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Effects of Gender on Emphasis Production in Jordanian Arabic: A Socio-Phonetic Study

تأثير جنس المتكلم على نطق الأصوات المفخمة في اللهجة الأردنية- دراسة صوتية اجتماعية

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Abstract:

This article investigates the effects of gender on two emphatic sounds, namely [s^ʕ] and [t^ʕ], in Ajlouni-Jordanian Arabic, a sub-dialect of Rural Jordanian Arabic. The study was mainly motivated by the relatively small literature on the bearing(s) of gender on emphasis production in Jordanian Arabic in general and in Ajlouni Jordanian Arabic specifically. To do so, the effects gender has on emphasis productions in this dialect were tested in mono- and bi-syllabic words, with the emphatic sounds occurring both word-initially and word-finally. The vowel qualities which were incorporated in the stimuli of this study include the long low-back vowel [a:], the short low-back vowel [a], the long high-front vowel [i:], the short mid-high front vowel [ɪ], the long high-back vowel [u:] and the short mid-high back vowel [ʊ]. The sample of this study consisted of 12 native speakers of Ajlouni-Jordanian Arabic, with each speaker producing 48 minimal pairs. The acoustic measurements that were carried out on the data are consonant duration (CD), Voice Onset Time (VOT), and the vowel first three formant frequencies (F1, F2, and F3). The study showed that, relative to gender, only VOT was a reliable acoustic correlate of emphasis where CD, on the one hand, and F1, F2, and F3 in both the target and non-target syllables, on the other hand, showed no significance.

Keywords: *emphasis; Ajlouni-Jordanian Arabic; Rural Jordanian Arabic; vowel quality; acoustic measurements.*

الملخص:

هدفت هذه الدراسة لايجاد تأثير جنس المتكلم على نطق صوتي التفخيم؛ الصاد والطاء في واحدة من اللهجات الأردنية وهي لهجة أهل عجلون. ولقد كان الدافع من إجراء هذه الدراسة هو قلة الدراسات على نطق الأصوات المفخمة في اللهجة الأردنية بشكل عام وفي لهجة أهل عجلون على وجه الخصوص. وللقيام بذلك تمت دراسة هذين الصوتين في بداية ونهاية الكلمات ذوات المقطع الواحد والمقطعين، كما تمت دراسة هذين الصوتين في بيئات صوتية مختلفة. وبناءً عليه، تم تقسيم عينة الدراسة المؤلفة من اثني عشر مشاركاً إلى مجموعتين: فئة الذكور وفئة الإناث. وبذلك قد نطق كل مشاركاً ثمان وأربعون وحدة من الازدواجات اللفظية (minimal pair). وتم استخدام خمسة معايير أكوستية (acoustic parameters) وهي (VOT, F1, F2, F3). وقد أظهرت النتائج بالنسبة لتأثير عامل الجنس على نطق التفخيم على هذه المعايير الأكوستية أن ال (VOT) فقط معيار أكوستي موثوق في حين أظهرت النتائج أن طول الصوت الصامت أو ال (CD) وأن (F1, F2, F3) في كلا المقطعين (المقطع المستهدف والمقطع غير المستهدف) ليست معايير أكوستية موثوقة عند نطق التفخيم في هذه اللهجة.

الكلمات المفتاحية: التفخيم؛ لهجة أهل عجلون؛ الازدواجات اللفظية؛ معايير أكوستية.

Introduction:

Arabic and its modern dialects, including Jordanian Arabic (JA), has, among Hebrew and its modern dialects, the segmental feature of emphasis which is often referred to as pharyngealization (Al-Masri and Jongman, 2004; Davis, 1995; Herzallah, 1990; Hetzron, 1998; Jakobson, 1957; Kahn, 1975; Lehn, 1963; Watson, 1999, Zawaydeh, 1998, inter alia). There has been little consensus upon defining the phenomenon of emphasis on articulatory basis. Some argue that it is uvularization (McCarthy, 1994; Kulikov, Mohsenzadeh, and Syam, 2019; Zawaydeh, 1999) whereas others still consider it as velarization (Obrecht, 1968; Norlin, 1978; Hetzron, 1998). Emphasis, which is the most common feature among Arabic dialects (Al-Deaibes, Al-Shawashreh, and Jarrah, 2021), is grossly used to refer to segments with a primary articulation and a secondary one happening simultaneously, with the former being articulated with a constriction in the alveolar/dental region and the latter being articulated with a constriction in the posterior region. Throughout this paper, the term emphasis will be adopted to refer to this linguistic phenomenon in Ajlouni-Jordanian Arabic (AJA), the dialect under present scrutiny.

Emphasis is traditionally used to refer to two sets of sounds, namely primary emphatics and secondary emphatics. The distinguishability between these two categories of sounds is solely based on the presence vis-à-vis absence of contrasting counterparts, as the presence/absence of such emphatic feature incurs change in meaning (i.e. phonemic). The primary emphatics are [tˤ], [sˤ], [dˤ], and [ðˤ] along with their plain counterparts [t], [s], [d], and [ð] as exhibited in Table (1).

Table (1): Primary emphatic sounds in JA

	Emphatic	Gloss	Plain	Gloss
a.	tˤa:b	'Recovered'	ta:b	'Repented'
b.	sˤin	'Listen carefully'	sin	'Tooth'
c.	dˤab	'Lizard'	dab	'Fell'
d.	ðˤil	'Shadow'	ðil	'Humiliate!'

The secondary emphatics do not have contrasting counterparts given that their difference is merely allophonic. That is, the presence/absence of the emphatic feature does not incur any change in the meaning of the word. However, secondary emphatics are further subdivided into two subcategories, namely allophonic emphasis and free-variational emphasis (for details see Al-Deaibes et al., 2021: p. 2).

Different studies have accounted for the variation of emphasis production in Arabic varieties from phonetic and phonological perspectives (Card, 1983; Jongman, Herd, Al-Masri, Sereno, and Combest, 2011; Khattab, Al-Tamimi, and Heselwood, 2006; Wahba, 1993, inter alia). Yet, only few studies have addressed the socio-phonetic aspects of emphasis in JA (Omari and Jaber, 2020; Omari and Jaber, 2019; Almomany, 2018; Alzoubi, 2017; Abudalbu, 2011; Abudalbu, 2010).

This paper proceeds as follows. Section (2) reviews the related literature on emphasis in Arabic and its related dialects. Section (3) gives a brief description of the dialect under present scrutiny RJA. Section (4) sheds light on the sociophonetics of emphasis. Section (5) proffers an elaborate description of the sample, data, and procedures. Section (6) displays the findings of the study. Section (7) converses about the findings exchanging views in light of them with some concluding comments.

Brief Overview of Jordanian Arabic Varieties:

The Hashemite Kingdom of Jordan encompasses a variety of dialects that have discrete phonological, syntactic, and morphological choices. Jordan originally has only two main dialects, namely Rural Jordanian Arabic (RJA) and Bedouin Jordanian Arabic (BJA) (Alzoubi, 2017). After the Palestinian-Israeli conflict, Jordan, being a home for many immigrants with different original regional dialects (Syrians, Iraqi, and Palestinians), added UJA to its dialectal repertoire (Al-Deaibes, 2016). Yet, few studies have touched on the categorization of JA dialects (Abdel-Jawad, 1987; Al-Sughayer, 1990; Sakarna, 1999).

