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Article

The Syllable Structure in Nyangatom

Moges Yigezu
(Addis Ababa University)
moges.yigezu260@gmail.com

Abstract

The syllable structure in Nyangatom is a key phonological unit that plays a central role in the organization of the phonological structure. The core syllable has a fairly complex structure consisting of a branching onset, an obligatory nucleus and a non-branching coda which is optional. The question of syllabification, that is, the division of words into syllables, both in complex onsets and reduplicated words, appear to be an interesting aspect of the phonology. The analysis of the internal structure of the syllable structure of Nyangatom shows that the Mora theory, rather than the traditional onset-rhyme conception, provides an insightful explanation in determining the syllable boundaries of disyllabic and multisyllabic words involving sequences of consonants as well as in the analysis of reduplicated words.

1 Introduction

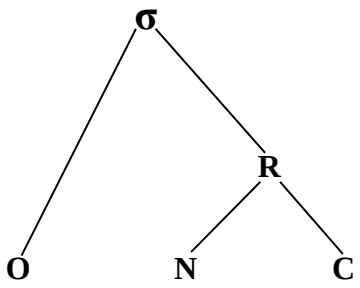
Nyangatom is an Eastern Nilotic language classified as a member of the Turkana-Teso cluster along with Toposa and Jie (Vossen 1982). Literature on the grammatical description of the language is still scanty. Some preliminary studies include Dimmendaal (2007), Kadanya & Schroder (2011) and Moges (2016). The current contribution is an attempt to add to the scanty literature by describing an aspect of the phonology of the language focusing on the syllable structure.

The syllable structure in Nynagatom, as in other languages, is a key phonological unit and plays a pivotal role in the overall organization of the phonology of the language. In describing the internal structure of the syllable in Nyangatom, the Mora theory has been employed. It is argued in this study that in Nyangatom the Mora plays a central role in organizing the sound pattern of the language and this role has been demonstrated at least in two domains of the phonology, namely, in the syllabification of complex onsets and in describing the phonological structure of reduplicated words.

2 The syllable

Currently, there are at least two competing conceptions as to how the syllable structure of a language should be represented, namely, the onset-rhyme theory and the Mora theory. The former is also called the phonetic syllable and comprises the traditional view of the internal structure of a syllable (onset-nucleus-coda) where the onset-rhyme boundary is a significant switching point. Hence, the nucleus is an obligatory member of the syllable structure and in this structure the nucleus and coda form a unit called rhyme as given in (1) below.

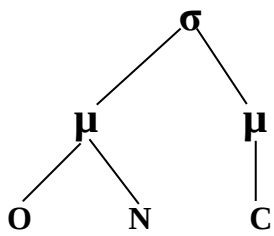
(1)



R: Rhyme
O: Onset
N: Nucleus
C: Coda

An alternative conception of the representation of the syllable structure, which is a phonological concept, is the Mora-Mora structure. Under this conception, the syllable does not consist of an onset-rhyme structure but of two moras - the first mora consists of an onset and a nucleus, and the second mora consists of an optional coda as shown in (2) below. The sigma '**σ**' is used to refer to a syllable, and the mu '**μ**' to a mora.

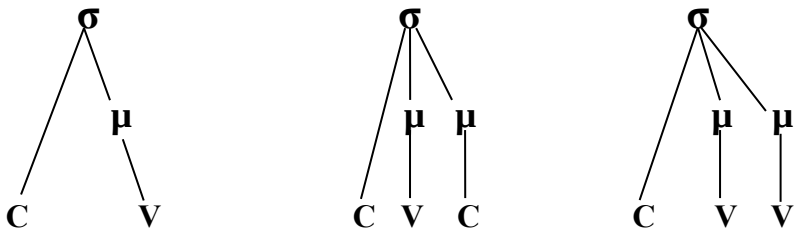
(2)



The representation in (2) treats moras as sub constituents of a syllable and the mora-mora structure leads to the generalization that heavy syllables consist of two moras and light syllables consist of one mora. In the traditional onset-rhyme structure weight usually refers to coda consonants and not to onset consonants. In addition, compensatory lengthening of vowels is always considered to be the result of the deletion of coda consonants, and never of onset consonants (Oostendorp 2005).

