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On the Bimoraicity of Tunisian Arabic Open Monosyllables: A Moraic Optimality-Theoretic Approach

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Abstract

The paper aims to analyze Tunisian Arabic (TA) open monosyllables in terms of moras within the constraint-based framework of Optimality Theory (Prince and Smolensky, 1993/2004). It focuses on two major types of TA syllables, namely CV and CCV, whose surface shapes represent a challenge to an analysis that desires to satisfy the universally unmarked binary foot. In fact, if analyzed as monomoraic, these vowel-ending forms would violate the minimum weight required by minimal words which is two moras. Previous studies of Arabic dialects have generally opted for an analysis that affiliates the initial consonant/s with an additional mora alongside the inherent vocalic head mora, so as to satisfy the minimality condition. Another alternative, one which will be argued for in this paper, recognizes a certain bimoraic nature of final vowels, the second mora of which surfaces only under certain conditions.

Keywords*:* moras, minimal words, syllable, binarity, Optimality Theory.

1 Introduction

Tunisian Arabic exhibits words of the form CV, such as [ma] (*water*) and [Ξu] (*brother*) and words of the shape CCV such as [kla] (*he ate*) and [mΣa] (*he went*). These two types of words seem to challenge the universal binary foot, as their surface rimes consist in a monomoraic short vowel. Knowing that the minimal word in TA cannot consist of less than two moras, attempts to capture these minimal shapes went in (at least) two directions. First, there is the straightforward analysis of onsets as moraic (Topintzi, 2006). The word [ma] for instance, would be analyzed as bimoraic by virtue of onset moraicity [$m_\mu a_\mu$], thus meeting foot binarity in terms of moras and satisfying minimality. Similar to this approach is the use of notions such as 'degenerate syllables' (Selkirk, 1981), and semisyllables (Kiparsky, 2003). A consequential violation of Strict Layer Hypothesis is necessary in these analyses. The second alternative, which is the one adopted here, allows mora count to take into consideration the underlying second mora in a final long vowel (shortened to V for peripherality reasons, as explained below; /maa/ > [ma]). The reason why the second mora does not surface owes to its failure to associate with segmental material as a result of the violation of PARSEPATH (Hewitt, 1994).

The next section presents a brief overview of the relevant theories within which the analysis is set, namely moraic theory and Optimality Theory. Subsequent sections review the previous studies of open monosyllables and present an alternative approach.

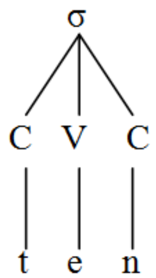
2 Theoretical framework

2.1 Moraic Theory

Syllable weight and the distinction between heavy and light syllables have been devised in three major ways: the CV-theory (McCarthy, 1979), the X-slot theory (Levin, 1985) and the moraic theory (Hyman, 1985 and Hayes, 1989). The monosyllabic word 'ten' is represented within the CV theory in [1a], the X-slot model in [1b] and the moraic theory in [1c]:

[1] *Syllable representation*

(a) CV theory



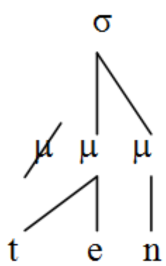
CV theory: Segments are specified as consonants (C's) or vowels (V's) on the CV tier. The problem with this theory is that it doesn't account for phenomena such as the V-lengthening in *eemi* from Greek *esmi* (I am) since the deleted /s/ has a corresponding C-slot on the CV tier rather than the required V slot.

(b) X-slot theory

X-slot theory: Segments are not specified as C's and V's, rather they are recognized as X's, something that accounts for the V-lengthening of *eemi* from *esmi*. The theory however fails to describe, for instance, the Mokilese reduplicated progressive form dii-diar from 'diar' (*find*), it rather wrongly predicts 'dia-diar'.

