

Ana Livia Agostinho* and Larry M. Hyman

Word Prosody in Lung'le: One System or Two?

<https://doi.org/10.1515/PRBS-2021-0002>

Published online April 27, 2021

Abstract: Creole languages have generally not figured prominently in cross-linguistic studies of word-prosodic typology. In this paper, we present a phonological analysis of the prosodic system of Lung'le or Principense (ISO 639-3 code: pre), a Portuguese-based creole language spoken in São Tomé and Príncipe. Lung'le has produced a unique result of the contact between the two different prosodic systems common in creolization: a stress-accent lexifier and tone language substrates. The language has a restrictive privative H/Ø tone system, in which the /H/ is culminative, but non-obligatory. Since rising and falling tones are contrastive on long vowels, the tone must be marked underlyingly. While it is clear that tonal indications are needed, Lung'le reveals two properties more expected of an accentual system: (i) there can only be one heavy syllable per word; (ii) this syllable must bear a H tone. This raises the question of whether syllables with a culminative H also have metrical prominence, i.e. stress. However, the problem with equating stress with H tone is that Lung'le has two kinds of nouns: those with a culminative H and those which are toneless. The nouns with culminative H are 87% of Portuguese origin, incorporated through stress-to-tone alignment, while the toneless ones are 92% of African origin. Although other creole languages have been reported with split systems of “accented” vs. fully specified tonal lexemes, and others with mixed systems of tone and stress, Lung'le differs from these cases in treating African origin words as toneless, a quite surprising result. We consider different analyses and conclude that Lung'le has a privative /H/ tone system with the single unusual stress-like property of weight-to-tone.

Keywords: tone, stress, accent, creoles, contact, São Tomé and Príncipe

1 Introduction

In the *Handbook of Pidgins and Creoles Studies*, Smith (2008: 126) argues that “the value of studying the synchronic and historical phonologies of creole languages

*Corresponding author: Ana Livia Agostinho, Universidade Federal de Santa Catarina, Florianópolis, Brazil, E-mail: a.agostinho@ufsc.br. <https://orcid.org/0000-0002-2395-4961>

Larry M. Hyman, University of California, Berkeley, USA, E-mail: hyman@berkeley.edu. <https://orcid.org/0000-0002-7676-6358>

does not lie in what we can learn about phonology, for nothing novel is to be learnt here”. However, relatively little research has been done in the area of word-prosodic systems in contact situations and creole phonology in general (cf. Clements and Gooden 2009; Lefebvre 2000; Smith 2008). Lung’Ie or Principense (ISO 639-3 code: pre), for example, has been analyzed in several different ways: as a fully-specified tone language with H, L and R tones (Günther 1973); a free “pitch-accent” language with obligatory H (Traill and Ferraz 1981); a fully-specified tone language with H and L tones (Maurer 2009) and a mixed system of stress and tone (Agostinho 2015, 2016). We will show that Lung’Ie has culminative¹ non-obligatory privative H tone, the question being whether it also has stress.

In what follows, we will show how creoles can provide a unique window into what is possible when languages with different word-prosodic systems come into contact. Our goal in this paper is to present a phonological analysis of the word-prosodic system of Lung’Ie, thereby providing an additional contribution to the effect of language contact on word-prosodic typology. As will be shown, Lung’Ie has produced a unique and previously unreported result of the contact between the two different prosodic systems common in creolization: a stress-accent lexifier (Portuguese) and tone language substrates (Edo, Kimbundu, Kikongo, Yoruba, etc.).

While it is clear that tonal indications are needed, Lung’Ie reveals two properties more expected of an accentual system: (i) there can only be one heavy syllable (CVV, CVC, CVG) per word; (ii) this syllable must bear a H tone. In this paper we diverge from the different past descriptions of Lung’Ie word prosody and consider two possible interpretations of the Lung’Ie data: the first is that it is a culminative /H/ tone system, with an unusual “weight-to-tone” requirement. The second is that Lung’Ie has a “split” word-prosodic system of some words with stress-and-tone vs. others with neither.

Our analysis is based on original fieldwork data collected and recorded by the first author in Príncipe Island in 2019 and consists of 517 lexical items (nouns, verbs and ideophones) in isolation and in 18 syntactic frames recorded with five speakers.² The extensive data were organized and analyzed using Dekereke (Casali 2020) and Praat (Boersma and Weenink 2017).

This paper is organized as follows. In §2 we provide a background on Lung’Ie. After providing an overview of creole word-prosodic typology (§3) we present the Lung’Ie prosodic system in §4, and further discussion and implications in §5 and §6. As will be seen, we conclude that Lung’Ie has a privative /H/ (high) tone system³

¹ At most one high (H) tone per phonological word (cf. Hyman 2014).

² Part of the data for the language game, compounds and vocalic sandhi examples was collected by the first author in field trips in 2009 and 2014.

³ A tone system in which there is only one active tone in the phonology, usually /H/ (cf. Hyman 2009).

without stress, similar to other culminative H tone systems such as Somali (Hyman 1981, see also Green and Morrison 2016; Le Gac 2003), but with the unusual stress-like property of weight-to-tone.

2 Background on Lung'le

Lung'le ([luŋgiɛ], lit. 'language of the Island' or 'language of Príncipe') is a Portuguese-based creole spoken in the Island of Príncipe, in São Tomé and Príncipe, located in the Gulf of Guinea. The official language is Portuguese, which is spoken by 98,4% of the population (INE 2012). Lung'le is a highly endangered language with the number of speakers ranging from 20 (Maurer 2009) to 200 when considering speakers with different levels of proficiency (Agostinho 2015). Its origin is linked to the Portuguese exploration and the kidnapping and confinement of African populations from the 15th to the 19th century.

The Gulf of Guinea islands of Príncipe, São Tomé, and Annobón were uninhabited before the arrival of the Portuguese in the late 15th century. Today, there are four genetically related Portuguese-based creoles native to the Gulf of Guinea: Lung'le, Forro or Santome (ISO 639-3 code: cri), and Angolar (aoa) – spoken in São Tomé and Príncipe – and Fa d'Ambô (fab) – spoken in Equatorial Guinea (see Map 1).



Map 1: The Gulf of Guinea.⁴

⁴ Source: [https://commons.wikimedia.org/wiki/File:Gulf_of_Guinea_\(English\).jpg](https://commons.wikimedia.org/wiki/File:Gulf_of_Guinea_(English).jpg).

The island of São Tomé was first populated by enslaved people mainly from the Niger Delta, and later primarily from Congo and Angola (Caldeira 2008, 2013: 67–72; Seibert 2013: 66–67, 2014: 46). The colonization of São Tomé and Príncipe was initially connected to the Atlantic slave trade economy and, after the beginning of the 16th century, to the sugar industry, when the country became the first monoculture plantation economy in the tropics (Seibert 2013). In this multilingual scenario, the Proto-Creole of the Gulf of Guinea (henceforth PGG) (Bandeira 2017; Ferraz 1979; Hagemeyer 2011) emerged from the contact between Portuguese and African populations during the 15th and 16th centuries in São Tomé.

During the early to mid-16th century, there was a geographical separation of the PGG speakers into the other islands due to economic and social factors and a further speciation that resulted in the four languages spoken today: Forro in São Tomé; Angolar, (which was developed in a maroon settlement) in São Tomé; Lung’le in Príncipe and Fa d’Ambô in Annobón (Bandeira 2017; Hagemeyer 2011). The four languages are currently non-mutually intelligible.

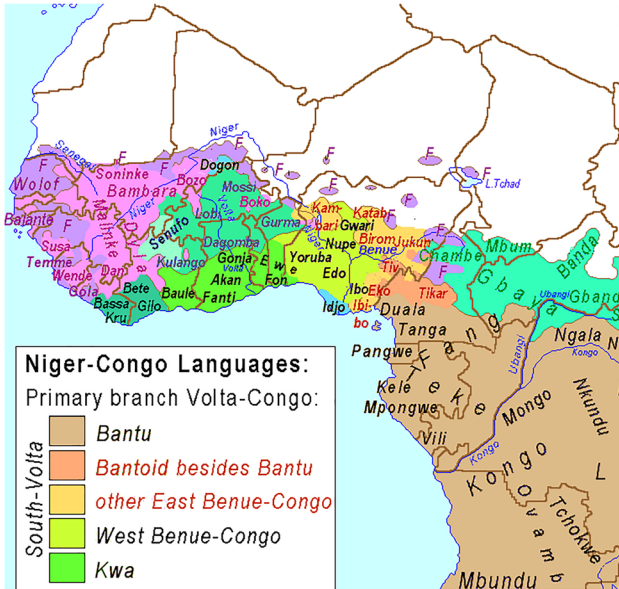
Subsequently, enslaved people from the Niger Delta region were transplanted from the continent directly to Príncipe Island. Príncipe received a small number of prisoners from Bantu regions in contrast to São Tomé that continued to receive a large Bantu input (Hagemeyer 2011).⁵

Contrary to Ferraz (1979), who considered both Edoid⁶ and Bantu languages to be the main substrates of the Gulf of Guinea creoles, the current view on their history is that languages from the Niger Delta, particularly Edoid languages, were the main substrate, while Bantu languages, such as Kikongo and Kimbundu, played a secondary role (Hagemeyer 2011; see also Agostinho et al. 2019; Ladhams 2012) (see Map 2).

Ladhams (2012) shows that Lung’le has the lowest percentage of Bantu words and the highest percentage of Edo words compared to the other Gulf of Guinea

⁵ Genetic studies show a predominance of Benin (52.3%) and Bantu (36.4%) haplotypes in the city of São Tomé (Tomás et al. 2002: 403), which also confirms that “Central-West Africa and the western areas of Bantu-speaking Africa were the major sources of the slave settlers in São Tomé” (Tomás et al. 2002: 407).

⁶ Since Edoid languages were earlier classified as Kwa (vs. current Benue-Congo), some authors also refer to a Kwa substrate. Other languages of southern Nigeria are also cited as present in the Gulf of Guinea creoles formation, such as Yoruboid (Yoruba and Itsekiri) (Ladhams 2003) and Ijoid languages (Hagemeyer 2011).



Map 2: West-Benue Congo and Bantu regions.⁷

creoles.⁸ This result is consistent with the social history of Príncipe, that, unlike São Tomé and Annobón, ceased to receive the contingent from the Bantu zone after the separation of the PGG speakers. This explains why Forro and Fa d’Ambô have a higher percentage of Bantu vocabulary compared to Lung’le. On the other hand, Angolar shows a very high percentage of Bantu words and very little of Edo and Yoruba. This is explained by a partial relexification by runaway prisoners speakers of Bantu languages (probably Kimbundu) in the maroon communities where it was further developed (Lorenzino 1998: 68).

- (1) Percentages of words identified as African by source languages from Ladhams (2012) in the Gulf of Guinea creoles:
- | | | | | |
|-----------|------------|----------|-------------------|------------|
| São Tomé: | Bantu 56%, | Edo 35%, | Yoruba 6%, | others 3%; |
| Príncipe: | Bantu 23%, | Edo 65%, | Yoruba 10%, | others 2%; |
| Annobón: | Bantu 52%, | Edo 38%, | Yoruba 6%, | others 4%; |
| Angolar: | Bantu 92%, | Edo 6%, | Yoruba and others | 2%. |

⁷ Source: modified from https://commons.wikimedia.org/wiki/File:Niger-Congo_map.png.

⁸ As the author points out, the data used for this calculation “is necessarily incomplete, as a result of the limited resources currently available, not only for the creoles themselves, but also for the African languages” (Ladhams 2012: 38).

As we will see, distinguishing Portuguese vs. African source words will be important in understanding the Lung'le word-prosodic system⁹.

