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The Domain of Emphasis Spreading in Rural Jordanian Arabic

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Abstract

Emphasis spread has been empirically investigated in a number of Arabic vernaculars. Previous accounts of its (non-)application indicate that its domain varies across dialects, ranging from the adjacent vowels to the syllable, to the morpheme, and finally to the (phonological) word. This research paper, which contains an experiment analyzing data from 14 native speakers of Rural Jordanian Arabic (RJA) spoken in Irbid, explores the domain of emphasis spread in this sub-variety, which is an understudied dialect. The results show that emphasis spread is not sensitive to the adjacent vowels or the syllable, but rather to the morpheme type; that is, it applies to suffixes and proclitics, but not to clitics, unless the source of emphasis is very close to the target clitic. Following Selkirk (1996) and consistent with Jaradat (2018), we propose a prosodic account to emphasize spread in RJA: proclitics and suffixes are prosodically integrated into the host stem, and therefore they allow emphasis spread. On the contrary, clitics are prosodically free. Hence, the prosodic word boundary between a stem and a clitic blocks emphasis spread from the stem onto the clitic, unless the source of emphasis is too close to the target clitic. This implies that the domain of emphasis spread is not only dialect-specific, but may also differ among the sub-varieties of one Arabic dialect.

Keywords: Emphasis spread rural Jordanian dialect, pharyngealization, morphemic boundaries; prosodic boundary.

حقل انتشار التفخيم في اللهجة العربية الأردنية

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ملخّص

انتشار التفخيم درس تطبيقيا في من اللهجات العربية العامية. الدراسات السابقة تشير الى ان حقل انتشار التفخيم يمكن ان يكون حرف العلة المجاور او المقطع الصوتي او المقطع البنيوي او حتى الكلمة الفونولوجية. تشير نتائج هذه الدراسة التطبيقية المكونة من 13 متحدث للهجة الاردنية المحكية في المناطق الريفية الشمالية في اربد، الى ان حقل انتشار التفخيم في هذه اللهجة هو المقطع البنيوي (المورفيم)، وهذا ينطبق على اللواحق والسوابق والملصقات الفونولوجية السابقة ولكن ليس اللاحقة، الا اذا كانت قريبة من مصدر انتشار التفخيم. وهذا يشير الى ان انتشار التفخيم لا يطبق الا اذا كانت المكونات داخل الكلمة الفنولوجية. وهذا يؤكد على ان انتشار هذه الظاهرة يختلف من لهجة لأخرى.

الكلمات الدالة :التفخيم في اللهجة الاردنية الريفية، التفخيم، حدود المقطع البنيوي (المورفيم)، الحدود التنغيمية.

1. Introduction

Emphasis is common in Semitic languages (Laufer and Baer 1988; Watson 1999). It is characterized by the involvement of the back of the tongue in constricting the upper pharynx with the primary articulation of emphatics, which are $d^{ʕ}$, $t^{ʕ}$, $s^{ʕ}$ and $ð^{ʕ}$ (McCarthy 1994; Davis, 1995; Jongman et al., 2011; Jaradat 2018; among others). In the literature on emphasis, the acoustic correlates of emphasis on surrounding vowels are: salient F2 lowering and potential F1 and F3 raising (Card 1983; Al-Masri and Jongman 2004; Khattab et al. 2006; Abudalbuh 2010; Jongman et al. 2011; Youssef 2013; Al-Deaibes 2016; Jaradat 2018, among others). With regard to emphatic consonants, it has been reported that they are longer than their plain counterparts and have shorter VOT (Khattab et al. 2006; Abudalbuh 2004).

It is well documented that the pharyngeal feature of these coronals can influence neighboring plain segments in a process commonly called emphasis spread (or pharyngealization), since the constriction of the pharynx, which is required for producing an emphatic sound, can occur earlier before producing this emphatic segment and may persist during the production of the subsequent sounds. Consider the emphasis spread in (1) wherein the emphatic sound $s^{ʕ}$ triggers the pharyngeal feature on all the segments in the monosyllabic word.

(1) /$s^{ʕ}aam$/ → [$s^{ʕ}a^{ʕ}a^{ʕ}m^{ʕ}$]
Fast.3SGM.PST
'He did fasting.'

Emphasis spread is common in Arabic varieties; however, there are some conditions on its application that may vary among Arabic varieties. One of these conditions is related to the directionality of application. For example, emphasis spread is unidirectional in Saudi Arabic as spoken in Abha (Davis 1995), but bidirectional in Jordanian Arabic (Zawaydeh 1999). Furthermore, regressive spread is unbounded in many dialects, unlike progressive spread which is normally bounded (Davis 1995; Watson 1999). Beside directionality, it was reported in several studies that emphasis spread can be blocked by a specific set of segments, such as the high vowel *i* and the palatal *j* (Davis 1995; Watson 1999; Jongman et al 2007; Jongman et al. 2011, among other). Several studies also reported distance as a negative factor on emphasis spread. Specifically, the impact of an emphatic sound on the surrounding plain sounds gradually fades away as we move away from the emphatic sound.

On this basis, it is uncontroversial that emphasis spread can apply in one or both directions in Arabic; however, the directionality of this process, its blockers and its maximal domain of application may vary among Arabic vernaculars. Its domain can be the adjacent vowels, the syllable, the morpheme, or the (phonological) word (Herzallah, 1990; Younes 1991; Davis 1995; Zawaydeh, 1999; Al-Masri 2010; Alhammad 2014; Jaber et al 2019, Al-Raba'a & Davis 2020, among others). The current study empirically investigates the maximal domain of emphasis spread in RJA in tri-syllabic bimorphemic words. Its goal is to explore whether or not emphasis can spread within the word domain regardless of word-internal syllabic or morphemic boundaries. Thus, the main research question in this study is:

(1) Can the pharyngeal feature of an emphatic sound spread within a word domain without being blocked by the introduction of a morpheme boundary within bi-morphemic words in RJA? The bimorphemic words belong to the following types: stem+suffix, stem+clitic and proclitic+stem. Our initial hypothesis in the current paper is that its domain is the word and the introduction of word-internal syllable or morpheme boundaries will not block the spread of the pharyngeal feature on the segments of the word.

