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On the Syllable Structure of Northwestern Moroccan Arabic

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ABSTRACT

This paper offers a critical examination of two influential analyses of syllable structure in Moroccan Arabic (MA), namely those proposed by Benhallam and Boudlal. Though differing in theoretical orientation—derivational and prosodic respectively—both frameworks have been widely cited as representative accounts of MA syllabification. The present study revisits these proposals in light of phonological data from the northwestern dialect of Moroccan Arabic (NWMA), a variety that exhibits distinct patterns of vowel distribution, schwa occurrence, and consonant clustering. The re-examination is conducted through a rule-based and representational comparison of the two frameworks against attested NWMA forms, relying on descriptive data and morphophonological generalizations rather than corpus-based frequency analysis. The analysis demonstrates that neither framework, in its current form, adequately accounts for these features. Benhallam's rule-based model fails to capture the interaction between syllable structure and morphological templatic organization, while Boudlal's prosodic approach overgenerates abstract entities of doubtful empirical status. By systematically exposing these limitations, the paper contributes to current theoretical debates on Arabic syllabification by clarifying the conditions under which derivational and prosodic models succeed or fail when applied to morphologically driven syllable structure, particularly in underdescribed dialects such as NWMA.

KEYWORDS

Syllable Structure
Phonology
Morphology
Moroccan Arabic

Introduction

Research on the syllable structure of Moroccan Arabic (MA) has produced a substantial body of work over the past four decades, reflecting a diversity of theoretical orientations and analytical frameworks. Two of the most influential and representative contributions are those of Benhallam and Boudlal. Both scholars have proposed systematic accounts of syllabification in MA, yet they do so from markedly different theoretical standpoints. Benhallam's analysis is firmly rooted in Rule-Based Generative Phonology, relying on sequential derivations such as the Onset and Rhyme Rule and the Coda Rule. In contrast, Boudlal reinterprets the process within a Prosodic and Optimality-Theoretic framework, introducing the concept of semi-syllables to capture patterns that seem to challenge the Sonority Sequencing Generalization.

Although these studies have laid valuable groundwork for understanding MA phonology, their empirical base is largely drawn from central and western urban varieties, leaving other regional dialects—such as that of the northwestern area (NWMA)—underrepresented.

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The limited attention paid to the northwestern dialect in this literature is rather incidental: most researchers happen to originate from areas where the more 'standard' central Moroccan Arabic is spoken. The phonological behavior of NWMA presents a number of characteristics that set it apart from the dialects typically discussed in the literature, particularly in the distribution of full vowels and schwas, and in the formation of consonant clusters. The predominance of full vowels, the restricted and morphologically governed occurrence of schwa, and the relatively permissive cluster patterns in NWMA raise serious questions about the applicability of existing accounts.

The present paper does not aim to propose an alternative model of syllabification, nor to adjudicate between the frameworks proposed by Benhallam and Boudlal. Rather, its primary goal is to assess critically how far these two influential analyses can be extended to NWMA. It will be shown that both encounter empirical and theoretical difficulties when applied to this variety. Benhallam's derivational model, while procedurally straightforward, does not capture the complex interaction between syllable structure and the templatic organization of morphology in NWMA. Boudlal's prosodic approach, on the other hand, invokes abstract prosodic units—semi-syllables—whose status remains questionable both descriptively and theoretically.

The discussion that follows, therefore, seeks to highlight the limitations of these proposals and their implications. Recognizing these limitations points toward the eventual need for a revised model—one that can accommodate the morphophonological particularities of NWMA while maintaining theoretical consistency with the broader typology of Arabic syllable structure. Developing such a model, however, lies beyond the scope of this study. The aim here is rather to demonstrate that the two major analyses of MA syllabification, though representative and insightful, cannot be straightforwardly extended to the northwestern dialect without substantial reformulation.

A Note on NWMA

NWMA refers to the variety, or cluster of closely related varieties, spoken in Northwest Morocco**.** The region comprises cities such as Tangier, Tetouan, Chefchaouen, and Larache, along with their surrounding suburbs. The variety does not diverge significantly from other MA varieties in terms of segmental inventory. Apart from some minor phonetic differences (El Hadri, Fares), the 31 consonant phonemes proposed in Harrell are the same. As for vowels, like other varieties, NWMA has three full vowels in addition to a controversial schwa. It is not the objective of this paper to discuss the status of the schwa, even though it is worth mentioning that NWMA is characterized by a considerable predominance of full vowels. In many instances where schwas are attested in other varieties of MA, NWMA instead employs full vowels, as illustrated in the following table:

1.

