Chapter

Five

Stress in UHA:

An Optimality Account

5.0. Introduction:

In the previous two chapters, I have established the importance of syllable weight in determining internal syllable structure in UHA. In particular, syllabic moraicity was shown to play a major role in motivating some processes like vowel epenthesis or syncope. In the present chapter, and the subsequent one, I discuss stress as a supra-segmental process that strongly requires the existence of the syllable. We will see how crucial syllable weight and position are for footing, and consequently for stress assignment. In particular, I shall demonstrate how stress is attracted to the right-most heavy syllable in the quantity-sensitive stress pattern of UHA. In addition, I will clarify how fundamental it is to assume Syllable Integrity as a constraint on footing. Although the process is purely moraic, distinguishing syllable boundaries is vital to achieve true footing in UHA.

In chapter two, I introduced the broad theoretical background of the different approaches to stress assignment. Adopting a constraint-based approach, this chapter offers a more in-depth analysis of the process of metrification in UHA. The following chapter, tackles the matter from a derivational perspective, nonetheless. Both will

contribute to the main objective of the study enabling us to determine which is capable of providing a more plausible account of this process in UHA.

The chapter has two sections. The fundamental contribution of the chapter is in section one, where I present the basic constraints and constraint settings. These are usually decided by the facts of the stress pattern in question. In addition, I will have to determine and argue for the ranking that will eventually achieve the desired constraint interaction. However, one of the formidable challenges encountered in this respect is the exceptional stress on final superheavy sequences (syllables) (CVCC and CVVC). I will demonstrate that only constraint interaction recognising the basic assumptions of syllabification, sketched in chapter three, may attain true stress assignment in this case. Another difficulty is the default rhythm-driven stress placement attested in UHA. We shall see how it motivates activating further constraints. However, these will have other undesired consequences elsewhere. So, the appropriate constraints or constraint rankings are introduced to control cases of over application. In the second section, I will discuss other related issues like Final /-CVC/ Footing and Final Vowel Shortening. I will demonstrate that OT is adequate enough to account for the issue of final consonant weakening vs. final vowel shortening. Towards the end of the second section, I will also discuss Stem-bound footing in UHA.

5.1. Optimality Theory and Stress in UHA:

The purpose of this section is to test out the capability of the constraint-based approach to metrification as an analytical framework for the stress pattern of UHA.

Before engaging in such discussion, it is appropriate to present some examples paving the way towards determining the stress pattern of the language.

5.1.1. Stress Pattern in UHA:

Let us start by listing the syllable types attested in UHA. Consider the following inventory:

(1) a. Light.......................CV
b. Heavy.....................CVV, CVC
c. Superheavy.............CVVC, CVCC[1]

Any syllable is stressable in UHA. Therefore, the determinant factors are syllable weight and position. To demonstrate this, let us consider the following groups of examples. Ultimately, we want to know how stress works in UHA:

(2) I. Stress on a Final Superheavy:

	a.	ka.tábt	'I/ you *sg. ms.* wrote'
	b.	bar.hánt	'I/ you *sg. ms.* justified'
	c.	naa.gáʃt	'I/ you *sg. ms.* argued'
	d.	ʔin.ta.sˤárt	'I/ you *sg. ms.* won'
	e.	fa.tˤúur	'breakfast'
	f.	muf.táaħ	'key'
	g.	faa.núus	'lantern'
	h.	ʔin.ta.χa.búuh	'they elected him'

II. Stress on a Heavy Penult:

	a.	dár.si	'my lesson'
	b.	dáa.fi	'warm *ms.*'
	c.	mák.tab	'an office'

[1] As we saw in the previous chapters, superheavies are not distinct syllable types. They are a combination of a heavy syllable plus a prosodified consonant, i.e. one that is not syllabified but is linked to the PrWd.

d.	táa.d͡ʒir	'merchant *ms.*'
e.	si.míʕ.ti	'you *sg. fm.* heard'
f.	ma.káa.ni	'my place'
g.	ma.dáa.ris	'schools'
h.	mu.tár.d͡ʒim	'an interpreter *ms.*'
i.	mar.káz.na	'our centre'
j.	sˤan.dúu.gi	'my box'
k.	saa.máħ.na	'we forgave'
l.	ʃaa.fúu.ha	'they saw her'
m.	mus.táʕ.mal	'second-hand'
n.	faa.túu.rah	'receipt'
o.	fus.táa.nik	'your *sg. fm.* dress'
p.	sˤaa.ħíb.hum	'their friend'

III. Stress on a Heavy Antepenult:

a.	máħ.ka.mah	'courthouse'
b.	sáa.ba.kum	'he left you *pl.*'
c.	mák.ta.bi	'my office'
d.	ʃáa.la.ha	'he raise her'
e.	ma.dáħ.ta.hum	'I/ you *sg. ms.* praised them'
f.	mu.gáa.ba.lah	'meeting'
g.	ʔak.kál.ta.ha	'I/ you *sg. ms.* fed her'
h.	ʔasˤ.ħáa.ba.na	'our friends'

IV. Stress on a Light Penult or Antepenult:

a.	sá.ma	'sky'
b.	má.ʃi	'walking'
c.	sá.min.	'(animal) fat'
d.	fá.d͡ʒur	'dawn'
e.	gá.ma.ri	'my moon'
f.	ká.ta.bu	'they wrote'
g.	bá.sˤa.lah	'an onion'
h.	sá.ʔa.lak	'he asked you *sg. ms.*'
i.	ba.ga.rá.ti	'my cow'
j.	dˤa.ra.bá.tak	'she hit you *sg. ms.*'
k.	tˤa.la.bá.tuh	'his students'
l.	ʃa.d͡ʒa.rá.tu.hu *msa*	'his tree'
m.	ʁa.na.má.tu.na *msa*	'our (nanny) goat'
n.	mak.tá.ba.ti *msa*	'my library'
o.	daħ.ra.d͡ʒa.tú.hu *msa*	'his rolling'

By looking at the list of words, we may propose that stress in UHA follows a pattern similar, though not identical, to some Arabic dialects, Cairene in particular, Mitchell (1960), McCarthy (1979), Hayes (1981), Halle & Vergnaud (1987), and some others. There are two crucial factors. Firstly, it is obvious that syllable weight has a considerable effect on stress placement in UHA. Heaviness seems to attract stress. Nonetheless, stress may not go beyond the antepenult, which means that it is confined to the final three syllable window. These facts may be formalised as follows:

(3) a. Stress a final superheavy syllable,
b. Otherwise, stress a heavy penult,
c. Otherwise, stress a heavy antepenult,
d. Otherwise, stress the penult or the antepenult, whichever is separated from the first preceding heavy syllable or (if there is none) from the beginning of the word by an even number of syllables.

Therefore, footing in UHA is, by default, rhythm-driven. The pattern in (3) above fundamentally says that stress is assigned to either a light antepenult or a light penult, the one that satisfies (3 d). Nonetheless, syllable weight plays a crucial role. For example, the appearance of a stress-attracting heavy penult, coupled with the absence of a superheavy ultima that is usually stressed, overshadows the totally rhythmic placement of stress. This implies a further complication involving a ternary weight opposition of syllable types (light vs. heavy vs. superheavy). In other words, there are two binary syllable weight distinctions, light and heavy vs. superheavy word-finally, and light vs. heavy word-internally (McCarthy 1979 b).

In what follows, firstly, I will have to identify the constraints and the constraint settings to which we may attribute the true footing, that will eventually achieve this stress pattern. Then, I will argue for establishing certain dominance

relations holding between these constraints in the overall constraint hierarchy. However, the facts in (3) above entail that we divide the discussion into two subsections. I will firstly talk about prominence-driven stress, i.e. (3 a, b, and c), highlighting the connection between heavy syllables and stress, in the final three syllable window. After that, I will discuss rhythm-driven stress proposing a constraint hierarchy that would account for both.

5.1.2. Active Constraints:

In this preliminary subsection, I relate the metrical principles relevant to the discussion of UHA stress pattern, to OT constraints. In particular, I will talk about Boundedness, Headedness, Weight sensitivity, Extrametricality, Directionality, and Exhaustivity.

The facts reported above dictate that a certain form must be parsed into bounded (binary) feet. This is because we fundamentally want to achieve the rhythmic footing required to attain (3 d). In other words, the even number of syllables required to intervene between the stressed syllable and the designated edge entails some sort of rhythmic (bounded) footing. Therefore, assuming the set of basic constraints on metrification presented in chapter two above, FT-BIN must be highly ranked in UHA, preventing ALIGN-FOOT from including all syllables in a given form under a single multi-syllabic foot.

As for headedness, we need to set two constraints to assign headhood to elements on both foot and word levels. RH-TYPE = T/I, that determines the dominant

flank of a certain foot, must be set to promote left elements of binary feet, i.e. RH-TYPE = T. The justification for this claim is the desire to realise the conditioned default stress pattern where crucially an even number of light syllables intervenes between the penult or the antepenult and the specified edge. The other headedness constraint to set is ALIGN-HEAD, that nominates a certain foot as the head of a given form. The tendency to assign word stress to the right-most heavy syllable strongly indicates that this constraint must be set to place the head foot as close as possible to the right edge of the prosodic word: Align(PrWd, R, H(PrWd), R).

As for weight sensitivity, WSP is the main constraint to consider. However, this principle can only be enforced when considering the binary weight distinction of heavy vs. light word-medially. This is because stress can never be final, whatever that ultima's weight is (with the exception of superheavies that are treated differently in a manner that does not prejudice this claim, as we shall see below). This indicates that some kind of non-finality must be imposed and crucially ranked higher than WSP (as we saw in the Latin case, in chapter two above). Nevertheless, NON-FIN must not be allowed to discriminate against footed monosyllabic forms. To ensure that the standard theory's principle of non-exhaustivity of the stress domain is maintained, LX = PR is introduced and ranked undominated.

The question to address now is related to the level where NON-FIN must apply. In particular, we want to determine whether it is the final syllable, foot, or both are evaluated by this constraint. As we saw in chapter two, Prince & Smolensky (1993) needed to evaluate both the head syllable and (the head foot), to account of Latin stress. This meant that a form with a final head foot erected on a single heavy

syllable would incur double violations of NON-FIN. Their decision to have the final foot affected by NON-FIN was initially motivated by their desire to achieve the default antepenultimate stress and by the fact that the directionality of footing in Latin is right-to-left. For UHA, I will initially use the same level of NON-FIN because, as we will see below, it helps in optimising almost all the stress instances attested in the language.[2]

As for the directionality of footing, UHA requires syllables to be parsed into feet starting with the initial syllable and going rightwards. This is again another consequence of its default stress pattern. As we saw in chapter two above, ALIGN-FOOT is the OT constraint that interprets this principle. This constraint requires all feet to appear at a certain edge. Of course this is not attainable unless we have only one foot per word. However, the interaction between ALIGN-FOOT and FT-BIN, that is ranked undominated, will achieve the directionality effect by optimising forms whose cumulative violations are the least, as their feet are closest to the preferred edge. So, for UHA, we must set ALIGN-FOOT as: Align (Ft, L, PrWd, L). This ensures that feet are as close to the left edge as possible, and consequently maintain the left-to-right directionality of footing.

Finally, the exhaustivity of parsing is attributed to PARSE-SYL. This constraint, along with FT-BIN and RH-TYPE = T, would carry the effect of FT-UNI or Rhythm in weight-insensitive bounded systems (cf. chapter two above).

