Triconsonantal Clusters in Qassimi Arabic

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1 Introduction

In Arabic, triconsonantal clusters can result from concatenation of morphemes: verbal affixation and other morphological processes such as attaching consonant-initial suffixes to stems ending in VCC sequences. They are also attested morpheme-internally as will be shown in this paper. Different Arabic varieties deal with them in various ways.

On the one hand, many Arabic varieties avoid triconsonantal clusters by vowel epenthesis (Broselow, 1992; Farwaneh, 1995; Ito 1986, 1989). Onset dialects (Broselow, 1992) such as Egyptian Arabic (henceforth EA) break up triconsonantal clusters by epenthesizing a vowel between the second and third consonants (CC**V**C).

(1) /CCC/ in EA:

a. /bint-ha/ → [bint**a**ha] "her daughter" (CCC → CC**V**C) (Zawaydeh, 1997)

Rime dialects (Broselow, 1992; Selkirk, 1981) (aka "VC-dialects", Kiparsky, 2003) such as Iraqi Arabic (henceforth IA) avoid triconsonantal clusters by inserting a vowel after the first consonant (C**V**CC).

(2) /CCC/ in IA:

a. /bint-ha/ → [bin**i**tha] "her daughter" (CCC → C**V**CC) (Zawaydeh, 1997)

On the other hand, "C-dialects" such as Moroccan Arabic (henceforth MA) allow triconsonantal clusters to surface (Kiparsky, 2003).

(3) /CCC/ in MA:

b. /gəlt-l-u/ → [gəltlu] "I told him" (CCC → CCC) (Kiparsky, 2003)

The present paper deals with triconsonantal clusters in Qassimi Arabic[1] (henceforth QA). The treatment of triconsonantal clusters in QA seems to be less straightforward than other Arabic varieties. Interestingly, Old QA speakers (age: above 65)[2] show variation between the patterns followed by onset dialects and rime dialects: (CC**V**C) ~ (C**V**CC). As exemplified by the underlined vowels in (4), they epenthesize in both available positions in avoidance of morpheme-internal CCCs in trisyllabic words.

(4)

	[C**V**CC]		[CC**V**C]	
a. /ʃbk/	i.ˈʃ**ə**b.kuh	~	iʃ́.b**ə**.kuh	"plug it in"
b. /ŝlħ/	ja.ˈŝ**ə**l.ħuh	~	ja̍ŝ.l**ə**.ħuh	"(may) god/ he guides him"

Such variation ceases to exist in the speech of younger QA speakers where, aligning with the right-hand column in (4), the vowel breaking up triconsonantal clusters in trisyllabic words is always epenthesized after the second consonant.

[1] An Arabic variety spoken in the center of Saudi Arabia. Particularly, it is spoken in Qassim Region which belongs to Najd.
[2] The age provided is approximate as it is difficult to specify a cut-off point separating optionality from non-optionality.

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I argue that the site of the epenthetic vowel breaking up illicit triconsonantal clusters is a product of an interaction between stress and epenthesis. This approach connects epenthesis to larger properties of the grammar and offers an independent justification for epenthesis. I also show that morpheme-internal triconsonantal clusters highlight tension between stress and epenthesis that yields variation for older speakers while younger speakers resolve that tension in an invariant fashion.

2 An Account for the QA Optionality

2.1 *Motivating Epenthesis* This section proposes an analysis of the QA optionality that takes into account an interaction between stress and epenthesis. Before delving into the analysis, let's set the basic assumptions. Given that morpheme-internal triconsonantal clusters are disallowed in QA, and that such illicit clusters are broken up by vowel epenthesis, it is assumed that a markedness constraint that militates against a sequence of three consonants in a row, *CCC, is undominated. It outranks the faithfulness constraint that militates against epenthesizing vowels DEP-V. In the data, the illicit triconsonantal clusters and the repairing epenthetic vowel occur morpheme-internally which indicates that O-CONTIGUITY, which penalizes morpheme-internal epenthesis, is also dominated by *CCC.

Table 1 *CCC>> DEP-IO (V), O-CONTIGUITY

jaŝlħuh	*CCC	DEP-V	O-CONTIGUITY
→ a. ja.ŝə́l.ħuh		*	*
→ b. jə́ŝ.lə.ħuh		*	*
c. ja.ŝlħuh	*!		

The constraints in (1) produce the two possible surface forms. Now, we need a way to choose between those options.

