

التباين في تأثير الصوت المفخم الساكن (ض) على الصوت المتحرك المجاور له (ا) في لهجتَيْهِ مِنْ لهجات اللغة العربية (باللغة الإنجليزية)

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الملخص

وثقت العديد من الدراسات اللغوية في بعض اللهجات العربية تأثير الأصوات العربية المفخمة على البيئة المجاورة لها. تركّز هذه الدراسة على تأثير الصوت الساكن المفخم (ض) على البيئة الصوتية المتحركة المجاورة له في لهجتين عربيتين مختلفتين: اللهجة الفلسطينية كإحدى اللهجات العربية الشامية، واللهجة السعودية كإحدى اللهجات العربية في شبه الجزيرة العربية. تقوم الدراسة على جمع عينات صوتية، تتمثل في تسجيلات لناطقين أصليين يتحدثون اللهجتين الفلسطينية والسعودية كلهجات أم، وتحليلها عبر برنامج التحليل الصوتي Praat، ومقارنة نتائج التحليل بين اللهجتين. تكشف الدراسة عن أن تأثير الصوت الساكن المفخم (ض) على الصوت المتحرك التالي (ا) يختلف في كلتا اللهجتين. تظهر اللهجة السعودية تأثيراً أعلى في قيمة F1؛ "بمعنى مدى ارتفاع الصوت المتحرك" للصوت المتحرك المجاور للصوت المفخم (ض) أكثر مما هو موجود في اللهجة الفلسطينية، بينما تظهر اللهجة الفلسطينية تبايناً أكبر فيما يتعلق بتأثير الصوت المفخم (ض) على الصوت المتحرك المجاور له بحسب موقعه في الكلمة؛ (أي في أول الكلمة، أو أوسطها، أو آخرها) أكثر مما تبديله اللهجة السعودية. تخلص الدراسة إلى أن تأثير التفخيم يمكن أن يختلف من لهجة إلى أخرى، وتمثل الدراسة سبراً لطبيعة التفخيم في اللهجات العربية المعاصرة.

Variation in the Influence of the Emphatic Consonant /dʕ/ on the Adjacent Following /a/ Vowel in two Arabic Dialects

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Abstract

The influence of emphatic sounds has been established in several Arabic dialects. This study focuses on the influence of the emphatic sound /dʕ/ on the neighboring vocalic environment in two different Arabic dialects: Palestinian, a Levantine Arabic dialect and Saudi, a Peninsular Arabic dialect. Based on recordings from native speakers of the two Arabic dialects, the study analyzes data through Praat. It is shown that the influence of the emphatic /dʕ/ on the following /a/ vowel in various word positions is different in both dialects. The Saudi dialect reveals much higher F1 value as well as a higher F2 value than the Palestinian dialect does. The Palestinian dialect shows more variation with regard to the effect of emphasis and vowel position in the word than the Saudi dialect does. The study shows that the influence of emphasis can vary from one dialect to another and gives an insight into the nature of emphasis in contemporary Arabic dialects.

Key words: Emphatics; emphasis; emphasis spread; pharyngealization; acoustic analysis.

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I. INTRODUCTION

Arabic is a diglossic language, according to Ferguson, Fishman, and Zughouli; it has two registers: in formal contexts and writing, Standard or Classical Arabic is used, whereas in informal speech, colloquial Arabic is used. Colloquial Arabic includes many dialects that spread over a wide geographical area. Classical as well as dialectal Arabic have emphatic consonants, such as /sˤ/, /dˤ/, /tˤ/, with non-emphatic counterparts /s/, /d/, and /t/, respectively.

Emphatic consonants impact the pronunciation of the adjacent vowel and the latter harmonizes for emphasis. The degree of emphasis can be measured by measuring the first and second formants (F1 & F2), (i.e. a formant is a concentration of acoustic energy around a particular frequency in the speech wave). For example, the vowel /a/ becomes /aˤ/, i.e. retracted (decrease F2), /u/ is lowered (increased F1), /i/ is both lowered and retracted (increasing F1 and decreasing F2). Kenstowicz and Louriz mention that it is reasonable that measuring the degree of F1 and F2 can tell us a lot about the consonant since there is a C/V harmony⁽¹⁾ for emphatics in Arabic.

The focus of the present study will be on the emphatic stop consonant /dˤ/, comparing its influence in two distinct dialects of Arabic: Palestinian, a Levantine Arabic dialect versus Saudi, a Peninsular Arabic dialect (Fischer and Jastrow). While the phonetic realization of emphatic consonants is different from one Arabic dialect to another, several authors argue that emphatics are typically produced with pharyngealization (Davis; McCarthy; Herzallah; Younes; Al-Ani).

II. THE CURRENT STUDY

The purpose of the current study is to analyze the phonetic properties of the emphatic sound /dˤ/ in two dialects of Arabic, i.e. Saudi Arabic and Palestinian Arabic. It is hypothesized that the quality of the consonant /dˤ/ is different in all environments in the two dialects. Furthermore, this variation is hypothesized to affect the neighboring vowels in different manners. Thus, the present study is guided by two major research questions:

1. What is the quality of emphasis produced by the emphatic sound /dˤ/ in the two dialects?
2. How does the emphatic sound /dˤ/ affect the following adjacent vowel in both dialects when it occurs in the same environment?

