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STRESS PATTERNS OF BEDOUIN HIJAZI ARABIC: An OT Account<sup>1</sup>

Eunjin Oh  
Stanford University

Abstract: Viewing Bedouin Hijazi Arabic stress system as being quantity-sensitive, rightward and nonfinal (cf. Al-Mozainy (1981)), I show that general constraints formulated in Prince and Smolensky (1993) derive the BHA stress patterns in much simpler way. An implication of this analysis is that at least two levels of representation should be separately constrained to deal with the cases showing identical syllable structures but nonidentical stress patterns in the surface.

1. A Rule-based Account: Al-Mozainy (1981)

In this paper I will provide an optimality-theoretic analysis for stress patterns of Bedouin Hijazi Arabic (BHA) dialect. Most of the data and their previous analysis come from Al-Mozainy (1981) who has accounted for the BHA stress patterns within a rule-based framework. This section introduces the Al-Mozainy's description and analysis of the BHA stress system.

In BHA, stress falls on one of the last three syllables. Stress falls on the final syllable if it is superheavy (CV:C or CVCC) (S: superheavy, H: heavy, L: light syllable).

- (1) a. HŚ     maktú'b (written)  
      b. LŚ     darábt (I hit)

If the final syllable is not superheavy and the penultimate is heavy (CV: or CVC), the penultimate receives stress.

- (2) a. HHH     maktú'fah (tied (f.s.))  
      b. HHĹ     ga:bíl'na (meet us (m.s.))

If the final syllable is not superheavy and the penultimate is not heavy, stress falls on the antepenultimate.

- (3) a. HLL     má'lana (our property)  
      b. HĹH     yáš'ribin (they (f.) drink)

In bisyllabic words stress falls on the penultimate if the final syllable is not superheavy.

- (4) a. ĹĹ     kítab (he wrote)

b.  $\acute{L}L$        $\acute{\text{v}}\acute{\text{a}}\text{z}\acute{\text{a}}$  (he raided)

Monosyllabic words receive stress on their vowel.

- (5) a.  $\acute{H}$        $\acute{\text{m}}\acute{\text{a}}\acute{\text{t}}$  (with)  
 b.  $L$        $\acute{\text{l}}\acute{\text{i}}$  (for me)

In addition to these basic stress patterns, BHA has several problematic cases. The first is some words with HLH pattern. According to the Al-Mozainy's generalization in (3) above, these words are expected to get stress on the antepenult, but, for example,  $\text{?al}\acute{\text{t}}\acute{\text{a}}\text{šur}$  is stressed on its penult.<sup>2</sup> For these cases, Al-Mozainy (1981) assumes that stress is assigned to underlying representation, and that some phonological processes follow the stress assignment rules. In the case of  $\text{?al}\acute{\text{t}}\acute{\text{a}}\text{šur}$ , the vowel *u* is epenthesized in the final syllable after the stress is underlyingly assigned on the final superheavy syllable.

- (6)  $\text{/?al}\acute{\text{t}}\acute{\text{a}}\text{šr/}$       (the afternoon)  
        $\text{?al}\acute{\text{t}}\acute{\text{a}}\text{šr}$       stress assignment  
        $\text{?al}\acute{\text{t}}\acute{\text{a}}\text{šur}$       epenthesis<sup>3</sup>  
        $[\text{?al}\acute{\text{t}}\acute{\text{a}}\text{šur}]$

Some words with  $L\acute{L}L$  in (7) are apparently unproblematic because the antepenultimate stress is expected in words with nonsuperheavy ultima and nonheavy penult.

- (7)  $\text{?al}\acute{\text{u}}\text{xu}$  (the brother)  
        $\text{?al}\acute{\text{i}}\text{bu}$  (the father)

But, assuming that stress is assigned on the underlying representation, the underlying forms of these words have HLL syllable (Al-Mozainy (1981)). The words in (7) are nouns prefixed with  $\text{?al}$  ('the'). Without  $\text{?al}$ , the words are as follows.

- (8)  $\text{?u}\acute{\text{xu}}$  (brother)  
        $\text{?u}\acute{\text{b}}\text{u}$  (father)

The word-initial glottal stop in (8) is deleted when preceded by a prefix which ends with a consonant. So the seemingly straightforward examples have some complications as shown in the following derivation.

- (9)  $\text{/?al}\text{?axu/}$       (the brother)  
        $\text{?al}\text{?axu}$       stress assignment  
        $\text{?alaxu}$       ?-deletion  
        $\text{?aluxu}$       vowel raising  
        $[\text{?aluxu}]$

BHA has many words with penultimate stress on the syllable patterns LLL or LLH where Al-Mozainy expects antepenultimate stress.