3 Creole Word-prosodic Typology

Creole languages are considered by some authors to be linguistically distinct from non-creole languages because they are “new” languages that have undergone extreme linguistic restructuring and simplification during their formation process (Bakker et al. 2011; Daval-Markussen 2013; Daval-Markussen and Bakker 2011; McWhorter 2005, 2011). Creole languages in McWhorter’s (1998, 2005, 2011) “Creole Prototype” are said not to use tone in distinguishing lexical items (pitch rather being epiphenomenal to stress) (McWhorter 2018: 23). Consequently, creolists have been addressing tone in order to prove or disprove the Prototype and to contribute to the debate on whether creoles are different from other languages. Even though tone seems to be at the center of this discussion, few attempts have been made to investigate the typology of creole word-prosodic systems, and most creole tone systems have yet to be studied thoroughly (Smith 2008).¹⁰

Significantly, Afro-Atlantic Creoles present a unique situation of contact between two word-prosodic systems: a stress-accent lexifier and tone language substrates.¹¹ In (2) we show the two types of lexifiers and substrates in this context:

- (2) The prosodic types of the lexifiers vs. substrates in Afro-Atlantic Creoles genesis

Type	Word Prosody	CVCV possibilities	Languages
Type 1	Stress-accent	¹ Ø-Ø, Ø- ¹ Ø	Portuguese, English, etc
Type 2a	Fully-specified tone	H-H, H-L, L-H, L-L (also M, ¹ H, etc.) ¹²	Edo, Yoruba, etc
Type 2b	Privative tone	H-Ø, H-H, Ø-H, Ø-Ø	Kikongo, Kimbundu, etc

⁹ The sources used for the origin of the African words were Agheyisi (1986), Aigbokhan et al. (2013), Junior (1947), (Bentley 1887), Günther (1973), Ladhams (2003, 2012) and Maurer (2009).

¹⁰ This likely contributes to why creole languages are not treated in recent handbooks on prosody, e.g. van der Hulst et al. (2010), Gussenhoven and Chen (2020).

¹¹ We consider only Afro-European creoles spoken in Africa and in the Caribbean in this paper.

¹² We ignore systems with /H/, /L/ and Ø, where Ø is a third value.

Type 1 is the stress-accent system of the lexifiers, e.g. Portuguese and English. The African languages can be divided into two: fully-specified tone systems (Type 2a)¹³, e.g. Edo and Yoruba, and privative H (high) tone systems (Type 2b), e.g. Kikongo and Kimbundu.

In non-creole languages, we find three possible outcomes of word-prosodic contact of different word-prosodic systems:

- (3) Result of contact between tonal and non-tonal word-prosodic systems in non-creole languages:
 - a. The tonal language loses tone: Swahili, North Atlantic languages (e.g. Wolof)
 - b. The non-tonal language acquires tone: Chadic languages (e.g. Hausa)
 - c. No change (the tonal language retains tone and the non-tonal language does not acquire tone)

Thomason and Kaufman (1988) point out that prosodic systems can change in extreme contact situations, with complete loss of tonal system (cf. Thomason 2001: 91), whereas Downing (2017: 47) notes that linguistic contact does not necessarily lead to tonal simplification or to the total replacement of one system by another. Likewise, Downing (2017: 39) argues that even though “Salmons (1992) and Trudgill (2011) suggest that tone will be eliminated under contact, as tone is a complex systemic feature and contact should lead to systemic simplification”, this is not always the case. Yet, as pointed out by Steien and Yakpo (2020: 1), there is a common assumption that when stress and tone languages come into contact, tone loses. In Lung'le, as we will show, the resulting system is rather “simple”, but tone is not the loser.

Of course, a lot depends on the nature of the contact and the relative status and degree of language interaction. Thus, the relevant question here is: what happens when different prosodic systems come into contact in the creolization process? In the case of Afro-Atlantic creoles, at least four types of resulting prosodic systems have been reported: (i) stress-accent; (ii) tone; (iii) stress-and-tone; (iv) split systems. However, as will be shown below, a considerable number of word-prosodic systems of creole languages have been subject to different interpretations and conflicting analyses, even by the same author.¹⁴ Still, much of the recent work in creole typology does not take into account the issue of

13 Every tone bearing unit is marked for tone.

14 Thus compare the following from Good (2004: 575): “I formerly believed Saramaccan (...) to be essentially a tone language. Then, for a time, I believed that Saramaccan could be analyzed as a pitch-accent language. However, in the end, neither description manages to accurately portray the phonological facts, and I've given up trying to classify the language as tonal, accentual, or even anything in between.”

interpretation of the data.¹⁵ At the same time, descriptions of stress-accent systems are impressionistic and potentially unreliable (de Lacy 2014: 173, 185). Furthermore, only a limited number of studies have addressed the prosody of the African-derived vocabulary in creoles, which may crucially differ from the European-derived vocabulary. Therefore, there are three issues to be addressed: (i) the issue of interpretation; (ii) the issue of reliability; and (iii) the issue of completeness of data, which must include African origin words.

In (4) we classify the different analyses of the word-prosodic systems of 16 pidgins & creoles. Out of the 16, 10 show conflicting interpretations. Because of the issues previously mentioned, the classification below should not be taken as definitive. We also abstract away from specific details within these broad types.

(4) Classification of creole word-prosodic systems analyses:

Type	Word Prosody	CVCV possibilities	Analyses
Type 1	Stress-accent	' \emptyset - \emptyset , \emptyset -' \emptyset	<p>Forro #1 (Ferraz 1979)</p> <p>Kabuverdianu #2 (Swolkien 2015)</p> <p>Kriyol #1 (Chapouto 2014; Kihm and Laks 1989)</p> <p>Casamancese (Quint and Bernard 2012)</p> <p>Sranan #1 (Barth 2016; Voorhoeve 1961)</p> <p>Jamaican #3 (Alderete 1993; Gooden 2003)</p>
Type 2a	Fully-specified tone	H-L, L-H, possibly L-L and/or H-H	<p>Lung'le #1 (Günther 1973; Maurer 2009)</p> <p>Forro #2 (Maurer 2008)</p> <p>Angolar (Maurer 1995)</p> <p>Fa d'Ambô #1 (Post 1994)</p> <p>Pichi #2 (Yakpo 2019)</p> <p>Nigerian Pidgin English #1 (Mafeni 1971)</p> <p>Saramaccan #1 (Rountree 1972)</p> <p>Guyanese (Thompson and Devonish 2010)</p> <p>Jamaican #1 (Lawton 1968)</p>

¹⁵ See Kouwenberg (2010a, 2010b) for further discussion on creole typology issues, such as data reliably and misinterpretation.

Type 2b	Privative tone (culminative and usually obligatory)	H-Ø, Ø-H, possibly Ø-Ø and/or H-H	Lung'le (our analysis) Lung'le #2 (Traill and Ferraz 1981) Papiamentu #2 (Smith 2008) Palenquero (Hualde and Schwegler 2008) Nigerian Pidgin English #2 (Elugbe 2008)
Type 3	Stress and tone (sometimes residual)	Type 1 and Type 2 within the same words	Lung'le #3 (Agostinho 2015, 2016) Fa d'Ambô #2 (Agostinho et al. 2019; Zamora Segorbe 2010) Papiamentu #1 (Kouwenberg 2004; Remijsen and van Heuven 2005; Rivera-Castillo 1998; Rivera-Castillo and Pickering 2004) Ndyuka (Huttar and Huttar 1994) Kabuverdianu #1 (Macedo 1979) Kriyol #2 (Couto 1994) Sranan #2 (Smith and Adamson 2006) Jamaican #2 (Devonish 1989) Saramaccan #2 (Good 2004) Nigerian Pidgin English #2 (Faraclas 1984) Pichi #1 (Yakpo 2009)
Type 4	Split system	Some words are Type 1; some are Type 2	

Type 1 is a stress-accent system. In this classification, there are languages that reportedly never had tone, such as Casamance, and others that lost tone and acquired stress, such as Sranan.

Type 2 tone systems are divided into those with fully-specified tone (Type 2a) and those with privative H tone (Type 2b).¹⁶ The need for a phonologically active /L/, and hence the distinction between Types 2a and 2b, is not always clear, and there can also be disagreements among researchers.

¹⁶ This includes systems sometimes referred to as “pitch-accent” or “tonal-accent”, where the privative H may be obligatory and/or culminative. See Hyman (2009) for further discussion.

Type 3 is a mixed system of tone and stress. In creoles, mixed systems such as Papiamentu are clearly due to linguistic contact. According to Good (2004: 617), “contact might be the critical factor in the creation of these kinds of systems”, even in non-creoles, e.g. Ma’ya (Remijsen 2002). Yet, non-creole languages may present a mixed stress-and-tone system that is not related to linguistic contact, such as Uspanteko (Bennett and Henderson 2013), Iquito (Michael 2011), Kuikuro (Becker et al. 2020), among others. In other words, a mixed system of stress and tone is not to be taken as a “creole” feature, nor it is present in all creoles. In creoles reported with a mixed system of tone and stress, such as Papiamentu (Kouwenberg 2004; Remijsen and van Heuven 2005; Rivera-Castillo 1998; Rivera-Castillo and Pickering 2004) and Ndyuka (Huttar and Huttar 1994), stress is not predictable from the tone, rather from metrical structure or present different phonetic cues. According to Kouwenberg (2004), tone can be predictable from grammatical class in Papiamentu and is not lexical.

Finally, Type 4 consists of languages that have been reported with split systems of “accented” vs. fully-specified tonal lexemes, such as Nigerian Pidgin English (Faraclas 1984), Saramaccan (Good 2004), and Yakpo’s original analysis of Pichi (2009). (Whether Lung’Ie should be analyzed as a split system will be discussed below.) In fact, such splits, which are clearly related to the origin of the lexical items and the contact between West African tonal languages and European stress-accent languages, might be found only in pidgins and creoles. However, few languages show such a pattern (only two when Yakpo’s 2019 reanalysis is taken into account). According to Good (2004), one reason might be that Saramaccan remained in isolation, while other creole languages of the Atlantic might have lost their tonal characteristics through more extensive contact with stress-accent languages. Another possibility argued by Good (2009) is that linguistic mixing, i. e. the formation process of a mixed language, and not creolization, is responsible for this kind of system and it explains why it did not occur more often. We will come back to this in §6.

We suggest that are two crucial questions to be answered when analyzing word-prosodic-systems in pidgins and creoles in the Afro-Atlantic context:

- (5) a. How do speakers of African languages interpret stress obligatoriness in the European lexicon?
- b. How do African origin words fit within the emergent system?

It is interesting to note that the analyses that show “unexpected” characteristics such as Saramaccan, Pichi, Nigerian Pidgin English, and Lung’Ie, are precisely the ones that take the African lexical input into account. With this in mind, we now turn to the word-prosodic system of Lung’Ie.

4 Lung'le Word Prosody

We will now show that Lung'le has a restrictive privative H/Ø tone system, in which the /H/ is culminative, but non-obligatory, and the tone-bearing unit is the (vocalic) mora. The H tones are generally realized on a mora of a syllable that had stress in Portuguese (via PGG) through diachronic stress-to-tone alignment. As expected, perception played an important role in the emergence of this system as the pitch variations associated with Portuguese stress were reanalyzed as H tones by the tone languages speakers.

The syllable in Lung'le can have any of the following shapes, considering onglides and offglides as consonants (cf. Agostinho 2015, 2016). In a lexicon of 4,000 words (Agostinho 2016: 73), 74% of the syllables are CV.¹⁷

- (6) Lung'le syllable structure (modified from Agostinho 2016: 71)
- | | | | | | | | | |
|-------------|----------|-------------|-----------|------------|------------|-------------|----------------------|------------|
| V | N | CV | VC | CVC | CCV | CCVC | VV | CVV |
| /upá/ | /N/ | /wε/ | /ɔNra/ | /kɔsáN/ | /ubwé/ | /mwiN/ | /áati/ ¹⁸ | /fɔɔsa/ |
| ‘tree’ | ‘1SG’ | ‘to go’ | ‘honor’ | ‘heart’ | ‘ox’ | ‘mother’ | ‘art’ | ‘strength’ |
| CVVC | | CCVV | | | | | | |
| /safaáN/ | | /bwéɛba/ | | | | | | |
| ‘safron’ | | ‘beard’ | | | | | | |

Table (7) shows the tone patterns in nouns, which can bear one H in syllables with V or VV or be all-Ø (see 4.1), i. e., have no phonological tone at all in words with more than one syllable. Similarly, table (8) presents the tone patterns of verbs which can have one H in the penultimate CV syllable or be all-Ø. Table (9) shows the tone patterns in ideophones, which are all-Ø in our data except for /pí/.

- (7) Lung'le tone patterns in nouns (´ = H tone)

	One H	All-Ø
V	/dó/ ‘pain’	/ibi/ ‘coal’
	/káfi/ ‘house’	/maNpata/ ‘palm oil residue’
	/kasó/ ‘dog’	/ugᵇododo/ ‘precipice’

¹⁷ Coda consonants are limited to nasals, a single fricative varying between [ʃ] and [ʒ] and the glides [w] and [j]. Syllabic nasals and nasals in coda, which we represent as /N/, assimilate to the point of articulation of the following element. Recent borrowings from Portuguese can present liquids as the second consonant of a complex onset (/pɹĩmu/ ‘cousin’) and, more rarely, as codas (/altúra/ ‘height’) (Agostinho 2015, 2016). See Klein (2004) for a discussion of diversity and complexity of syllables in creoles.

