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Full Vowel/Schwa Alternations in the Perfective of Moroccan Arabic Hollow Verbs

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Abstract

This paper purports to investigate full vowel/schwa (V/ə) alternations in the perfective of Moroccan Arabic (MA) hollow verbs. Earlier treatments on this issue show that the perfective schwa is derived from full vowels by a special reduction rule applying before /CC/ cluster within the core stem. These accounts fail to give convincing analyses since they make recourse to unmotivated rules and neglect to consider the bimoraicity prosodic requirement in the perfective of MA hollow verbs. The main aim of the present paper is to address this gap in the literature by conducting an Optimality Theory (OT) analysis of V/ə alternations as a result of Foot-Binarity (FT-BIN) in terms of bimoraicity. To achieve this objective, we rely on secondary data, which is taken from published grammar works. The major finding of the paper is that full vowels alternate with schwa in the perfective of MA CVC verbs to achieve the bimoraicity prosodic requirement. This finding provides a strong proponent in favour of the use of the mora in the analysis of V/ə alternations and enhances our understanding of the phonology of MA verbs.

1. INTRODUCTION

Over the years, the study of verb inflection in MA has increasingly gained the interest of a number of Moroccan scholars, namely El Himmer (1991), Youssi (1986), Ech-charfi (2008), Boudlal (2001, 2018), El Hamdi (2018), Houmman (2020), Ziani (2022), among others. Yet, the issue of full vowel/schwa alternations in the perfective of MA hollow verbs has not been sufficiently investigated in MA phonology. As far as our knowledge goes, the only works include the groundbreaking study of Benhallam (1980) which was subsequently followed by other works such as Heath (1987) and El Himmer (1991). Contrariwise, the perfective of strong verbs has received ample attention in MA phonological research (see El Hadri, 1993; Bernous, 1995; Boudlal, 2001; El Yamani, 2005; and Houmman, 2020 among others).

Benhallam (1980) and Heath (1987) argue that schwa is derived from full vowels by a special reduction rule applying before /CC/ cluster within the core stem. Working within the model of Prosodic Morphology, El Himmer (1991) holds that the underlying forms must be able to relate not only the perfective and imperfective, but also such derived forms as the causative. We believe that these accounts of V/ə alternations fail to give convincing analyses for three reasons. First, they merely cite the perfective alternations instead of accounting for them. Second, they are limited in terms of scope since they make recourse to unmotivated rules. Third, they neglect to consider the bimoraicity prosodic requirement in the perfective of MA hollow verbs.

Based on the earlier accounts presented so far, we can claim that the bimoraicity of MA CVC verbs in the perfective has never been subject to a systematic investigation using a constraint-based model or any other theoretical framework. In this paper, we will try to fill in this gap and consider V/ə alternations as a result of FT-BIN in terms of bimoraicity. Generally, this paper advances one major hypothesis to provide a fresh look at this issue: the hypothesis maintains that full vowels alternate with schwa in the perfective to satisfy the prosodic constraint FT-BIN in terms of bimoraicity[1]. This assumption can be confirmed or refuted by the data at hand.

The paper is divided into six main sections. The first section will present a brief review of the literature on different issues such as the status of schwa and the theoretical framework adopted. The second section will display the major objective of the study. The third section will present our research question. The fourth section will give a glance into our data collection procedure. The fifth section will provide an OT analysis of V/ə alternations. We conclude in section six.

2. LITERATURE REVIEW

2.1. The Vowels of Moroccan Arabic

The vocalic inventory has been a long-standing issue in MA scholarly works. This is mainly because linguists do not agree on the exact number of vowels, which differ from one linguist to another and from one dialect to another. For instance, Benkaddour (1982, p.148) assumes that the sedentary dialect of Rabat has four phonemes which are /i/, /u/, /a/, and / ə/. Contrariwise, Youssi (1977), Benhallam (1980), Harrell (1962) and El Himmer (1991) have agreed that the MA vowel inventory includes three full vowels /i/, /a/, and /u/ and a schwa. For the scholars, the full vowels are underlying whereas the schwa is epenthetic.

In the present work, we assume along the lines proposed by Boudlal (2001) that the vocalic inventory of MA consists of three underlying vowels which are /i, u, a/ and an epenthetic schwa, as shown in (1) below. Following Boudlal, the schwa is enclosed between parentheses to denote its epenthetic status:

(1) Adopted from Boudlal (2001, p.19)

High	i		u
Mid		(ə)	
Low		a	

[1] V/ə alternations in the perfective of MA hollow verbs are due to another factor: avoiding HL feet. This will also be analyzed in more detail in our future work.