The outline of this paper is as follows: Section 2 reviews previous studies on emphasis and emphasis spread in Arabic vernaculars with special attention to previous studies that investigated the domain of spread in JA sub-varieties. Section 3 presents the hypotheses and the designed experiment. Section 4 discusses the empirical results. Section 5 provides a discussion of the results and offers a new account to emphasis spread, namely, a prosodic account. Finally, Section 6 presents concluding remarks.

2. The domain of emphasis spread in Jordanian sub-varieties

The majority of previous empirical studies on emphasis spread and its domain in Jordanian Arabic focus mainly on the Urban sub-variety. RJA, however, has received less attention, while the Bedouin sub-variety has been neglected, to the best of our knowledge.

Al-Masri and Jongman (2004) and Jongman et al (2011) reported that the maximal domain of emphasis spread in Urban Jordanian Arabic (UJA), is the syllable. However, the stimuli in these studies consist of only monosyllabic words. Polysyllabic words were required in order to explore whether or not emphasis spread will apply to all the syllables of a polysyllabic word. On the other hand, Zawaydeh and de Jong (2011) investigated the domain of emphasis spread in UJA spoken in Amman. In this study, the stimuli contained polysyllabic and polymorphemic words. They found that regressive emphasis spread is unbounded, but progressive spread is gradient: the F2 values of vowels increase as they are more distant from the source emphatic sound. This entails that the effect of progressive spread fades away due to distance from a pharyngeal segment. Hence, in this study the domain of emphasis is the word which is influenced by distance in the case of progressive spreading.

Jaber et al. (2019) provided a morphemic analysis to emphasis spread in UJA. They examined polysyllabic and polymorphemic words in order to find out the maximal domain of this process in UJA. The empirical results indicated that its maximal domain in this dialect is the morpheme. They found that only in polymorphemic words, emphasis spread is blocked by the introduction of a new morpheme boundary. In this study, Jaber et al collected polymorphemic words that have various types of bound morphemes: proclitics (e.g. reduced function words), suffixes and clitics, such as pronominal clitics. All these types of morphemes have been acoustically analyzed together. Therefore, the main finding of this study is that the morpheme is the maximal domain of spread; nonetheless, further investigation is needed since different types of morphemes can have different reactions to emphasis spread.

With regard to RJA, Huneety and Mashaqba (2016) explored the directionality of emphasis spread and its triggers and blockers in this sub-variety. All the participants were from one village located in the northern part of Jordan. In this study, the researchers created a wordlist of 50 minimal pairs that only differ in the pharyngeal feature, such as *tˤaab* 'to heal' vs. *taab* 'to repent'. They reported that emphasis spreads bidirectionally in RJA. However, progressive spreading has three blockers: *i*, *j*, and *š*. The target words are either simple or inflected words. On this basis, emphasis spread is blocked neither by a syllable boundary nor by a morpheme boundary. However, what casts some doubts on the validity of the results is that the study is based on tokens impressionistically analyzed, as there is no indication that the researchers analyzed the tokens acoustically. Similarly, Al-Deaibes (2016) reported that emphasis can progressively spread over suffixes and regressively over prefixes in RJA.

More recently, Jaradat (2018) has conducted an empirical examination of the potential spread of the pharyngeal feature onto other segments across word boundaries in RJA. His initial hypothesis is that the pharyngeal feature can spread from a word having a pharyngeal sound onto a neighboring plain word if they are internal to a particular prosodic domain, namely, the prosodic word. In this study, the target structures under investigation are simple construct states and structures that are a product of cliticization (i.e., a function word is reduced and then procliticized to a lexical word). Jaradat has selected these structures as they are more likely mapped onto prosodic words in the prosodic representation. The study results confirmed his initial hypothesis. Therefore, he has proposed that the domain of emphasis spread in RJA is the prosodic word.

In the current study, the main aim is to determine whether or not emphasis spread is blocked by the boundaries of different bound morphemes in trisyllabic bimorphemic words in RJA. This research question is based on the results of the previous studies on the domain of emphasis spread in RJA, especially Al-Deaibes (2016). In his study, the boundaries of morphemes do not block emphasis spread. This finding seems to be overgeneralized, as the morpheme type should be taken into account. Hypothetically, suffixes, for example, may block this process, and proclitics or clitics may not be able to do so. There are three possible scenarios with respect to the spread of the pharyngeal feature onto neighboring segments in RJA. The first scenario is that all types of morphemes in RJA resist emphasis spread, as is the case in UJA. This way, the morpheme should be the domain of emphasis spread. The second scenario is that some but not all bound morphemes can undergo

pharyngealization. If this turns to be correct in RJA, it can then be proposed that the domain of spread in this dialect, like in UJA, is the morpheme; however, RJA is sensitive to the morpheme type: some but not all of them resist emphasis spread. The last possible scenario is that all types of bound morphemes do not resist emphasis spread. In this case, the domain of this process in RJA must be larger than the morpheme. We will argue later that the second scenario holds in the sub-variety under study.

3. Method

3.1. Hypothesis and predictions

Early studies on emphasis spread in Arabic varieties indicate that the maximal domain of this process may vary across Arabic dialects. Its application domain can be the syllable, as in Abha Saudi Arabic (Younes 1991; Davis 1995) or the phonological word as in Palestinian Arabic (Herzallah, 1990) and Ammani Jordanian Arabic (Zawaydeh, 1999). In Bukshaisha (1985), it was reported that this process can even override the word boundaries in Qatari Arabic: the pharyngeal feature can spread onto the adjacent word. More recently, it has been reported in Jaber et al (2019) and Alhammad (2014) that the domain of emphasis spread is the morpheme in UJA and the uninflected word in Najdi Arabic, respectively. In accord with that, Arabic varieties can be classified as syllable-sensitive, morpheme-sensitive and word-sensitive in terms of dealing with emphasis spreading. The main research question in the current study is: can syllable or morpheme boundaries systematically block the spreading of the pharyngeal feature in RJA?