---

[2] However, this may not completely hold when I discuss the rather complex default stress (3 d).

Thus, the following table sums up the required constraints, and the principles they maintain, to meet the basic facts of UHA stress pattern.

(4)

Principle	Boundedness	Headedness	Weight sensitivity	Extrametricality	Directionality	Exhastivity
Constraints	FT-BIN	RH-TYPE = T RH-HARM ALIGN-HEAD-RIGHT	WSP	NON-FIN (Σ, σ́)	ALIGN-FOOT-LEFT	PARSE-SYL

In the following subsection, I will propose and argue for a ranking that will render Eval capable of discriminating between different candidate analyses to optimise the true outputs attested in UHA.

5.1.3. Dominance Relations:

To optimise true outputs, Eval requires a language particular ranking of the constraints supplied by UG. In such a ranking, constraints usually belong to one of three distinct levels. Some are predominant, never violated. Others are dominant as they are only violated under duress, i.e. to satisfy a predominant constraint or a higher dominant one. And, thirdly the low ranked constraints that are violated more frequently. What appeals to us at this point is the interaction relations existing between these distinct levels and between individual constraints in the particular case of UHA. In what follows, I will focus on some of the interesting interactions clarifying the motivation behind the tentative ranking that I will eventually propose towards the end of this subsection. I would like to stress though that it will not be as straightforward as one expects. One apparent difficulty is the previously mentioned

issue of final superheavies. This will be clarified as I apply the ranking on real inputs taken from the language.

I will start by determining the predominant constraints that are literally never violated in UHA. Two essential characteristics of the system are foot binarity and left-headedness on the foot level. This means that FT-BIN and RH-TYPE = T are the two basic predominant FOOT-FORM constraints. Of course, RH-HARM is taken for granted to be represented here to discriminate against the uneven trochee. Another quite important restriction on the configuration of the stress domain is the total absence of final stress, leaving superheavies aside for the time being. As I mentioned earlier, this indicates that NON-FIN is highly ranked. But, as we saw above, NON-FIN must be always ranked lower than LX = PR to avoid exhausting the whole stress domain, especially with monosyllabic words. Also, this latter essential constraint is required to encourage footing.[3] Therefore, the only clear dominance relation holding between these constraints is the one forcing NON-FIN to be dominated by LX = PR. This is clarified in the following tableau:

(5)

/σ/	FT-BIN, RH-TYPE, RH-HARM, LX=PR	NON-FIN
a. ☞(σ́)	√	*
b. < σ >	*! LX=PR	√

Crucially however, NON-FIN must dominate certain lower ranked constraints to avoid optimising otherwise false outputs. The most obvious is WSP. This essential relation will guarantee stress non-finality even if the ultima is heavy. The following

[3] The assumption that a PrWd must comprise a minimum of one foot, McCarthy and Prince (1986) among others, requires some type of footing to achieve the correspondence between the morphological and phonological categories.

tableau demonstrates the dominance relations holding between these constraints (H = a heavy syllable, L = a light syllable):

(6)

/LH/	FT-BIN	NON-FIN	WSP
a. ☞ (ĹH)		*	*
b. L(H́)		**!	
c. (Ĺ)(H)	*!		

Clearly, ALIGN-HEAD, that attracts stress rightwards, is also strictly dominated by NON-FIN if the latter is operative on the foot level. This will keep the head foot off the final position, especially if erected over a final heavy syllable. Consider the following tableau:

(7)

/LLH/	NON-FIN	ALIGN-HEAD
a. ☞ (ĹL)(H)		σ
b. (LL)(H́)	*!*	∅

Another interesting dominance relation is the one that holds between WSP and PARSE-SYL. The former must be ranked higher to achieve true footing in /LHL/ forms. The following tableau clarifies this point:

(8)

/LHL/	RH-HARM	WSP	PARSE-SYL
a. ☞ L(**H**)L			**
b. (**L**H)L		*!	*
c. L(**H**L)	*!		*

The last interaction I will look into, for the time being, is the one between PARSE-SYL and ALIGN-FOOT. The former must dominate the latter to ensure exhaustive parsing of syllables into feet. Otherwise, we will end up with a single binary foot erected on the left edge of the form under consideration. However, the desired parsing that we are after must be in accordance with FT-BIN, to ensure that degenerate monomoraic feet are not formed. This will consequently rank FT-BIN over ALIGN-FOOT. Consider the following tableau:

(9)

/LLLLL/	FT-BIN	PARSE-SYL	ALIGN-FOOT
a. ☞ (LL)(LL)L		*	σσ
b. (LL)LLL		**!*	∅
c. (LL)(LL)(L)	*!		σσσσσσ
d. (LLLLL)	*!		∅

The ranking in (10) below sums up the dominance relations discussed above. This constraint ranking is only tentative and is subject to further substantial improvement as the discussion progresses.[4]

(10) FT-BIN, RH-TYPE = T, RH-HARM, LX = PR >>
NON-FIN >> WSP >> PARSE-SYL >> ALIGN-FOOT, ALIGN-HEAD

The issue to consider now is whether or not this ranking is capable of realising the complex stress pattern of UHA. The remainder of this chapter is basically devoted to looking into this inquiry, in order to understand and resolve the expected shortcomings of the proposed ranking.

---

[4] For the time being, there is no motivation for relatively ranking ALIGN-HEAD with respect to WSP,

5.1.4. Prominence-Driven Stress:

As mentioned above, the fact that heavy syllables usually attract stress demonstrates the influence of syllable weight on metrification in UHA. However, the tendency to place stress as close as possible to, although not exactly at, the right periphery of the word adds a further complication. Consequently, the constraints WSP, ALIGN-HEAD, and NON-FIN are respectively motivated by quantity-sensitivity, word right headedness, and extrametricality. In this subsection, I will demonstrate how the interaction of mainly these three constraints achieves heavy penult and antepenult stress. Also, they will be sufficient to attain final stress on superheavies.

I will start with stress on heavy penults. As a non-final syllable, and potentially composing a non-final foot, a heavy penultimate syllable will invariably attract stress, in the absence of a final superheavy. Consider the following tableaux:

(11)i. /galamkum/ → [ga.lám.kum] ‘your *pl.* pen’

/galamkum/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞ ga(lám)(kum)							*	σσσ	σ
b. ga(lam)(kúm)					*!		*	σσσ	
c. (gá.lam)(kum)						*!		σσ	σ
d. (ga)(lám)(kum)	*!							σσσ	σ

ii. /maktabna/ → [mak.táb.na] ‘our office’

/maktabna/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞ (mak)(táb)na							*	σ	σ
b. (mák)(tab)na							*	σ	σσ!
c. (mák)(tab.na)			*!					σ	σσ

PARSE-SYL, and ALIGN-FOOT. Yet, as we shall see below, a more specific ranking is in order.

d. (mak)(táb)(na)	*!							σσσ	σ

iii. /maktabhum/ → [mak.táb.hum] 'their office'

/maktabhum/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞(mak)(táb)(hum)								σσσ	σ
b. (mák)(tab)(hum)								σσσ	σσ!
c. (mak)(tab)(húm)					*!			σσσ	
d. (mák.tab)(hum)						*!		σ	σ

In all of these tableaux in (11), the heavy penultimate syllable systematically succeeds in attracting stress no matter what the weight of the preceding or following syllable is (excluding superheavies for now). Any attempt to place stress on a heavy ultima is ruled out by NON-FIN (11 i b and iii c). On the other hand, ALIGN-HEAD drags stress rightwards form a heavy antepenult to place it on the non-final heavy penult (11 ii b and iii b).

Another example of prominence-driven stress assignment is attested when a heavy antepenult is followed by two light syllables. Consider the following tableau:

(12) /daħrad͡ʒtaha/ → [daħ.rád͡ʒ.ta.ha] 'I rolled it *fm.*'

/daħrad͡ʒtaha/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞(daħ)(rád͡ʒ)(ta.ha)								σσσ	σσ
b. (dáħ)(rad͡ʒ)(ta.ha)								σσσ	σσσ!
c. (dáħ.rad͡ʒ)(ta.ha)						*!		σσ	σσ
d. (daħ)(rad͡ʒ)(tá.ha)					*!			σσσ	

Therefore, accounting for heavy antepenult stress seems to be quite straightforward. Again WSP, NON-FIN, and ALIGN-HEAD conspire to place stress on that syllable as tableau (12) demonstrates. As a consequence of the ranking, ALIGN-HEAD failed to achieve a perfect alignment of the head foot to the right periphery of the PrWd due to

the NON-FIN violation incurred by such a candidate (12 d). Also, minimising the number of feet to minimise ALIGN-FOOT violations and consequently aim at attaining a more harmonious candidate (12 c) is ruled out by WSP. Finally, ALIGN-HEAD enforces the three syllable window effect and denies preantepenultimate stress (12 b).

So far, I have been avoiding the stress pattern where a final superheavy syllable is stressed despite the relative predominance of NON-FIN, that disfavours forms where the head syllable is final. This means that a false output will be more optimal than anything with final stress. Consider the following tableau where the form /galam - een/ is evaluated:

(13) /galameen/ → [(ga.la)(mée)n] 'two pens'

/galameen/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ? (ga.la)(méen)					*!*			σσ	
b. ga.(lá.meen)					*!	*		σ	
c.☞*(gá.la)(meen)								σσ	σ

Hung (1994) suggests reanalysing final superheavy syllables in McCarthy's (1979) or Selkirk's (1981) sense as a way of getting around the problem of distinguishing them from final heavy syllables (CVC, CVV). She claimed, assuming the uniform syllable bimoracity, that the final consonant of a final superheavy syllable is Chomsky-adjoined to a preceding heavy syllable of the form CVX, i.e. CVV or CVC. Alternatively, it may be realised as an onset of an empty nucleus or an incomplete syllable (cf. McCarthy & Prince (1990)). She formalises these claims as follows:

(14) a. ...{{Cvx}σ C}σ'
b. ...{Cvx}σ {C Δ}σ

(Hung 1994: 187)

She thinks that the representation with the adjoined final consonant is superior to the one with final empty nucleus. An argument she presents is the superheavy syllable's manifestation of Broselow's (1979) phenomenon of "emphasis spread" in Cairene, by which emphasis usually spreads to all segments in a given syllable if only one segment in that syllable is emphatic.[5] A more Optimality Theory oriented argument, though, is related to the faithfulness constraint FILL. Obviously, an empty nucleus would incur a violation of FILL hinting at preferring the adjunction alternative.[6]

However, this assumption does not achieve any objective other than capturing the weight distinction between final heavies and superheavies, rendering the former light and the latter heavy. Although it is a substantial argument in its own right, the issue of NON-FIN double violation incurred by true outputs like (13 a) is still unresolved. This is because adopting (14 a), i.e. Chomsky-adjoining the final consonant to a higher recursive syllable node, does not make a form immune to NON-FIN. That syllable is not separated from the right periphery of the word, and neither is any foot erected over it. The following tableau demonstrates the inadequacy of this proposal to account for the data in question:

(15)

[5] This process is not attested in UHA. Minimal pairs like [sˤoot] 'voice or sound' and [sˤootˤ] 'a whip' and [sˤad.da.ha] 'he defended it *fm.*' and [sad.da.ha] 'he blocked it *fm.*' demonstrate this claim.
[6] Hung, admittedly, mentioned, especially in non-phrase-final positions, the need for epenthesis in brut violation of FILL for the sake of satisfying more highly ranked constraints on syllable structure. In such cases, the final C of a superheavy syllable becomes an onset of the following syllable.

