

Acoustic Cues of /h/ and /ʕ/ in Hourani Jordanian Arabic: Investigating Sociolinguistic Variation

Osama Omari*, Ola Khaza'leh, Aziz Jaber

Department of English Language and Literature, Yarmouk University, Jordan

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Abstract

This paper examines the interaction between the coarticulatory effects of pharyngeals on adjacent vowels and the speakers' age and gender in Hourani Jordanian Arabic. To this end, 28 participants were recorded reading a list of 24 words containing a pharyngeal sound (/ħ/ or /ʕ/) preceded (word-finally) or followed (word-initially) by a short or long vowel. A total of 1344 tokens were extracted and then analyzed in PRAAT. The first three formant frequencies (F1, F2, F3) of each vowel were manually measured at the midpoint. The measurements were then normalized using Nearey's (1977) intrinsic formula to reduce the effect of physiological differences between male and female speakers. The findings of the study show no significant effects of age or gender on the production of the adjacent vowels word-initially or word-finally. This suggests that, unlike the case of pharyngealized sounds (e.g., Omari and Jaber (2019)), pharyngeal-to-vowel coarticulation is not affected by the sociolinguistic variables of age and gender.

Keywords: Coarticulation; Extralinguistic variables; Hourani Jordanian Arabic; Pharyngeals.

1. Introduction

The sociolinguistic literature of Arabic dialects has extensively focused on a set of phonological variables such as the uvular stop (q) (see Schmidt 1974; Holes 1986 for Bahraini Arabic; Haeri 1991), the interdental (θ), (ð), and (dʰ) (see Holes 1983; Al-Wer 1999; Omari and Van Herk 2016), the stop (k) (see Abdel-Jawad 1981; Al-Tamimi 2001). Recently, however, pharyngealization¹ has gained a great deal of attention in the Arabic sociolinguistic literature (see Royal 1985; Abudaljuh 2010; Omari and Jaber 2019; Omari and Jaber 2020).

According to Royal (1985), pharyngealization, which is a secondary articulation of a sound that involves a constriction of the pharynx or epiglottis (Ladefoged 2005), has two linguistic variants: the 'weaker' form and the 'stronger' form. The strong form of pharyngealization is often correlated with femininity and prestige, whereas the weak form signals rurality and masculinity (Royal 1985). Acoustically, the stronger form conforms to stronger cues of pharyngealization in the neighboring vowels, while the weak form conforms to less acoustic cues of pharyngealization. Given that pharyngealization has been found to cause an F2 lowering and F1 and F3 raising of the neighboring vowels (Abudaljuh

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* Corresponding Author: osama.omari@yu.edu.jo

2010; Jongman et al. 2011; Jaber et al. 2019, among others), a more or a less degree of F2 lowering and F1 or F3 raising has been employed to examine the sociolinguistic variation in this context. For instance, a greater degree of F2 lowering by a group is used as a cue to the tendency to use the strong form of pharyngealization by that group.

However, the co-articulatory effect caused by the pharyngeal sounds (/ħ/ or /ʕ/) has not been examined as a sociolinguistic variable in Jordanian Arabic (JA). More precisely, while several studies have reported that pharyngealization in the context of a pharyngealized (i.e., emphatic) sound is constrained by gender (e.g., Abudaljuh 2010; Almbark 2008; Omari and Jaber 2019, 2020), social class (Royal 1985; Omari and Jaber 2019), and age (e.g., Royal 1985), little is known about whether pharyngeals or “primary pharyngeals”, to use Shahin’s (2011) term, in Arabic show patterns of sociolinguistic variation².

Examining data from Hourani Jordanian Arabic (HJA, henceforth)³, this study aims to find out whether the co-articulatory effect of the pharyngeal sounds may vary per speakers’ age or gender. The locus of the co-articulatory effect to be tested will be F1 raising. This is due to the fact that F1 raising has been consistently reported in the literature as a reliable acoustic cue of pharyngealization triggered by pharyngeals (Al-Ani 1970; Butcher and Ahmad 1987; McCarthy 1994, Shahin 1997, 2002; Zawaydeh 1997, 2004; Shar 2012, among others). Thus, after normalizing the vowel formants to filter out the influence of physiological differences between males and females on the formants, more F1 raising by a social group will be taken as a cue to ‘strong’ pharyngealization, while less F1 raising will indicate the ‘weaker’ variant. Thus, we adopt a variationist approach (Labov 1972) as a framework in this study. We assume that variation could be rule-governed by an interplay of both linguistic and social factors (Bayley 2013).

