

*The Prevalence of Voiceless Realisations of /ʕ/ as
Produced by Young Iraqi Arabic Speakers*

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Abstract:

Most studies investigating the pharyngeal consonant /ʕ/ found it to be voiced whether approximant or fricative. Few instances in some Arabic dialects, Iraqi being among them, were found to be voiceless and with those being related to stops only. Further investigations showed what seems to be an increase of voicelessness. Accordingly, acoustic and auditory analyses of the realisations of /ʕ/ were investigated in recordings of university-aged male Iraqi Arabic speakers from a number of Iraqi cities. Results showed /ʕ/ has more 'voicelessness' than voicing for all three manners of articulation. The sound is found to be characterised as a voiceless fricative, a voiceless approximant, or a voiceless stop. These voiceless productions were found in both initial and final word positions, but more prevalent in final position. Few productions were of voiced approximants; those were mostly found in initial position. /ʕ/ is also accompanied by glottal bursts, creak and aspiration. The age range of the speakers could explain the frequency of occurrence of the voicelessness of the sound which has not been previously reported in the literature.

انتشار اللفظ المهموس لصوت العين /ع/ عند المتحدثين العراقيين الشباب

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الملخص:-

اثبتت اكثر الدراسات التي تناولت تحليل صوت العين /ع/ انه صوت مجهور في اغلب حالاته سواء كان احتكاكي او تقريبي. وقليلة هي النتائج التي اظهرته صوتا مهموسا واغلبها كانت في اللغة العربية وبالاخص في اللهجة العراقية و متعلقة فقط بالانفجارية منها. لكن دراسات مستفيضة بينت ماقد يكون تزايد ظهور اللفظ المهموس للصوت. بناء على ذلك، يهدف البحث الحالي الى تحليل صوت العين /ع/ في تسجيلات صوتية لعشرة طلاب جامعيين ذكور من مدن عراقية مختلفة. اظهرت النتائج بان صوت العين له صفات مهموسة اكثر مما هي مجهورة ولكل افراد العينة وبالتالي يمكن من خلالها وصفه كصوت احتكاكي مهموس، تقريبي مهموس او انفجاري مهموس. ووجدت هذه في كل من بداية الكلمة ونهايتها ولكنها اكثر ظهورا في نهاية الكلمة. قليلة كانت الصفة المجهورة وان وجدت فانها كانت اكثر تواجدا في بداية الكلمة. الفئة العمرية للمتحدثين قد تفسر تزايد ظهور المهموس في لفظ العين والتي لم يتم التوصل لها مسبقا في دراسات سابقة.

1. Introduction

The consonant /ʕ/ has widely been investigated by many researchers and in many languages and dialects. The resulting huge literature agrees that the consonant is called a *pharyngeal*, although research has found that term to also be controversial. Much of the results show the consonant to have different manners of articulation, places of articulation and states of voicing. Out of the range of languages causing debate is Arabic whereby each researcher investigating the area reaches a different description of the /ʕ/ in at least one of its consonantal features.

/ʕ/ is mostly described as being a voiced pharyngeal fricative (McCarthy and Raffouli, 1964; Blanc, 1964; Ghazeli, 1977; Laradi, 1983; Abu-Haidar, 1991; Holes, 2004; Alotaibi and Muhammad, 2010); but also found to be a voiced epiglottal fricative (Laufer and Condax, 1979; 1981); a voiced approximant (Obrecht, 1968; Catford, 1977; Ingham, 1982; Esling, 1999; Shahin, 2002; Esling, 2005; Heselwood, 2007), or what Ingham (1974) considers as a voiced fricative which has some features of a stop instead of a true fricative constriction or what he calls a voiced frictionless continuant which would have a full closure when doubled; a tight approximant (Heselwood, 2007); a voiceless pharyngeal stop (Al-Ani, 1970; MacCurtain, 1981); an epiglottal stop [ʔ] (Esling, 1999; Esling, 2005; Edmondson et al., 2005; Edmondson et al., 2007); simply followed by a stop articulation in final position (Butcher and Ahmad, 1987), or what Erwin (1963) more precisely refers to it as being a heard glottal stop in that position; or even showing all three manners of articulation in addition to eleven (11) subcategories by Alsiraih (2013). In an entry for /ʕ/ in the 2012 edition of the *Encyclopedia of Arabic Language and Linguistics*, Heselwood (personal communication with the first author) states that in addition to the tight approximant he found, stop realisations have

also been observed in some varieties of Arabic, particularly in non-intervocalic contexts and when geminated (e.g. Al-Ani 1970: 62-64; Bukshaisha, 1985: 304-306; Heselwood 2007: 26-27), adding that the location of the occlusion is not entirely clear: it could be epiglottal-pharyngeal, aryepiglottic, ventricular, and/or glottal. An epiglottal trill variant is also reported by Ghali (1983), Hassan and Esling (2007), Hassan et al. (2011).

Interestingly, many of these controversies have been found in one Arabic dialect in particular, that of Iraqi Arabic (henceforth IA). However, none of the above studies have found /ʕ/ to be voiceless unless in the case of it being a voiceless stop, which is also particular to IA and some Arabic Gulf dialects. It never appeared as a voiceless approximant or a voiceless fricative. Furthermore, all above research were conducted on age groups of above 30 years old speakers, mainly being males. Thus, the age of speakers could also be a factor in the way speakers realise pharyngeal /ʕ/.

The present study is therefore set to investigate whether voicelessness is a new variant of /ʕ/ prevailing among young IA speakers by conducting the study on young speakers with an age range of 18-22 years old.

/ʕ/ in Iraqi Arabic

As is mentioned above, IA has the most controversies among other Arabic dialects. Therefore, this section will shed a close light on some of the realisations produced by IA speakers found in the literature.

In an impressionistic investigation of the Spoken Arabic of Baghdad, McCarthy and Raffouli (1964: 6-7) describe /ʕ/ as a voiced pharyngeal fricative. In an acoustic analysis of the consonant in the speech of eight IA speakers (the author himself being the primary speaker), Al-Ani (1970: 62) found that the most common allophone of /ʕ/ was realised as a voiceless pharyngeal stop

especially at initial and final positions, and realised as a glide inter-vocally. In an investigation using electrolaryngographic tracings of the productions of /ʕ/ by an IA speaker, MacCurtain (1981: 140, 205) confirms Al-Ani's (1970) description of /ʕ/ as being a pharyngeal stop.

In another investigation using both acoustic and aerodynamic techniques of the speech of three IA speakers, Butcher and Ahmad (1987: 167) found the amount of airflow is very low for /ʕ/ to be a fricative at initial position, nor is there any peak of airflow which could link it to releases of a stop or a fricative; while at final position it was realised as a stop.