/galameen/	LAYR.	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ? (ga.la)Σ({{mée}σ}nσˡ)Σ						*!*			σσ	
b. (ga.la)Σ{({mée}σ)Σn}σˡ	*!								σσ	
c.☞*(gá.la)Σ({{mee}σ}nσˡ)Σ									σσ	σ

Candidate (15 a), the true output, violates NON-FIN twice as its head syllable and head foot are final in their PrWd. On the other hand, (15 b) violates the undominated constraint, LAYEREDNESS (cf. Chapter 3 above). This constraint, introduced by Selkirk to capture a principle of the Strict Layer Hypothesis, is violated when a lower prosodic domain dominates a higher prosodic domain. Thus, such candidates are ruled out because the recursive syllable node dominates a foot node. Finally, the false output (15 c), that assigns stress to the light antepenultimate syllable, is optimised because it satisfies NON-FIN.

My proposal, as we saw in chapter 3 above, is to associate the final consonant of a superheavy syllable directly to the PrWd node. This would render the right-most foot in such a form non-final. This is because that consonant intervenes between any structure to its left and the right periphery of the word. Consequently, the head foot violates NON-FIN only if it is erected on a heavy syllable or a pair of lights.

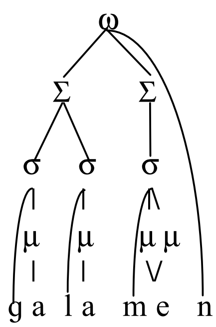
(16)

/galameen/	LAYR.	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ☞ #(ga.la)(mée)n#									σσ	
b. #(ga.la){({mée}σ)n}σˡ#	*!								σσ	
c. #(gá.la)({{mee}σ}nσˡ)#									σσ	σ!

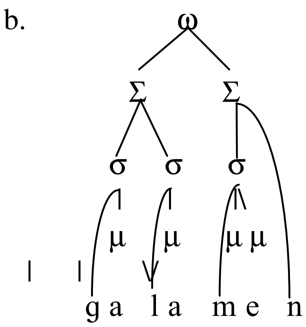
However, we may be tempted to associate the syllabically stray consonant to the foot node, which is lower in the prosodic hierarchy and consequently more eligible to dominate that consonant. This means that we will jump only the syllable level,

instead of both the syllable and the foot levels. Nonetheless, consider the following representations:

(17) a.



b.



This demonstrates why we are favouring the association to the PrWd node. By associating the final consonant to the preceding foot (17 b), the rightmost foot is rendered final, consequently violating NON-FIN once. On the other hand, in (17 a) the right peripheries of the final foot and the PrWd's are separated by the extrasyllabic consonant. The tableau below demonstrates how these candidates are evaluated.

(18)

/galameen/	LAYR.	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞#(gala$)($mée$)n #									σσ	
b. #(gala$)($mée$n)#						*!			σσ	

By this I conclude talking about prominence-driven stress after demonstrating that syllable weight is an essential determinant factor in the process of footing, and consequently in stress assignment in UHA. Attracting stress leftwards, but not beyond the antepenultimate syllable, and denying absolute word final headedness are the main complications analysed above. In what follows, I will tackle the default rhythm-driven stress pattern in UHA to examine the overall adequacy of the above proposed ranking.

5.1.5. Rhythm-Driven Stress:

The rhythm-driven default stress pattern attested in UHA poses a formidable challenge to the account pursued above. The facts encoded in (3 d) above indicate that the head foot can be final, violating NON-FIN. This asymmetry in the position of the head foot, especially exhibited in forms with an even number of light syllables, adds yet a further complication to the analysis. As we shall see in the following chapter, this alternation will only be accounted for by stipulating an unnatural and unexplanatory language particular foot extrametricality rule (or in the case of Idsardi's approach, an avoidance constraint). Conversely, the OT account proposed below avoids this shortcoming and provides an analysis utilising a set of universally motivated constraints. This will help achieve a more plausible discussion of the overall stress assignment process in UHA.

In the absence of a heavy syllable, especially in the final three syllable window, stress placement will be entirely rhythmically determined. An even number of light syllables will separate the stressed syllable (either the antepenult or the penult) from the first preceding heavy syllable or from the word's left periphery. The set of constraints suggested above will optimise a true output with an antepenultimate stress. However, in forms where a light penultimate syllable appears in a stressable position, final word headedness is inevitable. Consequently, a more harmonious candidate that does not violate NON-FIN will be optimised. This is prompted by the fact that the rhythm type in UHA is trochaic and degenerate feet are prohibited. The two tableaux below demonstrate this asymmetry:

(19)

/ʃad͡ʒaratuhu/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ☞ (ʃa.d͡ʒa)(rá.tu)hu							*	σσ	σ
b. (ʃa.d͡ʒa)ra(tú.hu)					*!		*	σσσ	
c. ʃa(d͡ʒa.ra)(tú.hu)							*	σσσ!σ	

(20)

/ʃad͡ʒarati/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ? (ʃa.d͡ʒa)(rá.ti)					*!			σσ	
b.☞*(ʃá.d͡ʒa)(ra.ti)								σσ	σσ
c. ʃa(d͡ʒá.ra)ti							*!*	σ	σ

An angle from which we can view this difficulty is the possibility of completely confining the application of NON-FIN to ruling out final head syllables (cf. Chapter 2 above). This means that it will move up to join the undominated constraints, as final head syllables are absolutely banned in the language. Nevertheless, if we adopt this solution, we will not be able to rule out candidates like (19 b or c) unless the relative ranking of ALIGN-FOOT and ALIGN-HEAD is specified. This means that if NON-FIN ceases to evaluate final feet, ALIGN-FOOT will have to emerge not only as a constraint encouraging true directionality of footing, but as one determining the overall harmony of candidates on such basis. Therefore, ALIGN-FOOT must properly dominate ALIGN-HEAD.[7] The two tableaux below show the positive effects of these changes:

(21)

/ʃad͡ʒaratuhu/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN-σ́	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. ☞ (ʃa.d͡ʒa)(rá.tu)hu							*	σσ	σ
b. (ʃa.d͡ʒa)ra(tú.hu)							*	σσσ!	
c. ʃa(d͡ʒa.ra)(tú.hu)							*	σσσ!σ	

[7] Crucially, this will only hold for the time being. As we shall see below, other reported facts of the stress pattern in question will enforce the exact opposite ranking of these two constraints. Clearly, such an assumption will be shown to prompt activating other constraints.

(22)

/ʃad͡ʒarati/	FT-BIN	RH-TYPE	RH-HARM	LX = PR	NON-FIN-σ́	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞(ʃa.d͡ʒa)(rá.ti)								σσ	
b. (ʃá.d͡ʒa)(ra.ti)								σσ	σ!σ
c. ʃa(d͡ʒá.ra)ti							*!*	σ	σ

Therefore, NON-FIN-σ́ does not discriminate against true outputs like (22 a). On the other hand, ALIGN-FOOT renders (21 a) most harmonious, and consequently optimal.

This analysis seems to be adequate enough to account for the rhythmically determined stress placement. Yet, it will not hold with forms containing stress attracting heavy syllables. Take the example /maktabi/. We cannot assign stress to the heavy antepenultimate syllable if we can not prevent right-most headedness. Consider the following tableau:

(23)

/maktabi/	NON-FIN-σ́	WSP	ALIGN-HEAD
a. ? (mák)(ta.bi)			σ!σ
b. ☞ *(mak)(tá.bi)			

To account for this inconsistency of the word-final head foot, we can call on PK-PROM. This constraint infers heaviness from stress. In particular, it appoints headedness to the heaviest syllable available. Thus, if this constraint is ranked higher than NON-FIN, it will rule out forms like (23 b).[8]

[8] We can achieve the same objective by assuming that WSP is violated when a heavy syllable, whether

(24)

/maktabi/	NON-FIN-σ́	PK-PROM	WSP	ALIGN-HEAD
a. ☞ (mák)(ta.bi)				σσ
b. (mak)(tá.bi)		*!		

However, this will motivate false stress placement in forms where a heavy syllable occupies a position outside the stress domain of the final three syllables. PK-PROM will attract stress beyond that domain. Consider the following tableau that evaluates a form containing a heavy preantepenult followed by a sequence of three light syllables:

(25) /daħrad͡ʒati/ → [(daħ)(rá.d͡ʒa)ti] 'my rolling'

/daħrad͡ʒati/	NON-FIN-σ́	PK-PROM	WSP	ALIGN-HEAD
a.☞*(dáħ)(ra.d͡ʒa)ti				σσσ
b. ? (daħ)(rá.d͡ʒa)ti		*!		σ

Therefore, the complications started when we had to abandon NON-FIN (Σ́) to be able to optimise true outputs like (LL)(ĹL), whose head foot is obviously final. The consequences were particularly undesirable with /HLL/ forms. There, NON-FIN (Σ́) was the only constraint that can override ALIGN-HEAD. Otherwise, stress on a heavy antepenult would obviously be less harmonious in such forms. As a remedy, I had to introduce PK-PROM. Nonetheless, as tableau (25) demonstrates, it can over apply and attract stress anywhere in the word as long as it is assigned to a heavy syllable. So, the present challenge is to confine stress assignment to the final 3-σ-window.

footed or unfooted, does not receive primary stress.

Tentatively, and only for the time being, I will utilise a constraint that has been mentioned in OT literature to account for similar stress patterns. This constraint maintains that stress is only assigned to one of the final three syllables. It may be formalised as follows:

(26) WINDOW-3: Stress is located among the final three syllables in a word.
(Green[9] 1995: 11)

Therefore, by introducing this constraint and ranking it higher than PK-PROM, we will achieve the desired effect. The following tableau clarifies this:

(27)

/daħrad͡ʒati/	NON-FIN-σ́	WINDOW-3	PK-PROM	WSP	ALIGN-HEAD
a. (dáħ)(ra.d͡ʒa)ti		*!			σσσ
b.☞(daħ)(rá.d͡ʒa)ti			*		σ

The candidate representing the desired output (27 b) is chosen as the most harmonious manifestation of footing and stress placement. However, the whole argument involving the constraint WINDOW-3 is, to say the least, rather *ad hoc* and negatively powerful. The primitive binary metrical constituency constraints are shown to be insufficient in locating stress. An independent justification is in order to confine stress to the domain of the final three syllables. Consequently, I am not adopting this analysis. In what follows, I shall provide a different account involving a different set of constraints that are more cross-linguistically motivated.

[9] Green did not actually use the constraint in his proper analysis. On the contrary, he explicitly mentioned that such a constraint is ‘a brute force statement’.

To overcome the difficulty sketched above, I will first of all need to draw a distinction between (L̀L)(ĹL) and (H́)(L̀L). Such true output candidates differ in their foot structural configuration. Assuming trochaic footing, a candidate like (H́)(L̀L) involves a pair of clashing feet while (L̀L)(ĹL) does not. Therefore, as a first step towards ruling out a false output like (H̀)(ĹL) (cf. tableau (23)), I will introduce the constraint *CLASH (Burzio (1994), Buckley (1994, 1995 a), Kager (1995b), Green (1996), among others).[10] This constraint, as we shall see below, discriminates against any candidate with adjacent stressed syllables (cf. Selkirk 1984b).[11] It can be formalised as follows:

(28) *CLASH: Clashing feet (stresses on adjacent syllables) are prohibited.[12]
(Buckley 1994: 19)

This means that, in a trochaic stress system like UHA, any footing like (**H**)(**L**L) will inevitably violate *CLASH, as the heavy syllable and the following light are heads of their respective feet constituting a pair of adjacent stress bearers. On the other hand, the foot structure (**L**L)(**Ĺ**L) does not.

