

## **Emphasis, Manner, and Voice in Urban Jordanian Arabic: Linguistic and Extralinguistic Interactions**

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**Abstract:** *The present paper examines the impact of extra-linguistic variables (gender and social class) on the linguistic interaction between emphasis and manner, on the one hand, and voice, on the other hand, in Urban Jordanian Arabic. To achieve this goal, 40 participants produced 12 monosyllabic CVC minimal pairs with the target consonant (plain or emphatic) occurring word-initially. Measurements taken were F1, F2, and F3 at vowel onset and midpoint positions. Acoustically, it was found that emphasis was stronger following a stop than following a fricative, and it is more pronounced following a voiced consonant than following a voiceless one. However, the extra-linguistic factors did not have a strong bearing on these linguistic interactions. In general, the interaction between emphasis and manner or voice was not influenced by gender or social class. An exception to this finding was the overlap between emphasis and manner at F1 onset, where the interplay of both gender and social class affected the linguistic interaction. In particular, upper-class males produced stronger emphasis following stops than following fricatives, whereas lower-middle class males produced stronger emphasis following a fricative than following a stop.*

**Keywords:** emphasis, gender, Jordanian Arabic, manner, social class, voice

### **1. Introduction**

Urban Jordanian Arabic (UJA, henceforth)<sup>1</sup>, like many other dialects of Arabic, is known to have contrastive pharyngealization (traditionally referred to as emphasis). Four pairs of contrasting plain and emphatic coronals can be identified in this dialect: /t, t̤, s, s̤, dh, TH, d, d̤/. A number of experimental studies have established that these emphatic consonants affect the adjacent vowels by raising their F1 and F3 and lowering their F2 (Yeou 1995; Zawaydeh 1999; Jongman, Al-Masri, Sereno, and Combest 2011; Alarifi and Tucker 2016; Jaber, Omari, and Al-Jarrah 2019, among others).

Recently, a few studies have shifted focus from the acoustic effect of emphasis on the adjacent vowels to the interaction between this effect and extra-linguistic factors such as gender, region, and social class (Khattab, Al-Tamimi, and Heselwood 2006; Abudlabuh 2010; Alzoubi 2017; Omari and Jaber (2019). For example, Abudalbu (2010) reports that the effect of emphasis on the adjacent vowel in Jordanian Arabic (JA) is greater by males than by females<sup>2</sup>. On the other hand, Omari and Jaber (2019) find that the main effect of emphasis in JA overlaps with both gender and social class. For instance, they find that at F2, differences in emphasis cues between males and females exist only within the lower-middle

class group. Upper-class speakers, on the other hand, do not have significant differences in emphasis cues.

On the other hand, a few other studies have shown that the effect of emphasis in JA may overlap with linguistic factors, particularly manner (Abudaljuh 2010; Jongman et al. 2011; Alzoubi 2017). These studies reveal disagreement over the overlap between manner and emphasis. Abudaljuh (2010: 38) finds that emphasis in JA is more pronounced in vowels following a fricative than those following a stop as measured at F1 midpoint and F2 offset. F1 raising and F2 lowering in these contexts are higher in the vowels following the emphatic fricatives than in those following the stops. In contrast, Jongman et al. (2011: 15) report that the effect of emphasis is “more pronounced in the environment of stops than fricatives”, as F2 lowering in vowels (at midpoint) following the emphatic stop consonants is significantly greater than that in vowels following the emphatic fricatives. In addition, Alzoubi (2017: 86) reports that emphasis is more acoustically evident in vowels following voiceless stops than those following voiceless fricatives, as evidenced from a greater degree of F3 raising at vowel onset position.

The results from the sociophonetic literature of emphasis discussed above imply that emphasis should not be dealt with as a purely linguistic phenomenon, rather it is a sociophonetic construct. Therefore, reliable findings of the main effect of emphasis or its potential interactions with other linguistic factors cannot be obtained without taking the extra-linguistic variables into account.