Our starting hypothesis is that the word, regardless of its internal morphemic boundaries, is the domain of emphasis spread; that is, the introduction of a new morpheme boundary will not result in the blockage of the spreading of this pharyngeal feature within the word domain. On the basis of this hypothesis, the pharyngeal feature of an emphatic consonant in morphosyntactically complex (bimorphemic) word should spread over the entire word overriding a morphemic boundary. For example, the pharyngeal feature of the emphatic sound *tˤ*, which is located in the first morpheme (the lexical morpheme/stem) *tˤalab* in (2a), is expected to spread progressively towards the right edge of the bimorphemic word *tˤa.la.b-aat* ‘orders’. In other words, the left boundary of the bound (functional) morpheme *-aat* (the feminine plural suffix) should not block pharyngealization. The same scenario should be observed in the second example in (2b): emphasis should spread progressively from the stem *ba.laatˤ* ‘tiles’ onto the suffix *-aat*. Note that the pharyngeal sound of the stems (i.e., lexical morphemes) is located on the opposite side of the bound morpheme in (2a) and immediately precedes it in (2b). This shows the possible impact of distance from the source emphatic sound on emphasis spread. (COLL = COLLECTIVE)

(2) a. /*tˤa.la.b-aat*/ → [*tˤaˤlˤaˤbˤ-aˤaˤtˤ*]
Order-PLF
‘Orders’

b. /*ba.laatˤ-aat*/ → [*bˤaˤlˤaˤaˤtˤ-aˤaˤtˤ*]
tile(COLL)-PLF
‘Tiles’

Beside suffixes, bound morphemes can be proclitics and clitics, as shown in (3&4), respectively. In (3), the two target words, which contain the emphatic sound *tˤ*, host the prepositional proclitic *la-*. Analogous to the examples in (2), the pharyngeal feature of *tˤ* should spread bidirectionally in (3a) and regressively from the right edge of the word to its left edge in (3b).

(3) a. /*la-tˤullaab*/ → [*lˤaˤ-tˤuˤlˤlˤaˤaˤbˤ*]
To-student.BPL
‘To students’

b. /*la-ba.laatˤ*/ → [*lˤaˤ-bˤaˤ.ˤlˤaˤaˤtˤ*]
to-tile. COLL
‘To tiles’

With respect to clitics, they should also acquire the pharyngeal feature from the host stem whether the source of emphasis (the emphatic sound) is located at the right or the left edge of the host stem. Consider the 1st plural pronominal clitic *-na* in (4) whose vowel acquires the pharyngeal feature from the stem *t͟ˤa.lab*.

(4) a.[*t͟ˤa.lab-na*] → [*t͟ˤaˤ.lˤaˤbˤ-nˤaˤ*]
Order-1PL
'We ordered.'
b. [*bal.lat͟ˤ-na*] → [*bˤaˤlˤlˤaˤt͟ˤ-nˤaˤ*]
Install.PST-1PL
'We installed tiles.'

It is predicted that the first three formants of all the instances of the target vowel in each bound morpheme (suffix, clitic or proclitic) in every bimorphemic word are influenced by the pharyngeal feature of the emphatic sound in the stem: the values of the first and the third formant (F1 & F3) should be raised and the value of the second formant (F2) should be lowered significantly. This pharyngeal impact is predicted to be the clearest on F2 of the target vowel, as the lowering of F2 values is the most salient correlate of the pharyngeal feature on vowels in Arabic. If these predictions are borne out in RJA, then this entails that the application of emphasis spread is not sensitive to the morphological complexity of words (and is, by extension, insensitive to phonological complexity). Therefore, the domain of emphasis is larger than the morpheme (or the syllable) in RJA.

On the other hand, if F2 lowering of the target vowel and F1 and F3 raising are not observed in the vowel of bound morphemes (proclitics, clitics and suffixes), this indicates that the morphemic boundary between the stem (lexical morpheme) and bound (functional) morpheme blocks emphasis spread. Therefore, the domain of spread should be the morpheme.

3.2. Stimulus

The wordlist of this study consists of 60 bimorphemic minimal pairs that contrast the pharyngeal sounds *tˤ* and *sˤ* with their plain counterparts (some of these words are nonsense words due to limitations on the target dialect: it is sometimes too difficult to find minimal pairs that differ only in emphatic-plain contrast of one sound). They are divided evenly into 6 pharyngealized groups, as shown in the following table (see the appendix for the full wordlists).[1] Each pharyngealized group has a plain counterpart. The vowel, which is under investigation in this current study, is the short low front /a/. This vowel has been targeted since it, as far as we can tell, has not been reported as a blocker of emphasis spread. This vowel is different from, for example, the vowel /i/, which was reported as one of the blockers of progressive emphasis spread in Palestinian Arabic (Davis 1995).

Table 1. Types of trisyllabic bimorphemic words and the distributions of the source pharyngeal consonant.

Word type	/tˤ/ or /sˤ/ distribution	Number of words
Stem+Suffix	Stem-initial	10
	Stem-final	10
Stem+Clitic	Stem-initial	10
	Stem-final	10
Proclitic+Stem	Stem-initial	10
	Stem-final	10

[1] Tri-morphemic or poly-morphemic words are beyond the scope of the current paper. Nevertheless, increasing the number of morphemes in a word should lessen the impact of the target emphatic sound on the surrounding vowels as this increment should activate the function of distance on emphasis spread. More specifically, vowels can be too far from the source of emphasis, and therefore the pharyngeal feature will fade away.

The total number of collected tokens is 1680 words (60 polymorphemic words x 2 (pharyngealized and plain minimal pair) x 14 participants).