---

[10] Kager (1995b) attributes the lack of secondary stresses on pretonic syllables, in Palestinian Arabic, to the undominated *CLASH.

[11] Similar constraints are suggested in the literature to attain the same effect of banning clashing feet. Hung (1994) introduced RHYTHM (as we saw in (16) above). Also, in an attempt to translate Halle and Vergnaud's (1987) "Stress Well", Pater (1995) introduced the constraint STRESSWELL to ban any stress on a pretonic syllable:

STRESSWELL: No stressed syllable may be adjacent to the head syllable of the Prosodic Word. (Pater 1995: 7)

This constraint, however, is not as general in its evaluation as is *CLASH. It only focuses on the syllable with primary stress.

[12] Due to the lack of secondary stresses in UHA, I will assume that the phrase "stresses on adjacent syllables" is interpreted as "adjacent metrically strong syllables", indicating that in **boldface**. However, Crowhurst (1996) attempts a more substantial analysis of secondary stresses and conflation in Cairene. By assuming that the processes of footing and foot-level head assignment are actually separable, she claims that we can create headless feet, as such processes may be attributed to two different (violable) constraints. I will not adopt this separationist attitude towards footing and headedness. On the contrary, I will assume the coexistence of feet and heads (cf. The Faithfulness Condition, Halle & Vergnaud 1987).

So, to avoid creating any clashes, *CLASH will force some kind of syllable underparsing, in forms containing /...HLL/ sequences. This is clarified in (29) below:

(29)		/HLL/	*CLASH
	a.	(**H**)(**L**L)	*
	b.	(**H**)LL	√
	c.	H(**L**L)	√
	d.	HLL	√

Therefore, ranking *CLASH undominated disfavours (29 a). Nevertheless, we must determine how we can optimise (29 b), rather than (29 c or d). The constraints WSP and Lx = Pr, respectively, achieve this desired effect. Consider the following tableau, that incorporates *CLASH:

(30) /maktabi/ → [(mák)ta.bi] 'my office'

/maktabi/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. (**mák**)(**ta**.bi)	*! *CLASH			σ	σσ
b. ☞ (**mák**)ta.bi			**		σσ
c. mak(**tá**.bi)		*!	*	σ	
d. mak.ta.bi	*! Lx = Pr	*	***		

After ruling out the *CLASH violating candidate (30 a), the above tableau demonstrates that (30 b), the true output, is certainly more harmonious than (30 d), which violates Lx = Pr, another undominated constraint. Also, the tableau clarifies how WSP discriminates against (30 c) because that candidate fails to metrify the initial heavy syllable.

Nonetheless, introducing *CLASH as an undominated constraint, will have undesired consequences elsewhere. For example, take the potentially quadri-syllabic

input /maktabati/. To avoid violating *CLASH, we must not metrify both the initial heavy syllable and the immediately following two light ones in two successive feet, as this would create two adjacent metrically strong syllables. Other candidates that satisfy this constraint could unparse a syllable between the two feet or just metrify the initial heavy syllable. These possibilities are listed in the tableau below:

(31) /maktabati/ → [mak(tá.ba)ti] 'my library'

/maktabati/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. (**mak**)(**tá**.ba)ti	*! *CLASH		σ	σ	σ
b. (**mak**.ta)(**bá**.ti)	*! RH-HARM			σσ	
c. ? mak(**tá**.ba)ti		*!	*	σ	σ
d. (**mák**)ta.ba.ti			**!*		σσσ
e. ☞*(**mak**)ta(**bá**.ti)			*	σσ	

Obviously, candidate (31 b) avoids violating *CLASH but violates another undominated constraint RH-HARM. More interestingly, however, candidates (31 c, d, and e) satisfy *CLASH, and all other undominated constraints. The problem is that candidate (31 c), the true output, is less harmonious than the other two as it incurs a violation of WSP.

Though more harmonious than the true output, (31 d) contains three successive unparsed syllables. This failure to group adjacent syllables into feet must be seen to violate a certain constraint, other than merely incurring three violations of PARSE-SYL. More than one proposal is available in the OT literature. Collectively, they are trying to interpret Selkirk's (1984) "Lapse" and/or Hayes' (1995) "Persistent Footing". I will introduce and utilise Kager's (1994) PARSE-2:[13]

[13] Green (1995) and Green and Kenstowicz (1995) attributed this banning on successive unfooted

(32) PARSE-2: One of two adjacent stress units must be parsed by a foot.
(Kager 1994: 9)

The notion of "stress unit" may be interpreted as a syllable or a mora. Consequently, we can decompose PARSE-2 into two constraints to attain the different requirements of quantity-sensitive and insensitive stress patterns. This also means that these two constraints, PARSE-2 (μ) and PARSE-2 (σ), can have different rankings.

(33) a. PARSE-2 (μ): Sequences of moras that are parsable by a foot should be parsed by a foot.

b. PARSE-2 (σ): Sequences of syllables that are parsable by a foot should be parsed by a foot.
(cf. Kager 1994: 9)

I chose to include this informal wording of Kager's, especially the word "parsable", to indicate that PARSE-2 must assume both Syllable Integrity and Foot Binarity, when evaluating candidates. Therefore, the second mora of a heavy syllable and a following light syllable's are not considered to be parsable. Also, in a system that requires strict binary moraic parsing, a pair of a light and a heavy syllable is not parsable into a foot.[14] As we shall see below, the latter restriction will be attributed to an undominated pair of constraints decomposing FT-BIN.

Therefore, I will only include (33 a) to evaluate the fundamentally moraic footing in UHA. More crucially, however, we must determine its ranking. Considering

---

syllables (or moras) to the constraint "Lapse" that forces the separation of adjacent unstressed moras or syllables by a foot boundary (cf. Eisner's (1997) ANTILAPSE). Alderete (1995) achieves the same effect by his PARSE-ADJ-SYLL

[14] Alternatively, we could achieve the same objective by introducing a pair of unmutually ranked

tableau (31) reveals the language-particular ranking. If we are to demonstrate that (31 c) is more harmonious than (31 d), PARSE-2 must at least dominate WSP. This means that underparsing a heavy syllable should be evaluated as less fatal than underparsing three successive light ones. In other words, we can avoid creating clashing feet by leaving out the two adjacent stress units (moras) of the initial heavy syllable unfooted. Although such a candidate violates WSP, it violates PARSE-2 only once. Therefore, assuming this ranking, (31 c) will be evaluated as more harmonious than failing to metrify a sequence of three moras, in which case PARSE-2 is violated twice. In particular, it will be violated once between the first and second moras and another time between the second and third moras, [(μ(μ)μ)] (cf. (35 c and d) below).

Yet, this will not render (31 c) optimal. We are left with (31 e) that does not violate PARSE-2 and only violates PARSE-SYL once. However, it is not difficult to rule out such a footing configuration. In that candidate, there is a stray syllable intervening between the two feet. This PARSE-SYL violation should be differentiated from one that is incurred by a peripheral syllable. As I mentioned in chapter three above, the constraint SYL-CONTIG, that discriminates against word-medial segment association to the prosodic word, can be augmented to constitute a larger family of constraints operative with other constituents. A member of this family is FOOT-CONTIG. It can be formalised as follows:

(34) FOOT-CONTIG:[15]

---

constraints to substitute PARSE-2 (μ), that will have to be activated for UHA. These two constraints are PARSE-2 (tautosyllabic μ) and PARSE-2 (mono-moraic σ).

[15] This constraint must be differentiated from Alderete's (1995) CONTIG-SYLL and, more generally, Rubach's (1997) CON-CONTIG that are against disturbing the contiguity of a foot or any phonological constituent by any material that is licensed by something else. For example, these constraints are violated when a syllable appears inside a foot but is associated to a different prosodic domain causing a

> Metrical well-formedness is enforced over contiguous strings of submetrical elements.
>
> (cf. McCarthy and Prince 1990)

This constraint simply says that nothing but a foot can appear between two feet. Therefore, unmetrified syllables are only allowed on the peripheries. As its syllabic counterpart, this constraint is ranked undominated.[16] Thus, including FOOT-CONTIG in our hierarchy will achieve the desired effect as we shall see very shortly.

So, to account for the shortcomings summarised in tableau (31), I have introduce two constraints, viz. PARSE-2 and FOOT-CONTIG. The central issue here is universality. These two constraints, as all others introduced so far, are not stipulatively imposed on our hierarchy by some language-particular requirement. On the contrary, they are there to maintain cross-linguistic principles of the process of footing. In addition, they are not utilised to perform a distinctive and localised role. They interact with other constraints to achieve a uniform evaluation of all candidates and in all environments. The tableaux in (35) below shows these two constraints in action:

(35)(i) /maktabi/ → [(mák)ta.bi] 'my office'

/maktabi/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a.☞(**mák**)ta.bi		*		σσ		σσ
b. mak(**tá**.bi)		*	*!		σσ	
c. (**mak**)(**tá**.bi)	*! *CLASH				σ	

(ii) /maktabati/ → [mak(tá.ba)ti] 'my library'

/maktabati/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD

split in that foot. Obviously, the need for such a constraint is justified in UHA for both syllabification and footing. Consequently, I am assuming its inclusion and undominated position in our hierarchy.

[16] This may indicate that the contiguity of subconstituent elements is attributed to a single constraint, throughout the prosodic domains.

a. (**mak**)(**tá**.ba)ti	*! *CLASH			σ	σ	σ
b. (**mak**.ta)(**bá**.ti)	*! RH-HARM				σσ	
c. ☞ mak(**tá**.ba)ti		*	*	*	σ	
d. (**mák**)ta.ba.ti		**!		***		σσσ
e. (**mak**)ta(**bá**.ti)	*! FOOT-CONTIG			*	σσ	

(iii) /maktabatuhu/→ [mak(ta.ba)(tú.hu)] ‘his library’

/maktabatuhu/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. (**mak**)(**ta**.ba)(**tú**.hu)	*! *CLASH				4σ	
b. (**mák**)ta.ba.tu.hu		**!		***	σσ	4σ
c. ☞ mak(**ta**.ba)(**tú**.hu)		*	*	*	4σ	
d. mak(**tá**.ba)(**tu**.hu)		*	*	*	4σ	σ!σ
e. (**mak**)ta.ba(**tú**.hu)	*! FOOT-CONTIG	*		**	σσσ	

Tableau (35 i) demonstrates how the dominated WSP resolves the tie on PARSE-2 between (35 i a and b). On the other hand, tableau (35 ii) showes how PARSE-2 and FOOT-CONTIG rule out otherwise more harmonious candidates. Finally, tableau (35 iii) highlights the decisive role of ALIGN-HEAD.

