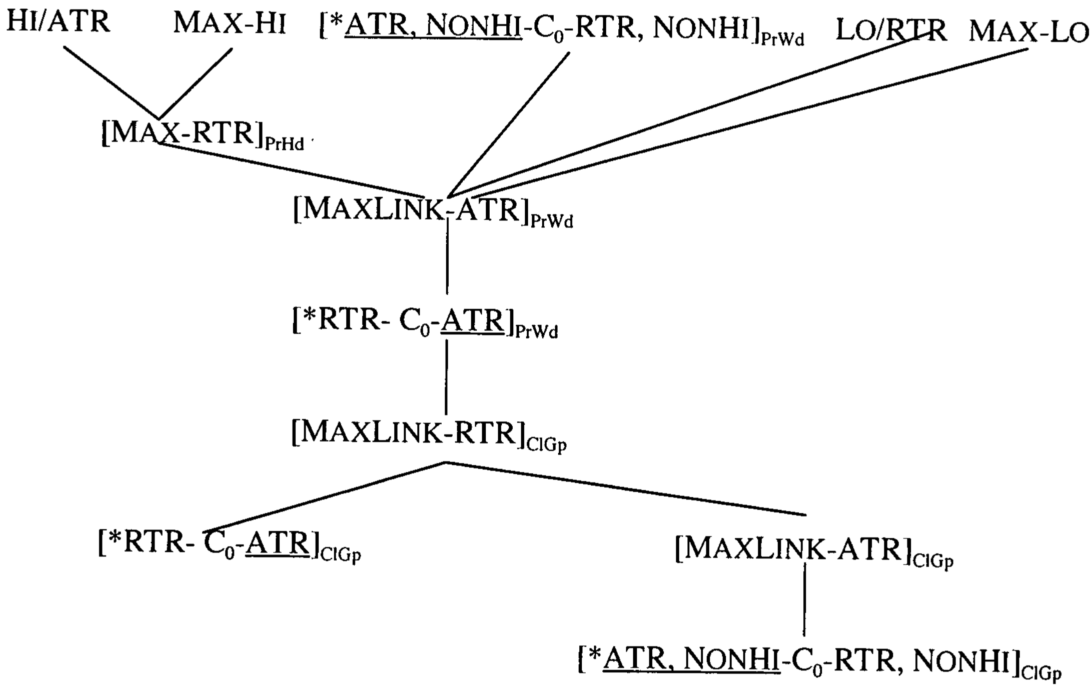
Recall that Standard Yorùbá differs from Mọba in that it does not allow leftward RTR harmony in the ClGp domain. This is easily accounted for by reversing the ranking of [MAXLINK-ATR]$_{ClGp}$ and [*<u>ATR, NONHI</u>-C_0-RTR, NONHI]$_{ClGp}$. Tableau (122) below illustrates this. Rightward ATR-harmony is ruled out since candidate (122c) violates [MAXLINK-RTR]$_{ClGp}$ fatally. The RTR-harmonic candidate (122b) is ruled out because it fatally violates [MAXLINK-ATR]$_{ClGp}$. The faithful candidate, (122a) is selected optimally even though it is disharmonic.

(122) No Harmony in Proclitics in Standard Yorùbá

/ó (PCl) jẹ/	[MAXLINK-RTR]$_{ClGp}$	[MAXLINK-ATR]$_{ClGp}$	[*ATR, NONHI-C_0-RTR, NONHI]$_{ClGp}$
☞ a. ó jẹ			*
b. ọ́ jẹ		*!	
c. ó je	*!		

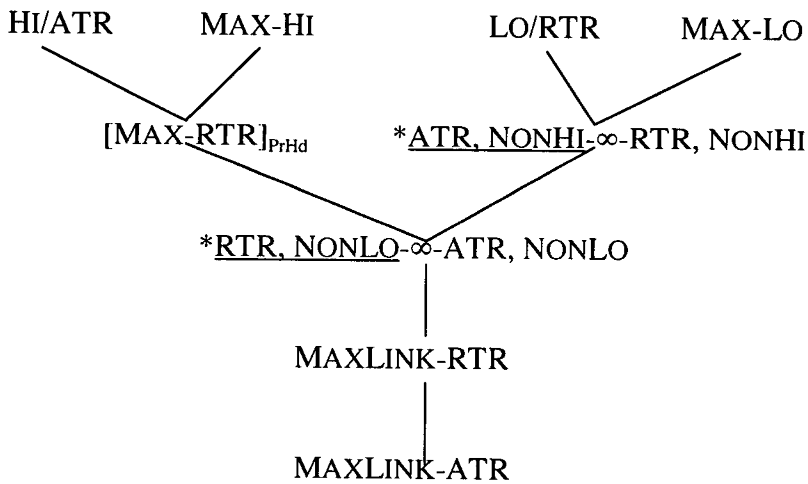
Since all other facts of Standard Yorùbá are identical to the facts of Mọba, the final ranking for Standard Yorùbá is identical to Mọba with the exception of the ranking reversal illustrated in (122) above. The final ranking for Standard Yorùbá is given in (123) below.

(123) Final Constraint Ranking for Standard Yorùbá RTR Harmony



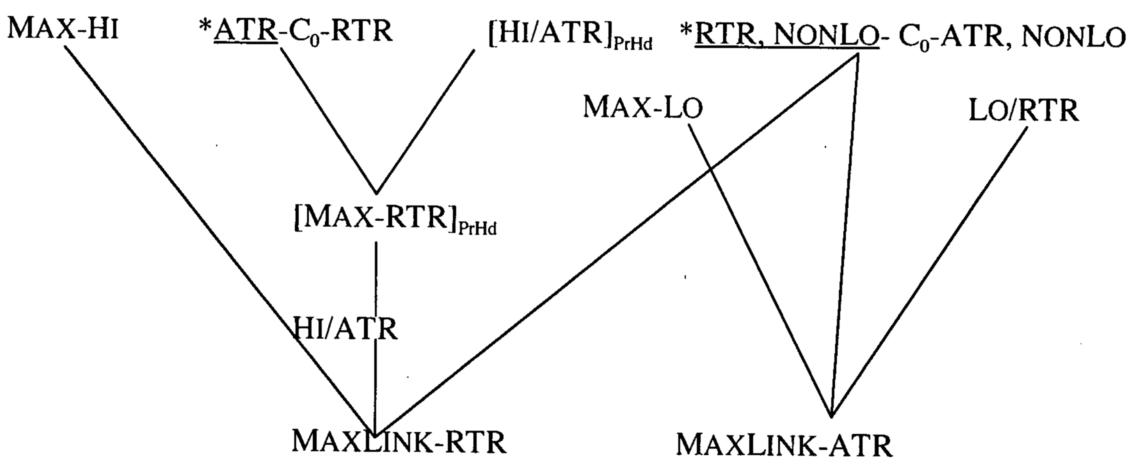
The accounts offered in section 2.4 for Ifẹ and Ekiti Yorùbá are summarized below. Since there is no data to provide us with an insight into the clitic-behaviour in these dialects, the prohibition and faithfulness constraints apply generally in order to derive the patterns seen within the word. Additionally, I assume identical prosodic status with respect to the PrHd, so that the PrHd is aligned with the right edge of the root in all dialects. First, the final ranking is given for Ifẹ Yorùbá, which exhibits transparency of high vowels and absolute right-alignment of the RTR feature with the right edge of the root.

(124) Final Constraint Ranking for Ifẹ Yorùbá RTR Harmony



Ekiti Yorùbá, meanwhile, had high vowels that actively participated in RTR harmony, but didn't trigger it. Additionally, absolute right-alignment of the RTR feature with the right edge of the root was seen.

(125) Final Constraint Ranking for Ekiti Yorùbá RTR Harmony



The accounts offered above capture the effects seen in four dialects of Yorùbá without encountering many of the problems that other existing accounts have.

Chapter 6 - Conclusion

Mọba Yorùbá differs from Standard Yorùbá with respect to RTR harmony in that proclitics are included in the harmonic domain in the former dialect but not in the latter one. I have argued that this is due to a reference to a different harmonic domain that includes clitics (the ClGp) in Mọba. In Standard Yorùbá, the harmonic domain is the PrWd instead. Two hypotheses were offered to explain this pattern. The first posited that the harmonic domain referenced the same prosodic constituent, the PrWd, but allowed clitics to be parsed in the PrWd in Mọba, and in the ClGp in Standard Yorùbá. This would essentially require an indirect reference to syntax, mapping the PrWd onto different syntactic constituents in the two dialects. The alternative hypothesis was to directly refer to the ClGp in Mọba and to the PrWd in Standard Yorùbá as the domains of reference for a harmony-driving constraint.

In order to test these hypotheses, nasal harmony was examined. While there is evidence that in Mọba, the domain of nasal harmony also includes clitics, the facts of Standard Yorùbá didn't enable a proper test of the hypotheses: nasal harmony is syllable-bound in Standard Yorùbá. Fortunately, an argument could be made based on evidence internal to Mọba RTR harmony. There is a single exception in the 2SG clitic. This clitic does not harmonize in Mọba. Instead, it surfaces invariably as RTR. However, in the case of prefixes, these harmonize invariably in both dialects. For this reason they are undoubtedly parsed in the PrWd in both dialects. However, since there was a single exception in the class of Mọba clitics, the clitics could not also be parsed in the PrWd if this single exception is to be accounted for in the phonology. This amounted to evidence that the harmonic domain refers to the ClGp in Mọba and the PrWd in Standard Yorùbá.

This account of RTR harmony in the clitic domain had implications for three existing accounts of RTR harmony, an alignment-based account (Pulleyblank 1996), a stem-control account (Baković 2000) and an account utilizing prohibition constraints on features (Pulleyblank 2002). The alignment-based account required only a few minor provisos, but otherwise could extend to include the facts of Mọba. However, since alignment relied on positing gradiently evaluated constraints to enforce harmony, a situation that is theoretically undesirable, the alignment-based account was abandoned in favour of an analysis that uses prohibition type constraints.

