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Ẹnà: An iterative affixation game in Yorùbá

Avery Ozburn, Department of Language Studies, University of Toronto Mississauga, CA, avery.ozburn@utoronto.ca

Samuel Akinbo, Department of Linguistics, University of Toronto, CA, samuel.akinbo@utoronto.ca

Murray Schellenberg, Department of Linguistics, University of British Columbia, CA, murray.schellenberg@ubc.ca

This paper presents novel data from a Yorùbá language game called Ẹnà, an iterative affixation game that typically involves copying of vowels and tones onto a dummy syllable. Yorùbá VV sequences are all analyzed as disyllabic in existing literature, yet we find that Ẹnà treats them differently depending on their provenance: underlying VV sequences, those created from pronouns, and those derived through floating tone are treated as a single locus of insertion, as variably are those that share tone, while VV sequences derived through consonant deletion or compounding are generally treated as two separate loci. We argue that the difference indicates that Yorùbá in fact has long vowels, contrary to previous assumptions. We analyze the pattern in Optimality Theory, following Krämer & Vogt's (2018) analysis of reduplicative language games but adding a reduplicative template and back-copying, and we consider the implications of the pattern and analysis to the study of Yorùbá and the study of language games.

1 Introduction

It is widely thought that language games provide insight into the phonology of natural language; speakers manipulate words in ways that can show us properties of the mental representations of the sounds (Hombert 1973; 1986; Bagemihl 1995; Botne & Davis 2000). In this paper, we raise puzzles posed by a language game in Yorùbá, in which the game forms of certain types of sequences appear to be inconsistent with the general assumptions about the phonology of Yorùbá, particularly the analysis that all VV sequences consist of two syllables (Orie & Pulleyblank 2002). The game, known as Ẹnà, involves copying vowels and tones onto a dummy syllable with onset [g]; it has previously been described only in little detail (Iṣọla 1982) and has never been analyzed.

Our novel data shows that some VV sequences are not treated as separate syllables in Ẹnà; pronouns, underlying VV in loans, and VV derived from floating tone are treated as a single unit, as variably are VV sequences with identical tone, while non-pronominal VV sequences with non-identical tone are treated as separate loci for dummy syllable insertion. We argue that this pattern is based on distinct structures between types of VV sequences, those derived from compounds and vowel deletion compared to those from other sources, combined with a tendency for VV sequences with identical tone to be reduced to V in colloquial speech. We propose an analysis that derives both the normal (non-ludling) language structures required under this account and the game forms. For the game, we posit that Ẹnà is derived through the addition of a game morpheme /-gV^{red}/, but in order to account for the differences between types of VV sequences, we posit that those that behave as a single locus of insertion in Ẹnà are in fact long vowels in normal-language Yorùbá. We analyze the fact that they do not appear as long in the game as being due to a combination of a CV reduplicative template and back-copying. Ẹnà, with the repeated insertion of a dummy syllable with a constant consonant but a copied vowel, is a common type of language game cross-linguistically, but one that has received relatively little theoretical attention. The few existing analyses posit either an epenthesis approach or a reduplicative vowel. As in most reported cases (Vaux 2011), the consonant inserted in Ẹnà and similar games is not the normal epenthetic consonant in the language. Ẹnà appears different on the surface from other reported cases in that, from the surface behaviour, it appears that it does not actually always copy a vowel, but rather only does so when necessary. According to our account, however, this appearance is deceptive, in that there is copying in all cases, but a prohibition on long vowels in the game makes it appear otherwise. There are no long vowels on the surface in the game, so it may seem odd to posit them, but an account that tries to derive the patterns otherwise requires many assumptions and stipulations, whereas emergence of the unmarked, reduplicative templates, and back-copying are well-established in reduplication. Our account provides a more satisfactory way of understanding the Ẹnà pattern.

Through the novel data presented here, we offer a contribution to the phonological literature on language games, as well as to the understanding of Yorùbá phonology, particularly of the representation of VV sequences and their vocalic correspondents of syllabic nasals, which copy in Ẹnà as [ũ] or [u] in free variation. The behaviour of VV sequences, including the difference between different sources of VV as well as the behaviour of same-tone VV, raises crucial questions regarding the representation of VV sequences in Yorùbá. This paper is structured as follows. Section 2 provides relevant background on Yorùbá phonology and language games. Section 3 describes our novel data on the language game, while Section 4 shows our proposal for how it should be analyzed. Section 5 provides a formal analysis, Section 6 discusses, while Section 7 concludes.

2 Background

2.1 Background on Yorùbá

2.1.1 Inventory and phonotactics

Yorùbá is a Volta-Niger language spoken in West Africa and most prominently Southwestern Nigeria by approximately 50 million people (Eberhard et al. 2022). While there are many dialects of Yorùbá, this paper is based on Standard Yorùbá, which has the consonant inventory in **Table 1** and the vowel inventory in **Table 2** (Pulleyblank 2009). Yorùbá is a three-tone system, H, M, L, and the syllable structure is (C)V, with no codas or complex onsets allowed (Awobuluyi 1978). The language allows syllabic nasals, which also bear tone, but onsets are not permitted in syllables in which a nasal is the nucleus (Awobuluyi 1978; Akinlabi & Liberman 2000; Pulleyblank 2004). It is also worth noting that words in Standard Yorùbá cannot start with high-back vowels, whether oral or nasal. Segments in parentheses appear on the surface but are not considered contrastive in the language; all others are contrastive.

	Labial	**Alveolar**	**Palatal**	**Velar**	**Labial-velar**	**Glottal**
Nasal	m	(n)		(ŋ)		
Stop	b	t d	ɟ	k g	k͡p g͡b	
Fricative	f	s	ʃ			h
Approximant		l	j		w	
Rhotic		r				

Table 1: Yorùbá consonants (Pulleyblank 2009: 868).

	Oral vowels		Nasal vowels	
	Front	**Back**	**Front**	**Back**
High	i	u	ĩ	ũ
Mid ATR	e	o		
Mid RTR	ɛ	ɔ	ɛ̃	ɔ̃
Low	a		(ã)	

Table 2: Yorùbá vowels (Pulleyblank 2009: 868).

2.1.2 Default vowel

As argued by Pulleyblank (1988a, b), [i] behaves as a default vowel in Yorùbá. Pulleyblank shows evidence that [i] sometimes behaves as exceptional to certain processes, as the only vowel that fails to trigger regressive assimilation and denasalization of [n] to [l]. In a hiatus context with a non-high vowel, the high vowel is often elided (Pulleyblank 1988b). He argues for an underspecification approach, where [i] has no specification at the point where these processes apply.

[i] also behaves as a default epenthetic vowel in Yorùbá loanword epenthesis, although [u] is sometimes epenthesized due to effects of surrounding vowels or consonants (Awobuluyi 1967; Ufomata 1991; Akinlabi 1993). Though loanword epenthesis is known to sometimes involve different vowels than epenthesis in language-internal processes (Uffmann 2006; Hall 2011), the combination of language-internal and loanword evidence supports the idea that [i] has a special default status in Yorùbá.

2.1.3 VV sequences

In Yorùbá, VV sequences are quite frequent, given that the syllable structure is (C)V, allowing vowels to frequently come into contact. An assimilation process means that the vowel quality in VV sequences is always identical, except in some limited cases of [ai] (Awobuluyi 1978). The tone, however, can differ on each V (Orie 2000; Orie & Pulleyblank 2002).

There are a few possible sources of VV sequences in Yorùbá, some examples of which are shown in (1). The 3sg object pronoun in the language is of form V, which means that VV sequences are created in any case of a verb (CV) followed by the pronoun (V); the vowel quality of the pronoun assimilates to that of the verb (Akinlabi & Liberman 2000). Examples are shown in (1a). VV sequences may also be derived through a process of intervocalic consonant deletion (Akinlabi 1992; 1993); examples are shown in (1b).[1] Compounding can also create VV sequences, when

[1] In certain nouns with at least two CV syllables, one of the syllables loses its onset if the onset is /r/ or identical to the onset of the adjacent syllable (Abímbọla & Oyelaran 1975; Akinlabi 1993).

a V-initial word is compounded after any other word, since the language has no codas (Orie & Pulleyblank 2002); examples are shown in (1c). Other VV sequences, particularly in loanwords, can be considered an underlying part of the word, though vowel length is never contrastive (Ufomata 1991). Examples are shown in (1d).

