International Journal of Language and Literary Studies
Volume 6, Issue 2, 2024
Homepage : http://ijlls.org/index.php/ijlls

Sonority-Induced Vowel Deletion and Epenthesis in Bedouin Hijazi Arabic

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DOI: http://doi.org/ 10.36892/ijlls.v6i2.1679
APA Citation: AL SOLAMI, M. (2024). Sonority-Induced Vowel Deletion and Epenthesis in Bedouin Hijazi Arabic. *International Journal of Language and Literary Studies.* 6(2).71-82. http://doi.org/ 10.36892/ijlls.v6i2.1679

Received:
15/03/2024

Accepted:
30/04/2024

Keywords:
vowel deletion, vowel epenthesis, sonority, Harmonic Serialism, Bedouin Hijazi Arabic .

Abstract

This paper examined vowel deletion triggered by sonority in Bedouin Hijazi Arabic. Bedouin Hijazi Arabic has a number of predictable vowel deletion processes that are phonologically conditioned. However, the type of vowel deletion examined in this paper is restricted in its application. It is triggered by sonority levels between a consonant in an onset position and a preceding coda. It results in word-medial clusters, which can trigger vowel epenthesis governed by the sonority hierarchy in the dialect. The epenthetic vowel varies in quality based on adjacent segments. The interaction between vowel deletion and epenthesis is examined within Harmonic Serialism, HS, a derivational framework of Optimality Theory. Instead of vowel deletion and vowel insertion taking place at all once, HS stipulates that only a single harmonic element is added progressively in each step. The same constraint hierarchy is implemented in each step until the desired output is achieved.

1. INTRODUCTION

The analysis in this paper focuses on Alwuʕara Dialect, henceforth AD, one of the Bedouin Hijazi Arabic of Saudi Arabia in the Hijaz area. AD is an under-studied Bedouin Hijazi Arabic dialect with a rapidly declining number of native speakers. Although vowel deletion and epenthesis in Bedouin Hijazi dialects have been examined in other studies (Abboud, 1979; Al-Mozainy, 1981; Irshied, 1985; Al-Sweel, 1987, 1990; Prochazka, 1988; Sakarna, 1990; Ingham, 1994; Alqahtani, 2014; Al Solami, 2020), sonority-triggered vowel deletion has not been reported. Previous studies examined high vowel deletion thoroughly in Bedouin dialects and attributed its occurrence to the idea that high vowels are weaker than low vowels. Low vowels, on the other hand, are only deleted due to exhaustive parsing preference, where unparsed syllables are deleted (Al Solami 2020). In addition to providing intriguing and useful data, this study examined low vowel deletion induced by sonority principles that is both not found in non-Bedouin dialects and has not been reported in other Bedouin dialects. It provides a deeper understanding of vowel deletion that is not governed by vowel quality nor by well-formedness principles, as previously suggested, but rather by the sonority of consonants preceding the vowel.

A distinctive aspect of the grammar of AD is that vowel deletion is predictable, and it has specific phonological environments. A different type of vowel deletion in AD that has not been examined previously or cited in any other study about Bedouin dialects can be observed in the examples in (1i), compare this with (1ii) where no vowel deletion takes place. The resulting clusters from vowel deletion in (1i) undergo epenthesis to adhere to the sonority requirements of the dialect.

The examples in (1ii) have a similar morphological makeup to those in (1i) but no vowel deletion is seen. An explanation for this is possible with reference to sonority generalizations as discussed below.

(1)	(i)	a. /madrasah/	mad.ra̲.sah	madr.sah	[ma.dir.sah]	‘a school’
		b. /muðˤrabah/	muðˤ.ra̲.bah	muðˤr.bah	[mu.ðˤur.bah]	‘a pan’
		c. /muknasah/	muk.na̲.sah	mukn.sah	[mu.kin.sah]	‘a broom’
		d. /musnadah/	mus.na̲.dah	musn.dah	[mu.sin.dah]	‘a recliner’
		e. /mufraʃah/	muf.ra̲.ʃah	mufr.ʃah	[mu.fur.ʃah]	‘a blanket’
		f. /mudʒrafah/	mudʒ.ra̲.fah	mudʒr.fah	[mu.dʒur.fah]	‘a duster’
	(ii)	a. /mibχarah/	mib.χa.rah		[mib.χa.rah]	‘a censer’
		b. /milʕagah/	mil.ʕa.gah		[mil.ʕa.gah]	‘a spoon’
		c. /mirsamah/	mir.sa.mah		[mir.sa.mah]	‘a pencil’
		d. /misbaħah/	mis.ba.ħah		[mis.ba.ħah]	‘a rosary’

The vowel deletion process in (1i) is found in Bedouin dialects and has not been reported in non-Bedouin varieties. Examples in (2)[1], from Urban Hijazi dialect, show similar examples to (1i) with no vowel deletion.

