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Syllabification, Tone Marking, and Minimality in Eleme

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Abstract

This paper discussed syllabification in Eleme. It accounted for the distribution of glides and phonotactic constraints on intrasyllabic segmental sequences via sonority hierarchy. Two types of extraprosodicity in Eleme – word-final /i/s and word-initial were also discussed. The paper also presented the analysis of foot construction and tone marking, adopting the framework of Halle and Vergnaud (1987). It argued for a minimal word constraint in Eleme, which states that the smallest allowable phonological word in Eleme is a maximal (i.e. binary) foot. This constraint is crucial to understanding why vowel-initial words with only a single well-formed syllable violate the tone rule and why sequences of equally sonorant vowels are allowed only in bivocalic words. Finally, the paper summarized the results of this study and their significance for linguistic theory and Ogonoid studies. The twofold objective of this paper is therefore to describe tone and syllabification in Eleme and their interaction with prosodic minimality, underscoring the implications of these phenomena for multilinear theories of phonology.

Introduction

Eleme belongs to the Ogonoid group spoken to the east of Port Harcourt, the capital of Rivers State in South-Eastern Nigeria. The languages of the group are known as Baan, Gokana, Kana, Tai and Yeghe (Ngulube 2011). They are the speech forms of the people of Eleme, Gokana, Kana and Tai Local Government Areas of Rivers State, Nigeria. The Eleme people live in some ten municipalities, which lie between 7^0 10′ and 7^0 15′ E and 4^0 35′ and 4^0 60′ N. Of recent, Bond and Anderson (2005) classified Eleme as: Niger-Congo; Benue-Congo; Cross River; Delta Cross; Ogonoid; Eleme.

Ngulube has conducted a research on Eleme as a doctoral research fellow at the University of Manchester, England. His corpus includes approximately ten dozen texts (average length: forty-five minutes) hundreds of elicited sentences and phrases, and a dictionary of approximately 2,000 entries.

'Multilinear phonology is a subset of generative research programmes, which analyse individual segments as the nexus of various hierarchically structured levels' (Everett 1993 p. 1). Preliminary studies in this tradition include Goldsmith (1990), Lieberman and Prince (1977), and others cited in the paper.

Phonemic representation in this paper differs from the one I presented in Ngulube (2013). Eleme has /m n p b t d k g kp gb k^w g^w f s ʧ ʤ j w l r/ distinctive consonants; some of these consonants such as /n w j/ have allophones that exhibit diverse and very complex phonological relationships and distribution (see Ngulube 2008 *pp* 95-106). International Phonetic Alphabetical symbols are employed here including certain non-Roman characters such as ɲ for the voiced palatal nasal; ŋ for the voiced velar nasal. Affricates are represented with digraphs [ʧ] and [ʤ]. The palatal approximant [j] is represented with the graph y following the convention prevalent in African language descriptions, although this somewhat deviates from the IPA accepted practice. Accordingly [r] is preferred to [ɹ]. The voiceless fricative [h] occurs only in word-initial position while the glottal stop [ʔ] never occurs word-initially. Note that vowels following nasal consonants are automatically nasalized and are marked in this paper with a tilde just as the nasal vowels.

At first glance, Eleme's (henceforth EL) tonal pattern and syllabification principles seem almost trivial: EL allows only **CV (V)** syllables and tone is the most common type – place a low tone on the first syllable within the (grammatical) word. If my analysis is correct, however, there are some theoretical significant 'twists' to EL's prosodic system. Specifically, I argue that two important theoretical implications follow from my analysis: (*a*) only the framework of Halle and Vergnaud (1987) can correctly predict EL's tone system, since only that framework allows tautosyllabic vowels to appear in separate feet; (*b*) prosodic minimality is responsible

for violations of syllabification extraprosodicity, a phenomenon not previously documented in precisely this form. This analysis is also the first detailed study of the prosody of any Ogonoid language. I hope it will lead to more studies of Ogonoid prosody and that it will contribute to studies of prosodic typology.