¹⁸ /t/ can be realized as [tʃ] before [i, j].

VV /fɔ̃ɔsa/ ‘strength’ /baana/ ‘banana’
 /tɛ́ɛ́la/ ‘star’ /igbee/ ‘room’¹⁹

(8) Lung’le tone patterns in verbs

One H **All-Ø**

V /víka/ ‘to come’²⁰ /sɛ/ ‘to roast’
 /dumu/ ‘to grind’
 /kidita/ ‘to believe’
VV – /fii/ ‘to hurt’
 /fɔ̃ɔsa/ ‘to force’

(9) Lung’le tone patterns in ideophones

One H

All-Ø

V /pí/ ideophone of ‘shut up’; ideophone of ‘black’
 /din/ ideophone of ‘blue’
 /rarara/ ideophone of ‘red’
 /pɔ̃tɔ̃pɔ̃tɔ̃/ ideophone of ‘wet’
VV –

4.1 Nouns

In (10) we can see all the patterns for nouns in our data. Monosyllables must bear a H and words with more than one syllable can be all-Ø, which constitutes a crucial difference between our finding and those presented in Günther (1973)²¹ and Traill and Ferraz (1981). The H can be in any syllable, although there is some skewing because of Portuguese stress placement. So, for example, there is no H-Ø-Ø-Ø word, since Portuguese stress must be on one of the last three syllables of the word. At the same time, words with more than 3 syllables are very rare in our data.²² Long vowels must have a H and (with very few exceptions) there are no final long vowels. In CV.CV words, the tone pattern is synchronically unpredictable. In 68% of the

¹⁹ These are the only examples of all-Ø noun with a long vowel in our corpus.

²⁰ There are only five H-Ø verbs in our data. See note 31.

²¹ Günther presents minimal pairs and examples in context, but does not offer a phonological analysis.

²² Within the 4,000 word lexicon, 11% have four, five or six syllables (Agostinho 2015, 2016).

nouns with a H, the H is on the penultimate syllable. Out of the 32% remaining, 23% have a final H and 9% have an antepenultimate H.

(10) Tone patterns of nouns

	Underlying tone	Occurrences	Origin	
			Portuguese	African
1σ	H	25	20 (80%)	5 (20%)
1σ:	\emptyset H	4	4 (100%)	0 (0%)
2σ	H- \emptyset	73	62 (84%)	11 (16%)
	\emptyset -H	39	37 (88%)	2 (13%)
	\emptyset - \emptyset	40	5 (9%)	36 (91%)
2σ:	H \emptyset - \emptyset	18	17 (89%)	1 (11%)
	\emptyset H- \emptyset	31	27 (87%)	4 (13%)
	$\emptyset\emptyset$ -H	1	1 (100%)	0 (0%)
	\emptyset - $\emptyset\emptyset$	1	0 (0%)	1 (100%)
	$\emptyset\emptyset$ - \emptyset	1	1 (100%)	0 (0%)
3σ	H- \emptyset - \emptyset	17	11 (69%)	6 (31%)
	\emptyset -H- \emptyset	30	26 (87%)	4 (13%)
	\emptyset - \emptyset -H	15	15 (100%)	0 (0%)
	\emptyset - \emptyset - \emptyset	43	1 (2%)	42 (98%)
3σ:	\emptyset -H \emptyset - \emptyset	4	4 (100%)	0 (0%)
	\emptyset - \emptyset H- \emptyset	3	3 (100%)	0 (0%)
	$\emptyset\emptyset$ -H- \emptyset	1	1 (100%)	0 (0%)
4σ	\emptyset -H- \emptyset - \emptyset	1	1 (100%)	0 (0%)
	\emptyset - \emptyset -H- \emptyset	6	6 (100%)	0 (0%)
	\emptyset - \emptyset - \emptyset -H	2	2 (100%)	0 (0%)
	\emptyset - \emptyset - \emptyset - \emptyset	2	0 (0%)	2 (100%)
Total:	358		244 (68%)	114 (32%)

Previous research on Lung'le word prosody has largely overlooked the role of African origin lexemes. Taking a closer look at the correlation of tone patterns, we find that nouns with one H are 87% of Portuguese origin and all- \emptyset nouns are 92% of African origin (which would be higher if ideophones were included; see 4.3), as shown in (11). As seen in (12), 70% of African origin nouns are all- \emptyset , while 97% of Portuguese origin nouns have one H.

(11) H/all- \emptyset nouns x origin

	Portuguese origin	African origin
One H	237 (87%)	33 (13%)
All-\emptyset	7 (8%)	81 (92%)
Total:	244	114

(12) Origin x H/all-Ø nouns

	One H	All-Ø
African origin	33 (30%)	81 (70%)
Portuguese origin	237 (97%)	7 (3%)
Total:	270	88

As in Saramaccan, Pichi, and Nigerian Pidgin English, there is thus a strong association between tone pattern and word origin in Lung'le. However, it is quite surprising that 70% of the African-origin words are (i) adapted in the same way and (ii) adapted as all-Ø.

As previously reported by Traill and Ferraz (1981), long vowels are either phonetically rising [LH] or falling [HL].²³ These contours derive from the loss of liquids with compensatory lengthening of the adjacent V²⁴, as seen in (13).

(13) [LH] and [HL] contours on long vowels

	Portuguese	PGG protoform (Bandeira 2017)	Lung'le	Phonetic realization
a.	'preto 'black'	*plɛ.tu	/pɛ́.ɛ.tu/	[pɛ́:tu]
b.	'perto 'close'	*per.tu	/pɛ́.ɛ.tu/	[pɛ̂:tu]
c.	tarta'ruga 'turtle'	*te.te.lu.ga	/te.tuú.ga/	[tetú:ga]

We can see that if a liquid onset is lost in the second position of a complex onset as in (13a), the result is a rising contour. If a liquid coda is lost, as in (13b), the result is a falling contour. (13c) shows a rising tone with the loss of a syllable containing the liquid. These results are very consistent in our data and we found no exceptions.²⁵

²³ Long vowels cannot be all H, and only four nouns have been found with a long toneless vowel: /baana/ 'banana', /igbee/ 'room', /maakita/ 'malagueta pepper' and /paagé/ 'parrot' (see the table in (9)). Since they are toneless in Lung'le, it is possible for a long toneless vowel to exist in verbs.

²⁴ Portuguese shows evidence of a vowel-like phonetic segment preceding a tap in onset position, which have the same quality as the nucleus, such as *estribo* [esti'riβo] (Nishida 2009: 68). We believe that this preceding segment could have been present in the PGG and later reanalyzed as moraic by the Lung'le speakers.

²⁵ Fa d'Ambô shows the same realizations for [pɛ́:tu] and [pɛ̂:tu] (Agostinho 2012), while Forro have [pletu] vs. [petu] (Araujo and Hagemeyer 2013). These findings corroborates the hypothesis that Lung'le and Fa d'Ambô developed from PGG as proposed by Bandeira (2017) since the coda loss without lengthening found in Forro could only have occurred after the separation.

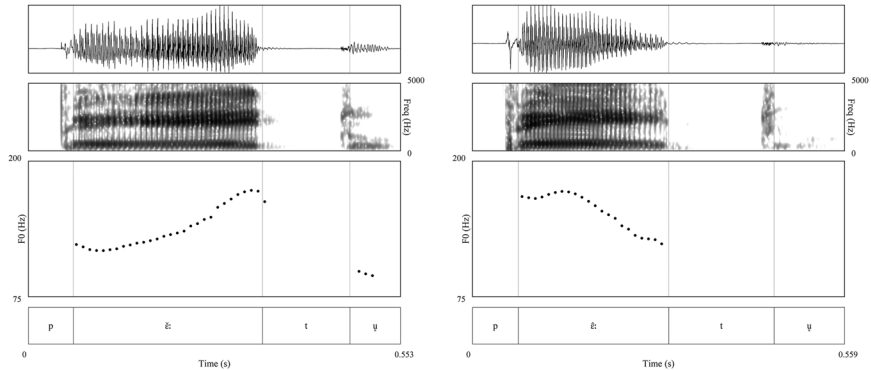


Figure 1: Waveforms, spectrograms and F_0 tracks of /pɛ́ɛtu/ ‘black’ and /pɛ̀ɛtu/ ‘close’ in isolation pronounced by the same speaker.

The rising tones are phonetically longer than the falling ones²⁶, as expected (cf. Zhang 2001).²⁷ There are minimal pairs of [HL] vs. [H] and [LH] vs. [H] as well, e.g. /máaka/ ‘mark’ vs. /máka/ ‘stretcher’ and /paáta/ ‘silver’ vs. /páta/ ‘duck’. Figure 1 shows the pitch traces for the minimal pair (13a-b).²⁸

Since CV́ and ĆV are contrastive and synchronically unpredictable, the location of the H tone must be marked underlyingly, independent of whether such words also have stress or not.

4.1.1 Phonetic Implementation

In order to support the claim that non-H syllables are phonologically toneless, we consider the issue of phonetic implementation in this section. As reported for other languages, the F_0 peak often occurs after the vowel that carries the H tone, a phenomenon known as “peak delay” (Xu 1999). In Lung’le, the H peak on nouns is

26 We measured 15 words in isolation and compared the vowel length of /ØH/, /HØ/ and /H/. The results show that /ØH/ is approximately 2.5x longer than /H/, while /HØ/ is approximately 1.5x. However, more data and a statistical analysis is needed in order to have more reliable results.

27 We believe that this is why previous authors (Agostinho 2015; Günther 1973; Maurer 2009) reported the [LH] contour but not [HL], which is cited only in Traill and Ferraz (1981). As pointed out by Zhang (2001: 33–34) “the perceived tonal contour depends on the duration of the tone carrier” and “a longer duration enhances the perception of a tonal contour with more inflections or a greater pitch distance”.

28 We used the software Praat (Boersma & Weenink 2018) with a script from Torreira (2005) to make the figures in this paper.

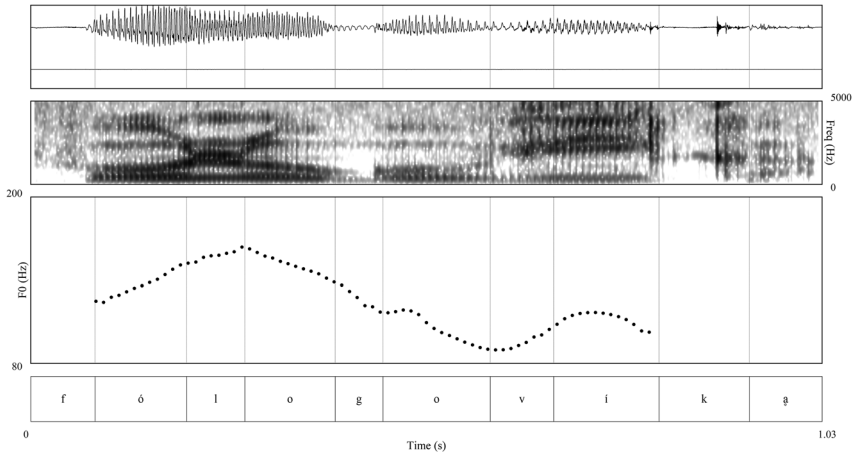


Figure 2: Waveform, spectrogram and F₀ track of /fólógo víka/ 'the breath came'.

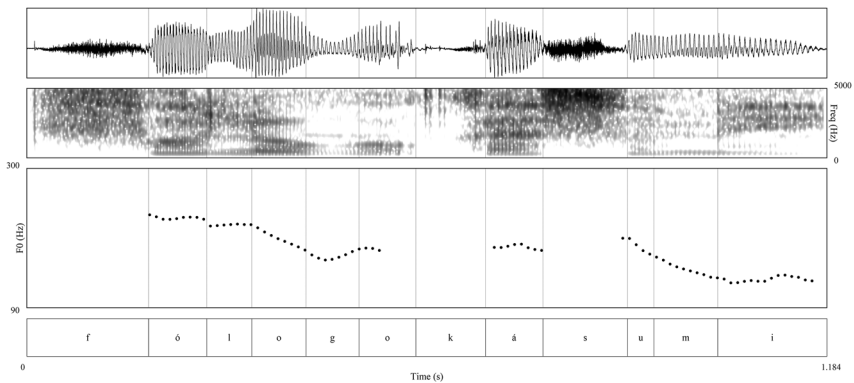


Figure 3: Waveform, spectrogram and F₀ track of /fólógo ká sumi/ 'the breath will vanish'.

generally realized later than the tone-bearing mora, usually on the next consonant or vowel.²⁹ In Figure 2 we can see in the pitch trace that the peak of /fólógo/ is realized just after the next consonant. In words with a H, /Ø/ is generally realized as [L], but there is some interpolation and variation (see 4.4).