2.2 *Interaction between Stress and Epenthesis* In this section, I show that the choice between epenthesis sites can be attributed to the stress system of QA. According to Ingham (1982), QA has a default-to-opposite stress system. There exists two competing forces in default-to-opposite stress systems; one requires stress to fall on the default edge of the word and another that takes weight into account and requires stress to fall on an opposite side (Bakovic 1998). Languages with a default-to-opposite stress system are divided into two groups: a group of languages, to which QA belongs, place stress on the rightmost heavy syllable whereas in the absence of heavy syllables, stress falls on the leftmost light syllable, and another group places stress on the leftmost heavy syllable, otherwise the rightmost light syllable is stressed in the absence of heavy syllables. In the former group, the left edge is the default edge since it is the one attracting stress in words with only light syllables. These languages are known as default-to-left languages and constitute the majority (Gordon, 2000). The latter group, on the other hand, has the right edge as its default since stress falls on the rightmost syllable in the absence of heavy syllables. These languages are categorized as default-to-right languages and they are not nearly as common as default-to-left languages (Gordon, 2000).

QA is a default-to-left language where stress falls on the rightmost heavy syllable while in the absence of heavy syllables, stress falls on the leftmost syllable. The fact that weight is taken into account when assigning stress indicates that QA is quantity-sensitive. Syllables that count as heavy in all positions are: CVVC, CVCC[3], CVV; except word-finally, CVC is also heavy (Ingham, 1982).

The account below adopts Bakovic's (1998) analysis of default-to-opposite (default-to-left) main stress. However, it is different from his analysis in a crucial way. While Bakovic's analysis accounts for both primary and secondary stress, I will be concerned only with primary stress. That is because the status of secondary stress in Classical Arabic (CA) is an area of controversy (Gordon, 2000), which I am assuming is the same in QA since none of the work on QA addresses secondary stress.

The initial stress in the absence of heavy syllables suggests that QA has trochees. It is assumed that the constraints responsible for this are high-ranking, and candidates that violate them will not be considered. In order to derive the default-to-left nature of QA stress system, the alignment constraints ALLFT-L (5a) and ALLFT-R (5b) (McCarthy & Prince 1993) are needed. ALLFT-L and ALLFT-R require a designated edge of every foot to be aligned with a designated edge of a prosodic word. They are often used to control the appearance of secondary stresses; however, given the absence of secondary stress in our data, their function

[3] This syllable type seems to only occur word-finally. That's because its occurrence word-medially creates a triconsonantal cluster, which, as we have seen, is subject to vowel epenthesis.

in the present analysis will be slightly different as they will be the responsible constraints for placing main stress on the initial syllable in the absence of heavy syllables. In the absence of heavy syllables, stress falls on the initial syllable indicating that ALLFT-L must outrank its counterpart ALLFT-R. Since we are only dealing with main stress, ALLFT-L must also outrank the markedness constraint that requires all syllables to be parsed into feet: Parse- σ (McCarthy & Prince 1993). Such an interaction between these three constraints where ALLFT-L is dominant results in (default) main stress falling at the left edge of the word as illustrated in the following tableau.

(5) a. ALLFT-L: "The left edge of every foot is aligned with the left edge of a PrWd" (Bakovic, 1998).
b. ALLFT-R: "The right edge of every foot is aligned with the right edge of a PrWd" (Bakovic, 1998).
c. Parse- σ: Syllables must be parsed into feet.

Table 2 Noniterative Footing (Words with Light Syllables)[4]

tanafɛs	ALLFT-L	Parse- σ	ALLFT-R
→ a. (ˈta.na).fɛs		*	*
b. ta.(ˈna. fɛs)	*!	*	
c. (ˈta).na.fɛs		**!	**
d. ta.(ˈna).fɛs	*!	**	*
e. ta.na.(ˈfɛs)	*!*	**	

The proposed ranking predicts the right winner. Candidates (2b), (2d) and (2e) are eliminated by incurring fatal violations of the highly-ranked ALLFT-L for not aligning the left edges of the feet with the left edges of the words. Candidate (2c) is ruled out by incurring two violations of Parse- σ. The winner has only one unparsed syllable satisfying Parse- σ better than (13c). I will also introduce FTBIN below which will end the competition between the winner and (2c) before reaching Parse- σ.

