Metrical Patterns in Arabic *

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1 Theoretical Background

1.1 Stress

What is stress?

> "the means of marking relative prominence within various organisational groupings of metrical units"

Lahiri [2001]

Metrical Stress Theory

Quantity Sensitivity	Yes		No	
Foot Type	Syllabic Trochee	Moraic Trochee	Iamb	
Parsing Directionality	Left-to-Right		Right-to-Left	
End Rule	Left		Right	
Extrametricality	Yes		No	
Unit	Consonant	Mora	Syllable	Foot

Hayes [1995]

Hayes assumes a small asymmetric inventory of binary feet:

Syllabic Trochee	
(x .) σ σ	
Moraic Trochee	**Iamb**
(x .) L L (x) H	(. x) (x) L H H (. x) L L

Syllable Weight:

Light CV
Heavy CVC, CVV
Superheavy CVVC, CVCC

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1.2 Lexical Phonology

Lexical Rules

- apply within the lexicon
- can apply cyclically

Postlexical Rules

- apply within syntax
- can act within words or across word boundaries

2 Palestinian Rule Ordering

Stress Moraic Trochees built left-to-right with End Rule Right and both foot and consonant extrametricality

CSS[a] CVVC → CVC / _C(V)

(1) a. / ʔistaˈʃaar/
'he consulted'
b. [ʔistaˈʃar-na]
'we consulted'
c. [ʔistaˈʃaar=na]
'he consulted us'

[a]Closed Syllable Shortening

OSS[a] $C\dot{V}V \rightarrow CV$ / $\_\bar{\sigma}^{\mu\mu}$

(2) a. / baab/
'door'
b. / baˈbeen/
'two doors'

[a]Open Syllable Shortening

Syncope $\dot{V}_{\text{HIGH}} \rightarrow \emptyset$ / C_CV(X)

(3) / fihim-na/ → [ˈfhimna]
'we understood'

Epenthesis $\emptyset \rightarrow V_{\text{HIGH}}$ / C_C(C)

(4) / katabt/ → [kaˈtabit]
'I wrote'

2.1 Previous Palestinian Rule Ordering Literature

Brame [1973] argues for Level 1 stress assignment then Level 2 stress assignment, syncope and epenthesis. He assumes the subject and possessive suffixes are Level 1, and object and negation are Level 2. Brame uses this to account for opacity in Palestinian Arabic:

[**fi**	**him**	**na**]	[[**fi**	**him**	]	**na**]	
							First Cycle
	1		1				
fi	him	na	fi	him			Stress Assignment
							Second Cycle
	1		**2**	1			
fi	him	na	fi	him	+	na	Stress Assignment
	1						
f	him	na	-	-	-		Syncope
	1		2	1			
f	**him**		**fi**	**him**	**na**		
'we understood'			'he understood us'				

Limitations:

- Only accounts for stress, syncope and epenthesis
- Assumes secondary stress to account for behaviour of syncope though none attested in PA

2.2 New Comprehensive Analysis: Palestinian

I propose the following more comprehensive analysis that does not require recourse to secondary stress:

Lexical Level:
Level 1: Subj Poss Num Stress
Level 2: Dat Obj Neg CSS Syncope Stress OSS
Postlexical Level:
Epenthesis

2.2.1 Key Evidence A and B: Two Levels are Necessary; Level 1 Stress, Level 2 Syncope and Stress

These two data points have same segmental underlying structure, but only one undergoes syncope. However, / -na/ is functioning as a subject suffix in one but object in the other. Therefore, we need at least two levels to account for this.

/ fihim+na/	/ [fihim]na/	
fiˈhim+na	ˈfihim	Level 1 Stress
fˈhim+na	—	Level 2 Syncope
fˈhim+na	fiˈhim+na	Stress
[fˈhimna]	[fiˈhimna]	
'we understood'	*'he understood us*	

By ordering syncope before stress on Level 2 (unlike Brame), this analysis accounts for opacity without need of secondary stress which is not attested in PA.

2.2.2 Key Evidence C: CSS precedes Syncope

CSS must order before Syncope to avoid shortening the long vowel incorrectly:

/ saːħib-ak/	
ˈsaːħibak	Level 1 Stress
ˈsaːħibak	Level 2
—	CSS
ˈsaːħbak	Syncope
[saːħbak]	
your friend	

/ saːħib-ak/	
ˈsaːħibak	Level 1 Stress
	Level 2
saːħbak	Syncope
saħbak	CSS
[*saħbak]	
your friend	

2.2.3 Key Evidence D: CSS is Level 2

CSS is triggered by the dative and negation suffixes, so must occur on Level 2 after their affixation.