Abdel-Jawad (1986) has suggested that UJA is the prestigious variety that is mainly spoken by city dwellers who migrated to Jordan from urban centres in the neighbourhood (e.g. Syrians) and who resided in big cities like Amman, Zarqa, and Irbid. The less preferred or stigmatized varieties are RJA and BJA, with the former being spoken by villagers or village residents in areas like Al-Rumtha and Bani Kenana (Al-Deaibes and Rosen, 2019) and the latter being spoken by people descending from Bedouin tribes (e.g. Bani Hasan) (Sakarna, 1999).

Following this dialectal evolution, Jordan has expanded its dialectal repertoire to add UJA. Each of these three dialects has its own distinct syntactic, phonological, and morphological structure. Phonetically speaking, these three varieties have remarkably different pronunciation of speech sounds, be it a consonant or a vowel. While RJA and BJA have more comparable phonetic variants, the same phonetic variants existent in UJA are noticeably different (Jarbou and Al-Share, 2012). Consequently, our choice of AJA, being a sub-dialect of RJA, is not arbitrary but is rather based on the distinctions that hold between RJA and BJA, on the one hand, and UJA, on the other hand.

Emphasis in Arabic:

Emphasis has acoustically been reported to have strong effects on the value of F2. F2 is believed to have a more lowered value in emphatic context. A large number of studies have confirmed the lowering of F2 value in emphatic environment as compared to F2 value in plain environments (Kulikov, 2022, for Qatari Arabic; Jongman, Herd, and Al-Masri, 2007, for JA; Al-Masri and Jongman, 2004, for JA; Wahba, 1993, for Alexandrian Arabic; Card, 1983, for Palestinian Arabic).

Kulikov (2022) has also studied the acoustic correlates of emphasis in Qatari Arabic. His data consisted of twenty-five words that were each incubated in a carrier sentence, with the target consonants [d, t, t^ʕ] occurring only word-initially. The participants of his study were eight female native speakers of Qatari Arabic. As for the acoustic cues, Kulikov (2022) has examined VOT, Spectral Central of Gravity (SCG) of burst, and pitch (F0), on the one hand, and F1 and F2 of vowels only at the vowel onset, on the other hand. The researcher has found that emphasis is characterized by a lowering of F2 value and a raising of F1 value. Relative to the spectral means, Kulikov (2022) has found that only SCG of burst was affected by emphasis. That is, the SCG of burst of plain /t/ showed a significantly lowered value in emphatic environment.

Jongman et al. (2007) have investigated the acoustic correlates of emphasis in JA. Their data consisted of mono- and disyllabic minimal pairs with the emphatic consonant occurring word-initially, word-medially, and word-finally. The participants were 8 native speakers of Irbid dialect, 4 males and 4 females. Jongman et al. (2007) have found that emphasis was characterized by raised F1 and F3 and a lowered F2. Jongman et al. (2007) have also argued that vowel quality affected the magnitude of F2 lowering. That is, emphaticized /æ/ showed the greatest magnitude of F2 lowering while emphaticized /u/ showed the least amount of F2 lowering. In addition to that, the researchers have pinpointed the correlation between the emphatic consonant locus and the amount of change in formant frequencies in that the closer the vowel to the emphatic consonant is, the more affected its formant frequencies become. As for consonantal means, Jongman et al. (2007) have found that the spectral mean was significantly lower for emphatic consonants than it is for plain ones.

Al-Masri and Jongman (2004) have examined the acoustic correlates of emphasis in the northern dialect of JA. Their data consisted of monosyllabic, bi-syllabic, and tri-syllabic minimal pairs with the emphatic consonants occurring word-initially, word-medially, and word-finally. The latter two types were to examine the effect of the target consonant locus on emphasis spread and thus to examine the spreading or blocking of emphasis spread. Al-Masri and Jongman (2004) have found that F2 lowering was significant for vowels in emphatic environment as compared to those in plain ones. However, the magnitude of F2 lowering was much higher for vowels in the target syllable (i.e. the syllable containing the emphatic sound) than that of vowels in distant syllables. Besides, Al-Masri and Jongman (2004) have confirmed that, by means of F2 lowering, emphasis spreads both rightward and leftward, with the fact that the more distant the vowel from the emphatic consonant is, the less affected it becomes. Notwithstanding that emphasis spreads in both directions, Al-Masri and Jongman (2004) have found that the vowels /i/ and /u/ block rightward spread as evinced on the indifferent values of F2 in emphatic and plain environments.

Wahba (1993) has studied the possible effects of gender on emphasis production in Alexandrian Arabic. His data consisted of minimal pairs of mono- and bi-syllabic words, and thus he incorporated eight vowel qualities. Wahba (1993) has only examined the first two formant frequencies (F1 and F2) only at the onset and midpoint of the vowel. Concisely, Wahba (1993) has pinpointed that whereas F1 is not a reliable acoustic correlate of emphasis neither at the onset nor at the midpoint of the emphaticized vowels, F2 lowering is a reliable acoustic correlate of emphasis both at the onset and at the midpoint of emphaticized vowels. Following this, Wahba (1993) has added that males produced more degrees of emphaticness as compared to those of females.

Card (1983) has examined the acoustic cues of emphasis in Palestinian Arabic. She has found that emphaticized vowels consistently show more lowered F2 values than their plain counterparts. Card (1983) has also argued that emphasis spread was found to be bidirectional (rightward and leftward). In addition, Card (1983) has argued that the magnitude of F2 lowering for secondary emphatics (i.e. sounds that exhibit emphasis by means of spread in emphatic environment) was not as high as those of segments with primary emphatics. Similarly, F2 lowering for secondary emphatics was not as high as those with plain consonants (Card, 1983).

Emphasis in Jordanian Arabic:

F2 lowering of emphaticized vowels has been reported to be unfailing (Al-Deaibes et al., 2021). Likewise, Omari and Jaber (2020), who have studied the effects of gender and social class on the interaction between emphasis and manner, on the one hand, and emphasis and voicing, on the other hand. The researchers have found that F2 lowering was a reliable acoustic correlate only for emphasis by voice and emphasis and manner interactions (for details, see Omari and Jaber, 2020, p. 15).

Investigating the effects of gender and social class on emphasis production, Omari and Jaber (2019) have found that F1 raising and F2 lowering are the reliable acoustic correlates of emphasis. They have also obtained that males

project more degrees of emphaticness than females and that lower-middle class speakers were in favour of emphasis as compared to upper class speakers.

Jongman et al. (2011) have probed the acoustic and perceptual effects of emphasis in Urban Jordanian Arabic (UJA). Manifested on vowels in emphatic environments, F1 and F3 raising and F2 lowering have been found to be reliable acoustic correlates of emphasis. Jongman et al. (2011) have therefore added that the spectral mean of emphatic stops was lower than that of plain consonants.