III. LITERATURE REVIEW

Arabic is well known for a special class of sounds called emphatics, distinguished from their non-emphatic counterparts by emphasis presence. As stated by a number

of authors, emphasis refers to the articulation process in which a sound is produced with a secondary co-articulation occurring in the back of the vocal tract and a primary articulation occurring in the front of the vocal tract, specifically in the dental or alveolar region (Jongman et al.). The pharyngealization (emphasis) accompanied with these emphatics takes place in the onset of the primary articulation, as claimed by Watson (293). In articulatory terms, emphasis, according to Muqbil, occurs as a result of retracting the tongue dorsum and creating a narrow passage for air in the upper part of the pharynx (40).

Arabic emphatics are classified into two main types: stop (plosive) emphatics [t^ʕ, d^ʕ] and fricative emphatics [ð^ʕ, s^ʕ]. As attested by Muqbil, these emphatics are similar to their non-emphatic counterparts [t, d, ð, s] in terms of articulation. In some dialects of southern Saudi Arabia, some lateral emphatics were found to be realized and preserved from historical Arabic, as mentioned by Watson and Al-Azraqi.

The influence of the emphatic segment on the neighboring sounds has been widely attested in Arabic. The most influential marker of emphatics has been found by several authors to lower adjacent vowel F2 value and raise F1 value (Jongman et al.; Al-Khairy; Muqbil; Zawaydah et. al.). Al-Khairy reports that F2 values for emphatic fricatives for male Saudi speakers were found to be significantly lower than their non-emphatic counterparts (118). Jongman et al. report that emphatic stops in Jordanian Arabic affect the neighboring vowel F2 value more than emphatic fricatives. Likewise, AlGhoul reports that the effect of the emphatic fricative /s^ʕ/ on the neighboring vocalic environment resulted in changes of F1 and F2 values.

The influence of the emphatic segment on lowering adjacent vowel F2 value has been attested to be spreading in different directions and to different extents in the word. Muqbil states that the direction of the emphasis spread has been found to be much more consistent from left to right rather than from right to left. Younes reports that in Palestinian Arabic, the direction of the emphasis spread is restricted from left to right while in Cairene Arabic the opposite direction has been found to be occurring. The extent to which emphasis spreads over a segment has been found to vary in different Arabic dialects. For example, emphasis spread in Cairene Arabic affects the whole phonological word, but in Abha Arabic (a dialect spoken in the southwest of Saudi Arabia), the emphasis usually does not spread beyond the adjacent vowels, as emphasized on by Watson (290).

There has been no unanimous agreement on how Arabic emphatics should be represented in terms of their exact secondary articulation. Al-Khairy points out that the similarity between pharyngeal fricatives or emphatics and uvular sounds in lowering adjacent vowel F2 value suggests the reliability of the representation of emphatics as uvulars rather than pharyngeal, supporting McCarthy's description of Arabic emphatics as uvularized rather than pharyngealized (119). Jongman et al. report

that their acoustic analysis of emphatics in Jordanian Arabic reveals that the point of secondary articulation is found to be near the uvula. Conversely, Muqbil argues that emphaticness is strongly related to the influence of a low and stable F2 value on the adjacent vowel, but the drop down in the F2 value for uvulars is not systematic and it depends on the identity of the adjacent vowel. According to his acoustic experiments, Muqbil asserts that pharyngeals show a higher and more consistent drop down in the F1 value than emphatics and uvulars. Thus, Muqbil points out that the representation of the articulation of emphatics should consist of a tongue dorsum retraction rather than a tongue root retraction, proposing a new challenge for the right representation of Arabic emphatics in the phonetic and phonological literature. Nonetheless, Al-Khairi suggests that the uvularization or pharyngealization of emphatics in Arabic depends on the spoken dialect to a large extent. Thus, there is a need to study emphatics in different Arabic dialects.

The current study aims to add to this literature on the nature of emphatics in various Arabic dialects to reach a proper understanding of the phenomenon of emphasis. In this study, we exclusively focus on the emphatic stop /d^ʕ/ with the primary goal of investigating how the emphatic sound /d^ʕ/ affects the following adjacent vowel in the word. To that end, the study aims to provide a comprehensive report on the similarities and differences between the two Arabic dialects under examination, i.e. Palestinian and Saudi Arabic dialects, with regard to the quality of emphasis in the two dialects as well as how the emphatic /d^ʕ/ affects the following vowel in the word. The study shows that while differences between the two dialects on these issues are not phonemic, these differences can be considered allophonic. However, its significance lies not only in the fact that emphatics have different phonetic properties in different varieties of Arabic, but also in the fact that it sets a precedent for future investigations on the phonemic and allophonic variations across current Arabic dialects with regard to different emphatic sounds.

IV. METHOD

A. Linguistic Corpus:

The forms have been chosen from Arabic. There are six words with emphatic [d^ʕ] and its non-emphatic counterpart [d] in three environments: word initially, medially, and finally. This is in order to be able to compare emphasis spread on the following vowel in different environments. The words are categorized into three groups according to vowel position in the word (i.e. word initially, medially, and finally) as shown in table 1 below. The targeted vowel is underlined.

Table 1: Corpus

Targeted Vowel	Words with [d ^ʕ]	Words with [d]
/a/	d ^ʕ ame:r “Conscience”	daxe:l “outsider”
	ħa:d ^ʕ ar “lectured”	ba:dar “initiate”
	ʕad ^ʕ a “bite”	?ada “caused”

B. Elicitation Technique:

Native speakers of the two dialects have been presented with lists containing the words identified in the linguistic corpus. Each speaker has been asked to produce the words in the table above. Speakers have been asked to produce each word in the list for three times, and three recordings for each word production by the same speaker have been recorded. All words from the corpus are written in Arabic script. As the study focuses on the impact of the emphatic /d^ʕ/ on the adjacent vowel, speakers have been asked to produce each word in isolation. This will enable us to focus more on how the vowel under investigation is influenced by the production of the preceding emphatic sound in the two Arabic dialects.

