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An Optimality-Theoretic analysis of stress in the Bani Sulaim dialect

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This study presents an Optimality-Theoretic analysis of stress assignment in a Bedouin Hijazi Arabic dialect. The proposed analysis includes several constraints, among which are NONFIN, which disallows stress word-finally, FBIN, which requires words to be minimally bimoraic, IAMBIC, which requires feet to be right headed, and WSP, which stipulates that heavy syllables are stressed. Importantly, the ranking relations between these constraints solve certain issues found in previous rule-based accounts of the dialect, namely accounting for trochaic stress in disyllabic words and stress in words with final heavy syllables. Trochaic stress in previous studies was seen to result from the interaction between extrametricality and foot binarity requirements, where final syllable extrametricality is revoked only in disyllabic words in favor of satisfying foot bimoraic weight. Words with final stress, on the other hand, were not accounted for in previous studies. The current study shows that Optimality Theory adequately accounts for trochaic stress and words with a final heavy syllable.

Keywords: iambic stress, Bedouin Hijazi, Optimality Theory, foot binarity

1. Introduction

Bedouin Arabic dialects are spoken in parts of the Arabian Peninsula. Several studies examined the linguistic component of these dialects. The focus has been mainly on semantic, syntactic, and morphological features. Phonology has not received much attention unless it was entangled with other fields of linguistics (e.g. Johnstone 1963, 1967a, 1967b; Lehn 1967; Prochazka 1988; Al Solami 2007, 2020; De Jong 2011). Recent years saw a rise in the number of studies that examined the metrical systems of Bedouin dialects. Among these dialects are the dialects spoken in the Hijaz region, to the west of Saudi Arabia, called collectively in the literature as Bedouin Hijazi Arabic (e.g. Il-Hazmy 1975; Al-Mozainy 1981; Al-Mozainy et al. 1985; Al Solami 2007, 2020, 2022).

One of the Bedouin dialects spoken in the Hijaz region is the Bani Sulaim dialect, henceforth BSD. BSD is spoken mostly in Wadi Starah (Starah Valley), located to the north of Jeddah city. Bedouin dialects in the Hijaz region are linguistically different from non--Bedouin (sedentary) dialects within the region. Bedouin dialects have iambic stress, unlike trochaic stress in non-Bedouin varieties, and they also have a number of vowel deletion processes that are absent in non-Bedouin dialects (e.g. Al-Mozainy 1981; Al-Mozainy et al. 1985; Abu-Mansour 1987; Al-Mohanna 1994, 1998; Kabrah 2004; Al Solami 2007, 2020, 2022; Abu-Mansour 2011).

The metrical system of Bedouin dialects is interesting, and it has been examined in several studies (e.g. Al-Mozainy 1981; Oh 1998; Al Solami 2007, 2020). However, none of these studies implemented a satisfactory account of stress patterns in Bedouin Hijazi Arabic within Optimality Theory (OT) framework. A main issue of stress assignment that has not been examined in previous studies is stress assignment in words with a final long vowel such as *sumú*: 'highness' and *hudú*: 'quietness'. Such words were left out and are incompatible with final syllable extrametricality parameter implemented in these studies, as discussed further in sections 4 and 5.

The current study aims to examine the stress system of the Bani Sulaim dialect implementing OT as a framework where universal violable faithfulness and markedness constraints are put in certain order to yield the desired output. OT provides a satisfactory account of stress assignment in BSD that overcomes the problem of words with a final long vowel.

The paper is organized as follows. In section 2 the source of data used in this study is discussed. Section 3 presents stress patterns in BSD. Section 4 gives an overview of previous analyses of stress patterns in BSD to show how rule-based approaches do not account for all stress patterns in BSD. In section 5 the analysis within OT framework is presented. Lastly, section 6 is the conclusion.

2. Data source

The data in this study was based on the speech of four speakers of BSD, two males and two females between the ages of 55 and 71. The data included words of different syllable shapes and morphological structures (see Appendix). The speakers with the least exposure to non-Bedouin dialects in the area were chosen in order to avoid contact-induced changes in Bedouin dialects (e.g. Al-Shehri 1995; Al Solami 2007; Miller et al. 2007; Al-Essa 2009).