In Figure 3, the peak of /fólógo/ is aligned with the mora that carries the H and there is some spill-over of the H onto the next syllable, going down in [go].

²⁹ Based on a visual analysis of the pitch traces in Praat.

The spilling over can occur with / \emptyset H- \emptyset / words, like /koósu/ ‘pit’, but is blocked in /H \emptyset - \emptyset / words, like /fóoti/ ‘strong’. The peak delay and spill-over found in such realizations explain why Maurer (2009) classified Lung'ie as non-culminative and fully specified for tone. In his description, /fólogo/ (phonologically H- \emptyset - \emptyset) is a H-H-L word, which is easily explained by the phonetic peak delay. The same is true for his L-H-H (phonologically \emptyset -H- \emptyset). Peak delay also explains the words with an apparent H-H vs. H-L contrast: Maurer interpreted our /H- \emptyset / as H-H and /H \emptyset - \emptyset / as H-L. It might be possible that some speakers mark this contrast phonetically by pronouncing a spilling over or late peak H tone for /H- \emptyset / words and an aligned H on the first syllable of /H \emptyset - \emptyset / words, which would account for Maurer's phonetic transcriptions. However, we do not find the latter realization in our data. In any case, Maurer seems to present surface patterns with phonetic implementation rather than a phonological analysis.

As mentioned in the introduction, Günther (1973) and Maurer (2009) assume a /L/ tone for Lung'ie. However, there is no evidence of a phonologically active /L/ tone in the language. Words that are all- \emptyset do not have pitch-targets, rather are realized as all [L] before a H, with variation and interpolation elsewhere. Figure 4 shows the toneless word /ukuru/ ‘raw’ being realized as [LLL] and [HHH] by the same speaker in isolation. This explains the words with variation “H-H-H or L-L-L” in Maurer (2009) which are all / \emptyset - \emptyset - \emptyset / in our analysis.

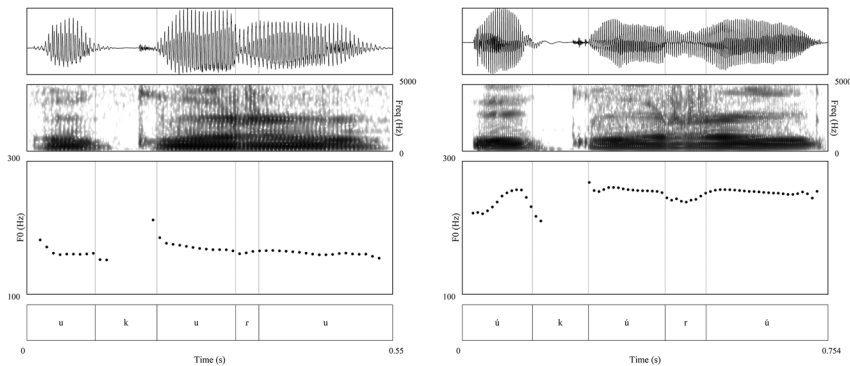


Figure 4: Waveforms, spectrograms and F_0 tracks of /ukuru/ ‘raw’ realized as [LLL] and [HHH] in isolation by the same speaker.

Trail and Ferraz (1981) present only three nouns that are analyzed by us as all-Ø of which only (14c) is of African origin:

(14)	All-Ø nouns in Trail and Ferraz (1981)	
	Our analysis	Their analysis and phonetic description
a.	/peru/ ‘turkey’	/péru/ [HL]
b.	/ɔzεγε/ ‘gecko’	/ózεγε/ [HML]
c.	/swaswa/ ‘a type of snake’	/swaswáa/ [LF]

Since the words in Trail and Ferraz’s data seem to be recorded in isolation, these phonetic realizations appear to be showing the afore-mentioned variation of /Ø/ sequences. In our data, all-Ø nouns, verbs and ideophones in isolation can be realized as a level [L] as in /muteNde/ throughout or show declination or final lowering as in /igigu/ shown in Figures 5 and 6.

In multi-word sentences, word-final H tones can be deleted and contour tones can be flattened before pause. A word-final H is realized as [H] before another word and H tones are lowered after another H. There also is a variable reduction process of devoicing a final vowel before pause, which is more common on Ø syllables.

4.2 Verbs

Verbs are toneless, with a few exceptions³⁰ for disyllabic verbs only in the Portuguese origin vocabulary³¹, as shown in (15). Long vowels can appear in monosyllables and the penultimate syllable in disyllabic verbs.

30 There are five exceptions, of which two are diachronically bimorphemic /víka/ ‘to come’ (Portuguese *vir* ‘come’ + *cá* ‘here’ (Maurer 2009: 241)), /dáka/ ‘to bring’ (Portuguese *dar* ‘give’ + *cá* ‘here’ (Maurer 2009: 216)); one is a modal /pódi/ ‘to be able’; one is a denominal verb /méNdu/ ‘to be afraid’ and one is a stative verb /fédi/ ‘to stink’.

31 The percentage of exceptions in our data is 4.5%, but these verbs were selected precisely because of their different pattern, which means that the /H-Ø/ percentage would actually be a lot lower if a larger vocabulary were taken into account.

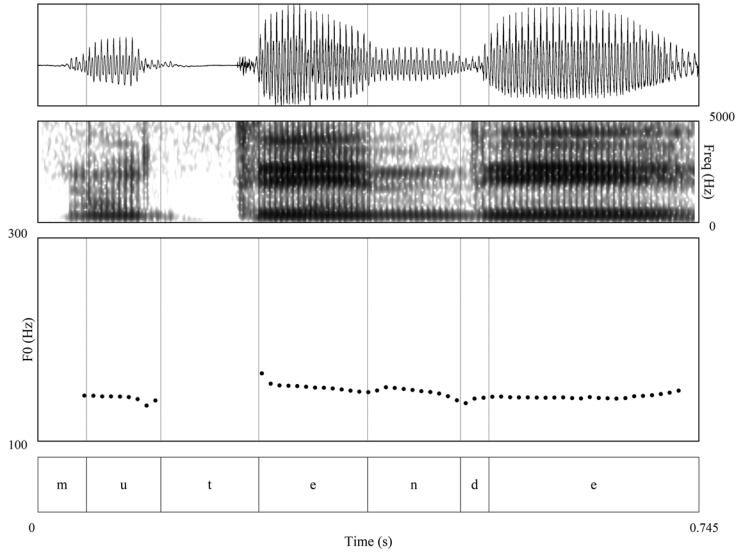


Figure 5: Waveforms, spectrograms and F₀ tracks of /muteNde/ 'palm tree sprout'.

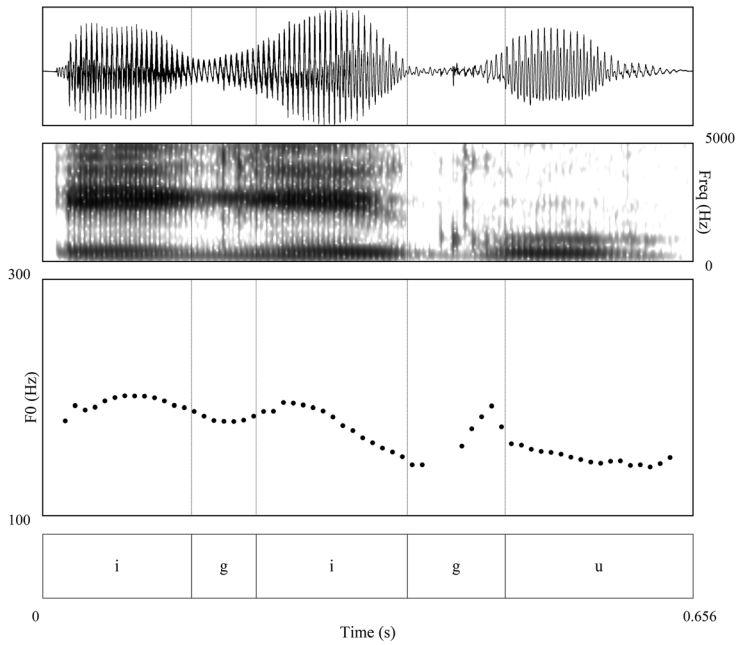


Figure 6: Waveforms, spectrograms and F₀ tracks of /igigu/ 'smoke' in isolation.

(15) Verbs tone patterns

	Underlying tone	Occurrences	Origin	
			Portuguese	African
1σ	∅	28	18 (64%)	10 (36%)
1σ:	∅∅	7	4 (57%)	3 (43%)
2σ	∅-∅	52	39 (75%)	13 (25%)
	H-∅	5	5 (100%)	0 (0%)
2σ:	∅∅-∅	14	14 (100%)	0 (0%)
3σ	∅-∅-∅	4	4 (100%)	0 (0%)
4σ	∅-∅-∅-∅	1	1 (100%)	0 (0%)
one H	5		5 (100%)	0 (0%)
only ∅	106		80 (75%)	26 (25%)
Total:	111		85 (77%)	26 (23%)

Even though there is no correlation between tone pattern and origin, it is worth noting, according to Bendor-Samuel (1989: 299), that Edo “verbs are not classified lexically by tone” and show grammatical functions. Similarly, Elugbe (1986) considers the verb stems in Edo to be toneless. In Portuguese, the stress in verbs is assigned by morphology and is predictable (Wetzels 2007). If we assume that Portuguese, French, and Spanish-based creoles generalize the infinitive as the verb stem (Lipski 2008; McWhorter 2011: 87), we would expect a final prominence in verbs. Traill and Ferraz (1981: 208) claim that some “verbs seem to have been derived from Portuguese infinitives, while others are from third person forms. For example, *pika* [] ‘prick’ < Portuguese *pi’car* (infinitive) but *kɔsa* [] ‘scratch’ < Portuguese *’çoça* (third person).” We did not find these different

patterns in our data (both are realized [L-L] phrase finally). Thus, we consider this variation to be a consequence of analyzing words with no pitch-targets in isolation, rather than in syntactic frames.

There are minimal pairs in nouns vs. verbs³² with the patterns H-∅ vs. ∅-∅ in (16); H∅-∅ vs. ∅-∅ in (17) and ∅H-∅ vs. ∅-∅ (18). As in nouns, the long vowels in verbs are derived from the loss of a liquid from Portuguese³³ (via PGG) in the coda (17a-d) and the onset (18a).

³² Maurer (2009: 26) inaccurately calls this lexical distinction “grammatical tone”. The same problem appears in his chapter in *Atlas of Pidgin and Creole Languages Structures* (APiCS) for Lung’le and other Gulf of Guinea languages (Maurer 2013).

³³ Portuguese shows a noun vs. verb distinction in some varieties using only stress, as in [kõtɛ] ‘account’ vs. [kõ’ta] ‘to count’. The only pair that does not have a relation with each other is (18b), from Portuguese [’frute] ‘fruit’ and [fur.’ta] ‘to steal’.

- (16) a. /kóNta/ ‘account’ vs. /koNta/ ‘to count’
 b. /póSta/ ‘bid’ vs. /pɔSta/ ‘to bid’
 c. /séra/ ‘saw’ vs. /sɛra/ ‘to saw’
 d. /péne/ ‘feather’ vs. /pɛne/ ‘to defeather’
- (17) a. /fáata/ ‘lack’ vs. /faata/ ‘to lack’
 b. /fóosa/ ‘strength’ vs. /fɔosa/ ‘to push’
 c. /páati/ ‘part’ vs. /paati/ ‘to part’
 d. /vóota/ ‘ride’ vs. /vɔota/ ‘to come back’
- (18) a. /póva/ ‘test’ vs. /pɔva/ ‘to try’
 b. /fuúta/ ‘fruit’ vs. /fuuta/ ‘to steal’

4.3 Ideophones

All ideophones in our data are of African origin, as expected. Ideophones follow the element they modify and are generally toneless (19a-d), except for /pí/ in (19e-f).³⁴ Yet, we have few examples of monosyllabic ideophones in our data.