MA	NWMA	GLOSS
mədd	madd	'to hand'
drəb	drab	'to beat'
ʈərʒəm	ʈarʒəm	'to translate'
ɣədda	ɣadda	'tomorrow'
ʃəft	ʃuft	'I saw'
qərd	qird	'a monkey'
gəlb/qəlb	qalb	'heart'

Additionally, some of the cases where schwas are used are limited to those where the use of a full vowel would result in homophonous cases, which casts a serious doubt on the epenthetic status of the schwa since the cases in (2) below are minimal pairs:

2.

ktəb	'he wrote'	ktab	'a book'
gləs	'he sat'	glas	'sitting'

Morphologically, NWMA, like CA and other varieties of MA, exhibits what is known in the literature as the Root-Pattern system. In terms of derivation, it "consists of a system of consonantal roots which interlocks with patterns of vowels and (sometimes certain other consonants) to form words" (Ryding 45). The consonantal root expresses a concept, and different meanings are derived by vowel-internal changes. The following table illustrates the Root-Pattern system for the root 'ʃrb' (drink), and provides a comparison between CA, MA (Central-Western), and NWMA:

3.

CA	MA	NWMA	Gloss
ʃariba	ʃrəb	ʃrab	'he drank'
ʃuriba	ttəʃrəb	ttəʃrab	'it (ms) was drunk'
maʃruːb	məʃrub	mə/aʃrub	'a drink'
ʃaːrib	ʃarəb	ʃarəb	'drunk'

Unlike derivation, inflection in Arabic (Classical or any other MA variety) is generally characterized by affixation. Tense/aspect, number, gender, and person are all expressed by either prefixes or suffixes, except the broken plural. Another point to make here is that NWMA, like other MA varieties, has lost case morphemes. Except for the genitive case, realized phonetically by a suffix in CA and MA and by a lexical clitic 'dyal', there is no phonetically realized form for the nominative nor the accusative cases in MA. The following table exemplifies and compares some inflectional paradigms in the three varieties for the root 'ktb'(write):

4. Table 1 Dialectal Variations

		CA	**MA**	**NWMA**	**Gloss**
Aspect	perfective imperfective	kataba jaktubu	ktəb jəktəb	ktəb jəktəb	'he wrote' 'he writes'
Person	perf.sing	katabtu/ katabti kataba	ktəbt ktəbti ktəb	ktəbt ktəbti ktəb	'I wrote' 'you wrote' 'he wrote'
Gender	masc. fem.	maktab maktaba	məktəb məktaba	maktab maktaba	'office (masc)' 'library (fem)'
Number	masc. fem.	makaːtib maktabaːt	makatib məktabat	makatib maktabat	'offices(masc)' 'libraries (fem)'
Case	nom. acc. gen.	maktabun maktaban maktabiː	 məktabi	 maktab dyali	'office (nom)' 'office (acc)' 'my office(gen)'

Furthermore, the variety under study is phonologically the closest to Classical Arabic. The remarks made above about the vowel system, including the schwa, suggest that NWMA is remarkably the most conservative of MA varieties. The predominance of full vowels, as a case in point, may be attributed to this sociolinguistic factor, which also explains the existence of the schwa itself in MA. The presence of the schwa can be regarded as a result of language contact between Arabic and Berber, and possibly with European languages historically used in the region. This assumption is supported by the absence of schwa in varieties spoken in areas lacking Berber and European influence, such as the Middle Eastern dialects.

The effects of these facts are clearly apparent in the lexicon of NWMA (and other MA varieties). Most lexical items in the variety are Arabic underlyingly, but may be subject to some variations that make them sound different on the surface. Some of these variations may affect the syllable structure of these words. In addition, the variations are not only synchronic but also diachronic. Consequently, any linguistic study of MA varieties, or of Arabic varieties more generally, should take diachronic factors into careful consideration.