3. Stress patterns in BSD

In this section the general patterns of stress in BSD are examined. The purpose of this section is to lay the foundation of the discussion in ensuing sections.

Stress in BSD falls on one of the last three syllables. It is assigned to the final syllable if it is CVVC or CVCC syllable (superheavy syllable), as in (1a), or has a long vowel CV:, as in (1b)[1].

(1) a. Stress final CV:C or CVCC syllables

Final CV:C syllable

[ki.rí:m]	'generous'
[ka.má:l]	'completeness'
[dʒi.má:d]	'non-living thing'
[sa.ná:m]	'camel hump'
[ru.má:d]	'ash'
[til.mí:ð]	'student'
[gi.rí:b]	'close'
[si.lí:m]	'unharmed'
[ri.bí:ʕ]	'spring'
[mi.ká:n]	'place'

Final CVCC syllable

[ki.tábk]	'he enlisted you (mas. sg.)'
[ri.ʒdámk]	'he stoned you (mas. sg.)'
[ħa.básk]	'he held you (mas. sg.)'
[sa:.máħt]	'I/you (masc. sg.) forgave'
[si.míʕt]	'I/you (masc. sg.) heard'
[ti.ʕíbt]	'I/you (masc. sg.) got tired'
[tˤi.fíʃtˤ]	'I/you (masc. sg.) got bored'
[sˤa.námk]	'your (masc. sg.) statue'
[ʁa.námk]	'your (masc. sg.) sheep'
[mak.tábk]	'your (masc. sg.) office'

b. Final CV: syllable

[su.mú:]	'highness'
[hu.dú:]	'quietness'
[mu.da.rá:]	'managers'

In the absence of the syllables in (1), stress falls on heavy CVC or CVV syllables in the penultimate position, as in (2a), and if the penultimate is light then it falls on heavy CVC or CVV syllables in the antepenultimate position, as in (2b).

(2) a. Stress heavy CV: or CVC syllables in the penultimate

[di.ʒá:.ʒah]	'a chicken (fem.)'
[dʒi.má:.ʕah]	'group'

[1] Syllables with geminates also occur in BSD. However, geminates are not discussed in this study.

[ʕa.báː.jah]	‘gown’
[ʕa.láː.mah]	‘sign’
[ħa.máː.mah]	‘a pigeon’
[ri.kíb.tin]	‘you (fem. pl.) rode’
[ʃi.ríb.na]	‘we drank’
[ti.ʕíb.na]	‘we got tired’
[tˤi.fíʃ.ti]	‘you (fem. sg.) got bored’

b. Stress heavy CVː or CVC syllables in the antepenultimate

[sáː.fa.rat]	‘she travelled’
[sáː.ʕa.dat]	‘she helped’
[gáː.ba.lat]	‘she met’
[ʕáː.na.dat]	‘she was stubborn’
[láː.ma.sat]	‘she touched’
[mák.ta.bah]	‘a library’
[máz.ba.lah]	‘garbage’
[mír.ti.ki]	‘reclining’
[mír.ti.ʃi]	‘bribed’

In the absence of words with heavy syllables, stress in trisyllabic words with light syllables falls on the penultimate syllable, as in (3).

(3) Trisyllabic words with light syllables

[ʔa.ká.lat]	‘she ate’
[ʔa.χá.ðu]	‘they (masc.) took’
[ʔu.má.ra]	‘princes’

In disyllabic words stress falls on the penultimate syllable, regardless of its weight, as in (4a). This results in trochaic stress in disyllabic words with light syllables, as in (4b). Note that CVC syllable in BSD does not attract stress word finally and only attracts stress in word medial position, as in (4c).

(4) a.

[mák.tab]	‘an office’
[már.kab]	‘a ride’
[tár.mi]	‘she throws’
[máː.ʃi]	‘walking’
[ráː.kib]	‘on board’
[ráː.kiz]	‘stable’

b.

[sí.miʕ]	‘he heard’
[ʃi.rib]	‘he drank’

[gí.ðˤa] ‘he judged’
[fí.da] ‘sacrifice’

c.
[ʔá.kal] ‘he ate’
[ʔa.kál.ha] ‘he ate it’

To summarize, stress in BSD falls on a word-final syllable if it is CV:C, CVCC or CV:. Otherwise, it falls on a heavy penultimate or antepenultimate of the shape CV: or CVC. In the absence of heavy syllables, stress falls on the penultimate syllable.