Giving ALLFT-L an undominated status would always place stress on the initial syllable which is not the case in the presence of heavy syllables. It has to be dominated. QA is quantity-sensitive which indicates that there is an active markedness constraint that requires heavy syllables to be footed and stressed. The responsible constraint is WEIGHT-TO-STRESS PRINCIPLE (WSP). This constraint must be undominated. Taking into account that Almotairi (2015) argues that syllables in QA are maximally bimoraic and given the controversy on stress patterns in words containing light syllables (Angoujard, 2014), it is assumed that feet in QA must be binary at the moraic level, and that all heavy syllables are bimoraic and all light syllables are monomoraic. This means that feet must have either a heavy syllable or two light syllables. The constraint that assures that feet are binary at the moraic level is FTBIN. This constraint, like WSP, is undominated in QA. WSP and FTBIN interact with ALLFT-L. To assure that heavy syllables regardless of their positions are footed and stressed, WSP and FTBIN must outrank ALLFT-L. Below, I present the newly-introduced constraints with their definitions. This is followed by a tableau explaining how the constraint ranking and interaction work. The forms [mu.ˈdar.ris] "teacher" with only one middle heavy syllable and [ju.gu.ˈluun] "they (m) say" with only one final heavy syllable are chosen to examine the current functionality of the analysis.

(6) a. WSP: Heavy syllables must be stressed and footed.
b. FTBIN: Feet must be binary at the moraic level.

[4] Candidates with iterative footing are not considered because it is assumed that foot building and stress assignment go hand in hand and secondary stress is not considered in the analysis. The proposed ranking will always place main stress on the initial syllable and get rid of any candidate with iterative footing. As for a candidate with a ternary foot that encompasses all three syllables, I will introduce FTBIN later, which will rule such a candidate out.

Table 3 Words with One Middle Heavy Syllable

mudarris	WSP	FTBIN	ALLFT-L	Parse- σ	ALLFT-R
→ a. mu.(ˈdar).ris			*	**	*
b. (ˈmu.dar).ris	*!	*!		*	*
c. mu.(ˈdar.ris)		*!	*	*	
d. (ˈmu).dar.ris	*!	*!		**	**
e. mu.dar.(ˈris)	*!	*!	**	**	

Table 4 Words with One Final Heavy Syllable

jagaluun	WSP	FTBIN	ALLFT-L	Parse- σ	ALLFT-R
→ a. ja.ga.(ˈluun)			**	**	
b. (ˈja.ga).luun	*!			*	*
c. (ˈja).ga.luun	*!	*!		**	**
d. ja.(ˈga).luun	*!	*!	*	**	*

Incorporating WSP and FTBIN into the analysis formalizes QA quantity sensitivity. In (3), the heavy syllable is the middle one, therefore, FTBIN is all that is necessary to choose the right candidate: other foot configurations necessarily violate FTBIN. This tableau shows that FTBIN must outrank ALLFT-L. Tableau (4) with a final heavy syllable, on the other hand, shows the significance of WSP and how it must outrank ALLFT-L. In this tableau, there exists a foot configuration that does not violate FTBIN (4b) but obviously violates WSP.

Thus far, the proposed metrical account handles words with light syllables and words with one heavy syllable well. However, words with multiple heavy syllables are currently predicted to stress the leftmost heavy syllable.

Table 5 Words with More than One Heavy Syllable

inʃidiihum	WSP	FTBIN	ALLFT-L	Parse- σ	ALLFT-R
(→) a. in.ʃi.(ˈdii).hum	*		*!*	***	*
💣 b. (ˈin).ʃi.dii.hum	*			***	***
c. (ˈin.ʃi).dii.hum	*	*!		**	**
d. in.ʃi.(ˈdii.hum)	*	*!	**	**	
e. in.(ˈʃi).dii.hum	**!	*	*	***	**
f. in.ʃi.dii.(ˈhum)	**!	*	***	***	

In the presence of more than one heavy syllable, the constraints developed thus far predict the wrong winner (5b). Forms with more than one heavy syllable such as [in.ʃi.ˈdii.hum] "you (f.s) ask them" pose a problem to the analysis because of the interesting competition between the heavy syllables in claiming stress. Our analysis becomes blind to the default-to-opposite nature of the stress system in the presence of more than one heavy syllable and resets itself to the default-to-left nature of the system seen in the absence of heavy syllables where stress falls on the initial syllable. That is because none of the constraints developed so far dictates which heavy syllable is more stress-deserving. Candidates (5a) and (5b) pass the two constraints introduced to account for the quantity sensitivity nature WSP and FTBIN with a tie leaving their fate to ALLFT-L. Candidates (5c) and (5d) are eliminated by incurring a violation of the maximality condition of FTBIN for having trimoraic feet. The last two candidates (5e) and (5f), on the other hand, are ruled out by violating the minimality condition of FTBIN as well as incurring two violations of WSP.