In this paper, we aim to examine whether the interaction between emphasis and other linguistic factors, particularly manner and voice, in UJA may overlap with some extra-linguistic variables, gender and social class. As discussed above, previous studies on JA have revealed disagreement over the interaction effect between emphasis and manner. These conflicting results may be related to a methodological shortcoming of not controlling for non-linguistic variables in their samples. These studies investigate the linguistic interaction between emphasis and manner without considering the potential effect of extra-linguistic factors such as gender and/or the socioeconomic status. Furthermore, while a few studies (Abudaljuh 2010; Jongman et al. 2011) have looked at the interaction between emphasis and voice in the consonants themselves, the interaction effect between emphasis and voice on the adjacent vowels in JA has not been examined before, to the best of the authors’ knowledge. Thus, this paper will examine the potential impact of extra-linguistic variables, gender and social class, on the linguistic interaction between emphasis and both manner and voice. In particular, the following questions will be addressed:

- 1- Is there an overlap between the linguistic variables (voice and manner) and emphasis in UJA?
- 2- Is the interaction between voice, manner, and emphasis, if any, influenced by the extra-linguistic variables (gender and social class)?

## 2. Experiment

### 2.1. Data and participants

The data for this experiment come from a recording of 40 native speakers of Urban Jordanian Arabic, producing 12 monosyllabic CVC minimal pairs with the target consonant (plain or emphatic) occurring in the initial position. The emphatic consonants used were /t̤, s̤, d̤, and TH/, the vowels were /i:/, /u:/, and /æ:/, and the coda slot was filled by the sound /b/. Non-words were sometimes used to complete the minimal pair list (see Appendix for the list of stimuli).

The participants are distributed evenly into four social groups per gender and social class: 20 upper-class (UC) speakers (10 males; 10 females) and 20 lower-middle class (LMC) (10 males; 10 females). The criteria for categorizing the participants into social class were based on school type, residential area, and parents' occupation. The UC group was high school students in a prestigious school in Amman, namely the Islamic Scientific College. The participants live in West Amman, and their parents occupied prestigious jobs such as businessmen and senior government officials. The LMC speakers, on the other hand, were freshmen or sophomores at a public university who had their school education in public schools, lived in East or North Amman, whose parents occupied low-paid jobs such as soldiers and clerks.

### 2.2. Recordings

The UC group was recorded in a quiet area at the school library by two teaching assistants (a male and a female). The second group was recorded in a soundproof room at the authors' affiliated university. All recordings were conducted using the built-in microphones of ZOOM H4n recorder at a sampling rate of 44,100 Hz at a resolution of 16 bits. The minimal pairs were randomized, and each word was put in the carrier phrase *bahki\_\_\_\_\_kama:n marrah* 'I say\_\_\_\_\_ once more'. The participants were instructed to read the list of stimuli three times.

### 2.3. Measurements

Acoustic measurements taken for this experiment were F1, F2, and F3 at vowel onset and midpoint positions. All the three attempts of the stimuli were measured, and the analysis was based on the mean values of the three measurements. The measurements were conducted in Praat (Boersma and Weenik 2009). The segmentation process was made based on the spectrogram, waveform, and auditory verifications. Following Jongman et al. (2011), vowel onset was recognized as the emergence of F1, while vowel offset was taken as the point at which F2 disappeared from the spectrogram.

All formant measurements (F1, F2, and F3) were then normalized to reduce the effect of physiological differences between males and females. The normalization process was performed using Kendall and Thomas's (2010) web-based application, The Vowel Normalization and Plotting Suite, using Nearey1 method (Nearey 1977). The mean value of the three measurements for each formant was generated automatically by The Normalization Suite. The normalized values (i.e., non-Hertz values) were then analyzed using the SPSS version 22.

### 3. Results

In this section, we present the results of the statistical analysis. The results are based on four-way ANOVA analyses, including the independent factors of emphasis, manner/voice, gender, and social class. Thus, the results of manner and voice will be presented in separate sections, as they are the product of two different runs. In each section, we first report the results of the main effects of the independent factors; then we report the results of the interaction effect between the factors.