(c) Moraic Theory

i. *Hyman (1985)*



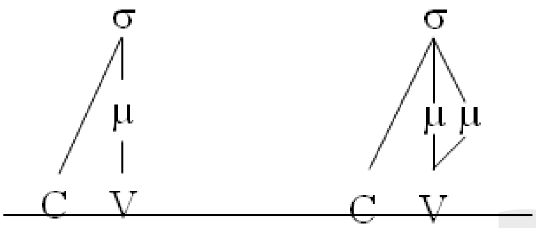
ii. *Hayes (1989)*

In Hyman's (1985) model, all segments have an underlying Weight Unit (WU). On the surface onsets lose their WU's and become dominated by the nucleic mora. Hayes (1989) proposes a model where the nucleus of the syllable does not share the mora with the onset. Both models agree that onsets are not moraic, an idea that is challenged in Topintzi (2006), where it is argued that onsets, just like codas, may or may not be moraic. In general, mora theory has the ability to account for the problematic instances encountered in CV and X-slot theories through mora counting.

The representations to follow adopt Hayes' (1989) theory, according to which a monomoraic syllable is a light syllable that has a short vowel (σ_{μ}), while a bimoraic syllable is a heavy syllable that has two moras ($\sigma_{\mu\mu}$) (the equivalent to CVC and CVV in CV-theory)[1]. In both types onsets are nonmoraic. The two types are represented in [2] below.

[2] *Light vs. heavy syllables*

a. light (CV)   b. heavy (CVV)



2.2 Optimality Theory

The second relevant theory to be sketched is Prince and Smolensky's (1993/2004) Optimality Theory (henceforth OT). The theory holds that at the heart of the Grammar there are constraints rather than rules. In other words, phonological generalizations are to be interpreted in terms of constraints with no reference whatsoever to linear rules. OT differs from its predecessors in various ways. It differs from the Chomskyan rule-based tradition in that it abandons the idea that a certain underlying form matches a certain surface form by means of phonological rules. Instead, it recognizes a set of constraints that militate for the formation of optimal outputs. The theory differs also from the preceding constraint approaches, such as the Theory of Constraints and Repair Strategies (Paradis, 1988) in that it considers constraints as violable and universal rather than inviolable and language specific. The conflict between the different constraints is resolved through ranking them in a strict dominance hierarchy.

OT is constructed around three basic components: GEN, CON, and EVAL. GEN (the generator) starts from the input and generates a (possibly infinite) set of output candidates. The latter may be identical to the input, somewhat modified, or even entirely unrecognizable. CON (for constraints) is the set of violable universal constraints. It serves to distinguish between the generated candidates. EVAL (the evaluator) compares the relational harmony of the candidates and selects the one that best satisfies the set of ranked constraints. The optimal candidate is the actual output used in the language.

Constraints in OT are mainly of two broad categories: Markedness constraints and Faithfulness constraints. Markedness constraints impose well-formedness conditions on the output. They may be formulated positively or negatively as exemplified in [3a] and [3b] respectively.

[3] Positive vs. negative formulation of constraints

a. ONSET   Syllables must have an onset.

b. NO-CODA   Syllables must not have a coda.