To address this issue, we must supplement Bakovic's constraint system with a constraint that requires main stress to fall on the rightmost available heavy syllable: Align (σ́μμ R, wd, R) (cf. McCarthy & Prince 1994). It interacts with its counterpart constraint which requires the leftmost available heavy syllable to be assigned primary stress: Align (σ́μμ L, wd, L) (cf. McCarthy & Prince 1994). Given that QA is default-to-left not default-to-right, Align (σ́μμ R, wd, R) must outrank Align (σ́μμ L, wd, L). These newly-introduced alignment constraints serve a different purpose than ALLFT-L and ALLFT-R. They only target heavy syllables with primary stress. Their scope is limited to only heavy syllables; their role is absent in deciding where stress occurs in the absence of heavy syllables. These are gradient head-alignment constraints where each syllable separating the designated edge of the head foot from the designated edge of the word incurs a violation. To satisfy the default-to-opposite nature of QA stress system and derive the right outcome under all circumstances, Align (σ́μμ R, wd, R) must be ranked higher than ALLFT-L[5].

(7) a. Align (σ́μμ L, wd, L): The left edge of the primarily stressed heavy syllable is aligned with the left edge of a PrWd.
b. Align (σ́μμ R, wd, R): The right edge of the primarily stressed heavy syllable is aligned with the right edge of a PrWd.

Table 6 Words with More than One Heavy Syllable

inʃidiihum	WSP	FTBIN	Align (σ́μμ R, wd, R)	ALLFT-L	Align (σ́μμ L, wd, L)	Parse- σ	ALLFT-R
→ a. in.ʃi.(ˈdii).hum	*		*	**	**	***	*
b. (ˈin).ʃi.dii.hum	*		**!*			***	***

By including the necessary alignment constraints Align (σ́μμ R, wd, R) >> Align (σ́μμ L, wd, L), only the surface form [in.ʃi.(ˈdii).hum] is produced. The ranking (σ́μμ R, wd, R) >> ALLFT-L, Align (σ́μμ L, wd, L) dictates the preference in terms of where main stress falls in the presence of more than one heavy syllable. This preference is responsible for ruling out the other candidate *[(ˈin).ʃi.dii.hum] where main stress falls three syllables away from the preferred right edge of the word. Now, our metrical account is complete and it produces the surface forms both when weight is taken into consideration in assigning stress and when it is not.

We are now ready to return to question of optionality in the site of epenthesis. The proposed account only predicts one surface form (7a) [ja.(ˈŝ**ə**l).ħuh] (C**V**CC) but not the other possible form (7b) [(ˈjaŝ).l**ə**.ħuh] (CC**V**C).

Table 7 QA Optionality

jaŝlħuh	WSP	FTBIN	Align (σ́μμ R, wd, R)	ALLFT-L	Align (σ́μμ L, wd, L)	Parse- σ	ALLFT-R
→ a. ja.(ˈŝ**ə**l).ħuh			*	*	*	**	*
(→) b. (ˈjaŝ).l**ə**.ħuh			**!			**	**
c. (ˈja).ŝəl.ħuh	*!	*				**	**
d. jaŝ.(ˈl**ə**).ħuh	*!	*		*		**	*
e. ja.ŝəl.(ˈħuh)	*!	*		**		**	
f. jaŝ.l**ə**.(ˈħuh)	*!	*		**		**	
g. ja.(ˈŝ**ə**l.ħuh)		*!		*	*	*	
h. jaŝ.(ˈl**ə**.ħuh)	*!			*		*	
i. (ˈja.ŝ**ə**l).ħuh	*!	*				*	*
j. (ˈjaŝ.l**ə**).ħuh		*!	*			*	*

The other possible form [(ˈjaŝ).l**ə**.ħuh] is ruled out by violating Align (σ́μμ R, wd, R) twice since the primarily stressed heavy syllable is two syllables away from the right edge of the prosodic word. Both possible variants (7a) and (7b) violate Parse- σ twice because of the two unparsed syllables. Those unparsed syllable are light

[5] It is worth mentioning that Bakovic (1998) handles this part of a default-to-opposite system a bit differently. This is mainly because he is concerned with both main and secondary stresses.

and parsing them into feet would incur violations of FTBIN. This is evident in Candidates (7c), (7d), (7e) and (7f) where FTBIN is violated by parsing monomoraic syllables into feet. These candidates violate WSP since heavy syllables are not footed nor stressed and thus eliminated. The same holds true for candidates (7h) and (7i). Candidates (7g) and (7j)[6], on the other hand, do not violate WSP, given that heavy syllables are footed and stressed, but ruled out by FTBIN.