- (10) a. ʔaʔádi (I am running)  
 b. ʔaxádat (she took)  
 c. ʔumára (princess)

The underlying forms of the words in (10) are not different from the surface forms, so we cannot resort to the assumption that it is the underlyingly-assigned stress. Al-Mozainy modifies his assumption that stress is assigned only in the underlying representation. A stress assignment rule is decomposed into the separate rules, as in (1) to (5) above, and these rules are applied in that order. If an underlyingly-stressed vowel is deleted in the course of phonology, the next stress assignment rule is applied.

- (11) /ʔaxadat/ (she took)  
 ʔáxadat stress assignment (3)  
 ʔxadat low vowel deletion  
 ʔxádat stress assignment (4)  
 ʔaxádat initial vowel epenthesis  
 [ʔaxádat]

Low vowel deletion is applied in two consecutive open syllables with low vowel and the first low stressed vowel is deleted. The stressed vowel being deleted, stress is reassigned by the stress assignment (4). Finally a vowel is epenthesized in the environment, #ʔ\_\_C. The same thing applies to (10a).

In (10c), however, since the first vowel is not a low vowel, low vowel deletion rule cannot be applied. Instead, Al-Mozainy posits high vowel deletion followed by vocalization of the first glottal stop before a consonant and a glottal stop insertion.

- (12) /ʔumara/ (princes)  
 ʔúmara stress assignment (3)  
 ʔmara high vowel deletion  
 ʔmara stress assignment (4)  
 wmára ʔ → w  
 umára vocalization  
 ʔumára ʔ-insertion  
 [ʔumára]

For motivating the vocalization of the glottal stop, Al-Mozainy (1981) states that ʔ/?/, sporadically, changes to a glide when it is adjacent to another consonant, and sometimes

freely (p. 167),” as shown in *wimar* (he ordered, /ʔamar/) and *yisār* (to imprison, /ʔasar/), and that “there is a variant for ‘princes’ in which /ʔ/ is realized as [w] on the surface *wmáʔa* (p. 167).”

Note that in the derivations (11) and (12) the underlying forms and the surface forms are identical. In order to explain the penultimate stress in these words, Al-Mozainy assumes several rules and the complicated derivations, which end up with the original forms. Also, his statement about the existence of the variant *wmáʔa* does not seem to motivate the fact that the same vocalization process is applied to the other variant *ʔumáʔa*.

Lastly, SLH stressed in the penultimate is another problematic case because antepenultimate stress is expected in this syllable pattern.

- (13) a. ʔixtbáraw (they (m.) took an exam, /ʔixtabaraw/)  
 b. ʔinkśárat (she got broken, /ʔinkasarat/)

These cases have been presented as evidence for *foot* structure and for the assumption that the foot *preserves* stress (Al-Mozainy (1981), Al-Mozainy et al. (1985)).

- (14) /ʔinkasarat/ (she got broken)  
 ʔinkárat stress assignment (3)  
 ʔin(kása)rat foot formation  
 ʔin(ksa)rat low vowel deletion  
 ʔin(ksá)rat stress shift within a foot  
 [ʔinkśárat]

## 2. An OT Account

Viewing the BHA stress patterns in a different way from Al-Mozainy (1981) and Al-Mozainy et al. (1985), I will show that general constraints formulated in Prince and Smolensky (1993) account for the BHA stress system in a very simple way. The several problematic patterns discussed in the last section are mostly explained by positing an input-output faithfulness constraint on stress peak and two-level evaluations of input and input-output faithfulness.

I view the BHA stress patterns as showing quantity-sensitivity, rightmost directionality and nonfinality. (I) superheavy syllable receives stress regardless of its position. (II) rightmost heavy syllable receives stress unless it is in the word-final position. (III) if there is neither superheavy nor heavy syllable, the penult receives stress by default. The following constraints and constraint ranking are formulated.

- (15) Š: Stress superheavy syllables.

H́: Stress heavy syllables.

\*σσσσ: No stress on more than the fourth syllable from the end of a word.

RIGHTMOST: Stress the rightmost syllable.

NONFINALITY: Stress must not fall on the word-final syllable.

CULMINATIVITY: There must be a single syllable that is the most prominent.

(16) \*σσσσ, CULMINATIVITY >> Ś >> NONFINALITY >> H́ >> RIGHTMOST

The constraints \*σσσσ and CULMINATIVITY are undominated. By high ranking of Ś, superheavy syllable receives stress wherever it is situated. Ranking NONFINALITY >> H́ >> RIGHTMOST says that penultimate heavy syllable would receive stress if there are more than one heavy syllable in a word. NONFINALITY >> RIGHTMOST says that if there is neither superheavy nor heavy syllable, the penult would receive stress by default.