#### 3.1 Manner

##### 3.1.1. Vowel formant frequency 1 (F1)

A Four-way Repeated Measures ANOVA showed a significant main effect of emphasis on F1 onset ( $F(1, 28) = 71.709, p = .000$ ). The mean F1 onset of vowels following emphatic consonants was higher (1.061) than that of vowels following the plain counterparts (.996). However, the main effect of manner on F1 onset was not significant ( $F(1, 28) = 2.392, p = .133$ ). In addition, there was no significant main effect of gender ( $F(1, 28) = 1.378, p = .250$ ) or social class on F1 onset ( $F(1, 28) = 1.386, p = .249$ ). [A value below 0.05 means a statistically significant difference].

The ANOVA analysis showed no significant emphasis\*manner interaction for F1 onset ( $F(1, 28) = .268, p = .609$ ). Furthermore, there was no significant interaction between emphasis, manner, and gender ( $F(1, 28) = .018, p = .895$ ) or between emphasis, manner, and social class on F1 onset ( $F(1, 28) = 1.435, p = .241$ ). This indicates that neither gender nor social class has an effect on the interaction between emphasis and manner. In other words, the linguistic effect of manner on emphasis is not affected by any of the extra-linguistic factors.

However, the emphasis\*manner\* gender\* social class interactions for F1 onset was significant ( $F(1, 28) = 4.491, p = .043$ ). Further follow-up runs were conducted to find out the source of this multiple interaction effects. We tested the interaction between emphasis and manner for each social group (i.e., males, females, UC, LMC, UC males, etc.). We found a significant interaction between emphasis and manner, and social class within the male group (i.e., excluding all the females) ( $F(1, 14) = 8.332, p = .012$ ). As illustrated in Figure 1, LMC males pronounced stronger emphasis in vowels following fricatives (e.g., *THa:b* ‘melted’) than following stops (e.g., *ta:b* ‘recovered’), as the amount of F1 raising after fricatives (0.126) was higher than that after stops (0.102). On the other hand, UC males pronounced stronger emphasis following a stop than following a fricative, since the amount of F1 raising in the stop environment (0.102) was greater than in the fricative one (0.063).

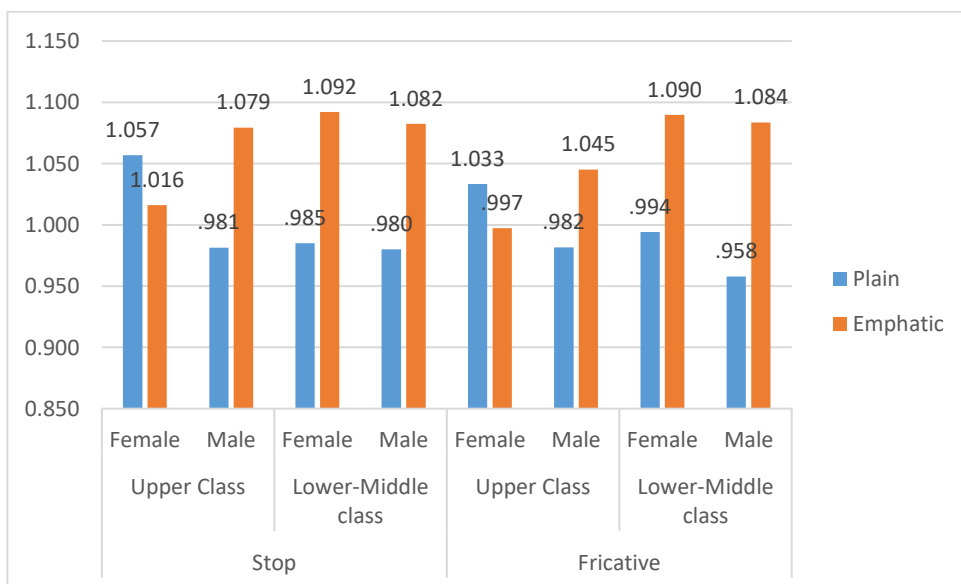


Figure 1: Emphasis\*manner\*gender\*social class interaction for F1 onset

As for F1 midpoint, there was no significant main effect of emphasis ( $F(1, 28) = 2.855, p = .102$ ) or manner ( $F(1, 28) = .715, p = .405$ ). However, there was a significant main effect of gender on F1 midpoint ( $F(1, 28) = 7.478, p = .011$ ). The mean F1 for females (1.065) was higher than that of the males (1.041). In addition, there was a significant main effect of social class on F1 midpoint ( $F(1, 28) = 7.478, p = .011$ ). The mean F1 midpoint of LMC speakers (1.066) is higher than that of the UC speakers (1.040).

