Wannune International Journal of Applied Management, Social sciences, Arts and Entrepreneurship (WIJAMSSAE)

Volume-1, Issue-3, pp-048-062
ISSN: 3141-4125

Research Paper **Peer-Reviewed/Open Access/ wijamssae.fedpolywannune.edu.ng/**

An Optimality Theory Account of Syllable Structure Constraints in Nkari

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ABSTRACT : *This study provides an Optimality Theory (OT) account of the syllable structure constraints and phonotactic rules in Nkari, an under-documented Lower Cross language spoken in Ini Local Government Area of Akwa Ibom State, Nigeria. Adopting a qualitative-descriptive research design, primary data were gathered from native speakers through the 1700-wordlist of the Summer Institute of Linguistics (SIL) and audio recordings of natural speech. The data were transcribed using the International Phonetic Alphabet (IPA) and analyzed within the OT constraint-interaction framework. Findings reveal that the primary surface syllable inventory of Nkari comprises V, N, CV, CVC, CGV, CrV, CGVC, and CVVC structures. A central finding of the study is that CrV and CGV sequences exhibit different structural behaviour in reduplication. CrV sequences are analysed as genuine complex onsets, as evidenced by the deletion of the tap /r/ in the reduplicative prefix, whereas CGV sequences are analysed as consonant–nuclear glide configurations. The complete retention of the glide in reduplication supports its association with the nuclear domain rather than its analysis as a second consonant in a complex onset. The study further demonstrates that the distribution of these syllable structures is regulated by the interaction of markedness and faithfulness constraints within an Optimality-Theoretic grammar. The findings contribute to the formal description of Nkari phonology and provide additional evidence for understanding syllable structure and phonotactic variation within the Lower Cross language group.*

Keywords: *Syllable Structure, Optimality Theory, Nkari, Lower Cross Languages, Phonotactics, Reduplication, Sonority Hierarchy.*

1.0 Introduction

Language expresses much of its phonological organization through the syllable, an abstract prosodic unit around which segmental distribution, sound co-occurrence, and phonological processes revolve (Urua, 2007). In generative linguistics, modern non-derivational frameworks specifically Optimality Theory (OT) propounded by Prince and Smolensky (1993, 2004) explain surface phonological representations not through serial rule derivations, but through the parallel evaluation of universal, ranked, and violable constraints.

Nkari is a dialect cluster of the Lower Cross language group spoken by the Nkari people in Ini Local Government Area of Akwa Ibom State, Nigeria. Despite sharing genetic and structural affinities with related Lower Cross languages such as Ibibio and Anaañ, Nkari remains severely under-documented in published formal literature.

A central issue addressed in this study concerns the structural interpretation of consonant sequences that occur before vowels, particularly sequences involving a tap /r/ and those involving glides /j/ and /w/. At the surface level, CrV and CGV sequences may appear similar because both contain a consonant followed by another non-vocalic segment before the vowel. However, their behaviour in reduplication suggests that they may have different internal syllable structures While consonant-tap sequences(CrV) and consonant-glide sequences (CGV) present them as a two segment sequences preceding a vowel, their phonological behaviour is deeply asymmetrical. To determine whether these sequences share a uniform syllable internal representation, whether both constitute true complex onsets, this study employs a morphological reduplication as a structural diagnostic tool.In constraint based Phonology, morphological operations are sensitive to prosodic sub-constituents. Furthermore, how these sequences split, simplify, or trigger lengthening under reduplication provides decisive empirical evidence for their underlying syllable constituency, bypassing the ambiguities that is sometimes present in surface level string matching. In particular, the deletion of /r/ in reduplicative forms of CrV stems contrasts with the retention of the glide in corresponding CGV forms.

This contrast provides a basis for examining whether CrV sequences constitute genuine complex onsets and whether CGV sequences should instead be analysed as involving a nuclear glide. The distinction is important because the two analyses make different predictions about the structure of the syllable and the interaction of markedness and faithfulness constraints in reduplicative domains.

Against this background, the present study investigates the syllable structure and phonotactic patterns of Nkari within an Optimality-Theoretic framework. It first identifies the surface syllable types attested in the language and then examines the structural behaviour of CrV and CGV sequences using reduplication data. The study subsequently formulates constraint rankings to account for the observed patterns.