Edmondson et al. (2007: 2065) investigated IA among other languages by analysing a number of video recordings of reflexes of the pharyngeal using transnasal laryngoscopy. They (ibid) chose IA due to "its extreme and phonologically challenging pharyngeal reflexes" which they found to be extremely varying in results of studies they reviewed. They found /ʕ/ realised as a voiced approximant with trilling instances, but is a full epiglottal stop [ʔ:] when occurring as a medial geminate /-ʕʕ-/. Similarly, in an investigation of an IA speaker from Basra (the first author) using acoustic, EGG, kymographic, high-speed laryngoscopic and aperture estimate techniques, Hassan et al. (2011: 831) found the sound to be a trill. These findings support Ghali's (1983: 441) suggestion to class /ʕ/ as a trill after his interpretation of Sibawayh's term *taraddudiyah* ('frequentative') as evidence that 'ayn was a trill back in the eighth century'.

Heselwood (2007) presented an approximant variant that has not been reported before which he termed as a 'tight approximant'. The variant can be thought of as "compressed or 'squeezed' in the articulatory, acoustic and auditory domains" (ibid: 1). He (ibid) found the frequency of occurrence of the variant in his data of 21

speakers from 11 different North African and Middle Eastern countries, among which are two IA speakers, to be a common variant in Arabic speech. However, he (2007, plus personal communication) found the most likely context for tight approximant realisations in IA is probably intervocalic and that they may not be so common in IA as in some other varieties.

In a more recent auditory and acoustic study by Alsiraih (2013), the researcher recorded the speech of nine speakers, each 3 from a different sub- IA dialect (Baghdad, Basra, Mosul), and with each speaker producing 26 tokens containing /ʕ/. That study (ibid) confirmed findings of previous investigations with all three realisations existing. However, the realisations were found to be depending on many factors as word position and sub-dialect with Baghdad and Mosul having the most stop-like productions of /ʕ/ while Basra had the most approximant productions with less stops. The study also found that all three realisations (approximants, fricatives and stops) occur in both initial and final positions, but also showed that approximants prevailed in general and in initial position while stops were more common in final position.

However, despite all the above realisations, no voiceless approximant or voiceless fricative variants of /ʕ/ was found in any of the reviewed studies.

Methodology

Participants

Ten male Iraqi speakers participated in the current experiment. They all speak the Iraqi dialect. The participants are students from the Department of English, College of Education for Human Sciences, University of Basra; but come from different cities and as follows: 7 from Basra city and its surroundings, 1 from Al-Muthanna, 1 from Babylon, 1 from Thi-Qaar. They are from

different classes (first, second, and fourth) and their ages range between 18-22 years.

Data Collection

Twenty target words were selected for the purposes of this study and distributed as follows: 10 words ending with /ʕ/, 10 words beginning with /ʕ/. They are all common colloquial IA words of the CVC type syllable structure, where (V) is one of a set of long vowels / a:, u:, o:, i:, e:/, and the pharyngeal consonant is either in initial or in final word positions (table. 1).

Table 1. list of selected target words with their meanings, grammatical category, and phonetic transcription

no.	Words ending with ʕ			no.	Words beginning with ʕ		
1	باع	ba:ʕ	look (v./order)	11	عار	ʕa:r	shame /disgrace (n.)
2	ماع	ma:ʕ	melted (v./past)	12	عاش	ʕa:f	he lived (v./past)
3	كاع	ga:ʕ	ground (n.)	13	عون	ʕo:n	help (n.)
4	جاع	dʒa:ʕ	he became hungry (v./past)	14	عوم	ʕo:m	float (n.)
5	ضاع	ða:ʕ	lost (v./past)	15	عوف	ʕu:f	leave (v./order)
6	ذيع	ði:ʕ	broadcast (v./order)	16	عود	ʕu:d	Stick (n.)
7	بيع	bɛ:ʕ	sale/selling (n.)	17	عيل	ʕi:l	tease (v./order)
8	زوع	zu:ʕ	vomit (v./order)	18	عيد	ʕi:d	repeat (v./order)
9	نوع	no:ʕ	type (n.)	19	عين	ʕɛ:n	eye (n.)
10	جوع	dʒo:ʕ	hunger (n.)	20	عيب	ʕɛ:b	flaw (n.)

All recordings were conducted in a quiet room at the Department of English, College of Education for Human Sciences, University of Basra. Each participant took approximately 5 minutes to produce all 20 words, and the recordings took three separate days to be conducted and finalised. All target words were recorded using a high-quality SONY MP3 IC RECORDER, and later transferred onto a computer. The latest version of Praat (6.0.30) was used to analyse the auditory and acoustic properties of the pharyngeal /ʕ/. Their realisations were identified according to the three main categories (approximant, fricative, and stop) along with their voicing (voiced, voiceless) and any other accompanying features such as creaky voice, glottal bursts and aspiration.

Statistical Analysis

Statistical tests were applied on the acoustic and auditory data using the SPSS statistical programme, version 19. Several one-way ANOVAs (analysis of variance) with a p -value of < 0.05 analysis were applied on each of the acoustic measures. For these ANOVAs, the independent variables were: number of items produced, and word-position; and the dependent variables were: the realisations of /ʕ/, and voicing. The second type of statistical test is a general *Pearson's Chi-square* test that is used to compare between the frequencies of occurrences of voicing and realisations of /ʕ/ in relation to word position (initial, final). Each of the independent variables has a number of sub-categories: number of items produced (200), word-position (2).

Analysis of the Results

Results showed that the realisation of pharyngeal /ʕ/ as an approximant prevails in both initial and final positions with a total of 144 tokens out of 200 (see: figs. 1 and 2). Stop realisations are the least with a total of 18 tokens in both positions. Fricatives are only slightly more than stops with a total of 32 tokens in total. There are also 6 tokens whereby the speakers started the production with an approximant then ended it as a fricative.

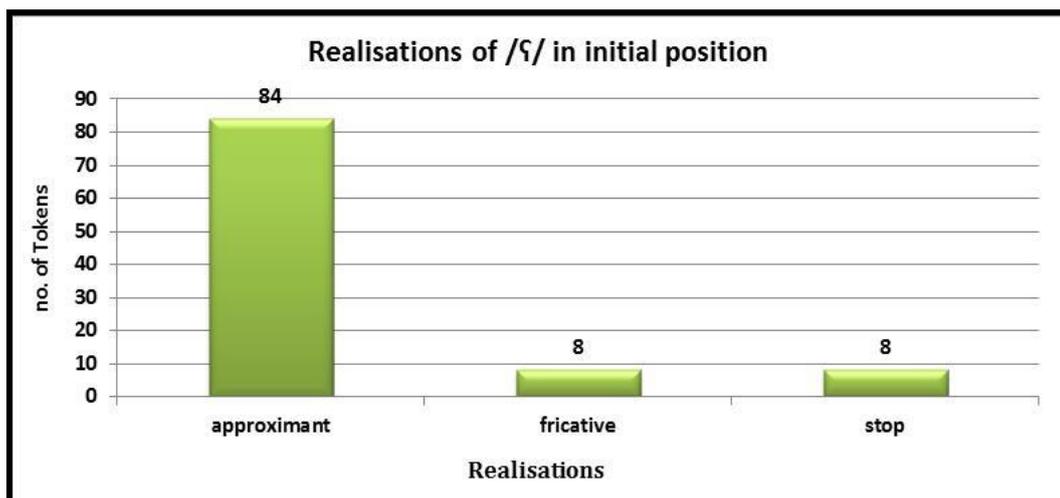


Fig. 1: Realisations of /ʕ/ in initial position as produced by 10 young Iraqi speakers.