(2)	a. /madrasah/	[mad.ra.sah]	‘a school’

[1] The data in (2) are from Jeddah dialect spoken in adjacent areas to AD.

b. /muknasah/	[muk.na.sah]	‘a broom’
c. /misnadah/	[mis.na.dah]	‘a recliner’
d. /mafraʃah/	[maf.ra.ʃah]	‘a blanket’
e. /miʒrafah/	[miʒ.ra.fah]	‘a duster’

The nature of the inserted vowel in (1i) is goverend by two elements, the nature of the vowel coming before the inserted vowel and by emphasis. Therefore, the inserted vowel is /u/ when there is an adjacent emphatic sound /tˤ, sˤ, ðˤ/. In the absence of an emphatic sound, it is /i/ unless when the preceding vowel is /u/, then the inserted vowel is /u/.

The words /muknasah/ and /musnadah/ in (1i) are expected to have /u/ as an inserted vowel because the preceding vowel is /u/. However, the language consultants suggested that the epenthetic vowel could be /i/ or /u/. A possible explanation is that the underlying word is /misnadah/ and the initial vowel is rounded as a consequence of labialization effect due to the preceding bilabial. Labialization seems to be ordered after vowel epenthesis, in terms of derivation.

The examples in (1i) could alternatively be analyzed as involving metathesis between the vowel in the second syllable and the onset in that syllable followed by a change in the quality of that vowel, as in (3).

(3)	a. /madrasah/	ma.dar.sah	[ma.dir.sah] ‘a school’
	b. /muðˤrabah/	mu.ðˤar.bah	[mu.ðˤur.bah] ‘a pan’

However, this does not seem possible since vowel quality in this dialect does not change unless it occurs in an open syllable, or when it is epenthesized. Vowels in closed syllables remain unchanged and adopting this analysis would be very difficult to prove.

The examples in (1) show that vowel deletion seems random since all the words are monomorphemic with a similar CVCCVCVC syllable shape. This is a unique process in AD which has not been mentioned in any other Bedouin dialect, to the best of my knowledge. A possible trigger for the deletion in (1i) is the degree of sonority of the onset in the second syllable in relation to the preceding coda. Onsets in the second syllables in (1i) are more sonorous than the codas in the initial syllables.

Although consonant clusters in different word positions have been thoroughly examined in Arabic dialects (e.g., Abu-Salim, 1980; Selkirk, 1981; Kabrah, 2004; Al Solami, 2020; Mohammed, Samad, 2020), the pattern in (1i) is peculiar compared to other vowel deletions in AD and has not been examined previously. Sonority levels between an onset and a preceding coda have not been considered in another study of a Bedouin dialect.

This study deals with the vowel deletion process in (1i). The analysis implements Harmonic Serialism Theory as a framework (McCarthy, 2000, 2009a, 2009b, 2010). It focuses on sonority levels between the onset and the preceding coda. Section 2 introduces the research methods. Section 3 of the paper discusses the theoretical background of sonority in general and in AD in specific. In section 4, the analysis within HS is given. Finally, conclusions are given in section 5.

2. Research method

The current study examines how vowel deletion is governed by sonority generalizations in light of Harmonic Serialism branch of OT. To this end, two steps were implemented. First, a list of words with different syllable and morphological shapes were extracted from previous fieldwork I did in the past few years. The fieldwork consisted of recording sessions with native speakers of the dialect where words with different syllable and morphological shapes were elicited. The sessions took place at the homes of the participants and in the village where the dialect is spoken.

Second, the list was revised, and mistakes were corrected, if any, with two male and two female speakers of the dialect. The ages of the speakers were between 55 and 71. Then, the list was used in the analysis in this paper as given in the next sections.