These constraints and constraint ranking derive the basic stress patterns discussed in section 1. First, in CVC.CV:C,

(17) maktú:b (written), darábt (I hit)

.CVC.CV:C	*σσσσ	CUL	Ś	NONFIN	H́	RM
.CV̇C.CV:C			*!			*
>.CVC.CV̇C				*	*	

since Ś >> NONFINALITY, the candidate with stress on its final superheavy syllable is selected as an optimal output.

In CVC.CVC.CV. pattern,

(18) maktú:fah (tied (f.s.)), ga:bílna (meet us (m.s.))

.CVC.CVC.CV	*σσσσ	CUL	Ś	NONFIN	H́	RM
.CV̇C.CVC.CV.					*	*!*
>.CVC.CV̇C.CV.					*	*
.CVC.CVC.CV̇.				*!	**	

the candidate with stress on the second syllable wins over the candidate with stress on the first syllable, due to the better satisfaction of RIGHTMOST.

The patterns H́LL and H́LH will be explained by H́ and NONFINALITY, the bisyllabic words ĹH and ĹL are by NONFINALITY, and the monosyllabic words H́ and Ĺ are by CULMINATIVITY.

Let us consider the problematic cases discussed in the last section. First, consider the pattern HLH. The ranking NONFINALITY >> H́ proposed in (16) will select the

candidate with stress on the antepenultimate as optimal, correctly predicting the stress patterns in (19).

- (19) a. máˈlana (our property)  
 b. yašribin (they (f.) drink)

Then how could we account for (20) below which has the same syllable structure with the data in (19) but shows penultimate stress rather than the expected antepenultimate stress?

- (20) ʔalʕáʕur (the afternoon)

It does not seem to be possible to account for (19) and (20) in terms of one-level output evaluation, because they have the same syllable structures in their output forms but show different stress patterns. I propose that a *faithfulness* constraint which requires preserving the input peak to the output outranks any constraint relevant to the stress assignments, and that two levels of representation be separately constrained to deal with the cases showing identical syllable structures but nonidentical stress patterns in the surface.

- (21) FAITH-PK: If a segment is the stress peak of the input, it is the stress peak of the output.

- (22) FAITH-PK, \*σσσσ, CULMINATIVITY >> Ś  
 >> NONFINALITY >> HÍ >> RIGHTMOST

Assuming a highly-ranked constraint INSERTION forcing the vowel insertion between the word-final consonant clusters, the correct output form ʔalʕáʕur is derived through the two-stage evaluations as shown in (23).

- (23) a. *Constraining input*

ʔalʕasr.	*σσσσ	CUL	Ś	NONFIN	HÍ	RM
ʔalʕasr.			*!			*
>ʔalʕasr.				*	*	

- b. *Constraining input-output faith*

ʔalʕasr.	FAITH-PK	*σσσσ	CUL	Ś	NONFIN	HÍ	RM
>ʔalʕaʕur.						**	*
ʔalʕaʕur.	*!					*	**

In (23b) even though the candidate .ʔalʕaʕur. constitutes more violations of the constraint HÍ than the other candidate on the surface, it wins since the stressed vowel in the input form is still the stress peak of the output.



This seems to be a problematic situation for the *correspondence* theory developed by Benua (1995), Kager (1996) and McCarthy and Prince (1995) according to which a direct surface-to-surface relation between stems and morphologically complex words are evaluated. What is needed for the BHA case is *constraining input forms themselves*.

The surface pattern LLL with antepenultimate stress as in (24) is also the case in which a segment which is the stress peak of the input remains the stress peak of the output.

- (24) ?áluxu (the brother)  
       ?álibu (the father)

(25) a. *Constraining input*

.?á.l.ʕa.xu.	*óóóó	CUL	Ś	NONFIN	H́	RM
>.?á.l.ʕa.xu.						**
?á.l.ʕá.xu					*!	*

b. *Constraining input-output faith*

.?á.l.ʕa.xu.	FAITH-PK	*óóóó	CUL	Ś	NONFIN	H́	RM
>.?á.lu.xu							**
?a.lu.xu.	*!						*

Remember the syllable structure LLL or LLH with penultimate stress for which Al-Mozainy assumed (i) the deletion of the vowel in the first syllable, (ii) stress assignment on the penult, (iii) the deletion of the word-initial glottal stop, (iv) the revival of the vowel in the first syllable, and (v) the revival of the word-initial glottal stop ((11) and (12) above).