A further complication of introducing the constraint *CLASH is manifested in inputs with a final superheavy preceded by a heavy penult. *CLASH will dictate that at least one of the two syllables is not footed. However, WSP will not be able to determine the harmony of either of the two candidates that satisfy *CLASH, as it will be violated in both. Therefore, the relative ranking of ALIGN-FOOT and ALIGN-HEAD will optimise a false output with penult stress. The following tableau demonstrates these constraint interactions:

(36) /muftaaħ/ → [.muf.táaħ.] ‘key’

/muftaaħ/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-FOOT	ALIGN-HEAD
a. [(**muf**)(**táa**)ħ]	*! *CLASH				σ	
b. ? [muf(**táa**)ħ]		*	*	*	σ!	

c.☞*[(**múf**)taa.ħ]		*	*	*		σ

As I have indicated in footnote (6) above, the most obvious and straightforward way of dealing with this undesired consequence of the restriction imposed by the constraint *CLASH is by ranking ALIGN-FOOT lower than ALIGN-HEAD. This will achieve the general pattern attested in the language where primary stress is assigned to the right-most (non-final) heavy syllable. Nonetheless, this will have undesired consequences with candidates like the one in (21) above, for which ALIGN-FOOT dominance over ALIGN-HEAD had to be assumed. We saw that unless we adopt this ranking, a true output candidate like [(ʃa.d͡ʒa)(rá.tu)hu] will not be evaluated as being more harmonious than a false output like *[[ʃa(d͡ʒa.ra)(tú.hu)]. This means that if we are going to adopt the newly proposed ranking, and we ought to, we will have to demonstrate that the latter candidate is actually less harmonious than the former. This may be achieved by introducing a constraint that rules out such false output candidate analyses.

In a rule-based approach, forms like (21 c), with an initial unmetrified syllable, can be interpreted as outputs of a rule marking initial syllables extrametrical. However, such a rule is not completely natural. Hayes (1981, 1995) reported that there is a cross-linguistic tendency towards confining extrametricality to the right edge. He translates that into one of the conditions he proposed to constrain this device (see the following chapter for a thorough discussion of extrametricality):

(37) Edge Markedness:
The unmarked edge for extrametricality is the right edge.

(Hayes 1995: 57)

Relating this to our earlier discussion, I will propose interpreting this condition as an OT constraint. Such a constraint will militate against candidates with stray syllables that do not occupy a word-final position. By “stray syllables” I mean syllables that are not immediately dominated by a foot.

(38) ALIGN-STRAY
Align (STRAYSYLLABLE, R, PrWd, R)

What this constraint says is that IF a certain candidate contains an unfooted syllable, this unfooted syllable must be on the right edge. Evaluation will be categorical, i.e. one violation for every syllable which fails the constraint. This is clearly motivated in tableau (40) bolow. Obviously, it will be violated by some optimal true outputs, but the violations should be kept minimal. This hints at ranking it relatively low in our hierarchy. Taking the newly proposed ranking ALIGN-HEAD >> ALIGN-FOOT into consideration, I will rank ALIGN-STRAY just higher than ALIGN-HEAD, and consequently ALIGN-FOOT. As the discussion progresses, however, we will see that this constraint will have to be ranked even higher to account for other inputs. Obviously, I will make sure that this has no fatal consequences on the present discussion.[17]

Therefore, by utilising this constraint and this ranking, the following tableau demonstrates how we optimise a candidate like (ʃa.d͡ʒa)(rá.tu)hu:

[17] Alternatively, we could do without ALIGN-STRAY. We may utilise Eisner’s (1997) version of NON-FIN that rules out footing final syllables altogether. Ranking such a constrain higher than ALIGN-HEAD, that will have to dominate ALIGN-FOOT, will rule out L(LL)(LL) and optimise (LL)(LL)L. Nonetheless, it will have to be ranked lower than PARSE-SYL to optimise (LL)(LL) rather

(39) /ʃad͡ʒaratuhu/ → [ʃa.d͡ʒa.rá.tu.hu] 'his tree'

/ʃad͡ʒaratuhu/	FT-BIN, RH-TYPE, RH-HARM, Lx=Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT
a.☞(**ʃa**.d͡ʒa)(**rá**.tu)hu				*		σ	2σ
b. ʃa(**d͡ʒa**.ra)(**tú**.hu)				*	*!		4σ

Now, let us consider the following tableau to see how this argument, that involves altering the ranking and introducing a new constraint, attains the desired optimisation of candidates like (36 b):

(40)

/muftaaħ/	FT-BIN, RH-TYPE, RH-HARM, Lx=Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT
a. [(**muf**)(**táa**)ħ]	*! *CLASH						σ
b. ☞ [muf(**táa**)ħ]		*	*	*	*		σ
c. [(**múf**)taa.ħ]		*	*	*	*	σ!	

Interestingly, this shows that both (40 b and c) are evaluated equally by ALIGN-STRAY. In these candidates, an unfooted syllable appears in a non-final position. In (40 b), it is separated from the right edge by a syllable and a stray consonant, and by the stray consonant in (40 c).[18] Therefore, the evaluation burden is transferred to ALIGN-HEAD, which is obviously satisfied better in (40 b).

Another undesired consequence of the *CLASH constraint is encountered when we evaluate forms containing three successive heavy syllables. In order to avoid any clashes, we either underparse one or more syllables or metrify more than one

than the false L(LL)L. However, as we shall see below, an independent factor motivates the constraint ALIGN-STRAY.

[18] Another characteristic of (40 c) which ought to make it even less harmonious than (40 b) is the obvious chaining of extraprosodicity, if that is to be interpreted into a constraint (cf. Hayes 1995 and chapter 6 below).

heavy syllable in a single foot. The following tableau lays out the various possibilities and reveals the problems to be tackled:

(41) /mustaʕmal/ → [mus(táʕ)mal] 'second-hand'

/mustaʕmal/	FT-BIN, RH-TYPE, RH-HARM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT
a. (**mus**)(**táʕ**)(**mal**)	*! *CLASH					σ	σσσ
b. (**mús**)taʕ(**mal**)	*! FOOT-CONTIG	*	*	*	*	σσ	σσ
c. mus.taʕ(**mál**)	*! NON-FINσ́	**	**	**	**		σσ
d. ? mus(**táʕ**)mal		*!*	**	**	*	σ	σ
e. (**mús**)taʕ.mal		*!*	**	**	*	σσ	
f. ☞ *(**mús**.taʕ)(**mal**)			*			σ	σσ

Candidates (41 a, b, and c) violate undominated constraints, so they are ruled out immediately. On the other hand, the remaining candidates avoid violating *CLASH by violating lower constraints. Candidate (41 e) is ruled out as it is a worse violator of ALIGN-HEAD than other competing candidates. Thus, we are left with (41 d and f). However, the true output, (41 d), is less harmonious than (41 f). Obviously, the latter does not violate PARSE-2, as all syllables are included in some foot, in a configuration that does not violate *CLASH. Also, (41 f) does not violate FT-BIN, as both feet are either moraically binary or syllabically binary. Therefore, our objective will be to rule out this false output.

To account for candidates similar to (41 f), Hewitt (1994) introduced various decompositions of the constraint FT-BIN. The one that interests us most aims at evaluating the binarity violations in terms of foot Minimality and Maximality.

(42) a. FT-BIN^{max}: For the elements of category X (σ, N, μ) contained within a foot assess a violation for each element that exceed 2.

b. FT-BIN^{min}: For the elements of category X (σ, N, μ) contained within a foot assess a violation if the foot contains less than 2 such elements.
(Hewitt 1994: 23)

As a quantity-sensitive language, UHA will set these two candidates to count the moraic content of feet.[19] Therefore, ranking them undominated, to substitute the original FT-BIN, will surely rule out (41 f).

Before, accounting for the problem revealed in (41), here is the overall ranking of the constraints discussed so far:

(43) FOOT-FORM [FT-BIN$^{max\ \&\ min}$, RH-TYPE, (RH-HARM)[20]],
NON-FIN σ́,
*CLASH,
Lx = Pr,
FOOT-CONTIG>>
PARSE-2 (μ)>>
WSP>>
PARSE-SYL,[21]
ALIGN-STRAY>>
ALIGN-HEAD>>
ALIGN-FOOT>>

This particular ranking needs to be subjected to further revisions and alternations before declaring its final compatibility to UHA. For the time being, however, activating these constraints will optimise (41 c), as the following tableau demonstrates:

(44)

/mustaʕmal/	FOOT-FORM, Lx = Pr, *CLASH, NON-FINσ́, FOOT-	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT

[19] This may not be considered as parameterisation for quantity-sensitive/quantity-insensitive footing.
[20] With FT-BIN^{max} , RH-HARM has become redundant. This is because any candidate that violates the latter must also violate the former, as (HL) is invariably a tri-moraic foot.
[21] Below, we will see that we need to precisely determine the relative ranking of PARSE-SYL and ALIGN-STRAY.

	CONTIG						
a. (**mus**)(**táʕ**)(**mal**)	*! *CLASH					σ	σσσ
b. (**mús**)taʕ(**mal**)	*! FOOT-CONTIG	*	*	*	*	σσ	σσ
c. mus.taʕ(**mál**)	*! NON-FINσ́	**	**	**	**		σσ
d. ☞ mus(**táʕ**)mal		**	**	**	*	σ	σ
e. (**mús**)taʕ.mal		**	**	**	*	σσ!	
f. (**mús**.taʕ)(**mal**)	* FT-BIN^{max}		*			σ	σσ

Finally, here is a summary of all the key dominance relations achieving the desired constraint interactions.

(45)	Dominance Relation:	Example:
a.	FT-BIN^{max} >> PARSE-2 (μ)	∴mus(**táʕ**)mal > (**mús**.taʕ)(**mal**)
b.	FOOT-CONTIG >> PARSE-2 (μ)	∴ mak(**tá**.ba)ti > (**mak**)ta(**bá**.ti)
c.	PARSE-2 (μ) >> WSP	∴ mak(**tá**.ba)ti > (**mák**)ta.ba.ti
d.	WSP >> ALIGN-HEAD	∴(**mák**)ta.bi > mak(**tá**.bi)
e.	ALIGN-HEAD >> ALIGN-FOOT	∴ mus(**táʕ**)mal > (**mús**)taʕ.mal
f.	PARSE-SYL >> ALIGN-FOOT	∴ (**ʃa**.d͡ʒa)(**rá**.ti) > ʃa(**d͡ʒá**.ra)ti
g.	ALIGN-STRAY >> ALIGN-HEAD	∴(**ʃa**.d͡ʒa)(**rá**.tu)hu > ʃa(**d͡ʒa**.ra)(**tú**.hu)

Now I may claim that I have attained some degree of control over the consequences of including *CLASH as an undominated constraint in UHA's constraint hierarchy. We saw how rejecting the account that involves the constraint WINDOW-3 (26 above) revealed the complications connected with the rhythm-driven stress pattern in UHA. I had to suggest activating some constraints like PARSE-2, FOOT-CONTIG, ALIGN-STRAY, and utilise a decomposition of FT-BIN. However, my main objective was to maintain the commitment to universality. In what follows, I shall tackle further issues related to metrification such as Final /-CVC/ Footing, Final Vowel Shortening, and Stem-bound Footing.

5.2. Other Factors Affecting Footing:

We saw in the previous section that footing must acknowledge certain basic factors that have a direct effect on its structural configuration. In what remains of this chapter, I will tackle rather different but very related issues pertaining to footing. Fundamentally, I will address the question of redundant vs. required metrification. In particular, we will see that word-final heavy syllables may or may not be included in a foot. This is determined by different factors. The challenge is to confine word-final footing or unfooting to where either is needed. Similarly, initial parsing may or may not be optimal. Therefore, I will argue for a uniform constraint ranking that will attain the desired effects in all cases.