4. Stress assignment in BSD within rule-based approach

This section examines how previous studies accounted for stress patterns in BSD within rule-based approaches. The aim is to show that rule-based analysis fails to account for all stress patterns in BSD.

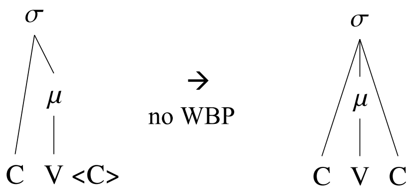
Stress in BSD is influenced by syllable weight and syllable position, and it is assigned to one of the three final syllables, similar to most dialects of Arabic (e.g. McCarthy 1980; Irshied 1985; McCarthy & Prince 1990; Sakarna 1990; Watson 2011; Abu Guba 2018). In BSD, moraic weight is determined by vowel length and coda presence. Monomoraic syllables are open syllables with short vowels, while heavy syllables have a long vowel and or/coda, based on moraic theory (Hyman 1985; McCarthy & Prince 1986; Hayes 1989a, 1989b).

Similar to the majority of Arabic dialects, the moraic weight of CVC syllable in BSD depends on its position in the word. Word medially, CVC syllable is bimoraic, while word finally it is monomoraic. This is reflected in stress assignments in the dialect where a CVC syllable only attracts stress in word medial position, as in (5).

(5) [ki.**sár**.ha] ‘he broke it’
[kí.**sar**] ‘he broke’

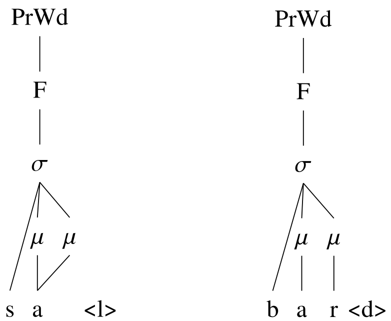
The asymmetrical patterns of CVC syllable in BSD, where it is heavy word medially but light word finally, are accounted for within rule-based approaches by referring to the extrametricality parameter and how it prevents the coda in a final CVC syllable from being moraic. In extrametricality a specific prosodic constituent is deemed unavailable for rule applications (e.g. Hayes 1979, 1982, 1995; Liberman & Prince 1977; Nanni 1977). The coda in CVC syllable in Arabic dialects receives a mora through the parametric rule weight by position, WBP, (Hayes 1989a, 1995). In final position, where extrametricality is an active parameter in BSD, WBP is blocked and the coda is moraless as a result, as in (6).

(6) Monomoraic CV<C> in final position



The extrametricality parameter also accounts for the lack of stress in word final position in BSD, as in (5). In order to exempt words with final CV:C or CVCC syllables from final syllable extrametricality, the peripherality condition (Hayes 1983: 80, 1995: 57), is implemented in which a final consonant in CV:C and CVCC syllables prevents extrametricality from applying to the preceding syllable since it is not peripheral and is separated by a segment from the word edge. The final consonant is called extrasyllabic in these syllables and it does not count toward the moraic weight of the syllable in final position, as in (7).

(7) [sa:l] ‘it flowed’ [bard] ‘cold’



Feet in BSD are iambic, unlike the majority of dialects in the Hijaz region where feet are trochaic. Therefore, in BSD feet can be (L.Ĺ), (L.H́) or a single heavy syllable (H́). This is evident in trisyllabic words with light syllables. In (8) words with different iambic feet are given.