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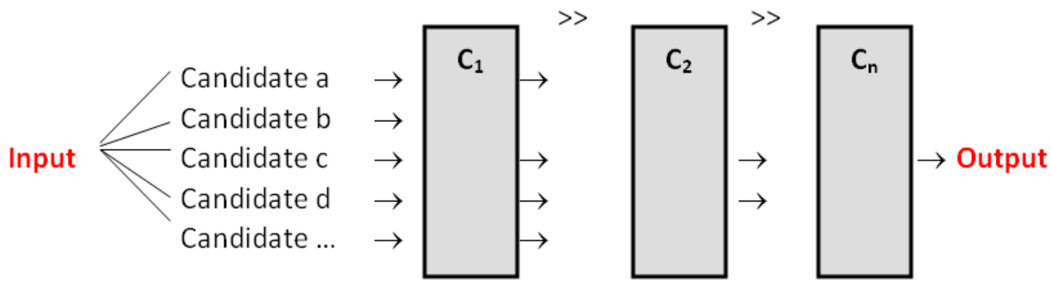
Faithfulness constraints control the relation holding between the input and the output. They militate for identity between the two representations in terms of number of segments, feature values, vowel quality, etc. In general, markedness constraints and faithfulness constraints are in an unremitting conflict and they are ranked in a strict dominance hierarchy. As Prince and Smolensky (1993/2004, p.3) note, "the grammar consists of the constraints together with a general means of resolving their conflicts". Constraints are in *conflict* because each constraint brings along its own claims about the well-formedness of a certain representation. Closely related to the notion of constraint conflict is the concept of constraint *violability*, which means that the optimal candidate need not satisfy all constraints in the hierarchy. As Prince (2002, p.1) puts it "optimality is relative success, not perfection". A candidate is optimal as long as it satisfies the higher-ranked constraints. The means that languages use to solve the conflict between the different constraints is to rank them in a *strict dominance hierarchy*, so that lower-ranked constraints may be repeatedly violated so long as higher-ranked constraints are satisfied. This means that the satisfaction of a higher-ranked constraint takes absolute priority over the satisfaction of the remaining set of constraints ranked lower in the hierarchy. OT uses the symbol " >> " to designate the idea of dominance:

[4] Constraints ranked in a strict dominance hierarchy

$$C_1 >> C_2 >> \ldots >> C_n$$

In [4], constraint C_1 is understood as being dominant as it is ranked higher than the rest of the constraints. The output candidates are *evaluated* against the set of ranked constraints and some of them are eliminated accordingly. Only one candidate survives and is selected as optimal. The selection process can be schematized as in [5].

[5] *OT schematized* (Kager, 1999, p.22)



[5] sums up the theory. It shows how from a certain input, GEN provides different candidates (a, b, c, d …); candidates in turn are submitted to EVAL to be evaluated, the output is the optimal form that is most harmonic with the input and that survives through the set of ranked constraints ($C_1 >> C_2 >> \ldots >> C_n$). To represent the claims in [5], OT makes use of *tableaux*. Let us assume (as in McCarthy and Prince, 1993) that a grammar consists of two constraints: constraint A and constraint B, and that Gen generates two candidates: $cand_1$ and $cand_2$ from an input i. A disagreement between A and B signifies a constraint conflict. This conflict is represented in the *constraint tableau* below.

[6] The constraint tableau in OT

/i/	A	B
☞ a. $Cand_1$		*

b. $Cand_2$	* !	

The tableau above includes most of the symbols and representations that OT uses: the input is at the top left corner; the candidates generated by GEN are in the first column; and constraints are ordered in the remaining columns. The order of constraints from left to right indicates the order of dominance (the one on the right dominates the other/s on its left); violations are marked by an asterisk (*); a fatal violation is marked by (!); constraint satisfaction is indicated by an empty cell; shaded cells are irrelevant after a fatal violation, and the optimal candidate is marked by the pointing hand ☞.

In the tableau above, $Cand_1$ satisfies constraint A but violates constraint B, whereas $Cand_2$ satisfies constraint B but fails A. $Cand_1$ is the optimal output because it satisfies the higher-ranked constraint A (A >> B). Similar representations will be used in the analysis of TA syllables within a moraic Optimality-Theoretic approach.

3 Open monosyllables

First, it is necessary to start with some generalizations about TA syllables. Words in TA may not start in a vowel; there has to be at least one consonant under the onset slot. Furthermore, triconsonantal tautosyllabic clusters are not permissible whether in onset or coda position (Jouini, 2014). In other words, at the left edge of the syllable there has to be at least one consonant and at most two. A syllable that has no onset consonant violates the ONSET constraint and a syllable that has three consonants violates the constraint $*_{\sigma}$[CCC. Both violations are always fatal.