Syllabification and Extraprosodicity

Syllabification

The canonical syllable shape in Eleme is (i). ***CV*** (***V***), i.e., the minimal syllable is CV and this may be supplemented by an additional vowel. I can derive this if I assume (*a*) that EL takes the unmarked value for the *onset parameter* (Ito 1989), i.e., that onsets are obligatory in Eleme, and (*b*) that the syllable is maximally bimoraic, where each nuclear position receives one mora. This syllable structure is illustrated by the examples in (ii) – (vii) **v̀** = low tone; **v̄** mid tone and **v́** high tone:

ii	dʒūá	'bring'
iii	kíē	'name'
iv	kèí	'kill (pl)'
v	kpɔ́ɛ́rū	'hurt'
vi	Kpíkpíí 'strength'	
vii	bēbēā	'break'

The absence of v-syllables in the above data automatically accounts for the fact that there are no word-internal sequences of three or more vowels. The syllable shape (i) does not allow for codas, word-initial vowels, or syllables larger than CVV. The latter two predictions are superficially violated, as will be seen directly, since there are CVVV syllables and V-initial words in EL. However, I argue below that peculiarities about the distribution and behaviour of these latter items turn out in fact to support an analysis of EL syllables (to be given directly) which takes the canonical syllable shape in (i) to be correct and which analyses both the final V of CVVV syllables and word-initial Vs as extraprosodic. Let me turn first, though, to the statement of the sonority hierarchy in EL.

In addition to requiring onsets and not exceeding two moras, EL syllables are constrained internally by a sonority-sequencing requirement. The basic observation is that adjacent segments must not have the same sonority value. This *sonority-sequencing* requirement is based on the sonority hierarchy in (viii) below (CF. Selkirk 1984 and Clements 1990):

(viii) $\begin{bmatrix} -\text{high} \\ -\text{cons} \end{bmatrix} > \begin{bmatrix} +\text{high} \\ -\text{cons} \end{bmatrix} > [+\text{cons}]$

This hierarchy, in conjunction with the onset parameter and the maximal syllable size restriction, will correctly account for EL syllabification. Before stating the syllabification rule for EL, though, let me further illustrate the restriction against adjacent segments of identical sonority. Observe carefully the contrast between the words in (1) and those in (2):

(1a) fĩa ‘fine’

(1b) badʒuɛ́ ‘they came’

(1c) dʒáumai ‘bought death for us’

(1d) fúāmà ‘cut it and go’

(1e) tíasíama ‘go through the front’

(2a) *kea

(2b) *badae

(2c) *jeemai

(2d) *faana

(2e) *taeseani

The hypothetical words in (2) would violate sonority sequencing and thus are correctly predicted to be non-existent. I now provide a syllabification algorithm for EL:

(3) ***Eleme syllabification***

(3a) Attach items of the least sonorant class (as defined by viii) to O.

(3b) Attach items of the most sonorant class to N

(3c) Attach remaining items to N or O, as determined by the syllabic constraints (sonority sequencing, onset requirement, or syllabic maximality)

(3d) Attach all subsyllabic material to σ (= syllable), beginning with the leftmost onset.

(3e) Begin a new σ with each onset.

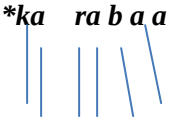
Consider how (3) syllabifies morphemes like kárādʒùà 'they are bringing it' and the hypothetical *kárabáa:

(4) ***k á r ā dʒ ù à***

ON ON O N N (3a - 3c)

σ σ σ (3d)

(5) ****ka ra b a a***



ON ON ON (3a – 3c)

σ σ σ (3d)

The ultimate /a/ in (5) is unsyllabifiable. It can only be syllabified if preceded by a less sonorant segment. Since it is preceded by a segment of equal sonority, it is disallowed here. Sonority sequencing also rules out complex onsets, since all onset segments are of equal sonority (cf. rule 8 below). Therefore, there could not be more than one segment in any O position.

It might help at this point to look more closely at how high vowels are treated by (3). The syllabification of a word like (6), for example, is guaranteed by sonority sequencing (where '**.**' = syllable boundary):

(6a) chúe 'type of bird'

(6b) .tue.