The Socio-phonetics of Emphasis:

Being one of the most influential social factors, gender has been reported to entail variation in language behaviour (Abdel-Jawad, 1981). That is, women tend to linguistically affiliate with the so-called “prestigious” forms, avoiding the stigmatized versions (Labov, 2001; Al-Shawashreh, 2016). Acoustically ratifying women’s preference of the prestigious forms, Royal (1985) has examined the interaction between emphasis and gender, among age and social class, in Cairene Arabic. The researcher has stressed that there are two forms of emphasis: strong pharyngealization and weak pharyngealization, with the former being stigmatized and the latter being prestigious. To this end, Royal (1985) has summed up that women produced weaker pharyngealization, to use Royal’s term, than males did.

Ahmad (1979) has investigated, similar to Wahba (1993), the contrast between [d^ɕ] and [d] at both edges of the word in the environment of the vowels: [æ], [i], and [u] in Cairene Arabic. The researcher has obtained that F2 lowering was greater for men than it is for women, a finding that was later attested by Wahba (1993). Wahba (1993), investigating the effect of gender on emphasis production in Alexandrian Arabic, has revealed that although females’ emphatic and plain slopes were closer to each other as compared to those of males, women showed less degrees of emphaticness relative to those of their male peers.

Al-Masri and Jongman (2004) have examined the emphatic-plain contrast among male and female speakers of JA. The researchers have proposed that females showed more degrees of emphasis than males did by virtue of F2 more lowered value. Besides, emphasis spread has been found to be bidirectional unless there is an opaque sound (e.g. [i] and [u]).

Investigating the acoustic and auditory differences between males and females in the [t]-[t^ɕ] opposition in JA, Khattab et al. (2006) have revealed, relative to the perceptual study, that all tokens of /t/ was realized as plain whereas all tokens of [t^ɕ] produced by females were rated as less emphatic compared to those of males. As for the acoustic cues, Khattab et al. (2006) have claimed that F1 raising and F2 lowering at the vowel onset, the only measured locus, are reliable acoustic cues of emphasis regardless of gender. Plotting F1 as a function of F2, the researchers have proposed an overlap between the female emphatic and plain vowels, which was not true for the males. Front-quality onsets of emphatic vowels were observed in the female data where 33% of the females showed this tendency, which was found in vowels following plain consonants. As for the consonantal cues, while females’ plain VOTs were oddly found to be longer than those of males, females’ emphatic VOTs were significantly shorter than those of males (Khattab et al., 2006). This could be ascribed to the inhomogeneity of the female data, to gender differences or to both of them.

Almbark (2008) has investigated the effects of gender and region on the production of emphasis in Syrian Arabic. Relative to gender, she has found that females showed more degrees of emphaticness only by means of F2 lowered value at the vowel onset of the vowels following emphatic stops. This pattern of effect was reversed for males in that emphasis was acoustically more prominent in males’ productions after emphatic fricatives. This corroborates the gender-related effects reached by Al-Masri and Jongman (2004) while simultaneously contradicting those of Ahmad (1979), Royal (1985), and Wahba (1993).

Socio-phonetically oriented, Abudalbh’s study (2011) has tackled the effects of gender on emphasis production in JA. The researcher has studied the three primary emphatics [t^ɕ, d^ɕ, s^ɕ] in monosyllabic words following one of the long vowels [i], [u], or [æ]. Abudalbh (2011) has concluded that, irrespective of gender, VOT for voiceless stops was a reliable acoustic correlate of emphasis, as emphatic VOT of voiceless stops is significantly shorter than that plain one of voiceless stops. Moreover, emphasis in males’ speech is, relative to gender, more pronounced than in that of females by means of both F1 raised values and F2 lowered value at the vowel onset and midpoint.

Investigating the effects of age and gender on emphasis production in AJA, Almomany (2018) has revealed that neither consonant duration nor F1, F2, and F3 were affected by age. However, only VOT has turned out to be a reliable acoustic correlate where middle-aged people maintained the most magnitude of change followed by the old group and the young one, respectively (for details, see Almomany, 2018; pp. 44-45). As for gender-related effects, where gender has proved to have a similar bearing on emphasis in that males produced longer VOTs for emphatics than females did, it did not show any such effect on the VOTs for plain consonants, nor on the CD of plain consonants (i.e. [t] and [s]). To validate these bearings on emphasis in AJA, Almomany (2018) has therefore pioneered running interactions in overall fashion. That is, he put all of the linguistic (i.e. vowel quality, manner, target consonant locus, word size, vowel length) and extra-linguistic variables, namely age and gender, in one pool. In the interplay between emphasis, on the one hand, and all of the other variables, on the other hand, it has become known that VOT is not a reliable acoustic cue of emphasis. Instead, F1 and F2 have shown to be reliable acoustic correlates of emphasis when

emphasis interacts with all variables, be it linguistic or non-linguistic, simultaneously (for details, see Almomany, 2018, pp. 78-80).

Omari and Jaber (2019) have examined the possible effects of gender and social class on the acoustic correlates in JA. The findings have shown that VOT was not a reliable acoustic correlate when interacting with gender and/or social class. While gender did not show any effects on post-release duration of voiced stops, social class did as lower-middle class respondents tended to have shortened the post-release of emphatic stops. To clarify, lower-middle class speakers projected more degrees of emphasis than those from the upper class. As for friction duration, females have produced longer tokens than males did.

As per the vocalic cues, Omari and Jaber (2019) have found that despite the insignificant interaction between gender and emphasis on vowel duration (VD), the interaction between social class and emphasis on VD was significant. To clarify, lower-middle class speakers tended to produce longer vowel durations in emphatic context, showing more cues of emphasis than their peers from the upper class did. However, the overall interaction of gender, social class, and emphasis on VD has shown no significance. Interacting with emphasis, gender has shown a significant effect on F1 in that male produced more raised F1 values than their female counterparts did in emphatic environment. With regard to emphasis and social class interaction, males from the lower-middle class showed more raised F1 in emphatic context than their equals from the upper class did, showing more exponents of emphasis. Overall interaction between emphasis, gender, and social class showed that only speakers from the upper-class group showed significance. That is to say, upper class males raised their F1 value while upper class females tended to lower theirs. Unlike upper class speakers, lower-middle class speakers from both sexes maintained the same pattern of F1 raising in emphatic environment.

Omari and Jaber (2019) have stressed the significant interactions between emphasis and gender, on the one hand, and emphasis and social class on F2, on the other hand. As for the former, males showed more lowered F2 values in emphatic setting than females did. The latter showed that lower-middle class speakers produced more lowered F2 values in emphatic contexts than the upper-class speakers. The overall interaction between emphasis, gender, and social class on F2 has shown that while males and females from the upper class maintained almost the same degree of F2 lowering in emphatic environment, females from the lower-middle class showed less F2 lowering as compared to that of their male peers from the same social group. Concerning F3, there was no significant interaction between emphasis, gender, and/or social class.