This study contributes to the formal documentation of Nkari phonology by providing an OT analysis of its syllable structures and phonotactic restrictions. It also demonstrates the usefulness of morphological reduplication as evidence for investigating the internal structure of similar consonant sequences in an under-documented Lower Cross language.

1.1. Statement of the Problem & Objectives

While syllable structures in major Lower Cross languages like Ibibio and Anaañ have received descriptive attention, Nkari lacks systematic formal representation within constraint-based frameworks. Consequently:

1. The surface syllable inventory of Nkari has not been cataloged in published theoretical literature.
2. The structural status of consonant sequences, particularly CrV and CGV sequences, remains insufficiently described. Although these sequences may appear similar at the surface level, their different behaviour in reduplication suggests that they may have different syllable-internal structures.
3. Nkari remains underrepresented in comparative and constraint-based studies of Lower Cross phonology, limiting the contribution of the language to broader discussions of syllable structure and phonotactics.

To address these empirical and theoretical gaps, this study pursues the following specific objectives:

a) To identify and classify the permissible syllable types in Nkari.
b) To examine the underlying phonotactic constraints regulating Nkari syllable formation.

c) To analyze the sonority behavior and structural differences between CrV and CGV sequences using reduplication data.

d) To establish constraint hierarchies and OT tableaux for Nkari syllable phonology.

2.0 Theoretical Framework & Literature Review

This section presents the theoretical concepts and analytical assumptions that guide the study. It focuses on syllable structure, the Sonority Sequencing Principle, and the basic principles of Optimality Theory that are relevant to the analysis of Nkari syllable patterns. Particular attention is given to the organization of syllable constituents and the distinction between complex onset sequences and consonant–glide sequences.

2.1 The Syllable and Sonority Hierarchy

The syllable is a prosodic constituent that organizes speech sounds into a hierarchical structure. A commonly assumed syllable structure consists of an onset and a rhyme, with the rhyme further divided into a nucleus and an optional coda (Blevins, 1995; Goldsmith, 1990; Trask, 1996). The nucleus constitutes the peak of the syllable and is typically occupied by a vowel, although syllabic consonants may also function as nuclei in languages that permit them. The onset precedes the nucleus, while the coda follows it.

The internal organization of the syllable is relevant to the analysis of Nkari because segments that occur consecutively at the surface level do not necessarily occupy the same syllable constituent. In particular, a sequence such as CrV may be analysed as a complex onset if both consonantal segments are associated with the onset, whereas a CGV sequence may receive a different structural analysis if the glide is associated with the nuclear domain.

The Sonority Sequencing Principle (SSP) provides an additional basis for examining the organization of segments within the syllable. According to the SSP, sonority generally rises towards the syllable nucleus and falls away from the nucleus towards the coda (Selkirk, 1984; Zsiga, 2013). The sonority hierarchy generally places vowels at the highest level, followed by glides, liquids, nasals, and obstruents. This hierarchy is relevant to Nkari because glides /j/ and /w/ have greater sonority and greater phonetic affinity with vowels than many consonants. Their behaviour therefore raises questions concerning their syllable affiliation.

In Lower Cross languages, vowels and syllabic nasals may occupy the nuclear position, while consonants generally occur at the margins of the syllable (Urua, 2007; Udoh, 2014). The present study builds on this general characterization while examining the structural status of Nkari consonant–glide sequences. Rather than assuming that every surface consonant sequence constitutes a complex onset, the study uses the behaviour of CrV and CGV sequences in reduplication to determine whether the have identical sequences or different internal structures.

2.2 Principles of Optimality Theory

Optimality Theory (OT), developed by Prince and Smolensky (1993/2004), provides the principal theoretical framework for this study. OT explains phonological patterns through the interaction of universal, violable constraints that are ranked according to the requirements of individual languages. The framework consists principally of three components: GEN, CON, and EVAL.

GEN (Generator) takes an underlying representation and generates a potentially infinite set of candidate output forms. The candidates may differ from the input in ways permitted by the theory.

CON (Constraint Set) consists of the universal set of constraints. These constraints fall broadly into two categories: markedness constraints and faithfulness constraints. Markedness constraints impose restrictions on undesirable or

structurally complex output forms, while faithfulness constraints require correspondence between input and output representations.