The stem-control account failed to handle the facts of Mọba RTR harmony in the clitic domain. Arguably, prosodic structure, and not morphological structure is responsible for the apparent dominance of the right-edge in Yorùbá roots. Ọla (1995) proposed a theory of prosodic constituency based on independent observations for

Yorùbá that is virtually identical to the inside-out morphological constituency that Baković assumes. However, the lack of evidence for morphological constituency in at least some VCV nouns and the wealth of evidence for prosodic structure that holds in all VCV nouns (for example) argued for an inside-out reference to prosodic constituency instead.

A unique account was then proposed that capitalized on the status of a head syllable that is right aligned via independent prosodic constraints with the morphological root. Positional constraints were posited that refer to this position, rather than ones referring to morphological structure. It succeeded not only in capturing the Mọba and Standard Yorùbá patterns of RTR harmony, but was also able to account for the patterns of Ifẹ and Ekiti Yorùbá.

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Appendix A – Constraint Definitions

A formal definition of each constraint-type used in this thesis is given generally with one example for clarification. Below the definitions, specific instantiations of each constraint that are used in the analysis above are listed. When shortened or alternate names are used for constraints these are included in brackets following the constraint. When constraint types are restricted to domains, this is denoted by a subscript following square brackets around the constraint. When a constraint is not restricted to a domain, it is assumed to apply generally across-the-board.

- **$*[\alpha F, \beta G\ldots]_X$:** No root node in domain X can dominate both [αF] and [βG] specifications on the surface. The constraint, *[+HI, RTR] would incur a single violation for every root node (on the surface) that simultaneously dominates both [+HI] and [RTR] specifications.

  Examples: *[+HI, RTR] (HI/ATR), *[+LO, ATR] (LO/RTR), $[\text{HI/ATR}]_{\text{PrHd}}$ ($([\text{HI/ATR}]_{\text{RtFinal}})$)

- **$[*[\underline{\alpha F, \beta G\ldots}]\text{-Y-}[\gamma H, \delta I\ldots]]_X$:** A violation is incurred for every segment in domain X that is specified as [αF, βG…] that is in the relation, Y with a segment that is also in domain X that is specified as [γH, δI…]. The relation Y is one of proximity: it can require adjacency, (Y=0), require adjacency between vowels so that intervening consonants are allowed (Y=C_0) or it can allow any number of intervening segments (Y=∞). The constraint *RTR-C_0-$\underline{\text{ATR}}$ incurs one violation for every ATR segment that is preceded by an RTR segment (allowing only consonants to intervene).

  Examples: *RTR-C_0-$\underline{\text{ATR}}$; *$\underline{\text{ATR}}$-C_0-RTR; *RTR-∞-$\underline{\text{ATR}}$; *$\underline{\text{RTR}}$-∞-ATR; *RTR; NONLO-C_0-$\underline{\text{ATR, NONLO}}$; *$\underline{\text{RTR}}$-∞-RTR; *$\underline{\text{ATR, NONHI}}$-∞-RTR, NONHI; *$\underline{\text{RTR, NONLO}}$-∞-ATR, NONLO; *$\underline{\text{ATR, NONHI}}$-∞-RTR, NONHI; $*[\underline{\text{ATR, NONHI}}\text{-}C_0\text{-RTR, NONHI}]_{\text{ClGp}}$; $[*\underline{\text{ATR, NONHI}}\text{-}C_0\text{-RTR, NONHI}]_{\text{PrWd}}$; $[*\text{RTR-}C_0\text{-}\underline{\text{ATR}}]_{\text{PrWd}}$; $[*\text{RTR-}C_0\text{-}\underline{\text{ATR}}]_{\text{ClGp}}$

- **AGREE(F):** Adjacent segments must have the same value of the feature, F. Violations of AGREE(ATR) are incurred per distinct pair of adjacent segments that do not have the same value for ATR (i.e. either both must be ATR or both must be RTR).

  Examples: AGREE(ATR)

- **ALIGN(Cat1, Edge1, Cat2, Edge2)**: Edge1 of Cat1 and Edge2 of Cat2 are required to coincide. Cat1 and Cat2 can be any morphologically or prosodically defined category. Pulleyblank (1996) extends this definition to include autosegmental features as potential categories following Myers (1995). Violations are incurred gradiently in Yorùbá, one for every root node that is contained in Cat2 that intervenes between Edge1 of Cat1 and Edge2 of Cat2.[61] ALIGN(RTR, R, Root, R) incurs violations for every root node that is not RTR within the Root, that follows an RTR span. This definition is based on that given by McCarthy and Prince (1993).

Examples: ALIGN(RTR, L, PrWd, L), ALIGN(RTR, R, Root, R), ALIGN(RTR, L, ClGp, L), ALIGN(ATR, L, PrWd, L), ALIGN(PrWd, R, ROOT, R)

- **LOCALIGN(Cat1, Edge1, Cat2, Edge2):** Edge1 of Cat1 and Edge2 of Cat2 are required to align. Cat1 and Cat2 can be any morphologically or prosodically defined category Pulleyblank (1996) extends this definition to include autosegmental features as potential categories following Myers (1995). Violations are incurred gradiently in Yorùbá, one for every root node that is not linked to any Cat1 that intervenes between Edge1 and Edge2 of the two categories in question. LOCALIGN(RTR, L, PrWd, L) would incur one violation per every root node that is both not linked to an RTR feature and that intervenes between the left edge of some RTR span and the left edge of the PrWd. Note that this constraint is defined such that over-alignment of a Cat1 feature with respect to a Cat2 feature could never incur a violation; only underalignment could incur violations of this constraint.

Examples: LOCALIGN(RTR, L, PrWd, L)

- **EDGEMOST:** This is essentially a special alignment constraint that aligns the head foot either with the right edge of the prosodic word (RIGHTMOST) or with the left edge of the prosodic word (LEFTMOST). One violation of RIGHTMOST is incurred for every prosodic word that does have its head foot right-aligned with its right edge.

Example: RIGHTMOST

- **RH-TYPE=X:** Every foot must be X-headed. If X=I, then feet are iambic or right-headed. If X=T, then feet are trochaic or left-headed. One violation of RH-TYPE=I is incurred per left-headed foot that occurs.

Example: RH-TYPE=I

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[61] This definition tolerates over-alignment of Cat1 with respect to Cat2 – it is not symmetric then. If we want a symmetric ALIGN constraint that militates against both over- and under- alignment, we would remove the 'contained in Cat2' condition. This results in the following definition: 'Violations are incurred gradiently, one for each root node that intervenes between Edge1 of Cat1 and Edge2 of Cat2. This incurs violations for any misalignment, without regard to the difference between over- and under-alignment.

- **[DEP-αF]$_X$:** For all featural occurrences [αF] that are linked to segments contained in domain X on the surface, these featural occurrences must be present underlyingly. DEP-RTR incurs one violation for an RTR feature that appears on the surface but that was present underlyingly.

  Examples: DEP-RTR

- **[DEPLINK-αF]$_X$:** Every root node in domain X that is linked (directly or indirectly) to a feature value [αF] on the surface, must also be linked to a feature value [αF] underlyingly. DEPLINK-RTR incurs one violation for every root node that is linked to an RTR feature on the surface that was not also linked to an RTR feature underlyingly.

  Examples: DEPLINK-RTR

- **[MAX-αF]$_X$**: For all featural occurrences, [αF] which are underlyingly linked to segments contained in domain X, these featural occurrences must be present on the surface. [MAX-RTR]$_{PrHd}$ incurs one violation for an RTR feature that was linked underlyingly to a segment in the PrHd domain, but that is not linked to *any* segment in the output (that is deleted).

  Examples: MAX-RTR, [MAX-RTR]$_{PrHd}$ ([MAX-RTR]$_{RtFinal}$), [MAX-RTR]$_{ROOT}$, [MAX-ATR]$_{ROOT}$, MAX-LO, MAX-HI

- **[MAXLINK-αF]$_X$**: Every root node in domain X that is linked (directly or indirectly) to a feature value [αF] in the input must have an output correspondent root node that is also linked to a feature value [αF]. [MAXLINK-RTR]$_{ClGp}$ incurs one violation for every root node in the ClGp domain that is linked to RTR underlyingly, but that does not have an output correspondent that is linked to RTR.

  Examples: MAXLINK-RTR, MAXLINK-ATR, [MAXLINK-RTR]$_{ClGp}$, [MAXLINK-ATR]$_{ClGp}$, [MAXLINK-ATR]$_{PrWd}$

- **IO-IDENT(F):** Given correspondence between segments in an underlying form and the surface form, all corresponding segments must have the same value for [αF] in the underlying form and in the surface form. Violations are incurred, one for each segment that has a correspondent in both the underlying form and the surface form, where the [αF] value is not identical. For example, IO-IDENT(ATR) incurs one violation for every segment that has a correspondent in the underlying form and the surface form that does not have identical ATR values.

  Examples: IO-IDENT(ATR) (IO)-ID(ATR)), [IO-IDENT(ATR)]$_{ROOT}$ (ROOT-IDENT(ATR), RT-ID(ATR)), IO-IDENT(HI) (IO-ID(HI)

- **SA-IDENT(F):** Given correspondence between segments in an affixed form and its corresponding stem, all corresponding segments must have the same value for [αF] in the stem and in the affixed form. Violations are incurred, one for each segment that has a correspondent in both the stem and the affixed form, where the [αF] value is not identical. For example, SA-IDENT(ATR) incurs one violation for every segment that has a correspondent in the stem and affixed form that does not have identical ATR values.

  Examples: SA-IDENT(ATR) (SA-ID(ATR))

- **❁-IDENT(F):** Given a correspondence between a sympathetic form and a surface form, all corresponding segments must have the same value for [αF] in the sympathetic form and in the surface form. Violations are incurred, one for each segment that has a correspondent in both the sympathetic form and the surface form, where the [αF] value is not identical. For example, ❁-IDENT(ATR) incurs one violation for every segment that has a correspondent in the sympathetic form and the surface form that does not have identical ATR values.