The winner [ja.(ˈŝə̲l).ħuh], where the vowel breaking up the illicit triconsonantal cluster is epenthesized after the first consonant, satisfies Align (σ́μμ R, wd, R) better than the other licit output; this means, though, that an epenthetic vowel is stressed, something languages often avoid (Alderete, 1995). Stressed epenthetic vowels violate Alderete's HEADDEP. The other possible surface form [(ˈjaŝ).lə̲.ħuh], where the epenthetic vowel breaking up the unpermitted triconsonantal cluster occurs after the second consonant, avoids stressing an epenthetic vowel while still stressing the heavy syllable; the cost, though, is a new violation of Align (σ́μμ R, wd, R) because that heavy syllable is farther from the right edge.

(8) HEADDEP: Stress must not fall on epenthetic vowels.

Each epenthetic vowel site seems to be governed by an interaction between stress and epenthesis. Epenthesizing after the first consonant creates a medial/non-final CVC syllable which attracts stress. On the other hand, inserting the repairing vowel after the second consonant creates an initial/non-final stress-attracting CVC syllable. The former option (7a) seems to be motivated by placing stress nearest the end of the word while the latter option (7b) is motivated by avoidance of stressed epenthetic vowels. The next section shows that Partial Order Grammar (Antilla, 1997; Antilla, 2006; Antilla & Cho, 1998) which is a theory of optionality can capture this trade-off.

2.3 *Partial Order Grammar* Partial Order Grammar allows the ranking to vary and thereby produce two or more outputs for a given input. In other words, producing optionality is achieved by not specifying the ranking between competing constraints and then resolving that underdetermined part of the grammar differently in different evaluations.

It is already established that epenthesizing a vowel after the first consonant [ja.(ˈŝə̲l).ħuh] is motivated by assigning stress nearest the end of the word whereas epenthesizing a vowel after the second consonant [(ˈjaŝ).lə̲.ħuh] is driven by avoidance of stressed epenthetic vowels. This tells us that our competing constraints are Align (σ́μμ R, wd, R) and HEADDEP. The following tableau clarifies the picture.

Table 8 QA Optionality: a Partial Order Grammar

jaŝlħuh	WSP	FTBIN	Align (σ́μμ R, wd, R)	HEADDEP	ALLFT-L	Align (σ́μμ L, wd, L)	Parse- σ	ALLFT-R
→ a. ja.(ˈŝəl).ħuh			*	*(!)	*	*	**	*
→ b. (jˈaŝ).lə.ħuh			**(!)				**	**

For space purposes, other suboptimal candidates (7c-7j) are not included in (8). They, however, are eliminated before we get to the variable part of the ranking. Tableau (8) shows that each output (8a & 8b) is possible depending on how the partial ranking is resolved. Candidate (8a) [ja.(ˈŝə̲l).ħuh] wins if Align (σ́μμ R, wd, R) outranks HEADDEP. On the contrary, candidate (8b) [(ˈjaŝ).lə̲.ħuh] surfaces if HEADDEP is ranked higher than Align (σ́μμ R, wd, R) in the grammar. In a nutshell, a partial order grammar can capture the variation in question by dealing with it as a product of a competition between these two constraints.

3 The Invariant Pattern (CCVC) in QA Younger Speakers' Speech

In contrast with older QA speakers' productions, younger QA speakers show no variation in breaking up

[6] These two candidates are phonetically identical to the winners, but since we are assuming exactly binary feet, they are ruled out by violating the maximality condition of FTBIN.

the morpheme-internal triconsonantal clusters in trisyllabic words. As exemplified by the underlined vowel in the following data set, the epenthetic vowel always occurs after the second consonant.

(9)	a. /ʃbk/	ˈiʃ.bə̲.kuh	"plug it in"
	b. /ŝlħ/	ˈjaŝ.lə̲.ħuh	"may god guide him"

Younger speakers invariably show one of the possible outputs from older speakers' speech, therefore, they have only the ranking that produces that variant: HEADDEP >> Align (σ́μμ R, wd, R).