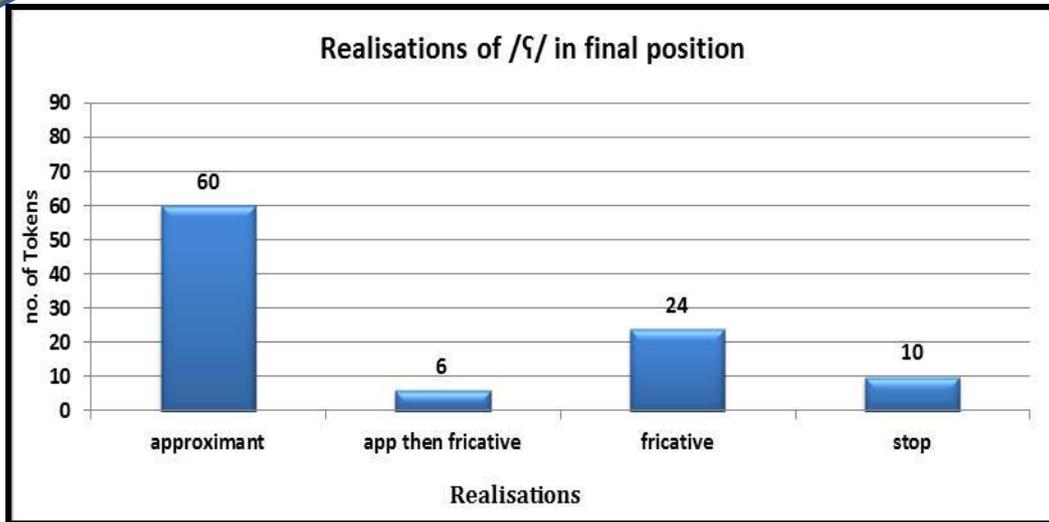


Fig. 2: Realisations of /ʕ/ in final position as produced by 10 young Iraqi speakers.

A one-way ANOVA test showed significant differences between realisations of /ʕ/ in initial position on a probability of $p < 0.05$; except in that between stops and fricatives with a p -value of (0.146) (table 2).

Table 2: Measure of Significance in comparing the different realisations of /ʕ/ in initial position

Word-Position	Realisation 1	Realisation 2	Sig.
Initial	Approximant	Fricative	.031
		Stop	.000
		Approximant then Fricative	.000
	Fricative	Stop	.146
		Approximant then Fricative	.000
		Approximant	.031
	Stop	Approximant then Fricative	.001
		Approximant	.000
		Fricative	.146
	Approximant then Fricative	Approximant	.000
		Fricative	.000
		Stop	.001

Another one-way ANOVA test applied on realisations in final position showed significant differences on a probability of $p < 0.05$; except between realisations ‘approximants’ and ‘approximants then

fricatives' with a *p*-value of (0.268) and again as in initial position between fricatives and stops with a *p*-value of (1.000) (table 3).

Table 3: Measure of Significance in comparing the different realisations of /ʕ/ in final position

Word-Position	Realisation 1	Realisation 2	Sig.
Final	Approximant	Fricative	.042
		Stop	.010
		Approximant then Fricative	.268
	Fricative	Stop	1.000
		Approximant then Fricative	.002
		Approximant	.042
	Stop	Approximant then Fricative	.001
		Approximant	.010
		Fricative	1.000
	Approximant then Fricative	Approximant	.268
		Fricative	.002
		Stop	.001

Voicing, on the other hand, showed a rather interesting result with voiceless tokens occurring more than voiced ones in both initial and final positions (see: fig. 3 and 4). This is in addition to a number of tokens which showed voicing accompanied with voicelessness or has voiceless instances.

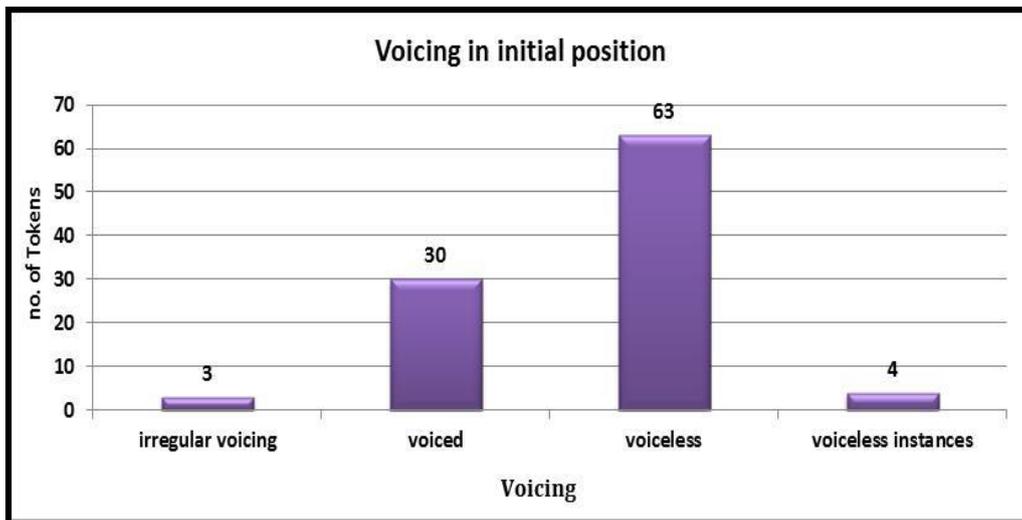


Fig. 3: Voicing of /ʕ/ in initial position as produced by 10 young Iraqi speakers.

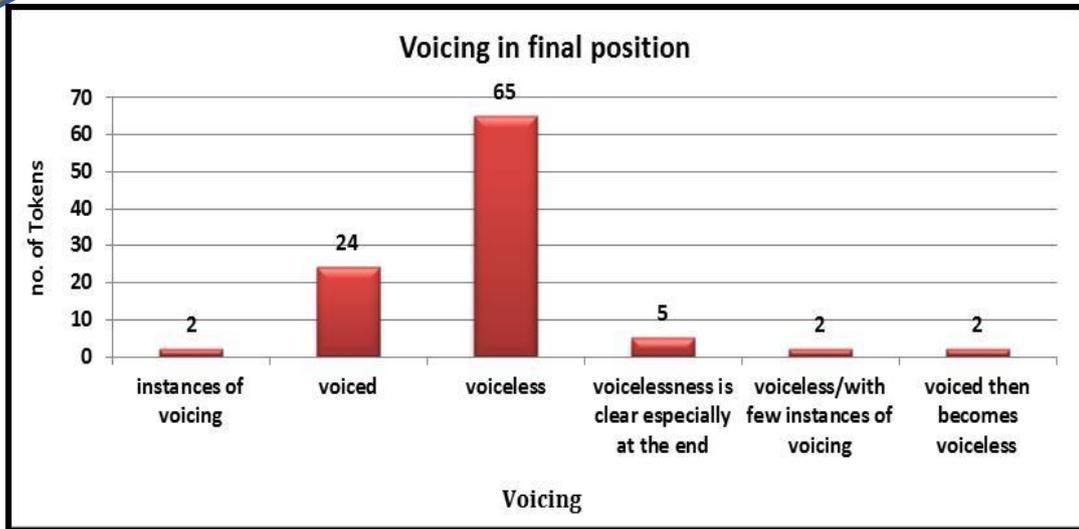


Fig. 4: Voicing of /ʃ/ in final position as produced by 10 young Iraqi speakers.