(8) (L.Ĺ)

(ʔa.ká).<lat>	‘she ate’
(ʔa.χá).<ðu>	‘they (masc.) took’
(ʔu.má).<ra>	‘princes’

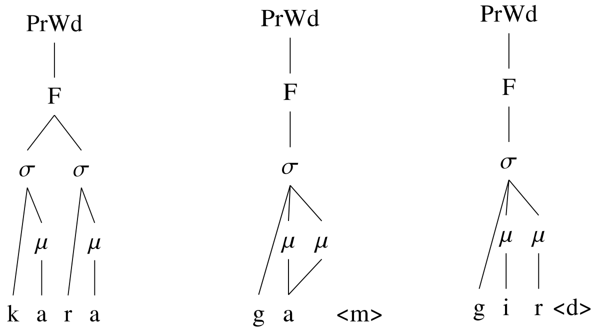
(LH́)

(si.mák).<na>	‘our (masc.) fish’
(ru.má:).<na>	‘he hurled at us’
(ki.táb).<tin>	‘you (fem. pl.) wrote’

(H́)	
(mák).<tab>	‘office’
(más).<baħ>	‘swimming pool’
(már).<kaz>	‘center’

However, stress is not always iambic in BSD. Disyllabic words with light syllables show trochaic stress, as in (4b). Trochaic stress in rule-based phonology is accounted for by imposing a strict order between final syllable extrametricality and foot binarity. BSD has a minimal word requirement of at least two moras where words need to have at least two light syllables or a single superheavy syllable CV:C or CVCC, as in (9). Minimal word requirement is based on the prosodic hierarchy, which requires each word to have at least a single bimoraic foot (McCarthy & Prince 1990; Hayes 1995; Kager 2007).

(9) [ka.ra] ‘laboured’ [ga:m] ‘he stood’ [gird] ‘monkey’



Minimal word requirement in BSD is evident in the lack of words with CV syllable shapes or CVC syllable shapes. A word with a single CV syllable is not found in BSD because CV syllable is monomoraic, likewise a word that has a CVC syllable shape is monomoraic due to extrametricality, as explained in (5) and (6).

Another evidence of bimoraic weight limit imposed on words in BSD is found in compensatory lengthening. Compensatory lengthening in BSD occurs in order to comply with word weight requirement when vowel deletion renders a word monomoraic, as in (10).

(10)	vowel deletion	compensatory lengthening	
/birak/	brak	[brakk]	‘ponds’
/kutub/	ktub	[ktubb]	‘books’
/furuʃ/	fruʃ	[fruʃʃ]	‘blankets’

To account for trochaic stress in BSD, previous studies implemented extrametricality revocation in disyllabic words with light syllables. According to this approach, since degenerate feet are prohibited in BSD, the final extrametrical syllable is incorporated after the application of stress, according to the rule in (11), which results in a surface trochaic foot.

(11) Incorporation of extrametrical material (Hayes 1982, 1995)

(X)	→	(X ˘)
(˘)<˘>		(˘ ˘)

The repair mechanism suggested by the rule in (11) is a consequence of the idea that languages allow degenerate feet early in the derivation and subject them to foot-repair mechanisms later in the derivation (Poser 1989; Halle & Kenstowicz 1991). A possible derivation within rule-based phonology is given in (12).

(12) /fida/ ‘sacrifice’

a. fi.<da>	final syllable extrametricality
b. (fi).<da>	degenerate foot
c. (fí).<da>	stress
d. (fí.da)	extrametricality revocation to satisfy foot binarity

The order in (12) is critical. A final light syllable in BSD does not receive stress, and, as a result, final syllable extrametricality is suggested to precede stress assignment, see Al Solami (2020, 2022) for more discussion.

The above analysis of BSD runs into some problems. Final syllable extrametricality was invoked in order to avoid word final stress. In words with a final CV:C or CVCC syllables the final consonant has been suggested to fall outside the domain of the final syllable (Aoun 1979; Selkirk 1981; Hayes 1995; Watson 2002). This means that final CV:C or CVCC syllables are not in final position and are separated from the word edge by an intervening consonant. In terms of extrametricality, the intervening consonant prevents these syllables from being extrametrical since extrametricality only applies to peripheral constituents as suggested by the peripherality condition. As a result, extrametricality excludes final CV(C) syllable from stress assignment while it allows superheavy syllables, CV:C and CVCC, to receive stress word finally. This accounts for the majority of the data from BSD; however, it yields the wrong outcome in words ending in long vowels, as in (13). The peripherality condition cannot be invoked for the examples in (13) since CV: syllable is not separated by any segment from the word edge.