3. Sonority generalizations in AD

Syllable phonotactics are language-based and they impose restrictions on the order of consonants within a syllable. Syllable phonotactics stem from sonority principles. Different sonority scales have been suggested in different studies. These scales are similar in many ways. However, despite similarities between languages, sonority principles differ from one language to the other (Selkirk 1984; Irshied 1985; Morelli 1999).

One shared feature of sound sequences within a syllable is that segments are ordered in a way which shows that the nucleus is the most sonorous element within the syllable and that further segments from the nucleus are less sonorous, called Sonority Sequencing Principle, SSP, (Selkirk 1984).

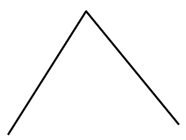
One proposal suggested by Clements (1990: 305) based sonority principles on different sound classes. This study implements a similar scale, as shown in (4).

(4) Sonority hierarchy in AD

Most Sonorous ↑	Vowels
	Glides
	Liquids
	Nasals
↓ Least Sonorous	Obstruents

One implication of the scale in (4) is that the level of sonority is expected to increase from the onset of the syllable to the nucleus and then it decreases towards the coda. This can be exemplified by the word *rabb* in (5).

(5)



r a bb

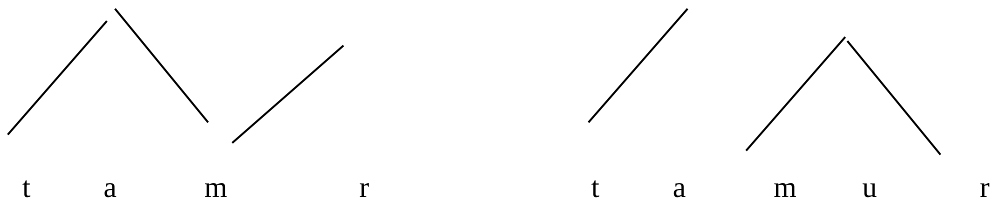
Clusters that do not follow the order in the hierarchy in (4), undergo vowel epenthesis as a repair mechanism in AD, as in (6).

(6) a. /tamr/ [ta.mur]'dates'

b. /ħibr/ [ħi.bir] 'ink'

c. /samn/ [sa.min] 'ghee'

d. /χibl/ [χi.bil] 'fool'



This representation shows that vowel [u] is inserted due to the coda cluster [mr] which violates the sonority hierarchy in AD according to the scale in (4).

The hierarchy in (4) shows that obstruents have the same level of sonority. This is why in (1ii) a word such as [mib.χa.rah] does not trigger elision because the second syllable has [χ] in the onset position which has the same level of sonority of [b] in the coda of the initial syllable.

Cross-linguistically, languages prefer low sonority onsets. An onset with low sonority has an auditory level that is different from the nucleus, and this facilitates the perception task (Delgutte 1997). This is evident in the order between clusters in onset position in languages such as Sanskrit and as reported in the phonology of child language (Gnanadesikan 1995; Barlow 1997).

A different sonority-based principle that is suggested to be found in different languages is the Syllable Contact Law (Hooper, 1976; Clements, 1988; Murray and Vennemann 1983), as given in (7).

(7) Sonority Contact Law (Vennemann, 1988: 40):
For all syllable contacts A.B, the more sonority falls from A to B, the more A.B is preferred.

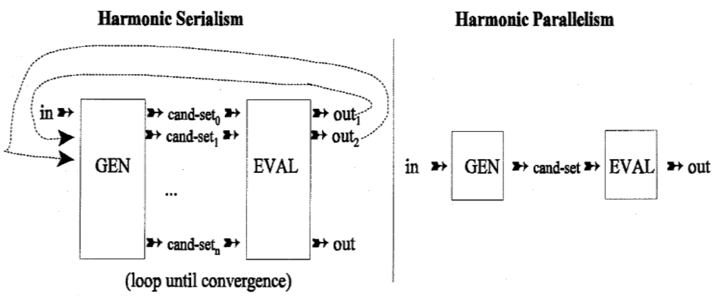
The Syllable Contact Law indicates that the sonority between hetero-syllabic coda-onset clusters needs to be equal or the coda needs to be higher on the sonority scale than a following onset. In other words, the initial sound of a syllable is expected to have a lower sonority level compared to the coda of the syllable that precedes it.