Figure (3) shows us that although there are four categories of voicing in initial position, two of them show voicelessness ('voiceless' and 'voiceless instances') and two show voicing ('voiced' and 'irregular voicing'); therefore, each two were merged together. The latter category 'irregular voicing' also denotes no voicing, but because it showed more voicing than voicelessness it was merged with 'voiced'. Accordingly, statistical calculations were applied to two categories: voiced and voiceless (see table 4). Similar to voicing in initial position, voicing in final position has six categories, yet four of them contain voicelessness. Therefore, those four categories would be grouped as one, 'voiceless'; with the remaining two being grouped as 'voiced'. The category 'instances of voicing' also denotes no voicing, but because it showed more voicing than voicelessness it was merged with 'voiced' (table 4).

Table 4: The number of Tokens having voicing and voicelessness in both word-positions

Position	Voicing	No. of tokens
Initial	Voiced	33
	Voiceless	67
Final	Voiced	26
	Voiceless	74

A one-way ANOVA test showed significant differences between voiced and voiceless tokens in both word-positions on a probability of $p < 0.05$ with a p -value of (0.000) (table 5).

Table 5: The significance of comparing voiced and voiceless tokens in each of the two word-positions

Position	Voicing 1	Voicing 2	Sig.
Initial	Voiced	Voiceless	.000
Final	Voiced	Voiceless	.000

In investigating the relationship between the realisations of /ʁ/ and voicing, results showed all three realisations having voicelessness (see: fig. 5 and 6). All stops occurring in both positions are voiceless. Fricatives showed both voicelessness and voicing but with more tokens being voiceless in initial position. Approximants, on the other hand, with them prevailing over the other realisations, also showed voicelessness and voicing but with more tokens showing voicelessness.

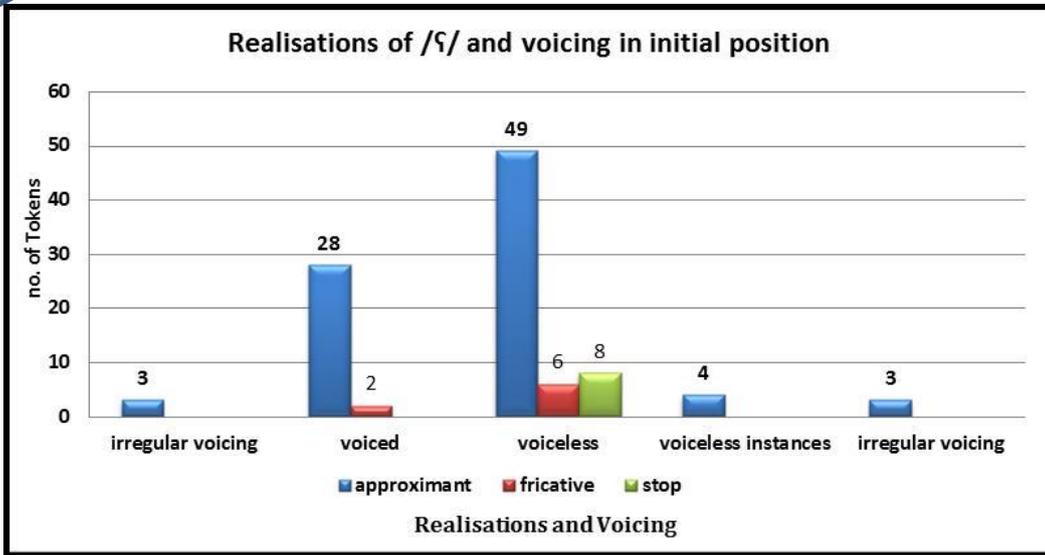


Fig. 5: Realisations of /ʕ/ in relation to voicing in initial position as produced by 10 young male Iraqi speakers.

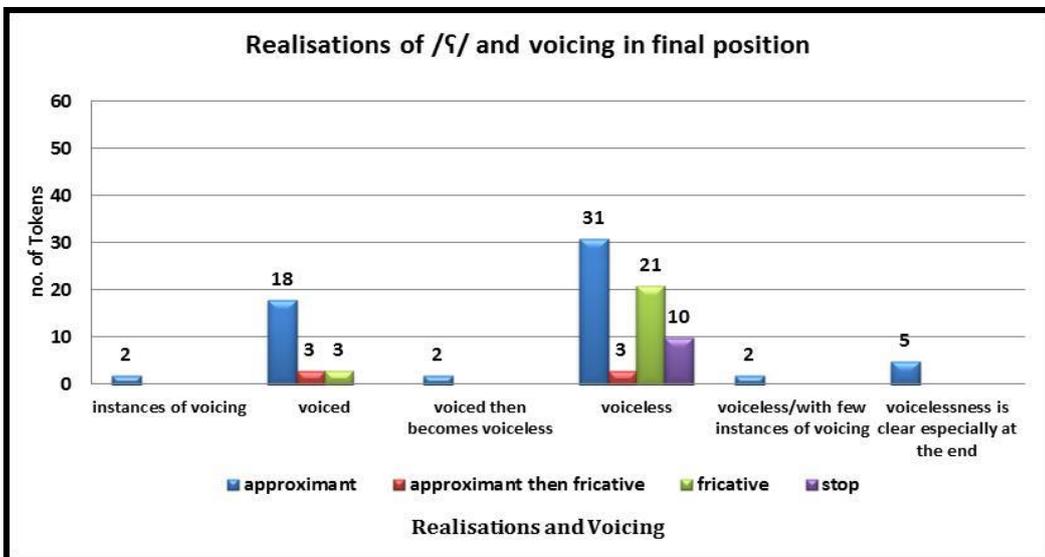


Fig. 6: Realisations of /ʕ/ in relation to voicing in final position as produced by 10 young male Iraqi speakers.

A *Pearson's Chi-square* test revealed that there are significant differences in the relationship between the different realisations of /ʕ/ and voicing in both word-positions. These results showed that voicing is significantly associated with all types of realisations and in both word-positions on a probability of $p < 0.05$ (table 6).

Table 6: Pearson Chi-Square Two-sided Significance of the different realisations of /ʕ/ in relation to voicing in initial position

Position	Pearson Chi-Square	df	Sig. (2-sided)
Initial	23.754 ^a	12	.022
Final	42.630 ^a	18	.001

Voiceless Fricative

Pharyngeal /ʕ/ when produced as a fricative has always been reported to be voiced. However, speakers in the present study have shown productions of voiceless fricatives in final position (figs. 7 and 8) and initial position (fig. 9).