  Examples: ❁-IDENT(ATR) (❁-ID (ATR))

- **PARSE(X, Y):** The constituent X must be linked to a constituent, Y that occupies a tier dominating it. PARSE(μ, σ) incurs one violation for every mora that is not linked to a syllable.

  Examples: PARSE(μ, σ), PARSE(Ft, PrWd), PARSE(σ, Ft), PARSE(PrWd, ClGp)

- **BINARY(X, Y):** The constituent X must be linked to two constituents Y that occupy a lower tier. BINARY(Ft, σ) incurs one violation for every foot that is not linked to exactly two syllables (this is a categorical definition).

  Examples: BINARY(Ft, σ), BINARY(PrWd, Ft), BINARY(Ft, μ)

- **$[$OCP-RTR$]_{ROOT}$:** One violation is incurred per root-RTR feature that is preceded by another root-RTR feature. Since this constraint applies only in the root domain, it does not incur violations for segment-level occurrences of RTR (i.e. for those attached to low vowels in order to satisfy segmental markedness constraints).

- **ONSET**: One violation is incurred for every syllable without an onset

Appendix B – Clitic-Aux-Verb Paradigm

*All data in this appendix is transcribed phonetically using IPA conventions.

	High Tone/ATR dé (arrive)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG	mĕ dé / mǐ dé	mo dé
2.SG	ɔ̆ dé	o dé
3.SG	é dé	ó dé
1.PL	ă dé	a dé
2.PL	ǐ dé	ɛ dé
3.PL	ã dé	w̃ɔ̃ dé
1.SG, NEG	*mī kè dé	ŋ̄ kò dé
2.SG, NEG	ɔ kè dé	o kò dé
3.SG, NEG	kè dé	kò dé
1.PL, NEG	a kè dé	a kò dé
2.PL, NEG	ī kè dé	ɛ kò dé
3.PL, NEG	ã kè dé	w̃ɔ̃ kò dé
*Throughout this appendix, sequences of adjacent low vowels folllowed by high vowels result in the high tone of the second vowel becoming a rising tone; this is a phonetic process.		
1.SG, FUT	mè è dé	n̄ ó dĕ
2.SG, FUT	ɔ̀ è dé	o ó dĕ
3.SG, FUT	é è dé	ó máa dé
1.PL, FUT	à è dé	a ó dĕ
2.PL, FUT	ì è dé	ɛ ó dĕ
3.PL, FUT	ã è dé	w̃ɔ̃ ó dĕ
1.SG, NEG, FUT	mī kè è dé	*ŋ̄ kò níí dé
2.SG, NEG, FUT	ɔ kè è dé	o kò níí dé
3.SG, NEG, FUT	kè è dé	kò níí dé
1.PL, NEG, FUT	a kè è dé	a kò níí dé
2.PL, NEG, FUT	ī kè è dé	ɛ kò níí dé
3.PL, NEG, FUT	ã kè è dé	w̃ɔ̃ kò níí dé
*nīī is the orthographic convention for this morpheme; however, sounds like only one vowel (unconfirmed phonetically)		

	High Tone/ATR dé (arrive)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG, PROG	mĩ̀ ĩ́ dé	mo ń dé
2.SG, PROG	ɔ̀ í dé	o ń dé
3.SG, PROG	í í dé	ó ń dé
1.PL, PROG	à í dé	a ń dé
2.PL, PROG	ĩ̀ ĩ́ dé	ɛ ń dé
3.PL, PROG	ã̀ ĩ́ dé	w̃ɔ̃́ ń dé
* The above paradigm can have a habitual or progressive reading		
1.SG, PROG, NEG	mĩ kè í dé	ŋ̄ kì í dé
2.SG, PROG, NEG	ɔ kè í dé	o kì í dé
3.SG, PROG, NEG	kè í dé	kì í dé
1.PL, PROG, NEG	a kè í dé	a kì í dé
2.PL, PROG, NEG	ĩ kè í dé	ɛ kì í dé
3.PL, PROG, NEG	ã kè í dé	w̃ɔ̃ kì í dé
* The above paradigm can have only a habitual reading (no progressive reading available)		
1.SG, PROG, FUT	mè e dé	n̄ ó máa dé
2.SG, PROG, FUT	ɔ̀ e dé	o ó máa dé
3.SG, PROG, FUT	é e dé	jóò máa dé
1.PL, PROG, FUT	à e dé	a ó máa dé
2.PL, PROG, FUT	ĩ̀ e dé	ɛ ó máa dé
3.PL, PROG, FUT	ã̀ e dé	w̃ɔ̃́ ó máa dé
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ e dé	ŋ̄ kò nĩ́ĩ́ máa dé
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ e dé	o kò nĩ́ĩ́ máa dé
3.SG, PROG, FUT, NEG	kè nĩ́ e dé	kò nĩ́ĩ́ máa dé
1.PL, PROG, FUT, NEG	a kè nĩ́ e dé	a kò nĩ́ĩ́ máa dé
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ e dé	ɛ kò nĩ́ĩ́ máa dé
3.PL, PROG, FUT, NEG	ã kè nĩ́ e dé	w̃ɔ̃ kò nĩ́ĩ́ máa dé

	High Tone/RTR sɛ́ / ʃɛ́ (change (money))	
Subject Proclitic + auxes	**MB**	**SY**
1.SG	mɛ̆ sɛ́ / mĭ sɛ́	mo ʃɛ́
2.SG	ɔ̆ sɛ́	o ʃɛ́
3.SG	ɛ́ sɛ́	ó ʃɛ́
1.PL	ă sɛ́	a ʃɛ́
2.PL	ĭ sɛ́	ɛ ʃɛ́
3.PL	ã sɛ́	w̃ɔ̄ ʃɛ́
1.SG, NEG	mī kɛ̀ sɛ́	ŋ̄ kò ʃɛ́
2.SG, NEG	ɔ kɛ̀ sɛ́	o kò ʃɛ́
3.SG, NEG	kɛ̀ sɛ́	kò ʃɛ́
1.PL, NEG	a kɛ̀ sɛ́	a kò ʃɛ́
2.PL, NEG	ī kɛ̀ sɛ́	ɛ kò ʃɛ́
3.PL, NEG	ã kɛ̀ sɛ́	w̃ɔ̄ kò ʃɛ́
1.SG, FUT	mɛ̀ ɛ̀ sɛ́	ñ ó ʃɛ̆
2.SG, FUT	ɔ̀ ɛ̀ sɛ́	o ó ʃɛ̆
3.SG, FUT	ɛ́ ɛ̀ sɛ́	ó máa ʃɛ̆
1.PL, FUT	à ɛ̀ sɛ́	a ó ʃɛ̆
2.PL, FUT	ì ɛ̀ sɛ́	ɛ ó ʃɛ̆
3.PL, FUT	ã ɛ̀ sɛ́	w̃ɔ̄ ó ʃɛ̆
1.SG, NEG, FUT	mī kɛ̀ ɛ̀ sɛ́	ŋ̄ kò nīí ʃɛ́
2.SG, NEG, FUT	ɔ kɛ̀ ɛ̀ sɛ́	o kò nīí ʃɛ́
3.SG, NEG, FUT	kɛ̀ ɛ̀ sɛ́	kò nīí ʃɛ́
1.PL, NEG, FUT	a kɛ̀ ɛ̀ sɛ́	a kò nīí ʃɛ́
2.PL, NEG, FUT	ī kɛ̀ ɛ̀ sɛ́	ɛ kò nīí ʃɛ́
3.PL, NEG, FUT	ã kɛ̀ ɛ̀ sɛ́	w̃ɔ̄ kò nīí ʃɛ́

*Note that in MB, nīī can also be used as the FUT marker as is seen below:

1.SG, NEG, FUT	mī kè nīí sɛ́
2.SG, NEG, FUT	ɔ kè nīí sɛ́
3.SG, NEG, FUT	kè nīí sɛ́
1.PL, NEG, FUT	a kè nīí sɛ́
2.PL, NEG, FUT	ī kè nīí sɛ́
3.PL, NEG, FUT	ã kè nīí sɛ́

	High Tone/RTR sɛ́ / ʃɛ́ (change (money))	
Subject Proclitic + auxes	**MB**	**SY**
1.SG, PROG	mĩ̀ ĩ́ sɛ́	mo ń ʃɛ́
2.SG, PROG	ɔ̀ í sɛ́	o ń ʃɛ́
3.SG, PROG	í í sɛ́	ó ń ʃɛ́
1.PL, PROG	à í sɛ́	a ń ʃɛ́
2.PL, PROG	ĩ̀ ĩ́ sɛ́	ɛ ń ʃɛ́
3.PL, PROG	ã̀ ĩ́ sɛ́	w̃ɔ̃ ń ʃɛ́
1.SG, PROG, NEG	mĩ kè í sɛ́	ŋ̄ kì í ʃɛ́
2.SG, PROG, NEG	ɔ kè í sɛ́	o kì í ʃɛ́
3.SG, PROG, NEG	kè í sɛ́	kì í ʃɛ́
1.PL, PROG, NEG	a kè í sɛ́	a kì í ʃɛ́
2.PL, PROG, NEG	ĩ kè í sɛ́	ɛ kì í ʃɛ́
3.PL, PROG, NEG	ã kè í sɛ́	w̃ɔ̃ kì í ʃɛ́
1.SG, PROG, FUT	mɛ̀ ɛ sɛ́	n̄ ó máa ʃɛ́
2.SG, PROG, FUT	ɔ̀ ɛ sɛ́	o ó máa ʃɛ́
3.SG, PROG, FUT	ɛ́ ɛ sɛ́	jóò máa ʃɛ́
1.PL, PROG, FUT	à ɛ sɛ́	a ó máa ʃɛ́
2.PL, PROG, FUT	ĩ̀ ɛ sɛ́	ɛ ó máa ʃɛ́
3.PL, PROG, FUT	ã̀ ɛ sɛ́	w̃ɔ̃ ó máa ʃɛ́
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ ɛ sɛ́	ŋ̄ kò nĩ́ĩ́ máa ʃɛ́
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ ɛ sɛ́	o kò nĩ́ĩ́ máa ʃɛ́
3.SG, PROG, FUT, NEG	kè nĩ́ ɛ sɛ́	kò nĩ́ĩ́ máa ʃɛ́
1.PL, PROG, FUT, NEG	a kè nĩ́ ɛ sɛ́	a kò nĩ́ĩ́ máa ʃɛ́
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ ɛ sɛ́	ɛ kò nĩ́ĩ́ máa ʃɛ́
3.PL, PROG, FUT, NEG	ã kè nĩ́ ɛ sɛ́	w̃ɔ̃ kò nĩ́ĩ́ máa ʃɛ́