- (19) a. /vé kɛkɛkɛ/ ‘very old’
 b. /baáNku fɛnɛnɛ/ ‘very white’
 c. /fyó kokoko/ ‘very cold’
 d. /zúlu din/ ‘very blue’
 e. /kala pí/ ‘shut up’
 f. /péétu pí/ ‘very black’

4.4 H Insertion Rules

Although further research is needed to fully account for tonal interactions at the phrase level, an optional [H] can be inserted onto the last syllable of a noun before a possessor, adjective, or determiner. Since the rule applies to both H and all-Ø nouns, and both behave differently before H and in isolation, we know that this is

³⁴ Interestingly the ideophones in (19e-f) are also found in Sranan with a H tone, constituting examples of residual tone in the language (Smith and Adamson 2006).

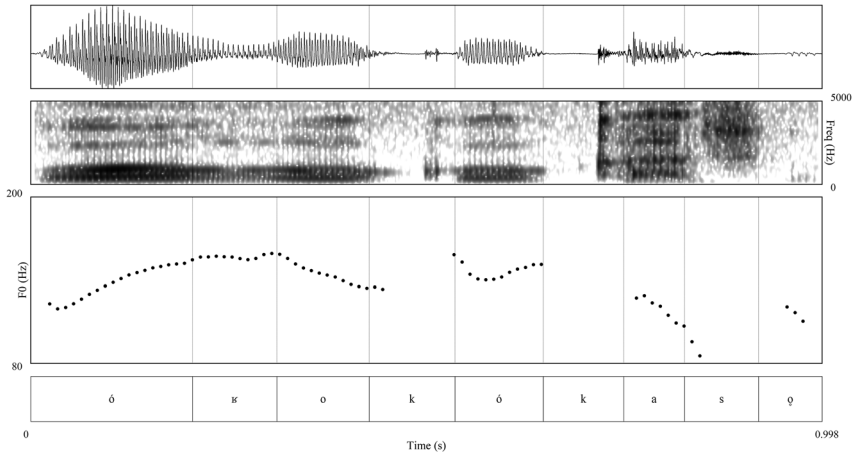


Figure 7: Waveform, spectrogram and F_0 track of /óroko kasó/ → [óʁokó kasɔ] ‘the dog’s mouse’.

not a final underlying /H/. Figure 7 shows a H being inserted onto the last vowel of /óroko/ before a possessor, which is thus realized with two H [óʁokó]. This example shows the possibility of one phonological word having two H tones at the phrase level. The phrase-final H of /kasó/ is deleted by another optional rule.

Figure 8 shows the all-Ø word /maNpata/ without H insertion while Figure 9 shows it with the H insertion in the same context showing that the H insertion is optional for all-Ø words.

By a slightly different rule, a [H] is inserted onto the last syllable of a toneless verb when it is followed by a /Ø/ syllable, whether followed by a H or not. The examples in

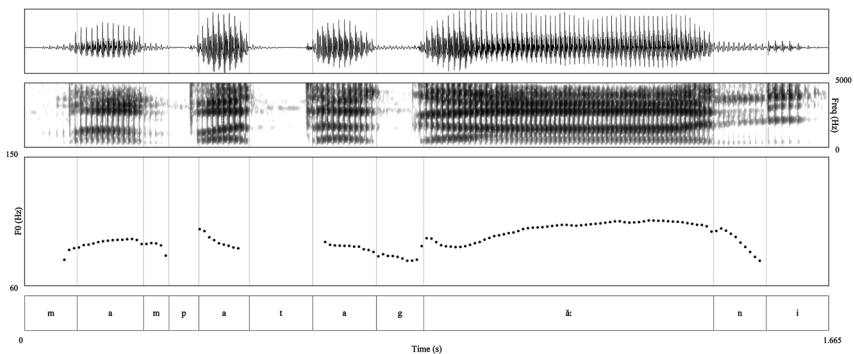


Figure 8: Waveforms, spectrograms and F_0 tracks of /maNpata gaáni/ → [mampata gã:ni] ‘big palm oil residue’ pronounced by the same speaker.

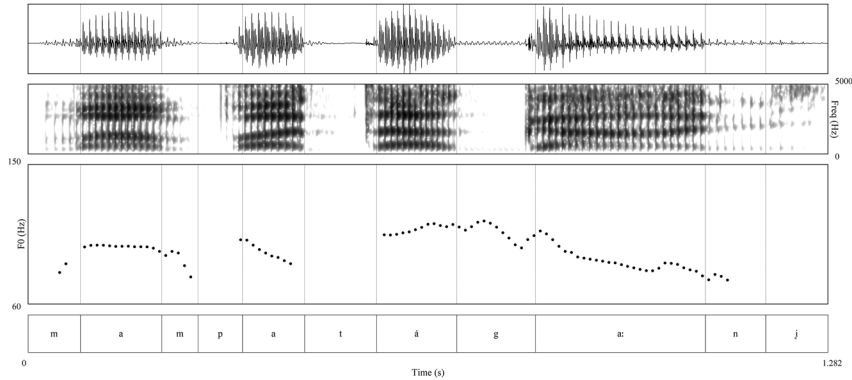


Figure 9: Waveforms, spectrograms and F_0 tracks of /maNpata gaáni/ → [mampatá ga:nj] ‘big palm oil residue’ pronounced by the same speaker.

(20) show toneless verbs before a H and there is no H insertion. Examples in (21) show the final H insertion in toneless verbs before a \emptyset .³⁵

- (20)
- /pwe póoko/ → [pwe pô:ko] ‘to birth pigs’
 - /lele póoko/ → [lele pô:ko] ‘to visit pigs’
 - /baja=dó/ → [bajadó] ‘dancer’
 - /tetuúga gɔɔ mútu/ → [tetũ:ga gɔɔ múntu] ‘the turtle dug a lot’
- (21)
- /pwe kasó/ → [pwe kaso] ‘to birth dogs’ (with H deletion on /kasó/)
 - /lele kasó/ → [lele kaso] ‘to visit dogs’
 - /mudja=du/ → [mundjádu] ‘to stand=past participle’
 - /tetuúga kɔsa lala/ → [tetũ:ga kɔsá lala] ‘the turtle scratched there’

Pitch traces for the examples in (20d) and (21d) are shown in Figures 10 and 11.

We considered but rejected interpreting verbs with a final /H/ that deletes before pause, since / $\emptyset\emptyset$ -H/ verbs would have a long vowel in a word with a H, otherwise prohibited in Lung’le. Note that we would also have to stipulate that H deletion before another H applies only on verbs. Instead, in our analysis, H tone insertion is slightly different in nouns and verbs. Also, a H tone is non-obligatory in phrases. Figures 12 and 13 show two all- \emptyset phrases.

³⁵ We noted that inserted H tones in monosyllabic verbs are realized later and drawn out when compared to underlying /H/ in nouns within minimal pairs. This could point out to a phonetic difference between phonological /H/ tones and inserted ones. There are no / \emptyset - \emptyset / verb vs. / \emptyset -H/ noun minimal pairs in our data. Still, we found the same behavior in a quasi-minimal pair: /kosa/ / \emptyset - \emptyset / ‘to scratch’ vs. /kosáN/ / \emptyset -H/ ‘heart’. However, more data is needed to confirm this hypothesis.

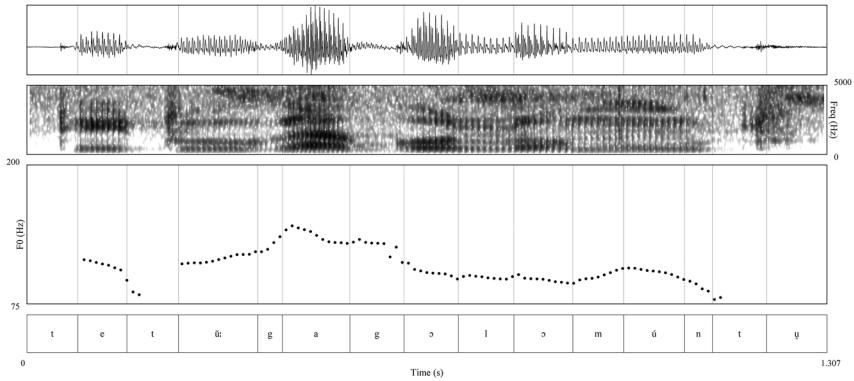


Figure 10: Waveforms, spectrograms and F₀ tracks of /tetuúga ɔɔɔ mútu/ → [tetũ:ga ɔɔɔ múntũ].

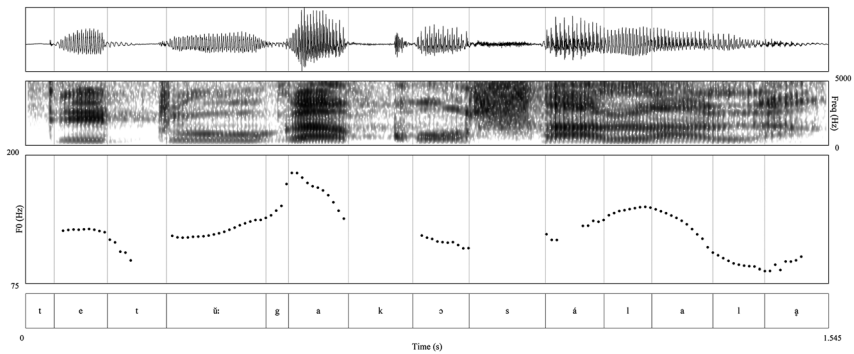


Figure 11: Waveforms, spectrograms and F₀ tracks of /tetuúga kɔsa lala/ → [tetũ:ga kɔsá lalá].

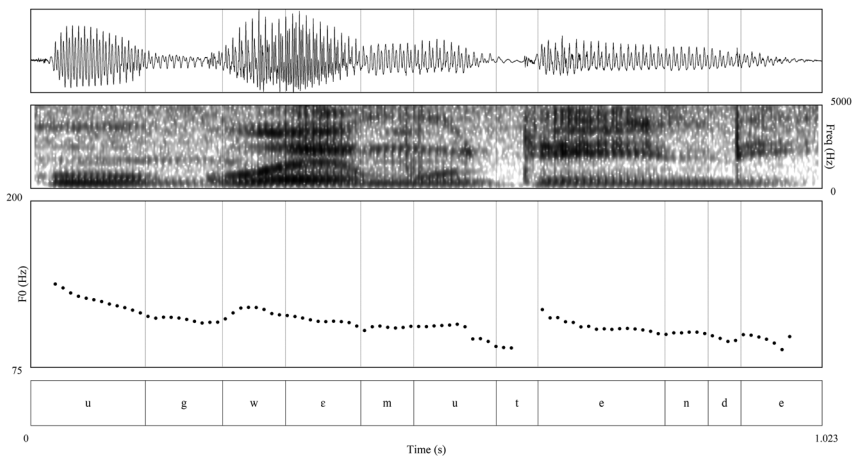


Figure 12: Waveforms, spectrograms and F₀ tracks of /ugwɛ muteNde/ ‘the palm tree sprout’s room’.

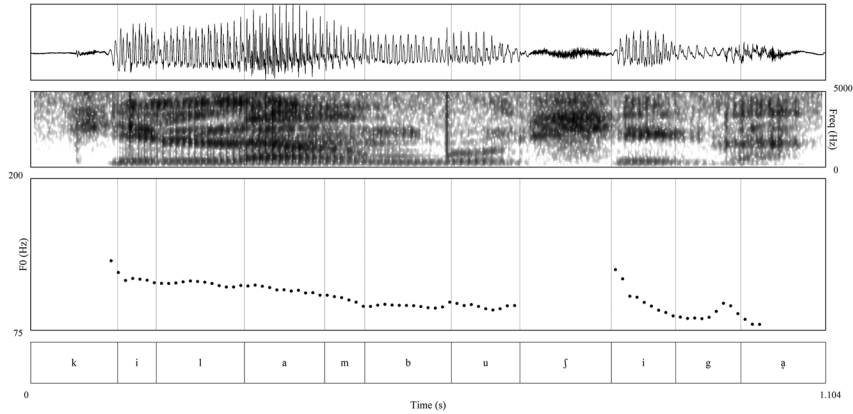


Figure 13: Waveforms, spectrograms and F_0 tracks of /kilaNbu ŋiga/ ‘the *kilambu*³⁶ arrived’.