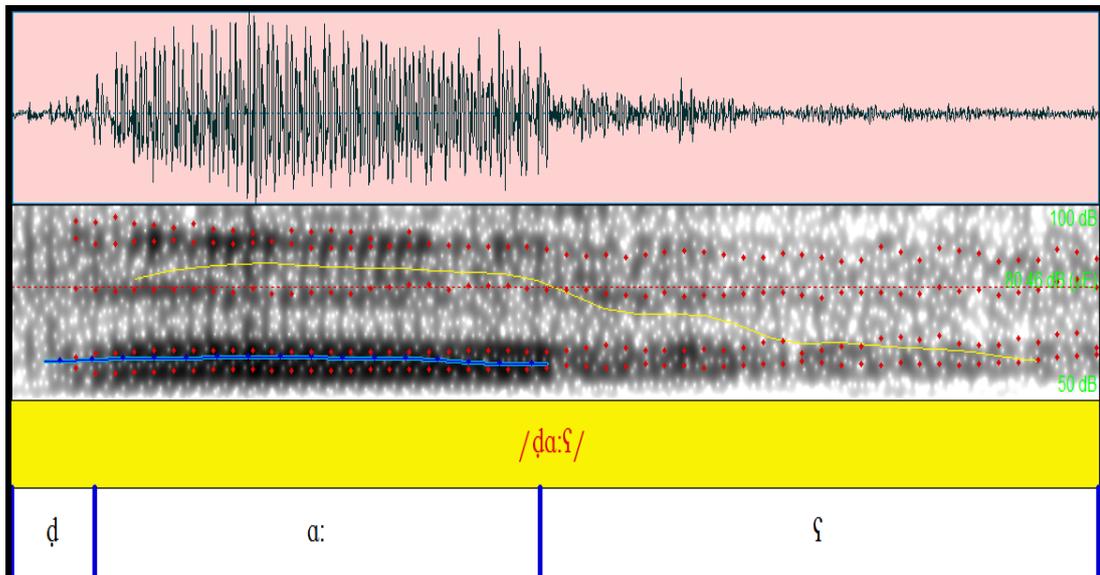


Fig. 7: Pharyngeal /ʕ/ produced in the word /ɖɑ:ʕ/ as a voiceless fricative in final position by a speaker from Al-Muthanna. The consonant is clearly voiceless throughout without any voicing instances despite it being a fricative.

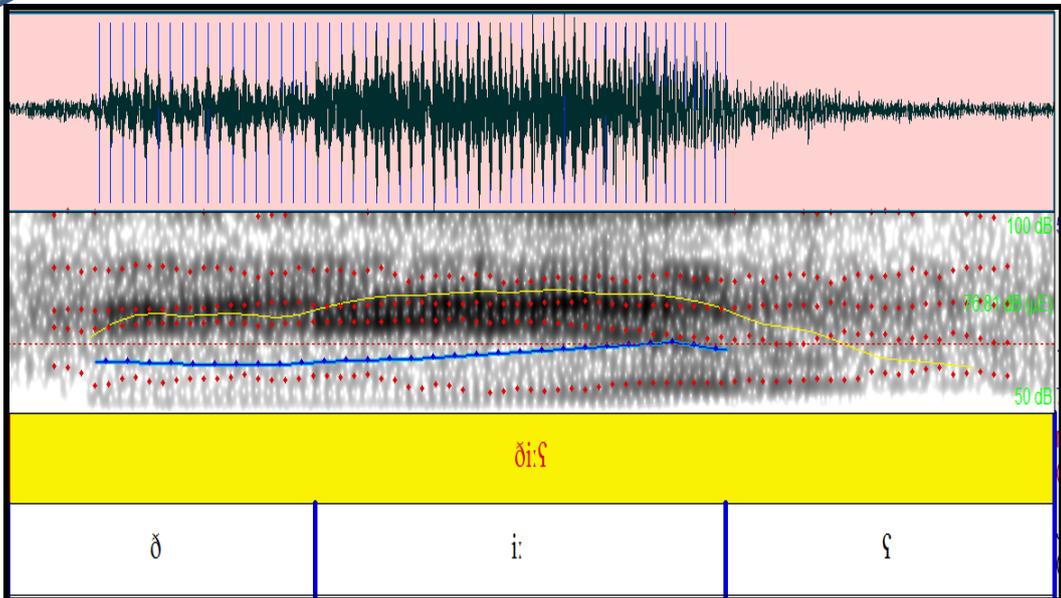


Fig. 8: Pharyngeal /ʃ/ produced in the word /ði:ʃ/ as a voiceless fricative in final position by a speaker from Babylon. No voicing instances are seen here during the production of the fricative compared to the voicing of the entire vowel.

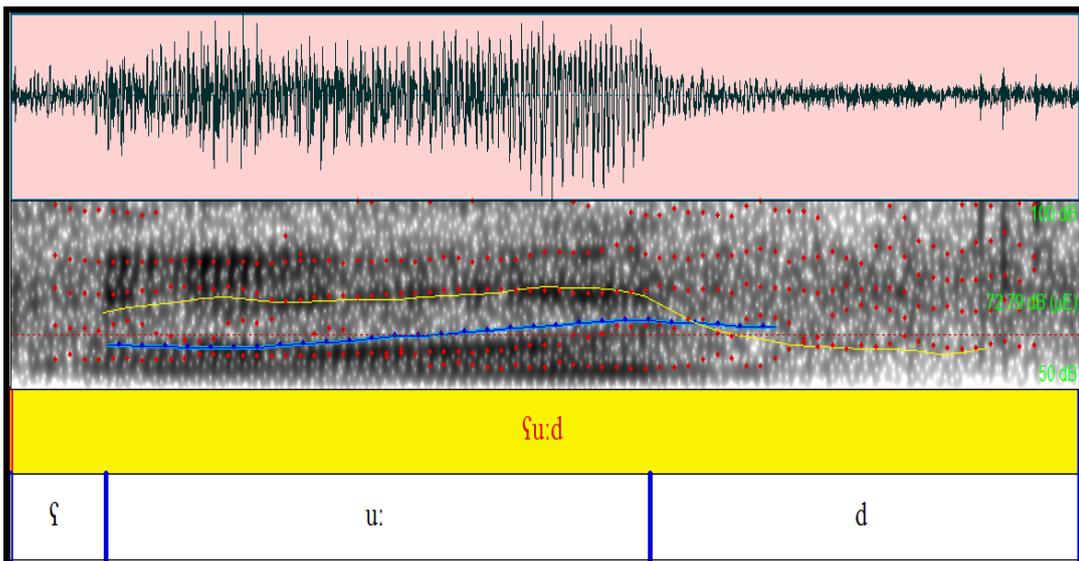


Fig. 9: Pharyngeal /ʃ/ produced in the word /ʃu:d/ as a voiceless fricative in initial position by the same speaker from Babylon. Another fully voiceless fricative compared to the adjacent vowel and following consonant which show a clear voicing bar.