Syllable Types in NWMA

Assuming that the syllable is recognized as a phonological unit, and based on extensive works on the syllable structures of many languages, the CV syllable is considered the most unmarked type (Jakobson). Evidence for this comes from a number of observations. All languages have CV syllables. There are even languages, such as Hua (Blevins) and Senoufo (Zec), which have CV syllables only. Moreover, no languages disallow CV syllables even though they disallow other forms of syllables. For example, there are no onsetless syllables in Yokuts and no codas in Tahitian (Steriade), but in both languages, there are CV syllables. The naturalness of the CV syllable is further supported by evidence related to language acquisition: the CV syllable is claimed to be the first syllable to be produced by infants (Topintzi).

NWMA is no exception. The universal tendency for syllables to have onsets is satisfied in NWMA by the insertion of a glottal stop, as is the case in Classical Arabic (Fares). It may be argued that the cases in which the glottal stop is inserted are mostly borrowed from Classical Arabic, as the examples below show

5.

amir	ʔamir	‘prince’
idara	ʔidara	‘administration’
ummahat	ʔummahat	‘mothers’
rais	raʔis	‘president’

But there are other cases which clearly show that the glottal stop insertion applies even in words that do not have origins in Arabic, as in

6.

ʔatay	‘tea’
ʔara	‘give me (imp)’

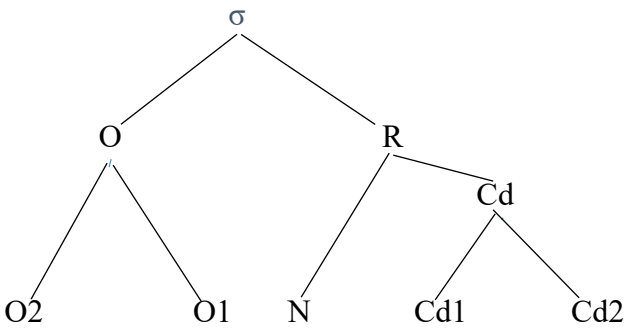
where it is evident that the glottal stop is part of the segmental inventory of NWMA. This being said, it seems that NWMA, like CA, doesn’t permit onsetless syllables at least phonetically. So I will assume that the basic syllable type in NWMA is CV. Other syllable types, such as CVC, CCVC, CVCC, CCVCC … are derived by rule. The table below illustrates all the syllable types found in the language under investigation:

7. Table 2 Types of Syllables

Syllable types	Examples	Gloss
CV	ʒa	'he came'
	ma	'water'
CVC	ʒab	'he brought'
	bir	'a well'
CCV	bra	'he recovered'
	mʃi	'go (imp)'
	dwa	'medicine'
CCVC	mʃit	'I went'
	ktəb	'he wrote'
	ʕwar	'blind'
CVCC	ləft	'turnip'
	ʒibt	'I brought'
	ʃadd	'closed'
CCVCC	ʃrabt	'I drank'
	ʃfənʒ	'dough nut'
	nʃudd	'I close'

Metrically, then, the syllable in NWMA can be represented by the following template (Fudge; Selkirk; Harris; Van der Hulst; Durand; among many others):

8.



However, this template must be constrained so that it does not predict ill-formed outputs. Some of these constraints are claimed to be universal (9a), while others remain language-specific (9b):

9.

a. Onset and coda may branch respecting Sonority Sequencing Generalization (SSG)
b. Open syllables cannot have a schwa in the nucleus

By virtue of (9a), CCV, CCVC, CVCC, and CCVCC are possible outputs; and by (9b), a *Cə and *CCə are filtered out.

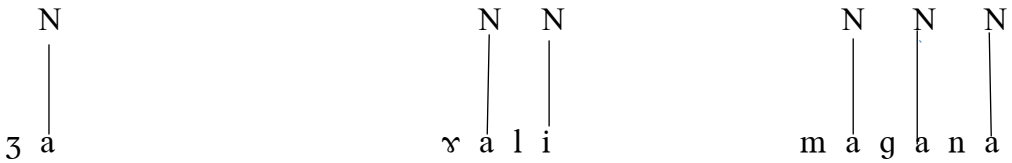
The preceding template captures a monosyllabic structure in which syllable boundaries are aligned with word boundaries. In polysyllabic contexts, however, the identification of syllable edges is considerably more intricate, as it necessitates specifying the phonological principles that regulate the mapping of individual segments onto the corresponding syllable nodes within the template.

Syllabification in NWMA

As stated above, CV syllable types are the most unmarked in NWMA. This fact must be captured by the principles of syllabification. One of these principles stipulates that vowels are naturally assigned to an N node, resulting in the following structures:

10.

a. b. c.