(1) Examples of VV Sequences

a.	ràá	"buy it"	<	/raꜜ "buy" + /μH/ 3sg[2]
	díi	"block it"	<	/dí/ "block" + /μH/ 3sg
	rúu	"steer it"	<	/rú/ "steer" + /μH/ 3sg
b.	èɛ̀kɛ́	"cheek"	<	/èrɛ̀kɛ́/
	eégű	"ancestral spirit"	<	/egűgű/
c.	ɔmɛɛrã	"child of an animal"	<	/ɔmɔ/ "child" + /ɛrã/ "animal"
	owéekpo	"oil money"	<	/owoꜛ "money" + /ekpo/ "oil"
d.	kpáàkì	"park"[3]		
	kɛ́ɛ̀gì	"keg"		

Previous literature has examined VV sequences in Yorùbá, discussing whether these are long vowels or separate syllables (Orie & Pulleyblank 2002). The conclusion in all of the literature is the latter, that all VV sequences in Yorùbá constitute separate syllables, regardless of which type they are. There are a few arguments used for this conclusion. First, in cases of distributive reduplication, Orie & Pulleyblank (2002) argue that the prosody of the VV sequence is problematic if it is tautosyllabic, in that the reduplicant and the base would be part of the same prosodic structure otherwise. Second, it has been argued that vowel length is never contrastive in the language, suggesting no independent need to allow bimoraic syllables (Awobuluyi 1978). As noted by Orie & Pulleyblank (2002), all VV sequences in Yorùbá are derived, aside from a small number of exceptions that are ambiguous. Moreover, similar patterns of vowel assimilation apply when three vowels come together as a result of consonant deletion and/or compounding, meaning that an analysis in which VV sequences were long vowels might have to analyze three levels of vowel length in Yorùbá. Orie & Pulleyblank (2002) also argue that speakers divide strings into moras or individual syllables, thereby not treating VV sequences as units, and that there seems to be slight rearticulation in VV sequences, though they note that more systematic investigation is necessary on both points. Overall, it is generally accepted in the Yorùbá literature from these arguments that all VV sequences are genuine sequences, not long vowels. However, it is worth noting that the majority of these arguments address compounding and consonant deletion, not cases like pronouns and loanwords. Dividing into moras does not preclude a long vowel analysis, and VVV sequences could be two syllables, a long vowel plus a short one. Morphological processes

[2] The 3sg is analyzed as being underlyingly a mora with an H tone.

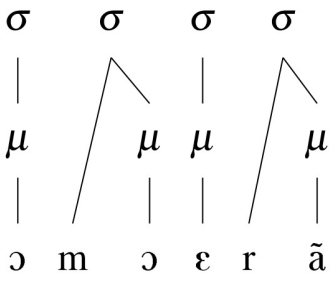
[3] Note that Yorùba does not have /p/; it is replaced by a labial-velar in 'park'.

that are just vowel lengthening suggest that allowing long vowels might be an easier analysis. Overall, there is no clear coherent argument against long vowels in the language besides a desire to avoid them in the representation. This issue will be addressed further in subsequent sections.

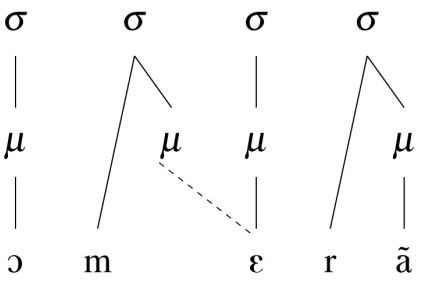
Previous discussions of VV in Yorùbá suggest that, regardless of their provenance, these sequences have identical surface forms, with two syllables (Orie & Pulleyblank 2002). In other words, the literature represents these sequences as having a single vowel, associated to two moras (in separate syllables). In derived VV sequences, where assimilation occurs, this means that one of the original vowels is deleted, followed by linking of the remaining vowel to its mora. For example, in ɔmɛɛrã, from ɔmɔ + ɛrã, the second ɔ of ɔmɔ deletes, then the ɛ attaches to its mora. The diagrams in (2) show the posited underlying and surface forms of this compound, in (a) and (b) respectively.

(2)

(a)



(b)



2.1.4 V syllables

While up until now we have said that Yorùbá syllable structure is (C)V, some literature argues that V alone is not a syllable in Yorùbá (Orie 2000). The defective status of onsetless syllables is shown through a range of evidence (Orie 2000; Orie & Pulleyblank 2002). For example, word-initially, any tone can be associated with CV syllables, but onsetless vowels cannot bear an H tone in the same context, as shown in (3). While there are V prefixes with an M or L tone, H tone prefixes must have an onset, as in (4). Orie (2000) also argues that lack of initial nasal vowels is further evidence for the lack of syllabic status of V. We do not take a strong position on this issue but note that it is unclear whether it being defective means that it is not a syllable at all.

(3) Tones of initial CV and V forms

a.	H	bábà	“barber”	*ígbá	
b.	L	bàbá	“father”	ìgbá	“garden egg”
c.	M	wɔlé	“enter”	igbá	“calabash”

(4) Tone of V-initial prefixes

	M-tone prefix		L-tone prefix		H-tone prefix	
a.	i-kú	“death”	ì-kú	“dying”	kí-kú	“dying”
b.	i-là	“marks”	ì-là	“line”	lí-là	“splitting”

2.2 Background on language games

In this section, we discuss the typology of language games and particularly what is known about games similar to the one we will describe. Bagemihl (1995) notes four categories for how language games are created typologically. These are shown with examples in (5) (chart taken from Ozburn & Schellenberg 2019: 511).

(5) Typology of language games

	Name	Description	Example
a.	Infixing/ affixing	A nonsense affix is added (can be multiple times)	Tigrinya (Bagemihl 1988), -gV affixed to each syllable: bɨt͡ʃa ‘yellow’ → b**ɨgɨ**t͡ʃa**ga**
b.	Templatic	Segments transferred onto a template specific to game words	Amharic (McCarthy 1985), Cs transferred to a C-ay-C-ə-C template: **gɯn** ‘but’ → **g**ay**n**ə**n**
c.	Reversing	The order of some subset of segments/syllables in a word is reversed	Tagalog (Gil 1996), complete reversal of segment order: bayawak ‘iguana’ → kawayab
d.	Replacing	Segments of a certain type are replaced by another segment	Cuna (Sherzer 1976), all vowels replaced with [i]: nuka ‘name’ → n**i**k**i**

The categories are not mutually exclusive. As an example, the English language game Pig Latin involves affixation of a suffix [-ej] and reversal of the word-initial consonant(s) (Barlow 2001), making it a combination of types (a) and (c).

All the categories identified by Bagemihl (1995) are attested in Yorùbá (Iṣọla 1982).[4] Of these types, the one of interest here is infixation/affixation games (5a), in which nonsense material is

[4] A reviewer asks whether all types are productive in Yorùbá. The answer is unclear from the limited existing literature, which has only a couple examples per game type and does not discuss productivity. Our study only investigated a single type of game, which does appear to be productive.

infixed or affixed within the word, often multiple times. Yorùbá Ẹnà is quite similar to a language game described by Bagemihl (1987; 1988) in Tigrinya, in that –gV is inserted after every syllable, with V being a copy of the preceding vowel. For example, bɨt͡ʃa ‘yellow’ in natural language Tigrinya becomes bɨgɨt͡ʃaga in the game. Krämer and Vogt (2018) provide a useful background and typology of this type of language game with numerous examples.

Yu (2008) calls language games of this type iterative infixation ludlings (IIL) and also provides several examples from a wide variety of languages, including *Lingua do Pê* in Brazilian Portuguese, which uses a [-pV] infix, and *hábàʔábà* in Hausa, where the infix form is [-bV]. Iterative infixation ludlings are canonically monosyllabic across languages but may vary in size, segmental content, and inserted position. For example, the argot infix in Colombia Jerigonza is inserted after each syllable but the one in Peruvian Jerigonza is inserted before each syllable (Piñeros 1998), as shown in (6).

(6) Position of insertion in Spanish-based Argot

	Base	**Colombia Jerigonza**	**Peruvian Jerigonza**	
a.	can.ción	càm.**pa**.cióm.**po**	**cha**.càn.**cha**.ción	“song”
b.	pá.ja.ro	pà.**pa**.jà.**pa**.ro.**po**	**cha**.pà.**cha**.jà.**cha**.ró	“bird”

One of the factors that determines an inserted position is the size of adjacent syllables. For example, Colombia Jerigonza examples in (6) show that the ludling infixes are inserted after the syllable, regardless of whether the preceding syllable has a coda or not. However, this is not the case in Costa Rican Jerigonza (Piñeros 1998), Akan (Adomako 2018) and Tigrinya (Bagemihl 1988). As shown in (7), these ludling infixes separate the rest of the syllable from the coda when the preceding syllable has a coda. In this case, the insertion site or anchor point is each vowel, rather than the end of each syllable. As Yorùbá does not have codas, the options are essentially equivalent for this language.

(7) Syllable structure and position of insertion

		Base	Argot form	
a.	Costa Rican Jerigonza	li.bro	li.**pi**.bro.**po**	“book”
		puer.ta	pue.**per**.ta.**pa**	“door”
b.	Akan	rì.ɥì.ɥɛ́n	rì.**gì**.ɥì.**gì**.ɥɛ́**gɛ́**n	“watching”
		jɛ́ŋ.kɔ́	jɛ́.**gɛ́**ŋ.kɔ́.**gɔ́**	“let’s also go”
c.	Tigrinya	ʔin.tay	ʔi.**gi**n.ta.**ga**y	“what”
		k’ar.ma	k’a.**gar**.ma.**ga**	“gnat”

Another property that can determine the position is stress. As shown in (8), the argot infix in Língua do Pê targets every syllable as an anchor point, except final unstressed syllables. Similarly, the argot infix in Faa di Vesu is inserted after a final syllable or an H tone syllable (in a privative tone system), as shown in (9).