Like in the onset position, there was no significant interaction between emphasis, manner, and gender ( $F(1, 28) = 1.918, p = .177$ ) or social class ( $F(1, 28) = 1.926, p = .176$ ).

In addition, there was no significant interaction between emphasis and manner ( $F(1, 28) = 1.376, p = .251$ ) or between emphasis, manner, gender, and social class for F1 midpoint ( $F(1, 28) = .149, p = .702$ ). This indicates that manner has no influence on the differences in F1 midpoint between plain and emphatic contexts, and the extra-linguistic variables do not affect this result.

### 3.1.2. Vowel formant frequency 2 (F2)

A Four-way Repeated Measures ANOVA showed a significant main effect of emphasis on F2 onset ( $F(1, 28) = 465.804, p = .000$ ) and midpoint ( $F(1, 28) = 202.703, p = .000$ ). In both contexts, vowels following the emphatic consonants were significantly lower than those following the plain ones. On the other hand, the main effect of manner on F2 was not significant at F2 onset ( $F(1, 28) = .363, p = .552$ ) nor at midpoint ( $F(1, 28) = .080, p = .779$ ). There was no significant main effect of gender at onset ( $F(1, 28) = 2.554, p = .121$ ) nor at midpoint ( $F(1, 28) = 2.164, p = .152$ ). The main effect of social class on F2 onset was also insignificant ( $F(1, 28) = 1.108, p = .301$ ), but it was significant at the midpoint

position ( $F(1, 28) = 9.324, p = .005$ ). The mean F2 (midpoint) for LMC speakers (1.085) was higher than that of the UC ones (1.063).

The ANOVA analysis showed that the emphasis\*manner interaction was significant at F2 onset ( $F(1, 28) = 49.753, p = .000$ ) and midpoint ( $F(1, 28) = 4.638, p = .040$ ). As illustrated in Figure (1), the amount of F2 lowering in F2 of vowels following an emphatic stop (e.g., *ta:b*) is greater than that following an emphatic fricative (e.g., *THa:b*). In other words, emphasis is stronger following an emphatic stop than following an emphatic fricative.