In their study, Omari and Jaber (2020) has investigated the effects of gender and social class on the acoustic correlates of emphasis in UJA. Examining the effects of these two extra-linguistic variables on the interactions: emphasis by manner and emphasis by voice, Omari and Jaber (2020) have found that there are no effects of either gender or social class on these interactions. However, the researchers have pinpointed the overlap of the interaction of gender and social class on emphasis by manner interaction at F1 onset. Concisely, while males from the lower-middle class showed more degrees of emphaticness following a fricative than following a stop, males from the upper class showed more degrees of emphaticness following a stop than following a fricative. Relative to F2, gender and/or social class, interacting with emphasis, has/have proved that there is no significant effect on F2. However, F2 was affected only in the interaction between emphasis and manner where speakers tended to produce more lowered F2 value following an emphatic stop than following an emphatic fricative. This effect was ruled out in both interactions: (1) emphasis and manner, on the one hand, and gender or social class, on the other hand, and (2) emphasis, manner, gender, and social class. Similarly, F3 was only affected by the interaction between emphasis and manner where F3 value in emphatic environment was greater following a stop than following a fricative. Gender and/or social class have not affected emphasis by voice interaction. However, emphasis by manner interaction has shown that, only by means of F2 lowered value, emphasis is more pronounced following a voiced consonant than following a voiceless one.

Al-Deaibes et al. (2021) have examined the possible effects of gender and dialect on the production of emphasis in JA. Concisely, they have studied the variation in the production of the secondary emphatic /w/ among males and females of RJA and UJA. It has been found that emphasis was more acoustically evident in males' speech than it is in females' one by virtue of F1 and F3 raised values and F2 lowered value. In addition, UJA speakers showed lesser degrees of emphaticness as compared to RJA speakers. The researchers have added that VD has been, unlike primary phonetics, found to be a valid acoustic correlate of emphasis for the emphatic labio-velar /w/.

Upon reviewing the pertinent literature, it can be deduced that the majority of studies adhere to the salient effect of gender on emphasis production. The bulk of studies strongly showed that males produced more degrees of emphaticness as compared to females (Abudalbh, 2011; Ahmad, 1979; Al-Deaibes et al., 2021; Card, 1983; Omari and Jaber, 2019; Khattab et al., 2006; Royal, 1985; Wahba, 1993). Completely at odds with this direction of effect are the studies of Al-Masri and Jongman (2004) and Almbark (2008) who have claimed that females show stronger cues of emphasis than males do. Counter to these two directions is Omari and Jaber's (2020) study, which has shown that emphasis is neither affected by gender nor affected by social class. Overall, there has been three conflicting views of emphasis in JA. Theses disperse endings could be attributed to many factors such as dialectal imprecision, inhomogeneity of data or sample, limited analysis, etc. To this end, the present study seeks to avoid such inconsistencies as to account for the plausible effects of gender on emphasis production in AJA.

Research Questions:

The present study addresses the following questions:

- Do males produce more degrees of emphaticness than females do in AJA?
- What are the reliable acoustic cues of emphasis when interacting with gender?

To answer the research questions above, the following hypotheses were devised for testing:

- VOT is a reliable acoustic correlate of emphasis when interacting with gender.
- There are acoustically motivated differences in the production of emphasis between males and females. That is, males show greater raising of F1 and greater lowering of F2 for vowels in emphatic environment as compared to those of females.

Method:**Participants:**

Twelve native speakers of AJA, 6 males and 6 females, were recruited in the production experiment. All of the subjects were selected according to four criteria. First, all subjects were native speakers of AJA. Second, all subjects descended from parents who are also native speakers of AJA. Third, all participants did not live in places other than the villages of Ajloun Governate. Fourth, none of the subjects suffered from any speech or hearing impairment as self-reported prior to the recordings.

Data:

The data of the present study consisted of 48 minimal pairs with the two emphatic consonants [t^ʕ] and [s^ʕ], along with their plain counterparts [t] and [s], occurring word-initially and word-finally in mono- and bi-syllabic words. As for the vowel qualities which were incorporated, these are the long low back [a:], short low back [a], long high front unrounded [i:], short mid-high front unrounded [ɪ], long high-back rounded [u:], and short mid-high back rounded [ʊ]. Almost 66% of the words were real words taken from the dialect under present investigation except for 33 words. However, nonwords are phonologically licensed in JA. As for the compatibility of the data, the stimuli of the current study were peer-reviewed by language specialists in the fields of phonetics, phonology, and syntax at Yarmouk University, Jordan. The total number of tokens was 1152, with each respondent yielding 96 tokens. For a full list of the stimuli, see Appendix A.

Recordings:

The participants of the present study were seated in a comfortable, sound-proof room at Ajloun Vocational Training Center. All of the recordings were made by using Remax RP1, a digital sound recorder that has a noise reduction quality. Sampling rate was 44.1 kHz. The participants were then cordially asked to read the list of minimal pairs in the carrier sentence thrice *ʔihki _____ (ʔ)ilwalad 'Say _____ the boy'* in a normal tone and rate. The minimal pairs were randomized as to draw away the respondent's attention from the target word. All recordings were conducted by the researcher himself. The recordings were then imported to a Toshiba Core I3 laptop and then to Praat (Boersma and Weenink, 2009). Several acoustic measurements were executed.

Acoustic Measurements:

The acoustic measurements of the present study consisted of consonant duration and Voice Onset Time (VOT), on the one hand, and F1, F2, and F3 of vowels both in the target syllable and in the non-target syllable. The vocalic cues were measured only at the vowel midpoint. In the following section, I present the findings on those measurements.

Results**Consonant Duration and Voice Onset Time:**

After running the Two-Way Analysis of Variance (ANOVA), the following findings have been secured:

- There was no significant interaction between emphasis and gender in terms of CD as the test value was ($F = .740$, $P = 0.390$) where $P = 0.390$ exceeds the significance level (0.05)
- There was, however, a significant interaction between emphasis and gender in terms of VOT ($F = 4.142$, $P = .043$), where males' emphatic VOTs were significantly longer than those of females were as shown in Figure (1) below.

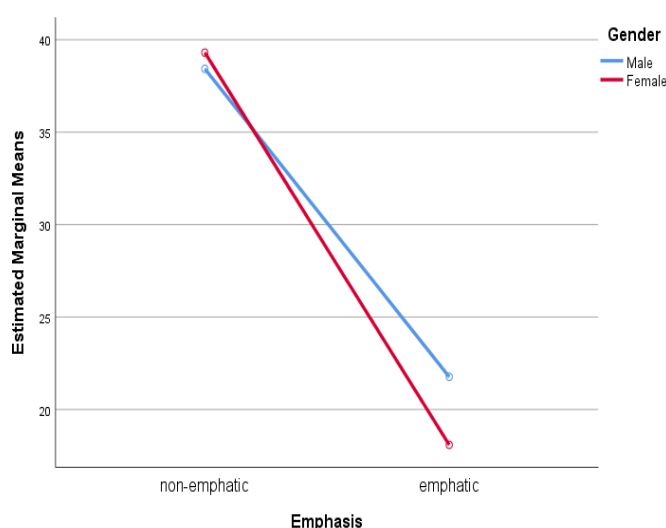


Figure (1): Emphasis and gender interaction on VOT

F1, F2, and F3 in the Target Syllable:

- There was no significant interaction between emphasis and gender on F1 in the target syllable ($F = .035$, $P = 0.818$) where $P = 0.818$ exceeds the significance level (0.05).
- There was also no significant interaction between emphasis and gender on F2 in the target syllable ($F = .107$, $P = .744$) where $P = 0.744$ exceeds the significance level (0.05).
- There was no significant interaction between emphasis and gender on F3 in the target syllable ($F = .1429$, $P = .232$) where $P = 0.232$ exceeds the significance level (0.05).