As a result, based on the rule in (7), a sequence such as [mar.ka], where [k] has a lower sonority level compared to the immediately preceding coda [r], is favoured to [mak.ra] with an increasing sonority. Languages resolve such clusters, where sonority is rising, through a number of strategies, among which are vowel deletion, and consonant or vowel epenthesis. In AD, as in (1), coda-onset combinations that do not follow the rule in (7) are resolved through vowel deletion.

4. ANALYSIS

The theory implemented in this study is based on Harmonic Serialism (HS) (McCarthy, 2000, 2009, 2010), which is different from Parallel Optimality Theory, OT. In HS, GEN is conditioned by the requirement of allowing only one change at a time to happen to candidates. McCarthy (2010: 2-3) indicates that the output of each round through GEN and EVAL functions as the input of a following pass through GEN and EVAL. Each run through GEN and EVAL is referred to as a step. This process continues until EVAL chooses an output that is not different from the input. The figure in (8), from McCarthy (2000: 2), shows the difference between Parallel OT and HS.

(8) The difference between Parallel OT and HS McCarthy (2000: 2)



One property of HS is that its GEN is restricted by Gradualness. In each step, GEN violates one faithfulness constraint. The candidate that is different from the input by one violation is the winner (McCarthy, 2007). Another property of HS is that deviations from the input must show harmonic improvement. In HS an input /A/ must map to output [C] with an intermediate form /B/, A→B→C, and the derivation must be in a gradual manner where B is more harmonic than A, and C is more harmonic than B (McCarthy, 2010). The constraints in HS are the same for each candidate set. In other words, the same grammar applies in every step (McCarthy, 2007).

McCarthy (2010: 3) gives an example from Classical Arabic to show how HS works. In many dialects of Arabic, consonant clusters are avoided in the onset position of the syllable by inserting a high vowel and a glottal stop. Implementing HS, as in (9) and (10), the mapping between the input /fʕal/ and the output [ʔif.ʕal] 'do!', needs to pass through an intermediate step where the vowel is inserted before the glottal stop fʕal→ ifʕal→ ʔifʕal, because in HS the GEN allows one step at a time.

(9) HS analysis of /fʕal/ → ʔif.ʕal — Step 1 (McCarthy 2010: 4)

/fʕal/	*COMPLEX-ONSET	MAX	CONTIGUITY	ONSET	DEP
a. → if.ʕal				*	*
b. fʕal	*W			L	L
c. fal		*W		L	L
d. fi.ʕal			*W	L	*

(10) HS analysis of /fʕal/ → ʔif.ʕal — Step 2

if.ʕal	*COMPLEX-ONSET	MAX	CONTIGUITY	ONSET	DEP
a. → ʔif.ʕal					*
b. if.ʕal				*W	L
c. fʕal	*W	*W			L

The HS analysis in (9) and (10) show that GEN does not allow the epenthesis of two segments at once, so the ultimate winner *ʔif.ʕal* is not available as a winner in the candidate set at the beginning of the derivation. Instead, the winner in (10) is *ifʕal* because it is the candidate that will eventually lead to the ultimate winner *ʔif.ʕal*.

At the next step in (11), the input of GEN is the winner in (10), which is *ifʕal*, and all the possible candidates in the candidate set that changes *ifʕal*. In this step, the same grammar is applied and chooses *ʔif.ʕal* as the winner because of MAX and DEP.

(11) HS analysis of /ʔifʕal/ → ʔif.ʕal — Step 3

ʔif.ʕal	*COMPLEX-ONSET	MAX	CONTIGUITY	ONSET	DEP
a. → ʔif.ʕal					
b. ʔi.fi.ʕal					*W
c. ʔif.ʕa		*W			

At step (3) in (11), the derivation has converged on the surface form because /fʕal/ has realised all of its potentials for harmonic improvement under this grammar (McCarthy, 2010: 4). This means that there are no other possible harmonic changes, and the output and the input are identical.

For the current analysis, vowel deletion and vowel epenthesis in AD due to sonority levels between an onset and a preceding coda can be accounted for within HS theoretical framework through the following constraints in (12).