EVAL (Evaluator) compares the candidates generated by GEN against the ranked constraints in CON. The candidate that best satisfies the highest-ranked constraints is selected as the optimal output. A lower-ranked constraint may therefore be violated when doing so allows the candidate to satisfy a higher-ranked constraint.

The following constraints are particularly relevant to the analysis of Nkari syllable structure and reduplication:

2.2.1 *COMPLEXONSET

*COMPLEXONSET: This constraint states that a syllable should not contain more than one consonant in the onset.

This markedness constraint is relevant to the analysis of CrV sequences and their behaviour in reduplicative forms. If /C/ and /r/ are associated with the onset, the resulting structure constitutes a complex onset and incurs a violation of *COMPLEXONSET.

2.2.2 *COMPLEXCODA

*COMPLEXCODA: A syllable should not contain more than one consonant in the coda.

This constraint accounts for the restriction against multiple consonants in the coda. It is relevant to Nkari syllable structures such as CVC and CGVC, where the number of segments occupying the coda must be distinguished.

2.2.3 NUC

NUC: This constraint states that every syllable must contain a legitimate nuclear peak.

The constraint requires a syllable to contain an element that can function as its nucleus. In Nkari, vowels constitute the principal nuclear elements, while the analysis also considers the possibility of a syllabic nasal occupying the nuclear position.

2.2.4 ONSET

ONSET: This constraint states that syllables should have an onset.

ONSET is a markedness constraint favouring syllables with onset constituents. However, because Nkari permits vowel-initial syllables, such as the V structures identified in the data, ONSET must be treated as violable rather than an absolute requirement.

2.2.5 NO CODA

NO CODA: This constraints states that syllables should not contain a coda.

NO CODA expresses a preference for open syllables. Since Nkari permits CVC and CGVC structures, the constraint cannot be undominated in the language. Its ranking relative to faithfulness and other markedness constraints determines whether codas are retained.

2.2.6 MAX-IO

MAX-IO: This constraint states that every segment in the input should have a correspondent in the output.

MAX-IO is a faithfulness constraint that prohibits deletion of input segments. It is used to determine whether deletion occurs in the base or whether deletion is restricted to the reduplicative domain.

2.2.7 MAX-BR

MAX-BR: This constraint states that every segment in the base should have a correspondent in the reduplicant.

MAX-BR regulates correspondence between the base and the reduplicant. A violation occurs when a segment present in the base is not copied into the reduplicant. The deletion of /r/ in the reduplicative prefix therefore constitutes a MAX-BR violation.

2.2.8 DEP-BR

DEP-BR: Every segment in the reduplicant should have a correspondent in the base.

DEP-BR prohibits the insertion of segments in the reduplicant that lack a correspondent in the base. It is also sine-quanon to the analysis of vowel lengthening or additional moraic material where such l is interpreted as an addition to the reduplicative structure.

2.2.9 *Cr (RED)

*Cr (RED): This constraint states that reduplicative prefix should not contain a tap /r/ following another consonant in its onset.

This is a domain-specific markedness constraint proposed for the analysis of Nkari reduplication. It accounts for the restriction against retaining the Cr sequence in the reduplicative prefix. Its interaction with MAX-BR allows the analysis to account for the deletion of /r/ in the reduplicant while preserving the corresponding /r/ in the base.

2.2.10 AGREE-PLACE

AGREE-PLACE: This constraint states that adjacent consonants, particularly a nasal and following stop, should share the same place-of-articulation in the same environment.

This constraint accounts for the homorganic realization of syllabic nasals before consonants. In Nkari, the nasal prefix assimilates to the place of articulation of the following stop.

The constraints outlined above provide the analytical tools for examining the syllable inventory, phonotactic restrictions, and reduplication patterns presented in the subsequent sections. Their rankings are not assumed to be universally fixed; rather, the analysis determines the relative ranking required to account for the Nkari data that will be presented.

2.3 Prosodic Morphology and Foot Templates

Morphological processes such as reduplication are not arbitrary string-copying operations. Instead, they are prosodically governed and restricted to specific prosodic categories, such as the mora, syllable, or foot (McCarthy & Prince,1995). In Nkari, the reduplicative frequentative prefix is structurally bound to a prosodic tier requiring a heavy monosyllabic foot. This requirement is formally captured by the following constraint:

RED=μμ (Bimoraic Reduplicant):
This constraint requires the reduplicative prefix to consist of a heavy syllable structure (two moras), ensuring that morphological derivation aligns with a well-defined prosodic foot shape.