3.3. Speakers and procedures

Fourteen native speakers (7 males and 7 females) of RJA spoken in Irbid participated in the recording sessions. They are between 18 and 40 years old. They are graduate and undergraduate students at Yarmouk University, an institution located in the city of Irbid. All of them were born and brought up in the rural areas of Irbid. Recordings were made with a unidirectional microphone connected to a solid-state recorder (Marantz PMD670) in a soundproof room. All the recordings are mono and the sampling rate is 44,100 Hz.

The wordlist was presented on PPT slides. Each slide contains a pharyngeal word (i.e., a word having a pharyngeal sound) and its plain counterpart (60 PPT slides). Each participant was asked to read the wordlist 2 times in one session that lasted around 20 minutes. Each participant was given 2 minutes after the first reading. Only the second reading was recorded and submitted to acoustic and statistical analyses.[2]

3.4. Measurements and statistical analysis

All measurements were made with Praat, a speech analysis software (Boersma and Weenink, 2007). Based on inspection of formants and waveforms, vowels of functional morphemes (i.e. clitics, proclitics and suffixes) were segmented. Following Jongman et al (2011), the onset of a vowel was taken at the point F1 emerged in the spectrogram and its offset was where F2 was clearly weakened or disappeared from the spectrogram. No *i*, *i:* and *j* were included between the source and target of pharyngealization, as they may block the coarticulation of pharyngealization (Zawaydeh 1999, Khattab et al. 2006, among others). Generally, pharyngealized segments have a higher F1 and F3 values than the values of their plain counterparts (Abudalbuh, 2011, Jongman et al 2011), but their most salient correlate, by far, is an important lowering in F2 (Wahba 1993, Zawaydeh 1999, Al-Masri and Jongman 2004). For this reason, in the current study all the three correlates of pharyngealization were measured at the midpoint of each target vowel within functional morphemes (the midpoint between the onset and offset of a vowel).

The F1, F2 and F3 measured values of the target vowel in the collected tokens have been normalized to avoid any impact of gender differences on the results. Then, the normalized values have been submitted to statistical analyses, One-way Repeated Measures Analyses of Variance (ANOVAs) to assess the effect of emphasis (the target pharyngeal sounds) on the vowel of an adjacent bound morpheme. More specifically, these analyses are to determine whether or not the pharyngeal feature spreads from a lexical item (a stem) onto an adjacent bound morpheme (a suffix, clitic and proclitic) by affecting the values of the first three formants of the vowel in each bound morpheme. The independent factor is the group (either the pharyngeal or plain context), and the dependent variables are the normalized F1, F2 and F3 values of the vowel /a/ within the target morphemes, namely, suffixes, proclitics and clitics.

4. Results

In this section, we will discuss the impact of pharyngeal sounds located within the stem on the first three formants of the vowel /a/ of suffixes, clitics and proclitics.

[2] Worth noting is that a carrier phrase was not used in the task. In the related literature, the carrier phrase is used to control for the context effects, especially when one tries to measure and determine the correlates of emphasis in all the sounds in a word (either consonants or vowels). In this study, there is only one vocalic target in each token. Since we were focusing only on the first three formants of this vocalic target, it was not a difficult task to delimit the onset and offset of each vowel, while segmenting them. A potential negative impact that made the researchers in this study avoid the carrier phrase/sentence is that they may lead the participants to lend much focus on the target words and vowels. The carrier sentence shall repeat, and therefore it will be given information and receive no focus by the participants. On the contrary, the target pharyngeal vs. plain words will keep changing throughout the reading task. This may make the participants subconsciously add focus to some of the words, but the interaction between focus and emphasis should be avoided. Hence, the goal, which is to make the task more natural, is not guaranteed using a carrier phrase.

4.1 Suffixes

As can be observed in Table 2 & 3, One-way Anova analyses show that only F2 values of vowels within suffixes attached to stems containing a pharyngeal sound in initial position (Table 2) and in final position (Table 3) are significantly lower than those of the vowels of the suffixes attached to plain stems.

Table 2. Difference of the first three formants between plain and pharyngealized words (stem-initial + suffix).

		Sum of Squares	df	Mean Square	F	Sig.
F1	Between Groups	.006	1	.006	.006	.939
	Within Groups	278.994	278	1.004		
	Total	279.000	279			
F2	Between Groups	63.348	1	63.348	81.663	.000
	Within Groups	215.652	278	.776		
	Total	279.000	279			
F3	Between Groups	.606	1	.606	.605	.437
	Within Groups	278.394	278	1.001		
	Total	279.000	279			

Table 3. Difference of the first three formants between plain and pharyngealized words (stem-final + suffix).

		Sum of Squares	df	Mean Square	F	Sig.
F1	Between Groups	.056	1	.056	.056	.813
	Within Groups	278.944	278	1.003		
	Total	279.000	279			
F2	Between Groups	129.432	1	129.432	240.573	.000
	Within Groups	149.568	278	.538		
	Total	279.000	279			
F3	Between Groups	.002	1	.002	.002	.965
	Within Groups	278.998	278	1.004		
	Total	279.000	279			

4.2 Vowels of clitics

One-way Anova analysis in Table 4 shows that all the three formants values of vowels within clitics in plain and pharyngeal contexts are not significantly different. On the other hand, Table 5 shows that there is a significant difference in F2 values when the pharyngeal sound is located in stem-final position. This confirms that the F2 mean lowering in Figure 4 is significant.

Table 4. Difference of the first three formants between plain and pharyngealized words (stem-initial + clitic).

		Sum of Squares	df	Mean Square	F	Sig.
F1	Between Groups	.005	1	.005	.004	.947
	Within Groups	278.995	278	1.004		
	Total	279.000	279			
F2	Between Groups	1.366	1	1.366	1.368	.243
	Within Groups	277.634	278	.999		

		Sum of Squares	df	Mean Square	F	Sig.
	Total	279.000	279			
	Between Groups	.441	1	.441	.440	.508
F3	Within Groups	278.559	278	1.002		
	Total	279.000	279			

Table 5. Difference of the first three formants between plain and pharyngealized words (stem-final + clitic).