C. Recordings:

The data have been recorded using *Praat* program installed in the data collector's personal computer in a quiet and comfortable environment. Recordings have been saved into the data collector's personal computer for further analysis.

D. Corpus Size:

The linguistic corpus of this study consists of 6 target words containing the emphatic segment focus /d^ʕ/ and the non-emphatic segment /d/ followed by the /a/ vowel occurring in various word positions. As each speaker has been asked to produce each word in the list for three times, the corpus size contains 72 tokens in which each speaker has produced 18 tokens, and each dialect is represented by 36 tokens.

E. Subjects:

The subjects of the study consist of four native speakers of Arabic. Each two speakers represent one dialect. Two speakers are adult male Saudi Arabic speakers and the other two are adult male Palestinian Arabic speakers. The subjects ranged in age from 27 to 30 and all of the participants have a college level of education. While

the subjects speak English as a second language, all subjects have lived in their home countries, i.e. Saudi Arabia and Palestine, for most of their lives.

F. Analysis:

The aim of this analysis is to acoustically analyze, through *Praat*, the vowel /a/ that immediately follows the emphatic sound [dʕ] in the two dialects in various word positions. In this analysis, the focus is on how the emphatic sound [dʕ] affects the following adjacent vowel /a/ word initially, medially, and finally in the two compared dialects.

This acoustic analysis measures F1 and F2 in /a/ during (T1) and (T2) temporal points, and then compares the vowel quality produced by the Saudi informants with that produced by their Palestinian counterparts. The analysis also checks whether or not the influence of emphasis on the following adjacent vowel is consistent in all word positions in both dialects. Measuring the vowel quality in two temporal points, (T1) and (T2), is important for this research since it shows when exactly the influence of the emphatic sound /dʕ/ takes place, i.e. at the onset of vowel or at its peak. Another significantly salient matter the researcher takes into account is the duration of vowels after emphasis spread. In other words, the relationship between emphasis and length is investigated, i.e. does the influence of emphasis spread to the adjacent vowel while articulating it make it longer or shorter? The durational analysis will illustrate to what extent this can be considered as a dialectal marker.

To summarize, the analysis is focused on three main issues: (1) measuring the first two formants (F1 and F2) in the adjacent vowel following the emphatic sound [dʕ], (2) measuring the vowel in two temporal points (T1 and T2), and (3) checking the relationship between emphasis spread and vowel length (durational analysis). Note that in the present study, the analysis does not focus on the intra dialectal variation between speakers. Rather, the focus is mainly on the dialectal variation observed between the two dialects regardless of the variation between speakers of each dialect. For this reason, the analysis presents the average results for each two speakers for each dialect.

V. RESULTS

Since this study is fundamentally comparative, the researcher starts by presenting the results of non-emphatic /d/. Afterwards, the results of the emphatic /dʕ/ are presented. The rationale behind this is to observe the difference between the impact of the emphatic consonant and its non-emphatic counterpart by presenting the neutral status first and then presenting emphasis influence.

1. Vowel Quality: Non-Emphatic /d/

Figure (1) below shows the vowel quality after the non-emphatic /d/ for the first one-third (T1) part of the vowel. The following vowel does not show any significant change in its quality during (T1) after the non-emphatic /d/ in both dialects. For the Saudi dialect (SA), F1 value in general seems to be lower than the F1 value of the Palestinian dialect (PA). F2 values for the Palestinian dialect in general appear to be higher than that of the Saudi dialect. However, in word initial position such as in the word form /daxil/, F2 value seems to be higher than the rest of the forms in medially and finally word positions. The following chart shows the first one-third (T1) of the vowel after the non-emphatic /d/.

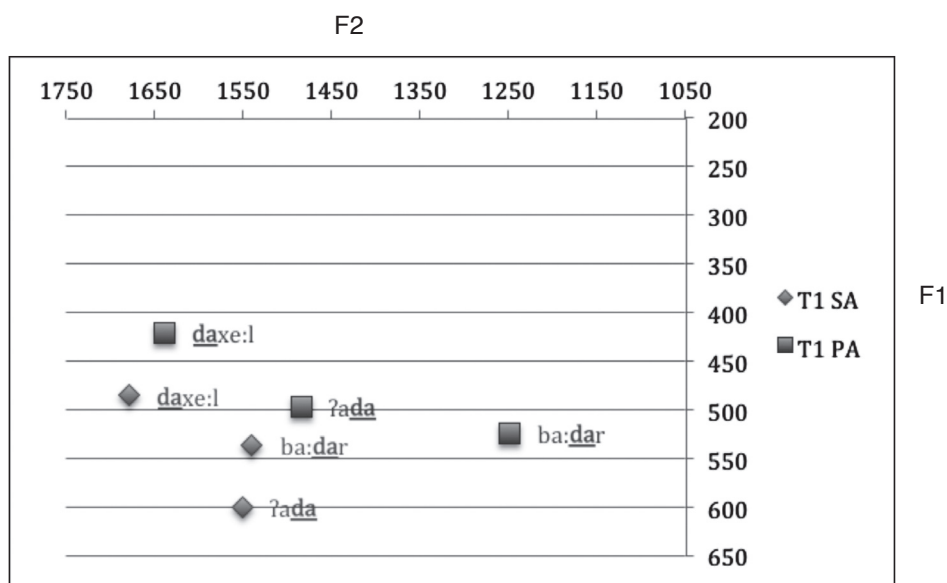


Figure (1). Temporal point (T1) average of the vowel quality after non-emphatic /d/ for Saudi (SA) and Palestinian (PA) speakers.