	High Tone/ATR lé (pursue)	
Object Enclitic + auxes	MB	SY
1.SG	adé lé mĩ	adé lé mĩ
2.SG	adé lé ɔ	adé lé ɛ
3.SG	adé le	adé l(é) e
1.PL	adé lé a	adé lé wa
2.PL	adé lé ĩ	adé lée ɲĩ́
3.PL	adé lé ã	adé lé w̃ɔ̃
1.SG, NEG	adé kè lé mĩ	adé kò lé mĩ
2.SG, NEG	adé kè lé ɔ	adé kò lé ɛ
3.SG, NEG	adé kè le	adé kò l(é) e
1.PL, NEG	adé kè lé a	adé kò lé wa
2.PL, NEG	adé kè lé ĩ	adé kò lée ɲĩ́
3.PL, NEG	adé kè lé ã	adé kò lé w̃ɔ̃
1.SG, FUT	adé éè lé mĩ	adé jóò lé mĩ
2.SG, FUT	adé éè lé ɔ	adé jóò lé ɛ
3.SG, FUT	adé éè le	adé jóò l(é) e
1.PL, FUT	adé éè lé a	adé jóò lé wa
2.PL, FUT	adé éè lé ĩ	adé jóò lée ɲĩ́
3.PL, FUT	adé éè lé ã	adé jóò lé w̃ɔ̃
1.SG, NEG, FUT	adé kè nĩ́ e lé mĩ	adé kò nĩ́ĩ máa lé mĩ
2.SG, NEG, FUT	adé kè nĩ́ e lé ɔ	adé kò nĩ́ĩ máa lé ɛ
3.SG, NEG, FUT	adé kè nĩ́ e le	adé kò nĩ́ĩ máa l(é) e
1.PL, NEG, FUT	adé kè nĩ́ e lé a	adé kò nĩ́ĩ máa lé wa
2.PL, NEG, FUT	adé kè nĩ́ e lé ĩ	adé kò nĩ́ĩ máa lée ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ e lé ã	adé kò nĩ́ĩ máa lé w̃ɔ̃

*Note: adé is a first name in Yorùbá.

	High Tone/ATR lé (pursue)	
Object Enclitic + auxes	MB	SY
1.SG, PROG	adé í lé mĩ	adé ń lé mĩ
2.SG, PROG	adé í lé ɔ	adé ń lé ɛ
3.SG, PROG	adé í le	adé ń l(é) e
1.PL, PROG	adé í lé a	adé ń lé wa
2.PL, PROG	adé í lé ĩ	adé ń lée ɲĩ́
3.PL, PROG	adé í lé ã	adé ń lé w̃ɔ̃
1.SG, PROG, NEG	adé kè í lé mĩ	adé kì í lé mĩ
2.SG, PROG, NEG	adé kè í lé ɔ	adé kì í lé ɛ
3.SG, PROG, NEG	adé kè í le	adé kì í l(é) e
1.PL, PROG, NEG	adé kè í lé a	adé kì í lé wa
2.PL, PROG, NEG	adé kè í lé ĩ	adé kì í lée ɲĩ́
3.PL, PROG, NEG	adé kè í lé ã	adé kì í lé w̃ɔ̃
1.SG, PROG, FUT	adé éè e lé mĩ	adé jóò máa lé mĩ
2.SG, PROG, FUT	adé éè e lé ɔ	adé jóò máa lé ɛ
3.SG, PROG, FUT	adé éè e le	adé jóò máa l(é) e
1.PL, PROG, FUT	adé éè e lé a	adé jóò máa lé wa
2.PL, PROG, FUT	adé éè e lé ĩ	adé jóò máa lée ɲĩ́
3.PL, PROG, FUT	adé éè e lé ã	adé jóò máa lé w̃ɔ̃
1.SG, PROG, FUT, NEG	adé kè nĩ́ e lé mĩ	adé kò nĩĩ́ máa lé mĩ
2.SG, PROG, FUT, NEG	adé kè nĩ́ e lé ɔ	adé kò nĩĩ́ máa lé ɛ
3.SG, PROG, FUT, NEG	adé kè nĩ́ e le	adé kò nĩĩ́ máa l(é) e
1.PL, PROG, FUT, NEG	adé kè nĩ́ e lé a	adé kò nĩĩ́ máa lé wa
2.PL, PROG, FUT, NEG	adé kè nĩ́ e lé ĩ	adé kò nĩĩ́ máa lée ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ e lé ã	adé kò nĩĩ́ máa lé w̃ɔ̃

	High Tone/RTR kɔ́ (teach)	
Object Enclitic + auxes	MB	SY
1.SG	adé kɔ́ mĩ	adé kɔ́ mĩ
2.SG	adé kɔ́ ɔ	adé kɔ́ ɛ
3.SG	adé kɔ	adé k(ɔ́) ɔ
1.PL	adé kɔ́ a	adé kɔ́ wa
2.PL	adé kɔ́ ĩ	adé kɔ́ɔ ɲĩ́
3.PL	adé kɔ́ ã	adé kɔ́ w̃ɔ̃
1.SG, NEG	adé kɛ̀ kɔ́ mĩ	adé kɔ̀ kɔ́ mĩ
2.SG, NEG	adé kɛ̀ kɔ́ ɔ	adé kɔ̀ kɔ́ ɛ
3.SG, NEG	adé kɛ̀ kɔ	adé kɔ̀ k(ɔ́) ɔ
1.PL, NEG	adé kɛ̀ kɔ́ a	adé kɔ̀ kɔ́ wá
2.PL, NEG	adé kɛ̀ kɔ́ ĩ	adé kɔ̀ kɔ́ɔ ɲĩ́
3.PL, NEG	adé kɛ̀ kɔ́ ã	adé kɔ̀ kɔ́ w̃ɔ̃
1.SG, FUT	adé ɛ́ɛ̀ kɔ́ mĩ	adé jóò kɔ́ mĩ
2.SG, FUT	adé ɛ́ɛ̀ kɔ́ ɔ	adé jóò kɔ́ ɛ
3.SG, FUT	adé ɛ́ɛ̀ kɔ	adé jóò k(ɔ́) ɔ
1.PL, FUT	adé ɛ́ɛ̀ kɔ́ a	adé jóò kɔ́ wa
2.PL, FUT	adé ɛ́ɛ̀ kɔ́ ĩ	adé jóò kɔ́ɔ ɲĩ́
3.PL, FUT	adé ɛ́ɛ̀ kɔ́ ã	adé jóò kɔ́ w̃ɔ̃
1.SG, NEG, FUT	adé kè nĩ́ kɔ́ mĩ	adé kɔ̀ nĩĩ́ kɔ́ mĩ
2.SG, NEG, FUT	adé kè nĩ́ kɔ́ ɔ	adé kɔ̀ nĩĩ́ kɔ́ ɛ
3.SG, NEG, FUT	adé kè nĩ́ kɔ	adé kɔ̀ nĩĩ́ k(ɔ́) ɔ
1.PL, NEG, FUT	adé kè nĩ́ kɔ́ a	adé kɔ̀ nĩĩ́ kɔ́ wa
2.PL, NEG, FUT	adé kè nĩ́ kɔ́ ĩ	adé kɔ̀ nĩĩ́ kɔ́ɔ ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ kɔ́ ã	adé kɔ̀ nĩĩ́ kɔ́ w̃ɔ̃

	High Tone/RTR kɔ́ (teach)	
Object Enclitic + auxes	**MB**	**SY**
1.SG, PROG	adé í kɔ́ mĩ	adé ŋ́ kɔ́ mĩ
2.SG, PROG	adé í kɔ́ ɔ	adé ŋ́ kɔ́ ɛ
3.SG, PROG	adé í kɔ	adé ŋ́ k(ɔ́) ɔ
1.PL, PROG	adé í kɔ́ a	adé ŋ́ kɔ́ wa
2.PL, PROG	adé í kɔ́ ĩ	adé ŋ́ kɔ́ɔ ɲĩ́
3.PL, PROG	adé í kɔ́ ã	adé ŋ́ kɔ́ w̃ɔ̃
1.SG, PROG, NEG	adé kè í kɔ́ mĩ	adé kì í kɔ́ mĩ
2.SG, PROG, NEG	adé kè í kɔ́ ɔ	adé kì í kɔ́ ɛ
3.SG, PROG, NEG	adé kè í kɔ	adé kì í k(ɔ́) ɔ
1.PL, PROG, NEG	adé kè í kɔ́ a	adé kì í kɔ́ wa
2.PL, PROG, NEG	adé kè í kɔ́ ĩ	adé kì í kɔ́ɔ ɲĩ́
3.PL, PROG, NEG	adé kè í kɔ́ ã	adé kì í kɔ́ w̃ɔ̃
1.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ́ mĩ	adé jóò máa kɔ́ mĩ
2.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ́ ɔ	adé jóò máa kɔ́ ɛ
3.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ	adé jóò máa k(ɔ́) ɔ
1.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ́ a	adé jóò máa kɔ́ wa
2.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ́ ĩ	adé jóò máa kɔ́ɔ ɲĩ́
3.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ́ ã	adé jóò máa kɔ́ w̃ɔ̃
1.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ́ mĩ	adé kò nĩ́ĩ́ máa kɔ́ mĩ
2.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ́ ɔ	adé kò nĩ́ĩ́ máa kɔ́ ɛ
3.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ	adé kò nĩ́ĩ́ máa k(ɔ́) ɔ
1.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ́ a	adé kò nĩ́ĩ́ máa kɔ́ wa
2.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ́ ĩ	adé kò nĩ́ĩ́ máa kɔ́ɔ ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ́ ã	adé kò nĩ́ĩ́ máa kɔ́ w̃ɔ̃