2.2. The status Schwa in MA

For most works on MA, the schwa is assumed to be purely phonetic and therefore epenthetic (Abdelmassih, 1973; Benhallam, 1980, 1988, 1990a; Marsil, 1988; Al Ghadi, 1990; El Himmer, 1991; Imouzaz, 1991; and Boudlal, 1993 among others). For illustration, Benhallam (1980) and Al Ghadi (1990) claim that schwa in MA is a purely phonetic vowel, synthesized in order to break up impermissible sequences of consonant clusters. Contrastively, some linguists hold that schwa has a phonemic status (Benkirane, 1982; Benkaddour, 1982; Keegan, 1986; Mohammed & Samad, 2020; and others). Benkaddour (1982) distinguishes two schwas: the phonetic schwa and the phonemic schwa. For him, the phonemic schwa serves as a morphological contrast between verbs of the type /CCəC/ such as /DRəb/ "hit" and /lʕəb/ "play", and nouns of the type of /CəCC/ such /DəRb/ "hitting" and /ləʕb/ "play/ game". The phonetic schwa serves to break up a three-consonant cluster that the language does not allow (e.g. /l-bnat/ ⟶[ləbnat] "the girls"). For the purpose of the current study, we assume along the lines proposed by Benhallam (1980, 1988, 1990a), Al Ghadi (1990), El Himmer (1991), and Boudlal (2001) that schwa is epenthetic.

2.3. A Note on CVC Verbs

Verbs with the form CVC are referred to as hollow or concave verbs in Harrell (1962). Unlike strong verbs, hollow verbs are weak since they have a vowel or a glide, usually occurring in the second element. Hollow verbs are "a subclass of triconsonantals that have a medial vowel" (Ech-charfi, 2008, p.94). They are traditionally distinguished from strong triconsonantals such as ktb 'write' which are made up of consonants only. Heath (1987) distinguishes three types within the category of hollow verbs itself, depending on the quality of the medial vowel. Some concave verbs have a low vowel such as 'bat' 'spend the night', while others, namely gul 'say' and fiq 'wake up' have front vowels. Consider the following examples from Heath (1987) and Ech-charfi (2004, 2008).

(2) Hollow verbs

CuC	**CiC**	**CaC**
ʃuf	biʕ	sal
dub	fiq	bat
nuD	dir	xaf

As for their frequency in the language, hollow verbs with the forms /CiC/ and /CuC/ are equally common, while /CaC/ is less common (Heath, 1987).

2.4. Optimality Theory

Unlike Generative Phonology, OT abandons rewrite rules and eliminates derivations, in the sense that all constraints relating to some sort of structure are evaluated within a single hierarchy (Prince & Smolensky, 1993/2004; McCarthy & Prince, 1993a, b; McCarthy, 2007). Archangeli (2006, p.534) distinguishes two major components in the OT grammar: GENERATOR (GEN) and EVALUATION (EVAL). GEN is an operation which creates the set of output candidates from which the optimal one is selected, as Archangeli states. EVAL is referred to as the "constraint component" in the sense that it filters candidates and chooses the most harmonic one (McCarthy, 2007). In a nutshell, both EVAL and GEN are the core universal elements of the OT architecture. This is summarized in (3) below:

(3) Basic OT architecture (McCarthy, 2002, p. 10)

Input → **GEN** → **Candidates** → **EVAL** → **Output**

Two basic types of constraints have emerged in the literature about OT: faithfulness and markedness constraints (McCarthy, 2002, p.11). Faithfulness constraints fall into two major types: MAXIMALITY (MAX) and DEPENDENCE (DEP). The former, on the one hand, militates against the deletion of any segment in the input. The latter, on the other hand, militates against the epenthesis of segments to the input. This is articulated as follows:

(4) Examples of Faithfulness constraints (Kager, 1999)

MAX-IO : The output must preserve all segments present in the input (No deletion).

DEP-IO : Output segments must have counterparts in the input (No epenthesis).

Unlike faithfulness constraints, markedness constraints are not input-oriented in that they take only the output into account. Markedness constraints are often in conflict with faithfulness constraints because the former favor some linguistic structures over others, whereas the latter resists structural changes to the input. This constraint conflict is resolved in OT by ranking.