(6c) *.twe. (Violates sonority sequencing)

The high vowel in (6) must be nucleus since, by (8) below; to place it in the onset would create a sequence of adjacent, tautosyllabic segments of equal sonority. The correct parse of (7) is provided by the onset requirement and syllable maximality:

(7a) túyaya 'pluck pawpaw'

(7b) .tu.ya.ya

(7c) *.tuia.ia. (Violates maximality and onset requirements)

(7d) *.tu.ia.ia. (Violates onset requirement)

(7e) *.tuiaia. (Violates maximality)

To our discussion above, we must still add a rule which decreases the sonority of high vowels dominated by O. This is forced on us by the fact that high vowels in the nucleus may be adjacent to tautosyllabic glides in onset position, illustrated by words like *nyímɛ* 'beauty' and *pasɛyi* 'threaten'. Although such words are quite rare, they nonetheless violate the sonority-sequencing requirement, since high vowels and glides are of the same sonority, according to (viii). To account for such words, we must either assume that glides (i.e. underlying high vowels in Onset position) are changed to [+consonantal] and are thus less sonorant than high vowels in Nuclear positions, or we must weaken the sonority-sequencing requirement by in effect applying it only within subsyllabic constituents (e.g., within the Onset or Nucleus), rather than across syllabic constituents. xxx

At least for [y], the evidence seems to support the former option, that is, that glides are rendered [+ cons]. The pronunciation of [y], for example, is almost always as an alveopalatal fricative. Although the pronunciation of [w] is more like a typical glide, with little oral friction, so that it may only be [y] that undergoes this process (just as it is apparently only [y] that undergoes word-final extraprosodicity; see 2.2), I have chosen to write the rule here to affect both [w] and [y], for reasons of economy. Alternatively, of course, I could just analyse [y] and [i] and/or [w] and [u] as separate phonemes. I prefer not to do this, since the members of these pairs are in complementary distribution, proposing instead the rule in (8).

(8) **Onset Sonority Reduction**

$$\textbf{[-consonatal]} \rightarrow \textbf{[+consonantal]} / \underline{\quad \textbf{O}}$$

This rule allows sonority sequencing to apply with maximal generality and accounts for the fricative pronunciation of [y]. Let me turn to consider two types of exception to our syllabification algorithm.

Extraprosodicity

Word-final Extraprosodicity

In apparent violation of the generalization that the maximal EL syllable is bimoraic, CVVV syllables are found. Such syllables are severely restricted, however, in that (a) the final V must be /i/ or /a/ and (b) they can only appear in word-final

position. It turns out, in fact, that word-final /i/ does not carry a different tone when preceded by another vowel. I return to these facts directly. The phenomenon in question is illustrated in (9):

(9a) *Chichiai* 'turn (pl)'

(9b).*puɛi* 'break (pl)'

(9c) *muɛi* 'lie (pl)'

I can account for the existence and distribution of this anomalous syllable type if I assume that [i] is extraprosodic in word-final position, following another syllable Nucleus. Cross-linguistically, it is not uncommon to encounter some longer syllables in word-final position only. Extraprosodicity is a common explanatory device for such a state of affairs and I invoke it here, as in (10) but cf. Goldsmith 1990: 123ff. and Ngulube 2008: 153ff. for a different type of approach):

(10) **/i/ → EP/N ___]**

Thus by (10), word-final [i] will never lead to a violation of the maximal syllable weight requirement. CVVi sequences will count as CVV syllables after Extraprosodicity, thus obeying the maximal syllable weight requirement and accounting for the fact that they only appear in word-final position.

Word-initial extraprosodicity

The syllabification algorithm in (3) predicts that a word cannot begin with a V, since a vowel can only be syllabified if its syllable contains an onset. This claim is clearly incorrect, however, given the existence of vowel-initial words, e.g. *awia* 'sibling'. My proposal is that V-initial words are allowed in Eleme because the initial, unsyllabifiable vowel is rendered extraprosodic, as in (11).

(11). V → EP / [____

Rule (11) predicts at least three things. First, it predicts that unsyllafiable vowels are allowed only in word-initial position. This is because an extraprosodic vowel will be invisible to the syllabification procedure and thus will not violate it. Exceptions abound consider:

1. aaba 'fry them'
2. baama 'they are lying'
3. eee 'what is it?'