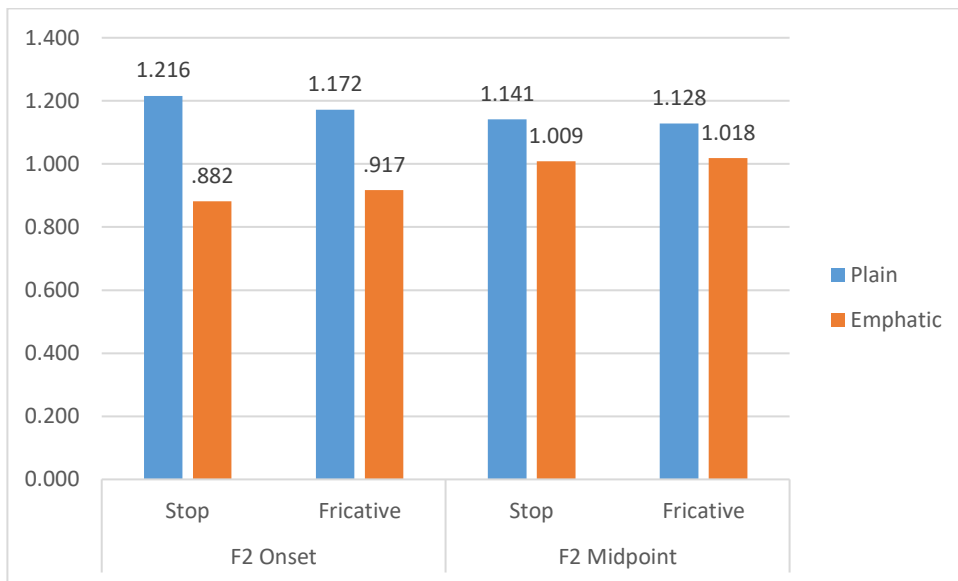


Figure 2: Emphasis\*manner interaction for F2

However, the emphasis\*manner interaction with gender or social class for F2 was not significant at onset (gender: ( $F(1, 28) = 2.162, p = .153$ ); social class: ( $F(1, 28) = 2.464, p = .128$ )) nor at midpoint (gender: ( $F(1, 28) = 3.155, p = .087$ ); social class: ( $F(1, 28) = 4.168, p = .051$ )). The emphasis\*manner\* gender\* social class interactions for F2 were also insignificant at onset ( $F(1, 28) = .169, p = .684$ ) nor at midpoint ( $F(1, 28) = 1.028, p = .319$ ). This simply implies that the extra-linguistic variables do not affect the interaction between emphasis and manner. That is, the effect of manner on emphasis is not influenced by the gender or the socioeconomic status of the speaker.

### 3.1.3. Vowel formant frequency 3 (F3)

The ANOVA analysis showed a significant main effect of emphasis on F3 onset ( $F(1, 28) = 47.129, p = .000$ ). And midpoint ( $F(1, 28) = 60.010, p = .000$ ). Vowels following the emphatic consonants were significantly higher than those following the plain ones. However, the main effect of manner was significant only at the onset position ( $F(1, 28) = 23.537, p = .000$ ), with the mean F3 value of stops (1.023) is higher than that of fricatives (.999). On the other hand, there was

no significant main effect of gender or social class at F3 onset (gender:  $F(1, 28) = .752, p = .393$ ); social class:  $F(1, 28) = 2.146, p = .154$ ) nor at midpoint (gender:  $F(1, 28) = 1.662, p = .208$ ); social class:  $F(1, 28) = 3.755, p = .063$ ).

The ANOVA analysis showed no significant emphasis\*manner interaction for F3 onset ( $F(1, 28) = .002, p = .967$ ), but the interaction at F3 midpoint was significant ( $F(1, 28) = 11.033, p = .002$ ). As shown in Figure (2), the amount of F3 raising was greater following an emphatic stop (*ta:b*) than following an emphatic fricative (*THa:b*). In other words, emphasis is more pronounced following a stop than following a fricative.

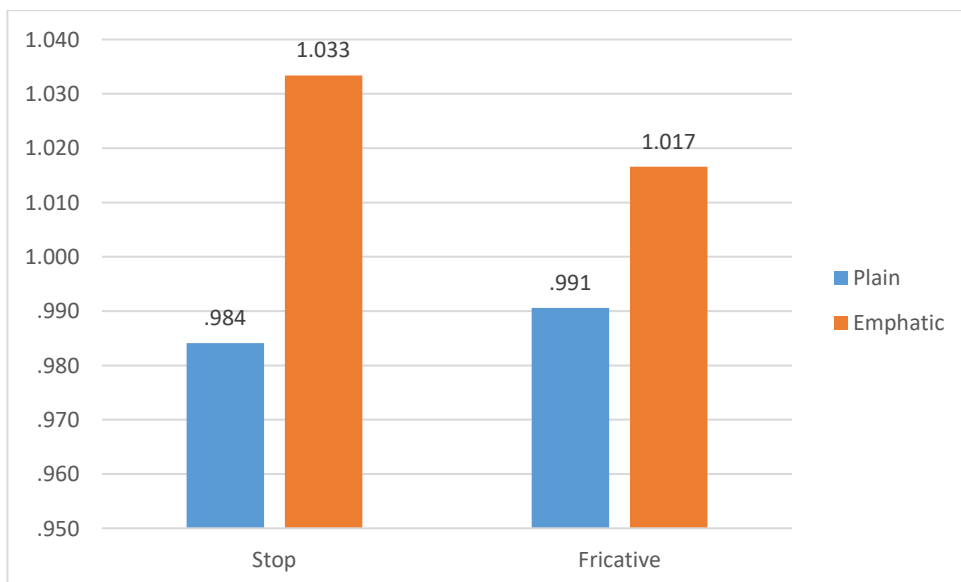


Figure 3: Emphasis\*manner interaction for F3 midpoint

The emphasis\*manner interaction with gender or social class for F3 was not significant at onset (gender:  $F(1, 28) = .080, p = .780$ ); social class:  $F(1, 28) = .558, p = .461$ ) nor at midpoint (gender:  $F(1, 28) = .210, p = .650$ ); social class:  $F(1, 28) = .421, p = .522$ ).