	Mid Tone/ATR se / ʃe (do)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG	mě se / mĩ̌ se	mo ʃe
2.SG	ɔ̌ se	o ʃe
3.SG	é se	ó ʃe
1.PL	ǎ se	a ʃe
2.PL	ĩ̌ se	ɛ ʃe
3.PL	ã̌ se	w̃ɔ̃́ ʃe
1.SG, NEG	mĩ kè se	ŋ kò ʃe
2.SG, NEG	ɔ kè se	o kò ʃe
3.SG, NEG	kè se	kò ʃe
1.PL, NEG	a kè se	a kò ʃe
2.PL, NEG	ĩ kè se	ɛ kò ʃe
3.PL, NEG	ã kè se	w̃ɔ̃ kò ʃe
1.SG, FUT	mè è se	n̄ ó ʃe
2.SG, FUT	ɔ̀ è se	o ó ʃe
3.SG, FUT	é è se	ó máa ʃe
1.PL, FUT	à è se	a ó ʃe
2.PL, FUT	ĩ̀ è se	ɛ ó ʃe
3.PL, FUT	ã̀ è se	w̃ɔ̃ ó ʃe
1.SG, NEG, FUT	mĩ kè è se	ŋ̄ kò nĩ́ĩ́ ʃe
2.SG, NEG, FUT	ɔ kè è se	o kò nĩ́ĩ́ ʃe
3.SG, NEG, FUT	kè è se	kò nĩ́ĩ́ ʃe
1.PL, NEG, FUT	a kè è se	a kò nĩ́ĩ́ ʃe
2.PL, NEG, FUT	ĩ kè è se	ɛ kò nĩ́ĩ́ ʃe
3.PL, NEG, FUT	ã kè è se	w̃ɔ̃ kò nĩ́ĩ́ ʃe

	Mid Tone/ATR se / ʃe (do)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG, PROG	mĩ̀ ĩ́ se	mo ń ʃe
2.SG, PROG	ɔ̀ í se	o ń ʃe
3.SG, PROG	í í se	ó ń ʃe
1.PL, PROG	à í se	a ń ʃe
2.PL, PROG	ĩ̀ ĩ́ se	ɛ ń ʃe
3.PL, PROG	ã̀ ĩ́ se	w̃ɔ̃́ ń ʃe
* The above paradigm can have a habitual or progressive reading		
1.SG, PROG, NEG	mĩ kè í se	ŋ̄ kì í ʃe
2.SG, PROG, NEG	ɔ kè í se	o kì í ʃe
3.SG, PROG, NEG	kè í se	kì í ʃe
1.PL, PROG, NEG	a kè í se	a kì í ʃe
2.PL, PROG, NEG	ĩ kè í se	ɛ kì í ʃe
3.PL, PROG, NEG	ã kè í se	w̃ɔ̃ kì í ʃe
* The above paradigm can have only a habitual reading (no progressive reading available)		
1.SG, PROG, FUT	mè e se	n̄ ó máa ʃe
2.SG, PROG, FUT	ɔ̀ e se	o ó máa ʃe
3.SG, PROG, FUT	é e se	jóò máa ʃe
1.PL, PROG, FUT	à e se	a ó máa ʃe
2.PL, PROG, FUT	ĩ̀ e se	ɛ ó máa ʃe
3.PL, PROG, FUT	ã̀ e se	w̃ɔ̃́ ó máa ʃe
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ e se	ŋ̄ kò nĩ́ máa ʃe
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ e se	o kò nĩ́ máa ʃe
3.SG, PROG, FUT, NEG	kè nĩ́ e se	kò nĩ́ máa ʃe
1.PL, PROG, FUT, NEG	a kè nĩ́ e se	a kò nĩ́ máa ʃe
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ e se	ɛ kò nĩ́ máa ʃe
3.PL, PROG, FUT, NEG	ã kè nĩ́ e se	w̃ɔ̃ kò nĩ́ máa ʃe

	Mid Tone/RTR lɔ (go)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG	mĩ̌ lɔ / mɛ̌ lɔ	mo lɔ
2.SG	ɔ̌ lɔ	o lɔ
3.SG	ɛ́ lɔ	ó lɔ
1.PL	ǎ lɔ	a lɔ
2.PL	ĩ̌ lɔ	ɛ lɔ
3.PL	ã̌ lɔ	w̃ɔ̃́ lɔ
1.SG, NEG	mĩ kɛ̀ lɔ	ŋ̄ kò lɔ
2.SG, NEG	ɔ kɛ̀ lɔ	o kò lɔ
3.SG, NEG	kɛ̀ lɔ	kò lɔ
1.PL, NEG	a kɛ̀ lɔ	a kò lɔ
2.PL, NEG	ĩ kɛ̀ lɔ	ɛ kò lɔ
3.PL, NEG	ã kɛ̀ lɔ	w̃ɔ̃ kò lɔ
1.SG, FUT	mɛ̀ ɛ̀ lɔ	ñ ó lɔ
2.SG, FUT	ɔ̀ ɛ̀ lɔ	o ó lɔ
3.SG, FUT	ɛ́ ɛ̀ lɔ	ó máa lɔ
1.PL, FUT	à ɛ̀ lɔ	a ó lɔ
2.PL, FUT	ĩ̀ ɛ̀ lɔ	ɛ ó lɔ
3.PL, FUT	ã̀ ɛ̀ lɔ	w̃ɔ̃ ó lɔ
1.SG, NEG, FUT	mi kɛ̀ ɛ̀ lɔ	ŋ̄ kò nĩ́ĩ́ lɔ
2.SG, NEG, FUT	ɔ kɛ̀ ɛ̀ lɔ	o kò nĩ́ĩ́ lɔ
3.SG, NEG, FUT	kɛ̀ ɛ̀ lɔ	kò nĩ́ĩ́ lɔ
1.PL, NEG, FUT	a kɛ̀ ɛ̀ lɔ	a kò nĩ́ĩ́ lɔ
2.PL, NEG, FUT	ĩ kɛ̀ ɛ̀ lɔ	ɛ kò nĩ́ĩ́ lɔ
3.PL, NEG, FUT	ã kɛ̀ ɛ̀ lɔ	w̃ɔ̃ kò nĩ́ĩ́ lɔ

*Note that in MB, nĩĩ can also be used as the FUT marker as is seen below:

1.SG, NEG, FUT	mĩ kè nĩ́ĩ́ lɔ
2.SG, NEG, FUT	ɔ kè nĩ́ĩ́ lɔ
3.SG, NEG, FUT	kè nĩ́ĩ́ lɔ
1.PL, NEG, FUT	a kè nĩ́ĩ́ lɔ
2.PL, NEG, FUT	ĩ kè nĩ́ĩ́ lɔ
3.PL, NEG, FUT	ã kè nĩ́ĩ́ lɔ

	Mid Tone/RTR lɔ (go)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG, PROG	mĩ̀ ĩ́ lɔ	mo ń lɔ
2.SG, PROG	ɔ̀ í lɔ	o ń lɔ
3.SG, PROG	í í lɔ	ó ń lɔ
1.PL, PROG	à í lɔ	a ń lɔ
2.PL, PROG	ĩ̀ ĩ́ lɔ	ɛ ń lɔ
3.PL, PROG	ã̀ ĩ́ lɔ	w̃ɔ̃ ń lɔ
1.SG, PROG, NEG	mĩ kè í lɔ	ŋ̄ kì í lɔ
2.SG, PROG, NEG	ɔ kè í lɔ	o kì í lɔ
3.SG, PROG, NEG	kè í lɔ	kì í lɔ
1.PL, PROG, NEG	a kè í lɔ	a kì í lɔ
2.PL, PROG, NEG	ĩ kè í lɔ	ɛ kì í lɔ
3.PL, PROG, NEG	ã kè í lɔ	w̃ɔ̃ kì í lɔ
1.SG, PROG, FUT	mɛ̀ ɛ lɔ	n̄ ó máa lɔ
2.SG, PROG, FUT	ɔ̀ ɛ lɔ	o ó máa lɔ
3.SG, PROG, FUT	ɛ́ ɛ lɔ	jóò máa lɔ
1.PL, PROG, FUT	à ɛ lɔ	a ó máa lɔ
2.PL, PROG, FUT	ĩ̀ ɛ lɔ	ɛ ó máa lɔ
3.PL, PROG, FUT	ã̀ ɛ lɔ	w̃ɔ̃́ ó máa lɔ
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ ɛ lɔ	ŋ̄ kò·nĩ́ĩ́ máa lɔ
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ ɛ lɔ	o kò nĩ́ĩ́ máa lɔ
3.SG, PROG, FUT, NEG	kè nĩ́ ɛ lɔ	kò nĩ́ĩ́ máa lɔ
1.PL, PROG, FUT, NEG	a kè nĩ́ ɛ lɔ	a kò nĩ́ĩ́ máa lɔ
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ ɛ lɔ	ɛ kò nĩ́ĩ́ máa lɔ
3.PL, PROG, FUT, NEG	ã kè nĩ́ ɛ lɔ	w̃ɔ̃ kò nĩ́ĩ́ máa lɔ