Voiceless Approximant

An approximant is another familiar realisation of /ʕ/ but again as being voiced. In this study, approximants have been noted to show voicelessness in final position (fig. 10) and initial position (figs. 11 and 12).

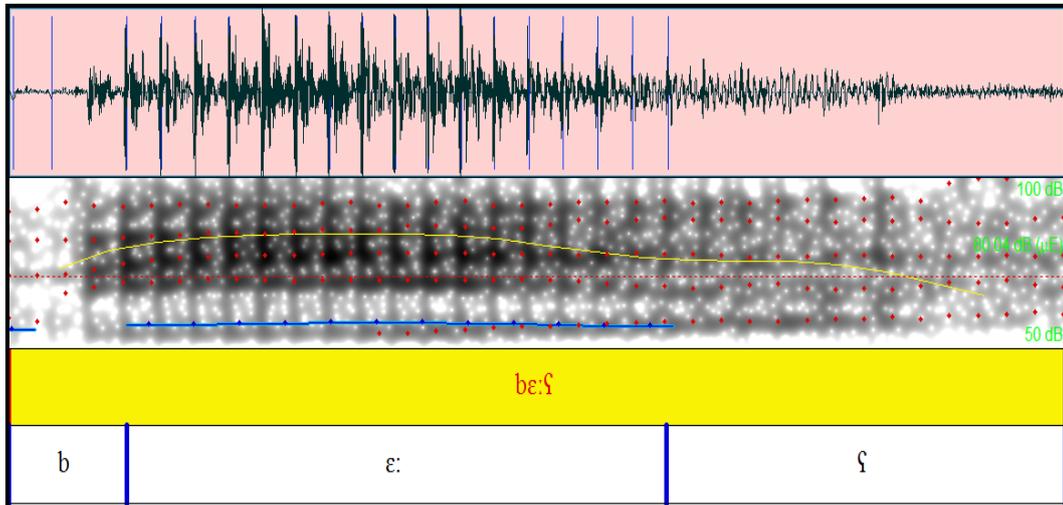


Fig. 10: Pharyngeal /ʕ/ produced in the word /bε:ʕ/ as a voiceless approximant in final position by a speaker from Babylon. There are no voicing instances or voicing bar during the production of the approximant in comparison to the adjacent vowel.

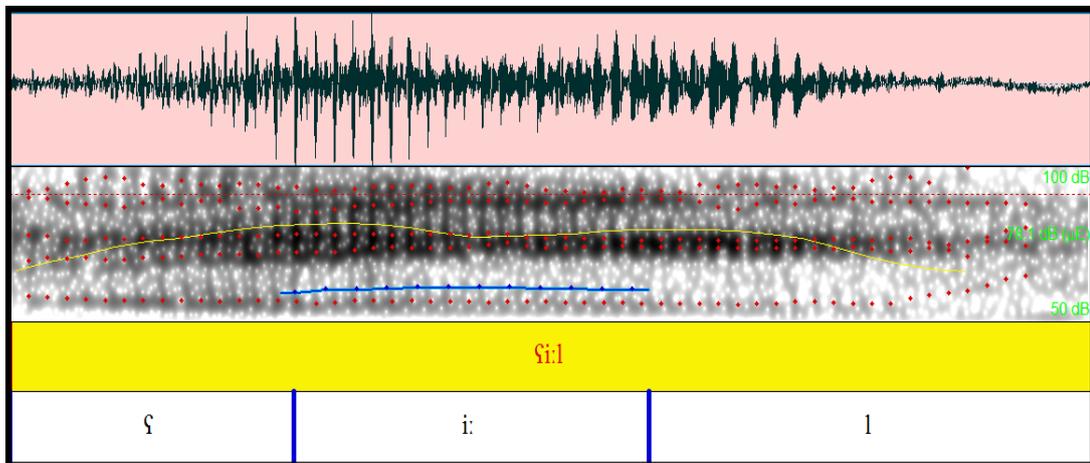


Fig. 11: Pharyngeal /ʕ/ produced in the word /ʕi:l/ as a voiceless approximant in initial position by a speaker from Basra. The consonant has formant-like features but no voicing compared to the voicing of the adjacent vowel.

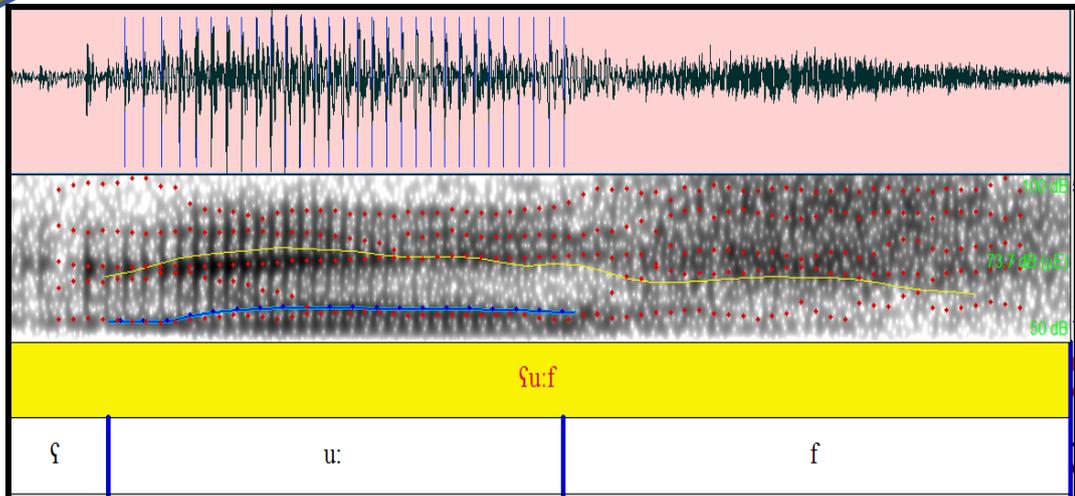


Fig. 12: Pharyngeal /ʕ/ in the word /ʕu:f/ produced as a voiceless approximant in initial position by a speaker from Basra. It also shows creak and a glottal burst but with no voicing instances as compared to the adjacent vowel.

Voiceless Stop

Stop productions of /ʕ/ are only noted to be voiceless, which is also confirmed in this study (fig. 13).