Table 9 Younger Speakers' Fixed Pattern: (CC**V**C)

jaŝlħuh	WSP	FTBIN	HEADDEP	Align (σ́μμ R, wd, R)	ALLFT-L	Align (σ́μμ L, wd, L)	Parse- σ	ALLFT-R
a. ja.(ˈŝəl).ħuh			*!	*	*	*	**	*
→ b. (ˈjaŝ).lə.ħuh				**			**	**

Since the epenthetic vowel is stressed, candidate (9a) is ruled out by incurring a fatal violation of HEADDEP. This is avoided by the winner by epenthesizing a vowel after the second consonant creating a stress-attracting initial CVC; the cost, though, is incurring one more violation of Align (σ́μμ R, wd, R).

Labov's (1963, 1966) groundbreaking work on social considerations for sound change as well as Pintzuk's (2003) work on grammatical competition in syntactic change and parameter resetting suggest that when a new change is introduced, both the new form and the old one co-exist until one prevails and takes over. Keeping this in mind, and given that the optionality in vowel epenthesis site in avoidance of morpheme-internal CCC in trisyllabic words ceases to exist in younger speakers' speech (CC**V**C), it seems that the optionality found in older speakers' speech constitutes the co-existing stage. The fixed pattern (CC**V**C) in younger speakers' speech is the prevailing pronunciation[7].

Sociolinguistically, the variation in older speakers' speech is attributed to the co-existing stage where both the new and old pronunciations are still operational. Younger speakers have resolved the variable ranking into a fixed ranking that categorically favors one pronunciation over the other.

4 Discussion

As stated in the introduction, many Arabic varieties use vowel epenthesis to break up triconsonantal clusters. The difference in vowel epenthesis site between onset (CC**V**C) and rime (C**V**CC) dialects in repairing illicit triconsonantal clusters has received an ample amount of attention in the literature (Farwaneh, 1995; Ito 1986, 1989; Mester & Padgett, 1994; Rose, 2000; Zawaydeh, 1997). Previous analyses have been built on either directional syllabification (Farwaneh, 1995; Ito 1986, 1989) or syllable alignment (Mester & Padgett, 1994; Rose, 2000; Zawaydeh, 1997).

Directional syllabification suggests that words are syllabified from one edge of the word to the other fixing disallowed structures along the way by vowel epenthesis if necessary; each starting edge/direction predicts a different vowel epenthesis site:

Table 10 Directional Syllabification

a. Left-to-Right syllabication (EA): ʔul-t-la → (ʔul)t_la → (ʔul)t_(la) → (ʔul)(t**i**)(la)
b. Right-to-Left syllabication (IA): gil-t-la → gil_t(la) → (gil)_t(la)→ (gi)(l**i**t)(la)

In both dialects, after syllabifying from one edge of the word, the second consonant cannot be syllabified because these Arabic dialects do not allow complex onsets nor complex codas. In EA, the stray C_2 becomes

[7] Given the lack of definite data on what pattern was followed before the co-existing stage, it is difficult to state with certainty whether the prevailing pronunciation is the old pronunciation or the new one.

an onset by inserting a vowel right after it whereas in IA the stray C_2 becomes a coda by epenthesizing a vowel right before it.

The other core idea that some of the previous studies have been centered around is syllable alignment (Mester & Padgett, 1994; Rose, 2000; Zawaydeh, 1997) where gradient alignment constraints interact with markedness constraints to produce the expected vowel epenthesis site depending on the type of the dialect. This analysis chooses the surface form by favoring candidates whose syllables are closest to a designated edge of the word.

(10) Align (σ-Edge, PrWd-Edge): Every syllable must be aligned with the edge of some prosodic word.

One violation is assigned for every mora separating a syllable from the given word edge. Nuclei and codas are moraic. The following tableaux help clarify the picture and show how those alignment constraints are different from the ones adopted in this paper.

Table 11 EA: *CCC >> Align-R(σ, PrWd)

/ʔul + t + la/	*CCC	Align-R (σ, PrWd)
→ a. ʔul.t**i**.la		σ1 σ2 σ3 μμ μ
b. ʔu.l**i**t.la		σ1 σ2 σ3 μμμ μ!
c. ʔult.la	*!	σ1 σ2 μ

In EA, the vowel breaking up the triconsonantal cluster is epenthesized after the second consonant because the edge with which each syllable must be aligned is the right edge of the prosodic word; epenthesizing the vowel after the first consonant would make the first syllable separated from the right edge of the prosodic word by three moras as exemplified by (11b). Epenthesizing a vowel after the second consonant, on the other hand, would make the first syllable two moras away from the right edge of the prosodic word (11a) thus win out over the second option (11b). The most faithful candidate (11c) is ruled out by the undominated *CCC for containing three consecutive consonants.