OT grammar is presented in tableaux (Kager, 1999). A tableau is defined as a graphic representation of an input form and its generated candidates along with a set of constraints (Prince and Smolensky, 1993; Sherer, 1994). It enables readers to follow the interaction of constraints easily. By way of illustration, let us consider the following tableau:

(5)Optimality Theory Tableau

Input	Constraint A	Constraint B	Constraint C
Output A	*!		
Output B		**!	
☛ Output C		*	*

Here, the input form is given at the top-left-hand column and its generated candidates appear underneath it (Sherer, 1994). The constraints are ordered from left to right in the order of their dominance. In the tableau above, constraint A occurs to the left of B because A dominates B. For Kager (1999), the ranking hierarchy of dominance between constraints is marked by a solid line ( ) and by '>>'in the text. Some constraints fail to be ranked if a hierarchical dominance relationship does not hold between them. They are separated by a vertical dotted line ( ) in tableaux, and by a comma in the text (e.g. B, C).

According to Sherer (1994), a violation of constraints is marked by an asterisk"*" and by exclamation marks "*!" when the violation is fatal. Shaded cells denote that the violation or satisfaction of constraints has no impact on the outcome. The optimal candidate is indicated by the pointing finger "☛". To illustrate, output C, in the tableau above, wins because it does not violate the highest ranked constraint, and it violates constraint B only once, whereas the competing output B violates it twice. Unlike output C, output A fatally violates constraint A.

Crucial to our analysis of V/ə alternations is the sub-theory of Generalized Alignment (GA) (McCarthy & Prince, 1993a, b). GA demands the edges of phonological and morphological categories to coincide with each other. Its general schema is presented in (6) below.

(6) Generalized Alignment (McCarthy &Prince, 1993b, p. 2)

ALIGN (Cat1, Edge1, Cat2, Edge2) $=_{def}$

∀ Cat1 ∃ Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.

Where

Cat1, Cat2 ∈ PCat ∪ GCat

Edge1, Edge2 ∈ {Right, Left}

In the schema above, it is shown that Edge1 of every Cat1 coincides with Edge2 of some Cat2. More precisely, the designated edge of PCat or GCat of Cat1 coincides with the designated edge of PCat or GCat of Cat2.

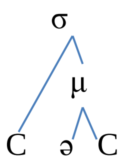
Alignment constraints may assume the function of designating an affix as either a prefix or a suffix, depending on the edge of the word (left/right) with which it aligns. In OT, Align-L and Align- R are present in every grammar but differently ranked (McCarthy, 2002, p.120).

2.5. The Prosodic Behavior of Schwa in OT

The prosodic behaviour of schwa within OT has received the attention of a number of scholars (Al Ghadi, 1990, 1994; Boudlal, 2001, 2006/2007; Rguibi, 2001; Ech-charfi, 2004, 2008; Bensoukas & Boudlal, 2012a-b; among others). This is mainly because schwa is a peculiarity of MA since other Arabic dialects make use of full vowels for epenthesis. Unlike full vowels, schwa is non-moraic in MA (Al Ghadi, 1990, 1994; Boudlal, 2001; and Bensoukas & Boudlal, 2012a-b). The constraint against the moraicity of schwa is formulated as *μ/ə (Al Ghadi, 1994). Consider the following definition of this constraint taken from Bensoukas & Boudlal (2012, p. 23):

(7)*μ/ə: moraic schwas are banned.
The constraint *μ/ə is violated when the mora is associated solely with schwa. Contrastively, the constraint is satisfied when a more associates with both schwa and a following consonant by virtue of the Weight-by-Position (WBYP) constraint, as shown in (8) below:

(8)



In MA, schwa cannot appear in open syllables. For this reason, schwa syllables must have codas. The constraint against the occurrence of schwa in open syllables is formulated as *ə]σ (Al Ghadi, 1994; Boudlal, 2001; Bensoukas & Boudlal, 2012a-b among others). This assumption has received different interpretations from Moroccan scholars. For instance, Al Ghadi (1990) proposes a negative constraint which prohibits schwa syllables from being dominated by non-branching rimes. Besides, Boudlal (2001) suggests the ranking of DEP-ə above No-Coda, allowing for schwa syllables to be closed.

For the sake of the present study, we assume, following Al Ghadi (1994), that epenthetic schwa is non-moraic while full vowels are underlyingly moraic.

2.6. Objective of the study

This paper intends to attain the following objective:

(i) To identify the prosodic domain at which the alternation occurs: segmental, moraic, syllabic or metrical (foot).

2.7. Research Question

The study is guided by the following research question:

(ii) What is the prosodic domain at which the alternation occurs: segmental, moraic, syllabic or metrical (foot)?