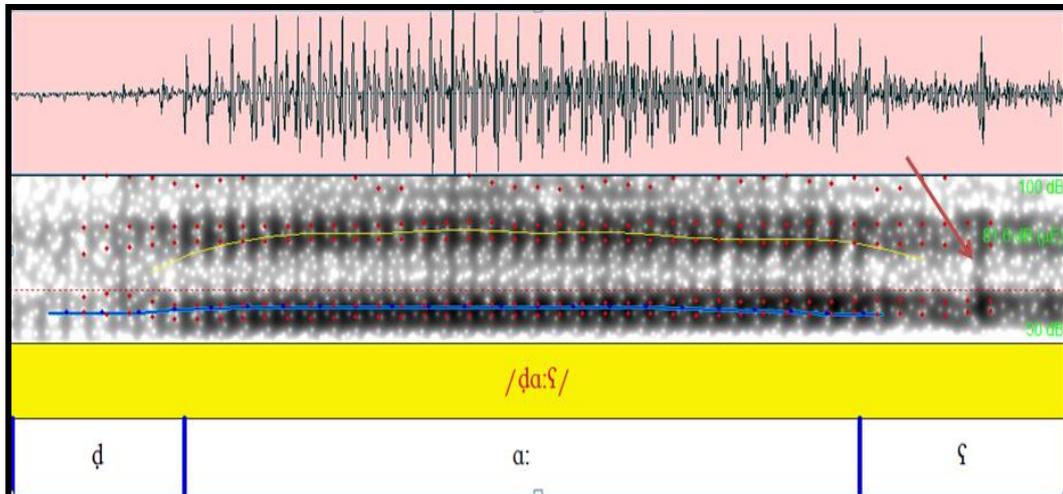


Fig. 13: The pharyngeal /ʕ/ produced in the word /da:ʕ/ as a voiceless stop with a clear burst (as indicated by the arrow) in final position by a speaker from Basra.

Mixed Realisations

The pharyngeal has also shown mixed realisations whereby it starts as an approximant within the vowel then becomes a fricative, or it would start as having voicing then loses it to turn to a voiceless sound, both happening in final position (figs. 14-18). The consonant would also be accompanied by creak, glottal burst and/or aspiration.

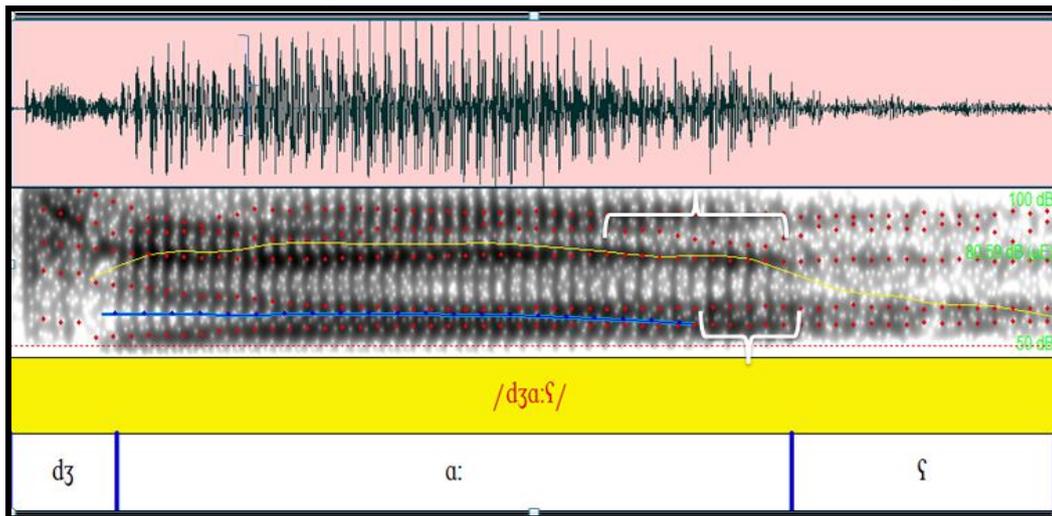


Fig. 14: Pharyngeal /ʕ/ produced in the word /dʒaːʕ/ as a voiceless fricative in final position by a speaker from Basra. Part of the consonant is also produced within the vowel as an approximant (indicted by the upper brackets) which loses voicing as it reaches the end of the vowel (indicated by the lower brackets).

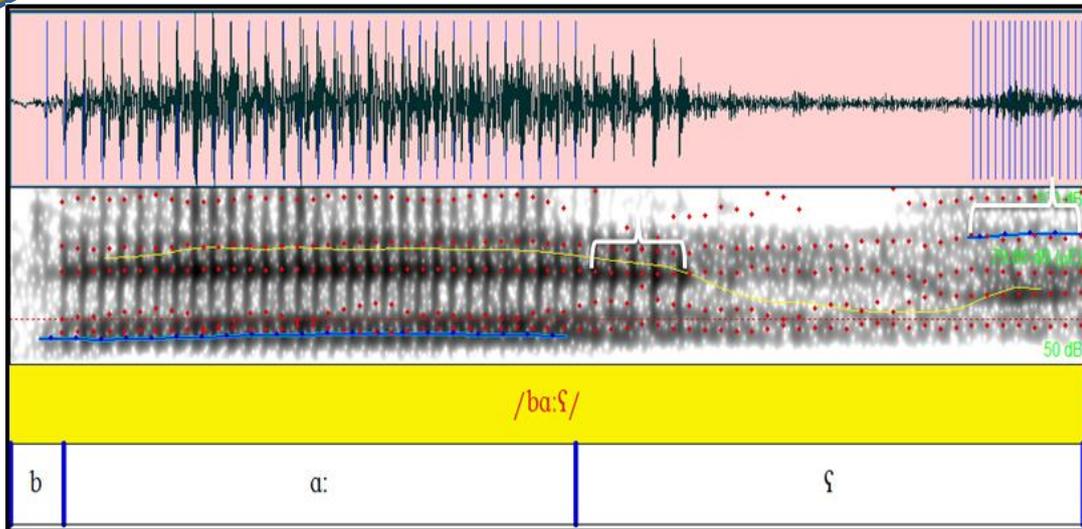


Fig. 15: Pharyngeal /ʕ/ produced in the word /ba:ʕ/ as a voiceless approximant starting within the vowel and ending voicing of that vowel (as indicated by having no pulses) and clear creak takes place (as indicated by the left brackets), then moves to clear friction which ends with clear aspiration sounding like a /h/ (as indicated by the right brackets), by a speaker from Basra.

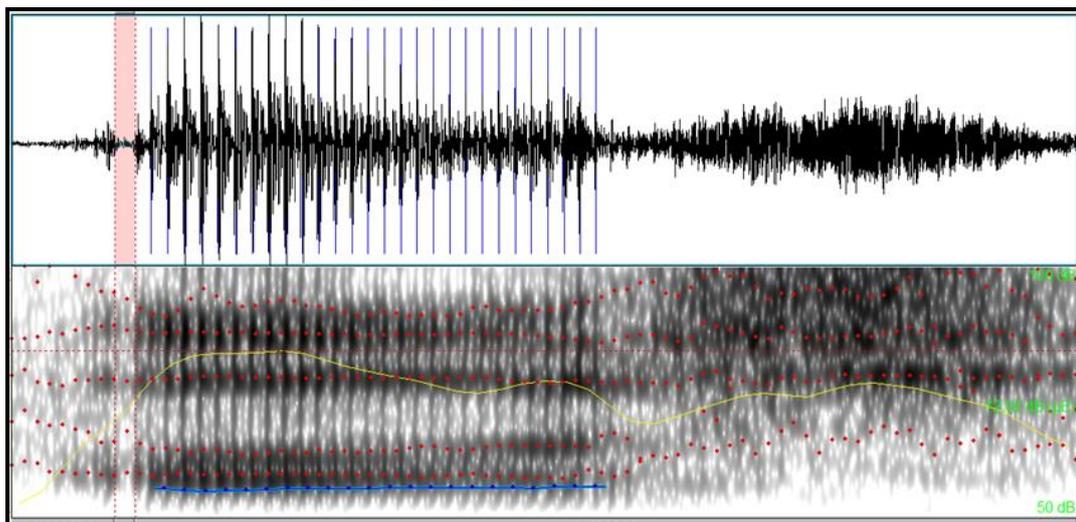


Fig. 16: Pharyngeal /ʕ/ in the word /ʕa:f/ produced as a voiceless approximant with creak by a speaker from Basra. But there seems to be a large gap between the last two striations even at onset before the start of the vowel (shown by the highlighted space).