By establishing this templatic requirement within the constraint set (CON), the grammar accounts for how Nkari resolves weight and markedness conflicts. Specifically, it drives nuclear lengthening when glides are parsed into the nucleus (CGV → [tjéé-tjé]), while interacting with complex onset constraints when evaluating tap sequences (CrV → [té-trê]).

2.4 Syllable Constraints and Tap versus Glide Behaviour in Lower Cross Phonology

Phonological research on Lower Cross languages has focused substantially on languages such as Ibibio and Anaañ. For Ibibio, Urua (2000, 2007) provides extensive descriptions of segmental, syllabic, prosodic, and morphophonological structures, while Michael (2009a, 2009b) provides detailed analyses of Anaañ syllable structure and syllabification. These studies demonstrate that syllable structure and segmental distribution in Lower Cross languages are constrained by language-specific phonotactic and prosodic patterns.

Research on Ibibio shows that syllable structure interacts with segmental distribution, syllable weight, and prosodic organization. Urua (1999) discusses the relationship between vowel and consonant length and syllable weight in Ibibio, showing that phonological processes such as lengthening, weakening, and truncation are

sensitive to syllable-weight requirements. Urua's analysis therefore demonstrates that consonantal realization cannot always be explained solely in terms of immediate segmental adjacency. Related work on Ibibio verbal structure further demonstrates the relevance of prosodic organization, particularly foot structure, to the interpretation of phonological and morphological patterns (Akinlabi & Urua, 2002).

Anaañ provides a complementary Lower Cross perspective on syllable structure and phonotactics. Michael (2009b) identifies V, CV, and CVC as basic syllable structures in Anaañ and discusses restrictions governing the distribution and sequencing of consonants. The analysis shows that syllabification is closely related to the language's phonotactic restrictions. Michael's discussion is particularly relevant to the present study because it also compares Anaañ with Ibibio and notes the occurrence of consonant sequencing involving sonorants in the latter language. Thus, the Lower Cross evidence indicates that apparently similar surface sequences need to be evaluated with reference to the phonotactic and syllabic properties of the individual language rather than being assumed to have identical structural representations.The Lower Cross literature also provides evidence for consonant weakening and tap-like realizations. In Anaañ, Michael (2013) reports weakening of intervocalic voiceless stops, including the realization of /t/ as [ɾ] in appropriate morphological environments. This demonstrates that a tap realization can arise through the weakening of an underlying stop. The Anaañ pattern is relevant to the present investigation because it establishes a Lower Cross precedent for tap-like phonetic realization through consonant weakening. However, the Anaañ process must be distinguished from the Nkari phenomenon investigated here. The Anaañ pattern involves the realization of an underlying /t/ as [ɾ], whereas the present study examines the structural behaviour of an underlying /r/ occurring in CrV sequences. Consequently, the Anaañ evidence does not establish that Nkari /r/ has the same derivational history.The structural interpretation of vowel–glide sequences is particularly relevant to the present investigation. In his analysis of Ibibio, Urua (1999, 2000) discusses earlier treatments of vowel–glide sequences as diphthongs and provides morphophonological evidence for analysing the glide as a consonantal element. In particular, the behaviour of such sequences under morphological processes patterns with V+C or CVC structures rather than with a simple CV representation. This observation is significant because it demonstrates that surface adjacency between a vowel and a glide does not, by itself, determine their syllable-internal constituency. Morphological behaviour may instead provide evidence for determining whether a segment belongs to the nucleus or occupies a consonantal position. Anaañ provides additional evidence that glides must be considered in relation to syllabification and segmental distribution (Michael, 2009a, 2009b). However, the available Anaañ literature does not establish the specific CrV versus CGV contrast under reduplication that is investigated in the present study. Nor does it provide grounds for assuming that the structural behaviour of Anaañ tap and glide sequences is identical to that of Nkari. Anaañ therefore serves here as comparative Lower Cross evidence rather than as a direct model for the analysis of Nkari.Against this comparative background, the present study examines CrV and CGV sequences in Nkari. Although the two sequence types are superficially similar in that a consonant is followed by a non-vocalic segment before the vowel, their behaviour under reduplication differs. In the Nkari data examined in the present study, CrV sequences such as /tré/ and /bré/ undergo deletion of /r/ in the reduplicative prefix, whereas the glide is retained in CGV sequences such as /tjé/ and /dwɔ/.