5.2.1. Final /-CVC/ Footing:

The need for FT-BIN$^{max \,\&\, min}$ in UHA is quite evident. The empirical facts of the language's stress pattern demand a strict binary moraic footing (trochaic in particular). Also, the process of evaluating forms that comprise a number of successive heavy syllables requires this restriction to rule out any candidate that avoids violating *CLASH by resorting to binary syllabic footing. However, forcefully imposing this undominated constraint can have undesired effects elsewhere.

Optimising the true output of a form that terminates in a heavy /-CVC/ sequence preceded by an odd number of light syllables can be rather problematic for the so far suggested set of constraints and/or constraint ranking. In such forms, stress is placed on the penultimate syllable, i.e. the one separated form the left edge of the word by an even number of light syllables. This means that this syllable must be

prominent in its foot structure. To achieve such a configuration, the penultimate syllable must be footed with the final CVC sequence. Obviously, this will violate FT-BIN^{max}. Consider the following tableau:

(46) /ʃad͡ʒaratak/ → [ʃa.d͡ʒa.rá.tak] ‘your *sg. ms.* tree’

/ʃad͡ʒaratak/	FOOT-FORM, Lx=Pr, *CLASH, NON-FINσ́, FOOT-CONTIG	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT
a. ? (**ʃa**.d͡ʒa)(**rá**.tak)	*! FT-BIN^{max}		*				2σ
b. (**ʃa**.d͡ʒa)(**rá**)tak	*! FT-BIN ^{min}	*	*	*		σ	2σ
c. ʃa(d͡ʒa.**rá**)tak	*! RH-TYPE	*	*	**	*	σ	σ
d. (**ʃá**.d͡ʒa)ra.tak		*!	*	**	*	2σ	
e. ☞ *ʃa(**d͡ʒá**.ra)(**tak**)				*	*		4σ

The light penultimate syllable, in the falsely optimised candidate (46 e), is denied foot headedness because of the existence of a heavy ultima. However, erecting a foot over a final pair of two lights, in a different input, will be evaluated as the most harmonious candidate, modulo the expected violations of ALIGN-FOOT. Therefore, this can be the solution. In other words, I will treat a final /-CVC/ syllable as light to attain penultimate stress in words like /ʃad͡ʒaratak/. The purpose of this subsection is to determine how that is achieved.

Along these lines, more than one analysis has been suggested in the OT literature (Hung (1994), Spaelti (1994), Eisner (1997)). Hung (1994), for example introduces the constraint Rhythm, (chapter 2 above). By virtue of demanding a weak *n* level grid mark after each stronger *n+1*, this constraint forces final consonant “weak parsing”, in Cairene for example. Also, in an article that takes on the challenge of adhering to extreme simplicity and locality in constraint formalisation, Eisner (1997) interprets NON-FIN as a constraint that militates against final syllable footing. More radically, though, Spaelti (1994) introduced WEAKEDGE as a constraint preferring

structural emptiness in the right periphery of prosodic categories. Collectively, all these proposals will, directly or indirectly, exclude a final consonant from the structure of the final foot. However, pursuing this line of argumentation adds up to systematic right edge weakening, whether or not required by the process of metrification or any other phenomenon. Consequently, I will seek a more plausible account. To clarify that, I will apply one of the above mentioned constraints, Spaelti's WEAKEDGE in particular, to the data above and provide my criticism and an alternative account.

Spaelti put forward WEAKEDGE to account for a process of vowel lengthening in Swiss German and some Micronesian languages. In these languages, an underlyingly short vowel lengthens in monosyllabic words to meet the bimoraic minimal word requirement (McCarthy and Prince 1986). He formalises the constraint as follows:

(47) WEAKEDGE (P-CAT):
The right periphery of P-CAT should be empty.
(P-CAT = PrWd for the present analysis)

Def: the Right Periphery of node *n* is the set of all nodes *m* such that *n* dominates *m*, and there is no node *m*' such that *n* dominates *m*', and *m* precedes *m*'.

(Spaelti 1994: 12)

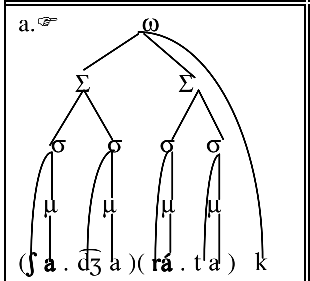
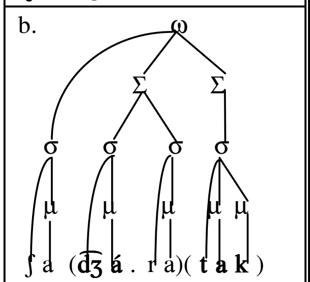
This means that the less the amount of structure (PrWd, Foot, Syll., Mora) contained in the right periphery of the evaluated prosodic category the more harmonious a candidate is.[22] Therefore, associating the final consonant directly to the PrWd node

---

[22] Hagstrom (1997) applies this idea of WEAKENING to some vowels in Mohawk and Passamaquoddy rendering them "metrically invisible". He also adopts the same argument to weaken the right periphery

satisfies WEAKEDGE better than any other association to lower prosodic domains. This, at the same time, contributes to metrification by rendering the final syllable monomoraic and consequently eligible to share a foot with the preceding light syllable. This is summarised in the following tableau, that tentatively includes WEAKEDGE ranking it undominated in the hierarchy:[23]

(48)

/ʃad͡ʒaratak/	FOOT-FORM, Lx=Pr, FOOT-CONTIG, *CLASH, NON-FINσ́, WEAKEDGE	PARSE-2 (μ)	WSP	PARSE-SYL	ALIGN-STRAY	ALIGN-HEAD	ALIGN-FOOT
a.☞ 	Right Periphery. ω, k						σσ
b. 	Right Periphery ω, Σ!, σ, μ, k			*	*	σ	4σ

Obviously, optimising the true output (48 a) is attributed to WEAKEDGE because the right periphery, in that candidate, contains the least structure possible.

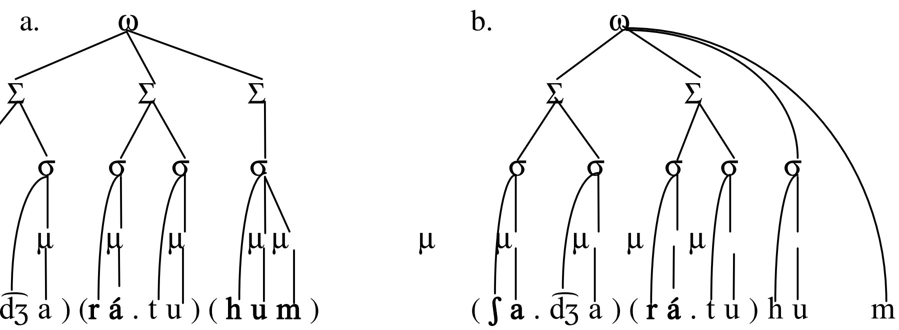
Nevertheless, we are not actually obliged to adopt this approach that systematically militates against candidate analyses with perfectly syllabified final consonants. In other words, the process of footing should not be made to require that a final consonant is always weakly parsed. Otherwise, a parsable final heavy syllable is

of a “lexical root”.

[23] If WEAKEDGE is to be adopted as a key constraint in a certain hierarchy, a more refined overall ranking is in order to confine edge weakening to final consonants (cf. Spaelti 1994). Final vowels must be treated differently by imposing PARSE-μ as an undominated constraint.

rendered stray, to serve no purpose whatsoever. This is particularly true for forms like [ʃa.d͡ʒa.rá.tu.hum] *msa* 'their tree' that comprise a heavy final syllable preceded by an even number of light syllables, which are all parsable into non-clashing binary feet. Consider the following representations:

(49)

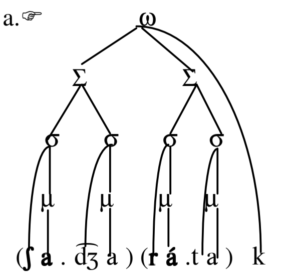
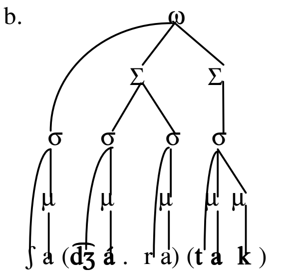


Clearly, the perfectly footed sequence of syllables, in (49 a), achieves true stress placement without needing to weaken the edge and create an unparsable final monomoraic syllable, as in (49 b). Therefore, I am not adopting this approach of 'across-the-board' edge weakening, because I think the device is too powerful to the extent that it obscures the indirect, though substantial, effect of key constraint interaction, as we shall see below.

The alternative account I am putting forward relies solely on constraint interaction. Precisely determining the ranking of Exhaustivity (EXHAUS) (cf. chapter 3 above) with respect to the constraints on metrification will force edge weakening only when required by footing. By carefully considering tableau (46), we can easily reveal this ranking. The highest constraint violated by (46 e), the most harmonious but false output, is PARSE-SYL. Therefore, ranking it higher than Seg.-EXHAUS, that is violated when a consonant is not dominated by a syllable node, means that weakening the edge by associating the final consonant to the PrWd is less fatal than unparsing a

syllable (the initial in (46 e)).[24] The following tableau demonstrates the effects of this ranking:

(50)

/ʃad͡ʒaratak/	FT-BIN^{max}	PARSE-SYL	Seg.-EXHAUS
a. ☞ 	√	√	*
b. 	√	*!	√

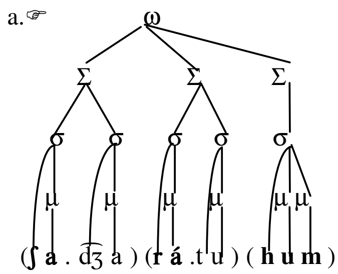
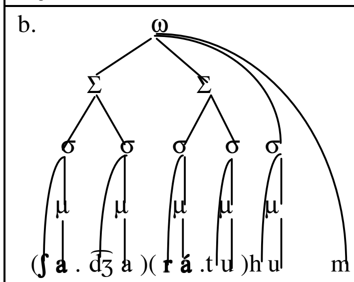
Candidate (50 a), that avoids violating PARSE-SYL by weakly parsing the final consonant, is optimised. Therefore, this dominance relation creates the appropriate interaction, between PARSE-SYL and EXHAUS, that obviously achieves the same effect for which WEAKEDGE had to be introduced, as we saw above.[25] However, unlike that constraint, the proposed interaction guarantees that final consonant weakening is only enforced if demanded by footing. Thus, we shall not expect a candidate like (49 b) to be optimised. Such a candidate will unnecessarily violate PARSE-SYL and EXHAUS. This is because unless the final consonant is syllabified,

[24] Of course, we cannot suggest deleting the final consonant to facilitate footing the final two syllables as this will violate the undominated constraint MAX-C (cf. chapter 3 above).