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	.104	1	.104	.104	.748
F1	Within Groups	278.896	278	1.003		
	Total	279.000	279			
	Between Groups	25.248	1	25.248	27.661	.000
F2	Within Groups	253.752	278	.913		
	Total	279.000	279			
	Between Groups	1.286	1	1.286	1.288	.257
F3	Within Groups	277.714	278	.999		
	Total	279.000	279			

4.3 Vowels of proclitics

Similar to the results of suffixes reported in 4.1, One-way Anova analyses, as can be seen in Tables 5&6, show that only the difference in F2 values of vowels within proclitics, attached to stems containing a pharyngeal sound in initial and final positions, is significant. This confirms that the lowering of the F2 means in Figure 5 and Figure 6 is significant.

Table 5. Difference of the first three formants between plain and pharyngealized words (stem-initial + proclitic).

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	3.375	1	3.375	3.404	.066
F1	Within Groups	275.625	278	.991		
	Total	279.000	279			
	Between Groups	18.108	1	18.108	19.295	.000
F2	Within Groups	260.892	278	.938		
	Total	279.000	279			
	Between Groups	.273	1	.273	.273	.602
F3	Within Groups	278.727	278	1.003		
	Total	279.000	279			

Table 6. Difference of the first three formants between plain and pharyngealized words (stem-final + proclitic).

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	.849	1	.849	.848	.358
F1	Within Groups	278.151	278	1.001		
	Total	279.000	279			
F2	Between Groups	12.207	1	12.207	12.720	.000
	Within Groups	266.793	278	.960		

		Sum of Squares	df	Mean Square	F	Sig.
	Total	279.000	279			
	Between Groups	.106	1	.106	.106	.746
F3	Within Groups	278.894	278	1.003		
	Total	279.000	279			

4.4 Summary of results

The results of the first three formants indicate that the lowering of F2 values is the only reliable correlate of pharyngealization in RJA. As for F1 and F3, the results do not confirm that there is significant raising of F1 and F3 values of the target vowels in pharyngealized environments. The findings also show that the pharyngeal feature in a stem spreads onto suffixes and proclitics in RJA, regardless of the position of the source of emphasis in the stem. As can be observed in Figure 7, the pharyngeal sound which is originally stem-internal spreads regressively onto the proclitic *la* 'to' on the left of the figure. The F2 value of its vowel on the left of the figure is only 965 Hz as it is the pharyngeal context. On the contrary, in the plain context on the left of Figure 7 the F2 value of the same vowel is about 1700 Hz.

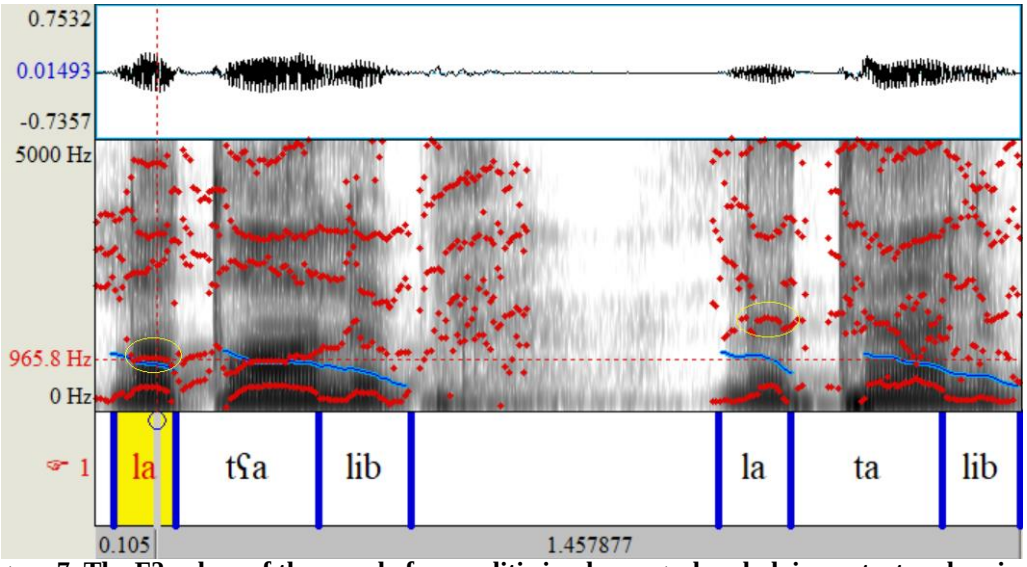

Figure 7. The F2 values of the vowel of a proclitic in pharyngeal and plain contexts, wherein the source of emphasis is stem-initial.

As for clitics, it has been shown that emphasis does not spread onto a clitic when the source of emphasis is far from it. On the contrary, a clitic is pharyngealized when the source of emphasis is close to it. As can be observed in Figure 8, the pharyngeal feature of the stem on the left does not spread onto the pronominal clitic *-na* '1PL'. The values of F2 of the vowel of *-na* in the pharyngeal context and the plain context are not that different, as marked by the yellow circles (around 1550 Hz for both).