In addition, there were no significant emphasis\*manner\* gender\* social class interactions for F3 onset ( $F(1, 28) = 3.159, p = .088$ ) or midpoint ( $F(1, 28) = 3.670, p = .066$ ). Again, this indicates that the overlap between emphasis and manner is not significantly influenced by the extra-linguistic factors.

## 3.2. Voice

### 3.2.1 Vowel formant frequency 1 (F1)

A Four-way Repeated Measures ANOVA showed a significant main effect of voice on F1 onset only ( $F(1, 28) = 13.822, p = .001$ ). The mean of F1 onset after voiceless consonants (e.g., *ta:b*) was higher than that after the voiced ones (e.g., *da:b* 'non-word'). [The result of the main effect of emphasis, gender, and social

class for voice is the same as the one reported about manner (section 3.1). Therefore, they will not be reported in this section.]

The ANOVA analysis showed a significant emphasis\*voice interaction for F1 midpoint only ( $F(1, 28) = 6.712, p = .015$ ). However, this interaction does not reflect a difference in the strength of emphasis cues, rather it shows differences in the amount of departure from emphasis cues, since there was an F1 lowering, instead of raising, in both contexts. As illustrated in Figure 4, there was a slight F1 lowering in the voiceless environment, and a significant F1 lowering in the voiced context.

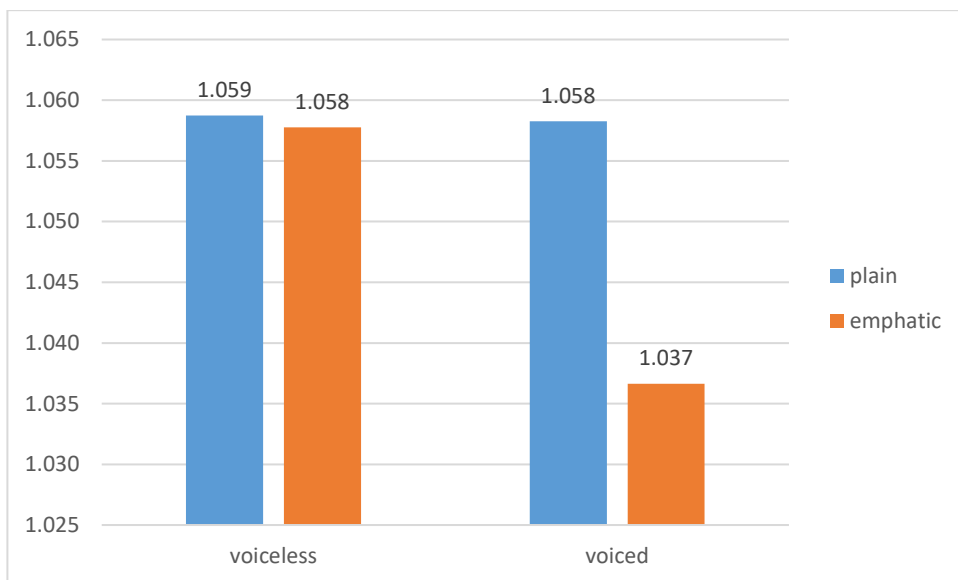


Figure 4: Emphasis\*voice interaction for F1

The emphasis\*voice interaction with gender or social class for F1 was not significant at onset (gender: ( $F(1, 28) = 3.246, p = .082$ ); social class: ( $F(1, 28) = .002, p = .965$ )) nor at midpoint (gender: ( $F(1, 28) = .037, p = .848$ ); social class: ( $F(1, 28) = .000, p = .984$ )).