In figure (2) below, the vowel quality exhibits some changes during the second third of the vowel, i.e. (T2). This suggests that for both dialects the changes in the vowel quality burst during (T2) rather than during (T1). To get deeper into these changes in the vowel quality in (T2) compared to that in (T1), it can be seen that F1 values in general get higher in (T2) for the two dialects. F2 values, on the other hand, get lower for both of the dialects in (T2). The changes observed after the non-emphatic /d/ reveal that the influence of the non-emphatic stop /d/ on the following vowel does not take place earlier in the vowel. Rather, the changes observed in vowel quality occur later in the vowel during (T2).

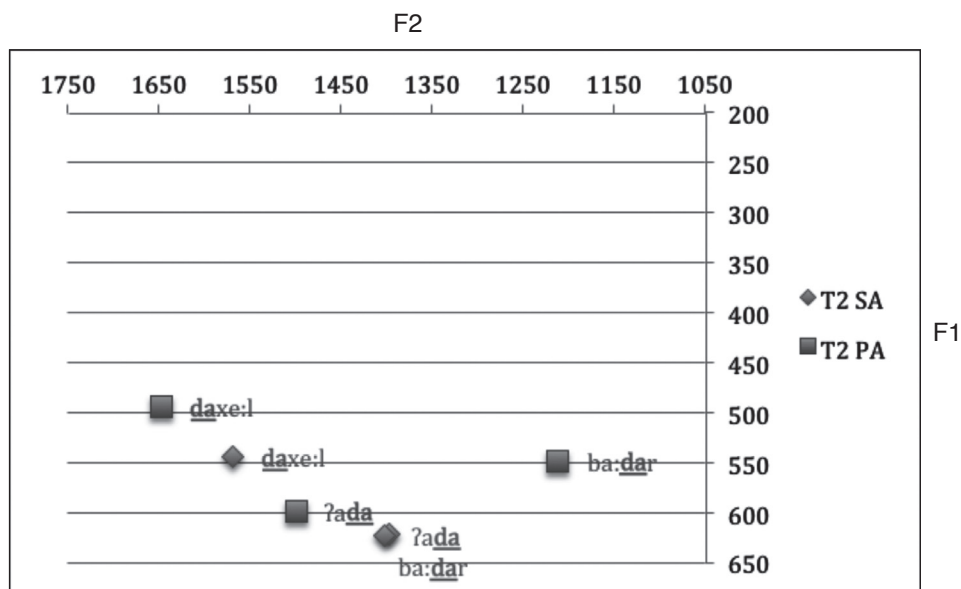


Figure (2). Temporal point (T2) average of the vowel quality after non-emphatic /d/ for Saudi (SA) and Palestinian (PA) speakers.

The vowel quality after the non-emphatic /d/ in the two dialects seems to be different during T1 and T2. For the Palestinian dialect, F2 value is not changing during T1 and T2 while F1 value exhibits some remarkable changes. The vowel F1 value in T2 appears to be at 495 to 595 Hz, which is higher than F1 value in T1 at 420 to 520 Hz. For the Saudi dialect, however, F1 value does not show any significant changes as much as F2 value does. In T1 for the Saudi dialect, F2 value ranges at 1500 to 1700 Hz, which is higher than F2 value in T2 and which is 1400 to 1500 Hz.

2. Vowel Quality: Emphatic /dʕ/

Changes in the vowel quality after the emphatic /dʕ/ appear to be at its highest level during T1 of the vowel (Figure 3). The chart shows that F2 values get significantly lowered during this phase of the vowel (T1) in both dialects. For the Palestinian dialect, the vowel after emphatic /dʕ/ in initial and final positions shows the lowest levels of F2 values across the two dialects. The Saudi dialect also shows a significant drop down in F2 values of the vowel following the emphatic /dʕ/ at a range of 1100 to 1130 Hz. By comparison, the changes in F2 values in the Saudi dialect after the non-emphatic /d/ appear at 1350 to 1550 Hz. The values of F1 do not exhibit notable changes during this phase.