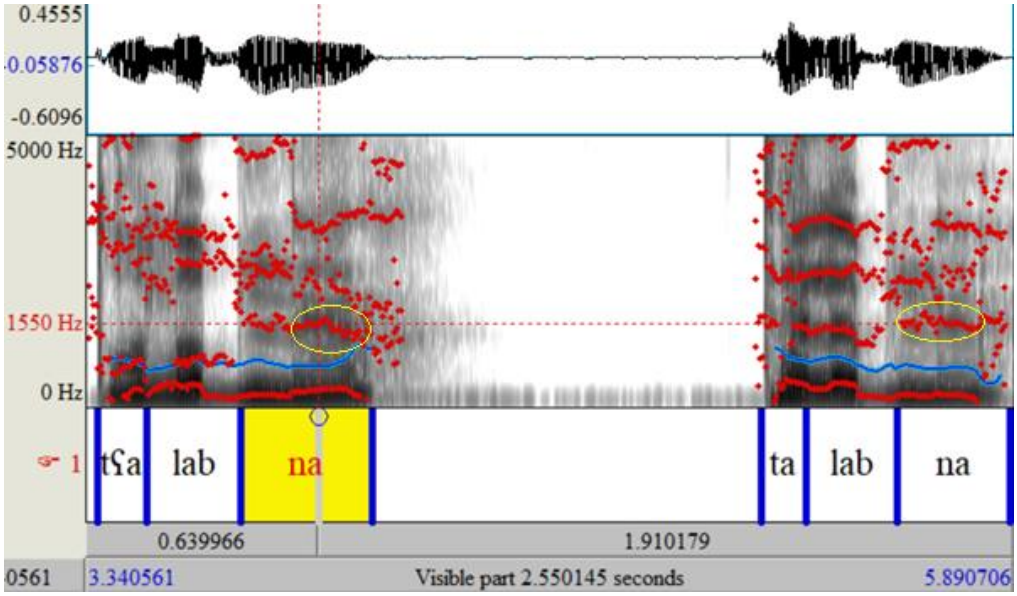

Figure 8. The F2 values of the vowel of a clitic in pharyngeal and plain contexts, wherein the source of emphasis is stem-initial.

On the other hand, the F2 value of the vowel of the clitic *-na* '1PL' in the pharyngeal context on the left of Figure 9 is clearly lower than its value in the plain context on the right. The former is 1046 Hz, while the latter is 1381 Hz. This is a clear indication that emphasis spreads when the source of emphasis is close to the clitic.

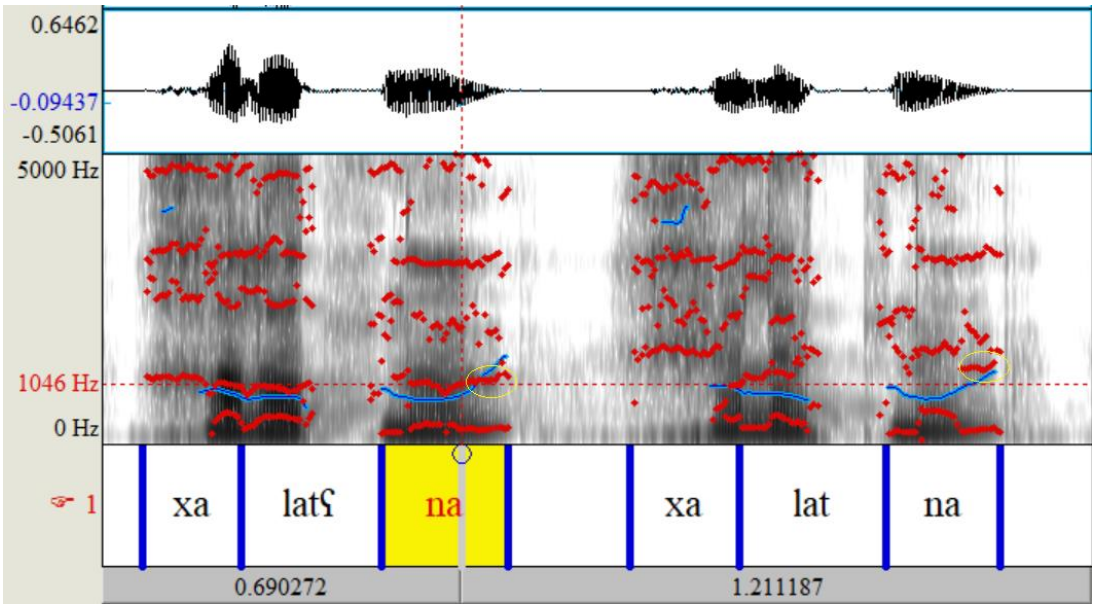

Figure 9. The F2 values of the vowel of a clitic in pharyngeal and plain contexts, wherein the source of emphasis is stem-final.

5. Discussion: the domain of emphasis spread in Rural Jordanian Arabic

In the current study, the effect of stem-internal pharyngeal sounds on the vowel /a/ of different bound morphemes in bimorphemic words was investigated in order to determine whether the domain of emphasis spread is the morpheme or whether it is a larger unit in RJA. In other words, does the introduction of a new morpheme boundary within a bimorphemic

word block emphasis spread? The bound morphemes under investigation are suffixes, clitics and proclitics. The results emphasize that emphasis of the pharyngeal feature spreads onto almost all types of morphemes, except for clitics only when the source of emphasis is far from the target clitic. The values of F2, which is the most salient correlate of pharyngealization, were significantly lowered in pharyngealized environments (except for clitics far from the source of emphasis). This is almost incompatible with the findings of Jaber et al (2019) who show that a morpheme boundary is a blocker to the spreading of the pharyngeal feature in UJA. This is also incompatible with Alhammad (2014) and Younes (1993) who argue that the domain of emphasis spread is the uninflected word in Najdi Arabic and Cairene Arabic.

The results of the current study also indicate that emphasis spread is not influenced by the distance between the source of emphasis and the target vowel except for the aforementioned condition of clitics. This entails that there is no restriction on emphasis spreading from stems onto suffixes and proclitics in RJA, but there is a restriction on rightward spreading onto clitics: distance can block spreading. When the source of pharyngealization (i.e. a pharyngeal consonant) is close to the boundary of a clitic, this boundary cannot block spreading, perhaps because of restrictions on articulation and timing: the narrowing of the pharynx caused by the pharyngeal consonant (Watson 1999) continues while producing the nucleus of the adjacent clitic since there is no enough time to change the status of the pharynx when the pharyngeal consonant is immediately adjacent to a clitic.

5.1 A prosodic account to emphasis spread in Rural Jordanian Arabic

The question arising here is: how can we account for the blockage of emphasis spread onto a clitic when the source is far from it? Following Selkirk (1996), and consistent with Jaradat (2018), we propose a prosodic analysis to emphasis spread in RJA, as follows:

I. Proclitics and suffixes act as prosodically internal clitics in this dialect. They are in the same (flat) prosodic word (ω) embedding the stem; therefore, the pharyngeal feature spreads onto their segments. As can be observed in (5), for instance, the pharyngeal feature of *tˤ* in the stem *tˤalab* spreads onto the entire bimorphemic word including the plural suffix *-aat* 'F.PL'.