This asymmetry provides evidence that the two sequence types should not automatically be assigned the same syllable-internal representation. In the present analysis, the behaviour of CrV is consistent with an analysis in which the tap and the preceding consonant form a complex onset. Under this interpretation, deletion of /r/ in the reduplicative domain reflects pressure against the preservation of a marked onset configuration. By contrast, the retention of the glide in CGV sequences, together with the observed expansion of the vowel in the reduplicant, is consistent with an analysis in which the glide is structurally associated with the nuclear domain rather than forming a complex onset with the preceding consonant.

The distinction between the two sequence types is therefore not based solely on their phonetic properties. Rather, it is revealed through their different morphological responses. Reduplication provides a diagnostic environment in which syllable structure, markedness, and faithfulness interact. The deletion of /r/ in CrV sequences is analysed as evidence of pressure against complex onsets, whereas the retention of the glide in CGV sequences is interpreted as evidence that the glide occupies a different structural position. These interpretations constitute the analysis proposed for the Nkari data and should not be attributed to the earlier Lower Cross literature.Taken together, the Lower Cross literature provides important evidence that syllable structure, prosodic organization, consonant weakening, and glide behaviour are interconnected. Ibibio demonstrates the relevance of syllable weight and prosodic structure to consonant realization and provides particularly useful evidence that morphological behaviour can inform the analysis of vowel–glide sequences (Urua, 1999, 2000, 2007; Akinlabi & Urua, 2002). Anaañ provides complementary evidence concerning syllable structure, phonotactic restrictions, syllabification, and intervocalic consonant weakening, including the realization of /t/ as [ɾ] (Michael, 2009a, 2009b, 2013). However, these studies do not directly address the structural asymmetry between CrV and CGV sequences in Nkari through reduplication. The present study therefore extends the Lower Cross literature by using reduplicative behaviour as a diagnostic for distinguishing the phonological representation and behaviour of tap and glide sequences in Nkari.

3.0 Research Methodology

This study adopted a qualitative-descriptive research design. Primary field data were collected from competent native speakers of Nkari residing in Nkari communities (Ini LGA, Akwa Ibom State). A total of 15 consultants (comprising both men and women aged 40–60 years) were selected via stratified and purposive sampling techniques. Purposive sampling was critical to ensure data authenticity: consultants within this specific age brackets were chosen because they had maintained continuous residency in the community for 20 to 30 years, demonstrating high fluency and ensuring that their idiolects were protected against heavy language contact influence or lexical borrowing from neighbouring dominant languages such as Ibibio and Anaañ.

Data were gathered using the 1700-wordlist of the Summer Institute of Linguistics (SIL), structured elicitation interviews, and natural speech recordings captured via mobile audio devices.Recordings were phonetically transcribed using the IPA. Syllable constituents (onset, nucleus, coda) were identified and categorized across nominal and verbal word classes. The data were evaluated within OT tableaux to establish language-specific constraint hierarchies.

Prior to data collection, oral informed consent was obtained from all participating consultants in which they were fully briefed on the objective of the study, the audio recording procedures and their fundamental right to withdraw from the session at any time without consequence. To ensure confidentiality and data protection, all audio files and field notes were codified using numerical identifiers. Knowing that the study was non invasive, standard linguistic elicitation with adult native speakers, it adhered fully to ethical guidelines for linguistic fieldwork.

4.0 Data Presentation, Analysis and Discussion

4.1 Permissible Syllable Inventory in Nkari

Fieldwork data establish eight distinct surface syllable patterns in Nkari:

1. V Syllable (Vowel Prefix)

Restricted to nominal prefixes.

a. /i-nùén/ → [i.nùén] “bird”
b. /i-kód/ → [i.kód] “bush”
c. /e-pé/ → [e.pé] “leopard”

2. N Syllable (Syllabic Nasal Prefix)

A homorganic nasal prefix occupying the nucleus node.

a. /ñ-kán/ → [ŋ.kán] “charcoal”
b. /m-bórò/ → [m.bórò] “banana”

3. CV Syllable (Verb Root)

a. /má/ → [má] “love”
b. /dí/ → [dí] “come”