The organization of the paper is as follows. Section 2 lays the background of the study. Section 3 describes the methodology of the study. The results of the study are discussed in section 4, and the discussion follows in section 5. Section 6 is a conclusion.

2. Background

2.1. The phonetic properties of pharyngeals

Pharyngeals are not very common across languages (Shosted et al. 2017). However, JA, like many other dialects of Arabic, has two pharyngeal sounds: /ħ/ and /ʕ/. The earliest phonetic description of pharyngeals in Arabic probably dates back to the seminal work of Sibawayh in the 8th century, who identified the middle of the throat as the place of articulation of these sounds (Sibawayh 1966). More precisely, pharyngeals are produced with a constriction in the lower pharynx with the involvement of two main articulators: the tongue root and epiglottis (Laufer and Condax 1979, El-Halees 1985; McCarthy 1994). However, using laryngoscopic analysis, Esling (1996, 1999) points out that the articulation of pharyngeals involves a constriction of the aryepiglottic folds.

The manner of articulation of these sounds has received different treatments in the literature. Ladefoged and Maddieson (1996) argue that both /ħ/ and /ʕ/ in Semitic languages are neither pharyngeals

nor fricatives; they consider them epiglottal approximants. Also, Yeou and Maeda (2011) maintain that the two sounds are approximants, not fricatives. While most studies have described the pharyngeal /ħ/ as a voiceless fricative (Ladefoged 1973; O'Connor 1973; Laufer and Condax 1979; Boff Dkhissi 1983), there has been disagreement over the status of the sound /ʕ/. It has been described as a voiced stop (O'Connor 1973; Adamson 1981), a voiceless stop (Al-Ani 1970; Laufer and Condax 1979), a voiced fricative (O'Connor 1973; Laufer and Condax 1979; Mashaqba 2015), a voiced glide (Laufer and Condax 1979), or an approximant (Adamson 1981; Boff Dkhissi 1983; Butcher and Ahmad 1987; Heap 1998; Al-Ani 1970; Heselwood 2007).

Despite the controversy over the phonetic properties of Arabic pharyngeals, most studies agree on the coarticulatory effect of these sounds on the neighboring vowels. A consistent acoustic correlate of these sounds is F1 raising (Klatt and Steven 1969; Delattre 1971; Gazelli 1977; Al-Ani 1970; Butcher and Ahmad 1987; McCarthy 1994, Shahin 1997, 2002; Zawaydeh 1997, 2004; Bin Muqbil 2006; Shar 2012). Zawaydeh (1997, 2004), for example, finds that the mean F1 value of the vowels /i/ and /a/ adjacent to a guttural, including the pharyngeals, in JA is higher than that in a non-guttural (i.e., oral) context.

On the other hand, F2 does not seem to function as a reliable cue of pharyngealization. Bin Muqbil (2006) finds no significant differences in F2 between vowels in pharyngeal and non-pharyngeal environments. Furthermore, Zawaydeh (1997) reports that the F2 of the low vowel /a/ in a pharyngeal environment is not significantly different from that in a non-guttural environment. Zawaydeh (2004) concludes that only the emphatics and the uvular /q/ out of the guttural class show F2 lowering in JA. In other words, the pharyngeals /ħ/ and /ʕ/, which were included in her experiment, did not show F2 lowering. An exception to these findings has been what Butcher and Ahmad (1987) reported about Iraqi Arabic. They mentioned that the short front vowels (/i/ and /a/) in a pharyngeal environment exhibit a lowering of F2. However, Butcher and Ahmad's experiment lacks a statistical analysis of the data. Therefore, their findings per F2 lowering in a pharyngeal environment remain speculative.

2.2. *Pharyngealization as a sociolinguistic variable in Arabic*

Several studies have looked at the patterns of sociolinguistic variation of pharyngealization in Arabic (Almbark 2008, Abudalbuh 2010; Omari and Jaber 2019, 2020). These studies, however, have focused on the pharyngealization triggered by the emphatic (i.e., pharyngealized) sounds, ignoring pharyngealization in the context of primary pharyngeals. In this section, we provide a review of these studies.

Royal (1985) maintains that the pharyngealization variable emerges into two variants: strong vs. weak. According to her, weak pharyngealization signals femininity and prestige, whereas strong emphasis implies masculinity and ruralness.