3. DATA COLLECTION

In this paper, we rely on secondary data for two main reasons. First, it allows us to save time and energy. Second, it permits us to generate new insights from previous analyses. Reanalyzing data can enable us to come up with new conclusions or confirm previous results. The corpus of data about verbal morphology is taken from published grammar works, namely Harrell (1962), Heath (1987), Boudlal (2001, 2018), Ech-charfi (2008), El Hamdi (2018) and Ziani (2022).

4. DATA ANALYSIS AND FINDINGS

4.1. The Data

In our analysis of V/ə alternations, we will not focus on whether the derivation goes from the perfective to the imperfective or the other way around. The directionality of derivation is not of particular interest to us here. Consider the following body of relevant data showing that the aorist forms have full vowels whereas the perfective forms have a schwa.

(9) ʃuf 'see'

1p	ʃəf-t	ʃəf-na
2pm	ʃəf-ti	ʃəf-tu
2pf	ʃəf-ti	ʃəf-tu

4.2. The Bimoraicity Prosodic Requirement in the Perfective of MA Hollow Verbs

Recall that our underlying assumption is that full vowels alternate with schwa to abide by the prosodic constraint FT-BIN in terms of bimoraicity. This constraint is defined as follows:

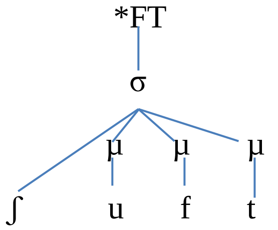
(10) FOOT-BINARITY (FT-BIN)

Feet should be binary under moraic or syllabic analysis (Prince and Smolensky, 1993).

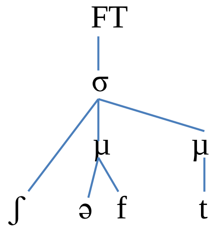
In the perfective of MA hollow verbs, this constraint has the effect of banning trimoraic structures as shown in (11) below:

(11)

a. trimoraicity



b. bimoraicity



The extra heavy trimoraic syllable *[ʃuft] is ruled out on the ground it contains three moras. In structure (11b), the high vowel /u/ in [ʃuft] gets reduced to satisfy the prosodic constraint FT-BIN in terms of bimoraicity. The reduced vowel is combined with the coda consonant [f] to get a moraic structure since schwa alone is not mora-bearing in MA.

We believe that in order to entertain an elegant constraint-based analysis of the bimoraicity prosodic requirement, we need to call upon another constraint namely MAX-V-IO, which is formalized as follows:

(12) MAX-V-IO (McCarthy and Prince, 1995, p.16)

Input vowels must have output correspondents (No V-deletion).

In order to complete the picture, we need to call upon the faithfulness constraint DEP-IO, which militates against epenthesis:

(13) DEP-IO (McCarthy and Prince, 1995, p.16)

Every segment in the output has a correspondent in the input.

To see how the output form [ʃəft] ‘ I saw’ is obtained, consider the constraint tableau below where the undominated FT-BIN dominates DEP-IO which in turn dominates MAX-V-IO: (14)

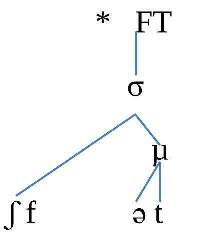
/ʃu$^{\mu}$f$^{\mu}$t$^{\mu}$/	FT-BIN	DEP-IO	MAX-V-IO
a. ʃu$^{\mu}$f$^{\mu}$t$^{\mu}$	*!		
b. ʃu$^{\mu}$ fa$^{\mu}$ t$^{\mu}$	*!	*!	
c. ʃft	*!		*
☛d. ʃəf$^{\mu}$t$^{\mu}$			

In this tableau, candidate (14a) is bad since it falls short on the top-ranked constraint FT-BIN. By epenthesizing the low vowel /a/, candidate (14b) fatally breaches the constraint DEP-IO, causing its elimination. Candidate (14c) is ruled out on the ground that it incurs a serious violation of the undominated FT-BIN and minimal violation of MAX-V-IO. Candidate (14d) wins the competition. To wrap up, tableau (14) shows that the driving force behind V/ə alternations is the prosodic requirement of verb bimoraicity.

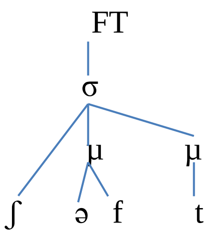
The position of schwa in the perfective of MA CVC verbs can either increase or decrease syllable weight. To make this concrete, the optimal output form [ʃəft] ‘I saw’ is bimoraic whereas the form *[ʃfət] is monomoraic.