This researcher has carefully analysed all exceptions and found that they are morphologically complex, such that long vowels either (a) belong to different

morphemes or (b) belong to a morpheme which has undergone the vowel-spreading rule induced by minimality. It is also significant that all of these word-initial vowel sequences involve identical vowels, which suggest that spreading, or reduplication is involved and there is no underlying violation of our syllabification proposals. While I am not sure about the internal morphological structure of all of these forms, I am confident that they do not violate my analysis. I mention them here only to advise the reader that I am aware of them, yet foresee no problems for my analysis resulting from them.

Second, (11) predicts that word-initial vowels never bear different tones. Third, it predicts that no word can begin with more than one unsyllabifiable vowel since the second vowel could not be extraprosodic (extraprosodicity only affects elements at the periphery of a domain [Hayes 1982]). If an unsyllafiable vowel is not extraprosodic, the word will be ruled ungrammatical since the vowel will be visible to the syllabification algorithm but unsyllabifiable. Some possible versus impossible word shapes predicted by this analysis are listed in (12) and (13):

(12) dʒuana 'bring meat' vs. *dʒaana, * dʒeena, * dʒeana, * dʒaena, * dʒadʒaaa, *dʒadʒaee

(13) odei 'you (pl) eat', edʒua 'he comes' vs. * eedʒa, *eadʒa

Alternative

If I was to assume, contrary to the above analysis, that EL had V-syllables (according to Ngulube 2008), I would correctly predict the existence of V-initial words. However, this very small local gain in economy is inadequate motivation to posit V-syllables for at least three reasons:

(15) Against V-syllables

(15a) Word-initial V-syllables fail to bear polar tones, which indicates that they would still need to be rendered extraprosodic, thus gaining us nothing on this score.

(15b) The proposal that EL has V-syllables incorrectly predicts V-sequences of more than two vowels.

(15c) This proposal also fail to predict the fact that all V-sequences respect sonority sequences, which would be separate syllables, no principle would prevent words with adjacent vowels of equal sonority, something I have already seen to be prohibited in EL.

Having established the basic principles of syllabification for Eleme, I would like to turn now to consider tone marking, focusing here primarily on low tone.

Tone marking

Basic statement

The basic statement of tone marking is easy: (extraprosodic materials take low tone), tone mark every other vowel (i.e. segments dominated by N) from left to right. This correctly and trivially accounts for the tone in words like:

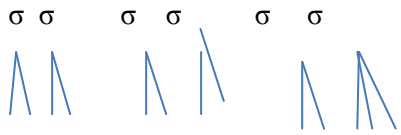
(16) māā lēbí ńsằ̀ 'I have shared the book.'

(17) <à> bábūrú 'they beat you'

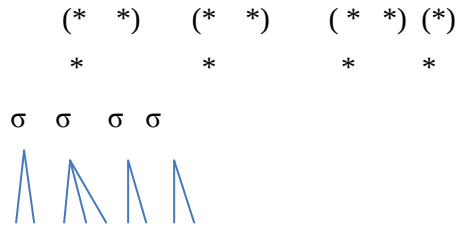
(18) <m̀>bádí 'name'

(19) dʒúakaba<ì> 'bring our mother'

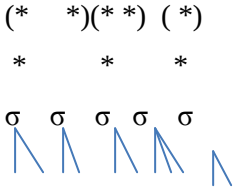
Interestingly, however, this analysis glosses over an important fact. Tautosyllabic vowels may belong to different mora (the lines above the example words show syllable structure; the lines below the words give foot structure):



(20) <è> *dʒ í b í <ǹ>k ã t ã <ǹ> t í m ɔ é<i>* 'he pitch (the fish) trap when I saw you'



(21) *b á dʒué b í r í* 'they have come to play'



(22) *k e r e w e jua ma* ‘he brought half of it’

(* *) (* *)(* *)

* * *

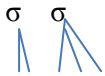
σ σ

(23) sá j i é <i> ‘if he pities you’

(* *) (*)

* *

σ σ



(24) chí ch iá <i> ‘change pl’

(* *) (*)

* *

To my knowledge, the only generative, multilinear model of tone marking which allows for this possibility is that of Halle and Vergnaud (1987), although their work is solely on stress placement. I have adopted and applied it here to tone marking. Therefore, I turn now to a formal statement of the tone marking algorithm for EL in this framework.