(8) Língua do Pê – São Tomé and Príncipe Portuguese (Agostinho & de Araujo 2021)

Base	**Argot**	
ˈga.to	ga.ˈ**pa**.to	“cat”
ˈmar	ma.ˈ**par**	“sea”
ka.ˈfɛ	ka.**pa**.fɛ.ˈ**pɛ**	“coffee”

(9) Faa di Vesu in Lung’Ie (Agostinho & Hyman 2021)

Base	**Argot**	
áriba	á.**pa**.ri.ba~ á.**pa**.ri.ba.**pa**	“herb”
i.dín.tʃi	i.di.**pí**n.tʃi.**pi**	“teeth”
akara	a.ka.ra.**pa**	“fried banana”

Bagemihl (1988; 1995) and Vaux (2011), among many others, discuss how language games are frequently used as evidence for properties of natural languages, including insights about the structure of a specific language and about properties of human language more broadly. While phonologists have debated such uses of language games, Vaux (2011) notes that they are generally seen as valuable for providing insight into phonological systems and representations (e.g. syllable structure, phonotactics, tonal melodies, etc.).

Previous literature on language games, as well as on natural language infixation and reduplication, proposes a limited set of “anchor points” that insertion can target, namely “first syllable, first foot, first consonant, first vowel, stressed syllable, and final syllable” (Vaux 2011: 729; see Vaux 2011 for an overview of anchor points). In discussing affixation games, Vaux (2011) goes on to discuss the permutations of permissible precedence-altering instructions and anchor points as determining which outputs are possible in a game like Pig Latin. While not discussed in any detail, the same presumably applies to other iterative affixation games, in that the dummy affix should target valid anchor points and introduce new precedence relations in a way that corresponds with those anchors.

2.3 Background on VV sequences

Since the focus of this paper will be on the behaviour of VV sequences in Ẹnà, we conclude the background section by addressing the extensive literature on the behaviour of VV sequences cross-linguistically. Given that virtually all Yorùbá VV sequences contain identical vowels, we focus on the distinction between long vowels and heterosyllabic sequences of two identical short vowels.

As discussed by Kenstowicz (1971) on Lithuanian and Pyle (1970) on West Greenlandic, phonology has traditionally used two methods of representing identical VV sequences, a single segment marked [+long] versus a sequence of identical short vowels. These two representations make different predictions in how different phonological processes should affect long vowels, and

both Lithuanian and West Greenlandic show evidence that both representations are necessary. For example, in West Greenlandic, lowering affects the entirety of long vowels, but not non-identical VV sequences, but long vowels can also block metathesis in the way that non-identical VV sequences do. As such, both representations seem necessary. While Pyle (1970) suggests that the representation switches at a point in the derivation, Kenstowicz (1971) instead suggests that different types of phonological processes (prosodic versus featural) use different types of representations. Pyle (1970) argues that both Lithuanian and West Greenlandic are consistent with both analyses.

More recently, it has been argued that in fact neither analysis works for other languages, such as Kamba (Roberts-Kohno 2000; Odden 2011). Instead, there has been a move towards an autosegmental analysis in which long vowels can be simultaneously a single vowel matrix and two timing positions (Odden 2011). It has also been noted that languages may contrast long vowels from heterosyllabic VV sequences, with languages such as Kamba, Gokana, and Matumbi showing phonological processes in which some VV sequences behave as long vowels, but others behave as a sequence of identical short vowels (Odden 2011). These languages show that the solutions proposed for Lithuanian and West Greenlandic (Pyle 1970; Kenstowicz 1971), where representation of VV sequences changes at a point during the derivation or is based on the process, cannot hold more generally. Instead, both types of representations must be possible within a language. We argue that Yorùbá is an example of a language where both representations occur.

It is also worth briefly examining some of the literature on the ambiguity of syllabification of identical VV sequences across a variety of languages. We will briefly discuss this question with respect to Fataluku (Heston 2014), some Kwa languages (Leben 2002), and Turkish (Kabak 2007).

Heston (2014) discusses a dialect of Fataluku that had previously been described as not having contrastive vowel length, but finds that it is in fact contrastive, just with very low functional load. Speakers in the study had some difficulty in certain cases saying whether vowels were long or short. Heston proposes that long vowels are sequences of vowels underlyingly, but that there is a rule that they can be realized in the same syllable when identical. This suggests that low functional load does not necessarily mean that there are no long vowels in a language.

Leben (2002) notes that in Kwa languages, if two vowels in hiatus are identical, they may sound like a single long vowel, and the syllabification is ambiguous according to speakers. For example, in chanting, such vowels can be mapped to one or two notes, which is not an option otherwise. Leben argues that these vowels therefore have ambiguous status, that they are phonologically two syllables but phonetically fused into one. He discusses some evidence from tonal patterns and language games about syllabification, including how language games can

show VV sequences being treated as separate syllables even when ambiguous. This suggests the importance of language games for resolving ambiguity of syllabification.

Finally, Kabak (2007) discusses VV sequences in Turkish, which like in Yorùbá can come from loanwords and consonant deletion. Like Yorùbá, these VV sequences have been argued to be heterosyllabic and Turkish is said to not have contrastive vowel length. Kabak discusses vowel assimilation, which applies in certain contexts of VV sequences, and notes that it applies generally, but that speakers tend to maintain separate vowels in careful, formal speech. Kabak's intuitions are that assimilated vowel sequences are heterosyllabic, particularly when there is a coda. However, he notes that syllabification judgements are difficult due to not knowing whether speakers might be using underlying or orthographic representations. He suggests that syllable-based language games might be used to test the status of VV sequences, and he discusses one in Turkish very similar to Yorùbá Ẹnà, in which –gV is added after every (C)V, where V is a copy. Informal data that Kabak collected on three assimilated words showed that the VV sequences were treated as separate syllables, confirming that they were heterosyllabic sequences. Kabak notes, however, that a more controlled study is necessary. The next section does so for Yorùbá and argues that not all are separate syllables.

3 Yorùbá Ẹnà

3.1 Background on Ẹnà and methodology

Ẹnà is a general Yorùbá term for argot, ludling or secret language, encompassing both spoken language (Ịṣọla 1982) and drum language[5] (Villepastour 2010; Akinbo 2019; 2021). Our focus in this work is one version of Ẹnà in spoken language. While Yorùbá Ẹnà has been briefly described (Ịṣọla 1982), it has not been documented in detail nor analyzed previously. Our data on Yorùbá Ẹnà were collected from one native speaker of Standard Yorùbá who was not involved in the analysis or writing of this paper. The consultant is educated to a Bachelor's degree level, having studied linguistics and Yorùbá at the University of Lagos, and is also competent at reading and writing in Yorùbá, as he wrote his BA thesis in and on Yorùbá. He is also bilingual in English. The consultant was 25 years old at the time of data collection and learnt to use Ẹnà at the age of 7. According to the consultant, he learnt Ẹnà by observing his mother and her siblings using the ludling to mask their conversation. By the age of 12, the consultant was proficient and used the ludling with his own siblings, who learnt it from observing their mother as well. Since then, the consultant has been using Ẹnà to communicate with friends, classmates, and colleagues beyond his home. He is not proficient in the use of other language games besides the one on which

[5] Drum language is an example of speech surrogacy, which involves communicating via music instruments by imitating linguistic features with music melodies (Stern 1957; James 2021).

data is reported here. Data was collected through written responses to wordlists, as the Yorùbá orthography effectively distinguishes relevant contrasts (e.g. tone, nasality). We met with the consultant via Zoom, and he was in Nigeria at the time.

3.2 General pattern

Our data show that, in general, in Ẹnà, gV is added after every syllable, where V is a copy of the vowel quality and tone of the preceding vowel. This is true for all vowels and tones, including nasal vowels, the language's 'default' vowel [i], and the 'default' mid tone. Some examples are shown in (10). Notably, in (10), we observe that V and CV syllables are treated the same way, despite the fact that they are considered structurally different in many analyses of Yorùbá (see Orie 2000).