[25] Of course, I am assuming that this EXHAUS violation is localised in the final consonant. This calls for utilising the set of constraints and constraint ranking introduced in chapter 3 to restrict such violations. Crucially though, I am also assuming that PARSE-SYL dominates SYL-MIN, so (50 a) is evaluated as more harmonious than (50 b), that has got one less submaximal syllable.

the final heavy syllable cannot be footed without any violation of PARSE-SYL, i.e. underparsing the initial syllable for example. Consider the following tableau:

(51)

/ʃad͡ʒaratuhum/	PARSE-SYL	Seg.-EXHAUS	ALIGN-FOOT
a.☞ 	√	√	σσσσσσ
b. 	*!	*	σσ

Obviously, PARSE-SYL is, yet again, the key constraint that rules out (51 b), which will be superficially evaluated optimal had a constraint like WEAKEDGE been introduced to the hierarchy. In addition, this tableau demonstrates that, independently of PARSE-SYL, EXHAUS must dominate ALIGN-FOOT. This is because a candidate that weakly parses a final consonant of a final CVC syllable creates less feet and consequently satisfies ALIGN-FOOT better.

Therefore, we are allowing EXHAUS to be dominated by some constraints on metrification, and consequently to be violated to maintain them. This assumption leads us to consider another problematic input. In particular, we could avoid violating WSP and optimise a candidate like [(mak)ta.ba.k] with a weakened final consonant

rather than one with a perfectly syllabified underlying string. The following tableau portraits this inconsistency:

(52) /maktabak/ → [mák.ta.bak] 'your *sg. ms.* office'

/maktabak/	PARSE-2 (μ)	WSP	Seg.-EXHAUS
a. ? [(mák)ta.bak]	*	*!	√
b. ☞ *[(mák)ta.ba.k]	*	√	*

Although stress placement is not affected by edge weakening, a candidate like (52 b) violates EXHAUS to achieve no genuine objective of footing or head allocation. A form like (52 a), where syllabification is perfect, must be shown to be more harmonious. This will entail finalising the ranking of ALIGN-STRAY placing it higher than WSP. Doing so will render (52 a) more harmonious that (52 b), that obviously violates ALIGN-STRAY twice. This will also make ALIGN-STRAY the key constraint that rules out candidates like (50 b) or (51 b). This proposed finalised ranking of ALIGN-STRAY is employed in the tableau below:

(53) /maktabak/ → [mák.ta.bak] 'your *sg. ms.* office'

/maktabak/	PARSE-2 (μ)	ALIGN-STRAY	WSP
a. ☞ [(mák)ta.bak]	*	*	*
b. [(mák)ta.ba.k]	*	**!	√

For purposes of clarity, I intentionally postponed talking about another possible candidate analysis of the input /maktabak/. Gen will provide us with a candidate like *[mak(tá.ba)k], where the final consonant is weakened. Obviously, this false output is more harmonious than (53 a). Consider the following tableau:

(54) /maktabak/ → [mák.ta.bak] 'your *sg. ms.* office'

/maktabak/	PARSE-2 (μ)	ALIGN-STRAY	WSP	PARSE-SYL	ALIGN-HEAD	EXHAUS	ALIGN-FOOT
a. ? [(mák)ta.bak]	*	*	*	**!	σσ		∅
b.☞*[mak(tá.ba)k]	*	*	*	*	∅	*	σ

Candidate (54 b) violates no undominated constraints. Also, it is evaluated completely like (54 a), as far as the constraints PARSE-2, ALIGN-STRAY, and WSP are concerned. However, it is more harmonious if we consider the lower ranked constraints PARSE-SYL and ALIGN-HEAD. It has got only one unfooted syllable versus two in the true output (54 a). In addition, no syllables intervene between its head foot and the right periphery, while there are two in (54 a).

Obviously, this is an undesired consequence of allowing constraints on metrification to motivate final consonant weakening. Therefore, to control this unattested EXHAUS violation, I will introduce an alignment constraint that maintains the coincidence of the right periphery of every PrWd to that of some syllable. This constraint may be formalised as follows:[26]

(55) ALIGN-RIGHT (PrWd, σ)
Align (PrWd, R, σ, R)
The right edge of each prosodic word must be aligned with the right edge of some syllable.

[26] Obviously, this constraint is invariably violated by final superheavies. This violation, however, is attributed to the undominated SYL-MAX.

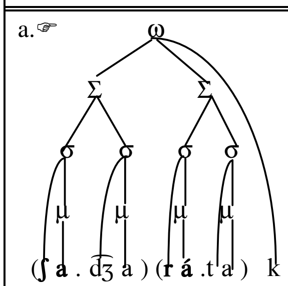
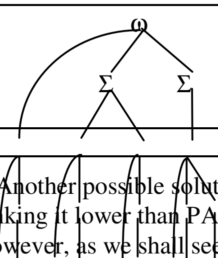
The universality of this constraint may not be disputed. It adheres to the dominance relations imposed by the Prosodic Hierarchy. Therefore, ranking it higher than PARSE-SYL will achieve the desired effect.[27] Consider the tableau below:

(56) /maktabak/ → [mák.ta.bak] 'your *sg. ms.* office'

/maktabak/	ALIGN-RIGHT (PrWd, σ)	PARSE-SYL	EXHAUS	ALIGN-HEAD
a. ☞ [(mák)ta.bak]		**		σσ
b. [mak(tá.ba)k]	*!	*	*	

However, ALIGN-RIGHT (PrWd, σ) will have to be ranked lower than both PARSE-2 and ALIGN-STRAY to enforce edge weakening only when required by footing. This is clarified in the following two tableaux, where candidates in tableaux (50 and 51) are re-evaluated assuming all these changes:

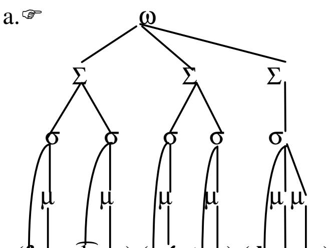
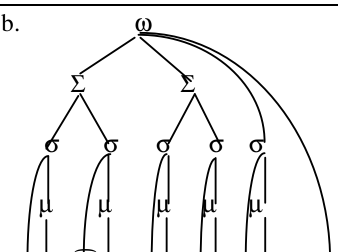
(57) (i)

/ʃad͡ʒaratak/	PARSE-2	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)
a.☞ 	√	√	*
b. 	√	*!	√

[27] Another possible solution is to activate the constraint PK-PROM (see chapter two). By crucially ranking it lower than PARSE-2, it will attract stress to heavy syllable, but not beyond the antepenult. However, as we shall see below when we talk about Final Vowel Shortening, ALIGN-RIGHT (PrWd, σ) will explain the alternation between final consonant weakening and final vowel shortening.

σ σ σ σ μ μ μ μ μ ʃ a (**d͡ʒ á** . r a) (**t a k**)			

(ii)

/ʃad͡ʒaratuhum/	PARSE-2	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)
a.☞  (ʃ **a** . d͡ʒ a) (**r á** .t u) (**h u m**)	√	√	√
b.  (ʃ **a** . d͡ʒ a)(**r á** .t u)h u m	√	*!	*

In a nutshell, I have demonstrated that final edge weakening (associating a final consonant to the PrWd node) is confined to cases where it is performed to include the ultimate syllable in a foot. This foot may be disyllabic or monosyllabic (i.e. erected over a final superheavy syllable or a final heavy plus a light penult). Otherwise, it will either create an extra misaligned stray syllable incurring more violations of ALIGN-STRAY (53 b) or violate ALIGN-RIGHT (PrWd, σ) (56 b) for no purpose of true footing. This shows that there are two factors supporting my proposal. Firstly, I am not imposing any independent device. Constraints that are motivated by universal facts of both syllabification and metrification interact to attain the desired effect. Secondly, final consonant weakening takes place only when required by footing.

By this I conclude discussing Final /-CVC/ Footing and move to the related issue of final /-CVV/ footing and its interaction with the more general process of Final Vowel Shortening.

5.2.2. Final Vowel Shortening:

From the discussion above, especially the previous subsection, it has been demonstrated that the process of metrification supports no evidence for the invariable final consonant weakening. Such degenerate prosodification was shown to be only enforced to reduce the number of stray syllables, where appropriate and consistent with higher requirements. Therefore, the expected pattern for final CVV sequences, the other heavy syllable type in UHA, is vowel shortening rather than weakening, as moraic elements must be properly syllabified (cf. chapter 3 above). Interestingly, however, the process of Final Vowel Shortening applies across the board, whether or not to satisfy ALIGN-STRAY, PARSE-SYL, etc. Nonetheless, I will demonstrate that this process is always motivated by the constraints on metrification.

Final Vowel Shortening is a phenomenon attested in UHA where vowels, mainly subject pronouns, that are underlyingly long shorten finally. In the following group of examples, these long vowels appear in final and non-final position to show the length contrast:

(58)	a.	/katab**uu**/	→	[ká.ta.b**u**]	‘they wrote’
			(cf.	[ka.ta.b**úu**.ha]	‘they wrote her name’)
	b.	/gatal**uu**/	→	[gá.ta.l**u**]	‘they killed’
			(cf.	[ga.ta.l**úu**h]	‘they killed him’)
	c.	/ʔaχaðt**uu**/	→	[ʔa.χáð.t**u**]	‘you *pl.* took’

		(cf.	[ʔa.χað.t**úu**.ni]	‘you *pl.* took me’)
d.	/simiʕt**uu**/	→	[si.míʕ.t**u**]	‘you *pl.* heard’
		(cf.	[si.miʕ.t**úu**.na]	‘you *pl.* heard us’)
e.	/liħign**aa**/	→	[li.ħíg.n**a**]	‘we followed’
		(cf.	[li.ħig.n**áa**.hum]	‘we followed them’)
f.	/misikn**aa**/	→	[mi.sík.n**a**]	‘we caught’
		(cf.	[mi.sik.n**áa**.ha]	‘we caught her’)
g.	/saħabt**ii**/	→	[sa.ħáb.t**i**]	‘you *sg. fm.* pulled’
		(cf.	[sa.ħab.t**íi**.ni]	‘you *sg. fm.* pulled me’
h.	/dˤarabt**ii**/	→	[dˤa.ráb.t**i**]	‘you *sg. fm.* hit’
		(cf.	[dˤa.rab.t**íi**.hum]	‘you *sg. fm.* hit them’)
i.	/gaddam**uu**/	→	[gád.da.m**u**]	‘they introduced’
		(cf.	[gad.da.m**úu**.na]	‘they introduced us’)
j.	/saamaħ**uu**/	→	[sáa.ma.ħ**u**]	‘they forgave’
		(cf.	[saa.ma.ħ**úu**.kum]	‘they forgave you *pl.*’)

One may superficially attribute this shortening to a brute force constraint like *LONG-V (cf. Rosenthall (1994), Burzio (1994), Benua (1996) for example). However, this constraint does not manifest the true motivation of this process. Consequently, I will not adopt any approach of this nature, despite the apparent simplicity. Alternatively, I will fundamentally attribute this vowel shortening process to stresslessness, assuming a proposal suggested by Kager (1997) to account for a similar process in Tepehuan.

Unlike the case of final consonant weakening, shortening a final long vowel will not directly create a non-final stray syllable, nor will it prejudice the coincidence of the right periphery of a PrWd to that of the final syllable. After shortening, the right edge of the final syllable will still be the right edge of the prosodic word, hence not violating ALIGN-STRAY.[28] Therefore, in an input like /gaddam**uu**/, I will claim that the final vowel is shortened to satisfy WSP, despite the established dominance of

[28] Also, it will still be the right edge of the lexical word since vowel length, i.e. moraicity, is purely phonological. Therefore, final vowel shortening does not violate the undominated ALIGN-RIGHT

ALIGN-STRAY and ALIGN-RIGHT (PrWd, σ). This must crucially be coupled with the assumption that WSP dominates MAX-μ, which means that input-output weight identity correspondence is sacrificed to maintain a constraint on metrification. These ideas are summarised in the following tableau:

(59)

/gaddamuu/	FOOT-CONTIG	PARSE-2 (μ)	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)	WSP	MAX-μ
a. ☞ (**gád**)da.mu		*	*			*
b. (**gád**)da.muu		*	*		*!	
c. gad(**dá**.mu)		*	*		*!	*
d. (**gád**)da(**muu**)	*!					