Furthermore, the emphasis\*voice\* gender\* social class interaction for F1 was not significant at onset ( $F(1, 28) = .955, p = .337$ ) nor at midpoint ( $F(1, 28) = .282, p = .599$ ). This indicates that voice has no influence on the differences in F1 between plain and emphatic contexts, and this result is not influenced by the extra-linguistic variables.

### 3.2.2. Vowel formant frequency 2 (F2)

There was a significant main effect of voice on F2 onset only ( $F(1, 28) = 10.252, p = .003$ ), with the mean F2 value of vowels following voiced consonants is higher than that following the voiceless ones.

On the other hand, the emphasis\*voice interaction was significant at both onset ( $F(1, 28) = 24.541, p = .000$ ) and midpoint ( $F(1, 28) = 13.785, p = .001$ )



positions. As illustrated in Figure (4), emphasis is more pronounced following a voiced consonant (e.g., *da:b*) than following a voiceless one (e.g., *ta:b*).

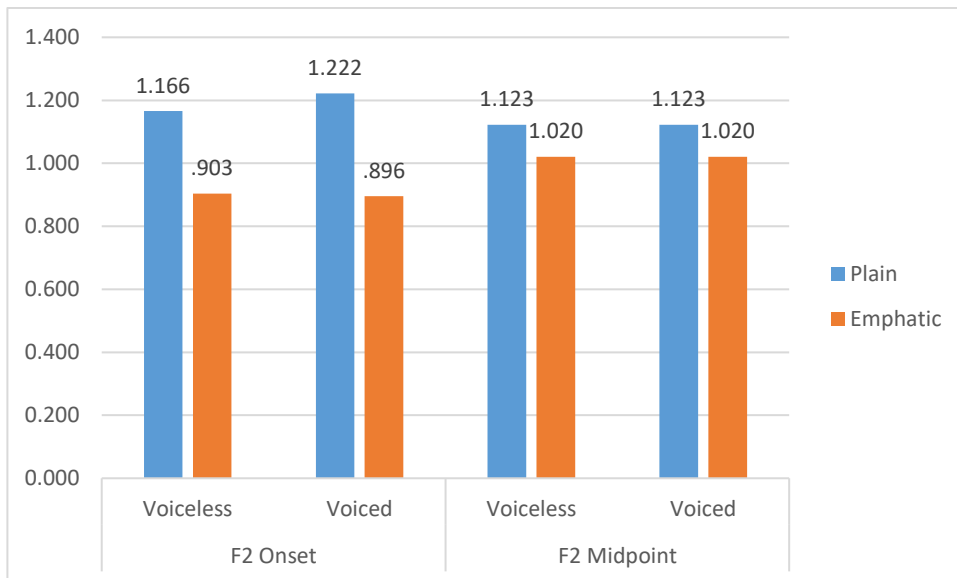


Figure 5: Emphasis\*voice interaction for F2

The emphasis\*voice interaction with gender or social class for F2 was not significant at onset (gender:  $F(1, 28) = .297, p = .590$ ); social class:  $F(1, 28) = 4.167, p = .051$ ) nor at midpoint (gender:  $F(1, 28) = .051, p = .823$ ); social class:  $F(1, 28) = 2.112, p = .157$ ). Likewise, there was no significant interaction between emphasis, voice, gender, and social class at onset ( $F(1, 28) = .076, p = .785$ ) or at midpoint ( $F(1, 28) = .442, p = .512$ ). This means that gender and social class do not place an effect on the emphasis\*voice interaction.

### 3.2.3. Vowel formant frequency 3 (F3)

There was no significant main effect of voice on F3 onset ( $F(1, 28) = .051, p = .823$ ) or midpoint ( $F(1, 28) = 2.050, p = .163$ ).

The emphasis\*voice interaction for F3 was also insignificant at the two positions (onset:  $F(1, 28) = 2.081, p = .160$ ; midpoint:  $F(1, 28) = .339, p = .565$ ). In addition, the emphasis\*voice interaction with gender or social class for F3 was not significant at onset (gender:  $F(1, 28) = .198, p = .660$ ); social class:  $F(1, 28) = .813, p = .375$ ) nor at midpoint (gender:  $F(1, 28) = .159, p = .693$ ); social class:  $F(1, 28) = .005, p = .943$ ).