(5) a. ˈjiːb
'you (m.s.) bring!'
b. ˈjib-l-i
'you (m.s.) bring for me'
c. ma ˈtjibiʃ
'you (m.s.) don't bring'

Abu-Salim [1982]

2.2.4 Key Evidence E: Stress Precedes OSS

OSS reduces unstressed vowels so must be preceded by stressed so stress is marked:

(6) a. ʃ**aa**f-u
'they saw'
b. ʃ**a**f-ˈ**uu**-ha
'they saw her'
c. (ma) ʃ**aa**f-**u**-ˈh**aa**-ʃ
'they didn't see her'

Abu-Salim [1982]

2.2.5 Key Evidence F: Epenthesis is Postlexical

Epenthesis can occur across word boundaries so must be postlexical.

/ bint/ / kibi:ra/		
bint	kibi:ra	Level 1
ˈbint	k**i**ˈbi:ra	Stress
ˈbint	k**i**ˈbi:ra	Level 2
ˈbint	kˈbi:ra	Syncope
bint kbi:ra		POSTLEXICAL
bint**i** kbi:ra		Epenthesis
[bint**i** kbi:ra]		
'big girl'		

2.2.6 Palestinian Rule Ordering Conclusion

This rule ordering is important because:

- Includes a broader range of phonological processes than elsewhere in the literature
- Accounts for opacity without secondary stress

3 Cairene Rule Ordering

3.1 Processes in Cairene Arabic

Stress Moraic Trochees built left-to-right with End Rule Right and **consonant** extrametricality

CSS CVVC → CVC / _C(V)

(7) a. [ʃ**aa**f]
'he saw'
b. [ma-ʃ**a**f-ʃ]
'he did not see'

OSS $C\dot{V}V$ → CV

(8) a. [ˈb**a:**ʕu]
'they sold'
b. [b**a**ˈʕ**u:**-ha]
'they sold it'
c. [ma-b**a**ʕ**u**ˈha:ʃ]
'they did not sell it'

Syncope$_{\omega}$[a] V_{HIGH} → ∅ / CVC_CV(C)

(9) / kanaˈk**i**t-u/ → [kaˈnaktu]
'his coffee pot'

Epenthesis ∅ → V_{HIGH} / **(C)**C_C

(11) / qul-t-la/ → [ʔult**i**la]
'I said to her'

Syncope$_{\phi}$[b] $\dot{V}_{HIGH}$ → ∅ / CV #_CV(C)

(10) / ˈʔana f**i**ˈhimt/ → [ʔana fˈhimt]
'I understood'

[a]Word-Level
[b]Phrasal Level

3.1.1 New Comprehensive Analysis: Cairene

Lexical Level:
Level 1: SUBJ POSS NUM
Stress
OSS
Syncope$_{\omega}$
Level 2: DAT OBJ NEG
CSS
Epenthesis
Stress
OSS
Postlexical Level:
Epenthesis
Syncope$_{\phi}$

3.1.2 Key Evidence A: Need Two Levels

Word-level Syncope doesn't affect objects so we need at least two levels to account for Cairene.

(12) a. / kanak**i**t-u/ → [kanakt-u]
'his coffee pot'

b. / katabit-u/ → [katabit-u]
[*katabt-u]
'she wrote it'

3.1.3 Key Evidence B: Level 1 Stress, OSS and Syncope; Level 2 Stress

To derive the the surface from ['safrit] from the underlying / saa'firit/, both syncope and vowel shortening must occur.

OSS must precede syncope as the vowel shortening creates the necessary environment where the vowel to be syncopated is flanked by CV syllables:

/ sa:firit/	
	Level 1
sa:'firit	Stress Assignment
sa'firit	OSS
safrit	Syncope
	Level 2
'safrit	Stress Assignment
'she travelled'	

/ sa:firit/	
	Level 1
sa:'firit	Stress Assignment
–	Syncope
–	OSS
	Level 2
saa'firit	Stress Assignment
'she travelled'	

3.1.4 Key Evidence C: Level 2 CSS

CSS is Level 2 as it is triggered by the dative and negation which are added on Level 2

(13) a. gaab
'he gave'
b. gab-l-i
'he gave to me'

(14) a. ʃaaf
'he saw'
b. (ma) ʃafʃ
'he didn't see'

3.1.5 Key Evidence D: CSS precedes Epenthesis

CSS must come before Epenthesis or else epenthesis removes CSS' environment

/ ma ʃaaf-ʃ/	
ma ʃaf-ʃ	CSS
	Epenthesis
[ma ʃaf-ʃ]	