(5) $(t^{ˤ}a^{ˤ}l^{ˤ}a^{ˤ}b^{ˤ}\text{-}a^{ˤ}a^{ˤ}t^{ˤ})_{\omega}$
Order-F.PL
'Orders'

II. Clitics are elements freely cliticized to stems. This creates a two-level ω, which is commonly called recursive ω. It consists of a minimal and a maximal ω, as can be seen in (6). On this basis, the pronominal clitic *-na* '1PL' in (6) is cliticized at the time the maximal ω is formed. Hence, the right boundary of the minimal ω blocks the spreading of the pharyngeal feature onto the free pronominal clitic *-na*. (minω = minimal ω and maxω = maximal ω.)

(6) $((t^{ˤ}a^{ˤ}.l^{ˤ}a^{ˤ}b^{ˤ})_{\min\omega}\text{-}na)_{\max\omega}$
order-1PL
'We ordered.'

III. However, when the source of the pharyngeal feature is too close to the free clitic, it is expected to be pharyngealized. Because of the adjacency of underlying emphatic sound in (7), the target clitic is not influenced by the intervening prosodic boundary due to restrictions on articulation and timing, as discussed above. Thus, emphasis spread applies.

(7) $((b^{ˤ}a^{ˤ}.l^{ˤ}a^{ˤ}a^{ˤ}t^{ˤ})_{\min\omega}\text{-}n^{ˤ}a^{ˤ})_{\max\omega}$
Tiles-1PL
'Our tiles'.

Based on the previous discussion, the major argument of the current paper is consistent with the findings in Jaradat (2018), where the domain of emphasis spread in RJA is a prosodic domain, the ω. However, the structures under investigation

are different in these two studies. In the current paper, different types of bound morphemes have been examined (i.e., suffixes, proclitics and clitics), whereas in Jaradat (2018) the target structures are simple construct states and sequences containing a reduced function word and a lexical word. On this basis, the current empirical study confirms that the domain of emphasis spread is dialect-specific. Further, it also shows that the domain of emphasis spread may vary among the sub-varieties that belong to the same Arabic dialect. It reports that the domain of emphasis spread in RJA has its own peculiarity in comparison with the well-studied Jordanian sub-variety, UJA, along the lines of Jaradat (2018). The domain of the former is a prosodic unit, and that of the latter is the morpheme. In RJA, it has been shown that the prosodic account is adequate to capture its domain of application. It is favored over the morphemic account, which is proposed by Jaber et al. (2019) for UJA, since it can capture the peculiarities of emphasis spread in RJA.

Before closing this paper, we should address an important issue and it can be summarized in the following question: what happens if emphasis spreads in words containing more than 2 morphemes? To approach this issue, we have listed the possible scenarios in (8):

(8) a. *Proclitic+stem+affix*
b. *Proclitic+stem+clitic*
c. *Proclitic+stem+affix+clitic*

Based on the findings of the current study, in (8a) it is expected that emphasis should spread from the stem onto the proclitic and the affix. In (8b), it should spread onto the proclitic but not on the clitic, unless the pharyngeal sound is very close to the clitic. In (8c), it should spread from the stem onto the proclitic and affix, but not onto the clitic as it is not close to the clitic.

Another important question that should be raised here is: What if the stem has more than two syllables (e.g., three syllables)? Will that leave an impact on emphasis spread from the stem to the surrounding functional morphemes (i.e., proclitics, suffixes and clitics)? It should not leave an impact on clitics as they show some resistance to emphasis spread in the current study. This means that the increase of the number of syllables in a stem may increase the distance between it and the clitic (i.e., emphasis spread will somehow fade away by distance). This distance will make it easy for the clitic to block emphasis spreading. With regard to proclitics, it has been reported in several experimental studies that the regressive spreading is stronger than the progressive one (see Davis 1995). For instance, the regressive one is less influenced by spread blockers, such as the high vowel *i* and the glide *j*. Thus, we expect that emphasis will spread on a proclitic even if the source of emphasis is far from the proclitic. As for affixes, it is possible that distance from a suffix will have an impact on emphasis spread on the suffix; however, the suffix is prosodic word-internal and should be pharyngealized. We leave these two questions for future research where wordlists will be designed in a way to capture these variables.

6. Conclusion

In this paper, the main focus was the domain of emphasis spread in RJA. Generally speaking, previous studies on emphasis spread in various Arabic dialects indicate that this process is sensitive to syllable or morpheme boundaries. This study, however, showed that this process in the RJA under consideration is not sensitive to these boundaries. It has been proposed in this study that the spreading of the pharyngeal feature is sensitive to prosodic boundaries in RJA: the prosodic boundary (i.e., ω boundary) between a word and a bound morpheme that behaves like a prosodically free morpheme blocks the spreading of the pharyngeal feature onto that bound morpheme. On the basis of these results, this paper shows that Jaber et al.'s (2019) recent claim that in UJA, another subdialect of Jordanian Arabic, emphasis spread applies only within the morpheme domain cannot be generalized to all Jordanian sub-varieties as the prosodic account presented in this paper is preferable to the morphemic account for RJA results.

Appendix: Wordlist in 6 environments of emphasis spread.