With regard to the nucleus, it is always vocalic; there are no syllabic consonants. It can be formed by one of the main vowels /a/, /u/, or /i/ or of their long counterparts /aa/, /uu/, /ii/. Sequences of different vowels are not possible, so that forms such as *[au], *[ai], *[ua], *[ui], *[ia], *[iu] never exist. There are however [ay] and [aw] sequences, where the vowel is followed by one of the glides [y] or [w].

The coda position may or may not be filled. When it is not filled, the resultant form is either CV or CVV. When it is, it results in the syllables CVC, CVVC and CVCC but not *CVCCC or *CVVCC. Accordingly, while triconsonantal clusters are not permitted, biconsonantal clusters are allowed in both onset and coda positions (but not after long vowels). Given these generalizations, vowel ending monosyllables have one of three forms: CV, CCV, and CVV, with no possible longer forms such as *CCCV or *CVVV. Having said that CVV syllables undergo what is known as Final-Vowel Shortening and surface as CV or CCV, only two possible open monosyllables are left: CV and CCV. They are exemplified below.

[7] /CVV/ > [CV]

ma	*water*
mya	*100 millimes*

hwa	*air*
bu	*father*
Ξu	*brother*
ħmu	*father-in-law*

In general, CCV words are more common than CV words. Other examples include the verbs [d∂a] (*he prayed*), [mΣa] (*he walked*), [kla] (*he ate*), [wfa] (*it ended*), [bka] (*he cried*) etc. What is common between all the words in [7] is that they all seem to be formed of a monomoraic syllable, although prosodic words in TA cannot be formed of a single mora. In fact, the apparent short vowels in the words above come from underlying long vowels that have undergone shortening due to their final position. They stand as a further evidence for "[…] prosodic weakness of final open syllables, which are liable to de-stressing, de-voicing, shortening, truncation, and so on, under purely phonological conditions" (Prince and Smolensky, 1993, p.111). Interestingly, the addition of a consonantal affix or clitic renders the vowel to its initial state; a long vowel. For instance, [maah] means *his water*. The move of [ma] from having the minimal shape of a light syllable ([ma] = CV) to having a maximal monosyllabic shape of a superheavy syllable ([maah] > CVVC) as a result of the addition of [h] (*his*) is worth investigating and is further illustrated below. This move is also observed in verbs. The data in [8] is quite important in determining the real nature of these words.

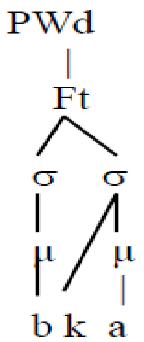
[8] *CCV verbs*

		3rd sg. fem. Perf. (a)	(b)
kla	*he ate*	klaat	klitt
mša	*he went*	mΣaat	mšitt
bka	*he cried*	bkaat	bkitt
Ξða	*he took*	Ξðaat	xðitt

The forms in [8a] belong to the variety of TA spoken in the capital city Tunis, and in most of the coastal regions. It is also the one used in the media (TVs and radios). The ones in [8b] belong to the variety of TA spoken in the northwestern city of Jendouba. Overlooking the vowel change, what is interesting about the varieties is that both of them force the stem syllable to move from CCV to CCVVC (8a) or $CCVC_iC_i$ (8b). Intermediate forms such as *klat and *klit are not possible in TA, which reflects an underlying preference for monosyllabic words to correspond to a superheavy syllable.

Still, CCV forms may be analyzed as bimoraic in different ways. Boudlal's (2001) analysis consists in adopting the notion of 'Minor Syllable', which is very much like Selkirk's (1981) notion of 'degenerate syllable' except that minor syllables contribute a mora. The way he represents CCV words is as in [9].

[9] *Minor Syllables* (Boudlal, 2001, p.66)



There is a lengthy argument behind the adjunction of the initial consonant to a mora, especially that onsets are inherently nonmoraic. Among the most oft-cited explanations is that vowel syncope, a process that deletes short vowels in medial CV syllables, forces forms such as [baka] to surface as [bka]. However, the process deletes the vowel and leaves behind a floating mora which subsequently attaches to the onset of that initial syllable. This analysis is quite adequate for CCV forms, yet it is not extendable to CV forms. Notice the representations below.