5 Discussion: Tone and Stress?

The facts presented in §4 suggest two possibilities of analysis, as previously mentioned. The first is that Lung’le has a single privative /H/ tone system, with an unusual “weight-to-tone” requirement.³⁷ The second is that a syllable with a /H/ is also stressed, in which case Lung’le would be a stress-and-tone language with the more usual “weight-to-stress” requirement.³⁸ However, the second interpretation would require toneless words also to have a stressed syllable since every word must have a stress in a stress-accent system (Hyman 2006). Thus, both phonetic and phonological studies were undertaken to seek independent evidence for one syllable having metrical prominence (stress) in both H and all-Ø words. In our investigation, we did not find any evidence for stress in toneless words. Therefore if H words have stress, i. e. “stress-to-tone”, we would have to consider Lung’le a “split” system of words with stress-and-tone versus words lacking both.

In this section, we will show that syllable weight, vowel quality, length, intensity, as well as infixation and compounding support the first analysis. As previously mentioned, Lung’le has a weight-to-tone requirement, such that syllables with a coda or a long vowel require a H. In (22) we show that in 33 out of 35 H nouns with a closed syllable, the H is on the heavy syllable. (The five all-Ø nouns with a closed syllable are exceptional.) In addition, (23) shows that out of 49 H nouns with

³⁶ A type of traditional clothing.

³⁷ If a syllable is heavy, it must bear a H.

³⁸ If a syllable is heavy, it tends to be stressed (cf. Prince 1990).

long vowels, 47 bear a H on one of the morae of the long vowel, with only four exceptions.³⁹ The shaded cells indicate the exceptions.

(22) Coda in nouns (excluding compounds)

	H in CVC syllable	Ø in CVC syllable
Pre-final H	15	2
Final H	18	0
Total:	33	2
	Final CVC syllable	Pre-final CVC syllable
All-Ø	2	3

(23) Long vowel in nouns (excluding compounds)

	H in CVV syllable	Ø in CVV syllable
(Ø-Ø-Ø)ØH-Ø	30	0
HØ-Ø	15	0
Ø-ØH	1	0
Ø-HØ	1	0
ØØ-H	0	1
ØØ-H-Ø	0	1
Total:	47	2
	VV in final Ø	VV in non-final Ø
Ø-ØØ	1	0
ØØ-Ø	0	1

With regard to the distribution of vowel contrasts, we see in (24) that the full inventory of 7 phonological vowels can bear a H tone and can be Ø in H vs. Ø vowels. In other words, there is no “stress-like” reduction related to bearing a H or not. Thus, unlike Portuguese, which contrasts 7 vowel phonemes in stressed syllables vs. 5 or 3 in unstressed syllables (depending on dialect and/or the position of the vowel in relation to the stress), a H syllable does not license more contrasts than a Ø syllable in Lung’le.

³⁹ There are only two cases of H nouns with /ØØ/ long vowels: /maakita/ ‘malagueta pepper’ and /paagé/ ‘parrot’; and two cases of all-Ø words with long vowels: /baana/ ‘banana’ and /igḽee/ ‘room’.

(24) Vowel quality and tone in nouns

	Words with one H		All-Ø words		Total zeros		Total	
	H	Ø	Ø	Ø	Ø	Ø		
a	83 33%	91 32%	66 31%	157 31%	240 32%			
ɛ	37 15%	9 3%	14 6%	23 5%	60 8%			
ɔ	25 10%	11 4%	16 7%	27 5%	52 7%			
e	13 5%	9 3%	28 13%	37 7%	50 7%			
o	38 15%	21 7%	16 7%	37 7%	75 10%			
i	30 12%	53 19%	32 15%	85 17%	115 15%			
u	27 11%	89 31%	44 20%	133 27%	160 21%			
Total:	253	283	216	499	752			

In H words, /u/ is more common in Ø syllables since the Portuguese definite article [u] is sometimes incorporated as part of the stem in Lung'le, e.g. /ubúka/ 'mouth' from *boca* and /ugáafu/ 'fork' from *garfo* (Agostinho 2015, 2016; Günter 1973; Hagemeyer 2009; Ladhams 2012; Maurer 2009).⁴⁰ Vowel contrasts therefore do not provide evidence for stress.

Turning to potential phonetic evidence, Traill & Ferraz (1981: 208) mention a "slight increase of length" in "pitch-accented" syllables or no difference in length at all. Our measurements also show that length is not consistently increased when there is a H. In (25), where the H tone-bearing vowels are shaded, we compare the percentage of vowel duration of each vowel of the total vowel duration of a word in (quasi-)minimal pairs in the frame __/ká sumi/ 'will vanish'. In the first two pairs (a-b), the H is shorter than the Ø. The examples in (c-f) show a slight increase in the H syllables. The average increase in our data is 5%, whereas in Brazilian Portuguese it is around 25% (calculated from the data from Seara 2000 in Cristófaró Silva et al. 2019: 123), in Santomean Portuguese it is 32% and in Principense Portuguese it is 30% (calculated from the data in Balduino).

(25) Vowel length and tone in nouns in the __/ká sumi/ 'will vanish' frame

	Gloss	Tone	V1	V2	V3
a.	/ukúru/ 'dark'	Ø-H-Ø	36%	36%	28%
	/ukuru/ 'raw'	Ø-Ø-Ø	25%	41%	35%
b.	/úsuda/ <i>usuda</i> (a type of pepper)	H-Ø-Ø	21%	32%	47%
	/usúva/ 'rain'	Ø-H-Ø	25%	35%	40%
c.	/Ngóla/ 'Angola'	(Ø)-H-Ø	64%	36%	–
	/Ngola/ 'Angolar people/speaker'	(Ø)-Ø-Ø	62%	38%	–

⁴⁰ There is also ATR vowel harmony on mid-vowels that prohibits close-mid and open-mid vowels in the same word (Agostinho 2015, 2016; Araujo et al. 2020; Hagemeyer 2009).

d.	/upá/	‘tree’	Ø-H	40%	60%	–
	/úpa/	<i>upa</i> (a type of fiber)	H-Ø	48%	52%	–
e.	/óto/	‘other’	H-Ø	59%	41%	–
	/oto/	‘neck’	Ø-Ø	56%	44%	–
f.	/bóbo/	‘fool’	H-Ø	50%	50%	–
	/bobo/	‘ripe banana’	Ø-Ø	45%	55%	–

Besides duration, greater intensity may be a reflection of stress, but also generally correlates with higher pitch (cf. Zee 1978). We therefore agree with Odden (1999: 191): “work on tone languages has noticed a correlation between tone and amplitude, with higher pitched vowels having a higher amplitude than analogous lower pitched vowels. (...) It is likely that, with enough acoustic studies of tone languages that directly address this issue, amplitude could be shown not to be a reliable phonetic diagnostic of stress versus tone.”

Though not necessarily an indication of stress, an infixation process in a language game shows that the H tones are salient and accessible to the phonology (Agostinho 2015, 2016; Agostinho and Araujo 2021). The two rules of the ludling and examples are given in (26).

- (26) Language game in Lung’ie: Insert a CV syllable with [p] as the onset and a copied vowel as the nucleus
- i. after the syllable bearing a H in the base (the -pV- syllable bears the H tone)
 - ii. word-finally (optional for words with a H)

	Base	Ludling	Gloss	Rules	
a.	/fólogo/	fopólogo	fologopo	‘breath’	(i), (ii)
	/áriba/	apáriba	aribapa	‘herb’	(i), (ii)
b.	/idíNti/	idipíntʃipi		‘teeth’	(i) and (ii)
	/pésugu/	pépésugupu		‘peach’	(i) and (ii)
	/fóSfari/	fópóʃfari		‘match’	(i) and (ii)
c.	/péetu/	pépéetu		‘close’	(i)
	/paátu/	papaátu		‘plate’	(i)
d.	/mutaNbu/	mutambupu		‘trap’	(ii)
	/igigu/	igigupu		‘smoke’	(ii)
	/akara/	akarapa		‘fried banana’	(ii)

The examples in (26a) show each of the rules (i) and (ii) applying by itself, while (26b) shows both rules being applied at the same time. The examples in (26c) show

the culminativity of long vowels and synchronic evidence of weight-to-tone.⁴¹ As shown in (26d), in toneless words, only rule (ii) can apply. Since rule (ii) can apply also to a H word, the fact that we did not find rule (i) applying in all-Ø words does not support the claim that all-Ø words have final prominence (i.e. “stress”), as proposed in previous works (Agostinho 2015, 2016; Maurer 2009: 27).⁴²

Another place to seek evidence for stress is in subordination and rhythmic effects. As seen in (27), neither is found in Lung'le. Thus, compounds may have more than one H each of which is phonetically realized, as in (27).

- (27) a. /ufi kumín/ ‘road’ (lit. ‘thread way’)
 b. /sáNta bwéeba/ ‘lightening’ (lit. ‘Saint Barbara’)
 c. /aláN pwéema/ ‘fiber extracted from palm-tree’

The examples in (27a-b) show two H tones with a Ø syllable in between. Example (27c) shows two adjacent H tones without any clash resolution as it would tend to occur with two adjacent stressed syllables in stress-accent languages (Kenstowicz 1994), such as Portuguese. It is worth noting that the compounds with two H tones receive two ludling syllables in the language game. Thus, (27a) comes out as *ufipí-kumipín*.

In addition, vowels that bear a H are not protected from elision before another vowel in the external vowel sandhi processes shown in (28), which would be prohibited in stressed syllables in Portuguese.

- (28) a. /upá úsuda/ → [(u)pǔ:suda]; [(u)púsuda] ‘usuda plant’
 b. /ufjá íkoko/ → [ufíkoko] ‘yam leaf’
 c. /upá ukjebu/ → [upú:kyebu]; [upúkjebu] ‘okra plant’
 d. /ufjá ununu/ → [ufíwnunu] ‘ununu leaf’

In (28a-b) the sandhi process occurs between two H tones. The first vowel is deleted and a H tone remains (on the second mora if there are two). Examples in (28c-d) show the process between a H and a Ø vowel. The first vowel is deleted and the H tone is then associated with another mora (the first if there are two).

Regarding all-Ø words, we found no evidence of a prominent syllable, i. e., no phonetic correlates of “stress” (pitch, intensity, length). Also, the final Ø syllable can undergo reduction in all-Ø words just as in words with a (non-final) H. We found no difference in syllable structure or segment inventory between initial, medial, or final syllables, nor stronger vs. weaker realization of consonants and vowels other than final reduction which result in devoicing. The lack of stress-like

⁴¹ According to Agostinho and Araujo (2021: 226), the ludling copies the long vowel and deletes one mora of the original vowel while maintaining the tone pattern on the ludling syllable.

⁴² Maurer briefly mentions that L-L words (all-Ø in our analysis) have final stress. However, he does not consider stress in his analysis.

prominence in all- \emptyset words in Lung'le is similar to that found in the fully-tonal lexicon of Saramaccan, which does not show any effect of stress or indication of being marked for accent (2004: 594).

6 Conclusion and Implications

In the preceding sections, we have seen that Lung'le must be analyzed with a privative /H/ tone clearly needed in order to distinguish the [HL] vs. [LH] contrast on long vowels. Certainly the Lung'le word-prosodic system is “simple”. Still, the [HL] vs. [LH] vs. [H] distinction as well as the all- \emptyset words and nouns vs. verbs tonal distinction in monosyllables, go against McWhorter's Prototype (1998, 2011, 2018). The following summarizes and elaborates on what we found in our search for evidence of stress:

- a. More complex syllable structure in H tone syllables than \emptyset , e.g. H syllables can be (C)V, CVV, or CVC; \emptyset syllables can only be (C)V. Note that heavy syllables require an onset (as well as a H tone).
- b. No greater number of contrasting vowels in H tone syllables vs. \emptyset tone syllables, or in the case of all \emptyset words, in final syllable vs. preceding syllables.
- c. No greater number of contrasting consonants in H tone syllables vs. \emptyset tone syllables; in the case of all- \emptyset words, in final syllable vs. preceding syllables.
- d. No strong realizations of consonants in H tone syllables vs. \emptyset tone syllables, e.g. no aspiration difference.
- e. No difference between a final \emptyset syllable in a H word and a \emptyset syllable in an all- \emptyset word, i. e. both can undergo final reduction. That is, there is no greater “post-tonic” effect which might be expected if the H syllable were also stressed.
- f. H tone syllables potentially have increased amplitude and slightly greater length.
- g. H tone vowels are protected from a process of final reduction (low pitch vowels are more likely to reduce), but there is no protection from vowel elision before another vowel.
- h. The H tone syllables are naturally prominent via their culminativity (at most one per word), also as seen in their accessibility in word-game infixation of **pV**.
- i. No clash resolution for adjacent H tones; there might be more than one H in a phonological word or compound.
- j. All- \emptyset words do not show any kind of prominence.