One of the main extralinguistic variables that have been shown to constrain pharyngealization variation in Arabic is gender. In her overall sample of Cairene Arabic speakers, Royal (1985) did not find significant gender differences in pharyngealization patterns. Gender differences, however, were found only in the young-upper class subgroup, where the females tended to favor weak pharyngealization more than the males do. Furthermore, Khan (1975) and Ahmad (1979) report that males in Cairene Arabic tend

to produce stronger cues of pharyngealization than females. That is, male speakers of Cairene Arabic tend to favor strong pharyngealization.

In JA, females tend to favor weak pharyngealization more than males (Abudalbouh 2010; Khattab et al. 2006; Omari and Jaber 2019). In contrast, Al-Masri and Jongman (2004) maintain that females rather than males tend to favor strong pharyngealization in JA.

The effect of gender on pharyngealization in Syrian Arabic was found to interact with the type of pharyngealized sounds. Females tended to favor strong pharyngealization more than the males do following the emphatic stop /t^ʕ/; whereas females favored weak pharyngealization only after the emphatic fricative /s^ʕ/.

On the other hand, Salem (2018) found no significant gender differences in the cues of pharyngealization in Algerian Arabic. That is, gender does not seem to constrain pharyngealization in this dialect of Arabic.

Other social factors have also been shown to constrain pharyngealization variation such as the ethnolect (Alzoubi 2017) and social class (Omari and Jaber 2019). Alzoubi (2017) reports that Jordanians of urban-Palestinian origin tend to favor strong emphasis more than those from rural Jordanian or Palestinian backgrounds.

Furthermore, Omari and Jaber (2019) found that the effect of gender on pharyngealization interacts significantly with social class. They report that significant gender differences in pharyngealization cues are understood only when integrating social class along with the linguistic environment. For example, they reported that gender differences in pharyngealization as measured by F2 were found only in the lower-middle-class group; the upper-class group did not show significant gender differences in this environment.

Also, Omari and Jaber (2020) examined the effect of gender and social class on complex linguistic interactions between emphasis, manner, and voice in Urban Jordanian Arabic. They report that the effect of social factors is found only in the interaction between emphasis and manner. They report that at F1, upper-class males tended to produce stronger emphasis cues following an emphatic stop, whereas lower-middle class males did so after a fricative.

2.3. Summary

To summarize, as the name suggests, the place of articulation of the pharyngeals /h/ and /ʕ/ is the pharynx. The manner of articulation of these sounds has been debatable. The /h/ is often described in the literature as a fricative; the /ʕ/ has received various treatments: a fricative, plosive, glide, or an approximant. On the other hand, pharyngeal sounds have a clear effect on adjacent vowels (i.e., pharyngealization). A consistent acoustic cue of pharyngealization caused by the primary pharyngeals has been F1 raising.

Sociolinguistically, pharyngealization is constrained by several social factors such as gender, ethnic-dialect, and social class. It is clear, though, that this literature has conclusively focused on pharyngealization in the context of the emphatic (i.e., pharyngealized) sounds. The coarticulatory effect

of the primary pharyngeals has not been investigated in the literature. The present study aims to fill in this gap in the literature.

In this experiment, we will use F1 as the reliable cue of pharyngealization. A higher F1 value will indicate strong pharyngealization; whereas a lower F1 will signal weak pharyngealization. Nevertheless, we will examine F2 and F3 to check for any potential variation between the social groups. It is worth noting here that we will filter out the physiological differences in formant frequencies (F1, F2, and F3) between the males and females using the Normalization Suit website (Kendall and Thomas 2010)

Based on the findings of the literature reviewed above, we make the following hypotheses:

1. Female speakers are expected to favor weak pharyngealization more than males.
2. Young speakers tend to favor weak pharyngealization more than the middle-aged speakers