In moraic theory, the syllable does not consist of an onset and a rhyme but of two morae. In a language like Nyangatom, where closed syllables and syllables with a long vowel are considered to be heavy syllables, whereas other syllables are light, we can represent the syllable structure in the following way:

(3) **(a) light** **(b) heavy** **(c) heavy**



It is assumed in this study that moraic theory, in which the onset and the nucleus are treated as single unit, provides an insightful representation of the internal structure of the syllable in Nyangatom in at least two domains. That is, in describing the syllabification structure of a complex onset structure, i.e. a consonant followed by a glide (**CG-** sequence) and the phonological structure of reduplicated words. In both cases, the Mora theory allows for a more insightful analysis of the issues.

2.1 The Onset

The Mora in Nyangatom can be defined, following Hayes (1989), as having at least two functions: (a) it encodes phonological weight, i.e., a light syllable has only one Mora and a heavy syllable has two, and (b) it represents a phonological position, i.e., it can be used to indicate length. The phonologically weightless melodic units are directly linked to the syllable node. Hence, onset consonants are directly linked to the syllable node and they are non-moraic while coda consonants are dominated by a Mora. In this regard, Bickmore (1995:147) notes that "since onsets never contribute to syllable weight, their deletion should never induce compensatory lengthening of an adjacent vowel. In moraic theory this is accounted for by not assigning onsets to morae, but instead, linking them directly to the syllable node".

The onset in Nyangatom may consist of a zero consonant, a single consonant, or a sequence of consonant and glide. Any single consonant can occur in the onset position. But in the situation where sequences of consonants appear in onset position, there is restriction. That is, the second member of the cluster has to be a glide. A consonant followed by one of the glides is the only type of cluster allowed in the language. Some

examples illustrating the consonants and sequences of consonants assuming the onset positions are given in (4) below[1].

(4)	**ŋi-tjaŋì**	'wild animals'
	a-kwan	'body'
	ɛ-kwana	'blade/edge'
	e-gjelìt	'kind of necklace'
	e-dja	'boy'
	a-tuɓwa	'plate'

Sequences such as [**kw**-] or [**tj**-] occur only as the onset of a syllable and they are interpreted as sequences, not as modified units. In other words, they are not labialized [**C^{w}**] or palatalized [**C^{j}**] segments. The reason for treating such complex sounds as sequences is that they only occur as the onset of the syllable but not as a coda. Besides, each of the glides occur on their own, as single consonants, as in the verb root **-wa** 'stop, trans.' The glides also contrast with the consonant-glide sequence root-initially as in **-tatʃ** 'pay' and **-tjak** 'divide'. Some more examples are given in (5) below.

(5)	**-tjak**	'divide'
	-tatʃ	'pay'
	-kwaŋ	'be white'
	-wa	'stop (trans.)'
	-nwat	'repair'
	-nap	'wear, carry on back'

Moreover, the glide in sequences such as **-tjak** 'divide' cannot be interpreted as the high front vowel [**i**], for instance, since independently it constitutes the onset of a syllable, as in **a-jɛpɛ** [**a.jɛ.pɛ**] 'axe', a position which vowels cannot constitute. Hence, the glides in Nyangatom behave like consonants with regard to syllable structure and they are part of the consonant inventory of the language. Some examples illustrating the occurrence of glides in onset position are given in (6) below. A dot in the data indicates syllable boundaries.

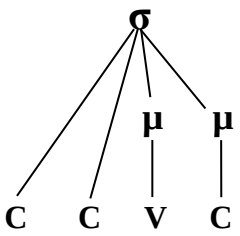
(6)	**a-ki-jɛp**	[a.ki.jɛp]	'to cut'
	a-jɛpɛ	[a.jɛ.pɛ]	'axe'
	a-wɔru	[a.wɔ.ru]	'cloth'

[1] The prefix **ŋi-** is a plural marker and the prefix vowel **V-** marks singular nouns. The prefix vowel is subject to vowel harmony process prevalent in the language. The nominal root is generally preceded and followed by various inflectional morphemes that mark gender, number, case, etc. As an agglutinative language, Nyangatom verbs contain various affixes. A verb root or stem may be preceded and followed by different inflectional morphemes that indicate agreement, tense, aspect and voice. The verb stem can also be extended by derivational suffixes. A hyphen is used to separate the root noun and the root verb from the affixes attached to it.

In Turkana, Dimmendaal (1983) points out that sequences of consonant plus a glide only seems to occur in nouns borrowed from other languages such as Kiswahili. This does not seem to be the case in Nyangatom since basic lexical items such as /**edja**/, 'boy' /**iiŋokwo**/ 'dogs', /**akwara**/ 'spear', /**aamwara**/ 'horn' contain such kind of complex sequences.