(10) Examples of basic Ẹnà pattern with CV and V syllables

	Yorùbá		**Ẹnà**
a.	bá	"meet"	bá**gá**
	bà	"land"	bà**gà**
	ba	weave"	ba**ga**
b.	àbá	"plan"	**àgà**bá**gá**
	àgbà	"elder"	**àgà**gbà**gà**
	ata	"pepper"	**aga**ta**ga**
	ibí	"here"	**igi**bí**gí**
	abà	"village"	**aga**bà**gà**
	ajá	"dog"	**aga**já**gá**
	àba	"incubation"	**àgà**ba**ga**
c.	tấ	finish	tấgấ
	kỹ̃	paint	kỹ̃gỹ̃
	hũ	weave	hũgũ

3.3 Syllabic nasals

As noted in Section 2.1.1, Yorùbá also has syllables that consist only of a syllabic nasal. When such syllables are copied in the game, again gV is added and the tone is a copy of the syllabic nasal's tone, but there is no vowel to copy, and [g] cannot be an onset to a syllabic nasal according to Yorùbá phonotactics. In such cases, the consultant noted that the vowel in the Ẹnà syllable can be either [ũ] or [u]; the consultant's description is consistent with either of these vowels being used in free variation with syllabic nasals in Ẹnà.[6] Some examples are shown in

[6] A reviewer asks whether there is progressive nasal assimilation or whether the syllabic nasal could be part of the nucleus plus coda. To our knowledge, there is no progressive nasal assimilation in Yorùbá. Moreover, Yorùbá does not allow codas, so the second explanation is unlikely. Since the focus of this paper is on VV sequences, we leave further exploration of the issue of free variation in these forms to future work.

(11). Note that the choice is the high back vowel, either oral or nasal, regardless of the specific nasal or on the surrounding vowels and consonants.

(11) Examples of Ẹnà pattern with syllabic nasals

Yorùbá		**Ẹnà**
mo	“it is giving birth”	**ŋ́gú** bí**gí**~ **ŋ́gű** bí**gí**
ḿ bɔ̀	“coming”	**ŋ́gú** bɔ̀**gɔ̀**~ **ŋ́gű** bɔ̀**gɔ̀**
m gbɔ́	“is it so?”	n**gu** gbɔ́**gɔ́**~ **ŋgũ** gbɔ́**gɔ́**
ń gǜ	“it’s climbing”	**ŋ́gú** gǜ**gǜ**~**ŋ́gű** gǜ**gǜ**
ǹ dʒɛ́ sadé lɔ	“so, did Ṣade go?”	**ŋ̀gù**dʒɛ́**gɛ́** sa**ga**dé**gé** lɔ**gɔ**~**ŋ̀gǔ**dʒɛ́**gɛ́** sa**ga**dé**gé** lɔ**go**
ó ńta fìlà	“(s)he is selling caps”	ó**gó** **ŋ́gú** ta**ga** fì**gì**là**gà**~ ó**gó** **ŋ́gű** ta**ga** fì**gì**là**gà**

3.4 VV sequences

As noted in Section 2.1.3, VV sequences are quite common in Yorùbá: they can be underlying in loans, derived through consonant deletion, created with pronouns, or occur through compounding. Due to an assimilation process, adjacent vowels are always identical, except for the exceptional combination [ai] in certain lexical items. VV sequences, regardless of how they are derived, are traditionally analyzed in Yorùbá as belonging to separate syllables (Orie & Pulleyblank 2002).

In Ẹnà, however, there are two ways in which VV sequences behave. Some indeed behave as separate syllables, with VV --> VgVVgV, but others show the pattern VV --> VgV, with the [g] simply inserted between the two vowels. Pronouns, VV sequences derived from floating tones, and underlying VV sequences always behave in the latter way, and VV sequences in which the tones are identical can variably use either pattern, while other VV sequences use the former pattern. This is summarized in **Table 3**.

VV type	**Tones**	**Result of game**
Pronouns	Any	VgV
Floating tones		
Underlying VV sequences		
Compounds	Distinct	VgVVgV
Consonant deletion		
Compounds	Same	VgV / VgVVgV (can variably take either pattern)
Consonant deletion		

Table 3: Summary of VV patterns.

3.4.1 VV as separate units

VV sequences that are derived through consonant deletion or compounding are generally treated as separate loci for dummy syllable insertion in Enà (though see discussion of same-tone below). In these situations, the infix is inserted after each V in the base sequence, as shown in (12).

(12) Examples of VV sequences behaving as two loci, from compounding and consonant deletion

(a) Non-identical tone

N	N			
ɔbɛ̀	ɛrã	ɔbɛ̀ɛrã	soup of the animal	ɔ**gɔ**bɛ̀**gɛ̀**-ɛ**g**ɛrã**gã**
owó	òde	owóòde	tax	o**go**wó**gó**-ò**gò**de**ge**
oko	òdʒó	okoòdʒó	Ojo's farm	o**go**ko**go**-ò**gò**dʒó**gó**
àkpò	owó	àkpòowó	sack of money	à**gà**k**g**pò**gò**-o**go**wó**gó**
ɔkɔ̀	ɔlá	ɔkɔ̀ɔlá	Ola's car	ɔ**gɔ**kɔ̀**gɔ̀**-ɔ**g**ɔlá**gá**
àì	gbɔ́	àìgbɔ́	lack of listening	à**gà**ì**gì**g**g**bɔ́**gɔ́**
igi	owó	igoowó	tree of money	**i**g**i**go**go**o**go**wó**gó**
owó	igi	owóogi	money of tree	o**go**wó**gó**o**go**g**i**g**i**
ère	àgbò	èraàgbò	statue of ram	è**gè**ra**ga**à**gà**gbò**gò**

(b) Identical tone

ère-ekpo	statue of oil	è**gè**re**ge**-e**ge**kpo**go**
ɔbɛ̀-èrɔ̀	soup of easiness	ɔ**gɔ**bɛ̀**gɛ̀**-è**gè**rɔ̀**gɔ̀**
oko-olè	thief's farm	o**go**ko**go**-o**go**l**gè**
òwòòlè	robbery	ò**gò**wò**gò**-o**go**l**gè**
ɔmɔɔlá	child of wealth	ɔ**gɔ**mɔ**gɔ**-ɔ**g**ɔlá**gá**

3.4.2 VV as single unit

There is a clear distinction between the VV sequences shown above and other classes of VV sequences. The behaviour of Ẹnà VV forms in very similar words depends on the status of the vowels, with pronouns, underlying VV sequences, and VV sequences from floating tones patterning differently from the other VV sequences discussed above, and same-tone VV sequences variably taking either pattern. While the VV sequences discussed above pattern as two separate loci for Ẹnà nonsense syllable insertion, the other types pattern as a single unit, with VV surfacing as VgV; in other words, there is just one Ẹnà consonant added, with the original second V seemingly serving as the vowel and tone for the game syllable. The native speaker second author and the consultant agree that both vowels are short in the game form; they are confident that VV becomes VgV, not *VVgVV.

VV sequences may arise from floating tones in the derivational morphology. In the examples in (13), the sequences are induced by a grammatical tone. In this case, a mora is inserted to accommodate the floating tone.

(13) Examples of VV sequences behaving as one locus, derived from floating tones

abàa tójì̀	Toyin's settlement	a**ga**bà**ga** tó**gójì̀gì̀**
ìdʒìi ʃà̰pɔ̀nɔ́	measle's flu (flu-like symptoms of measles)	**ìgi̋**dʒ**ìgi** ʃa̰**gà̰**pɔ̰̀**gɔ̰̀**nɔ́**gɔ̰́**

Enà VV forms derived through pronouns pattern this way as well, as shown in (14). As noted previously, pronouns in Yorùbá are assumed to be an unassociated mora.

(14) Examples of VV sequences behaving as one locus, derived from pronouns

gbá a	kick it	gba**g**a
kpa á	kill it	kpa**g**á
kà á	count it	kà**g**á
rí i	see it	ri**g**i
bi í	ask him/her	bi**g**í
fì í	swing it	fì**g**í
bú u	insult him/her	bu**g**u
kṹṹ	skin it	kṹ**gṹ**
rù ú	carry it	rù**gú**
kpè é	call it	kpè**gé**
ʃe é	do it	ʃe**g**é
sè é	cook it	sè**g**é
fɛ́ ɛ	marry him/her	fɛ**g**ɛ
dʒɛ ɛ́	eat it	dʒɛ**g**ɛ́
bɛ̀ ɛ́	beg him	bɛ̀**g**ɛ́
kó o	park it	kó**g**o
so ó	tie it	so**g**ó
rò ó	think it	rò**g**ó
kɔ́ ɔ	teach him	kɔ**g**ɔ
kɔ ɔ́	write it	kɔ**g**ɔ́
bɔ̀ ɔ́	boil it	bɔ̀**g**ɔ́
bɛ́ɛ̀ni	so it is	bɛ́**g**ɛ̀ni**gi**

Other processes in Yorùbá derivational morphophonology may also involve the addition of a mora, and these behave the same way, as shown in (15). These differ from the floating tone cases in that here both a tone and a mora are hypothesized to be inserted, whereas floating tone is only a tone.

(15) Emphatic form derived from the addition of a mora

ʃáà lɔ	(you) should go	ʃá**g**à lɔ**gɔ**

It is also worth noting that, while the general pattern for pronouns is VV --> VgV, in cases where the first vowel is H tone and the second is M, the Ẹnà form is MM tonally. Other tonal combinations remain consistent between the natural language form and Ẹnà.

Finally, VV derived through compounding or consonant deletion can behave as a single locus of insertion, but only if they have the same tone, as seen in (16). This behaviour is variable, in that all same-tone VV sequences derived this way can behave in either way.