3. Methodology

3.1. The stimuli

The data of the study are 24 words containing the pharyngeal sounds /h/ and /ʕ/ in word-initial and word-final positions (12 word-initial; 12 word-final). Each of the target consonants is followed or preceded by one of the long /a:, i:, u:/ or short /a, i, u/ vowels. All the stimuli are tri-syllabic words with the syllable frame CV(V).CV(V).CV(V)(C). The main criteria for selecting these words were based on the type of vowel following/preceding the target sound. In other words, we guaranteed that all the six vowel phonemes are included in the target syllable (i.e., word-initial or word-final). As for the second, and third syllables, we did not control for the type of vowel included since we will end up having many nonsense words in the experiment. In this experiment, we will only examine the coarticulation effects in the adjacent vowels. This study is part of a large research project on pharyngealization in JA; thus, the inclusion of tri-syllabic stimuli was meant for examining other linguistic aspects of pharyngeals to be discussed in a forthcoming article. All the words, except for two, are real words used in HJA, and the words were judged as acceptable (except for the non-words) by the native speakers of the dialect. We did not control for the rate of the frequency of these words. It is possible that some words are more frequently used than other words in the dialect, but we assume that linguistically native speakers will articulate the target sounds consistently in both the frequent and the less frequent words (see the appendix).

3.2. Participants

The participants of this study were 28 (14 young; 14 middle-aged) native speakers of HJA. Each group is divided evenly into males and females. The age range of the participants is 17- 39 for the young participants and 40 – 55 for the middle-aged group. To control for potential overlap of other social factors, all the participants had similar socioeconomic backgrounds. They all can be categorized to belong to the lower-middle-class. The middle-aged speakers were occupying low-paid jobs in the public sector jobs such as teachers or clerks, and some of them were running small businesses. As for the young participants, their socioeconomic status was categorized according to the occupation of their parents. Their parents were also employed in low-paid government posts or running small businesses. All of the participants were residents of al-Ramtha city.

3.3. Procedures

The data for this experiment were collected through recordings using the built-in x/y microphones of the ZOOM H4n recorder at a sampling rate of 44,100 Hz and a resolution of 16 bits. All recordings were conducted by the second author, who is a native speaker of HJA. To reduce the level of formality of the recordings, the participants were selected from the acquaintances of the second author. They were her relatives, friends, or friends of friends. The researcher assured the participants that their identities will be kept anonymous.

After taking the approval of the participants, the researcher explained the procedure of the recording for each participant by recording the stimuli or the list of words in front of them without explaining the main goal of this study. Recordings were conducted in a quiet room in the participants' houses. They were instructed to read the stimuli twice using their everyday language. The target words were embedded in the carrier sentence *Ani baḥki..... kamaan marah* 'I say ... once again', and they were randomized in the list to further distract the participants' attention away from the type of sounds targeted in the experiment. The usage of the carrier sentence was meant for reading the list at a stable rate. If any participant read the target word incorrectly, s/he was asked to start over from the preceding two words ahead of the word s/he mispronounced.

A total of 1344 tokens (24 words* 2 repetitions* 28 participants) were extracted and then analyzed in PRAAT (Boersma and Weenink 2009). The first three formant frequencies (F1, F2, F3) were then measured at the steady state of the vowel.

To reduce the effect of physiological differences between men and women, the formant frequencies were normalized according to Nearey's (1977) formant intrinsic formula (1) using the Normalization Suit (Kendall and Thomas 2010). This formula is labeled as Neary1 method by the Normalization Suit. The authors chose Neary1 because it works well in reducing the sociolinguistic differences between males and females (see Kendall and Thomas 2010), and it allows for the inclusion of F3 in the normalization process.

The mean of the two measurements of the normalized values was then analyzed in the SPSS program. A two-way ANOVA analysis was performed to examine the effect of the independent factors (gender and age) on the co-articulatory effect of the pharyngeals.

4. Results

This section reports the results of the experiment. These results are based on a two-way ANOVA analysis of the normalized formants. Section 4.1 presents the results of the word-initial environment, while section 4.2 introduces the results of the word-final position.

4.1. Word-initial position

This section presents the differences between young and middle age participants on vowel formants F1, F2, and F3 word-initially.

4.1.1. *The effect of age*

The two-way ANOVA analysis of the normalized data shows that there are no significant differences in F1 between middle-aged and young participants in word-initial position ($F(1, 28) = 1.776, P = 0.195$). The mean of the normalized F1 value of the vowel following the target consonant for the middle-aged group (1.026) was almost identical to that of the young group (1.048).

Also, there were no significant differences in F2 ($F(1, 28) = .414, P = .526$) nor F3 ($F(1, 28) = .258, P = .616$) between the young and middle-aged groups. These findings are presented in Figure (1).