	Mid Tone/ATR se / ʃe (hurt / implicate)	
Object Enclitic + auxes	**MB**	**SY**
1.SG	adé se mĩ́	adé ʃe mĩ́
2.SG	adé se ɔ́	adé ʃe ɛ́
3.SG	adé seé	adé ʃ(e) é
1.PL	adé se á	adé ʃe wá
2.PL	adé se ĩ́	adé ʃe ɲĩ́
3.PL	adé se ã	adé ʃe w̃ɔ̃
*This mid-high sequence on the vowel in the verb is a mid-high contour on a single vowel througout this appendix		
1.SG, NEG	adé kè se mĩ́	adé kò ʃe mĩ́
2.SG, NEG	adé kè se ɔ́	adé kò ʃe ɛ́
3.SG, NEG	adé kè sě	adé kò ʃ(e) é
1.PL, NEG	adé kè se á	adé kò ʃe wá
2.PL, NEG	adé kè se ĩ́	adé kò ʃe ɲĩ́
3.PL, NEG	adé kè se ã	adé kò ʃe w̃ɔ̃
1.SG, FUT	adé éè se mĩ́	adé jóò ʃe mĩ́
2.SG, FUT	adé éè se ɔ́	adé jóò ʃe ɛ́
3.SG, FUT	adé éè sě	adé jóò ʃ(e) é
1.PL, FUT	adé éè se á	adé jóò ʃe wá
2.PL, FUT	adé éè se ĩ́	adé jóò ʃe ɲĩ́
3.PL, FUT	adé éè se ã	adé jóò ʃe w̃ɔ̃
1.SG, NEG, FUT	adé kè nĩ́ e se mĩ́	adé kò nĩ́ĩ́ máa ʃe mĩ́
2.SG, NEG, FUT	adé kè nĩ́ e se ɔ́	adé kò nĩ́ĩ́ máa ʃe ɛ́
3.SG, NEG, FUT	adé kè nĩ́ e seé	adé kò nĩ́ĩ́ máa ʃ(e) é
1.PL, NEG, FUT	adé kè nĩ́ e se á	adé kò nĩ́ĩ́ máa ʃe wá
2.PL, NEG, FUT	adé kè nĩ́ e se ĩ́	adé kò nĩ́ĩ́ máa ʃe ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ e se ã	adé kò nĩ́ĩ́ máa ʃe w̃ɔ̃

	Mid Tone/ATR se / ʃe (hurt / implicate)	
Object Enclitic + auxes	**MB**	**SY**
1.SG, PROG	adé í se mĩ́	adé ń ʃe mĩ́
2.SG, PROG	adé í se ɔ́	adé ń ʃe ɛ́
3.SG, PROG	adé í seé	adé ń ʃ(e) é
1.PL, PROG	adé í se á	adé ń ʃe wá
2.PL, PROG	adé í se ĩ́	adé ń ʃe ɲĩ́
3.PL, PROG	adé í se ã	adé ń ʃe w̃ɔ̃́
1.SG, PROG, NEG	adé kè í se mĩ́	adé kì í ʃe mĩ́
2.SG, PROG, NEG	adé kè í se ɔ́	adé kì í ʃe ɛ́
3.SG, PROG, NEG	adé kè í seé	adé kì í ʃ(e) é
1.PL, PROG, NEG	adé kè í se á	adé kì í ʃe wá
2.PL, PROG, NEG	adé kè í se ĩ́	adé kì í ʃe ɲĩ́
3.PL, PROG, NEG	adé kè í se ã	adé kì í ʃe w̃ɔ̃́
1.SG, PROG, FUT	adé éè e se mĩ́	adé jóò máa ʃe mĩ́
2.SG, PROG, FUT	adé éè e se ɔ́	adé jóò máa ʃe ɛ́
3.SG, PROG, FUT	adé éè e seé	adé jóò máa ʃ(e) é
1.PL, PROG, FUT	adé éè e se á	adé jóò máa ʃe wá
2.PL, PROG, FUT	adé éè e se ĩ́	adé jóò máa ʃe ɲĩ́
3.PL, PROG, FUT	adé éè e se ã	adé jóò máa ʃe w̃ɔ̃́
1.SG, PROG, FUT, NEG	adé kè nĩ́ e se mĩ́	adé kò nĩ́ĩ máa ʃe mĩ́
2.SG, PROG, FUT, NEG	adé kè nĩ́ e se ɔ́	adé kò nĩ́ĩ máa ʃe ɛ́
3.SG, PROG, FUT, NEG	adé kè nĩ́ e seé	adé kò nĩ́ĩ máa ʃ(e) é
1.PL, PROG, FUT, NEG	adé kè nĩ́ e se á	adé kò nĩ́ĩ máa ʃe wá
2.PL, PROG, FUT, NEG	adé kè nĩ́ e se ĩ́	adé kò nĩ́ĩ máa ʃe ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ e se ã	adé kò nĩ́ĩ máa ʃe w̃ɔ̃́

	Mid Tone/RTR rɔ (to feed (greedily like a baby))	
Object Enclitic + auxes	**MB**	**SY**
1.SG	adé rɔ mĩ́	adé rɔ mĩ́
2.SG	adé rɔ ɔ́	adé rɔ ɛ́
3.SG	adé rɔɔ́	adé rɔ ɔ́
1.PL	adé rɔ á	adé rɔ wá
2.PL	adé rɔ ĩ́	adé rɔ ɲĩ́
3.PL	adé rɔ ã	adé rɔ w̃ɔ̃
1.SG, NEG	adé kɛ̀ rɔ mĩ́	adé kò rɔ mĩ́
2.SG, NEG	adé kɛ̀ rɔ ɔ́	adé kò rɔ ɛ́
3.SG, NEG	adé kɛ̀ rɔ̌	*adé kò rɔ ɔ́
1.PL, NEG	adé kɛ̀ rɔ á	adé kò rɔ wá
2.PL, NEG	adé kɛ̀ rɔ ĩ́	adé kò rɔ ɲĩ́
3.PL, NEG	adé kɛ̀ rɔ ã	adé kò rɔ w̃ɔ̃
*The vowel in the verb rɔ seems like it might be optional in SY (consultant unsure)		
1.SG, FUT	adé ɛ́ɛ̀ rɔ mĩ́	adé jóò rɔ mĩ́
2.SG, FUT	adé ɛ́ɛ̀ rɔ ɔ́	adé jóò rɔ ɛ́
3.SG, FUT	adé ɛ́ɛ̀ rɔ̌	*adé jóò rɔ ɔ́
1.PL, FUT	adé ɛ́ɛ̀ rɔ á	adé jóò rɔ wá
2.PL, FUT	adé ɛ́ɛ̀ rɔ ĩ́	adé jóò rɔ ɲĩ́
3.PL, FUT	adé ɛ́ɛ̀ rɔ ã	adé jóò rɔ w̃ɔ̃
*The vowel in the verb rɔ seems like it might be optional in SY (consultant unsure)		
1.SG, NEG, FUT	adé kè nĩ́ rɔ mĩ́	adé kò nĩ́ĩ́ rɔ mĩ́
2.SG, NEG, FUT	adé kè nĩ́ rɔ ɔ́	adé kò nĩ́ĩ́ rɔ ɛ́
3.SG, NEG, FUT	adé kè nĩ́ rɔɔ́	*adé kò nĩ́ĩ́ rɔ ɔ́
1.PL, NEG, FUT	adé kè nĩ́ rɔ á	adé kò nĩ́ĩ́ rɔ wá
2.PL, NEG, FUT	adé kè nĩ́ rɔ ĩ́	adé kò nĩ́ĩ́ rɔ ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ rɔ ã	adé kò nĩ́ĩ́ rɔ w̃ɔ̃
*The vowel in the verb rɔ seems like it is obligatory in SY (but consultant unsure)		

	Mid Tone/RTR to feed (greedily like a baby))	
Object Enclitic + auxes	**MB**	**SY**
1.SG, PROG	adé í rɔ mĩ́	adé ń rɔ mĩ́
2.SG, PROG	adé í rɔ ɔ́	adé ń rɔ ɛ́
3.SG, PROG	adé í rɔɔ́	adé ń rɔ ɔ́
1.PL, PROG	adé í rɔ á	adé ń rɔ wá
2.PL, PROG	adé í rɔ ĩ́	adé ń rɔ ɲĩ́
3.PL, PROG	adé í rɔ ã	adé ń rɔ w̃ɔ̃
1.SG, PROG, NEG	adé kè í rɔ mĩ́	adé kì í rɔ mĩ́
2.SG, PROG, NEG	adé kè í rɔ ɔ́	adé kì í rɔ ɛ́
3.SG, PROG, NEG	adé kè í rɔɔ́	adé kì í r(ɔ) ɔ́
1.PL, PROG, NEG	adé kè í rɔ á	adé kì í rɔ wá
2.PL, PROG, NEG	adé kè í rɔ ĩ́	adé kì í rɔ ɲĩ́
3.PL, PROG, NEG	adé kè í rɔ ã	adé kì í rɔ w̃ɔ̃
1.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔ mĩ́	adé jóò máa rɔ mĩ́
2.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔ ɔ́	adé jóò máa rɔ ɛ́
3.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔɔ́	adé jóò máa r(ɔ) ɔ́
1.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔ á	adé jóò máa rɔ wá
2.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔ ĩ́	adé jóò máa rɔ ɲĩ́
3.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ rɔ ã	adé jóò máa rɔ w̃ɔ̃
1.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔ mĩ́	adé kò nĩĩ́ máa rɔ mĩ́
2.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔ ɔ́	adé kò nĩĩ́ máa rɔ ɛ́
3.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔɔ́	*adé kò nĩĩ́ máa r(ɔ) ɔ́
1.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔ á	adé kò nĩĩ́ máa rɔ wá
2.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔ ĩ́	adé kò nĩĩ́ máa rɔ ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ rɔ ã	adé kò nĩĩ́ máa rɔ w̃ɔ̃
*Mid tone on verb rɔ only present in careful speech in SY		