[9] *Disyllabic 'ma'*

a. → b.

The representation in [9b] meets the necessary minimal weight by interpreting the onset consonant as a minor syllable (as in Boudlal, 2001). This is unacceptable though, since the second syllable fatally violates one of the most highly ranked constraints, namely ONSET: no syllable may start in a vowel.

A more appropriate way to account for such minimal forms is to look for an explanation that has to do with the vowel. What is the nature of the vowel in nouns such as

[ma] (*water*) and verbs such as [Za] (*he came*)? If we add a clitic or a suffix to the right edge, these vowels are long as the examples in [10] show it.

[10] *Open monosyllables + C*

a. CV + C								
	ma	(*water*)	-h	(*his*)	>	*mah	>	maah (*his water*)
	Za	(*he came*)	-t	(*fem.*)	>	*Zat	>	Zaat (*she came*)
b. CCV + C								
	dwa	(*medicine*)	-k	(*your*)	>	*dwak	>	dwaak (*your medicine*)
	bda	(*he started*)	-w	(*they*)	>	*bdaw	>	bdaaw (*they started*)

The data in [10] hides a long debate about the nature of the vowel: Is it a long vowel that undergoes final vowel shortening (in CV and CCV words)? Or is it a short vowel that exhibits pre-suffixal lengthening (in CV and CCV +C words)?

Angoujard (1978, p. 16) describes the phenomenon in TA and says: “à choisir entre une règle d’abrégement et une règle d’allongement ... à vrai dire, je n’en ai pas trouvé de clairement décisifs”. In other words he couldn’t decide on the nature of these vowels. This study prefers ‘final-vowel shortening’ (FSV) to pre-suffixal lengthening for three main reasons. First there is the principle of ‘Richness of the base’ (ROTB) (Prince and Smolensky, 1993/2004) which requires that as much material as possible should be included in the base form. Accordingly, if the input form is to be stated as either /ma/ or /maa/ then the latter form is more convenient following ROTB. Second, the phenomenon of FVS is cross-linguistically attested, and it is less marked than pre-suffixal lengthening. Finally, a diachronic observation regarding open monosyllables shows that they are actually the result of the historical glottal elision and compensatory lengthening.

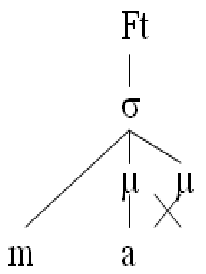
[11] *Glottal elision and compensatory lengthening*

a. Compensatory lengthening						
	/ra?s/	>	[raas]		(head)	
	/fa?s /	>	[faas]		(pickaxe)	
b. *Glottal elision*						
	/maa?/	>	[maa]	>	[ma]	
	/Zaa?/	>	[Zaa]	>	[Za]	

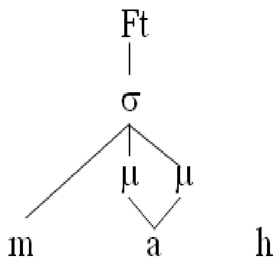
It is obvious, then, that the vowels in CV and CCV words are underlyingly long, yet they are subject to final-vowel shortening. In other words, these vowels are bimoraic, except that the second mora, which is present in the input form, fails to surface in the output form. There seems to be a silent mora at the right edge of these monosyllables. This mora is similar to Hammond's (1999) notion of the catalectic beat: it exists to satisfy phonological rules but it is not apparent in the word. Below is an illustration through the words [ma] (*water*) and [maah] (*his water*).