(16) Same-tone VV sequences behaving as one locus

ɔmɔ	ɛrã	ɔmɛɛrã	child of an animal	ɔgɔmɛgɛrãgã
èrɔ	owó	èroowó	machine of money	ègɔ̀rɔgɔwógó
wàhálà	èèjà̀	wàhálèèjã	to trouble people	wàgàhágálègèjà̀gà̀

The preceding discussion has exemplified Ẹnà for all syllable types in Yorùbá: V, CV, syllabic nasals, and VV sequences. Now that we have thoroughly described and exemplified Ẹnà, we move to discussing the problems it poses for analyses of Yorùbá, as well as our proposed account.

4 Proposal

In this section, we provide a proposal for accounting for the Ẹnà pattern, including addressing the complications of two aspects: where the Ẹnà syllables are inserted and why the VV patterns are inconsistent. In terms of where Ẹnà dummy syllables are inserted, we note that VV sequences make it appear that it is not after every syllable, surface or underlying, nor after every vowel or every tone. This is because the [g] seems to be inserted between the two vowels in some cases, with only a single [g] and no apparent reduplicative vowel/tone in those examples. We argue that this is an artifact of a reduplicative template and backcopying, plus incorrect assumptions about representations. We also discuss the implications of the game to the representation of VV sequences in the language. The formal analysis is saved for the next section.

4.1 VV Sequences in Yorùbá

As discussed, previous literature argues that all VV syllables in Yorùbá are separate syllables, though arguments are primarily based on the behaviour of VV sequences derived through compounding and consonant deletion, as well as through a more theory-driven desire to avoid positing long vowels in the language. The data in Section 3 shows that VV sequences do not all act as separate syllables in the game. Instead, in Ẹnà, some VV sequences show separate syllable behaviour, VV --> VgVVgV , while others instead behave as VV --> VgV. The latter type of behaviour occurs with pronouns, underlying VV, and floating tone cases, as well as variably with VV sequences that share tone, while the former appears with compounding and consonant deletion (non-pronominal, non-underlying, non-floating-tone VV sequences).

There are two main possible directions that could be taken to account for these differences in behaviour: either previous analyses do not reflect differences in speakers' representations of VV sequences, or the location of the dummy syllable in Ẹnà is not as simple as "after every syllable".

We argue here for the former. Indeed, the native speaker intuition of both the consultant and the second author is that there is no distinction in how types of VV sequences would be counted, but rather that they might be counting moras rather than syllables.[7] For cases like pronominals, previous arguments in the literature for treating them as separate syllables are not based on strong arguments, as discussed previously, and they are inconsistent with the behaviour of the language game. We therefore argue that Yorùbá has long vowels, which behave as one in the game. Long vowels are clearly marked in the language, but as discussed in Section 2.3, low functional load does not mean that they do not exist. We suggest that the unmarked short vowel form emerges in the game context due to a reduplicative template and backcopying from the reduplicant onto the base. This process creates a case where it looks like the VV sequence is split by the game [g], when in fact there is copying and shortening. We will argue in Section 6 that this analysis is significantly simpler than any in which the language lacks long vowels.

4.2 Behaviour of same-tone sequences

While the basic Ẹnà pattern is that the Ẹnà syllable is inserted after every syllable, the situation is clearly more complex. It appears that there is no level of representation where this is true, particularly with respect to the non-pronominal VV sequences that share tone, which are analyzed in previous literature to be separate syllables with separate vowels both underlyingly and on the surface. According to our analysis of other VV sequences derived through compounding and consonant deletion, there is no reason to posit separate that the same-tone ones are long vowels, so it is odd that they can behave like the VV sequences that we do analyze as long vowels. Separate tones is also evidently not the appropriate analysis for where Ẹnà syllables are inserted, as pronominal forms have separate tones, yet behave as one for the purposes of Ẹnà.

To address this issue, we consider a crucial comment from our consultant, who says that the same-tone VV sequences treated like a single V behave as such because the VV becomes a single V in quick speech. The second author, who is a native speaker of Yorùbá, agrees that in colloquial, fast Yorùbá, same-tone VV sequences are typically produced with only V. The same is not true for distinct-tone VV sequences. A separate study of the nuances of Yorùbá colloquial speech would be necessary to fully understand this pattern, but for our purposes, we can assume that Ẹnà applies (or at least can apply) at a level of representation at which same-tone VV have been reduced to a single V. In this case, these examples behave in exactly the way that we would expect, with a single vowel. We suggest that the variability in the language game comes from the variability in natural language. Note that the other cases of VV that behave as one in the game, such as pronominals, cannot be reduced to V.

[7] A reviewer asks how we asked this of the consultant. The consultant has taken linguistics courses, so we simply asked him how many moras/syllables he thought different VV sequences had.

4.3 Distinct-tone VV sequences

What remains, then, is to understand the different types of distinct-tone VV sequences. As previously noted, previous analyses of Yorùbá posit that in derived (compound and consonant deletion) VV cases, one of the Vs deletes, followed by the other V joining to its mora. This structure was represented in (2), and it is identical to the structure that is assumed for underlying, pronominal, and floating tone VV sequences in previous literature, in which there is only a single underlying vowel but two moras for the vowel to attach to.

It is widely assumed that language games apply at intermediate levels of representation, not the UR or surface form (e.g. Vaux 2011). As noted, previous accounts assume that the surface forms of various VV sequences are the same, with one V associated to two moras, but the URs have a distinction between two separate vowels in compounds and consonant deletion cases, versus a single vowel in the cases of pronouns, underlying VV, and VV from floating tones. If Ẹnà happens at a level of representation where there are still two vowels in derived VV cases, before one vowel deletes and the other associates to a second mora, then we could claim that Ẹnà targets individual vowels. Other cases have only one V at all levels of representation. One potential issue with this analysis is that Ẹnà would then happen before vowel assimilation, as assimilation involves deletion. However, there remain two adjacent vowels that could undergo assimilation and force their base-argot correspondents to agree as well. For example, in ɔmɔ + ɛrã, if we added a gV to each syllable, we would get ɔgɔmɔgɔɛgɛrãgã, which still contains an ɔɛ sequence that could be forced to assimilate.

The larger issue for any proposal without long vowels is the paradox involving same-tone VV sequences, since we said previously that Ẹnà must apply at a level of representation after deletion of a mora occurs in same-tone VV sequences. Given that this mora deletion seems like a post-lexical phenomenon, as it occurs only in fast and colloquial speech, it would be strange for it to occur before the assimilation pattern that results in deletion of a vowel (but not a mora) in other VV sequences. Instead, we posit that Ẹnà actually applies on the surface, referencing colloquial surface forms. This requires a proposal for a new structure for some VV sequences. Specifically, we argue that some VV sequences are long vowels.

4.4 Proposed surface forms

We begin with the case of derived (compound and consonant deletion) VV sequences. Given that these vowels result from separate underlying vowels that assimilate, we posit that they remain separate syllables (but agreeing vowels) on the surface. **Figure 1** illustrates our hypothesized normal (non-ludling) language surface forms for derived VV sequences. This analysis is the same as in previous literature.

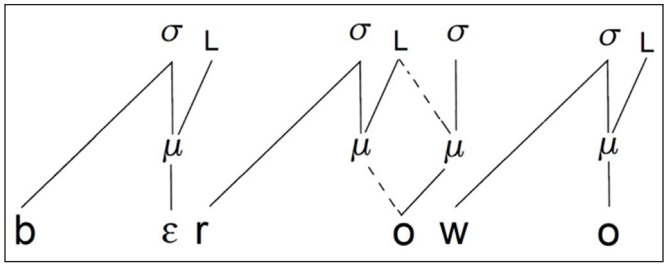


Figure 1: Tone association in VV (bèròòwò “start business” (<bèrè “start” + òwò “business”).

For pronominal VV sequences, the traditional analysis of Yorùbá is that there is no underlying pronominal vowel, but rather the pronoun consists of a mora and tone. This mora then joins with the preceding vowel. As such, there is only one vowel, doubly-linked to two moras. We propose that these are in fact long vowels, within the same syllable. There is no clear evidence against this analysis for Yorùbá and it fits within the literature for other languages, both in terms of general discussion on the behaviour of VV sequences and in terms of what kinds of evidence a game can provide about representations. Specifically, the fact that the two types of VV sequences pattern differently in the game argues for different representations, and the fact that only one game consonant is inserted in these types of VV sequences suggests that they consist of a single syllable. Under this analysis, the game forms are derived through reduplicating the vowel as usual, but then a CV reduplicative template and backcopying onto the base results in short vowels in both the base and reduplicant. **Figure 2** illustrates our proposed surface form of normal language pronominal VV sequences. Similar forms are posited for other structures that behave this way, such as floating tones.