‘he came’ ‘expensive/dear’ ‘ a watch’

Sonority plays a major role in defining the range of segments that are syllabic in a language and delimiting the contour of the syllable. Assuming the sonority scale in (11), only segments that have the highest sonority value in the scale can fill the nucleus of syllables.

11.

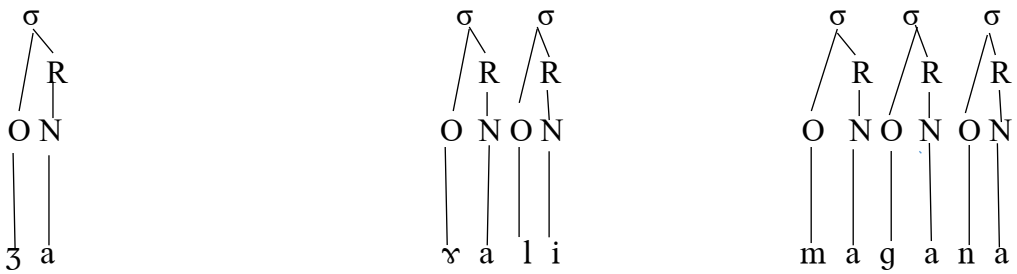
vowels liquids nasals fricatives stops
most sonorous least sonorous

(Steriade)

The Nucleus node is assigned to the Rhyme node. The unassigned consonants are assigned to the onset node, and then both onset and rhyme are assigned to the higher node:

12.

a. b. c.



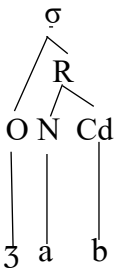
The workings of this principle (traditionally dubbed the Onset Rhyme Rule in works such as Benhallam (among others) do not only predict the right output but also implicitly filters out undesirable ones such as *ʏal-i and *mag-an-a. Such outputs are possible at least theoretically given the fact that there are languages which allow onsetless syllables like Japanese, Diola-Fogney, Ponapean and English (Itô; Kager).

This leads to considering syllable edges, which are not always coextensive with word edges. Let us first consider some monosyllabic CVC cases where syllable edges do coincide with

higher-level edges (viz, word edges). These cases are normally syllabified by adjoining the final unassigned consonants to the coda to produce a branching rhyme:

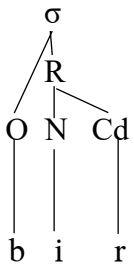
13.

a.



'he brought'

b.

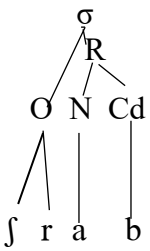


' a well'

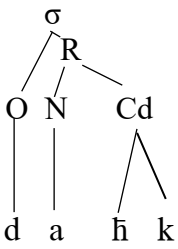
Since the forms in (13) are monosyllabic, their structure appears straightforward. The consonants that remain unassociated to the right of the nucleus are incorporated into the rhyme as codas, thereby yielding closed syllables through the application of the Coda Rule (Benhallam). Consequently, the application of the Onset and Rhyme Rule followed by the Coda Rule derives well-formed outputs. Furthermore, permitting the Onset and Coda Rules to apply iteratively makes it possible to generate cases involving complex onsets and codas. As in the examples below:

14.

a.



b.



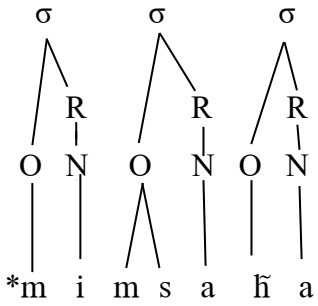
However, the syllabification of polysyllabic words is not as straightforward as the cases in (13-14), especially in words where different syllable types co-occur. A word like 'təmra' (date. sg. fem) is intuitively syllabified as 'təm.ra'. The same thing applies to 'kəfta' (diced meat) or 'mimsaħa' (eraser): 'kəf.ta' 'mim.sa.ħa'. The question now is, if the onset rule is allowed to apply iteratively, how can outputs like 'tə.mra' 'kə.fta' 'mi.msa.ħa' be blocked? The iterative application of the onset rule is triggered by the Onset Maximization Principle (OMP), also dubbed Onset First Principle (cf. Selkirk; Itô; among others), which stipulates that 'if a segment may belong to both the coda of the first and the onset of the second syllable, it belongs to the onset of the second syllable'. The OMP is constrained by another principle, namely SSG (cf. (9a)), stipulating that in a syllable, sonority increases toward the peak and decreases toward the margins (Selkirk; Blevins; Zec). In addition, other language-specific phonotactic constraints prohibit schwa light syllables as outputs (cf. (9b)). Hence, the following counter-intuitive syllable structures:

15.

a.



b.