4. CVC Syllable (Closed Verb Root)

a. /bób/ → [bób] “tie”
b. /tàd/ → [tàd] “untie”
c. /tém/ → [tém] “cook”

5. CGV Syllable (Consonant–Glide–Vowel)

a. /tyê/ → [tjê] “sit”
b. /dwó/ → [dwɔ] “fall”

6. CGVC Syllable

a. /syák/ → [sják] “split”
b. /dwók/ → [dwók] “throw”

7. CrV Syllable (Consonant–Tap–Vowel)

a. /tré/ → [tré] “stop”
b. /fré/ → [fré] “forget”
c. /bré/ → [bré] “play”

8. CVVC Syllable (Long Nucleus Closed Stem)

a. /táád/ → [táád] “loosen”
b. /fúúk/ → [fúúk] “cover”

4.2 Reduplication and the Structural Status of CrV vs. CGV

A crucial theoretical question in Lower Cross phonology is whether surface consonant-glide (CG) and consonant-tap (Cr) sequences occupy the same structural slot within the syllable onset. Nkari generally restricts complex onsets, yet permits surface consonant-tap (CrV) sequences in underlying root stems. However, these complex margins are strongly prohibited within the reduplicative domain. Further evidence against a uniform structural analysis emerges from the observation that if both sequences were true complex onsets, they should trigger identical constraint interactions under reduplication. Nevertheless, morphological evidence from frequentative reduplication of gerundive verbs reveals a stark behavioral asymmetry that discredits the notion of a unified structural analysis.

1. Tap Sequences (CrV)

The tap /r/ ranks low on the sonority hierarchy compared to glides. When a CrV stem undergoes reduplication (in the process of forming a gerundive verb), /r/ is obligatorily deleted in the reduplicant (RED), yielding outputs such as:

Stem	**Reduplicated Form**	**Gloss**
/trê/	[té-trê]	"be stopping"
/brê/	[bé-brê]	"be playing"
/frê/	[fé-frê]	"be forgetting"

This deletion demonstrates that CrV constitutes a true complex onset in underlying stems, but is constrained in the reduplicative prefix by high-ranking, domain-specific markedness constraints—namely, *Cr(RED) and *COMPLEXONSET—which prohibit complex margins inside the morphological prefix. The forced shedding of /r/ proves that CrV operates as a true complex onset in the base, whose structural complexity is repaired within the copy domain. In other words, Nkari permits surface CrV sequences in un-reduplicated root stems, but when reduplication applies, the Cr cluster is banned from appearing in the RED.

The domain-specific markedness constraint *Cr(RED) is formally required alongside *COMPLEXONSET to explain the specific repair strategy. While *COMPLEXONSET prohibits any complex onset, *Cr(RED) accounts for the targeted elimination of the tap /r/ within the reduplicative prefix, ensuring that the primary onset consonant is preserved rather than the liquid. The governing hierarchy is as follows:

MAX-IO: An input-output faithfulness constraint that bans deletion of underlying segments from the input.

***COMPLEXONSET:** A markedness constraint that penalizes two or more consonants in the onset position.

***Cr(RED):** A reduplicant-domain constraint that bans the tap /r/ from appearing in the onset position of the RED prefix.

MAX-BR: A base-reduplicant faithfulness constraint that penalizes the reduplicant if it fails to copy a segment from the base.

DEP-BR: A base-reduplicant dependence constraint that bans insertion of segments or moraic length into the RED that does not exist in the base.

The constraint ranking is:

**MAX-IO >> *COMPLEXONSET >> Cr(RED) >> MAX-BR >> DEP-BR*

Tableau 1: Reduplication of Tap Cluster (/tré/)

Input: RED-/tré/	**MAX-IO**	***COMPLEXONSET**	***Cr(RED)**	**MAX-BR**	**DEP-BR**
a. [tré-tré]		*!	*!		
☞ b. [té-trê]				*	
c. [é-trê]				**!	
d. [té-té]	*!				

Evaluation:

- **Candidate (a)** retains the tap cluster in the reduplicant, fatally violating *COMPLEXONSET and *Cr(RED).
- **Candidate (c)** deletes both initial consonants of the prefix, fatally violating MAX-BR twice.
- **Candidate (d)** deletes /r/ from the base root, fatally violating MAX-IO.
- **Candidate (b)** deletes only /r/ in the reduplicant, incurring a non-fatal violation of low-ranked MAX-BR, and emerges as the optimal candidate.