The syllabification of complex onsets discussed above can be straight forward if considered in the terms of mora-mora structure in which the onset and the following nucleus are treated as part of a single mora as in the following representation in (7).

(7)



2.2 Coda (C)

In light of the moraic theory, hierarchically coda consonants are linked to a mora optionally. The coda in Nyangatom consists of at most one segment. The coda position can be assumed by any consonant in the language as there are no restrictions except that there is a distinct preference for dissimilar consonants in either manner or place of articulation. Similar consonants within consecutive syllables are rare. Some examples of consonants assuming coda positions are given in (8) below.

(8)				
	p	**a-kwàp**	[a.kwap]	'land/country'
	t	**ɛ-rɛɛt**	[ɛ.rɛɛt]	'face'
	k	**ɛ-pɛnɛk**	[ɛ.pɛ.nɛk]	'animals'
	ɓ	**-taɓ**		'tobacco'
	ɗ	**-tɪɗ**		'spleen'
	ɟ	**-muɟ**		'food'
	s	**e-kipiis**	[e.ki.piis]	'arm'
	ɲ	**ɛ-maɲ**		'liver'
	n	**á-pón-ój**		'lip'
	ŋ	**e-tjan-ìt**		'wild animal'
	r	**a-kwar**		'evening'
	l	**e-gjɛl-ìt**		'kind of necklace'
	w	**á-kɔ̀w**		'head'
	j	**aj**		'where'

Although no case of consonant harmony is attested in the language, there are a few cases of similar consonants within disyllabic words.

(9)	**-kɔɔk**	‘belly’
	-koku	‘child’
	tɛtɛn	‘right’
	a-kakʊ	‘back’

2.3 The Nucleus (N)

The nucleus is represented by a short vowel, but it can also branch in order to accommodate the long vowels and diphthongs. Long vowels and diphthongs are treated as sequences of two identical and non-identical vowels respectively. Some examples of short and long vowels assuming the nucleus position are as follows.

(10)	**e-kir**	‘flea’
	ɛ-mun	‘snake’
	ŋɪ-tɛŋ	‘animals’
	ŋɪ-ɲa	‘grass’
	ɗaan	‘all/whole’
	kwá	‘like’
	ta-apaa	‘grandfather’
	ɓeen	‘yesterday’
	sʊ̀à	‘we (inclusive)’
	èèsì	‘you (pl.)’

3 Phonotactics

Nyangatom puts very few restrictions on phoneme sequences and has a moderately simple pattern. A word can begin or end in any of the phonemes, that is, a word can begin with a vowel or a consonant without any restriction on the type of phoneme. As stated above, consonant clusters do occur in Nyangatom but limited to syllable-initial positions and a combination of any consonant with one of the two glides is allowed as shown in examples (4) above. It follows then that the same sequences of consonants occur word-initially as well but not word-finally.

A sequence of two consonants, other than the consonant-glide sequence, is rare in the language. A few exceptions include the sequences of **[-kr-**] as in **ɛ-krɔ** ‘name’, and a homorganic nasal **-mp-** as in **a-tʃumpi** ‘date’.

4 Partial Reduplication

Partial reduplication occurs in both noun and verb roots and the reduplication process repeats only the first syllable, i.e., the onset and the following nucleus. The coda consonant appears to be unaffected by the process. Since the process affects only the onset and the following nucleus, reduplication in Nyangatom follows the Mora-Mora

structure rather than the onset-rhyme structure. The first mora consists of an onset and the nucleus and the second mora consists of an optional coda. The reduplication process repeats only the onset and the following nucleus, i.e., **<C₁V₁ >C₂ > -C₁V₁C₁V₁C₂**. Some examples:

(11) **e-lɔlɔm** ‘widen’;
e-kokor ‘hen, generic’
a-kokoŋo ‘rough stone’
a-pipiot ‘fire sticks/matches’
lo-tutuj ‘Nubian wood peaker’
ɗʊɗʊŋ ‘tie’.
tɛtɛn ‘right’

There are no obvious restrictions on the possible C1 C2 combinations within the reduplicated structure, except that most of the C2 consonants are sonorants (nasals, trill and glide). The base of the reduplicated form does not occur as an independent root. It is often the case that the first syllable is short.