(13)

[su.mú:]	‘highness’
[ʕa.dú:]	‘enemy’

Furthermore, while feet are iambic in BSD, the rule-based analysis suggests that trochaic stress in BSD is an exception to the general iambic stress pattern. As in (11) and (12), it proposes that a degenerate foot is allowed initially only to be repaired later in the derivation. However, it is not clear how, in a dialect where degenerate feet are strictly prohibited, a degenerate foot is allowed to form. This goes against many assumptions of phonology theory where languages show systematic restrictions on the allowable foot type.

The following section provides a more elaborate and coherent analysis of stress patterns within OT framework. The analysis will account for words with a final CV: syllable, and trochaic stress will be regarded as a possible outcome of different ranking between conflicting constraints.

5. OT account of stress patterns in BSD

This section provides an account of stress patterns in BSD within OT (Prince & Smolensky 1993, 2004). According to the theory, universal grammar provides several violable constraints, faithfulness and markedness constraints. The ranking of these constraints evaluates a set of candidates to yield an optimal candidate that satisfies high ranked constraints. In analysing stress patterns using OT, it is possible to account for parameters such as moraic weight, extrametricality, and stress window.

As discussed in section 3, the majority of examples from BSD do not allow stress word finally. Preventing stress word finally in OT is achievable using the constraint NONFINALITY, in (14), as exemplified in the tableau in (15). The version of the NONFINALITY constraint implemented in this paper is violated when a word-final syllable is stressed. BSD allows the optimal candidate to violate this constraint only when a word ends with a heavy syllable, as discussed in (21).

(14) NONFINALITY (NONFIN):
No head of foot-level occurs over the final syllable of a prosodic word (Hyde 2003).

(15)

/maktab/ ‘office’	NONFIN
☞a. (mák).tab	
b. (mak).(táb)	*!

Within OT, word minimum weight in BSD can be accounted for by the constraint in (16). This constraint is ranked high since BSD strongly prohibits degenerate feet.

(16) FOOTBINARITY(FBIN):
Feet are binary (μ, σ) (McCarthy & Prince 1993, 2004)

The data in section 3 shows that stress is assigned to the final member of the binary foot in BSD, which means that stress is iambic and foot inventory includes (L.Ĺ), (L.H́), or (H́). The constraint that ensures that stress is iambic in BSD is given in (17), with an example in (18).

(17) IAMBIC:
Feet are moraic iambs (Hayes 1995).

(18)

/ʔaχaðat/ 'she took'	NONFIN	IAMBIC	FBIN
☞a. (ʔa.χá).ðat			
b. (ʔá.χa).ðat		*!	
c. ʔa.(χá).ðat			*!
d. ʔa.(χa.ðát)	*!		

The trochaic stress candidate in (b) is ruled out by the IAMBIC constraint. The iambic stress candidate in (a), on the other hand, is the optimal candidate.

In disyllabic words with CVCV(C) syllable structure, feet are trochaic, as in (4b). Trochaic stress arises from the interaction between extrametricality and moraic weight requirement in BSD, as discussed in section 4. However, instead of allowing a degenerate foot to be formed and then include the final syllable after extrametricality revocation to repair the degenerate foot, as discussed in (12), within OT the NONFIN constraint outranks the IAMBIC constraint and, as a result, trochaic stress is found, as shown in the tableau in (19). So, trochaic stress is a possible outcome of the ranking relations between the conflicting constraints.

(19)

/ħama/ 'he guarded'	FBIN	NONFIN	IAMBIC
☞a. (ħá.ma)			*
b. (ħa.má)		*!	
c. (ħá).ma	*!		*

Tableau (19) shows that the IAMBIC constraint is dominated by the NONFIN constraint. Candidate (b) is eliminated because it has stress word finally violating NONFIN while candidate (c) is eliminated as it incurs a fatal violation of FBIN. The optimal candidate in (a) satisfies the constraint NONFIN but violates the low ranked constraint IAMBIC. This ordering relations between the constraints result in trochaic stress in BSD.

The ordering relations in (19) can also account for stress in trisyllabic words made of light syllables. For example, in (ʔa.χá).ðu 'they (masc.) took' the first two syllables form an iambic foot with stress on the second syllable of the foot. Stress is prevented from occurring on the final syllable due to NONFIN while IAMBIC prevents trochaic stress.