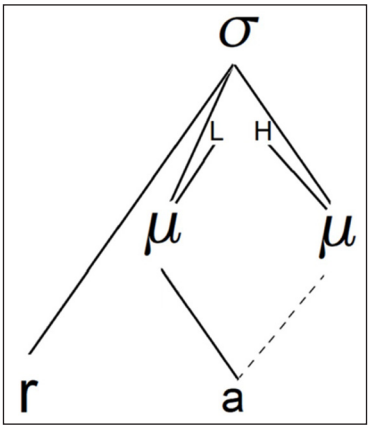


Figure 2: Tone association in VV sequence (ràá “buy it” (rà “buy” + μ “3.sg obj)).

In the next section, we formalize this account, using a standard analysis of reduplication games based on that of Krämer & Vogt (2018), combined with a reduplicative template and back-copying. We show that these assumptions allow us to account effectively for the patterns in the game. We then argue in Section 6 that this game poses an issue for accounts that do not treat Yorùbá as having long vowels.

5 Analysis

5.1 Basic pattern

We begin by illustrating our basic proposal about how Ẹnà works in the uncomplicated case, for (C)V syllables. As discussed, we assume that the syllable is the locus of insertion, although since the language does not have codas, this is equivalent to the vowel being the locus. We posit that Ẹnà involves the insertion of a single game morpheme, /-gV^{red}/, following Krämer & Vogt (2018). To fill out the dummy syllable, a vowel and tone need to be supplied, and reduplication occurs from the preceding syllable.

More formally, we adopt the constraints in (17) to analyze the basic pattern in Ẹnà.

(17) Constraints for basic pattern
- ANCHORL: "Assign one violation mark for every segment at the left edge of the derived word that is not at the left edge of the base word." (Krämer and Vogt 2018: 94)
- ALIGNL(AFFIX, WRD): "Assign one violation mark for every segment separating the left edge of the affix and the left edge of the word containing it" (Krämer and Vogt 2018: 94)
- ALIGNR(AFFIX, WRD): "Assign one violation mark for every segment separating the right edge of the affix and the right edge of the word containing it" (Krämer and Vogt 2018: 94)
- MAXBR-V: "Assign one violation mark for every vowel in the Base that is not present in the Reduplicant" (Krämer and Vogt 2018: 97)
- CONTIGUITY: "Assign one violation mark for every pair of adjacent segments in the input that is not adjacent in the output" (Krämer and Vogt 2018: 97)
- IDENTBR-T: Assign one violation mark for every tone in Base and RED that is not identical (after Krämer and Vogt 2018, IDENTBR-F)

Tableau (18) shows an example, with a VCV root meaning 'plan'. Even though the game morpheme exists only once in the input, it appears after every syllable, since any other option is a fatal violation of MAXBR-V, following Krämer & Vogt (2018). The constraint IDENTBR-T enforces tone copying. In (19), candidates (a) and (b) are ruled out by MAXBR-V, as they each only have one reduplicant instead of the iterativity required for the game. Candidates (c), (d), and (e) each violate both CONTIGUITY and ALIGNL, but (d) and (e) are ruled out by violations of BR-Ident-T, as the tone associated with the reduplicant vowels differs from that on the base. Candidate (f) satisfies ALIGNL, but fatally violates ANCHORL, as the edges of the source and game words do not correspond. The winning candidate is therefore (c).

(18)

	/àbá + gV^{red}/	MaxBR-V	Contiguity	AnchorL	AlignL	AlignR	IdentBR-T
a.	àbágá	*!			**		
b.	àgàbá	*!	*		*	**	
☞ c.	àgàbágá		*		*		
d.	àgabága		*		*		*!*
e.	àgábágá		*		*		*!
f.	gààgábá		*	*!		**	

5.2 Ẹnà VV sequences

For the VV sequences that we analyze as separate syllables, the exact same analysis as above will work, as these are simply two independent syllables and the constraints will derive the reduplicative dummy game affix being inserted after each one, in the same way as it did above with two syllables where the second had an onset. Since an identical tableau as above would work, with the word replaced by one with a separate-syllable VV sequence, we do not include the tableau for space reasons.

Turning now to the VV sequences that we analyze as long vowels in normal language Yorùbá, such as pronominals and floating tone, we posit that these forms show evidence for a reduplicative template and back-copying in Ẹnà. Specifically, while Yorùbá allows limited instances of long vowels, Ẹnà does not allow any long vowels; the long vowels are not copied into the reduplicative game morpheme, and they are further not kept in the base. Previous research on Yorùbá has posited a highly ranked constraint against long vowels. We diverge from previous literature in suggesting that this constraint is in fact violated in Yorùbá. However, we argue that a reduplicative template ensures that long vowels do not exist in reduplicants; all vowels in the game are short. Long vowels may not be copied as long into the game, and a requirement for length agreement between base and reduplicant forces the base to also have a short vowel in the game. We follow Gouskova (2007) and Kennedy (2009) on similar reduplication patterns that show long vowels becoming short in reduplication, both in the reduplicant and the base. Since all other vowels are short, this analysis does not affect anything in the other examples.

The long vowel examples are the only ones in which the tone differs on base and reduplicant. We suggest that this fact is due to the existence of two tones on the original base long vowels, which cannot be maintained on a single vowel once it is shortened. As such, the two tones spread out, one onto the base and the other onto the reduplicant, in order to keep both tones without creating contours. This is done at the expense of tonal identity between base and reduplicant. In other words, the tones in the Ẹnà form come from bans on deleting tones (MaxIO-T) or leaving tones floating (*Float) and on having two tones associated to a short vowel (*Contour), despite

violating correspondence between the syllables in tone (IDENTBR-T). These considerations are again not relevant for examples with short vowels. The additional necessary constraints are defined in (19).

(19)

- MAXIO-μ: "Each mora in the input has a correspondent in the output" (Downing 2005: 199)
- MAXBR-μ: Each mora in the base has a correspondent in the reduplicant (after Downing 2005 for MAXIO-μ)
- MAXIO-T: Every tone of the input has a correspondent in the output; Assign a violation for every tone in the input that does not have a correspondent in the output (after McCarthy & Prince 2004).
- RED = σ_{μ}: "The reduplicative morpheme is a light syllable (cf. McCarthy & Prince 1993b)" (Gouskova 2007: 375)
- *LONGV: "Avoid vowels dominated by more than one mora" (Alderete 2000: 8)
- *FLOAT: "A tone must be associated with a syllable" (Meyers 1997: 867)
- *CONTOUR: "No more than one tone may be linked to a single vowel" (Pulleyblank 1997: 97)

The tableau in (20) illustrates. Candidates (a) and (c) are ruled out by having a long vowel in the reduplicant, which violates RED = σ_{μ}. Candidate (b), which keeps the long vowel in the base but shortens it in the reduplicant, is ruled out by MAXBR-μ, which requires the number of moras to be the same in base and reduplicant. In other words, this constraint enforces back-copying. The remaining candidates all violate MAXIO-μ, as they shorten the base vowel. Candidate (e) deletes one of the tones, violating MAXIO-T; candidate (f) leaves the second tone floating, violating *FLOAT, and candidate (g) keeps both tones by creating contours, violating *CONTOUR. The winning candidate is (d), which keeps both tones without creating contours, at the expense of violating IDENTBR-T.

(20) Long vowel analysis

	/kàá + g V^{red} /	RED = σ_{μ}:	MAXBR-μ	MAX-IO μ	*LONG V	MAXIO-T	*FLOAT	*CONTOUR	IDENT-BR-T
a.	kàá - gàá	*!			**				
b.	kàá ga		*!		*				
c.	kà gáá	*!	*	*	*				
☞ d.	kà gá			*					*
e.	kàgà			*		*!			
f.	kágá L			*			*!		
g.	kăgă			*				*!*	

6 Discussion

Having illustrated our analysis, we now turn to the discussion. First, we discuss syllabic nasals and tone changes, which were omitted from the formal analysis. Then we turn to other types of analyses of similar games and alternative views of Yorùbá VV sequences, explaining how they fail to account for certain aspects of the pattern discussed above. Finally, we consider the implications of this pattern to our understanding of Yorùbá and of phonology more broadly.

6.1 Syllabic nasals and tone changes

6.1.1 Syllabic nasals

In terms of syllabic nasals, there is no vowel quality to copy, and the Ẹnà vowel ends up being [u] or [ũ], in free variation. This is in contrast to evidence discussed above from other Yorùbá processes suggesting that [i] is the default vowel in the language. If Ẹnà is simply copying a vowel quality onto a featureless vowel and there is nothing to copy, then we would expect the default to appear, but it fails to do so.

In Yorùbá, it may seem that there is a potential explanation of this behaviour coming from the fact that high back vowels are not permitted word-initially in the language. Thus, we could propose that the underlying form of syllabic nasals is /un/, with /u/ deleting to satisfy language-specific requirements on the surface but remaining available for copying in the game. However, we have already posited that this game happens on the surface form. Additionally, syllabic nasals can occur word-medially in Yorùbá as well, where this analysis would not work. Moreover, interestingly, similar games in other languages also use [u] as the vowel with syllabic nasals, such as in Fa do Vesu (Annobón Island, Equatorial Guinea) (Agostinho & de Araujo 2021). To our knowledge, these cases cannot be explained using the same mechanism suggested above for Yorùbá, and so instead we must posit a more general solution.