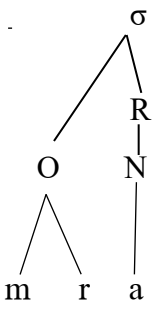
Cases like (14) do not seem to constitute a problem for OMP since SSG is not violated neither in the onset nor in the coda. Cases in (15), however, seem to cast a doubt on the validity of SSG, which is a universal principle since the onset cluster 'ms' in (15b) violates it. For the cluster 'mr' in (15a), even though sonority is respected, the resulting Cə syllable is a violation of the phonotactics of the language.

Benhallam's proposal blocks generating outputs like Cə, though no reference is made to the phonotactics of the language, by the Schwa Insertion rule, which applies to every sequence of two unsyllabified consonants after the application of the Onset Rhyme Rule. Additionally, the Coda Rule assigns the first consonant of 'ms' to the coda of the preceding syllable, thereby violating OMP.

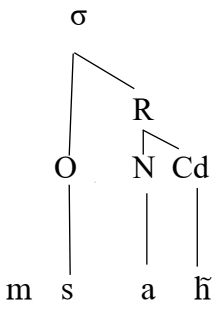
One solution to propose is 'resyllabification', whereby the onset 2 is resyllabified as the coda of the previous syllable. Another solution is to constrain OMP so that the iterative application of the Onset Rule is blocked if the resulting structure contravenes the phonotactics of the language. This works when there is a preceding syllable. If not, the same onset cluster may be found in word-initial position, in which case onset 2 will be licensed as in (16a), since there is no violation of sonority; or not licensed for breaking sonority but at the same time will fail to resyllabify, resulting in a stray or unsyllabified consonant as in (16b).

16.

a.

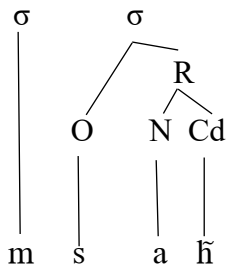


b.



The third solution proposes that consonants that fail to be licensed will constitute an appendix, yielding the following structure for (16b):

17.



Appendix—also dubbed semisyllable—are adjoined to prosodic words instead of being affiliated with syllables. By allowing a constituent to skip immediate membership in the next higher prosodic level, appendices/semisyllables violate the Strict Layer Hypothesis (SLH), which maintains that each level of the prosodic hierarchy is fully contained within the level dominating it (Selkirk; Nespor and Vogel; Hayes). According to Selkirk, mismatches between morpho-syntactic and prosodic boundaries are captured and accounted for along with a set of structures defined in the following Prosodic Hierarchy:

18.

The Prosodic Hierarchy

Utt Utterance
|
IP intonational phrase
|
PhP phonological phrase
|
PWd prosodic word
|
Ft foot
|
σ syllable

A weaker version of the SLH in which violation of strict layering is allowed is opted for in the literature, as it turns out to be independently motivated in the prosody of languages. Cross-word resyllabification in languages such as Spanish (Harris; Nespor and Vogel) and Italian (Face) constitutes a clear case of violation of the SLH as syllables are not fully contained in the words. This is referred to as the Weak Layering Hypothesis (WLH) (Itô and Mester).

Semisyllables have been adopted to account for clusters of consonants that violate the SSG. Cho and King argue that what seems to be a case of SSG violation in Georgian, Polish, and Bella Coola can be explained by adopting semisyllables as entities in phonology. Féry's semisyllable analysis of word-final syllables with extra consonants in German makes the same claim. Semisyllables in her account are proposed to account for apparent cases of SSG violations in the CVCC word final structure. In Moroccan Arabic, the same proposal is made by Boudlal. He claims that MA does not allow complex onsets and analyzes syllables with two-consonant clusters by assigning the first consonant to a "minor syllable."