One of the problems of rule-based analyses of stress in BSD discussed in section 3 was the inability to account for stress occurring in word final position in words ending in a long vowel such as *mudara:* 'managers'. Within OT, this is possible through the constraint in (20).

(20) Weight-to-Stress Principle (WSP):
Heavy syllables are prominent on the grid (Prince 1990)

WSP is important for capturing a phonological property shared by many weight-sensitive Arabic dialects where a heavy syllable in the last three syllables attracts stress. It is violated when a heavy syllable is not stressed, as illustrated in (21). Ranking the WSP constraint above the NONFIN constraint guarantees that a heavy syllable is stressed even in a word final position.

(21)

i.

/sumu:/ 'highness'	WSP	NONFIN
☞a. (su.mú:)		*
b. (sú.mu:)	*!	

ii.

/mudara:/ 'managers'	WSP	NONFIN
☞a. (mu.da).(rá:)		*
b. (mu.dá).(ra:)	*!	

WSP incurs a violation in candidate (b), in both examples, because the heavy syllable does not receive the stress. The optimal candidate in (a) does not satisfy the dominated constraint NONFIN by stressing the final heavy syllable to satisfy the high ranked constraint WSP.

In words with more than one heavy syllable in the last three syllables, stress falls on the rightmost eligible heavy syllable. The constraint in (22) requires the rightmost foot to bear the stress and it ensures that a stressed syllable is aligned with the right edge of the word. This constraint is subject to gradient violation determined by how far the stressed syllable is from the right edge of the word, as shown in (23).

(22) Edgemost(Pk; R; Word):
A peak of prominence lies at the right edge of the word (Prince & Smolensky 1993, 2004)

(23)

i.

/mida:ra:t/ 'orbits'	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (mi.da:).(rá:)<t>	*		*
b. (mi.dá:).(ra:)<t>	*	*!	

ii.

/kitabna:ha/ 'we wrote it (fem.)'	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (ki.tab).(ná:).ha	*	*	
b. (ki.táb).(na:).ha	*	**!	

iii.

/kattabtu:na:ha/ 'you made us write it (fem.)'	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (kat).(tab).(tu:).(ná:).ha	*	*	
b. (kat).(tab).(tú:).(na:).ha	*	**!	
c. (kat).(táb).(tu:).(na:).ha	*	**!*	

In the examples in (23), the optimal candidates are the ones that assign stress to the rightmost heavy syllable. Note that in (23i) the constraint Edgemost(Pk; R; Word) outranks the constraint NONFIN in order to assign stress to a final CV:C syllable.

In disyllabic words with a final CVC syllable, as discussed in (5) and (6), the final CVC syllable is monomoraic due to the lack of mora assignment on the final consonant. Within OT, this is accounted for through the constraint in (24). The *FINAL-C-μ constraint blocks mora assignment to a final consonant in word final position. This results in monomoraic CVC syllable in word final position, as exemplified in (25).

(24) *FINAL-C-μ
Word final consonant is not moraic (Prince & Smolensky 1993, 2004)

(25)

/maktabah/ ‘a library’	*FINAL-C-μ	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (má$_{\mu}$k$_{\mu}$).ta$_{\mu}$.ba$_{\mu}$h			**	
b. (mak).(ta$_{\mu}$.bá$_{\mu}$h)		*!		*
c. (mak).(tá$_{\mu}$.ba$_{\mu}$h)		*!		
d. (mak).(ta$_{\mu}$.bá$_{\mu}$h$_{\mu}$)	*!	*		*

Candidates (b) and (c) are eliminated because they incur a fatal violation of the constraint WSP, while candidate (d) is eliminated because it violates the constraint *FINAL-C-μ, which does not allow a final coda to be moraic. The optimal candidate in (a), on the other hand, satisfies these two constraints at the expense of incurring violations of the low ranking constraint Edgemost(Pk; R; Word).

In disyllabic words with final CV:C or CVCC syllables, such as *niba:t* ‘plants’, the initial light syllable is expected to be part of the canonical iambic foot (LH́). In order to parse the light syllable within the foot, the constraint in (26) is implemented. PARSE-σ incurs a violation to any unparsed syllable into a foot, as in (27).