Halle and Vergnaud (1987)

The model developed in Halle and Vergnaud (1987) incorporates both a metrical grid (Prince 1983), as well as metrical constituents, e.g. feet (Lieberman and Prince 1977, Hayes 1982, and others). Certain units, e.g. vowels or syllabic nuclei, project a ‘tick’ (*) to an initial grid (line Ø) and these are then grouped into bounded or unbounded constituents. The head of a line *n* is projected to line *n* + 1. The procedure is repeated until the word is exhaustively parsed. The tone algorithm for Eleme is stated in (25).

(25) Eleme Tone

(25a) For each segment immediately dominated by N (ucleus), project a * to line Ø (extraprosodic material does not project);

(25b) Going from left-to-right, group line Ø *s into binary, left-headed feet;

(25c) (Project heads of line Ø constituents to line 1).

The parenthetical material in (25c) is given only for expositional convenience. Since these steps follow from the theory, it is not really necessary to state them here. Consider how (25) tone marks words in (26) – (34):

(26) māā lē bí ń sɜ̀̌ 'I have shared the book.'

(* *)(* *)(* *) Line Ø

* * * Line 1

(27) ɛ-ja pu ma 'he bought excess.'

(* *) (*) Line Ø

* * Line 1

(28) rɛ bɛ nu ma 'we shifted it to him.'

(* *) (* *) Line Ø

* * Line 1

(29) <è> *dʒ í b í <ǹ>k ã t ã t í mé* 'he pitch (the fish) trap when I saw you'

(* *) (* *) (* *) Line Ø

* * Line 1

(30) ɛ wa ri <i> 'they drank'

(* *) Line Ø

* Line 1

(31) chi chi a<i> 'repent'

(* *) (*) Line Ø

* * Line 1

(32) be chu ba si ma 'he took them to him.'

(* *) (* *) (*) Line Ø

* * * Line 1

(33) tia siɔ mɔ 'go there'

(**)(**)(*) Line Ø

* * * Line 1

(34) fu a ma 'cut and go with it'

(**)(*) Line Ø

* * Line 1

(35) dʒua bi ne <i> ‘bring (and) squeeze it for us’

(* *)(* *) Line Ø

* * Line 1

Minimality

The analyses of syllabification and tone marking advocated above are systematically violated in binuclear words. Word-initial vowels are tone marked in such words, contrary to (25), and geminate vowels are allowed in these words, contrary to (3). In this section, I argue that these facts can be explained via the notion of ***prosodic minimality*** (McCarthy and Prince 1990). Specifically, I claim that all Eleme words must be at least a binary (or maximal, since Eleme lacks unbounded feet) foot in length, as formalized in (36):

(36) Minimality

[word (*)]

This is a paradigm example of minimality, as discussed originally in McCarthy and Prince (1990). If words arise which would otherwise violate (36), they are brought into conformity by one of two means: Spreading or ‘Suppression’ of extraprosodicity (cf 40 below). Consider the words in (37) and (38):

(37) *ábá* ‘they’, *áwā* ‘s/he drinks’, *íimai* ‘fetch with’, *úríí* ‘creel’, *áwii* ‘he call’

(38) *ífà* ‘coconut’, *àbāā* ‘type of fish’, *dāada* ‘name for female’, *òbíí* ‘type of fish’, *búubua* ‘stuff the mouth’, *ǹsã táá* ‘fire burnt him’

The first set of data violates the tone rule in (26), since a word-initial V-syllable carries tone other than L. The second set of data violates the syllabification principles, which otherwise prohibits sequences of equally sonorant vowels. Both of these phenomena strongly support the minimality constraint in (36). For example, consider what words of the first set would look like prosodically if the word-initial vowel were marked extraprosodic (where <,> indicate extraprosodicity and (,) indicate a metrical foot):

(39) <*a*> *b* (*a*) ‘they’