Bimorphemic words (word+suffix) with pharyngeal/plain contrast in word-initial position			
Pharyngealized word		**Plain counterpart**	
tˁa.ba.ʕaat	'Editions'	*ta.ba.ʕaat*	'Consequences'
sˁa.la.waat	'Prayers'	*sa.la.waat*	Nonsense word
sˁa.fa.raat	'Flights'	*sa.fa.raat*	'Flights'
tˁa.la.baat	'Orders'	*ta.la.baat*	Nonsense word
tˁaw.waa.gaat	'Nonsense word'	*taw.waa.gaat*	Nonsense word
tˁa.ra.faat	'Edges'	*ta.ra.faat*	Nonsense word
tˁab.baa.laat	'Drummers'	*tab.baa.laat*	Nonsense word
tˁaw.waa.faat	'Helicopters'	*taw.waa.faat*	Nonsense word
tˁa.ra.faat	'Edge.PL'	*ta.ra.faat*	Nonsense word
tˁa.ma.saat	'Smear-PL'	*ta.ma.saat*	Nonsense word

Bimorphemic words (word+suffix) with pharyngeal/plain contrast in word-final position			
Pharyngealized word		**Plain counterpart**	
xal.la.tˁaat	'Blenders'	*xal.la.taat*	Nonsense word
wa.sa.tˁaat	'Connections'	*wa.sa.taat*	Nonsense word
ba.la.tˁaat	'Tiles'	*ba.la.daat*	'dullness-PL'
ha.ba.tˁaat	'Relegations'	*ha.ba.taat*	Nonsense word
ba.sˁaat	'Buses'	*ba.saat*	Nonsense word
ma.gasˁ.sˁaat	'Scissors'	*ma.gas.saat*	Scissors
xal.laa.tˁaat	'Blenders'	*xal.laa.taat*	Nonsense word
waas.tˁaat	'Connections'	*waas.taat*	Nonsense word
xu.laa.sˁaat	'Conclusions'	*xu.laa.saat*	Nonsense word
mxasˁ.sˁa.sˁaat	'Special-F.PL'	*mxas.sa.saat*	'Made thinner-F.PL'

Bimorphemic words (word+clitic) with pharyngeal/plain contrast in word-final position			
Pharyngealized word		**Plain counterpart**	
xa.latˁ.na	'We mixed.'	*xa.lat.na*	Nonsense word
ʕaj.jatˁ.na	'We cried.'	*ʕaj.jat.na*	Nonsense word
ga.ratˁ.ha	'He bites it.'	*gar.rad.ha*	'He drove it crazy.'
ga.rasˁ.na	'He tweaks us.'	*ga.ras.na*	Nonsense word
ħa.rasˁ.na	'We were careful.'	*ħa.ras.na*	'We guarded'.
fa.ratˁ.ha	'He picked it.'	*fa.rat.ha*	Nonsense word
gatˁ.tˁatˁ.ha	Nonsense word	*gat.tat.ha*	Nonsense word
faʕ.ʕasˁ.ha	'He squeezed it'.	*faʕ.ʕas.ha*	'He squeezed them.'
ma.ratˁ.ha	'He cut it into two pieces.'	*ma.rad.ha*	'Her destination'
ga.ratˁ.ha	'He bites her.'	*ga.ras.ha*	Nonsense word

Bimorphemic words (word+clitic) with pharyngeal/plain contrast in word-initial position			
Pharyngealized word		**Plain counterpart**	
tˤa.lab.na	'We ordered.'	*ta.lab.na*	Nonsense word
sˤa.laat.ha	'Her prayers.'	*sa.laat.ha*	Nonsense word
tˤa.baʕ.ha	'He printed it out.'	*ta.baʕ.ha*	'Theirs'.
sˤa.raʕ.na	'He made us crazy.'	*sa.raʕ.na*	'We walked faster.'
tˤa.bal.na	'He made us crazy.'	*ta.bal.na*	Nonsense word
sˤa.mad.ha	'He made her a bride.'	*sa.mad.ha*	Nonsense word
sˤa.lab.na	'He crossed us.'	*sa.lab.na*	'He stole us'.
tˤa.baʕ.ha	'He printed it out.'	*ta.baʕ.ha*	'Theirs'
tˤa.ra.gna	'He hit us.'	*ta.rak.na*	'He left us.'
tˤa.laa.ha	'He painted it'	*ta.laa.ha*	'Next to her'

Bimorphemic words (word+proclitic) with pharyngeal/plain contrast in word-initial position			
Pharyngealized word		**Plain counterpart**	
la.tˤaaw.leh	'To a table'	*la.taw.leh*	Nonsense word
la.tˤaj.jaar	'To a pilot'	*la.taj.jaar*	'To a water stream'
ma.tˤa.la.bish	'He did not ask.'	*ma.ta.la.bish*	Nonsense word
ʕa.sˤa.faar	'Yellowish'.	*ʕa.sa.far*	'About to travel'
ʕa.sˤa.laah	'On prayers'.	*ʕa.sa.laah*	Nonsense word
la.tˤi.baa.ʕah	'To a printer'.	*la.taab.ʕah*	'To a follower'.
la.tˤaa.rig	'To Tariq'.	*la.ta.rik*	'To whom he left'
la.tˤaa.lib	'To a student'.	*la.taa.lib*	Nonsense
ma.sˤaa.dish	'He did not catch fish.'	*ma.saa.dish*	'He did not role.'
ma.sˤaa.liħ	'To Saleh'.	*la.saa.jiħ*	'To a tourist'.

Bimorphemic words (word+proclitic) with pharyngeal/plain contrast in word-final position			
Pharyngealized word		**Plain counterpart**	
ʕa.ba.laatˤ	'On tiles'	*ʕa.ba.laat*	Nonsense word
la.ba.laatˤ	'To tiles'	*la.ba.laat*	Nonsense word
ma.ra.ba. tˤiʃ	'He did not make it tight.'	*ma.ra.ba.tiʃ*	'He did not fondle'
ma.ħa.ra.sˤiʃ	'He was not careful.'	*ma.ħa.ra.siʃ*	'He did not guard'.
ma.fa.ra.tˤish	'He did not pick.'	*ma.fa.ra.dish*	'He did not spread'
la.baasˤ	'To a bus'	*la.baas*	Nonsense word
la.magasˤsˤ	'To a scissor'	*la.ma.gass*	Nonsense word
la.baa.sˤitˤ	'To Baasit'	*la.baa.sit*	Nonsense word
la.xal.laatˤ	'To a mixer'	*la.xal.laat*	Nonsense word
ma.xa.lasˤ	'it did not finish'	*ma.xal.las*	Nonsense word

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