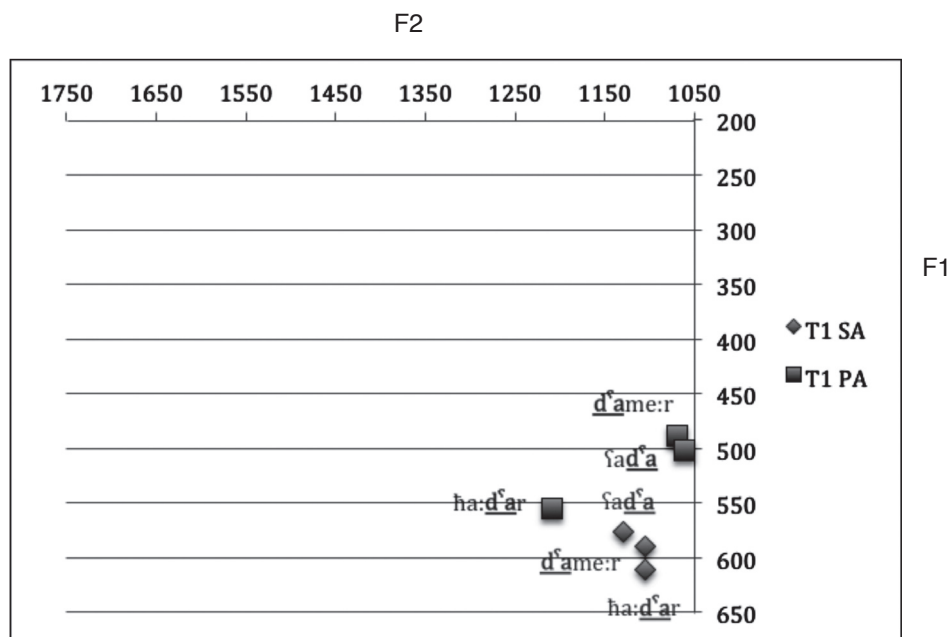


Figure (3). Temporal point (T1) average of the vowel quality after emphatic /dʰ/ for Saudi (SA) and Palestinian (PA) speakers.

On the contrary, figure (4) shows that changes in the vowel quality after emphatic /dʰ/ in the second third (T2) of the vowel continue to occur but in a different manner. During T2 in the chart, it can be seen that the formants of the vowel look like they are going back to their normal positions after the intense influence of the first third (T1) of the vowel (Figure 3). In general, F2 values seem to get higher after a sharp drop down for the two dialects. In the Saudi dialect, F2 values get higher to the range 1150 to 1180 Hz for all word positions. However, in the Palestinian dialect, F2 values get higher for only two word positions, i.e. initially and finally, to 1100 Hz, which is still lower than that of the Saudi dialect. The exception seen with the word medial position in the Palestinian dialect is significant and will be discussed later. The values of F1 do not exhibit any significant changes during this phase for the Saudi dialect. Yet, there is a rather higher F1 level for the Palestinian dialect at range of 550 to 600 Hz during T2.

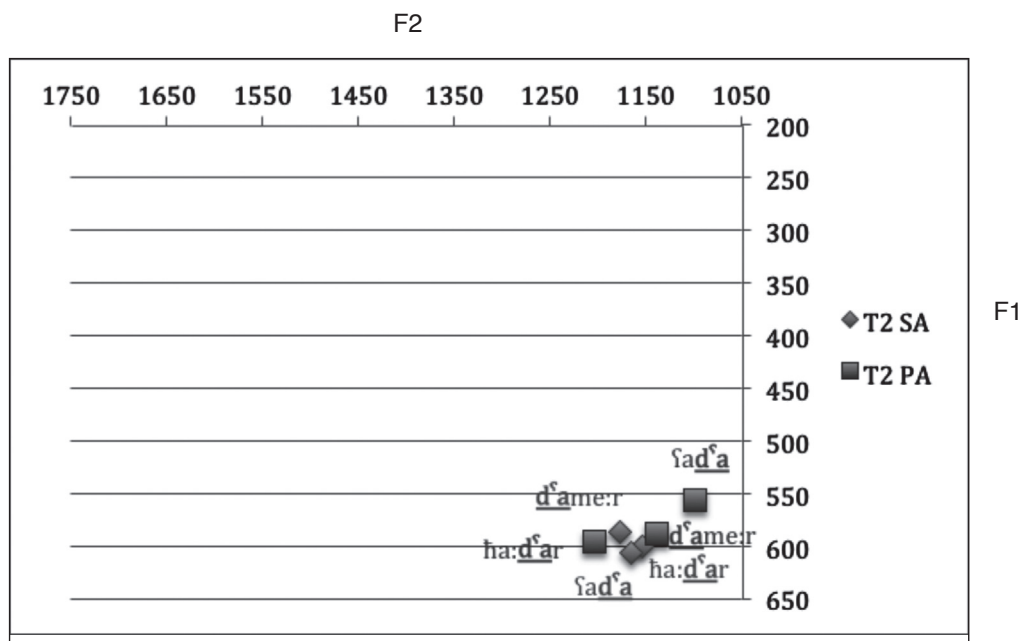


Figure (4). Temporal point (2) average of the vowel quality after emphatic /dˤ/ for Saudi (SA) and Palestinian (PA) speakers.

To summarize, emphatic /dˤ/ and non-emphatic /d/ affect the following vowel differently in the two dialects. The most important result is that the influence of the non-emphatic /d/ on the following vowel takes place later in the vowel during T2. However, the influence of the emphatic /dˤ/ on the following vowel occurs earlier in the vowel during T1. The influence of the emphatic /dˤ/ continues until T2 but to a lesser degree compared with that occurring during T1.

3. Vowel Duration

In both dialects, the effect of the emphatic /dˤ/ and non-emphatic /d/ is prevalent in the duration of the following vowel. The following figure (5) shows the results of the vowel duration after the emphatic /dˤ/ in the Saudi and Palestinian dialects.