- (26) a. ?aʕádi (I am running)  
       b. ?umára (princess)

These are simply followed from our generalizaion: The constraints NONFINALITY >> RIGHTMOST would select the candidate with stress on the penultimate CV in the CV.CV.CV words.

The surface syllable pattern SLH with penultimate stress was the pattern for which Al-Mozainy has argued for the *foot* structure and the foot preserves stress.

- (27) ?inksarát (she got broken, /ʔinkasarat/)

This is just the case in which the input peak is faithful to the output peak, as shown in the following tables. Note that we do not resort to any foot structure to explain this case (cf. Al-Mozainy (1981), Al-Mozainy et al. (1985)).

(28) a. *Constraining input*

ʔin.ka.sa.rat.	*óóóó	CUL	Ś	NONFIN	HÍ	RM
ʔin.ka.sa.rat.	*!				*	***
ʔin.ká.sa.rat.					**	* *
>.ʔin.ka.sá.rat.					**	*

b. *Constraining input-output faith*

ʔin.ka.sá.rat.	FAITH-PK	*óóóó	CUL	Ś	NONFIN	HÍ	RM
>.ʔink.sá.rat.				*		*	*
ʔínk.sa.rat.	*!					*	**

One more case worth mentioning is the surface pattern HĤ. Consider the following derivations which Al-Mozainy (1981) suggests.

- (29) /šaribat/ (she drank)  
 šáribat stress assignment (3)  
 šárbat vowel deletion  
 [šárbat]

- (30) /katabat/ (she wrote)  
 kátabat stress assignment (3)  
 ktabat low vowel deletion  
 ktábat stress assignment (4)  
 ktíbat vowel raising  
 [ktíbat]

This is the case in which the stressed vowel in the input undergoes deletion. With the deletion of the segment with the input peak, the constraint CULMINATIVITY will still require a peak in the word.

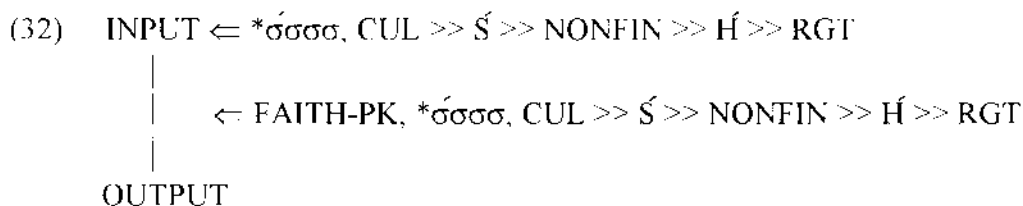
## (31)

ša.rí.bat.	FAITH-PK	*óóóó	CUL	Ś	NONFIN	HÍ	RM
šar.bat.	*		*!			**	
>.šár.bat.	*					*	*
šar.bat.	*				*	*	

The deletion of the input segment /i/ with the stress peak causes FAITH-PK violation. Then the same ranking which constrained the input form evaluates the output, selecting the form with stress on the penult correctly.

## 3. Conclusion

In conclusion, I have proposed the following model for the BHA stress patterns.



What is missing here is comparison among Arabic dialects. Palestinian Arabic, among other dialects, has similar stress patterns with the ones of BHA: (i) Stress falls on the rightmost heavy syllable of the word, (ii) a stress must appear on one of the final three syllables of the word, (iii) if there is no heavy syllable within three syllables from the end of the word, the antepenult gets stress, and (iv) the final syllable never gets stress (Kenstowicz (1983)).

- (33) ba:rak ('bless' 3sg.m.)  
 ba:raku (3pl)  
 ba:rakat (3sg.f.)  
 ba:rakátna (3sg.f.+us)  
 ba:rákatu (3sg.f.+him)

Palestinian Arabic can be explained by the constraints and the constraint ranking shown in (34) below.

- (34)  $* \acute{\sigma} \sigma \sigma \sigma, \text{NONFINALITY} \gg \acute{H} \gg \text{LEFTMOST}$

The similar constraints and constraint ranking seem to account for the Palestinian Arabic stress patterns, except the constraints designating the left or rightward directionality.

## NOTES

<sup>1</sup> Bedouin Arabic is the dialect spoken in the Hijaz, Saudi Arabia (Al-Mozainy et al. (1985)).

<sup>2</sup> Some of the symbols used in the text represent the following;  $\acute{y}$ : voiceless alveolar emphatic sibilant,  $\acute{r}$ : emphatic  $r$ ,  $\acute{s}$ : voiceless palatoalveolar fricative (Al-Mozainy (1981)).

<sup>3</sup> According to Al-Mozainy (1981), an epenthetic vowel is inserted between two consonants when a word ends with a consonant cluster of an obstruent and a sonorant.

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