[12] *Representing open monosyllables*

a. 'ma' *water*



b. 'maah' *his water*



The barred association line in [12a] represents a violation of a correspondence constraint that requires input moras to associate with a segment in the output. This violation is motivated by a higher ranking constraint against word-final long vowels. This follows from the fact that final long vowels are permitted only when the prosodic word ends in a consonant (as shown in [12b]). Within OT, different ways have been proposed to deal with final vowel shortening. Below is a review of a few of them. Only the last approach is deemed adequate here.

Fulmer (1997) deals with final vowel shortening by positing a direct markedness constraint 'FINAL SHORT VOWEL' (FSV) to force word-final long vowels to surface as short. The constraint has the shape *μμ]. Obviously, such an approach presents a number of analytical problems. First, were it not for the statement of the constraint, which tells that it concerns only vowels, the constraint *μμ] could also be extended to banning word-final VC rimes in an analysis where codas contribute a second mora. Second, it is argued (in Gouskova, 2003 for example) that economy constraints are unnecessary and even harmful, and that economy effects should result from constraint interaction rather than from positing an unmotivated markedness constraint; which is the case here with FSV. Finally, the analysis guarantees the choice of an optimal output with a final short vowel but it does not tell anything about the mora that fails to surface; is it completely deleted or is it preserved in the input? Is it accessible to weight scanning or not? For our present matter we need a system that prevents the second mora from associating to an output segment, while at the same time keeping it visible to minimal weight requirements.

McCarthy (2005) ranks FINAL-C, a markedness constraint against word-final vowels, below the gradual correspondence constraint MAX(V:), which cares for the preservation of vowel length between input and output pairs. An interaction between the two constraints comes to the consensus that only one mora may surface out of the bimoraic long vowel. In the present context, a candidate such as *[m] (out of the input /maa/ *water*) would fatally violate the high ranking MAX(V:). Candidates *[maa] and [ma] both satisfy MAX(V:) but violate FINAL-C. [maa] incurs two violations of FINAL-C while 'ma' incurs only one, by virtue of losing only one mora. The minimal violation incurred by [ma] makes it surface as optimal. The analysis in McCarthy (2005) is quite adequate in accounting for final vowel shortening; yet again, it entirely deletes the second mora that is needed for minimal weight in TA prosodic words.

Prince and Smolensky (1993/2004) introduce the constraint FREE-V, which states that word-final vowels must not be parsed. Interpreting FREE-V as a gradient constraint enables it to take into consideration the number of violations incurred by candidates. With regard to open monosyllables, the second mora is not parsed. The constraint MAX-μ, which militates for the surface realization of input moras, is ranked below FREE-V. The ranking FREE-V >> MAX-μ ensures that only one mora surfaces out of the underlying long vowel.

[13] FREE-V >> MAX-μ

μ μ V	FREE-V	MAX-μ
a. μ μ V	**!	
b. ☞ μ <μ> V	*	*

Though tempting, this analysis is still inadequate for the present matter. It is true that by not parsing the second mora, the vowel is shortened, yet not parsing an element is quite similar to denying its very existence. It is as if we were saying that the unparsed element has no role in the phonology of the word, at least as far as weight is concerned. The system that we need is one that treats phonetically short vowels in final positions as bimoraic within the phonology, even though their second mora is unfilled with segmental material. The rightmost mora will thus remain visible to mora count (in order to meet the bimoraicity minimum).

The objective can be attained by an analysis that is similar to the one in Hewitt (1994). Recall that the representation in [12] above recognizes the existence of the second mora but the association line fails to associate it with any segment in the output form. This is a violation of PARSEPATH. A statement of this constraint along with other necessary ones is given in [14]:

[14] *Final V shortening constraints*

a. PARSE-μ: moras must be parsed into syllables.
b. FT-BIN: the foot must be binary under moraic or syllabic analysis.
c. *ALIGNR-PW-V: the right edge of the prosodic word must not be aligned with the right edge of a vowel.
d. PARSEPATH: a path (association line) present in the input should be parsed in the output

PARSE-μ ensures that moras are parsed into syllables, which is needed to account for the bimoraicity of the word. The latter is controlled by FT-BIN. *ALIGNR-PW-V scans just the rightmost unit of the prosodic word. By virtue of its being an alignment constraint, it has no access to what precedes the edgemost element. PARSEPATH is violated when an association line fails to associate an underlying element with a given phonetic realization. The constraint hierarchy is given in [15a], the analyses of ‘ma’ and ‘maah’ follow.