(26) PARSE-σ
All syllables must be parsed into feet (Prince & Smolensky 1993, 2004).

(27)

i.

/niba:t/ ‘plants’	NONFIN	PARSE-σ
☞a. (ni$_{\mu}$.bá:$_{\mu\mu}$)<t>	*	
b. ni$_{\mu}$.(bá:$_{\mu\mu}$)<t>	*	*!

ii.

/maktab/ ‘office’	NONFIN	PARSE-σ
☞a. (mák).tab		*
b. (mak).(táb)	*!	

The PARSE-σ constraint is limited in its application. As in (27ii), it is outranked by the NONFIN constraint. In addition, the PARSE-σ constraint is outranked by the IAMBIC constraint to avoid unwanted foot shapes, such as (H́L) foot[2], as in (28b).

(28)

/milʕagah/ 'a spoon'	NONFIN	IAMBIC	PARSE-σ
☞a. (míl).ʕa.gah			**
b. (míl.ʕa).gah		*!	*
c. (mil).(ʕá.gah)		*!	
d. (mil).(ʕa.sáh)	*!		

So far, we have established the following constraint ranking relations in (29).

(29) WSP, *FINAL-C-μ >> Edgemost(Pk; R; Word) >> FBIN, NONFIN >> IAMBIC >> PARSE-σ

The data in section 3 shows that stress in BSD is limited to one of the last three syllables in the word. The order between the constraints so far prevents stress from applying further than the antepenultimate syllable, as in (30).

(30)

i.

/ʔalmaktab/ 'the library'	*FINAL-C-μ	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (ʔal).(mák).ta.ba$_{\mu}$h			**	
b. (ʔal).(mak).(ta.bá$_{\mu}$h)		*!		*
c. (ʔal).(mak).(tá.ba$_{\mu}$h)		*!		
d. (ʔal).(mak).(ta.bá$_{\mu}$h$_{\mu}$)	*!	*		*
e. (ʔál).(mak).(ta.ba$_{\mu}$h)		*!	***	

ii.

/mistagwijah/ 'strengthened'	*FINAL-C-μ	WSP	Edgemost(Pk; R; Word)	NONFIN
☞a. (mis).(tág).wi.jah			**	
b. (mis).(tag).(wi.jáh)		*!		*
c. (mis).(tag).(wí.jah)		*!		
d. (mis).(tag).(wi.jáh$_{\mu}$)	*!	*		*
e. (mís).(tag).wi.jah		*!	***	

[2] This foot type is reported in some dialects of Arabic, such as Makkan Arabic (Kabrah 2004) and Ruwaili Arabic (Al Solami 2020).

In (30), the eliminated candidates incur fatal violations of the constraint WSP since stress is not assigned to the rightmost heavy syllable. Candidates (id) and (iid) assign a mora to the coda of the final syllable, violating the constraint *FINAL-C-μ, which militates against moraic codas in final position. The optimal candidate in (a) assigns stress to the rightmost heavy syllable.

6. Conclusion

In conclusion, this paper presents an OT-based analysis of stress in a Bedouin Hijazi Arabic. The aim is to provide a cogent and a comprehensive account that covers all the data and to avoid problems in previous studies. It is argued that the foot in BSD is iambic and degenerate feet are strongly prohibited because word minimality requirement stipulates that words need to be at least bimoraic. The constraints suggested for BSD are given in (31).

(31) WSP, *FINAL-C-μ >> Edgemost(Pk; R; Word) >> FBIN, NONFIN >> IAMBIC >> PARSE-σ

The ordering relations between the constraints in (31) induces the expected stress position in different word shapes without the need of including any more parameters. In addition, ranking the FBIN and NONFIN constraints higher than the IAMBIC constraint yields the expected trochaic stress in disyllabic words.

Another important contribution of the study is to account for words with final stress. Words with a final long vowel are found in BSD and are accounted for through the ordering relations between the WSP and NONFIN constraints. That is, the WSP constraint is ranked higher than the NONFIN constraint which means that violating NONFIN is necessary to satisfy the WSP constraint.

Including the Edgemost(Pk; R; Word) constraint in the analysis limits stress to a three-syllable window at the right edge of the word and prevents stress from going further back than the antepenultimate syllable.