2. Glide Sequences (CGV)

Unlike taps, glides (/j, w/) possess high sonority and vocalic characteristics that render them completely resistant to deletion. In reduplication, the glide is fully copied into the reduplicant along with compulsory vowel lengthening, as seen in:

Stem	Reduplicated Form	Gloss
/tjé/	[tjéé-tjé]	"to be sitting"
/dwɔ/	[dwɔɔ-dwɔ]	"to be falling"
/swá/	[swáá-swá]	"to be hating"

If CGV were a true complex onset, it would be subject to the same cluster-reduction pressure as CrV, incorrectly predicting an illegal form such as *[té-tjé]. The complete copying of the glide, coupled with compensatory lengthening of the nucleus to satisfy the bimoraic foot requirement (RED=μμ), demonstrates that the glide resides under the nucleus node as a nuclear on-glide, rather than occupying a true consonant slot in the onset. This deletion for taps versus preservation and nuclear expansion for glides provides unambiguous structural proof that Nkari surface sequences are phonologically distinct: CrV represents a true onset cluster, while CGV represents a consonant-nucleus configuration.

The constraint ranking is:

MAX-IO: An input-output faithfulness constraint that bans deletion of underlying segments from the input.

***COMPLEXONSET:** A markedness constraint that penalizes two or more consonants in the onset position.

RED=μμ (Bimoraic Reduplicant): A constraint requiring the reduplicative prefix to consist of a heavy syllable structure (two moras), ensuring that morphological derivation aligns with a well-defined prosodic foot shape.

MAX-BR: A base-reduplicant faithfulness constraint that penalizes the reduplicant if it fails to copy a segment from the base.

DEP-BR: A base-reduplicant dependence constraint that bans insertion of segments or moraic length into the RED that does not exist in the base.

The constraint ranking is:

**MAX-IO >> COMPLEXONSET >> RED=μμ >> MAX-BR >> DEP-BR*

Tableau 2: Reduplication of Glide Sequence (/tjé/)

Input: RED-/tjé/	MAX-IO	*COMPLEXONSET	RED=μμ	MAX-BR	DEP-BR
a. [té-tjé]			*!	*	
b. [tjé-tjé]		*!	*		
☞ c. [tjéé-tjé]					*

Evaluation:

- **Candidate (a)** deletes the glide /j/ to avoid a cluster, incurring a violation of MAX-BR; however, it crashes fatally on high-ranking RED=μμ because the reduplicant [té] remains monomoraic (μ).
- **Candidate (b)** parses the glide into the onset node, violating *COMPLEXONSET and RED=μμ due to its monomoraic structure.
- **Candidate (c)** preserves the nuclear glide and extends the nucleus to satisfy bimoraic weight (RED=μμ), violating only low-ranked DEP-BR for the added length, and emerges as optimal.

4.3 Formal OT Constraint Evaluation across Syllable Templates
1. Vowel-Prefix Nominal Evaluation

Nominal prefixing is governed by VPREF ("Only vowel prefixes begin nominal words"). The constraint ranking is:

VPREF: A markedness constraint that prefers vowel prefixes to begin nominal words.

NUC: A markedness syllable-peak constraint requiring every syllable to contain a valid vocalic nucleus peak.

ONSET: A markedness constraint stating that all syllables must have an onset.

NO CODA: A markedness constraint banning syllables with codas.

The constraint ranking is:

VPREF >> NUC >> ONSET >> NO CODA

Tableau 3: Evaluation of V-CV Nominal (/i-tám/ "hat")

Input: /i-tám/	VPREF	NUC	ONSET	NO CODA
a. [tám]	*!			*
b. [i-tm]		*!	*	*
☞ c. [i-tám]			*	*

Evaluation:

- **Candidate (a)** deletes the vowel prefix entirely, fatally violating VPREF.
- **Candidate (b)** lacks a vocalic nucleus in the second syllable, fatally violating NUC.
- **Candidate (c)** satisfies both high-ranking constraints, winning despite violating lower-ranked ONSET and NO CODA.

2.Syllabic Nasal Evaluation
Syllabic nasals must occupy the nucleus peak and assimilate in place of articulation to the following stop (AGREE-PLACE). The governing constraints are:

N=NUC: A markedness constraint requiring a syllabic nasal prefix to function as the nucleus peak of its own syllable.