Table 12 IA: *CCC >> Align-L (σ, PrWd)

/gil + t + la/	*CCC	Align-L (σ, PrWd)
→ a. gi.l**i**t.la		σ1 σ2 σ3 μ μμμ
b. gil.t**i**.la		σ1 σ2 σ3 μμ μμμ!
c. gilt.la	*!	σ1 σ2 μμμ

Unlike EA, In IA, the vowel breaking up the triconsonantal cluster is inserted after the first consonant because the edge with which each syllable must be aligned is the left edge of the prosodic word. The suboptimal candidate (12b) loses because inserting a vowel after the second consonant furthers the distance between the second syllable and the left edge of the prosodic word by two separating moras. This is not true when the epenthetic vowel occurs after the first syllable (12a) as in this case the second syllable is only separated from the left edge of the prosodic word by one mora. The most faithful candidate (12c) is ruled out early by the power of the undominated *CCC.

Both directional syllabification and syllable alignment seem, if modified accordingly, to be able to account for QA variation as can be seen in (13) and (14), respectively.

Table 13 Directional Syllabification for QA Variation

a. left-to-right syllabification (CC**V**C): jaŝ-l-ħuh → (jaŝ)l_(ħuh) → (jaŝ)(l**ə)**(ħuh)
b. right-to-left syllabification (C**V**CC): jaŝ-l-ħuh → jaŝ_l(ħuh) → (jaŝ)_l(ħuh) → (ja)(ŝ**ə**l)(ħuh)

(13a) and (13b) show that directional syllabification can account for the data by allowing either direction of syllabification.

Modification to the syllable alignment analysis involves adding a partial ranking between Align-R (σ, PrWd) and Align-L (σ, PrWd) so that the variation in question can be produced (14).

Table 14 QA Variation: Syllable Alignment

/jaŝ + l + ħuh/	*CCC	Align-R (σ, PrWd)	Align-L (σ, PrWd)
a. → jaŝ.l**ə.**ħuh		σ1 σ2 σ3 μμ μ	σ1 σ2 σ3 μμ μμμ(!)
b. → ja.ŝ**ə**l.ħuh		σ1 σ2 σ3 μμμ μ(!)	σ1 σ2 σ3 μ μμμ
c. jaŝ.lħuh	*!	σ1 σ2 μ	

Imposing a variable ranking between Align-R (σ, PrWd) and Align-L (σ, PrWd), each candidate is possible depending on how the partial ranking is resolved.

However, the present analysis is more appealing and superior because it explains what motivates each epenthesis site rather than merely stipulating where epenthetic vowels go. This fact makes it more appealing even in the absence of variation. The proposed analysis both produces the QA optionality and improves on other analyses by providing an independent justification for the epenthesis sites. As illustrated earlier, the present analysis suggests that each vowel epenthesis site is governed by a different type of interaction between stress and epenthesis. The actual explanation of why vowels might want to be epenthesized in two different positions (C**V**CC) ~ (CC**V**C) is lacking in previous analyses and this very fact is what makes the present analysis more attractive.

Given the abovementioned merits of the present analysis, it can be extended to account for other dialects (onset and rime dialects). Onset dialects such as EA are in line with the invariant pattern followed by younger QA speakers (CC**V**C) which means that, assuming similar stress facts, the account for younger speakers where HEADDEP outranks Align (σ́μμ R, wd, R) can be employed to account for EA. On the other hand, rime dialects such as IA where the epenthetic vowel occurs after the first consonant (C**V**CC) can be accounted for by adopting the opposite invariant ranking Align (σ́μμ R, wd, R) >> HEADDEP. I, however, leave verifying the applicability of the present analysis to other dialects to future research. The present analysis serves as a starting point; whether the present analysis applies without change to the other dialects depends on the stress facts of those dialects; if other dialects do not have the same stress patterns as QA, the analysis will have to be modified accordingly.

5 Conclusion

The present paper throws light on an under-studied variety of Arabic. It expands the typology of Arabic varieties by showing that intolerance of triconsonantal clusters is treated differently across Arabic varieties as old QA speakers show variation in avoidance of morpheme-internal triconsonantal clusters in trisyllabic words: (CC**V**C) ~ (C**V**CC). It argues that QA variation is a product of an interaction between stress and epenthesis. In a partial order grammar (Antilla, 1997; Antilla, 2006; Antilla & Cho, 1998), it argues that variation is produced by allowing the ranking between constraints related to stress and epenthesis to vary.