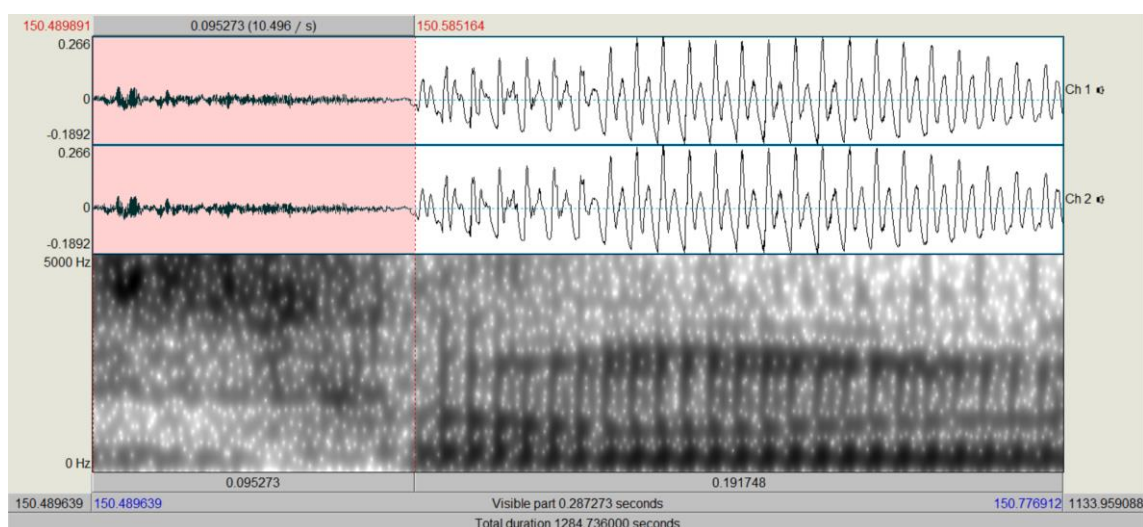
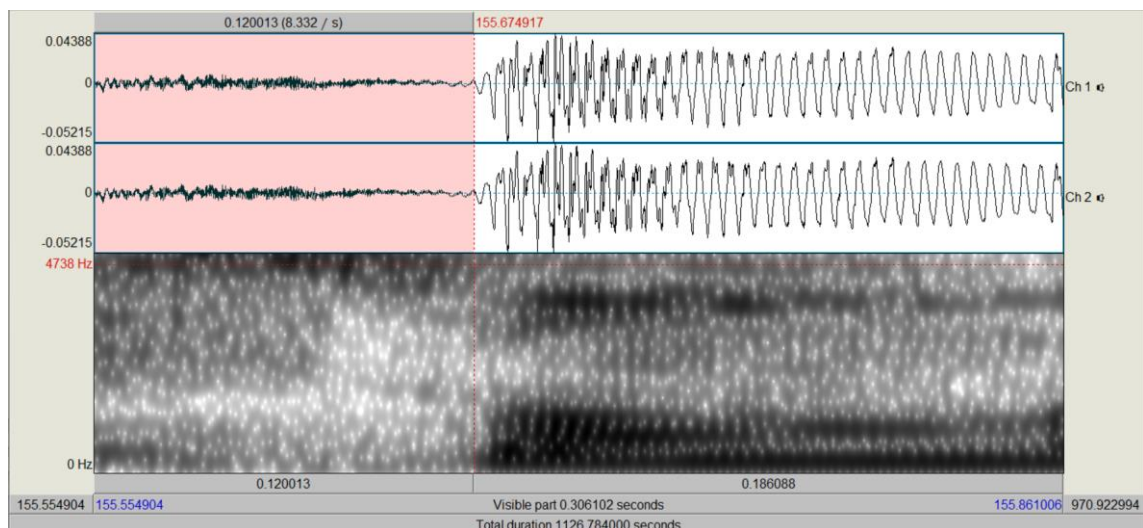
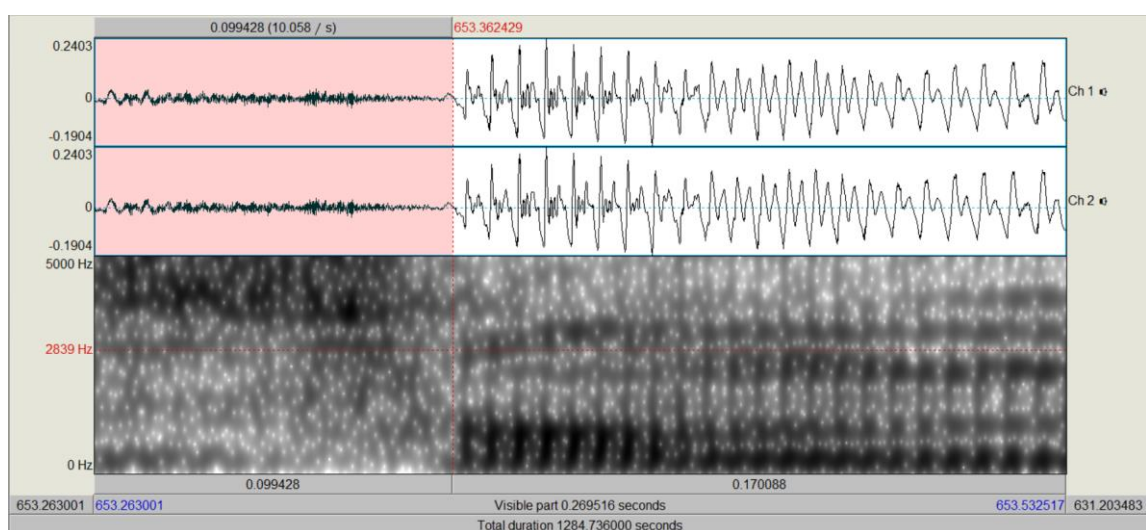
F1, F2, and F3 in the Non-target Syllable:

- There was no significant interaction between emphasis and gender on F1 in the non-target syllable ($F = .008$, $P = .928$) where $P = 0.928$ exceeds the significance level (0.05).
- There was also no significant interaction between emphasis and gender on F2 in the target syllable ($F = .458$, $P = .499$) where $P = 0.499$ exceeds the significance level (0.05).
- There was no significant interaction between emphasis and gender on F3 in the target syllable ($F = .035$, $P = .851$) where $P = 0.851$ exceeds the significance level (0.05).