Unsurprisingly, the culminative H tone is perceptually ‘salient’ in Lung'le as a target for H pitch and for **pV** insertion in the language game. If every H syllable has stress, we would have weight-to-stress and stress-to-tone, in other words, weight-to-stress-to-tone. Since “stress”, if existing, would be predictable from tone and tone needs to

be marked underlyingly, we propose to cut out the middleman and analyze the requirement as weight-to-tone.⁴³ Since toneless words are also stressless, this means that Lung'le has a culminative /H/ tone system that just happens to care about weight.⁴⁴ This is also not surprising, as Portuguese stress is (at least to some extent) sensitive to weight and words with codas (and long vowels) are 86% of Portuguese origin. While the resulting privative tone system is closer to Bantu languages such as Kikongo and Kimbundu (even though the non-contrastive verb system shows a similarity with Edoid (see 4.2)) it is clear that the culminativity emerged because of Portuguese. In fact, we might apply McWhorter (2011: 104) and propose that Lung'le culminativity-without-obligatoriness and weight-to-tone represent “a compromise between tonal systems spoken natively by its creators and the stress-based ones of the lexifier language”.

The fact that African words come in as toneless in Lung'le is very unusual and quite surprising (see 4.1). Even though we argued for a holistic analysis of Lung'le word prosody, there is an obvious correlation between the origin of words and tone pattern in Lung'le. The same is true for the “split” systems reported in the creole literature. However, pidgins and creoles reported with such systems have culminative H “accent” vs. fully specified tonal lexemes (Nigerian Pidgin English (Faraclas 1984), Saramaccan (Good 2004), Pichi (Yakpo 2009) (see also Yakpo 2019)), not culminative H “accent” vs. “Ø”. That way, Lung'le presents a unique result of the contact of languages with different word prosody systems that was not previously found in the literature.

Since “split” systems are generally not common in creoles, Good (2009) suggests that the system of Saramaccan is the result of a limited type of language mixing rather than creolization. However, “split” systems have not been found outside pidgins and creoles and seem to be a result of extreme language contact common in pidginization and creolization processes. The Gulf of Guinea creoles

43 Odden (1999: 21) mentions that although “uncommon, weight-related tone attraction is also attested”. Similarly, Newman (1981: 672) argues that “[w]hile strictly speaking it is erroneous to say that syllable weight is a negligible variable in tone languages, as a characterization of what might be considered “normal”, such a statement can be maintained”. An ambiguous case concerns second stem mora H tone in the verb paradigm in a number of Bantu languages. In Haya, for instance, if the root is toneless, the second mora H is assigned as CVCV... and CVVCV..., with the latter realized CVCV, since rising tones are not permitted (Hyman and Byarushengo 1984). Although assignment of the H by mora is historically correct, we could equally well state the synchronic rule as “assign the H to the first syllable if heavy, otherwise to the second syllable”. Although the second interpretation is reminiscent of weight-to-stress, there is no stress in Haya.

44 A similar issue is found in Chickasaw, for which Ladd (2017: 7) argues that “the prosodic system of the language depends in a number of ways on syllable weight. The only prosodic distinction that it is absolutely necessary to make use of is ‘heavy’ vs. ‘light’ (...). Nothing is added by describing all heavy syllables as stressed.”

have a similar history to the language mixing in Saramaccan since the older African stratum is Edo⁴⁵ and the Bantu contribution is considered secondary (Hagemeijer 2011). However, most of the toneless African words in Lung'le are of Edoid origin rather than Bantu (Ladhams 2012). At the same time, the Gulf of Guinea creoles are considered to be heavily restructured in comparison to other Afro-Atlantic creoles (Lucchesi and Baxter 2009: 122; McWhorter 2020) and are often cited as typological exceptions (cf. Blasi et al. 2017; Heine and Nurse 2007; McWhorter 2011).

Nonetheless, the question of why Lung'le marked the African words as toneless remains a mystery. On that note, we believe that there might have been a different system during the first generations of PGG speakers, i. e., a fully specified tone system for the African origin words that were later generalized as all-Ø as the majority of the lexicon did not allow for more than one H per word. Another hypothesis is that the all-Ø words are a result of a sort of clash resolution between the different systems of the two African strata (Type 2a and 2b in (2)).⁴⁶ In any case, similar studies must be carried out with the other Gulf of Guinea creoles (as they developed in different social and linguistic contexts after the PGG separation) to try to answer this question.⁴⁷

Finally, we showed that research on prosodic systems of creoles can contribute to a wider understanding of word-prosodic typology. Since not all descriptions of creole languages' word prosody systems include African origin data and some analysis also rely on data from published sources that are inconsistently transcribed for tones (Good 2006), more research is needed in order to know what is possible when languages with different word-prosodic systems come into contact. We might find other systems like Lung'le.

45 The Edoid input already present in the PGG was maintained in Lung'le since Príncipe was still receiving prisoners from the Niger Delta, which was not the case for the others islands. Slaves were brought directly from the Niger Delta to Príncipe, where António Carneiro, the *donatário* of Príncipe, had an exclusive contract between 1514 and 1518 over the slave trafficking (Ladhams 2003: 151). So, at the same time, it is very likely that new Edoid origin words entered Lung'le after the separation. Grammatical features such as the labial-velar phonemes in Lung'le also point to this maintenance (cf. Agostinho 2015, 2016; Bandeira 2017; Hagemeijer 2011).

46 Similarly enough, McWhorter (2018: 23) mentions that “the differences in tonal systems tend to cancel tone out”, although this may not always be the case.

47 Good (2009: 35) claims that “a sociolinguistically motivated process that affected the language after the escape of the maroons who would form the basis of the Saramaccan community”. So, in order to further contribute to the creolization vs. language mixing debate, it would be crucial to understand what happened to the tones in the Bantu vocabulary of Angolar, since its later Bantu influence can be seen as language mixing and contact-induced relexification.

Acknowledgments: We are very grateful to Bob Ladd, Jeff Good, Tjerk Hagemeijer, Leo Wetzels, and Armin Schwegler for commenting on an earlier version of this paper. We also thank the audiences at the *Berkeley Phonetics and Phonology Forum Talk Series 2020* and at the *Society for Pidgin and Creole Linguistics 2021 Winter Meeting* as well as Amanda Macedo Balduino, Björn Köhnlein and Gerhard Seibert for discussing some of the issues presented here. Research by the first author was supported by the Brazilian National Council for Scientific and Technological Development (CNPq), grant 200519/2019-0.

References

- Agheyisi, Rebecca N. 1986. *An Edo - English dictionary*. Benin City: Ethiope Publishing Corporation.
- Agostinho, Ana Lívia. 2012. *Fieldnotes and data collection - Malabo and Annobón*. Manuscript. São Paulo: Universidade de São Paulo.
- Agostinho, Ana Lívia. 2015. *Fonologia e Método Pedagógico do Lung'le*. Tese de Doutorado em Filologia e Língua Portuguesa. Universidade de São Paulo.
- Agostinho, Ana Lívia. 2016. *Fonologia do Lung'le*. München: LINCOM.
- Agostinho, Ana Lívia & Gabriel Antunes de Araujo. 2021. Playing with language: Three language games in the Gulf of Guinea. *Language Documentation & Conservation* 15. 219–238.
- Agostinho, Ana Lívia, Gabriel Antunes de Araujo & Eduardo Ferreira dos Santos. 2019. Interrogative particle and phrasal pitch-accent in polar questions in Fa d'Ambô. *Boletim do Museu Paraense Emílio Goeldi Ciências Humanas* 14(3). <https://doi.org/10.1590/1981.81222019000300009>.
- Aigbokhan, Emmanuel Izaka, V. E. Omozuwa & B. Osemwegie. 2013. Extracts from Melzian's Bini dictionary: Plant names in Edo language. *Nigerian Journal of Botany* 26(1). 1–39.
- Araujo, Gabriel Antunes de, Manuele Bandeira & Ana Lívia Agostinho. 2020. Vowel harmony in the Proto-Creole of the Gulf of Guinea. *Entrepalavras* 10(1). 35–38.
- Araujo, Gabriel Antunes de & Tjerk Hagemeijer. 2013. *Dicionário Livre Santome/Português*. São Paulo: Hedra.
- Bakker, Peter, Aymeric Daval-Markussen, Mikael Parkvall & Ingo Plag. 2011. Creoles are typologically distinct from non-creoles. *Journal of Pidgin and Creole Languages* 26(1). 5–42.
- Balduino, Amanda Macedo. Processos Fonológicos no Português de São Tomé e do Príncipe. São Paulo: Universidade de São Paulo, In preparation.
- Bandeira, Manuele. 2017. *Reconstrução Fonológica e Lexical do Protocrioulo do Golfo da Guiné*. Tese de Doutorado em Filologia e Língua Portuguesa. Universidade de São Paulo.
- Barth, Emily. 2016. Tone loss in Sranan Creole: Re-thinking contact driven change. *Papers in Historical Phonology* 1. 76–89.
- Becker, Michael, Bruna Franchetto, Arawa Didi Kuikuro, Yanapa Mehinaku Kuikuro & Andrija Petrovic. 2020. The incoherent stress of Kuikuro. *Talk at Annual Meeting on Phonology*. Santa Cruz: University of California.
- Bendor-Samuel, John. 1989. *The Niger-Congo languages: A classification and description of Africa's largest language family*. Lanham, MD: University Press of America.

- Bennett, Ryan & Robert Henderson. 2013. Accent in Uspanteko. *Natural Language & Linguistic Theory* 31(3). 589–645.
- Bentley, William Holman. 1887. *Dictionary and grammar of the Kongo language, as spoken at San Salvador, the Ancient Capital of the Old Kongo Empire, West Africa*. London: Trübner & Co. Ltd.
- Blasi, Damián E., Susanne Maria Michaelis & Martin Haspelmath. 2017. Grammars are robustly transmitted even during the emergence of creole languages. *Nature Human Behaviour* 1(10). 723–729.
- Boersma, Paul & David Weenink. 2017. Praat: Doing phonetics by computer. <http://www.praat.org/>.
- Caldeira, Arlindo Manuel. 2008. Tráfico de Escravos e Conflitualidade. O Arquipélago de São Tomé e Príncipe e o Reino Do Congo Durante o Século XVI. *Revista Ciências e Letras* 44.
- Caldeira, Arlindo Manuel. 2013. *Escravos e Traficantes No Império Português*. Lisboa: Esfera do Livro.
- Casali, Roderic F. 2020. Dekereke. <https://casali.canil.ca/>.
- Chapouto, Sandra Marisa da Costa. 2014. Contributo Para a Descrição de Aspetos Fonológicos e Prosódicos Do Crioulo Guineense. Dissertação de Mestrado em Linguística. Universidade de Coimbra.
- Chen, Aouj & Carlos Gussenhoven (eds.). 2020. *The Oxford handbook of language prosody*. Oxford: Oxford University Press.
- Clements, J. Clancy & Shelome Gooden. 2009. Language change in contact languages: Grammatical and prosodic considerations: An introduction. *Studies in Language* 33(2). 259–276.
- Couto, Hildo Honório do. 1994. *O Crioulo Português Da Guiné-Bissau*. Hamburg: Helmut Buske Verlag.
- Cristófaro Silva, Thaís, Izabel Seara, Adelaide Silva, Andréia Rauber & Maria Cantoni. 2019. *Fonética Acústica: Os Sons Do Português Brasileiro*. São Paulo: Contexto.
- Daval-Markussen, Aymeric. 2013. First steps towards a typological profile of creoles. *Acta Linguistica Hafniensia* 45(2). 274–295.
- Daval-Markussen, Aymeric & Peter Bakker. 2011. A phylogenetic networks approach to the classification of English-based atlantic creoles. *English World-Wide* 32(2). 115–146.
- de Lacy, Paul. 2014. Evaluating evidence for stress. In Harry van der Hulst (ed.), *Word stress: Theoretical and typological issues*, 149–193. Cambridge: Cambridge University Press.
- Devonish, Hubert. 1989. *Talking in tones: A study of tone in Afro-European Creole languages*. Barbados: Caribbean Academic Publications.
- Downing, Laura J. 2017. Convergence of prosody under contact: Two african case studies. In Andrea Castro, Anton Granvik, Ester Fernández Incógnito, Sara Lindblad, Andreas Romeborn & Katharina Vajta (eds.), *Språkens Magi: Festskrift for Ingmar Söhrman*, 29–40. Göteborg: Göteborgs Universitet, Institutionen för Språk och Litteraturer.
- Elugbe, Ben. 1986. Comparative edoid: Phonology and lexicon.
- Elugbe, Ben. 2008. Nigerian pidgin English: Phonology. In Rajend Mesthrie (ed.), *Varieties of English volume 4: Africa, South and Southeast Asia*, 55–64. Berlin: Mouton de Gruyter.
- Faraclas, Nicholas. 1984. Rivers pidgin English. *Studies in the Linguistic Sciences* 14(2). 67–76.
- Ferraz, Luiz. 1979. *The creole of São Tomé*. Johannesburg: Witwatersrand University Press.
- Good, Jeff. 2004. Tone and accent in saramaccan: Charting a deep split in the phonology of a language. *Lingua* 114(5). 575–619.
- Good, Jeff. 2006. The phonetics of tone in saramaccan. In Ana Deumert & Stephanie Durrleman (eds.), *Structure and variation in language contact*, 9–28. Amsterdam: Benjamins.