(12) a. MAX-C (McCarthy, 2008):

Every consonant of the input has a correspondent in the output (no consonant deletion).

b. MAX-V (McCarthy, 2008):

Every vowel of the input has a correspondent in the output (no vowel deletion).

c. DEP-IO (McCarthy & Prince, 1995):
Every segment of the output has a correspondent in input (no epenthesis).

d. Syllable contact (SYLLCON) (Alderete, 1995; Rose, 1997):

The initial segment of a syllable may not be of greater sonority than the final segment of the preceding syllable.

e. Sonority Sequencing Principle (SSP) (Selkirk, 1984):

Sonority increases towards the syllable peak and decreases towards the syllable margins.

Examining the data in (1), a word such as /madrasah/ ‘school’ has the following derivation in (13).

(13) HS analysis of /madrasah/ → [ma.dir.sah] ‘school’— Step 1

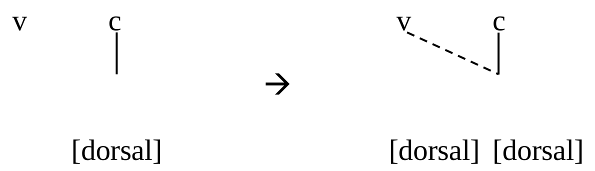
/madrasah/	SYLLCON	MAX-C	SSP	DEP-IO	MAX-V
a. → madr.sah			*		*
b. mad.ra.sah	*W				
c. ma.da.sah		*W			

The set of constraints in (13) successfully selects candidate (a) as the desired output in step 1. The remaining candidates are eliminated because they fail to satisfy the high-ranked constraints. Candidate (b) fatally violates SYLLCON constraint because the onset of the second syllable is higher in sonority compared to the coda of the initial syllable. Candidate (c) is eliminated because it did not satisfy the MAX-C constraint due to the deleted consonant. The optimal candidate *madrsah* in step 1 has a sonority reversal. In order to repair this sonority violation, vowel epenthesis is implemented.

As mentioned earlier, the type of the inserted vowel in AD is /u/ when there is an adjacent emphatic sound /$t^{ʕ}$, $s^{ʕ}$, $ð^{ʕ}$/. If the word has no emphatic consonant, the inserted vowel is /i/ unless when the preceding vowel is /u/, then the inserted vowel is /u/.

Emphasis in Arabic dialects is produced with a secondary, posterior constriction[2]. Card (1983) refers to the secondary articulation in emphatics in Arabic as pharyngealization since the back of the tongue moves toward the pharyngeal wall during the production of emphatics. The effect of emphatic sound on the vowel /i/, which results in a surface /u/ vowel, stems from the spread of the feature [dorsal] from emphatic sound to the underlying vowel, as can be illustrated in Figure 1. The presence of emphasis triggers a backing effect on adjacent vowels.

Figure 1. [dorsal] feature spread



In order to account for different epenthetic vowel qualities in the data, the constraint in (14) is introduced into the analysis.

(14) Agree (Place)

An inserted vowel and a tautosyllabic consonant agree in place feature.

In order to allow epenthesis to take place, the constraint in (14) cannot be lower in rank than DEP-IO. In addition, it eliminates possible candidates with vowels that do not have [dorsal] features similar to emphatic sounds, as in the following constraints in (15). The table in (16) shows steps 2 and 3 of HS analysis of the example in (13).

[2] Analyses of the nature of the secondary articulation in emphatic sounds in Arabic dialects vary from one study to another.

(15) SYLLCON, MAX-C >> SSP, Agree (Place) >> DEP-IO, MAX-V

(16) (i) HS analysis of /madrasah/ → [ma.dir.sah] ‘school’—Step 2

/madrsah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. ma.dir.sah →					*	
b. madr.sah			*W			
c. ma.dur.sah				*W	L	
d. mad.ra.sah	*W				L	

(ii) HS analysis of /madrasah/ → [ma.dir.sah] ‘school’—Step 3 (convergence)

/madirsah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. ma.dir.sah →						
b. ma.dur.sah				*W		
c. madr.sah			*W			L

At the intermediate stage in the derivation in (16i), the possible candidates are (b), which is faithful to the input, and the candidates that epenthesize different vowels in different word positions. Candidate (a) is the optimal candidate for step 2 because it satisfies Agree (Place) constraint and inserts the front vowel /i/, unlike candidate (c) where the back vowel /u/ is inserted. The word /madrasah/ does not have an emphatic sound and, as a result, there is no emphasis spread.