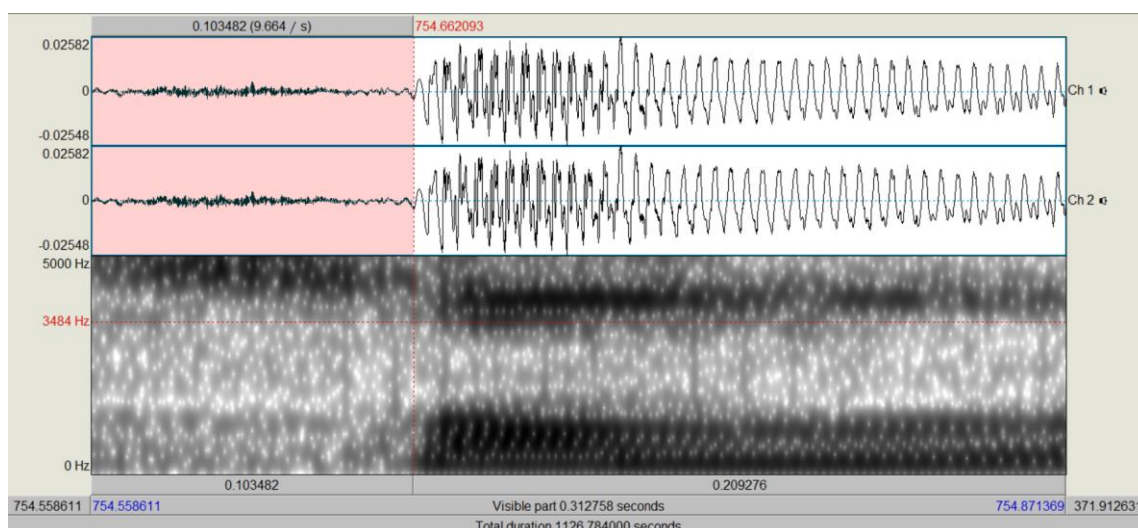
Discussion:

The present study has generally been a probe into the effects of gender on the acoustic cues of emphasis in AJA. The study has showed, for the most part, contrary findings to what has been reported in the previous literature while simultaneously supporting few, past research findings.

Counter to the majority of previous research findings (e.g. Royal 1985; Ahmad 1979; Wahba 1993; Al-Masri and Jongman, 2004, among others), the results have shown that F1 and F3 raised values and F2 lowered value of emphatic vowels are not reliable acoustic correlates neither in the target syllable nor in the non-target syllable. Yet, the results have confirmed few research findings (Abudalbuh, 2011; Al-Masri and Jongman, 2004; Almomany 2018) that consonant duration is not a reliable acoustic cue of emphasis in AJA. In addition, gender did not show any effect on CD of emphatic or plain consonants. That is, males and females produced comparable CDs both for emphatic consonants and for non-emphatic consonants. Spectrograms (1) – (4) show the approximation:

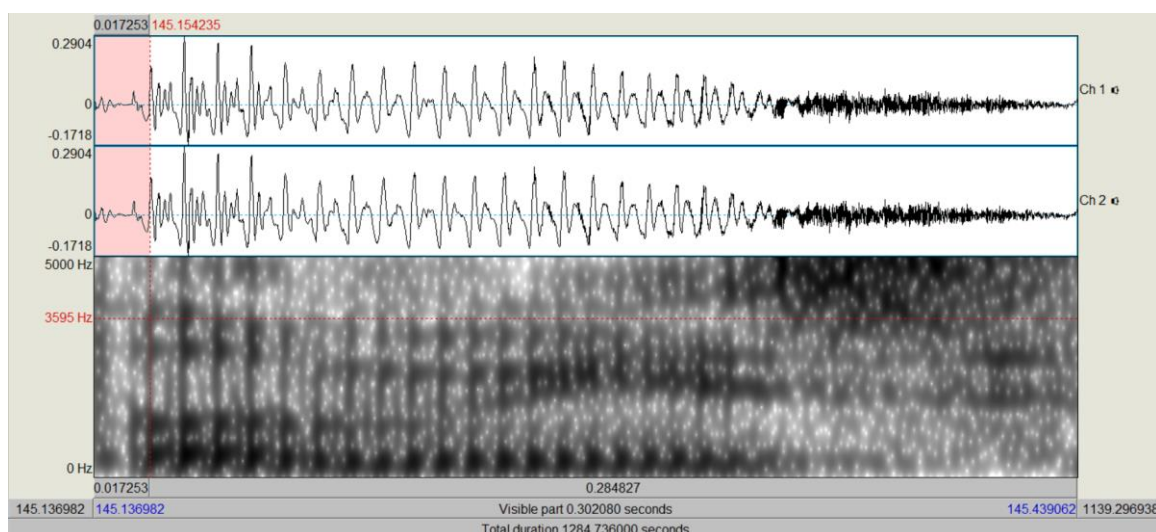
Spectrogram (1): CD of plain [s] in [sum] produced by a male speaker (being almost 95 ms.)**Spectrogram (2):** CD of plain [s] in [sum] produced by a female speaker (being almost 120 ms.)**Spectrogram (3):** CD of emphatic [s] in [s^ʕum] produced by a male speaker (being almost 99 ms.)

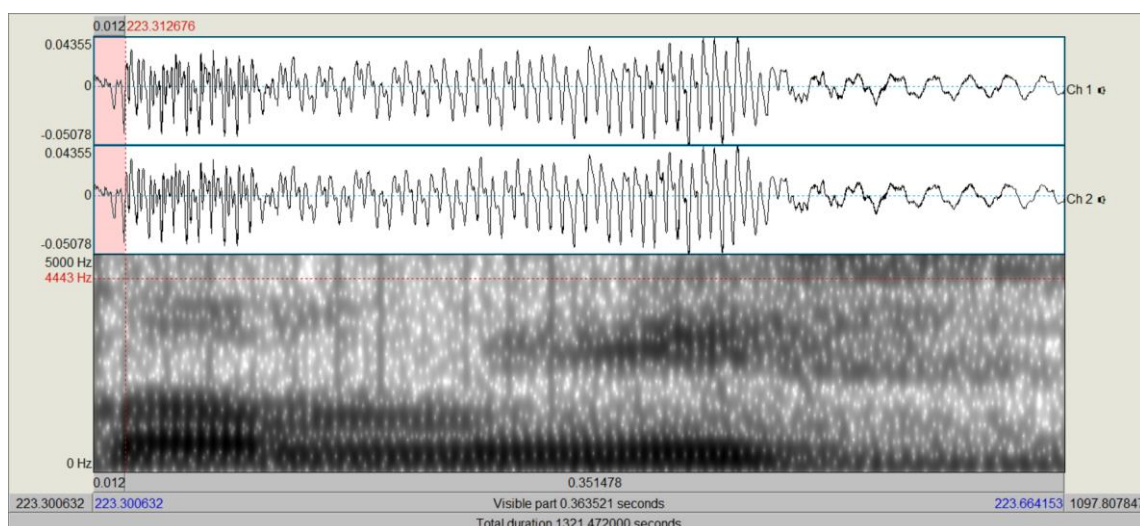
Spectrogram (4): CD of emphatic [s] in [s^ʕum] produced by a female speaker (being almost 103 ms.)