	Low Tone/ATR fò (jump)	
Subject Proclitic + auxes	MB	SY
1.SG	mě fò / mĩ̌ fò	mo fò
2.SG	ɔ̌ fò	o fò
3.SG	é fò	ó fò
1.PL	ǎ fò	a fò
2.PL	ĩ̌ fò	ɛ fò
3.PL	ã̌ fò	w̃ɔ̃́ fò
1.SG, NEG	mĩ kè fò	ŋ̄ kò fò
2.SG, NEG	ɔ kè fò	o kò fò
3.SG, NEG	kè fò	kò fò
1.PL, NEG	a kè fò	a kò fò
2.PL, NEG	ĩ kè fò	ɛ kò fò
3.PL, NEG	ã kè fò	w̃ɔ̃ kò fò
1.SG, FUT	mè è fò	n̄ ó fò
2.SG, FUT	ɔ̀ è fò	o ó fò
3.SG, FUT	é è fò	ó máa fò
1.PL, FUT	à è fò	a ó fò
2.PL, FUT	ĩ̀ è fò	ɛ ó fò
3.PL, FUT	ã̀ è fò	w̃ɔ̃́ ó fò
1.SG, NEG, FUT	mĩ kè è fò	ŋ̄ kò nĩ́ĩ́ fò
2.SG, NEG, FUT	ɔ kè è fò	o kò nĩ́ĩ́ fò
3.SG, NEG, FUT	kè è fò	kò nĩ́ĩ́ fò
1.PL, NEG, FUT	a kè è fò	a kò nĩ́ĩ́ fò
2.PL, NEG, FUT	ĩ kè è fò	ɛ kò nĩ́ĩ́ fò
3.PL, NEG, FUT	ã kè è fò	w̃ɔ̃ kò nĩ́ĩ́ fò

	Low Tone/ATR rò (think)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG, PROG	mĩ̀ ĩ́ fò	mo ń fò
2.SG, PROG	ɔ̀ í fò	o ń fò
3.SG, PROG	í í fò	ó ń fò
1.PL, PROG	à í fò	a ń fò
2.PL, PROG	ĩ̀ ĩ́ fò	ɛ ń fò
3.PL, PROG	ã̀ ĩ́ fò	w̃ɔ̃́ ń fò
* The above paradigm can have a habitual or progressive reading		
1.SG, PROG, NEG	mĩ kè í fò	ŋ̄ kì í fò
2.SG, PROG, NEG	ɔ kè í fò	o kì í fò
3.SG, PROG, NEG	kè í fò	kì í fò
1.PL, PROG, NEG	a kè í fò	a kì í fò
2.PL, PROG, NEG	ĩ kè í fò	ɛ kì í fò
3.PL, PROG, NEG	ã kè í fò	w̃ɔ̃ kì í fò
* The above paradigm can have only a habitual reading (no progressive reading available)		
1.SG, PROG, FUT	mè e fò	n̄ ó máa fò
2.SG, PROG, FUT	ɔ̀ e fò	o ó máa fò
3.SG, PROG, FUT	é e fò	jóò máa fò
1.PL, PROG, FUT	à e fò	a o máa fò
2.PL, PROG, FUT	ĩ̀ e fò	ɛ ó máa fò
3.PL, PROG, FUT	ã̀ e fò	w̃ɔ̃́ ó máa fò
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ e fò	ŋ̄ kò nĩ́ máa fò
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ e fò	o kò nĩ́ máa fò
3.SG, PROG, FUT, NEG	kè nĩ́ e fò	kò nĩ́ máa fò
1.PL, PROG, FUT, NEG	a kè nĩ́ e fò	a kò nĩ́ máa fò
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ e fò	ɛ kò nĩ́ máa fò
3.PL, PROG, FUT, NEG	ã ke nĩ́ e fò	w̃ɔ̃ kò nĩ́ máa fò

	Low Tone/RTR wɛ̀ (swim)	
Subject Proclitic + auxes	**MB**	**SY**
1.SG	mɛ̌ wɛ̀ / mĩ̌ wɛ̀	mo wɛ̀
2.SG	ɔ̌ wɛ̀	o wɛ̀
3.SG	ɛ́ wɛ̀	ó wɛ̀
1.PL	ǎ wɛ̀	a wɛ̀
2.PL	ĩ̌ wɛ̀	ɛ wɛ̀
3.PL	ã̌ wɛ̀	w̃ɔ̃ wɛ̀
1.SG, NEG	mĩ kɛ̀ wɛ̀	ŋ̄ kò wɛ̀
2.SG, NEG	ɔ kɛ̀ wɛ̀	o kò wɛ̀
3.SG, NEG	kɛ̀ wɛ̀	kò wɛ̀
1.PL, NEG	a kɛ̀ wɛ̀	a kò wɛ̀
2.PL, NEG	ĩ kɛ̀ wɛ̀	ɛ kò wɛ̀
3.PL, NEG	ã kɛ wɛ̀	w̃ɔ̃ kò wɛ̀
1.SG, FUT	mɛ̀ ɛ̀ wɛ̀	n̄ ó wɛ̀
2.SG, FUT	ɔ̀ ɛ̀ wɛ̀	o ó wɛ̀
3.SG, FUT	ɛ́ ɛ̀ wɛ̀	ó máa wɛ̀
1.PL, FUT	à ɛ̀ wɛ̀	a ó wɛ̀
2.PL, FUT	ĩ̀ ɛ̀ wɛ̀	ɛ ó wɛ̀
3.PL, FUT	ã̀ ɛ̀ wɛ̀	w̃ɔ̃ ó wɛ̀
1.SG, NEG, FUT	mĩ kɛ̀ ɛ̀ wɛ̀	ŋ̄ kò nĩ́ĩ́ wɛ̀
2.SG, NEG, FUT	ɔ kɛ̀ ɛ̀ wɛ̀	o kò nĩ́ĩ́ wɛ̀
3.SG, NEG, FUT	kɛ̀ ɛ̀ wɛ̀	kò nĩ́ĩ́ wɛ̀
1.PL, NEG, FUT	a kɛ̀ ɛ̀ wɛ̀	a kò nĩ́ĩ́ wɛ̀
2.PL, NEG, FUT	ĩ kɛ̀ ɛ̀ wɛ̀	ɛ kò nĩ́ĩ́ wɛ̀
3.PL, NEG, FUT	ã kɛ̀ ɛ̀ wɛ̀	w̃ɔ̃ kò nĩ́ĩ́ wɛ̀

*Note that in MB, nĩĩ can also be used as the FUT marker as is seen below:

1.SG, NEG, FUT	mĩ kè nĩ́ĩ́ wɛ̀
2.SG, NEG, FUT	ɔ kè nĩ́ĩ́ wɛ̀
3.SG, NEG, FUT	kè nĩ́ĩ́ wɛ̀
1.PL, NEG, FUT	a kè nĩ́ĩ́ wɛ̀
2.PL, NEG, FUT	ĩ kè nĩ́ĩ́ wɛ̀
3.PL, NEG, FUT	ã kè nĩ́ĩ́ wɛ̀

	Low Tone/RTR wɛ̀ (swim)	
Subject Proclitic + auxes	MB	SY
1.SG, PROG	mĩ̀ ĩ́ wɛ̀	mo ń wɛ̀
2.SG, PROG	ɔ̀ í wɛ̀	o ń wɛ̀
3.SG, PROG	í í wɛ̀	ó ń wɛ̀
1.PL, PROG	à í wɛ̀	a ń wɛ̀
2.PL, PROG	ĩ̀ ĩ́ wɛ̀	ɛ ń wɛ̀
3.PL, PROG	ã̀ ĩ́ wɛ̀	w̃ɔ̃́ ń wɛ̀
1.SG, PROG, NEG	mĩ kè í wɛ̀	ŋ̄ kì í wɛ̀
2.SG, PROG, NEG	ɔ kè í wɛ̀	o kì í wɛ̀
3.SG, PROG, NEG	kè í wɛ̀	kì í wɛ̀
1.PL, PROG, NEG	a kè í wɛ̀	a kì í wɛ̀
2.PL, PROG, NEG	ĩ kè í wɛ̀	ɛ kì í wɛ̀
3.PL, PROG, NEG	ã kè í wɛ̀	w̃ɔ̃ kì í wɛ̀
1.SG, PROG, FUT	mɛ̀ ɛ wɛ̀	n̄ ó máa wɛ̀
2.SG, PROG, FUT	ɔ̀ ɛ wɛ̀	o ó máa wɛ̀
3.SG, PROG, FUT	ɛ́ ɛ wɛ̀	jóò máa wɛ̀
1.PL, PROG, FUT	à ɛ wɛ̀	a ó máa wɛ̀
2.PL, PROG, FUT	ĩ̀ ɛ wɛ̀	ɛ ó máa wɛ̀
3.PL, PROG, FUT	ã̀ ɛ wɛ̀	w̃ɔ̃́ ó máa wɛ̀
1.SG, PROG, FUT, NEG	mĩ kè nĩ́ ɛ wɛ̀	ŋ̄ kò nĩ́ĩ́ máa wɛ̀
2.SG, PROG, FUT, NEG	ɔ kè nĩ́ ɛ wɛ̀	o kò nĩ́ĩ́ máa wɛ̀
3.SG, PROG, FUT, NEG	kè nĩ́ ɛ wɛ̀	kò nĩ́ĩ́ máa wɛ̀
1.PL, PROG, FUT, NEG	a kè nĩ́ ɛ wɛ̀	a kò nĩ́ĩ́ máa wɛ̀
2.PL, PROG, FUT, NEG	ĩ kè nĩ́ ɛ wɛ̀	ɛ kò nĩ́ĩ́ máa wɛ̀
3.PL, PROG, FUT, NEG	ã ke nĩ́ ɛ wɛ̀	w̃ɔ̃ kò nĩ́ĩ́ máa wɛ̀