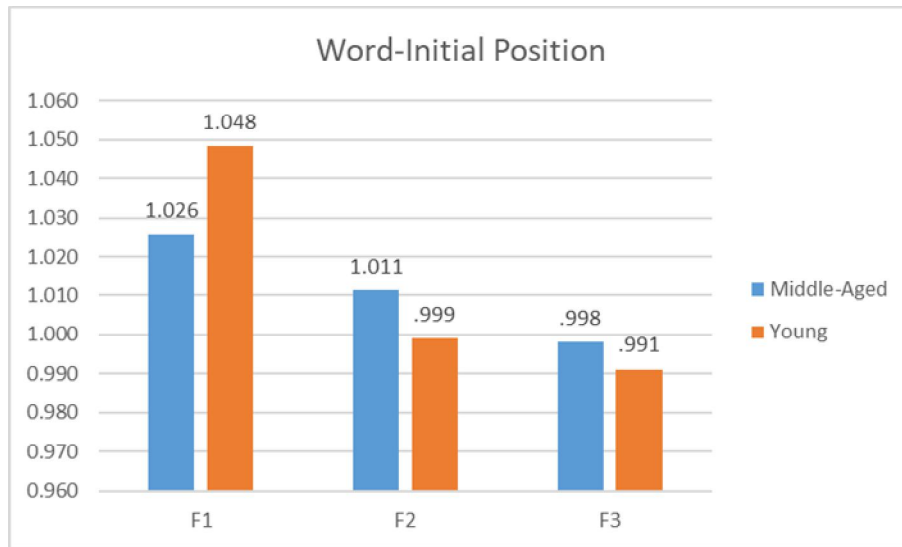


Figure 1: Age differences in vowel formants following the pharyngeals

4.1.2. *The effect of gender*

The two-way ANOVA analysis of the data indicates that there are no significant differences in F1 between males and females ($F(1, 28) = 2.511, P = 0.051$). The mean of the normalized F1 of the vowels following the pharyngeal sounds by the females (1.050) was non-significantly higher than that of the males (1.024).

Likewise, there were no significant gender differences at F2 ($F(1, 28) = .280, P = .602$) nor F3 ($F(1, 28) = 3.683, P = .067$) in word-initial position. The results of gender differences in word-initial position are presented in Figure (2).

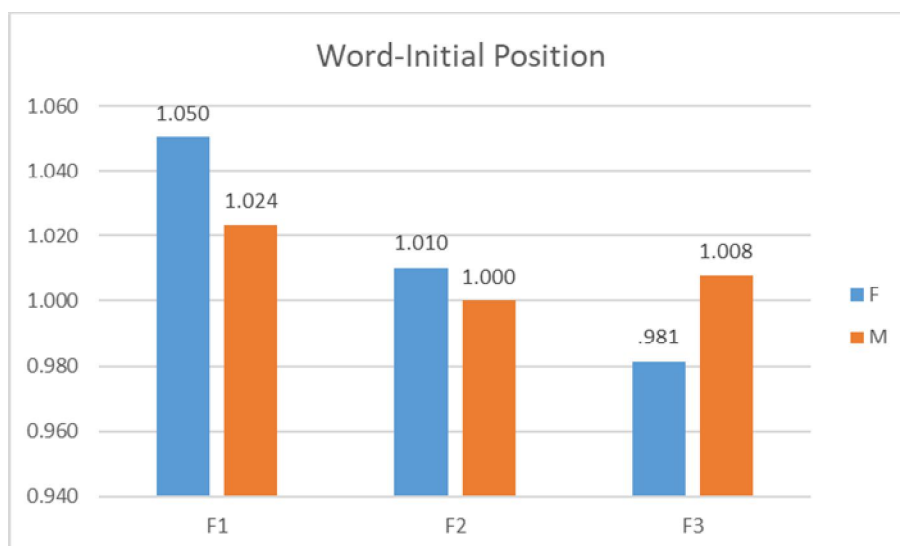


Figure 2: Gender differences in vowel formants following the pharyngeals

Furthermore, there was no significant interaction between gender and age on the coarticulatory effect of pharyngeals at F1 ($F(1, 28) = .018, P = .894$), F2 ($F(1, 28) = .173, P = .681$) nor at F3 ($F(1, 28) = 1.565, P = .223$). This means that males and females behaved similarly across the two age groups, showing no differences in the quality of the vowels adjacent to the pharyngeals.