/ ma ʃaaf-ʃ/	
ma ʃaafiʃ	Epenthesis
	CSS
[*ma ʃaafiʃ]	

3.1.6 Key Evidence E: Epenthesis before Stress

Epenthetic vowels can be stressed:

(15) a. bint-na → bin'tina
our daughter
b. mad'rasa
school

3.1.7 Key Evidence F: Stress before OSS

OSS reduces unstressed long vowels, so must follow stress to avoid reducing stressed vowels:

(16) a. 'baaʕu
they sold
b. baaʕuuha → ba'ʕuuha
they sold it (f.sg.)
c. ma baaʕuuħaaʃ → mabaʕu'ħaaʃ
they did not sell it (f.sg.)

3.1.8 Key Evidence G: Epenthesis and Phrasal Stress and Postlexical

Epenthesis and phrasal stress occur across word boundaries so are postlexical. Epenthesis must precede syncope to give the environment necessary to syncope first high vowel of the second word:

/ bint kibiira/	
binti kibiira	Epenthesis
binti kbiira	Syncope
[bintikbiira]	

/ bint kibiira/	
	Syncope
binti kibiira	Epenthesis
[*bintikibiira]	

3.2 Cairene Rule Ordering Conclusion

This rule ordering is important because:

- Uses a broader range of phonological processes than found in the literature
- Accounts for opacity
- It solves some exceptions to Cairene stress parameters

4 Non-Exceptional Exceptions: Cairene Stress

Cairene stress is analysed as moraic trochees built left-to-right with End Rule Right and Consonant extrametricality. There are four noted exceptions in the literature: (1) Broken Plurals with Penultimate Stress; (2) 3FEMSG Past verbs with object suffixes with Penultimate Stress ; (3) Two forms of syncope; (4) Unstressable clitics. Let's focus on the first two:

4.1 Broken Plurals with Penultimate Stress

Three light syllables are expected to receive initial stress:

(17) [ˈ**bu**xala] misers

But a set of broken plurals take penultimate stress instead:

(18) a. [liˈ**bi**sa]
'underpants'
b. [tuˈ**ku**sa]
taxis
c. [ʕuˈ**su**da]
lions

Watson [2002] analyses this as lexicalisation of older pattern iCCiCa, stress assignment and subsequent reanalysis as CiCiCa

(19) [igˈriba] → [giˈriba]
'crows'

These broken plurals also don't undergo word-level syncope, as others of the form CVC$_{\text{HIGH}}$CV do:

(20) a. / wiħ**i**ʃa/ → [wiħʃa]
'bad (f.)'
b. / lib**i**sa/ → [lib**i**sa]
'clothes'

4.1.1 Solution

Given that the initial and medial vowels are the same in this set, we can reanalyse them as : $CCV_{HIGH}Ca$. Therefore, they receive penultimate stress before epenthesis, and do not undergo syncope as the initial vowel hasn't been epenthesised at that stage. These broken plurals do not undergo cyclic stress in Level 2:

/ lbisa/	
	Level 1:
lˈbisa	Stress Assignment
—	Syncope
	Level 2:
liˈbisa	Epenthesis
[liˈbisa]	Surface Form
'underpants'	

4.2 3FEMSG PAST + Object Suffix

(a) and (b) take penultimate not the predicted initial stress, whereas (c) takes expected penultimate stress.

(21) a. [ʃaˈ**f-i**t-u]
'she saw him'
b. [raˈ**m-i**t-u]
'she threw it'
c. [kataˈ**b-i**t-u]
'she wrote it'

Given all three are stressed on the vowel of the 3FEMSG ending, previous solutions have focused on this:
McCarthy [1979] Branching node over /-it/ and following material associated with primary stress
Angoujard [1981] /-it/ has indestructible rhyme
Watson [2002] exceptional reversal of parsing directionality

4.2.1 Solution

However, not all these verbs are the same underlyingly. We can analyse verbs as based on a triliteral root. These are most commonly all consonants, but can be glides.