- Good, Jeff. 2009. A twice-mixed creole?: Tracing the history of a prosodic split in the saramaccan lexicon. *Studies in Language* 33(2). 459–498.
- Green, Christopher R. & Michelle E. Morrison. 2016. Somali wordhood and its relationship to prosodic structure. *Morphology* 26(1). 3–32.
- Günther, Wilfried. 1973. *Das portugiesische kreolisch der ilha do Príncipe*. Marburg an der Lahn: Im Selbstverlag.
- Hagemeijer, Tjerk. 2009. Initial vowel agglutination in the Gulf of Guinea Creoles.
- Hagemeijer, Tjerk. 2011. The Gulf of Guinea creoles: Genetic and typological relations. *Journal of Pidgin and Creole Languages* 26(1). 111–154.
- Heine, Bernd & Derek Nurse. 2007. *A linguistic geography of Africa A linguistic geography of Africa*. Cambridge: Cambridge University Press.
- Hualde, José Ignacio & Armin Schwegler. 2008. Intonation in palenquero. *Journal of Pidgin and Creole Languages* 23(1). 1–31.
- Huttar, George L. & Mary L. Huttar. 1994. *Ndyuka*. London: Routledge.
- Hyman, Larry M. 1981. Tonal accent in Somali. *Studies in African Linguistics* 12(2).
- Hyman, Larry M. 2006. Word-prosodic typology. *Phonology* 23(2). 225–257.
- Hyman, Larry M. 2009. How (not) to do phonological typology: The case of pitch-accent. *Language Sciences* 31. 213–238.
- Hyman, Larry M. 2014. Do all languages have word accent? In Harry Van Der Hulst (ed.), *Word stress: Theoretical and typological issues*, 56–82. Cambridge: Cambridge University Press.
- Hyman, Larry M. & Ernest Rugwa Byarushengo. 1984. A model of Haya tonology. In George N. Clements & John Goldsmith (eds.), *Autosegmental studies in bantu tone*, 53–103. Dordrecht: Foris.
- INE. 2012. *São Tomé e Príncipe Em Números 2011*. São Tomé: Instituto Nacional de Estatística.
- Junior, A. de Assis. 1947. *Dicionário Kimbundu-Português - Linguístico, Botânico, Histórico e Corográfico*. Luanda: Argente, Santos e Cia Ltda.
- Kenstowicz, Michael. 1994. *Phonology in generative grammar*. Oxford: Blackwell.
- Kihm, A & Bernard Laks. 1989. De l'accent en kriyol. *Linx (Analyse grammaticale des corpus oraux)* 20. 89–111.
- Klein, Thomas B. 2004. Diversity and complexity in the typology of syllables in creole Languages.
- Kouwenberg, Sílvia. 2004. The grammatical function of Papiamentu tone. *Journal of Portuguese Linguistics* 3(2). 55.
- Kouwenberg, Sílvia. 2010a. Creole studies and linguistic typology: Part 1. *Journal of Pidgin and Creole Languages* 25(1). 173–186.
- Kouwenberg, Sílvia. 2010b. Creole studies and linguistic typology: Part 2. *Journal of Pidgin and Creole Languages* 25(2). 359–380.
- Ladd, D. Robert. 2017. Practical introduction to stress, accent and tone course materials – Part two.
- Ladhams, John. 2003. The formation of the Portuguese plantation creoles. Ph.D. Dissertation. University of Westminster.
- Ladhams, John. 2012. Article agglutination and the african contribution to the Portuguese-based creoles. In Angela Bartens & Philip Baker (eds.), *Black through white*, 31–50. London: Battlebridge.
- Lawton, David L. 1968. The implications of tone for Jamaican Creole. *Anthropological Linguistics* 10(6). 22–26.
- Lefebvre, Claire. 2000. What do creoles have to offer to mainstream linguistics? *Journal of Pidgin and Creole Languages* 15(1). 127–153.

- Le Gac, David. 2003. Tonal alternations in Somali. In J. Lecarme (ed.), *Research in afroasiatic grammar II*, 287–304. Amsterdam/Philadelphia: John Benjamins.
- Lipski, John M. 2008. Spanish-based creoles in the caribbean. In Silvia Kouwenberg & John Victor Singler (eds.), *The handbook of pidgin and creole studies*, 565–592. Oxford: Wiley-Blackwell.
- Lorenzino, Gerardo A. 1998. The angolar creole Portuguese of São Tomé: Its grammar and sociolinguistic history. Ph.D. Dissertation. The City University of New York.
- Lucchesi, Dante & Alan Baxter. 2009. A transmissão linguística irregular. In Dante Lucchesi, Alan Baxter & Ilza Ribeiro (eds.), *O Português Afro-Brasileiro*, 101–124. Salvador: EDUFBA.
- Macedo, Donaldo Pereira. 1979. A linguistic approach to the capeverdean language. Ph.D. Dissertation. Boston University.
- Maurer, Philippe. 1995. *L'angolar: Un Créole Afro-Portugais Parlé à São Tomé*. Hamburg: Helmut Buske Verlag.
- Maurer, Philippe. 2008. A first step towards the analysis of tone in santomense. In Susanne Michaelis (ed.), *Roots of creole structures*, 253–261. Amsterdam/Philadelphia: John Benjamins.
- Maurer, Philippe. 2009. *Principense (Lung'le)*. London: Battlebridge Publications.
- Maurer, Philippe. 2013. Tone. In Susanne Maria Michaelis, Philippe Maurer, Martin Haspelmath & Magnus Huber (eds.), *The atlas of pidgin and creole language structures*, 480–483. Oxford: Oxford University Press.
- McWhorter, John H. 1998. Identifying the creole Prototype: Vindicating a typological class. *Language* 74(4). 788–818.
- McWhorter, John H. 2005. *Defining creole*. New York: Oxford University Press.
- McWhorter, John H. 2011. Tying up loose ends: The creole Prototype after all. *Diachronica* 28(1). 82–117.
- McWhorter, John H. 2018. *The creole debate*. Cambridge: Cambridge University Press.
- McWhorter, John H. 2020. What adults do to language and how they create new one. *Talk at Abralín ao Vivo: Linguists Online*. <https://aovivo.abralin.org/lives/john-h-mcwhorter/>.
- Michael, Lev. 2011. The interaction of tone and stress in the prosodic system of Iquito (zaparoan). *Amerindia* 35. 53–74.
- Newman, Paul. 1981. Syllable weight and tone. *Linguistic Inquiry* 12(4). 670–673.
- Nishida, Gustavo. 2009. A Natureza Intervocálica Do Tap Em PB.
- Odden, David. 1999. Typological issues in tone and stress in Bantu. In Shegeki Kaji (ed.), *Cross-linguistic studies of tonal phenomena: Tonogenesis, typology, and related topics*, 187–215. Tokyo: ILCAA.
- Post, Marike. 1994. Fa d'Ambu. In Jacques Arends, Pieter Muysken & John Victor Singler (eds.), *Pidgins and creoles: An introduction*, 191–204. Amsterdam/Philadelphia: John Benjamins.
- Prince, Alan. 1990. Quantitative consequences of rhythmic organization. *Chicago Linguistic Society* 26(2). 355–398.
- Quint, Nicolas & Biagui Noël Bernard. 2012. Casamance creole. In Susanne Maria Michaelis, Philippe Maurer, Martin Haspelmath & Magnus Huber (eds.), *The survey of pidgin and creole languages*, 40–49. Oxford: Oxford University Press.
- Remijsen, Bert. 2002. Lexically contrastive stress accent and lexical tone in ma'ya. *Laboratory Phonology* 7. 585–614.
- Remijsen, Bert & Vincent J. van Heuven. 2005. Stress, tone and discourse prominence in the curaçao dialect of Papiamentu. *Phonology* 22(2). 205–235.

- Rivera-Castillo, Yolanda. 1998. Tone and stress in papiamentu: The contribution of a constraint-based analysis to the problem of creole genesis. *Journal of Pidgin and Creole Languages* 13(2). 297–334.
- Rivera-Castillo, Yolanda & Lucy Pickering. 2004. Phonetic correlates of stress and tone in a mixed system. *Journal of Pidgin and Creole Languages* 19(2). 261–284.
- Seibert, Gerhard. 2013. São Tomé and Príncipe: The first plantation economy in the tropics.
- Seibert, Gerhard. 2014. Crioulização Em Cabo Verde e São Tomé e Príncipe: Divergências Históricas e Identitárias. *Afro-Ásia* 49. 41–70.
- Smith, Norval. 2008. Creole phonology. In Silvia Kouwenberg & John Victor Singler (eds.), *Handbook of pidgins and creoles studies*, 98–129. Oxford: Wiley-Blackwell.
- Smith, Norval & Lilian Adamson. 2006. Tonal phenomena in sranan. *Sprachtypologie und Universalienforschung* 59(2). 211–218.
- Steien, Guri Bordal & Kofi Yakpo. 2020. Romancing with tone: On the outcomes of prosodic contact. *Language* 96(1). 1–41.
- Swolkien, Dominika. 2015. The Cape Verdean Creole of São Vicente: Its genesis and structure. Tese de Doutorado. Universidade de Coimbra.
- Thomason, Sarah G. 2001. *Language contact*. Edinburgh: Edinburgh University Press.
- Thomason, Sarah G. & Terrence Kaufman. 1988. *Language contact, creolization, and genetic linguistics*. Berkeley: University of California Press.
- Thompson, Dahlia & Hubert Devonish. 2010. *A concise grammar of guyanese creole (creolese)*. München: LINCOM.
- Tomás, Gil, Luísa Seco, Susana Seixas, Paula Faustino, João Lavinha & Jorge Rocha. 2002. The peopling of São Tomé (Gulf of Guinea): Origins of slave settlers and admixture with the Portuguese. *Human Biology* 74(3). 397–411.
- Torreira, Francisco. 2005. Draw objects. Available at: https://github.com/MinhChauNGUYEN/praatfig/blob/master/Script3_DrawObjects_byFranciscoTorreira/DrawObjects-Origin.PraatScript.
- Trail, Anthony & Luiz Ferraz. 1981. The interpretation of tone in Principense creole. *Studies in African Linguistics* 12(2). 205–215.
- van der Hulst, Harry, Rob Goedemans & Ellen Van Zanten. 2010. *A survey of word accentual patterns in the languages of the world*. Berlin/New York: De Gruyter Mouton.
- Voorhoeve, Jan. 1961. Le Ton et La Grammaire Dans Le Saramaccan. *WORD* 17(2). 146–163.
- Wetzels, W. Leo. 2007. Primary word stress in Brazilian Portuguese and the weight parameter. *Journal of Portuguese Linguistics* 6(1). 9–58.
- Xu, Yi. 1999. F0 peak delay: When, where, and why it occurs. In *Proceedings of the 14th International Congress of Phonetic Sciences, 1881–1884*. San Francisco: Berkeley University of California.
- Yakpo, Kofi. 2009. *A grammar of Pichi*. Berlin, Accra: Isimu Media.
- Yakpo, Kofi. 2019. *A grammar of Pichi*. Berlin: Language Science Press.
- Zamora Segorbe, Armando. 2010. *Gramática Descriptiva del Fã d'Ambô*. Madrid: CEIBA
- Zee, Eric. 1978. Duration and intensity as correlates of F0. *Journal of Phonetics* 6(3). 213–220.
- Zhang, Jie. 2001. *The effects of duration and sonority on contour tone distribution*. Los Angeles: University of California.