4.2. Word-final position

4.2.1. The effect of age

The two-way ANOVA analysis of the normalized data shows that there are no significant age differences at F1 ($.086, p = .772$). That is, the coarticulatory effect of pharyngeals on the adjacent vowels is not different between the young and middle-aged speakers.

However, significant age differences were found at F2 ($F(1, 28) = 6.332, P = .019$). The mean normalized F2 by the young group (1.011) was higher than that by the middle-aged group (.979). This indicates that vowels by the young speakers in this environment tend to be higher than those by the middle-aged group.

On the other hand, there were no significant age differences at F3 ($F(1, 28) = .221, P = .623$). The findings of the effect of age on the word-final syllable are illustrated in Figure (3).

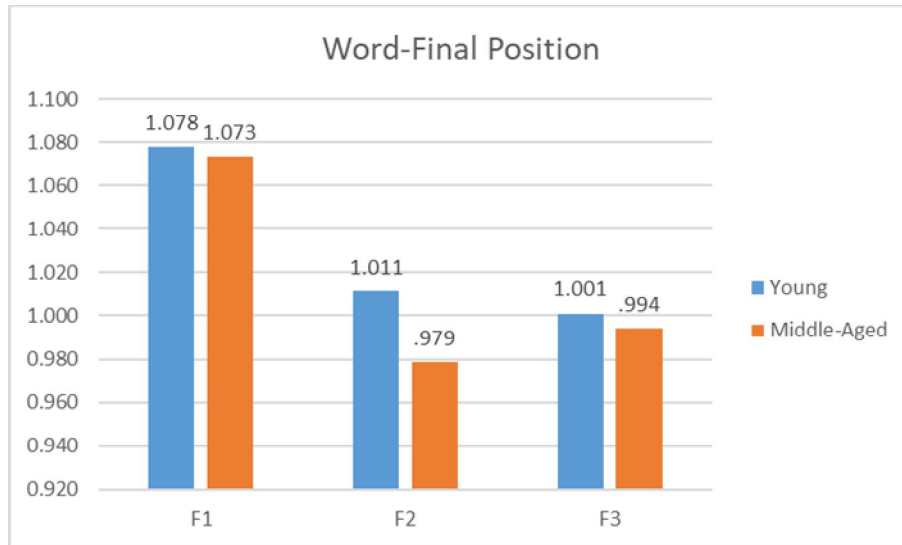


Figure 3: Age differences in vowel formants preceding the pharyngeals

4.2.2. The effect of gender

The two-way ANOVA analysis of the normalized data shows that there are no significant gender differences at F1 ($F(1, 28) = 1.760, P = 0.198$). That is, both males and females showed similar cues of pharyngealization in this context.

On the other hand, there were significant differences between males and females at F2 ($F(1, 28) = 7.631, P = 0.011$) and F3 ($F(1, 28) = 7.832, P = 0.010$). The means of F2 and F3 by the female speakers were significantly lower than those by the males. These findings are illustrated in Figure (4).

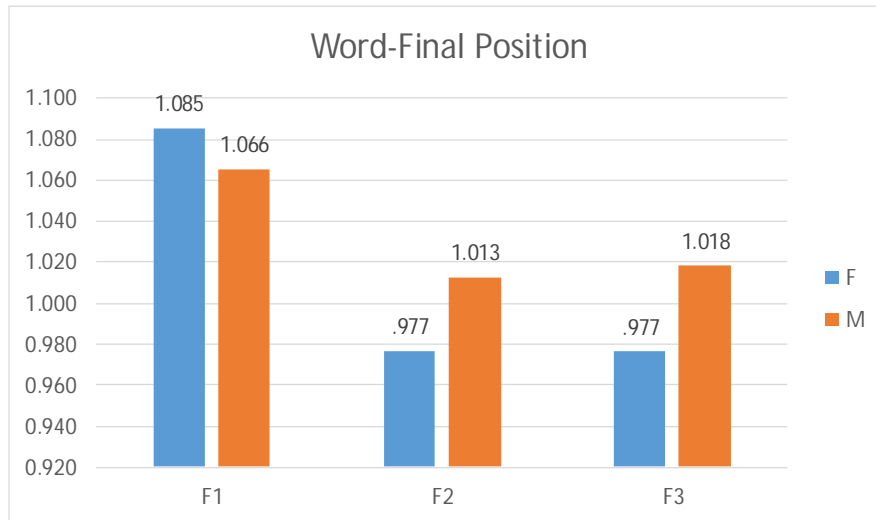


Figure 4: Gender differences in vowel formants preceding the pharyngeal

Like in word-initial position, there was no significant interaction between gender and age on the coarticulatory effect of pharyngeals at F1 ($F(1, 28) = 2.139, P = .157$), F2 ($F(1, 28) = 2.634, P = .118$), nor at F3 ($F(1, 28) = 1.194, P = .286$). This means that males and females did not show differences in the quality of the vowels adjacent to pharyngeals across the two age groups.