In Yorùbá, like in many languages with syllabic nasals, including those for which similar games have been documented, syllabic nasals cannot have onsets. As language games are known to follow the phonotactics of the base language, this means that a game form like *ńgń is impossible due to Yorùbá phonotactics. The syllabic nasal must therefore be replaced by the closest vocalic approximation.

As discussed previously, there is strong evidence for [i] being a default vowel in natural language Yorùbá. We might therefore expect that this vowel would be used in syllabic nasal cases in the game. However, given that Ẹnà copies the features of vowels, we expect the copying of [+nasal] onto the dummy syllable vowel, even if the full syllabic nasal cannot be copied. It may be this feature that prevents the default [i] from surfacing as the vowel in the dummy syllable in Ẹnà. Specifically, while [i] is the overall default vowel, there is no place in the normal language phonology where a default nasal vowel appears, so we have no way of knowing the typical result of applying the feature [+nasal] to an otherwise under-specified vowel. That said, Yorùbá

syllabic nasals can also be derived from and in free variation with high back nasal vowels, as shown in (21).

(21) un [ũ] > n [n̩] (Akinlabi 2007)
a. o**ṹ**dʒɛ ~ o**ṇ́**dʒɛ "food" (< o**ũ** + dʒɛ "thing + eat")
b. ò**ṵ̀**gbɛ ~ ò**ŋ̀m̀**gbɛ "thirst" (< o**ũ** + gbɛ "thing + dry")

Given the expected copying of the [+nasal] feature and the existence of this free variation between [ũ] and syllabic nasals, it makes sense to see [ũ] as the vowel copied for syllabic nasals in the game. However, it remains unclear why this vowel is in free variation with [u] in such cases.

One possibility is that this free variation with [u] may result from the features of the nasal; Yorùbá syllabic nasals are argued to be underlyingly labial, which could be copied as vowel rounding. They also undergo place assimilation; before the game consonant [g], this assimilation would be to velar place, and this dorsal consonant feature could be copied as vowel backness.[8] As our focus is on VV sequences, we leave these issues for future research.

Overall, it appears from the game that high back vowels are the best vocalic representation of a syllabic nasal. However, given that there is no other apparent evidence for this assertion, there is a lot of future work to do, both in Yorùbá and in other languages. Yorùbá-internally, one piece of evidence we used was free variation involving syllabic nasals and vowels. However, there is also evidence that syllabic nasals can alternate with sequences that include [i] (Pulleyblank 1988a). As such, we might have expected the possibility of using [i] to copy syllabic nasals in Ẹnà, but this hypothesis is not borne out. More work needs to be done to understand why high back vowels are the only option. Future work should also look at overlaps in evidence between Yorùbá and Fa do Vesu, which treats syllabic nasals in the same way in the language game, as discussed above.

6.1.2 Tone changes

Another data point that we omitted from our analysis is the tone changes that occur for HM pronoun forms, which surface with the tone pattern MM in Ẹnà, rather than the expected HM. For example, gbá a 'kick it', becomes gbaga in the game (repeated from (14)). This pattern violates the usual preservation of tones in Ẹnà, where tones from the real language form are maintained in the game form. However, it does allow for base-argot/base-reduplicant agreement in tone, which otherwise does not happen with the forms that we analyze as long vowels, including the pronouns.

[8] Thank you to a reviewer for suggesting the argument about velars.

Part of the difficulty in analyzing this pattern is that similar tone changes do not occur with other pronominal forms, including LH and MH patterns. These are the only three pronominal tone patterns possible in the language. From the pronouns alone, then, we might try to analyze the pattern by saying that the HM tones change because of the second M, which is the default tone in the language.

In contrast, the other types of VV sequences that we analyze as long vowels can have other tonal patterns. Specifically, we have an example of a floating tone VV sequence with LM that does not change (cf. abàa tójì̃ 'Toyin's settlement', which becomes agabàga tógójì̃gì̃ in the game (repeated from (13)). There is no obvious motivation for positing a tone change for an HM sequence but not LM, given the overall parallels between the behaviour of H and L tones in the Yorùbá system.

Further data with additional examples of tone combinations on different types of long vowels would help to clarify the pattern here. While it is not possible to get an LM sequence with pronouns in the language, we could look for HM on non-pronominal long vowels. Determining how such tone sequences behave would be necessary to confirm whether the tone change pattern is due to something special about pronominals (e.g. the fact that the tone is determined through OCP, according to existing literature), or whether it is something specific about H and M tones in that order. Either way, such a follow-up study would provide interesting new information about the language.

6.2 Existing analyses of similar games

As noted previously, there are reports of similar iterative affixation games in quite a few languages. Such reports have been primarily descriptive, but there are some existing analyses, both in rule-based frameworks and in OT. In this section, we consider the major components to existing analyses, aside from the one that we adopted, and consider them in light of the evidence from Yorùbá.

Several analyses of iterative affixation games, including Bagemihl (1988) and Piñeros (1998), motivate the game consonant and/or the game vowel through epenthesis. Bagemihl (1988: 247) has a rule that looks like ∅ --> X $\underline{X}$ / $\underline{X}$ _ to derive iterative affixation in a Tigrinya game. Similarly, Piñeros (1998) uses a markedness hierarchy of consonants to derive the choice of an epenthetic consonant in Spanish games. In contrast, in our analysis, the [g] from the game is part of the input for creating game forms.

Iterative affixation games do not typically insert the normal epenthetic consonant for the language (Bagemihl 1988; Alidou 1997; Yu 2008; Krämer & Vogt 2018). For example, the Yorùbá epenthetic consonant is normally [h] (Bamidele 2019), but the game inserts [g]. In fact, while coronals and glottals are the typical epenthetic consonants cross-linguistically, most of the

iterative affixation games we have encountered in the literature use labials or velars as the affix onset. These facts suggest that the consonant belongs to the game, rather than being epenthesized, which makes it sensible to put it in the underlying form for the game. Since many other types of games are currently analyzed as having a game morpheme, either an overt one or one that serves as a trigger for a reversal or both (e.g. Borowsky & Avery 2009; Ozburn & Schellenberg 2019), it is also more congruent with other language games to have a game morpheme that accounts for the consonant, rather than epenthesis.

The choice of having a game consonant as part of the input, which then aligns with every syllable, matches the assumption of Krämer & Vogt (2018), the analysis that serves as the foundation of ours. The games discussed by Krämer & Vogt (2018) are in non-tonal languages, so they do not need to deal with the behaviour of tone. In cases of tone in non-game reduplication, it is sometimes copied (Akinlabi & Urua 2003; Pulleyblank 2008), but those are typically situations where entire syllables are copied, so there is no need to specify which parts of a syllable are reduplicated. In contrast, in games, it is typically only the vowel copied, with a constant consonant, and so for Krämer & Vogt's (2018) analysis, they use V^{red} to indicate that only the vowel is reduplicated. In Yorùbá, then, we would appear to need separate reduplicative vowels and reduplicative tones, both V^{red} and T^{red}. Instead, we suggest that the tonal patterns are due to a base-reduplicant tone identity requirement. The violability of this constraint allows us to explain why, in certain VV sequences, the base and reduplicant do not have the same tone, by ranking this constraint below those that ban tone deletion, floating tones, and contour tones.

Using a reduplicative template and backcopying allows us to account for Yorùbá VV sequences in a way that would be quite difficult otherwise in Krämer & Vogt's (2018) analysis. Specifically, in certain types of VV sequences in Yorùbá, as discussed above, the game [g] is inserted between the vowels. This means that, on the surface, it appears that neither vowel (or tone) is a reduplicated copy in these sequences. It therefore appears difficult to explain why it is allowed for that reduplicative vowel slot to be filled by a non-reduplicated vowel that is in fact part of the original Yorùbá word. We argued instead that there is reduplication, just combined with deletion of a mora due to a ban on long vowels in the game.

Accounts of iterative affixation games in both Piñeros (1998) and Yu (2008) make use of feet. Even if Yorùbá does use feet in its phonology, it would be difficult to motivate the different behaviours of VV sequences using that type of account: there is no direct match in Yorùbá between normal language syllables and the insertion of game syllables. We need to be able to explain why certain VV sequences are the locus of two game affix insertions while others are only one. Using feet does not help address this issue, so it has no apparent benefit over our analysis.

Yorùbá does not have codas or clusters, which means that it would be possible to motivate the presence of the vowels after every [g] through syllable structure constraints. However, our

account does not require this, which is a benefit for extending the analysis to other languages with similar games that do allow for these more complex syllable types. While Yorùbá lacks codas, similar games in languages with codas often have the coda after the dummy CV from the game, as discussed in Section 2 in reference to Akan (Adomako 2018) and Tigrinya (Bagemihl 1988). For Yorùbá, after every syllable is equivalent to after every vowel, since the language does not have codas. This also means that we do not need to take a strong position on whether V on its own can be a syllable in the language (see Section 2.1.4).