5 Root Structure

Word classes do not differ substantially from each other in their phonotactic structure and there is very little that helps to distinguish verbs from nouns except for one minor exception that class of verbs have an initial high front vowel. The most frequent form of root structure in Nyangatom is - CGVC-. A few verbs have been found with a root pattern of **-C₁V₁C₁V₁C₂** as in **-lɔlɔm** ‘widen’; **ɗʊɗʊŋ** ‘tie’.

Simple nouns and verb roots rarely exceed two syllables, and can be distinguished with regard to their canonical pattern -CGVVC-. The following data exemplify possible structures within roots.

(12)	**- CV-**	**ŋá-kɪ**	‘ear’
	- CVC-	**tatʃ**	‘pay’
	- CVV-	**sʊ̀à**	‘we (inclusive)’
	- CVVC-	**ɓeen**	‘yesterday’
	- CGCV-	**a-kwar**	‘evening’
	- CGV-	**kwá**	‘like’
	- VV-	**èè.sí**	‘you (2p pl.)’
	- VC-	**aj**	‘where’
	- VCV-	**ŋa-arɪ**	‘two’
		a-ɪtɛ̀	‘cow’
	-VCVV-	**-ataa**	‘grandmother’

The syllable structure of a root can be described as a sequence of one or two syllables and roots with more than two syllables are rare.

6 Syllabification procedures and finding syllable boundaries

Syllabification, which is the segmentation of sound strings into syllables, is related to the phonological shape of a word. Segmenting words into syllables and identifying syllable boundaries is an important aspect of the phonology because the syllable can be conveniently used to formulate a number of phonological phenomena. Among other things, the syllable is the basic phonotactic unit that regulates the ways in which lower level units (C's and V's) of the phonological hierarchy can be combined. It is also a unit in which the rules that reflect speaker's knowledge of what combinations of sounds are allowed in their language can be stated.

The question of syllabification is quite controversial and there are different approaches used in determining syllable boundaries within a word. Within the onset-rhyme theory there are two established principles used in organizing the syllable structure and determining syllable boundaries across languages. These are Sonority Sequencing and Onset Maximization principle.

6.1 Sonority Sequencing

The term sonority refers to energy relative to effort. A sonorous sound is one with high output relative to the articulatory effort required to produce it; accordingly sounds can be ranked in terms of their degree of sonority. There is a clear ranking of accessibility to the head position and the class of segments capable of functioning as syllable peaks is not arbitrary. Trask (1996:328) points out that "the sonority profile of the syllable must slope outwards from the peak. In other words, the level of sonority must rise as we proceed from the peak to the end, in accordance with the Sonority Hierarchy". A sonority hierarchy, which was suggested by Hooper (1972), is adapted to the class of segments in Nyangatom as in (13) below.

(13) **A standard sonority hierarchy**

	Sonority index (SI)	**Sounds**
More	**9**	**low vowels (e.g., a ʌ)**
Sonorous	**8**	**mid vowels (e.g., e ɛ ɔ o)**
↑	**7**	**high vowels/glides (e.g., i ɪ j u ʊ w)**
	6	**trill (e.g., r)**
	5	**laterals (e.g., l)**
	4	**nasals (e.g., m n ŋ ɲ)**
	3	**voiced affricates (e.g., ʤ)**
↓	**2**	**voiceless fricatives and affricates (e.g., s tʃ)**
Less	**1**	**voiced plosives (e.g., b d g ɓ ɗ ɟ ɠ)**
Sonorous	**0**	**voiceless plosives (e.g., p t k)**

Despite the fact that the SI needs to be refined in various respects, it allows us to determine not only the head of the N, but also makes prediction as to the overall shape of syllables. The distribution of segments in syllables follows a clear pattern which can be stated in terms of the sonority hierarchy. In terms of sonority, onsets are typically on an ascending slope and that codas are on a descending slope. For example, in the word **ŋamwar** 'horns' the sonority curve looks like as follows. The syllable boundary is predicted to be before the least sonorous consonant; hence the syllabification **ŋa.mwar** is predicted.

(14) **ŋa.mwar**
4-9-4-7-9-5 **sonority curve**

Vowels are the most likely segments to occupy the N of a syllable, and the voiceless stops the least likely ones. This notion of 'degree of eligibility' for the syllabic position in a syllable is essentially to do with the sonority of elements, which is closely linked, in articulatory terms, with the degree of blockage of the airstream (degree of constriction or stricture). Vowels are the least constricted segments (they are all characterized by a stricture of open approximation); the lower a vowel, the more open the vocal tract, and the less constriction there is. Low vowels are therefore the least constricted, and thus the most sonorous, of all segments.