5. Discussion

The main goal of this experiment was to explore the variation in the carryover effects of pharyngeals in HJA. Our first hypothesis that females tend to favor weak pharyngealization effects is not borne out in this experiment. Building on the generalization in the literature that F1 is the most reliable cue of pharyngeal coarticulation, we did not find any significant differences in F1 between males and females. These findings were consistent in the two linguistic environments: word-initial and word-final position. This result, however, is not compatible with the findings of the previous literature on pharyngealization variation in the context of an emphatic sound. Most previous sociolinguistic studies on emphasis variation in Arabic have reported that females tend to favor weak pharyngealization more than males (Almbark 2008; Abudaljuh 2010; Omari and Jaber 2019, among others).

However, it is not unusual in the literature to report no significant gender differences in pharyngealization variation, but these findings should be approached with some caution due to subtle observations worth explaining here. Royal (1985) found no significant differences between males and females in her sample from Cairene Arabic. Significant differences between males and females were evident only in the young-upper-class group. That is, when the factors of age and social class are controlled for in her analysis. Furthermore, Omari and Jaber (2019) argued that the role of gender in pharyngealization variation in JA is better understood when the social class comes into play. Thus, given that the participants of this study belong to the same socioeconomic group, namely lower-middle class, the insignificant gender differences between the group could be due to not including the social class in the experiment. Hence, further examination of this phenomenon including more social factors, particularly social class, is needed to reach stronger generalizations about the pattern of variation of the pharyngeals.

It is worth mentioning here that significant gender differences between males and females in this experiment did exist at F2 and F3 in word-final position. The F2 values by the females were significantly lower than that of the male speakers. Linguistically, this finding may have implications for the acoustic literature. One of the well-established findings of the previous literature on emphasis in Arabic has been that the extent of leftward spreading is stronger than that of rightward spreading (Davis 1995; Jaber et al. 2019). This might explain why differences in these values were found in word-initial position (rightward spread). In other words, it could be that speakers are more aware of the cues of pharyngeal co-articulation in word-final position than in word-initial position. Socially, however, this finding may imply that the females tended to favor stronger pharyngealization than the males in this environment. Although the literature on JA has reported that female speakers produce stronger cues of pharyngealization in the context of emphatic sounds (Al-Masri and Jongman 2004), we cannot build generalizations based on this finding in our experiment due to the lack of studies on the role of F2 as a reliable exponent of pharyngeal

co-articulation in JA in both word-initial and word-final environments. Thus, further acoustic investigation of this phenomenon is badly needed to better understand the pattern of variation in this context. Likewise, we are unable to draw generalizations over the finding that females' F3 values were significantly lower than that of the males, which indicates that the females favor weaker pharyngealization more than the males, due to a lack of full understanding of the phonetic phenomenon of pharyngeal co-articulation in JA or the dialect under examination (HJA).

On the other hand, when examining her lower-middle-class sample, Royal (1985) found a significant overlap between gender and age within this group. She reported that young females in this group tended to favor weak pharyngealization more than the young males. The present study shows that neither age nor the overlap between age and gender has a significant influence on the carryover effects of the pharyngeals onto the vowels. There was no significant difference between the middle-aged and young participants at F1, the main cue of pharyngeal-to-vowel co-articulation, and there were no significant differences found at the other two formants. Therefore, our hypothesis that young speakers are expected to favor weak pharyngealization was not supported by the results of the study. However, it is worth noting here that only two age groups were included in the experiment (young and middle-aged). Further examination of the effect of age including old speakers would give us more conclusive generalizations of the role of age in the variation.