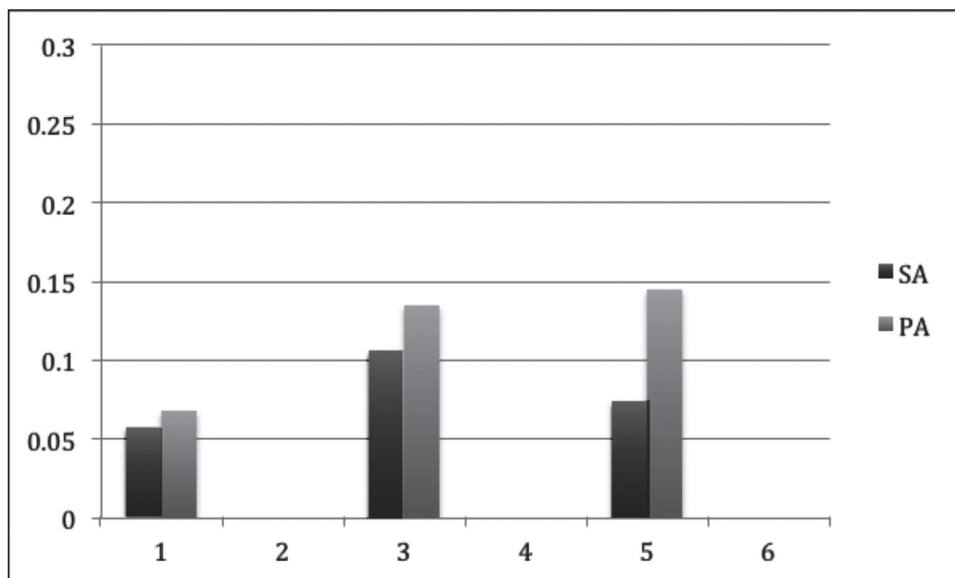


Figure (5). Mean vowel duration for the target vowel /a/ after emphatic /dˤ/ word initially (1), medially (3), and finally (5) for Saudi (SA) and Palestinian (PA) speakers.

The mean vowel duration reveals differences for the vowel duration between the two dialects. In general, the mean vowel duration is affected by the preceding emphatic /dˤ/ in both dialects, resulting in reducing the vowel duration compared to the mean vowel duration after non-emphatic /d/ (see Figure 6). However, after emphatic /dˤ/, the mean vowel duration for the Palestinian dialect appears to be longer than the mean vowel duration in the Saudi dialect. Taking into account that emphasis would generally reduce the following vowel duration, the influence of emphasis in reducing the vowel duration in the Saudi dialect seems to be lesser than that in the Palestinian dialect.

The vowel duration in both dialects exhibits similar tendency for longer vowel duration word initially and medially after the emphatic /dˤ/. The longest vowel duration for word final position after emphatic /dˤ/ can be attested only in the Palestinian dialect. This word final position shows a point of difference between the two dialects. Examining the vowel duration after non-emphatic /d/ in word final position would reveal more details about this difference.

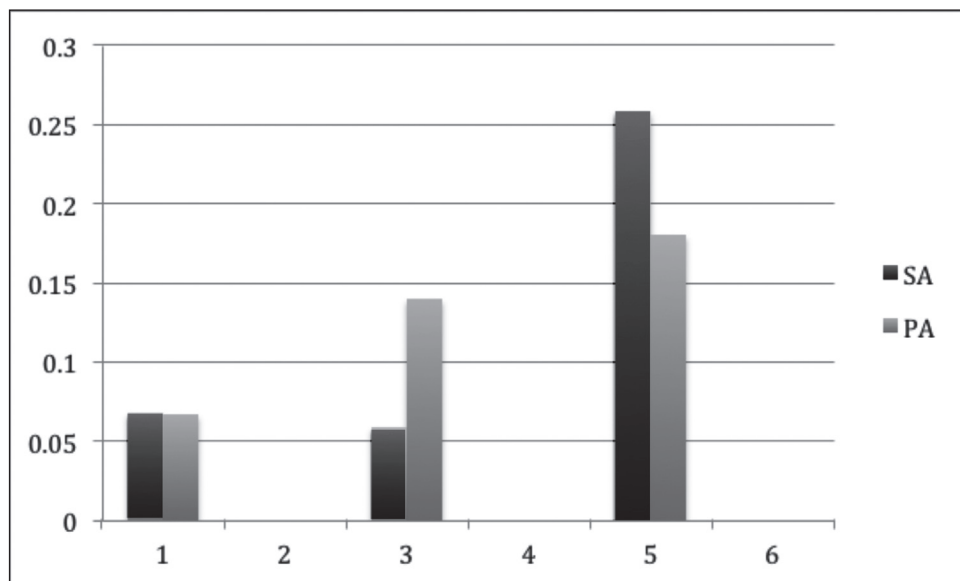


Figure (6). Mean vowel duration for the target vowel /a/ after non-emphatic /d/ word initially (1), medially (3), and finally (5) for Saudi (SA) and Palestinian (PA) speakers.

The mean vowel duration after the non-emphatic /d/ reveals interesting results. First, the mean vowel duration after non-emphatic /d/ in both dialects seems to be longer than after the emphatic /d^ʕ/. Second, in a word initial position, the influence of the emphatic /d^ʕ/ or the non-emphatic /d/ is the same to a large extent in the two dialects. For the Palestinian dialect, the vowel duration increases systematically from initial position as the shortest duration to final position as the longest duration. However, for the Saudi dialect, the duration increment is not demonstrated in the same way.

In the Saudi dialect, the mean vowel duration after emphatic /d^ʕ/ (see Figure 5) is at its highest-level word medially at about 0.2 ms. This, in fact, is not expected because the vowel duration is expected to be longer word finally more than other positions in the word as is the case with the Palestinian dialect. However, while vowel duration for the Palestinian dialect is longer in all word positions than in the Saudi dialect, the most interesting case here is the vowel duration word finally where a huge difference between the two dialects seems to exist.