In sonority voicing plays a role since voicing is required to produce sonority. A sonority hierarchy takes into account two factors: voicing and degree of sonority.

There is an agreement that "relative sonority" plays a role in determining which elements can be nucleus, which elements can border the nucleus, and which elements occur in syllable-initial and syllable-final positions. In terms of sonority sequencing, the Nyangatom words given below in (15) are syllabified in the following manner.

(15)	**a.ɓo.lja**	'shield'
	a.kwap	'land/country'
	a.kwar	'evening'
	lu.ki.ljok	'to the people'
	a.dwɛl	'kind of apron'
	ŋa.mwar	'horns'
	i.kwa	'like'

In all cases, the sonority profile confirm to the sonority sequencing.

6.2 Onset Maximization Principle

One of the universal guiding principles in the calculation of syllable boundaries is the onset maximization principle. In a situation where consonant clusters occur, the onset maximization principle predicts that if a segment may belong to both the coda of the first syllable and the onset of the second syllable, it belongs to the onset of the second syllable. According to this principle, VCV is syllabified as **V.CV** and never as **VC.V**. Hence, the onset maximization principle would syllabify the same words given above in (15) as in (16) below.

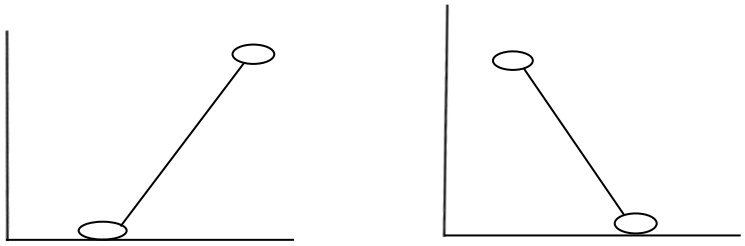
(16)	**a.ɓol.ja**	'shield'
	ak.wap	'land/country'
	ak.war	'evening'
	lu.kil.jok	'to the people'
	ad.wɛl	'kind of apron'
	ŋam.war	'horns'
	ik.wa	'like'

As shown under (16) above, the onset maximization principle, for instance, correctly predicts the structure **ak.war**. But the same principle says that if a segment belongs to both coda of the first syllable and the onset of the second syllable, it belongs to the onset of the second syllable and hence predicting the structure **a.kwar**, a structure that confirms to the language-specific phonotactic constraint. The phonotactic constraint in Nyangatom requires that sequences of a consonant followed

by a glide occur only syllable-initially ruling out the syllable structure **VC.CVC** and such a sequence must be part of the following onset. The **V.CCVC** structure in **a.kwar** 'evening' also satisfies the sonority sequencing principle as the sonority profile **9-0-7-9-6** illustrates.

According to the sonority sequencing principle, when a rising-sonority cluster occurs as in **-kw-** cluster (with a 0-7 sonority profile), both consonants are in an onset. Whereas in case of a falling-sonority cluster as in **-wk-** (with 7-0 sonority profile), the first consonant is a coda and the second becomes an onset.

(17) **(a) A rising-sonority cluster** **(b) A falling-sonority cluster**



As shown above, both the sonority sequencing and the onset maximization principle correctly predict the syllable boundaries in disyllabic and multisyllabic words.

7 Conclusions

Nyangatom has a fairly complex onset with an obligatory nucleus followed by a non-branching coda. Any consonant in the language can assume an onset position and there are no restrictions imposed on the consonant types that occur at coda position either. Sequences of consonants are allowed but only at syllable-initial position. The type of cluster permissible is a combination of any consonant and a glide. Such clusters are treated as part of the syllable onset. In determining the syllable boundaries in disyllabic and multisyllabic words of Nyangatom both the sonority hierarchy and the maximal onset principle agree and happened to be the organizing principles.

Nevertheless, treating the complex onsets in light of the Mora theory, where the complex onset and the following nucleus are treated as part of the first mora, would provide a more insightful and economical description of the syllable structure of Nyanagatom. Moreover, the phonological structure of the partial reduplication of noun and verb roots would offer another piece of evidence in favor of the Mora theory,

where a heavy syllable is considered to have two morae - the first mora consists of the onset and the nucleus and the second consists of the coda. This conception of the syllable structure elegantly describes the partial reduplication process that repeats only the first syllable of the root form.

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