6. Conclusion

The present study investigated the influence of age and gender on the carryover effects of pharyngeals /ʕ/ and /h/ on the adjacent vowels in HJA. The findings of this study reveal that there are no significant effects of gender or age on F1, the most reliable cue of the coarticulatory effect of pharyngeals on the adjacent vowels. After normalizing vowel formants to reduce the physiological differences between males and females, no significant differences were found at F1 in the two linguistic environments (word-initially and word-finally). The interaction between gender and age on the coarticulation effects was also insignificant. Thus, unlike the case of emphatics, the pharyngeal-to-vowel coarticulation does not seem to be constrained by gender or age in this variety of Arabic.

However, the present study has some limitations. First, the data of the present study are collected from one Arabic dialect. Examining other dialects or controlling for other extralinguistic factors such as education and social class will provide us with a deeper understanding of the phenomenon. Besides, the inclusion of old speakers would be very useful to test the variation across more age groups. In addition, further investigation of the acoustic correlates of pharyngeals in JA is needed to be able to make reliable generalizations about the pattern of variation that may be found in other phonetic cues, if any, other than F1.

الدلائل الصوتية للأصوات الحلقية (الحاء والعين) في اللهجة الحورانية الأردنية: دراسة لغوية اجتماعية

أسامة العمري، علا خزايلة، عزيز جابر
قسم اللغة الإنجليزية وآدابها، جامعة اليرموك، الأردن

الملخص

يهدف هذا البحث الى دراسة العلاقة ما بين الدلائل الصوتية للأصوات الحلقية (الحاء والعين) في الأصوات الصائتة المجاورة وما بين جنس وعمر المتكلم في اللهجة الحورانية الأردنية. لتحقيق هذا الهدف، قام الباحثون بتسجيل قراءة 28 مشاركا لقائمة من الكلمات تحتوي على صوت العين أو الحاء في أول الكلمة أو في اخرها متبوعا/مسيوقا بأحد الأصوات الصائتة. لقد قام الباحثون باستخلاص 1344 كلمة وتحليلها في برمجية PRAAT حيث جرى قياس الترددات الصوتية رقم 1 و 2 و 3 لكل واحد من الأصوات الصائتة في المنتصف، ثم قام الباحثون بعمل تطبيع للاختلاف الفيسيولوجي بين الإناث و الذكور باستخدام معادلة نيري (1977). وجدت هذه الدراسة انه لا يوجد فروقات ذات دلالة إحصائية في المؤشرات الصوتية للأصوات الحلقية بين المتكلمين من كلا الجنسين أو العمريين (الشباب ومتوسطي العمر)، وهذه النتيجة تشير الى أن الأصوات الحلقية في هذه اللهجة الاردنية، بخلاف الأصوات المفخمة، لم تتأثر في المتغيرات الاجتماعية كما ورد في الدراسات السابقة في اللهجة الأردنية (العمري وجابر 2019).

الكلمات المفتاحية: المتغيرات الاجتماعية؛ اللهجة الحورانية الأردنية؛ الأصوات الحلقية.

Endnotes

- ¹ It is worth mentioning that some studies have argued that the co-articulation of the emphatic sounds involves a uvularization (Zawaydeh and de Jong 2011) or a velarization (Watson 1999) process. We will use the term pharyngealization throughout this article.
- ² The pharyngeal segments have a primary pharyngeal articulation, whereas the pharyngealized (i.e., emphatic) sounds have a secondary pharyngeal articulation (Shahi 2011).
- ³ Hourani Arabic is a variety of Arabic spoken in southern Syria and extends down to some parts of north Jordan. The data of the study are collected in al-Ramtha, which is located close to the southern borders of Syria.

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The Appendix

Initial Position		Final Position	
Word	Gloss	Word	Gloss
ʕa:lima:t	'female scholars'	ʔimtina:ʕ	'refusal'
ʕu:da:ni	'nonword'	mana:gu:ʕ	'nonword'
ʕi:sa:wi	'a family name'	maga:li:ʕ	'uprooted things'
ʕamara:t	'a family name'	ingalaʕ	'departed with humiliation'
ʕumari	'a family name'	itburguʕ	'wearing face covers'
ʕidwa:ni	'aggressive'	baraagiʕ	'face covers (niqaabs)'
ha:lima:t	'ambitious females'	istaba:h	'He made it permissible'
hu:riyya:t	'mermaids'	wa:kalu:h	'nonword'
hi:fawi	'a family name'	mafa:ti:h	'keys'
halawa:n	'desserts'	infatah	'It was opened'
huruma:t	'shrines'	itburbuḥ	'living happily'
hiʕari	'intrusive'	mara:biḥ	'profits'