Furthermore, the interaction between emphasis, voice, gender, and social class was not significant at onset ( $F(1, 28) = .901, p = .351$ ) nor at midpoint ( $F(1, 28) = .053, p = .819$ ), meaning that the insignificant linguistic interactions between emphasis and voice at F3 are not affected by the speaker's gender or social class.

#### 4. Discussion and conclusions

The main goal of the present experiment was to examine the impact of extra-linguistic variables (gender and social class) on the linguistic interaction between emphasis and manner or voice in UJA. Forty participants produced twelve monosyllabic CVC minimal pairs with the target consonant (plain or emphatic) occurring word-initially. Measurements taken were F1, F2, and F3 at vowel onset and midpoint positions.

The acoustic results showed that the effect of emphasis on the adjacent vowels significantly overlaps with that of manner at F2 and F3 midpoint positions. In each of these contexts, emphasis was stronger following a stop than following a fricative. This result confirms the finding reported in previous studies that emphasis in JA is more pronounced following stops than following fricative (Jongman et al. 2011; Alzoubi 2017).

Concerning the effect of voice on emphasis, the present study shows that emphasis is more pronounced following a voiced consonant than following a voiceless one. F2 lowering (onset and midpoint) was higher following the voiced emphatic consonants than following the voiceless ones. It is worth mentioning here that although the intersection between voice and emphasis was found significant at F1 (onset), we consider this result irrelevant because there were no cues of emphasis detected at F1 in either voiced or voiceless contexts. As shown in Section (3.2.1), the statistical significance of this result reflected the difference in the amount of F1 lowering, not raising, in the emphatic environment.

Previous studies have reported significant interactions between emphasis and gender or social class (Khattab et al. 2006, Abudaljuh 2010, Alzoubi 2017, Omari and Jaber (2019)). Generally, the present study shows that the linguistic interactions between emphasis and manner or voice are not significantly affected by gender or social class. However, there was only one context where both gender and social class appear to influence the linguistic interactions, namely between emphasis and manner at F1 onset. As shown in section (3.1.1), UC males tended to pronounce stronger emphasis following stops than following fricatives, whereas LMC males tended to produce stronger emphasis following a fricative than following a stop. The effect of social factors on the interaction between emphasis and manner has been reported elsewhere in the literature. Based on F2 measurements, Almbark (2008) finds that in Syrian Arabic, female speakers tended to produce stronger emphasis following a stop, whereas male speakers pronounced stronger emphasis after fricatives. The present study, however, shows that the interaction between emphasis and manner in this context is not affected by either gender or social class, rather it is the intersection of gender and social class together that affects the linguistic interaction.

Thus, the effect of manner or voice on emphasis seems to be a purely linguistic phenomenon that is not influenced by the speaker's gender or socioeconomic status. Therefore, unlike the case of the main effect of emphasis, no social meaning seems to be encoded through the linguistic interaction between emphasis and other factors.

This paper has examined the impact of gender and social class on the interaction between emphasis and both voice and manner. However, further investigation of the influence of other extra-linguistic factors such as age and education is recommended to get a clearer picture of this interesting phenomenon in Arabic.

### Endnotes

<sup>1</sup> Urban Jordanian Arabic is a variety spoken mainly in urban centers such as Amman, Zarqa and Irbid.

<sup>2</sup> For an acoustic description of vowels in JA, see Kalaldeh (2018).

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#### Appendix: The stimuli

Arabic word	English gloss	Arabic word	English gloss
ti:b	non-word	ṭi:b	perfume
tu:b	repent	ṭu:b	blocks
ta:b	repented	ṭa:b	he recovered
si:b	leave	ṣi:b	touch
su:b	non-word	ṣu:b	non-word
sa:b	left	ṣa:b	he touched
dhi:b	wolf	ṬHi:b	non-word
dhu:b	You melt	ṬHu:b	non-word
dha:b	melted	ṬHa:b	non-word
di:b	non-word	ḍi:b	non-word
du:b	non-word	ḍu:b	non-word
da:b	non-word	ḍa:b	non-word