Comparing tableaux (53) and (59) reveals the key difference between the two processes of final consonant weakening and final vowel shortening. Associating the final consonant directly to the prosodic word node, without footing the last syllable, creates an extra non-final stray syllable (53 b) violating both ALIGN-STRAY and ALIGN-RIGHT (PrWd, σ) . On the other hand, (59 a), where the final long vowel is shortened, does not run into such difficulties.

However, we will have to assume that I-CONTIG (McCarthy and Prince 1995, see chapter three), that militates against deletion of any medial material, dominates WSP. This will rule out instances of internal mora deletion to satisfy WSP, since we do not want to shorten all unfooted long vowels.[29] Consider the following tableau:

(60)

/faanuus/	I-CONTIG	WSP	MAX-μ

(LxWd, PrWd) (cf. chapter 3).

[29] The Contiguity "definition assumes that we are dealing with strings. When the structure S_k is more complex than a string, we need to define a way of plucking out a designated substructure that is a string, in order to apply the definitions to the structure." (McCarthy and Prince 1995: 371).

a. ☞ [faa(**núu**)s]		*	
b. [fa(**núu**)s]	*!		*

Nevertheless, as we saw in chapter three above, instances of internal long vowel shortening are attested in the language. However, their environment is restricted and the constraint DEP-IO$^{\{C1, C2\}}$ was introduced to achieve this effect (see section 3.2.3. in chapter 3), as I have argued there. Thus, DEP-IO$^{\{C1, C2\}}$ will have to be ranked higher than I-CONTIG.

(61)

/gaal+li/	DEP I-O$^{\{C1C2\}}$	I-CONTIG	DEP-IO	WSP	MAX-μ
a. ☞ (**gál**)li		*			*
b. (**gáa**)la.li	*!		*		

Thus, the fact that MAX-μ is to be ranked lower than WSP does not mean that the latter dominates all other syllable structure constraints dominated by the former, like O-CONTIG, DEP-IO, etc. Only MAX-μ is re-ranked lower than some constraints on metrification to allow for final vowel shortening. On the other hand, I-CONTIG substitutes it in ranking to maintain the restriction on medial deletion, syncope and shortening. These arrangements will guarantee that no medial deletion or epenthesis are performed to include any given syllable in a foot structure, for example.

Therefore, we saw how WSP prompts Final Vowel Shortening in forms with unfootable final CVV sequences, comparing that to final consonant weakening that is blocked to avoid violating ALIGN-STRAY or ALIGN-RIGHT (PrWd, σ). Nevertheless, there is yet another environment where this shortening process applies even if not motivated by WSP. Take, for example, a potentially trisyllabic input that

comprises two initial light syllables and a heavy ultima. Parsing the two lights into a foot and the final heavy into a separate monosyllabic foot will not violate *CLASH, as the metrically strong syllables are separated by the weak syllable of the initial foot. Thus, shortening the final vowel, in such a configuration, means that we are creating a final stray syllable to violate PARSE-SYL. Obviously, this does not satisfy any higher constraint on metrification or syllabification. Consequently, the true output with a shortened final vowel will not be optimised. Consider the following tableau:

(62)

/katabuu/	PARSE-2 (μ)	ALIGN-STRAY	WSP	MAX-μ	PARSE-SYL
a. ? (**ká**.ta)bu				*!	*
b. ☞ *(**ká**.ta)(**buu**)					

To disfavour a candidate like (62 b), I will utilise an account proposed by Crowhurst (1996), in an attempt to account for the lack of secondary stresses in Cairene. She thinks that it is the product of a pair of constraints. The first is imposed on foot heads requiring them to be promoted to word headedness. She formalises this constraint as follows:

(63) HEAD-MAX:
Link (Head (Ft), Head (PrWd))

(Crowhurst 1996: 417)

This constraint is violated by every foot head that is not a word head. In our analysis, to avoid violating HEAD-MAX means that we either have only one foot per word or assign word headedness to each foot. To render the latter unnatural option impossible, Crowhurst had to assume the constraint MONOHEADEDNESS, ranking it undominated.

(64) MONOHEADEDNESS:

Prosodic constituents are uniquely headed.

(Crowhurst 1996: 418)

For our present purposes, I will say that a candidate like (62 a) vacuously satisfies HEAD-MAX by simply shortening the final vowel, and consequently denying the final syllable any footing. However, the relatively high ranking of PARSE-2 controls this process of unfooting. Therefore, I will include this constraint in our hierarchy ranking it lower than ALIGN-STRAY but crucially higher than MAX-μ and PARSE-SYL. This is to ensure that only vowel shortening rather than consonant weakening, that would otherwise create a misaligned stray syllable, is performed even if that creates a final stray syllable. The two tableaux below demonstrate this ranking and offer a comparison between final CVV and CVC footing:

(65)(i) /katabuu/ → [ká.ta.bu] 'they wrote'

/katabuu/	PARSE-2 (μ)	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)	HEAD -MAX	WSP	MAX-μ	PARSE-SYL
a. ☞ [(**ká**.ta)bu]						*	*
b. [(**ká**.ta)(**buu**)]				*!			

(ii) /katabat/ → [ká.ta.bat] 'she wrote'

/katabat/	PARSE-2 (μ)	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)	HEAD -MAX	WSP	MAX-μ	PARSE-SYL
a. ☞ [(**ká**.ta)(**bat**)]				*			
b. [(**ká**.ta)ba.t]		*!	*				*

In conclusion, I can claim that only through independently motivated constraints on both syllabification and footing may one attain a plausible analysis achieving the desired effects of final heavy syllable footing. Ranking ALIGN-STRAY higher than both WSP and HEAD-MAX meant that only final vowel shortening is enforced in all environments. On the other hand, final consonant weak association is

only performed to include the final syllable in a foot. Though not as simple as an analysis where final heavy syllables are always interpreted as monomoraic, the account I am putting forward commits itself to universality and abstracts away from any additional devices that are basically motivating redundant effects on the overall process of metrification. Moreover, my proposal assumes the theory of economy where triggering is essential to justify a given phonological process (see Prince and Smolensky 1993 chapter 3).

5.2.3. Stem-bound Footing:

Finally, I will consider the process of assigning stress to forms that surface with the initial epenthetic pair of a glottal stop and a vowel like /nkasar/ → [ʔin.(ká.sa)r] (*[(ʔín)ka.sar]) (§ 3.2.1. in chapter 3 above). As we saw in chapter four above, my derivational account orders the process of initial epenthesis postlexically, hence the initial syllable's streslessness. However, we want to maintain our commitment to Parallelism in OT, i.e. one level evaluation.[30] However, such true outputs violate ALIGN-RIGHT (PrWd, σ). The account I shall adopt overrides such a violation. In particular, I will introduce a constraint that enforces the alignment of the left edge of the stem and that of the initial foot and rank it higher than ALIGN-RIGHT (PrWd, σ) (cf. Al-Ageli 1995).

(66) ALIGN-STEM:
Align (Stem, L, Foot, L)

[30] We could always call on constraint domains or multi-strata evaluation. This will entail delimiting the constraint or the set of constraints and constraint rankings enforcing initial glottal stop and vowel epenthesis to apply only in the postlexical domain. More plausibly however, an analysis based on HEAD-DEP (Alderete 1995), where we assume that epenthetic vowels reject stress, may be considered.

The left edge of each stem coincides with the left edge of some foot.
(Al-Ageli 1995: 240)
(cf. Kenstowicz 1994c: 22)

This constraint will require the alignment of the left edge of the stem with that of some foot. Al-Ageli demonstrated that evaluation is gradient counting a violation for each segment intervening between the two edges. This is clarified in the following tableau:

(67)

/nkasar/	PARSE-2	ALIGN-STEM	ALIGN-STRAY	ALIGN-RIGHT (PrWd, σ)	WSP
a.☞[ʔi|n.(ká.sa)r]	*	*	*	*	*
b. [(ʔi|n)ka.sar]	*	**!	*		

Although the true output (67 a) violates both ALIGN-RIGHT (PrWd, σ) and WSP, it is a better satisfier of ALIGN-STEM. In (67 a), the left edges of the stem and the initial foot are only separated by one segment /n/. On the other hand, two segments /ʔi-/ intervene in (67 b).

Of course, I will be assuming the dominance of both *COMPLEX and O-CONTIG. This ensures that any candidate that satisfies ALIGN-STEM by maintaining perfect input-output faithfulness or by epenthesising a vowel between the two consonants of the initial cluster are ruled out. Consider the following tableau where similar candidates are evaluated in (69 b) and (69 c), respectively:

(69)

/nkasar/	*COMPLEX	O-CONTIG	PARSE-2	ALIGN-STEM	ALIGN-STRAY	WSP
a.☞[ʔi|n.(ká.sa)r]			*	*	*	*
b. [(|ní.ka)(sar)]		*!				*
c. [(|nká.sa)r]	*!					

There remains one final point. Although Al-Ageli claims that his account enforces the alignment of the left edges of the initial foot and the stem, he does not demonstrate how that is achieved. The formalisation of ALIGN-STEM above does not relate to the initial foot. There, the left edge of "some foot" must coincide with that of the stem. Therefore, this constraint may not determine the overall harmony of the two candidates [ʔi|n(ka.sa)r)] and *[(ʔi|n)(ka.sa)r)]. They equally incur a violation of ALIGN-STEM, as one segment intervenes between the two edges of some foot and the stem's, in both candidates. On the other hand, in my account, the phrase "some foot" is indirectly interpreted as the initial foot in a candidate like *[(ʔín)(ka.sa)r], that will inevitably violate the undominated *CLASH. Consider the evaluation below:

(70)

/nkasar/		*CLASH	ALIGN-STEM
a.	☞ [ʔi|n(ka.sa)r)]		*
b.	[(ʔi|n)ka.sar]		**!
c.	[(ʔi|n)(ka.sa)r)]	*!	*

This OT analysis involving the constraint ALIGN-STEM may raise some questions regarding its cross-linguistic plausibility. However, the phenomenon of bounding footing to stem boundaries is attested in other languages. For example, Kenstowicz (1994 c) demonstrated that a similar constraint is active in Indonesian. In that language, enforcing such an alignment, on the right periphery of a stem, renders true foot configurations, that would otherwise be ruled out by more cross-linguistically motivated constraints. For example, the true output [bi(ca.ra|)kan] 'speak about (something)' violates PARSE-SYL twice while a false candidate like *[(bi.ca)(ra.|kan)] does not (Kenstowicz 1994 c: 22).

5.3. Conclusion:

Obviously, this OT analysis of UHA's stress pattern plausibly accounts for the attested idiosyncrasies committing itself to universality and abstracting away from any form of language-specific stipulation. Nevertheless, it is fairly complex. Therefore, this may be taken as an argument against it, especially if compared to any derivational counterpart. For the sake of completeness and fairness to DT, the following chapter attempts to investigate this matter by providing a derivational account of the same process of stress assignment, applying the principal approaches to metrification available in the DT literature, the ones sketched in chapter two above.