Future directions in research could investigate some phonological processes found in BSD, such as vowel deletion and epenthesis, to see how they fit in an OT analysis.

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Appendix

Monosyllabic words:

[dá:m]	‘persisted’
[ná:s]	‘people’
[ná:ʃ]	‘touched’
[fá:r]	‘boiled’
[tíbt]	‘I repented’
[níʃt]	‘I touched’
[fízt]	‘I won’
[gímt]	‘I stood’

Disyllabic words:

[sí.ma]	‘sky’
[rí.ga]	‘he climbed’
[mí.ʃa]	‘he left’
[ʃí.bir]	‘handspan’
[há.ram]	‘pyramid’
[ħá.mas]	‘toasted’
[ʃa.hád]	‘testified’
[ru.bá:tˁ]	‘tying rope’
[ba.rá:ħ]	‘wideness’
[ka.lá:m]	‘talk’
[ni.zált]	‘I/you (masc. sg.) climbed down’

[fa.ráʃk] ‘he whipped you (masc. sg.)’
[si.míʕt] ‘I/you (masc. sg.) heard’
[lá:.mat] ‘she blamed’
[fá:.zat] ‘she won’
[ná:.zil] ‘climbing down’
[mán.zil] ‘house’
[más.kah] ‘a hold’
[fár.ħah] ‘happiness’
[ʃa:.lú:h] ‘they (masc. pl.) carried him’
[la:.mú:h] ‘they (masc. pl.) blamed him’
[na:.ʃú:h] ‘they (masc. pl.) touched him’
[mad.ʕú:m] ‘supported’
[mar.kú:n] ‘neglected’
[mat.rú:k] ‘left behind’
[χa:.látk] ‘your (masc. sg.) aunt (maternal)’
[na:.ʃátk] ‘she touched you (masc. sg.)’
[na:.dátk] ‘she called you (masc. sg.)’
[ðˤar.bátk] ‘your (masc. sg.) hit’
[ʁur.fátk] ‘your (masc. sg.) room’
[nab.tátk] ‘your (masc. sg.) plant’

Trisyllabic words:
[si.mák.ha] ‘her fish’
[li.bás.ha] ‘he wore it (fem.)’
[di.fáʕ.ha] ‘he paid it (fem.)’
[máz.ra.ʕah] ‘a farm’
[máʁ.sa.lah] ‘sink’
[di.wá:.jir] ‘circles’
[zi.bá:.jil] ‘garbage’
[ma.rá:.kiz] ‘centers’
[mi.sak.tú:h] ‘you (masc. pl.) captured him’
[ha.zam.tú:h] ‘you (masc. pl.) defeated him’
[ki.ʃaf.tú:h] ‘you (masc. pl.) disclosed it’
[mi.da:.rá:t] ‘orbits’
[du.wa:.má:t] ‘jobs’
[ka.ra:.má:t] ‘miracles’
[dʒa:.mal.ná:h] ‘we complemented him’
[wa:.dʒah.ná:h] ‘we saluted him’
[ga:.bal.ná:h] ‘we met him’
[dʒa:.mál.na] ‘we complemented’
[wa:.dʒáh.na] ‘we saluted’
[ga:.bál.na] ‘we met’

Longer words:

[dʒa:.mal.ná:.hum]	'we complemented them (masc. pl.)'
[wa:.dʒah.ná:.hum]	'we saluted them (masc. pl.)'
[ga:.bal.ná:.hum]	'we met them (masc. pl.)'
[ki.tab.tú:.ha]	'you (masc. pl.) wrote it (fem.)'
[ra.ħam.tú:.ha]	'you (masc. pl.) forgiven it (fem.)'
[fa.ram.tú:.ha]	'you (masc. pl.) minced it (fem.)'
[ki.tab.tú:.ni]	'you (masc. pl.) wrote me'
[ra.ħam.tú:.ni]	'you (masc. pl.) forgiven me'
[fa.ram.tú:.ni]	'you (masc. pl.) hit me hard'
[dʒa:.mal.ná:.ha]	'we complemented her'
[wa:.dʒah.ná:.ha]	'we saluted her'
[ga:.bal.ná:.ha]	'we met her'