(15)

a. Monomoraic



b. bimoraic



To provide an OT account for the directionality of schwa epenthesis in the perfective of MA CVC verbs, we make recourse to the theory of Generalized Alignment (McCarthy and Prince, 1993a). More specifically, we call upon the constraint ALIGN-R which requires that schwa must be inserted before the second consonant. This constraint is formalized as follows:

(16) ALIGN-R

The right edge of a stem coincides with the right edge of a syllable.

To account for the difference between [ʃəft] and* [ʃfət], we assume that ALIGN-R must dominate DEP-IO which in turn dominates MAX-V-IO. The constraint interaction is exhibited in tableau (17) below:

(17)

	FT-BIN	ALIGN-R	DEP-IO	MAX-V-IO

/ʃu$^{\mu}$f$^{\mu}$t$^{\mu}$/				
a. ʃu$^{\mu}$f$^{\mu}$t$^{\mu}$	*!			
b. ʃft	*!			*
c. ʃfət$^{\mu}$	*!	*!	*!	*
☛d. ʃəf$^{\mu}$t$^{\mu}$				

In this situation, candidate (17a) is ruled out on the ground that it breaches the prosodic constraint FT-BIN. Candidate (17b) is discarded since it falls short on the constraints FT-BIN and MAX-V-IO. By inserting schwa between the second and third consonants, candidate (17c) incurs a serious violation of FT-BIN, ALIGN-R and DEP-IO, leading to its elimination. As things stand, candidate (17d) wins the competition for satisfying all the constraints. In light of this analysis, we assume that the driving force behind V/ə alternations between the first and second consonants is the prosodic constraint FT-BIN.

Now let us consider items that end up with a vowel, which presents a special case that needs to be analyzed. For illustration, consider the following data set.

(18) The perfective form of ʃuf 'see'

1P.	_____	ʃəf.n**a**
2P.Masc.	ʃəf.t**i**	ʃəf.t**u**
2P.Fem.	ʃəf.t**i**	ʃəf.t**u**

The high vowel -u- gets reduced in closed syllables whereas the three vowels [a, i,u] remain unaffected in open syllables. This is mainly due to the fact that schwa can't occur in open syllables, unlike full vowels, which can freely occur freely in all positions. The constraint against the occurrence of schwa in open syllables is formulated as *ə]σ (Al Ghadi, 1994; Boudlal, 2001; Bensoukas and Boudlal, 2012a-b among others). With this background in mind, we can assume that V/ə alternations take place in closed syllables by virtue of the constraint *ə]σ.

The constraints developed so far along with the constraint *ə]σ can account for items that end up with a vowel. To show how the output form [ʃəftu] 'you saw' is obtained, let's consider the constraint tableau below. To simplify the constraint tableau, we have not included DEP-IO and MAX-V-IO.

(19)

/ʃu$^{\mu}$f$^{\mu}$ .tu$^{\mu}$/	FT-BIN	*ə]σ	ALIGN-R
a. ʃu$^{\mu}$f$^{\mu}$.tu$^{\mu}$	*!		
b. ʃu$^{\mu}$f$^{\mu}$.tə		*!	*!
☛c. ʃəf$^{\mu}$tu$^{\mu}$			

In this situation, candidate (19a) is eliminated as it contains three moras, thus breaching the undominated FT-BIN. Candidate (19b) fails because it fatally violates the constraint *ə]$_{\sigma}$ as it allows schwa to appear in open syllables, something the language does not allow. Candidate (19c) ends up winning the competition by virtue of its satisfaction with all the constraints.

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5. CONCLUSION

In this paper, we have argued that V/ə alternations in the perfective are triggered by prosodic constraints on foot structure. By providing empirical evidence, we have claimed and shown that schwas of the perfective forms can't occur between the second and third consonants by virtue of the ALIGN-R constraint. Additionally, we have demonstrated that schwas of the perfective can't occur in open syllables. Based on this, we have come to the conclusion that the only location for V/ə alternations to apply is in closed syllables.

Generally, the major finding of the paper is that full vowels alternate with schwa in the perfective of MA CVC verbs to achieve the bimoraicity prosodic requirement. This finding provides a strong proponent in favour of the use of the mora in the analysis of V/ə alternations. In our future works, we will examine another factor behind V/ə alternations in the perfective. In particular, we will defend the claim that initial heavy syllables get lightened to satisfy the prosodic constraint LL, which requires that the output consist of an iambic foot of the type LL.

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