The invariant pattern in younger QA speakers' speech, on the other hand, is attributed to the invariant ranking HEADDEP >> Align (σ́μμ R, wd, R), which represents the end of the grammatical competition (co-existing stage) consistent with Labov (1963, 1966) and Pintzuk (2003). Moreover, the proposed analysis is superior to alternatives as it ties the variability in the site of epenthesis to other phonological concerns in the language. Extending the present analysis to the other dialects seems promising, depending on those dialects' systems.

The present analysis serves as a starting point as there is always room for improvement. Also, there are still some remaining issues that need to be tackled. Incorporating secondary stress into the analysis would definitely take us a step further into having a more complete analysis of QA stress system in general and QA optionality in specific. In the process of doing so, we would also bridge more gaps in the literature as secondary stress in Arabic has not been given much attention.

References

Alderete, John. (1995). Faithfulness to prosodic heads. *Ms., University of Massachusetts, Amherst.*

Almotairi, Sarah. (2015). An optimality-theoretic analysis of syllable structure in Qassimi Arabic. (Master's thesis). Eastern Michigan University.

Angoujard, Jean-Pierre. (2014). *Metrical structure of Arabic* (Vol. 35). Walter de Gruyter GmbH & Co KG.

Anttila, A. (1997). Deriving variation from grammar. *Amsterdam Studies In The Theory And History Of Linguistic* Science *Series 4*, 35-68.

Anttila, Arto. (2006). Variation and opacity. *Natural Language & Linguistic Theory*, *24*(4), 893.

Anttila, Arto., & Cho, Yu. (1998). Variation and change in Optimality Theory. *Lingua*, *104*(1-2), 31-56.

Bakovic, Eric. (1998). Unbounded stress and factorial typology. Ms. Rutgers University. [available on Rutgers Optimality Archive, ROA-244, http://roa.rutgers.edu/files/244-0298/roa-244-bakovic-2.pdf

Broselow, Ellen. (1992). Parametric variation in Arabic dialect phonology. In Ellen. Broselow, Mushira. Eid, & John. McCarthy (Eds.), *Perspectives on Arabic linguistics* (Vol. IV, pp. 7-45). Amsterdam, The Netherlands: John Benjamins.

Farwaneh, Samira. (1995). Directionality effects in Arabic dialect syllable structure. (Doctoral dissertation). University of Utah, Salt Lake City, UT.

Gordon, Matthew. (2000). Re-examining default-to-opposite stress. *In Annual Meeting of the Berkeley Linguistics Society* (Vol.26, No. 1, pp. 101-112).

Ingham, Bruce. (1982). Notes on the dialect of the Ḍhafr of north-eastern Arabia. *Bulletin of the School of Oriental and African Studies* 45.2: 245-259.

Itô, Junko. (1986). Syllable theory in prosodic phonology. (Doctoral dissertation). University of Massachusetts at Amherst, Amherst, MA.

Itô, Junko. (1989). A prosodic theory of epenthesis. *Natural Language & Linguistic Theory*, 7(2), 217-259.

Kiparsky, Paul. (2003). Syllables and moras in Arabic. *The syllable in optimality, 147, 182.*
theory (pp. 147-182). Cambridge, United Kingdom: Cambridge University Press.

Labov, William. (1963). The social motivation of a sound change. *Word*, *19*(3), 273-309.

Labov, William. (1966). The social stratification of English in New York City. Washington D.C.: Center for applied linguistics.

McCarthy, John & Prince, Alan. (1993). Generalized Alignmen*t*. Yearbook of Morphology 1993, 79- 153. (ROA-7, Rutgers Optimality Archive, http://ruccs.rutgers.edu/roa.html.).

McCarthy, John & Prince, Alan. (1994). The emergence of the unmarked: Optimality in prosodic morphology.

Mester, Armin & Padgett, Jaye. (1994). Directional syllabification in generalized alignment. *Phonology at Santa Cruz, 3, 79-85.*

Pintzuk, Susan. (2003). 15 Variationist approaches to syntactic change. *The handbook of historical linguistics*, 509.

Rose, Sharon. (2000). Epenthesis positioning and syllable contact in chaha. *Phonology*, 17(3):397425.

Zawaydeh, Bushra. (1997). On an optimality-theoretic account of epenthesis and syncope in Arabic dialects. In M. Eid & R. Ratcliffe (Eds.), *Perspectives on Arabic linguistics* (Vol. X, pp. 191-214). Amsterdam, The Netherlands: John Benjamins.