6.3 Existing analyses of Yorùbá VV sequences

As noted, this paper argues against previous literature on Yorùbá by claiming that some VV sequences in the language are long vowels. We have already argued that the reasoning in previous literature for avoiding positing long vowels is primarily either theory-internal or based on compounding and consonant deletion, which do indeed seem to be separate syllables. There is no strong theory-external evidence related to the behaviour of other types of VV sequences, such as pronouns and floating tones. We argue that our language game data constitutes this evidence, because such VV sequences are treated as a single locus of dummy affix insertion, unlike other VV sequences. This suggests that they are single syllables.

In this section, we argue that an account of this game without positing that certain VV sequences are long vowels in Yorùbá would be difficult and stipulative. Specifically, any such account would need to determine a consistent location for dummy affix insertion, such that VV sequences from compounding and consonant deletion behave as two separate loci, while VV sequences from pronominals and floating tone behave as one locus. As noted, previous literature on the language assumes that all of these VV sequences are identically structured on the surface.

We argued in Section 4 that the Ẹnà game applies on the surface, because doing so provides the most straightforward account of the behaviour of same-tone VV sequences, which are variable in whether they behave as a single V or two in both regular language Yorùbá and in the game. As argued in Section 4, having the game apply at an early stage makes it difficult or impossible to account for why same-tone compounds behave differently from distinct-tone compounds.

The fact that the game seems to apply on the surface means that we cannot explain the different patternings of VV sequences in terms of their underlying structures. Previous literature on the language assumes that all VV sequences have identical surface structures, but they do not behave the same in the game. As such, we need to posit some sort of representational difference between these forms.

If we were to persist in claiming that there are no long vowels in Yorùbá, then the syllable could not be the locus of insertion of the game morpheme. We could potentially claim that the Ẹnà syllable is inserted after each unique vowel, but doing so would require some strange

assumptions. Specifically, it would require compound and consonant deletion examples to have two unique surface vowels, instead of assimilation happening through deletion and re-association. Doing so violates many formulations of the OCP for vowels. It also remains difficult to formalize where the game syllable is inserted, in that the [g] would be occurring between two syllables, without being repeated for both. Further, we still would be unable to explain without extra work why we fail to get a reduplicated vowel, but instead split up the original two vowels. In other words, even if we could justify the presence of only a single game syllable, we would anticipate a game structure like VgVV, not VgV. This type of analysis, in order to insert the [g] between existing vowels, would also require internal inconsistency in where C/V tier segregation is used, in order to make the [g] appear between the vowels.

In contrast, our long vowel analysis is much simpler. Under this analysis, it is straightforward to describe where the game morpheme occurs: it is after every syllable. It is also straightforward to explain why the [g] appears to split up the vowels, in that it is an effect of a reduplicative template, back-copying, and requirements to maintain base tones in the game. All of these effects are well-established in other kinds of phonological processes in other languages.

Overall, long vowels clearly provide a more satisfactory account of the Ẹnà pattern. Without them, it would be complex and would require many unusual assumptions to describe where the game morpheme occurs and why reduplication fails to happen for the second V in some VV sequences. As such, we take Ẹnà as providing evidence that Yorùbá has long vowels. As previously noted, the evidence against long vowels in the language is primarily about compounds and consonant deletion, or theory-internal (not wanting to posit long vowels), or could be re-analyzed in terms of speakers counting moras rather than syllables. Thus, long vowels remain consistent with other facts about the language, but provide a more satisfactory account of the game.

6.4 Implications

The Ẹnà game discussed in this paper has multiple interesting implications to our understanding not only of Yorùbá, but also of language games and syllable structures more generally. This section considers these implications in more detail.

As noted in Section 2, there is an assumption in previous discussions of Yorùbá VV sequences that they are all separate syllables, regardless of provenance. However, there is also an assumption that their underlying structures differ, such as pronouns containing a mora without an underlying vowel. In this paper, we have seen that VV sequences pattern differently in a way that corresponds to the posited underlying structures. However, the game also operates on a level of representation where colloquial speech vowel deletion in same-tone VV sequences has applied. Language games are thought to operate on intermediate structures, but we end up with a paradox if we try to apply that to Ẹnà. Instead, we argue that VV sequences in Yorùbá that are

derived from consonant deletion or compounding are indeed separate syllables, but other VV sequences are long vowels.

In Yorùbá, as noted in Section 2, there are multiple possible sources for VV sequences: underlying (e.g. in loanwords), pronouns, floating tone, consonant deletion, and compounding. In keeping with previous literature, we assume these sources have distinct underlying structures: respectively, underlying double-associated V, a V plus an unassociated mora, a V plus an unassociated tone, a VCV sequence with each V attached separately, and two separate V in separate words. Thus, all types have two underlying moras, but while the first three types have a single V underlyingly, the latter two have two underlying Vs. This difference corresponds to the difference in their patterning in Ẹnà: a single vowel underlyingly corresponds to a single Ẹnà insertion site, while two underlying vowels generally corresponds to the insertion of two Ẹnà dummy syllables, except when the two vowels share tone.

Previous work on Yorùbá suggests that, regardless of the provenance, all VV sequences end up as a single V associated with two moras in separate syllables. Moreover, the language game literature argues that language games operate on intermediate representations, rather than underlying or surface representations (e.g. Bagemihl 1988; Vaux 2011; Kitaoka & Mackenzie 2021). In Yorùbá, it is unclear why there would be an intermediate level of representation at which one of the moras in same-tone VV has deleted, but the deletion inherent in previous analyses of the assimilation pattern for other VV sequences has not yet occurred. As such, the combination of these assumptions causes a paradox for Ẹnà, where certain VV sequences behave as having a single syllable, while others behave as though they have two. In this paper, we have suggested that some VV sequences in Yorùbá are long vowels if they have only a single V underlyingly. In other words, if there are two underlying vowels, then they may assimilate on the surface, but they remain separate syllables, whereas other cases have underlying long vowels or morphological lengthening. The importance of game evidence for distinguishing long vowels from heterosyllabic VV sequences has been previously discussed by Leben (2002) and Kabak (2007), both of whom found that ambiguous VV sequences were separate syllables. Our paper is, to our knowledge, the first to show a case where games illuminate two distinct structures of apparently surface identical VV sequences, further emphasizing the importance of games to disambiguate. While traditionally phonology did not allow languages to have two different types of representations, modern work has shown that several languages do need to allow both long vowels and heterosyllabic identical VV sequences (see Odden 2011 for an overview), and Yorùbá appears to be such a case. As previously noted in other work on other languages, such as by Heston (2014), the low functional load of long vowels does not necessarily imply that they do not exist.

Overall, in terms of Yorùbá, this language game analysis has suggested new Yorùbá structural representations of VV. The analysis confirms the posited underlying distinctions, in that these

distinctions are reflected in different patterning in the game. We have argued for different surface representations than previous literature on Yorùbá, particularly in reference to long vowels, which are necessary for a satisfactory account of the game patterns, despite claims in the literature that the language does not have long vowels. As has been previously argued by Leben (2002) and Kabak (2007), among others, games can illuminate intuitions of VV sequence syllabification in cases that are otherwise ambiguous, and Yorùbá is a clear example of this.

Finally, we note that the study of Ẹnà illuminates the importance of examining these sorts of language games in tone languages, in order to fully understand the requirements of a satisfactory analysis. While games like Ẹnà are known in the literature, there are few theoretical analyses, and many of the existing ones have difficulty dealing with the addition of tone to the equation and with VV in this game. The analysis of Ẹnà showed, for instance, that the simplest analysis is not reduplication of tone, but rather a base-reduplicant tone identity requirement. Examining language games in a wider variety of languages can only help in understanding the patterning of tone in language games, the behaviour of reduplication and games more generally, and what such patterns tell us about human language.

7 Conclusion

Overall, the game described here, known as Ẹnà, generally inserts gV after every syllable, where the V is a copy of the vowel quality and tone of the preceding vowel. While some VV sequences behave as separate syllables, as expected from the literature, VV sequences of certain types, such as pronouns, behave as a single unit for the purposes of the game, becoming VgV. Moreover, while it is claimed that the 'default' vowel in Yorùbá is [i], the game vowel is [u] in the case of syllabic nasal syllables, where there is no vowel quality to copy. In the case of the VV sequences, we argue for a different surface representation for some VV sequences than has previously been assumed for Yorùbá. Specifically, we argue that Yorùbá has long vowels, including underlyingly in loanwords and in forms that appear to be morphological lengthening (e.g. pronouns). We also note that the game apparently applies on a level where colloquial, fast speech reduction of same-tone VV to V has applied, which is a phenomenon not previously discussed in detail in the literature on the language, and which resulted in our analysis of the game taking place on surface rather than intermediate representations. Overall, the novel data and analysis presented here illuminate a variety of important new facts about Yorùbá phonology.

Supplementary Files

Supplementary file: Appendix. Spreadsheet of all data collected on the language game. DOI: https://doi.org/10.16995/glossa.10429.s1

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Competing interests

The authors have no competing interests to declare.

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