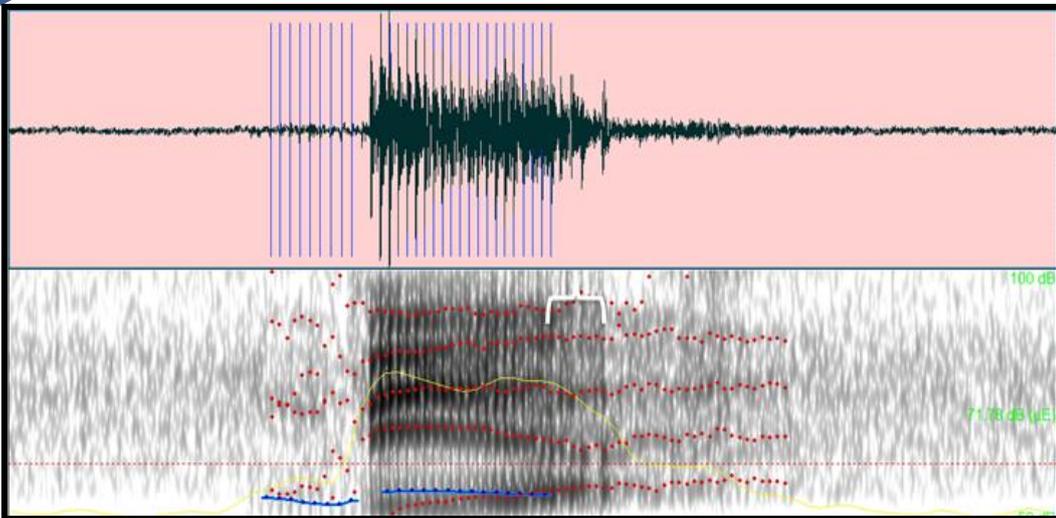


Fig. 17: Pharyngeal /ʕ/ in the word /bε:ʕ/ produced by a speaker from Basra. It is very clearly distinguished from the vowel (as shown by the brackets). It clearly shows no voicing which is confirmed by having no pulses or pitch during the whole consonant. It also has creak. This speaker has also shown to have the last two striations as very far apart and sometimes much further. Then there is friction with a continuation of formants.

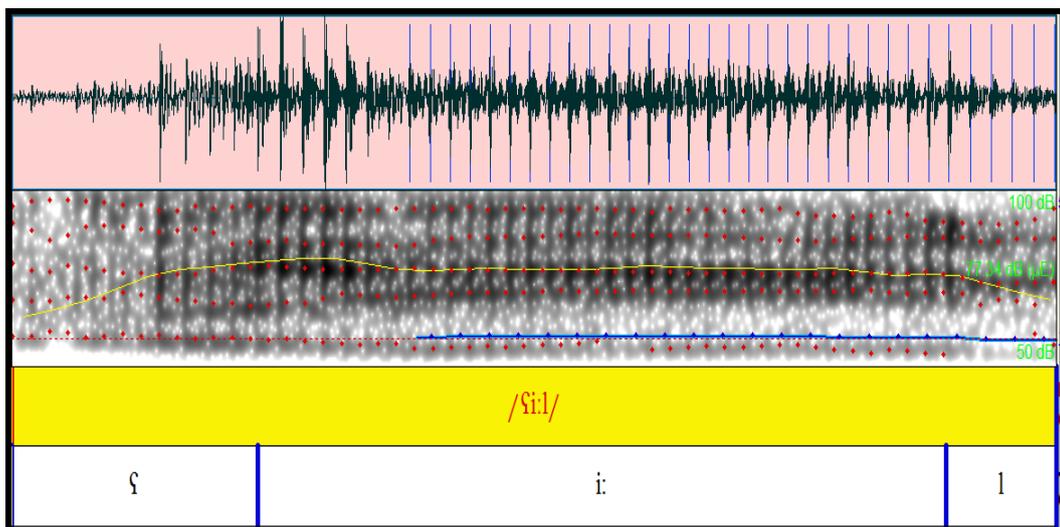


Fig. 18: Pharyngeal /ʕ/ in the word /ʕi:l/ as produced by a speaker from Thi-Qar. The consonant is a voiceless fricative with one faint striation which sounds like creak or a slight glottal constriction; which then becomes a voiceless approximant which continues into the first part of the vowel affecting the latter by losing its voicing as indicated by having no pitch of pulses.

Discussion and Conclusions

The present study investigated the realisations of pharyngeal /ʕ/ as produced by 10 young Iraqi male speakers. Results revealed that there is a prevalence of voicelessness in the productions of pharyngeal /ʕ/ for all three manners of articulations (approximants, fricatives, and stops) and in two word positions (initial, final). Results also show that approximants prevail over the other realisations particularly in initial position. Statistical tests showed significant differences of occurrence between the three realisations and in both word positions; except between stops and fricatives because the number of occurrences of these two realisations were very similar.

Results also showed these speakers are changing the production of this consonant aiming for a more voiceless version whether a fricative or an approximant in addition to the already existing voiceless stop. All stops showed voicelessness, which confirms results reported in the literature. What was interestingly noted in the present study is the voicelessness of the other two realisations, which has not been previously reported. Even in instances of mixed realisations containing a fricative then an approximant or vice versa, there was voicelessness sometimes continuing into part of the duration of the vowel, whether in initial or final positions. Statistical tests showed significant differences of occurrence of voicing and in both word-positions. They also showed that there are significant differences in the relationship between voicing and realisations of the pharyngeal and in both positions.

The pharyngeal is also produced with accompanying creak, glottal burst(s) and/or aspiration, which are usual co-occurrences of the pharyngeal. Furthermore, voiced realisations are still present particularly in initial position.

This study has only investigated this trend of voicelessness in pharyngeal /ʕ/; other voiced consonants could be undergoing the same changes, which would be a suggestion for future research. The study also only included speakers aged 18-22 years old; therefore, further research could include different age-groups to investigate whether or not age is in fact a factor deciding the type of realisation of pharyngeal /ʕ/ and its voicing. Results can trigger a possible language change appearing in the speech of young generations of Iraqi Arabic speakers; or it may show what might be considered a new trend among young speakers.

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