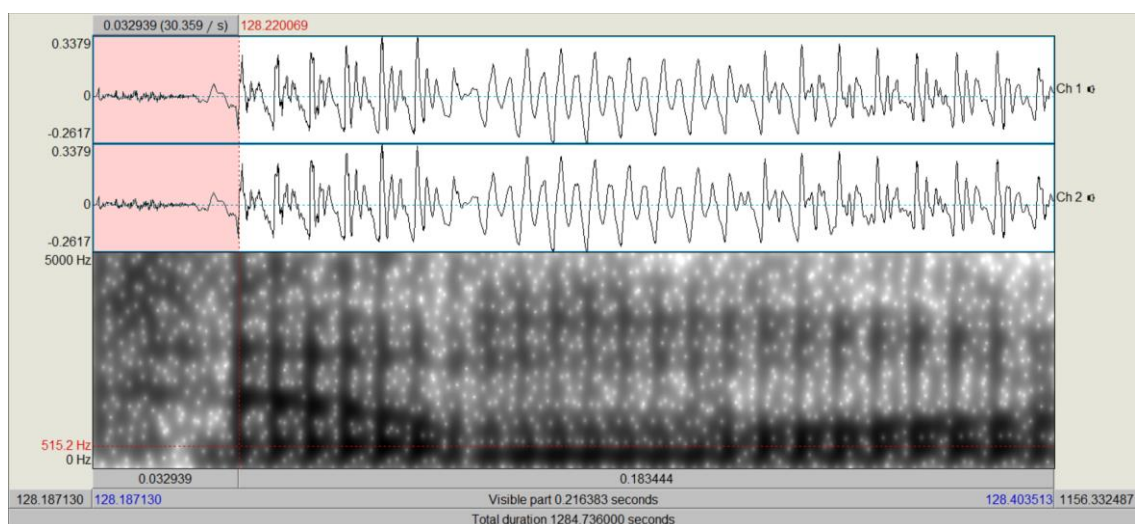
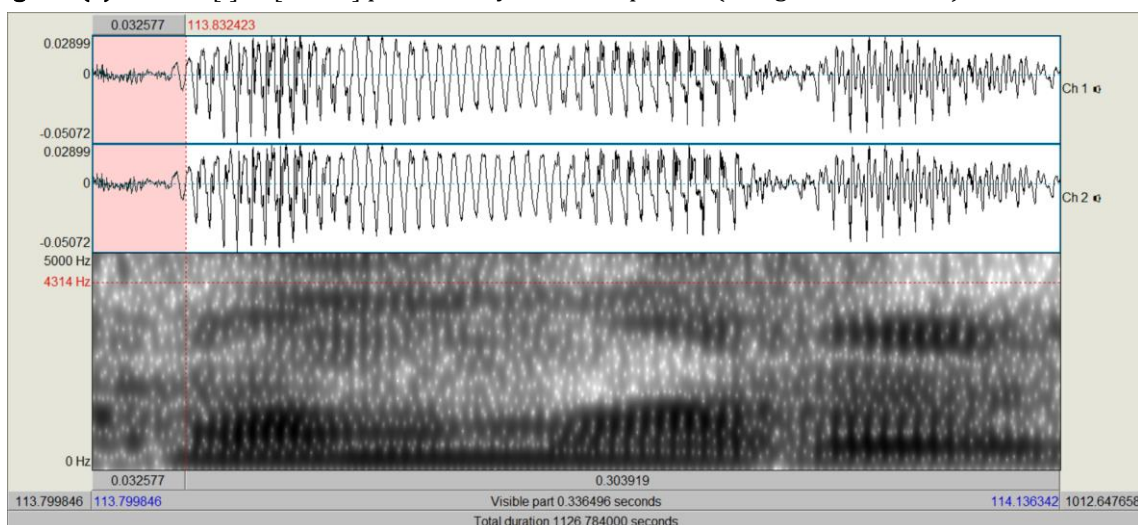
Our main research finding somehow runs in tandem with those of some researchers (e.g. Abudalbuh, 2011; Almomany, 2018; Khattab et al., 2006). To clarify, males' emphatic VOTs for [t^ʕ] were significantly longer than those of females were. Spectrograms (5) and (6) below show the difference:

Spectrogram (5): Emphatic VOT of [t^ʕ] in [t^ʕami:s] produced by a male speaker (being almost 17 ms.)



Spectrogram (6): Emphatic VOT of [tʕ] in [tʕami:s] produced by a female speaker (being 12 ms.)

Despite this statistically significant difference, males' and females' plain VOTs were almost the same (i.e. statistically nonsignificant) as shown in Spectrograms (7) and (8):

Spectrogram (7): VOT of [t] in [tamur] produced by a male speaker (being almost 33 ms.)**Spectrogram (8):** VOT of [t] in [tamur] produced by a female speaker (being almost 33 ms.)

Partially supporting our main finding, Abudalbuh (2011) has argued that VOT is, regardless of gender, a reliable acoustic cue of emphasis only for voiceless stops, where the emphatic VOT of a voiceless stop is significantly lower than that of the voiced one. As for gender-related effects, Abudalbuh (2011) has upheld the precedence of F1 raised value and F2 lowered value in emphatic environment over VOT in detecting emphasis production in JA.

In opposition to our research finding is Khattab et al.'s (2006) finding that females' emphatic VOTs were significantly longer than those of their male peers. Similarly, Almomany (2018) has maintained that VOT is the only reliable acoustic correlate of emphasis when interacting with either age or gender. Almomany (2018) has found that, relative to gender, males' emphatic VOTs were significantly longer than those of females. However, Almomany (2018) has concluded that the degree to which an acoustic correlate is dubbed reliable is dependent on the interaction it is involved in (i.e. pair-wise, overall).

Counter to this is Omari and Jaber's (2019) finding that VOT is not a reliable acoustic correlate of emphasis in JA. The researchers have, however, shown similar findings to ours on the vocalic cues in their subsequent study (i.e. Omari and Jaber, 2020), where they have found that gender did not have any bearings on the first three formant frequencies (F1-F3), a finding that was first instigated by Almomany (2018).

At odds with our findings are Al-Deaibes et al.'s (2021) findings, where they have highlighted the salience of the first three formant frequencies in emphatic environment as reliable correlates of emphasis. Al-Deaibes et al. (2021) have argued that F1 and F3 raised values and F2 lowered value are reliable acoustic correlates of emphasis for the secondary emphatic /w/ in both dialects of JA, namely RJA and UJA. Contrary to our main finding is their conclusion that emphasis is more pronounced in males' speech than it is in females'.

Overall, there has been little consensus as to what holds as a reliable acoustic correlate of emphasis. Such little consensus could be ascribed to some research peculiarities. For the most part, there was no uniform methodology among researchers of emphasis in Arabic dialects. That is to say, some researchers (e.g. Omari and Jaber, 2020; Omari and Jaber, 2019) resorted to increasing the number of respondents at the expense of the data while others (e.g. Almomany, 2018; Jongman et al., 2011) did the opposite. Such research inconsistencies would affect the data and thus the outcomes we draw our conclusions on. Moreover, some of the previous researchers (e.g. Abudalbuh, 2011; Al-Masri and Jongman, 2004; Khattab et al., 2006) confined their analysis to pair-wise interactions (i.e. emphasis and x) whereas others (e.g. Almomany, 2018; Omari and Jaber, 2019; Omari and Jaber, 2020) have employed the mixed-effects model of analysis. To illustrate, Omari and Jaber (2019) and Omari and Jaber (2020) have utilized a sample of 40 respondents while using only 12 monosyllabic minimal pairs. While Omari and Jaber (2019) have argued that males showed more degrees of emphaticness by means of F2 lowered value than females did in emphatic environment, our present study, which resorted to a sample of 12 participants but a stimuli production of 48 mono and bi-syllabic minimal pairs, showed that F2 is not a reliable acoustic cue of emphasis in the interaction of emphasis and gender. However, our present study has shown that females favored emphasis more than males did by means of females' shorter emphatic VOTs as compared to those of males in AJA.