Root glides surface as (long) vowels in some environments - and this is the crucial property here. These long vowels permit the attested stress patterns before being shortened by OSS:

The roots are highlighted here in red and bold for clarity:

Regular 3 Consonantal Roots
[**k**a**t**aˈ**b**ito]
Hollow 2nd Root is a Glide
/ ʃ**aaf**itu/
Weak 3rd Root is a Glide
/ r**ama**itu/

/ ʃa:fit-u/ ʃa:fit	/ ramait-u/ ramait	Level 1
ʃa:fit-u	ramait-u	Level 2
ʃaːˈfitu	raˈmaitu	Stress
ʃaˈfitu	raˈmitu	OSS
[ʃaˈfitu]	[raˈmitu]	

5 Typology of Arabic Extrametricality

5.1 Previous Stress Analysis of Arabic Dialects

Stress for a range of Arabic dialects has been previously analysed as follows [4]:

Variety	FtType	Dir	End Rule	Extrametricality
Levantine				
Palestinian	MT	L-R	right	foot/consonant
Damascene	MT	L-R	right	syllable
Lebanese	MT	R-L		Syllable
Negev Bedouin	Iamb	L-R	right	Foot
Wadi Ramm Arabic	Iamb	L-R	Right	Foot
Gulf				
Makkan	MT	L-R	right	foot/consonant
Najrani	MT	L-R	right	Consonant
San'ani	MT	L-R	right	foot/consonant
Bedouin Hijazi	MT	R-L		syllable
Other				
Cairene	MT	L-R	right	Consonant
Iraqi Hit	MT	L-R	right	foot/consonant
Oran Algerian	MT	L-R	right	none

5.1.1 Previous Extrametrical Unit Distribution

There is no clear distribution of the extrametrical units: Levantine dialects receive syllable, foot, and foot & consonant extrametricality; and Gulf receive consonant, syllable and foot& consonant extrametricality:

Foot	**Foot & Consonant**	**Consonant**	**Syllable**	**None**
Wadi Ramm Negev Bedouin	Iraqi Hit Makkan Palestinian San'ani	Cairene Najrani	Bedouin Hijazi Lebanese Damascene	Oran Algerian

[4]Note that the analyses for Bedouin Hijazi, Negev Bedouin, Palestinian, Cairene and Lebanese are taken from Hayes [1995]; the analysis for San'ani taken from Watson [2002]; the analysis for Iraqi Hit from Al Abdely [2011]; the analysis for Wadi Ramm Arabic from Al Mashaqba [2015]; the analysis for Oran Algerian from Bouhadiba [1988]; the analysis for Makkan Arabic from Kabrah [2010], the analysis for Najrani Arabic from Alfadly and Alhamami [2018]

5.2 New Metrical Stress Analyses

However, a typological pattern emerges if we reanalyse some of these dialects and introduce some new analyses

5.2.1 Palestinian and Iraqi Analysis

Hayes [1995] and Al Abdely [2011] argue for Foot and Consonant Extrametricality for Palestinian and Iraqi Hit respectively:

Palestinian	Iraqi
X (x .) ki ta< b>	X (x. .) ka ta< b>
X (x) <(x .)> mad ra sa	X (x) <(x .)> mad ra sa

The same effect can be made with syllable extrametricality, which prevents the final foot from being footed. In the case of a bisyllabic word, the residue is stressed:

Palestinian	Iraqi
X 'ki < tab>	X 'ka < tab>
X (x) 'mad ra < sa >	X (x) 'mad ra < sa>

5.2.2 Wadi Ramm and Negev Bedouin Analysis

Al Mashaqba [2015] and Hayes [1995] argue that both Wadi Ramm and Negev Bedouin Arabic can be analysed with foot extrametricality. However, the same effect can be had with syllable extrametricality - an analysis not only with a smaller unit of extrametricality, but one with typological benefits.

With Foot Extrametricality:

Wadi Ramm	Negev Bedouin
X (x) <(x)> naa gil	X (x) <(x)> it ti fag

With **Syllable** Extrametricality:

Wadi Ramm	Negev Bedouin
X (x) <(x)> naa gil	X (x) <(x)> it ti fag

In a bisyllabic LL or LH word, syllable extrametricality will not apply as both dialects are iambic so require stress on the final syllable.

5.2.3 Moroccan Analysis

Casablanca Moroccan Arabic can be analysed as moraic trochees built left-to-right with End Rule Right and no extrametricality based on data from Boudlal [2001]:

Moraic Trochee

X
(x .)
ˈʃmi ʕa
a little candle

Left-to-Right

X
(x .)
ˈqDi na ha
big deal!

End Rule Right

X
(x) (x .)
məz ˈɣu ba
wretched(f.)

No Extrametricality

X
(x) (x)
nəx ˈdem
I work

The alternative parameter options predict stress in unattested locations:

***Iamb**

X
(. x)
*ʃmi ˈʕa
a little candle

***Right-to-Left**

X
(x .)
*qDi ˈna ha
big deal!

***End Rule Left**

X
(x) (x .)
*ˈ məz ɣu ba
wretched(f.)