	Low Tone/ATR k͡pè (call)	
Object Enclitic + auxes	MB	SY
1.SG	adé k͡pè mĩ́	adé k͡pè mĩ́
2.SG	adé k͡pè ɔ́	adé k͡pè ɛ
3.SG	*adé k͡pē	adé k͡pè é
1.PL	adé k͡pè á	adé k͡pè wá
2.PL	adé k͡pè ĩ́	adé k͡pè ɲĩ́
3.PL	adé k͡pè ã	adé k͡pè w̃ɔ̃
*Derived mid-tone on vowel in k͡pē in MB is lower than mid tone but higher than low tone		
1.SG, NEG	adé kè k͡pè mĩ́	adé kò k͡pè mĩ́
2.SG, NEG	adé kè k͡pè ɔ́	adé kò k͡pè ɛ́
3.SG, NEG	adé kè k͡pē	adé kò k͡pè é
1.PL, NEG	adé kè k͡pè á	adé kò k͡pè wá
2.PL, NEG	adé kè k͡pè ĩ́	adé kò k͡pè ɲĩ́
3.PL, NEG	adé kè k͡pè ã	adé kò k͡pè w̃ɔ̃
1.SG, FUT	adé éè k͡pè mĩ́	adé jóò k͡pè mĩ́
2.SG, FUT	adé éè k͡pè ɔ́	adé jóò k͡pè ɛ́
3.SG, FUT	adé éè k͡pē	adé jóò k͡pè é
1.PL, FUT	adé éè k͡pè á	adé jóò k͡pè wá
2.PL, FUT	adé éè k͡pè ĩ́	adé jóò k͡pè ɲĩ́
3.PL, FUT	adé éè k͡pè ã	adé jóò k͡pè w̃ɔ̃
1.SG, NEG, FUT	adé kè nĩ́ e k͡pè mĩ́	adé kò nĩ́ĩ máa k͡pè mĩ́
2.SG, NEG, FUT	adé kè nĩ́ e k͡pè ɔ́	adé kò nĩ́ĩ máa k͡pè ɛ́
3.SG, NEG, FUT	adé kè nĩ́ e k͡pē	adé kò nĩ́ĩ máa k͡pè é
1.PL, NEG, FUT	adé kè nĩ́ e k͡pè á	adé kò nĩ́ĩ máa k͡pè wá
2.PL, NEG, FUT	adé kè nĩ́ e k͡pè ĩ́	adé kò nĩ́ĩ máa k͡pè ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ e k͡pè ã	adé kò nĩ́ĩ máa k͡pè w̃ɔ̃

Object Enclitic + auxes	Low Tone/ATR k͡pè (call)	
	MB	SY
1.SG, PROG	adé í k͡pè mĩ́	adé ń k͡pè mĩ́
2.SG, PROG	adé í k͡pè ɔ́	adé ń k͡pè ɛ́
3.SG, PROG	adé í k͡pē	adé ń k͡pè é
1.PL, PROG	adé í k͡pè á	adé ń k͡pè wá
2.PL, PROG	adé í k͡pè ĩ́	adé ń k͡pè ɲĩ́
3.PL, PROG	adé í k͡pè ã	adé ń k͡pè w̃ɔ̃
1.SG, PROG, NEG	adé kè í k͡pè mĩ́	adé kì í k͡pè mĩ́
2.SG, PROG, NEG	adé kè í k͡pè ɔ́	adé kì í k͡pè ɛ́
3.SG, PROG, NEG	adé kè í k͡pē	adé kì í k͡pè é
1.PL, PROG, NEG	adé kè í k͡pè á	adé kì í k͡pè wá
2.PL, PROG, NEG	adé kè í k͡pè ĩ́	adé kì í k͡pè ɲĩ́
3.PL, PROG, NEG	adé kè í k͡pè ã	adé kì í k͡pè w̃ɔ̃
1.SG, PROG, FUT	adé éè e k͡pè mĩ́	adé jóò máa k͡pè mĩ́
2.SG, PROG, FUT	adé éè e k͡pè ɔ́	adé jóò máa k͡pè ɛ́
3.SG, PROG, FUT	adé éè e k͡pē	adé jóò máa k͡pè é
1.PL, PROG, FUT	adé éè e k͡pè á	adé jóò máa k͡pè wá
2.PL, PROG, FUT	adé éè e k͡pè ĩ́	adé jóò máa k͡pè ɲĩ́
3.PL, PROG, FUT	adé éè e k͡pè ã	adé jóò máa k͡pè w̃ɔ̃
1.SG, PROG, FUT, NEG	adé kè nĩ́ e k͡pè mĩ́	adé kò nĩĩ́ máa k͡pè mĩ́
2.SG, PROG, FUT, NEG	adé kè nĩ́ e k͡pè ɔ́	adé kò nĩĩ́ máa k͡pè ɛ́
3.SG, PROG, FUT, NEG	adé kè nĩ́ e k͡pē	adé kò nĩĩ́ máa k͡pè é
1.PL, PROG, FUT, NEG	adé kè nĩ́ e k͡pè á	adé kò nĩĩ́ máa k͡pè wá
2.PL, PROG, FUT, NEG	adé kè nĩ́ e k͡pè ĩ́	adé kò nĩĩ́ máa k͡pè ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ e k͡pè ã	adé kò nĩĩ́ máa k͡pè w̃ɔ̃

	Low Tone/RTR kɔ̀ (reject)	
Object Enclitic + auxes	**MB**	**SY**
1.SG	adé kɔ̀ mĩ́	adé kɔ̀ mĩ́
2.SG	adé kɔ̀ ɔ́	adé kɔ̀ ɛ́
3.SG	adé kɔ̄	adé kɔ̀ ɔ́
1.PL	adé kɔ̀ á	adé kɔ̀ wá
2.PL	adé kɔ̀ ĩ́	adé kɔ̀ ɲĩ́
3.PL	adé kɔ̀ ã	adé kɔ̀ w̃ɔ̃
1.SG, NEG	adé kɛ̀ kɔ̀ mĩ́	adé kò kɔ̀ mĩ́
2.SG, NEG	adé kɛ̀ kɔ̀ ɔ́	adé kò kɔ̀ ɛ́
3.SG, NEG	adé kɛ̀ kɔ̄	adé kò kɔ̀ ɔ́
1.PL, NEG	adé kɛ̀ kɔ̀ á	adé kò kɔ̀ wá
2.PL, NEG	adé kɛ̀ kɔ̀ ĩ́	adé kò kɔ̀ ɲĩ́
3.PL, NEG	adé kɛ̀ kɔ̀ ã	adé kò kɔ̀ w̃ɔ̃
1.SG, FUT	adé ɛ́ɛ̀ kɔ̀ mĩ́	adé jóò kɔ̀ mĩ́
2.SG, FUT	adé ɛ́ɛ̀ kɔ̀ ɔ́	adé jóò kɔ̀ ɛ́
3.SG, FUT	adé ɛ́ɛ̀ kɔ̄	adé jóò kɔ̀ ɔ́
1.PL, FUT	adé ɛ́ɛ̀ kɔ̀ á	adé jóò kɔ̀ wá
2.PL, FUT	adé ɛ́ɛ̀ kɔ̀ ĩ́	adé jóò kɔ̀ ɲĩ́
3.PL, FUT	adé ɛ́ɛ̀ kɔ̀ ã	adé jóò kɔ̀ w̃ɔ̃
1.SG, NEG, FUT	adé kè nĩ́ kɔ̀ mĩ́	adé kò nĩ́ kɔ̀ mĩ́
2.SG, NEG, FUT	adé kè nĩ́ kɔ̀ ɔ́	adé kò nĩ́ kɔ̀ ɛ́
3.SG, NEG, FUT	adé kè nĩ́ kɔ̄	adé kò nĩ́ kɔ̀ ɔ́
1.PL, NEG, FUT	adé kè nĩ́ kɔ̀ á	adé kò nĩ́ kɔ̀ wá
2.PL, NEG, FUT	adé kè nĩ́ kɔ̀ ĩ́	adé kò nĩ́ kɔ̀ ɲĩ́
3.PL, NEG, FUT	adé kè nĩ́ kɔ̀ ã	adé kò nĩ́ kɔ̀ w̃ɔ̃

	Low Tone/RTR kɔ̀ (reject)	
Object Enclitic + auxes	**MB**	**SY**
1.SG, PROG	adé í kɔ̀ mĩ́	adé ŋ́ kɔ̀ mĩ́
2.SG, PROG	adé í kɔ̀ ɔ́	adé ŋ́ kɔ̀ ɛ́
3.SG, PROG	adé í kɔ̄	adé ŋ́ kɔ̀ ɔ́
1.PL, PROG	adé í kɔ̀ á	adé ŋ́ kɔ̀ wá
2.PL, PROG	adé í kɔ̀ ĩ́	adé ŋ́ kɔ̀ ɲĩ́
3.PL, PROG	adé í kɔ̀ ã	adé ŋ́ kɔ̀ w̃ɔ̃
1.SG, PROG, NEG	adé kè í kɔ̀ mĩ́	adé kì í kɔ̀ mĩ́
2.SG, PROG, NEG	adé kè í kɔ̀ ɔ́	adé kì í kɔ̀ ɛ́
3.SG, PROG, NEG	adé kè í kɔ̄	adé kì í kɔ̀ ɔ́
1.PL, PROG, NEG	adé kè í kɔ̀ á	adé kì í kɔ̀ wá
2.PL, PROG, NEG	adé kè í kɔ̀ ĩ́	adé kì í kɔ̀ ɲĩ́
3.PL, PROG, NEG	adé kè í kɔ̀ w̃ɔ̃	adé kì í kɔ̀ w̃ɔ̃
1.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̀ mĩ́	adé jóò máa kɔ̀ mĩ́
2.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̀ ɔ́	adé jóò máa kɔ̀ ɛ́
3.SG, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̄	adé jóò máa kɔ̀ ɔ́
1.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̀ á	adé jóò máa kɔ̀ wá
2.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̀ ĩ́	adé jóò máa kɔ̀ ɲĩ́
3.PL, PROG, FUT	adé ɛ́ɛ̀ ɛ kɔ̀ ã	adé jóò máa kɔ̀ w̃ɔ̃
1.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̀ mĩ́	adé kò nĩĩ́ máa kɔ̀ mĩ́
2.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̀ ɔ́	adé kò nĩĩ́ máa kɔ̀ ɛ́
3.SG, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̄	adé kò nĩĩ́ máa kɔ̀ ɔ́
1.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̀ á	adé kò nĩĩ́ máa kɔ̀ wá
2.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̀ ĩ́	adé kò nĩĩ́ máa kɔ̀ ɲĩ́
3.PL, PROG, FUT, NEG	adé kè nĩ́ ɛ kɔ̀ ã	adé kò nĩĩ́ máa kɔ̀ w̃ɔ̃