Several points can be made based on the foregoing discussion. First, cluster licensing in a domain does not necessarily apply in other domains. As seen above, the fact that onset clusters

are permitted or non-permitted word-internally does not mean that the same thing will be observed at word edges. This further implies that syllabification should be position-sensitive. Second, licensing a cluster in one domain but not in another would be a costly inconsistency and hence non-explanatory. Another equally important remark is that NWMA (like other varieties of MA) appears to be insensitive to SSG, as the discussion of cases above demonstrates. A consideration of the following data (adapted to NWMA from Lahrouchi 4) shows clearly that there are no sonority restrictions imposed in cluster formation.

19.

ʃra 'he bought'	rʃa 'he bribed'	ktab 'book'
sna 'he signed'	nsa 'women'	kdub 'lies'
mra 'woman'	rma 'he tossed'	ʃkun 'who'
blaʕ 'swallowed'	lbas 'clothes'	xbar 'news'

A logical consequence of this is to ban clusters altogether and claim that the stray consonants make minor syllables, following Boudlal's proposal, even though this solution results in a violation of SLH. Besides, this solution implies that we will end up having two types of syllables: a 'full' syllable and a minor one, which is costly. Adding a minor syllable would unnecessarily complicate the grammar and may even lead to questioning the nature of the syllable and its status as a prosodic category.

Furthermore, the principal shortcoming of these proposals (Benhallam and Boudlal's) lies in their foundational assumption that syllabification occurs after the completion of all morphological operations. This assumption presupposes that the phonological composition of a word solely determines its syllable structure and syllabification. While this view is valid for languages such as English—where, for example, plural formation depends entirely on the phonemic sequence of the base and its affix, thereby dictating syllable number and configuration—it does not hold for Arabic. In Arabic, syllable affiliation is primarily constrained by morphological structure and only secondarily by the phonological concatenation of segments. In this respect, syllable structure constitutes an integral component of the morphological template. Consequently, when speakers of Arabic select a particular derivational category, they simultaneously select the associated syllabic configuration. For instance, speakers of MA or NWMA who opt for the causative pattern of a verb inherently produce a disyllabic form, whose syllabic composition is predetermined within its lexical representation. This holds not only for Arabic but also for other templatic languages, such as Hebrew and Yokuts.

A natural consequence of this is to contend that syllable structure assignment in Arabic is lexical (underlying) and not phonetic, as the above-mentioned works claim. When a root and pattern are combined, a word is formed together with its syllable structure. Roots are consonantal while patterns are vocalic. Both are represented on separate levels or tiers to avoid the crossing of association lines. The CV slots constitute a separate tier (CV-tier). The two segmental tiers are represented above and below the CV-tier. The CV-tier determines segmental quality and segmental length, where long segments are represented with double slots. The CV-tier also determines syllable membership (Cs representing syllable margins and Vs syllable peaks, Gussenhoven and Jacobs).

One hypothesis is to assign root consonants (radicals) a heterosyllabic status at the lexical level, so that they make onsets to syllables yet to be formed, depending on whether there is a following vowel or not. If there is one, a CV syllable is formed. If not, these consonants remain stray. At the post-lexical level, where more affixes/clitics are added, consonants are equally

heterosyllabic joining with following vowels, if any. Otherwise, they remain stray. In the case that an affix or clitic begins with a vowel, resyllabification applies. This implies that 'semisyllables' cannot be avoided, nor resyllabification. In addition, the problem of consonant clusters, and long segments (geminates and long vowels) will still have to be resolved.

Conclusion

In conclusion, adopting Benhallam's approach would necessitate accounting for the stipulation that two distinct sets of syllable structure assignment rules operate in Moroccan Arabic: one governing full vowels and another governing schwas (cf. Boudlal). Similarly, permitting consonant clusters at syllable margins would contravene the universal Sonority Sequencing Principle (SSP). Boudlal's alternative proposal, which sought to resolve the issue of sonority-violating clusters by prohibiting clusters altogether, ultimately required the introduction of semi-syllables—a theoretical device that undermines the robustness of the syllable as a prosodic unit. Moreover, the autosegmental framework (cf. Gussenhoven and Jacobs), which more effectively captures the interaction between syllable structure and morphology, offers a relatively more convincing analysis. Nevertheless, even within this framework, the recurrent need to invoke semi-syllables in order to address consonant clustering suggests that the locus and timing of syllabification in Arabic require further theoretical reconsideration.

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