***Extrametricality**

X
(x) (x)
*ˈnəx de<m>
I work

5.2.4 Tunisian Analysis

Tunisian Arabic can be analysed as moraic trochees built left-to-right with End Rule Right and consonant extrametricality based on data from Maamouri [1967]:

Moraic Trochee Left to Right

X
(x .)
ˈha ra ka
social or political movement

End Rule Right

X
(x .) (x)
bu da ˈda:
tiresome people

Consonant Extrametricality

X
(x)
ˈmsa: mi< *r* >
nails

The alternative parameters predict incorrect stress assignment:

Moraic Trochee *Right to Left

X
(x .)
*ha ˈra ka
social or political movement

***Iamb Left to Right**

X
(. x)
*ha ˈra ka
social or political movement

***End Rule Left**

X
(x .) (x)
*ˈbu da da:
tiresome people

***Iamb**
Right to Left

X
(. x)
*ha ra 'ka
social or political movement

*** Syllable**
Extrametricality

X
(x .) < (x) >
*'bu da da:
tiresome people

***No Extrametricality**

X
(x) (x)
*msa: 'mir
nails

5.2.5 Qatari Analysis

Qatari Arabic can be analysed as moraic trochees built left-to-right with End Rule Right and consonant extrametricality based on data from Al-Sulaiti [1993]:

Moraic Trochee

X
(x .)
'ʃa ra <t>
she bought

End Rule Right

X
(x) (x)
maʃ 'hu: ra
popular(f.s.)

Consonant Extrametricality

X
(x) (x .)
zaT 'Ti hu< *m* >
you devoured them

Left-to-Right

X
(x .)
'ma θa la< *n* >
for example

The alternative parameters predict incorrect stress assignment:

***Iamb**

X
(. s)
*ʃa 'ra <t>
she bought

***End Rule Left**

X
(x) (x)
'maʃ hu: ra
popular(f.s.)

***Syllable Extrametricality**

X
(x) <>
*'zaT Ti hum
you devoured them

***Right-to-Left**

X
(x .)
*ma 'θa la< *n* >
for example

5.3 New Distribution of Extrametrical Units

The analyses motivated above produce a distribution of extrametrical units that shows geographical patterns:

None	Consonant	Consonant/Foot	Syllable
Moroccan	Tunisian	San'ani	Palestinian
Oran Algerian	Qatari	Makkan	Lebanese
	Najrani		Damascene
	Cairene		Negev Bedouin
			Wadi Rumm
			Iraqi Hit
			Bedouin Hijazi

North African **Gulf** **Levantine**

5.4 CV vs VC vs C Dialects: Kiparsky 2003 Typology

Syllable and syllabification related phenomena have been analysed extensively for Arabic. Kiparsky [2003] has proposed the following typology of CV vs VC vs C dialects, thus named before how they epenthesise a triconsontal cluster as in:

(22) / qult-la/
I/you (m.sg.) told him

VC Epenthesise after first element in consonant cluster
[gilitla] (Iraqi)

CV Epenthesise before final element in consonant cluster
[ʕultilu] (Cairene)

C Do not epenthesis consonantal clusters
[qiltlu] (Moroccan)

Watson [2007] has extended the typology further to incorporate more dialects, and recognise that some dialects lie between these categories.

Here is a distribution of the dialects both scholars discuss:

CV	**VC**	**C**
Cairene	Syria	North Africa
Libya	Lebanon	Morocco
Yemen	Palestine	Mauretania
Saudi	Iraq	
	Turkey	
	Bedouin Hijazi	

5.5 Similar Typologies

Broadly speaking:

- CV dialects correspond to consonant extrametricality and include Gulf dialects
- VC dialects correspond to syllable extrametricality and include Levantine dialects
- C dialects correspond to no extrametricality and include North African dialects

Furthermore, the dialects that pose a problem for the extrametricality typology by requiring both foot and consonant extrametricality are also unusual for the syllable/syllabification typology:

San'ani Foot extrametricality is optional in connected speech ([Watson, 2002]
CVV and CVG are heavier than CVCC or CVVC ([Watson, 2002]
Shares properties of CV and VC dialects

Makkan Foot extrametricality does not apply if there's a clitic (i.e. in Level 2)

6 Conclusion

- PA Rule Ordering Analysis accounting for opacity without secondary stress
- CA Rule Ordering Analysis accounting for opacity and two apparent 'exceptions' to stress parameters
- New metrical stress analyses for seven dialects
- Developed a typology of extrametricality that mirrors existing typologies of syllable behaviour across Arabic dialects

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