Omari and Jaber (2020) have revealed that gender did not show any effect on either interactions: emphasis*manner or emphasis*voice. Rather, the researchers have identified the overlap in the overall interaction of gender and social on emphasis*manner interaction at F1 onset of emphaticized vowels. In addition, Omari and Jaber (2020) have argued that F2 and F3 are not reliable acoustic correlates in the interactions between emphasis and gender and/or social class. This finding lends support to our finding that F2 and F3 are not reliable acoustic correlates of emphasis in AJA. What this basically suggests is that our main findings are not far from true, as one takes the measurements in a different environment.

Almomany (2018), for instance, has utilized several analyses to investigate the effects of age and gender on emphasis production in JA. The researcher has increased the amount of data at the expense of the respondents. Almomany (2018) has used a sample of 12 participants with a stimuli production of 48 minimal pairs; therefore, he has utilized three types of interactions: one-to-one interaction, pair-wise interaction, and overall interaction. Almomany (2018) has found that, similar to our findings, CD, on the one hand, and F1, F2, and F3 in the target and non-target syllables, on the other hand, are not reliable acoustic cues of emphasis in JA in the interactions of emphasis and age and/or gender. Similar to our VOT finding, Almomany (2018) has argued that males' emphatic VOTs were longer than those of females. The researcher has added that VOT was also reliable in the interaction between emphasis and age, where speakers of the second group showed the most magnitude of change followed by the third and first groups, respectively. However, VOT has transpired to be unreliable in the overall interaction of emphasis and all of the other variables (linguistic and extra-linguistic).

Conclusions:

This study has been an attempt to identify the plausible effects of gender as an extra-linguistic variable on the production of the two primary emphatics, namely [s^ʕ] and [t^ʕ] in AJA, a sub-dialect of JA. Twelve native speakers of AJA, 6 males and 6 females, participated in the production stimuli of this study, which consisted of 48 mono and bi-syllabic minimal pairs. Several acoustic parameters have been utilized including CD, VOT, F1, F2, and F3. The study has shown that CD, along with F1, F2, and F3 in the target and non-target syllables, is volatile, as it has shown no

significance in the direction of emphasis. Instead, VOT has turned out to be the only reliable acoustic correlate of emphasis, where males produced longer emphatic VOTs than their female peers did. Concisely, emphasis was more evident in females' speech than it is in males' in AJA.

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Appendix A.

Stimulus material for monosyllables (*Please note that the asterisk after each word indicates that it is a non-word).

Consonant	Mono-syllabic Words								
	Vowel	Word-Initial				Word-Final			
		Plain	Gloss	Emphatic	Gloss	Plain	Gloss	Emphatic	Gloss
s/s ^ʕ	a:	sa:b	Dissipated	s ^ʕ a:b	Touched	ba:s	Kissed	ba:s ^ʕ	Bus
	a	sab	Badmouthed	s ^ʕ ab	Poured	bas	Enough	bas ^ʕ *	—
	i:	si:b	Leave!	s ^ʕ i:b	Touch!	ni:s*	—	ni:s ^ʕ	Porcupine
	ɪ	sɪn	A tooth	s ^ʕ ɪn	Shut up!	bɪs	A cat	bɪs ^ʕ *	—
	u:	su:g	Drive!/Market	s ^ʕ u:g*	—	bu:s	Kiss!	bu:s ^ʕ *	—
	ʊ	sʊm	Poison!	s ^ʕ ʊm	Tie tightly!	nʊs*	—	nʊs ^ʕ	Half
t/t ^ʕ	a:	ta:b	Repented	t ^ʕ a:b	Recovered	ba:t	Stayed overnight	ba:t ^ʕ *	—
	a	tam	Done!	t ^ʕ am	Covered	mat	Did (something) lazily	mat ^ʕ	Stretched
	i:	ti:n	Figs	t ^ʕ i:n	Mud	bi:t*	—	bi:t ^ʕ *	—
	ɪ	tɪf	Spit!	t ^ʕ ɪf*	—	zɪt	Throw!	zɪt ^ʕ *	—
	u:	tu:b	Repent!	t ^ʕ u:b	Bricks	fu:t	Enter!	fu:t ^ʕ	—
	ʊ	tʊn*	—	t ^ʕ ʊn*	Tuna fish	bu:t	Decide!	bu:t ^ʕ	Stab!

Stimulus material for bi-syllabic words (*Please note that the asterisk after each word indicates that it is a non-word).

Consonant	Bi-syllabic Words								
	Vowel	Word-Initial				Word-Final			
		Plain	Gloss	Emphatic	Gloss	Plain	Gloss	Emphatic	Gloss
s/s ^ʕ	a:	sabba:r*	—	s ^ʕ abba:r	Cactus	ha:ɖɪs	Obsession	ha:ɖɪs ^ʕ *	—
	a	samar	Female name	s ^ʕ amar*	—	?abus	Shall I kiss!	?abus ^ʕ *	—
	i:	safi:*	—	s ^ʕ afi:	Pure	mi:das	A furniture shop name	mi:das ^ʕ *	—
	ɪ	samɪr	Male name	s ^ʕ amɪr*	—	bɪmos*	Related to	bɪmos ^ʕ	Is sucking
	u:	su:mu:	Estimate!	s ^ʕ u:mu:	Fast!	mu:bɪs*	—	mu:bɪs ^ʕ *	A village name
	ʊ	sabʊr*	—	s ^ʕ abʊr	Cactus fruit	fʊsfʊs	Flies	fʊsfʊs ^ʕ *	—
t/t ^ʕ	a:	tu:ba:s*	—	t ^ʕ u:ba:s	Name of a city in Palestine	ʃa:mit	Humiliating	ʃa:mit ^ʕ	High
	a	tabar*	—	t ^ʕ abar	An axe	bafut	Slicing	bafut ^ʕ	Stand up abruptly
	i:	tami:s	A type of bread	t ^ʕ ami:s*	—	ʃi:mat	Characteristics	ʃi:mat ^ʕ *	—
	ɪ	tɪbɪr	Gold nuggets	t ^ʕ ɪbɪr*	—	əa:bit	Fixed	əa:bit ^ʕ *	—
	u:	tʊmu:r	Dates	t ^ʕ ʊmu:r*	—	du:da:t	Worms	du:da:t ^ʕ *	—
	ʊ	tamʊr	Dates	t ^ʕ amʊr	Heap	bʊket	Bouquet	bʊket ^ʕ *	—