AGREE-PLACE: A markedness constraint requiring that neighboring nasal consonants homorganically align.

ONSET: A markedness constraint stating that all syllables must have an onset.

NO CODA: A markedness constraint banning syllables with codas.

The constraint ranking is:

N=NUC >> AGREE-PLACE >> ONSET >> NO CODA

Tableau 4: Evaluation of N-CV Structure (/N-kán/ → [ŋ-kán] "charcoal")

Input: /N-kán/	N=NUC	AGREE-PLACE	ONSET	NO CODA
a. [n-kán]		*!	*	*
b. [e-kán]	*!		*	*
☞ c. [ŋ-kán]			*	*

Evaluation:

- **Candidate (a)** fails place assimilation (alveolar nasal before velar stop), violating AGREE-PLACE.
- **Candidate (b)** substitutes a vowel for the syllabic nasal, violating N=NUC.
- **Candidate (c)** satisfies all high-ranked constraints and emerges as optimal.

3. CVC Verb Stem Evaluation

Nkari strictly penalizes complex margins while permitting simple codas in verbal roots. The governing hierarchy is:

***COMPLEXONSET:** A markedness constraint that penalizes two or more consonants in the onset position.

***COMPLEXCODA:** A markedness constraint stating that a syllable must not have two codas.

NUC: A markedness syllable-peak constraint requiring every syllable to contain a valid vocalic nucleus peak.

ONSET: A markedness constraint stating that all syllables must have an onset.

NO CODA: A markedness constraint banning syllables with codas.

The constraint ranking is:

***COMPLEXONSET, COMPLEXCODA, NUC >> ONSET >> NO CODA*

Tableau 5: Evaluation of CVC Verb (/tàd/ "untie")

Input: /tàd/	*COMPLEXONSET	*COMPLEXCODA	NUC	ONSET	NO CODA
a. [mtád]	*!				*
b. [tádp]		*!			*
c. [td]			*!	*	
☞ d. [tád]					*

Evaluation:

- **Candidate (a)** contains a complex onset, violating *COMPLEXONSET.
- **Candidate (b)** contains a complex coda, violating *COMPLEXCODA.
- **Candidate (c)** lacks a nucleus vowel, violating NUC.
- **Candidate (d)** satisfies all high-ranking constraints, incurring only a non-fatal violation of NO CODA.

5.0 Discussion of Findings

The empirical data demonstrate that Nkari syllable phonology is strictly regulated by markedness constraints that prohibit complex margins. It is noteworthy that rather than relying on superficial phonetic similarities, this study has been able to resolve the status of two segment sequences (CrV versus CGV) through the use of morphological reduplication. Reduplication here acts as a natural laboratory that forces the grammar to treat taps and glides differently. This behavior—whereby CrV yields to cluster simplification (*Cr(RED)) while CGV triggers nuclear expansion (RED=μμ)—provides evidence that surface strings can be phonologically deceptive. This distinction aligns with what is known of Lower Cross languages, thereby reinforcing morphological alternations as diagnostic tools for internal syllable geometry.

6.0 Conclusion and Recommendations

6.1 Conclusion

This study has provided an Optimality Theory account of syllable structure constraints in Nkari. The language permits eight surface syllable templates (V, N, CV, CVC, CGV, CrV, CGVC, CVVC). By evaluating reduplication patterns, the study established that CrV represents a true complex onset simplified during morphological derivation, whereas CGV represents a nuclear on-glide. Overall, Nkari syllable grammar is governed by high-ranking markedness constraints prohibiting complex margins, with language-specific constraint rankings dictating surface well-formedness.

6.2 Recommendations

1. **Tone-Syllable Interaction:** Further research should investigate how high, low, and contour tones map onto simple (CV) versus complex (CVVC) nuclear slots in Nkari connected speech.
2. **Orthography Standardization:** Language committees and literacy planners should leverage these empirical findings to establish a standardized orthography for Nkari.

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How to cite this article: *Ashinya, T., & Jack, U. U. (2026). An Optimality Theory account of syllable structure constraints in Nkari. Wannune International Journal of Applied Management, Social Sciences, Arts and Entrepreneurship, 1(3), 48-62. https://wijamssae.fedpolywannune.edu.ng/*