[15] *An OT analysis of small words*

a. *The constraint hierarchy:*

PARSE-μ >> FT-BIN >> *ALIGNR-PW-V >> PARSEPATH

b. *Tableau for* [ma] (input /maa/ *water*)

/maa/	PARSE-μ	FT-BIN	*ALIGNR-PW-V	PARSEPATH
a. σ μ μ [m a]			*!	
b. σ μ < μ> [m a]	*!	*	*	**
c. ☞ σ μ μ < / > [m a]				*

In this tableau, candidate (a) $[maa]_{\mu\mu}$ is the most faithful to the input. However, it fatally violates *ALIGNR-PW-V which ensures that no optimal candidate may surface with a final long vowel. At the same time, the high ranking FT-BIN is ready to rule out any candidate that does not meet the minimum bimoraicity, which is the case with candidate (b) $*[ma]_{\mu}$. With candidate (c) $[ma]_{\mu\mu}$, a compromise is attained as a result of constraint interaction. It recognizes the underlying presence of the second mora and it explains the absence of its realization in the output as a violation of low ranking PARSEPATH. Monosyllables are interpreted as being bimoraic while at the same time constrained not to surface as such. The constraint that bans final long vowels does not intervene when the long vowel is not final. This is the case with polymorphemic 'maah'.

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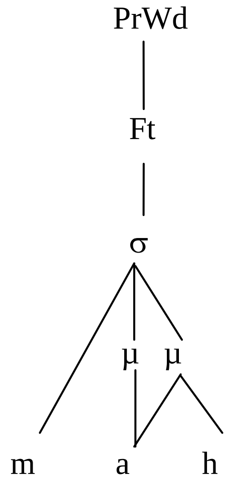
[16] *Tableau for* [maah] (input /maa+h/ *his water*)

/maa+h/	PARSE-μ	FT-BIN	*ALIGNR-PW-V	PARSEPATH
a. ☞ σ μ μ [m a h]				
b. σ μ < μ> [m a h]	*!	*		**
c. σ μ μ < / > [m a h]				*!

The optimal candidate ([16a]) satisfies all the constraints in the hierarchy. The other candidates are ruled out because they try to ban the second mora in an environment that allows it. The advantage of this analysis is that it does not require any mechanism of vowel lengthening from [ma] to [maah]. The second mora is already there; it is a floating mora that manages to gain a surface realization by associating to the vowel as the concatenation of the final consonantal clitic makes it unconstrained by *ALIGNR-PW-V. As for the association of the final consonant, it is overlooked here because it has to do with the representation of superheavy syllables, which is beyond the scope of this paper. Following an Argument in Jouini (2014), it should share a mora with the preceding vowel, as represented in [17].

[17] *The representation of superheavy CVVC syllables in TA* ([maah])



4 Conclusion

In this paper, the interesting argument made about open monosyllables is that they should be treated as bimoraic. Thus, monosyllables of the form CV and CCV meet the bimoraicity minimal requirement by virtue of comprising two moras, yet the second mora fails to associate with any segmental material and incurs a violation of the constraint PARSEPATH. This mora is a floating unit that surfaces the moment a consonantal morpheme is concatenated with the right edge of the word. The analysis, in this respect, argues for 'final-vowel shortening' at the expense of 'pre-suffixal lengthening'.

Note:

[1] This distinction between light and heavy syllables follows McCarthy and Prince (1986, p. 7) "Light syllables contain one mora, heavy syllables two". This has been challenged in de Lacy (1997) who argues that the distinction between syllables based on weight yields more than two types.

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