To justify why such a significant difference occurs, some phonological issues that might be relevant to this case are considered. Taking into account the fact that the final emphatic /d^ʕ/ occurring word finally is a geminate [ʕad^ʕd^ʕa], the emphasis on a geminate emphatic /d^ʕ/ here seems to be what is causing vowel reduction in the

word final position in the Saudi dialect. While the emphatic /d^ʕ/ in this word form is a geminate in both dialects, in the Saudi dialect the quality of the emphatic segment is different from the quality of the emphatic segment in the Palestinian dialect, resulting in the vowel reduction.

Contrary to vowels occurring word finally after emphatic /d^ʕ/ (see Figure 6), vowel duration in the Saudi dialect in a final position after non-emphatic /d/ seems to be the longest. This reflects the fact that although the non-emphatic /d/ before the vowel in a word final position is also a geminate [ʔadda], the lengthening of the vowel in a word final position applies successfully. As shown above, emphatic /d^ʕ/ preceding a vowel word finally will result in vowel reduction due to the fact that emphatic /d^ʕ/ consumes a higher energetic power to supply two features born by the segment: gemination and emphasis. Consequently, the word final vowel is produced relatively shorter than it used to be considering its position as word final. Having said that, there seems to be more differences between the two dialects with regard to the influence of emphasis on the neighboring environment. The researcher takes all of these differences between the two dialects into consideration when discussing the results of the study in the following section.

VI. DISCUSSION

The analysis reveals differences in the quality of the vowel when it is preceded by emphatic /d^ʕ/ in the two Arabic dialects. The influence of the emphatic /d^ʕ/ on the following vowel /a/ in both dialects can be seen in terms of F1 and F2 features. The F1 value in an initial word position in the Saudi dialect is relatively lower when it is compared to the F1 value in the Palestinian dialect. As for F2 value, although it does not show a greater difference as that of F1, it can be seen that it is a bit higher in the Saudi dialect than that in the Palestinian dialect.

The difference in word final position reveals an interesting variation. In the Saudi dialect, F1 value is significantly lower than the Palestinian F1 value. The value of F2 is also different. F2 value in the Saudi dialect is higher than that of the Palestinian dialect. Indeed, in this position, F2 value in the Palestinian dialect seems to be very low. This word final position for the Palestinian dialect reveals the most extreme result wherein F1 and F2 values are the lowest in both dialects while in the Saudi dialect it retains a moderate quality that is much similar to that of word initial position.

The difference in word medial position seems to be more diverse. In the Saudi dialect, F1 value seems to be the highest value with an F2 value that seems to be similar to other positions. However, medial position in the Palestinian dialect shows the most divergent quality both inter and intra dialectally. Word medial position in the Palestinian dialect shows that F1 value is the highest among various vowel positions in this dialect. F2 value is also the highest among different word positions in the two

dialects. Word medial position in the Palestinian dialect is also significantly different from its counterpart position in the Saudi dialect. Across both dialects, word medial position registers the highest F1 value.

Contrarily, the effect of the non-emphatic /d/ on the following vowel is more systematic than the emphatic /d^ʕ/. Taking into consideration the use of non-emphatic words as a controlling corpus, it can be seen that the non-emphatic /d/ registers a relatively consistent vowel quality within and between the two dialects. On the one hand, F1 value in the Saudi dialect seems to be higher than the Palestinian F1 value in all word positions whether initially, medially, or finally. F2 values, on the other hand, are similar between the two dialects, especially word initially and word finally.

By comparison within the same dialect, the influence of the non-emphatic /d/ in the Saudi dialect shows much higher F2 values than the emphatic /d^ʕ/. F1 values do not seem to be affected by the preceding sound being an emphatic or non-emphatic. For the Palestinian dialect, the influence seems to be clear on both dimensions, i.e. F1 and F2. The non-emphatic /d/ does not affect the F1 value of the following vowel as much as the emphatic /d^ʕ/ does.

Taking the non-emphatic /d/ into account as a controlling sample, the comparison between the two dialects shows a significant difference. In general, in both dialects, the influence of the emphatic /d^ʕ/ on the following vowel is resembled in lowering F2 value. This lowering effect on F2 value seems to be more intense in the Palestinian dialect than in the Saudi dialect. However, for the Palestinian dialect the influence is not only restricted to F2 value, but can also be seen as an influential marker for F1 values as well, which is not the case for the Saudi dialect in which the vowel F1 value is more stable regardless of the emphatic or non-emphatic identity of the preceding sound.

The results reveal an interesting finding regarding emphasis quality in the Palestinian dialect. In a word-medial position, there is no discrepancy between non-emphatic /d/ and emphatic /d^ʕ/. In fact, the results reveal that the Palestinian non-emphatic /d/ in a word medial position is produced as an emphatic /d^ʕ/. By taking the word that represent the non-emphatic /d/ in word medial position /badar/ as an example, we can see that the range of F2 value of the /a/ vowel following the non-emphatic /d/ is at 1150 to 1250 Hz. In its emphatic counterpart word /had^ʕar/, the vowel F2 value range is at 1150 to 1250 Hz⁽²⁾.

By comparing these results with the Saudi dialect, we can notice a significant difference between the two dialects. In the Saudi dialect, F2 value of the vowel after a non-emphatic /d/ in word medial position as in the word /badar/ ranges at 1350 to 1500 Hz, which is higher than its Palestinian counterpart. The emphatic /d^ʕ/ in the word /had^ʕar/ in the Saudi dialect lowers the range of F2 value to 1100 (T1) to 1150 (T2) Hz.