Finally, convergence takes place in step (3) in (16ii) where the input does not require any further changes. This means that the winner in step (2) remains the winner in step (3) with respect to the unchanged ranking hierarchy.

The following derivation examines the word /muðˤrabah/ ‘pan’ which has an emphatic sound /ðˤ/. It shows how to account for epenthetic vowels that are influenced by adjacent segments.

(17) (i) HS analysis of /muðˤrˤabah/ → [mu.ðˤur.bah] ‘pan’—Step 1

/ muðˤrabah /	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. → muðˤr.bah			*			*
b. muðˤ.ra.bah	*W					
c. mu.ðˤa.bah		*W				

(ii) HS analysis of /muðˤrˤabah/ → [mu.ðˤur.bah] ‘pan’—Step 2

/muðˤrˤbah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. → mu.ðˤur.bah					*	
b. muðˤr.bah			*W			
c. mu.ðˤir.bah				*W	L	
d. muðˤ.ra.bah	*W				L	

(iii) HS analysis of /muðˤrˤabah/ → [mu.ðˤur.bah] ‘pan’—Step 3 (convergence)

/muðˤurˤbah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. → mu.ðˤur.bah						
b. mu.ðˤir.bah				*W		
c. muðˤr.bah			*W			L

The derivation in (17) is similar to (13) and (16) with one difference. The epenthetic vowel is different in step 2. In (16) there is no emphatic sound, and the inserted vowel is a front vowel. In (17ii), on the other hand, the emphatic /ðˤ/ triggers a dorsal feature spread which requires the inserted vowel to be the back vowel /u/. This is illustrated in the elimination of candidate (c) in step 2 in (17ii) since the inserted vowel /i/ does not agree with the emphatic segment-in-place feature.

The number of derivation steps depends on the complexity of the structure. In examples with no violation of the SYLLCON constraint, no vowel deletion takes place in the first step. Consequently, the derivation does not involve vowel epenthesis which means that there is no need for an intermediate step. This is exemplified by the following tables.

(18) (i) HS analysis of /mirsamah/ → [mir.si.mah] ‘pencil’—Step 1

/mirsamah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. → mir.sa.mah						
b. mirs.mah						*W

(ii) HS analysis of /mirsamah/ → [mir.si.mah] ‘pencil’—Step 2 (convergence)

/mirsamah/	SYLLCON	MAX-C	SSP	Agree (Place)	DEP-IO	MAX-V
a. → mir.sa.mah						
b. mir.su.mah				*W		

In *mir.sa.mah* the sonority levels between the first consonant of the second syllable and the coda of the preceding syllable do not violate the hierarchy in (4). As a result, there is no need for a repair strategy, i.e., vowel deletion. The analysis does not require an intermediate level for vowel epenthesis as found in previous examples.

5. CONCLUSION

The analysis in this paper aims to examine vowel deletion triggered by differences in sonority levels between an onset and an immediately preceding coda. It also examines epenthesis that arises due to phonotactically prohibited consonant clusters that result from vowel deletion. The occurrence of such syllables is restricted by the Sonority Contact Law. Violation of the Sonority Contact Law triggers vowel deletion that creates a word medial cluster at an intermediate level within HS theory. The cluster is then subjected to vowel epenthesis. The epenthetic vowel is either /i/ or /u/ depending on adjacent segments. What is instrumental in deciding which epenthetic vowel is optimal is the Agree (Place) constraint.

These points are examined within HS theoretical framework. HS is powerful in allowing generalizations about intermediate representations that do not belong to neither the underlying level nor to the surface level. In addition, the restricted structure of GEN in HS results in separating vowel deletion from vowel epenthesis in AD with minimal changes in each step.

While this paper investigated structures and phonological processes that are uncommon in Arabic dialects and have not been examined in any other study, certain points need to be included in future research. Emphasis and emphasis spread in this paper could use more discussion within feature geometry. Different studies suggested different triggers of emphasis (e.g., Rose, 1996). Also, emphasis spread is a point of discussion in the literature of Arabic emphatics where they pattern differently in terms of spread direction. In addition, segments that block emphasis spread need to be examined in future studies.

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