This word clearly violates (36) above in consisting only of a degenerate, i.e. non-maximal foot. In order to conform to (36), extraprosodicity must be suspended. There are various ways in which one might implement this proposal. One popular way would be to propose that minimality ‘blocks’ extraprosodicity from applying in bi-

syllabic words (cf Wilkinson 1988). However, as pointed out in Ngulube (*forthcoming*), I believe that such blocking constraints in phonology lead to serious conceptual and computational difficulties, and thus I reject such an approach here. My proposal is simply to allow minimality to remove extraprosodicity, as in (40). This rule will be ordered after syllabification but before tone marking:

(40) Extraprosodicity Removal

<V> → V / [____ (*)]

I recognize that this rule and rule (41) below are not entirely satisfactory because they inelegantly restate minimality in their structural descriptions. This is a typical case of rule 'conspiracy' of the type first discussed in detail by Kisseberth (1970). However, inelegant the formalism at this point, though, I nevertheless believe that this is the best way to handle the statement of Eleme minimality. Arguing for this position would take me too far astray from my central purpose here, however, so I shall simply run the risk of frustrating my readers with this and leave it as is.

Let me now consider how the words in (38) support minimality. The question is why bivocalic words allow adjacent vowels of equal sonority, in violation of the syllabification procedure in (3) which, as I have shown, is quite successful in accounting for the phonotactic constraints observe in polysyllabic words. If (3) is correct, there could be no lexical items corresponding to the forms in (38). My proposal is that these items are underlying monovocalic and that they are brought into conformity with minimality via a Spreading rule, as in (41):

(41) [CV] → [CV]

* * *

I assume that minimality checks words ***after*** the sonority-sequencing restriction has applied and thus that the output of Spreading is not seen by, and thus does not violate, sonority sequencing. Multiply linked vowels are allowed only by (41), i.e., to avoid a violation of minimality. There is no need to propose an independent restriction against geminates at underlying form in Eleme, if my reasoning here is correct. Underlying geminates would violate sonority sequencing, if I assume that the latter looks at the skeletal level, rather than the phonemic melody level (i.e., that it looks at the level of the asterisk in 41 and not at the top line), since these skeletal sequences, unlike those triggered by minimality, would be visible at the level at which the sonority-sequencing restriction applies.

Residual observations

There are some examples where the tone rules are violated in isolated words. I am unable to offer a complete analysis of this counterexample at the present, but it is worth mentioning them here since each counterexample appears to fall into a particular morphosyntactic class and could be handled straightforwardly by my analysis along the lines I suggest below. I have come across a handful of reduplicated forms in my corpus. Two examples are:

(42) dʒàa ‘match’

rɛ́dʒádʒaa ‘he didn’t match (it)’

(43) ìsa ‘forget’

rɛ́íʔisa ‘I didn’t forget’

The reduplicated forms violate the tone rule in that the first syllable, the reduplicated syllable, is HT. However, this is compatible if we assume that reduplication follows a different tone marking rule. Another type of counterexample – again I have very few examples – concerns the infix – o- ‘progressive marker’. Consider examples (44):

(44) gbì ‘think’

gbí*ó*gbí ‘thinking’

In this example, the tone on this progressive marker is copied from the adjacent syllable. Again, this can be accounted for if I assume that progressive markers follow different tone marking rule. Deeper understanding of the ordering of tone marking, however, must await more detailed studies of Eleme morphology.

Conclusion

In this paper, I have analysed the interaction of tone marking, syllable structure, and prosodic minimality in the Ogonoid language, Eleme. I have shown that while some aspects of the prosodic system of this language are quite simple (e.g., the fact that tone is mark on every syllable, left-to-right, skipping word-initial vowels in polysyllabic words), the interaction of these various prosodic phenomena is subtle and, I believe, provides significant empirical support for proposals of multilinear phonology. In particular, it is very interesting that the notion of metrical foot helps explain tone marking in Eleme and that this requirement overrides both extraprosodicity and syllabic constraints. Moreover, the data here appear to offer strong support for the tone theory of Halle and Vergnaud (1987). I wish to underscore for my fellow fieldworkers that has played an important role in my otherwise ‘descriptive’ task. Further work remains to be done in studying tone patterns in connected text and in a wide variety of morphosyntactic processes. However, I

believe that this analysis represents an important first step in the analysis of Eleme phonology in particular and in Ogonoid generally.

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