The vowel duration is another major point of difference between the two dialects. In the Palestinian dialect, the vowel duration after non-emphatic /d/ in the word /badar/ is at about 0.14 ms., whereas vowel duration after emphatic /d^ʕ/ in the word /had^ʕar/ is at 0.13 ms. The mean vowel duration in the Palestinian dialect after emphatic /d^ʕ/ or non-emphatic /d/ is very close to one another, suggesting that in such a word position the non-emphatic /d/ is surprisingly produced in a very similar way to the emphatic /d^ʕ/.

However, for the Saudi dialect, the mean vowel duration is different. After non-emphatic /d/, the mean vowel duration ranges at 0.05 ms. while after emphatic /d^ʕ/, the duration ranges at 0.1 ms. Generally speaking, in both cases, it is still shorter than the mean vowel duration in the Palestinian dialect. Nonetheless, the duration exemplifies a difference after an emphatic /d^ʕ/ or non-emphatic /d/. After non-emphatic /d/, the duration is shorter than it is after emphatic /d^ʕ/, suggesting that the emphatic /d^ʕ/ in the Saudi dialect affects the duration of the following vowel in a way that, in general, increases vowel duration. Accordingly, the properties of the emphatic /d^ʕ/ in the Saudi dialect seem to be interestingly different from those of the Palestinian dialect.

The nature of emphasis in the two dialects appears to be different. F2 values of the vowel reveal significant differences about the nature of the emphatic /d^ʕ/ in both dialects. Starting with the non-emphatic /d/, we can observe that F2 value for almost all word positions is similar in the two dialects with regard to the vowel position in the word. For the Saudi dialect, F2 after non-emphatic /d/ ranges from 1450 to 1650 Hz, while for the Palestinian dialect, F2 value ranges from 1250 to 1650 Hz.

However, after emphatic /d^ʕ/, F2 values in both dialects are lower than those attested after non-emphatic /d/. Whereas for the Saudi dialect F2 value ranges from 1100 to 1200 Hz, the Palestinian dialect shows a sharp lowering in F2 value, with the exception of word medial position, at range of 1050 to 1250 Hz. What is interesting here is the nature of the emphatic /d^ʕ/ in the Palestinian dialect, which seems to exert a huge influence on lowering the F2 values more than the Saudi dialect does, especially during (T1). This difference suggests a difference in the quality of the emphatic /d^ʕ/ between the two dialects.

There are various factors that make the quality of the emphatic /d^ʕ/ different in the two dialects. While it is hard to decide on what exactly makes the difference between the two dialects without examining more data from these dialects, we attribute the observed differences to the primary point of articulation of the emphatic /d^ʕ/ in the two dialects. That is, the stop primary closure point of articulation for the emphatic /d^ʕ/ in the Palestinian dialect is alveolar while in the Saudi dialect, the stop closure is dental. The dental closure in the Saudi dialect would result in a fricative-like closure. In other words, it would result in an emphasis produced with much more amount of noise or friction. Thus, the difference in the quality of emphasis as perceived in the Saudi and

the Palestinian dialects can be attributed to the distinction between dental plosives and fricatives, which is not at all trivial. This, in fact, coincides with the study of Jongman et. al. Also, there could be some differences with regard to the secondary point of articulation in the back cavity of the vocal tract that contribute to the differences of the quality of emphasis found between the two dialects, which is an interesting matter of investigation, but it is beyond the scope of the present study.

To summarize, the influence of the emphatic /d^ʕ/ on the following /a/ vowel is different in both dialects. The Saudi dialect reveals a higher F1 value and a higher F2 value than the Palestinian dialect. The Palestinian dialect shows more variation with regard to the position of the vowel in the word than the Saudi dialect in which the vowel position in the word does not seem to express significant variation compared to the Palestinian dialect.

VII. CONCLUSION

The results of the study present three main findings that indicate some aspects of major differences in the influence of the emphatic /d^ʕ/ on the adjacent following vowel in the Saudi and the Palestinian dialects. First, the vowel F2 value is lowered after emphatic /d^ʕ/ in the Palestinian dialect more than in the Saudi dialect, and the most lowered F2 value occurs earlier in the vowel during the first third (T1) of the vowel duration in the two dialects. Second, F1 value is raised after emphatic /d^ʕ/ in the Saudi dialect more than in the Palestinian dialect, and the highest raising of F1 value in the Palestinian dialect occurs later in the vowel during the second third (T2) while F1 raising in the Saudi dialect is consistent during the two phases, i.e. (T1 and T2). Third, vowel duration after emphatic /d^ʕ/ in the Palestinian dialect is longer than vowel duration in the Saudi dialect in all word positions.

Finally, the present study examined the influence of one stop emphatic sound in two Arabic dialects. In order to provide more details about the interesting similarities and differences of the quality and the influence of emphatics in Arabic dialects, further research is indeed needed to examine how emphatic plosives and fricatives are represented in different Arabic dialects.

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Notes

- (1) Unlike real harmony languages, this is not a phonemic switch. That is, these vowel variants do not contrast in themselves.
- (2) As noted by an anonymous reviewer, the similarity between the emphatic /d^ʕ/ and its non-emphatic counterpart /d/ in this particular environment can be attributed to the presence of /r/ after /a/ in /ba:dar/. The consequence of that is the spread of emphasis. While this is interesting, we leave this issue for future research.

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