THE EMPHATIC AND PHARYNGEAL SOUNDS IN HEBREW AND IN ARABIC*

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This study addresses physiological, acoustic, and linguistic issues in the production of the emphatic sounds /t̴, s̴, d̴, z̴, k̴/ and the pharyngeal sounds /ħ,ʕ/. Approximately 300 minutes of video recordings were obtained from nine Hebrew and Arabic speakers, using a fiberscope positioned in the upper pharynx and simultaneous audio recording through an external microphone. We also studied a cineradiographic film of three Arabic speakers. Results clearly show that all the emphatic sounds, when pronounced as such, share pharyngealization as a secondary articulation. A constriction is formed between the pharyngeal walls and the tip of the epiglottis, which tilts backwards. To a lesser degree, the lower part of the root of the tongue is also retracted. The data show that all the emphatic and pharyngeal sounds we studied are made with qualitatively the same pharyngeal constriction. However, the pharyngeal constriction is more extreme and less variable for the pharyngeal sounds, where it is the primary articulation, than for the emphatic sounds, where it is a secondary articulation. Because the same sort of pharyngealization is seen for all the emphatics, we use a common notational symbol, [~], for all of them, including /k̴/ in place of /q/. We note that where pharyngeals and pharyngealized sounds were realized, the Hebrew and Arabic speakers produced them in essentially the same way.

Key words: emphaticness, pharyngeals, Hebrew, Arabic

INTRODUCTION

This paper describes a physiological and acoustic study of the emphatic and pharyngeal sounds of Hebrew and Arabic. The main assumption underlying the work is that the term "emphatic" describes a linguistic (phonemic) feature. The aim of this paper is to investigate the main articulatory and acoustic attributes which correspond to this feature

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"emphatic" in Hebrew and in Arabic. The reason that we deal with both pharyngeals and emphatics in this work is that we believe there is something in common between the emphatic sounds and the pharyngeal consonants, /ħ ʕ/ (Laufer, 1986, p. 58). In particular, we believe that both classes of sounds are characterized by a constriction in the pharynx.

It is generally accepted that emphaticness is a distinctive feature in Semitic languages (Hebrew, Arabic, Ethiopic-Ge'ez). (For a survey of the Semitic languages family, see for example Rabin, 1972.) Since our main concern in this paper is to study the phonetic realization of emphaticness, we will not go into much phonemic detail. We note, however, that the realization of this feature differs somewhat across languages. It is known, for example, that the emphatic sounds are realized as glottalized (ejective) in the Semitic languages of Ethiopia (e.g., Catford, 1977, p. 70; Ladefoged, 1971, pp. 25–28; Rabin, 1972, p. 1153; Ullendorff, 1955, pp. 151–157).

As for the two Semitic languages Hebrew and Arabic, there are several theories about the realization of emphaticness. A small minority of investigators have claimed that the phonetic difference between an emphatic sound and its nonemphatic counterpart is in the place of articulation. According to these investigators, the difference between the pairs /s̴ s/, /t̴ t/, and /q k/ is that the place of articulation for the emphatics is behind that for their nonemphatic counterparts. This generalization may have grown from the commonly accepted differences between /q/ (uvular) and /k/ (velar) (see, for instance, Bergsträsser, 1972). However, it seems unlikely that emphatics are distinguished from their nonemphatic counterparts by such differences in place of articulation. As has already been noted by Meinhof (1921, pp. 85–86), there is variation in place of articulation within both groups, and it is difficult to accept that place would also distinguish between the groups.

It has also been suggested that the difference between emphatic-nonemphatic cognates in ancient Hebrew is in degree of aspiration (Bergsträsser, 1972). Nonemphatics were thought to involve more aspiration than emphatics. Bergsträsser based this argument on transcriptions of ancient Hebrew into Greek orthography. While there may be a systematic difference in degree of aspiration, this seems to be at most a secondary attribute of the distinction, as noted by Morag (1963). Bergsträsser himself proposed this distinction only for ancient Hebrew, and suggested that the distinction had changed to one of velarization in modern Semitic languages.

A survey of the literature dealing with emphatics indicates that most investigators, although some did not state so explicitly, believe that emphaticness in Hebrew and Arabic involves a secondary articulation. Secondary articulation is defined as an articulation performed separately from and in addition to the primary articulation associated with a sound. "The secondary articulation, according to definition, is less constricted than the primary articulation; if the primary articulation is constricted to the degree of 'stop', for instance, the secondary articulation can be constricted to the degree of 'fricative' or 'frictionless continuant'. If the primary articulation is to the degree of 'fricative', the secondary articulation must be wider." (Laufer, 1985, p. 83, translated from Hebrew. For exceptions to this rule see Catford, 1977, pp. 188–189. According to Catford's definition, when there are two simultaneous articulations, an articulation in the pharynx is considered the secondary one.) In the pair /t̴ t/, for instance, there is one main articulation: alveolar constriction to the degree of 'stop'; the emphatic sound is differentiated from its nonemphatic cognate in that its production involves a secondary articulation in another place and with a wider constriction than for a 'stop'.

Concerning the realization of the secondary articulation associated with emphaticness in Hebrew and Arabic, ideas diverge. We shall see from the literature survey that there are two main theories. We hope that the results of our investigations will throw some light on this debated subject.

The theory that emphaticness is realized as velarization

The vast majority of the scholars who dealt with emphaticness believe that it is realized as velarization. The origin of this belief is probably Sibawayhi, one of the greatest Arabic grammarians, who lived in the eighth century. Sibawayhi's famous detailed book has been republished many times (for example, Sibawayhi, 1889 or 1975). Although Sibawayhi sometimes uses opaque and unfamiliar terminology, the outcome of his writing is clearly that he thinks: (1) that emphaticness is a secondary articulation and (2) that it is realized as velarization, namely that the back of the tongue is constricted against the velum (see discussion in Ghazeli, 1977, p. 6; Giannini and Pettorino, 1982, pp. 7–9).

Probably because of Sibawayhi's stature, many accept his (or his followers') theory without question and thus the word 'emphaticness' has become, for the majority of scholars, synonymous with 'velarization'. See, for example, Bergsträsser (1972); Gairdner (1925, pp. 15–20); Segal (1928, pp. 20–26); Ullendorff (1955, p. 157); Ferguson (1956, pp. 446, 451); Rabin (1972, pp. 1153–1154), to name only a few. However, many of these researchers used the term 'velarization' loosely, and probably did not mean to imply that the sounds were velarized rather than pharyngealized. They were merely using a phonetic term rather than the phonemic term, 'emphatic'.

A striking example of the use of "velarization" to refer to emphaticness is Obrecht's book (1968), titled "Effects of the Second Formant on the Perception of Velarization Consonants in Arabic". A reading of it reveals that the sole aim of the book is to deal with the acoustic aspects of emphaticness. Concerning the articulation, Obrecht himself notes (e.g., p. 22) that emphaticness can be velarization or pharyngealization, and (on the same page) he states that in Lebanese the dialect he examined, emphaticness is produced by a constriction in the pharynx. Accordingly, we argue that he should have used the term 'pharyngealization' instead of 'velarization' in his title, or at least, since articulation was not his main concern, he should have used the phonological term 'emphatic'.

In a recent book, Kästner (1981) cites Marçais (1948) and Delattre (1971), and probably because of their influence, he notes that during the emphatics there is also a constriction in the upper pharynx because of the retraction of the tongue and the constriction of the lateral pharyngeal walls. (As we shall see below, both found that there is a constriction in the pharynx during emphatics.) Still, Kästner does not consider the narrowing in the pharynx important, because he thinks that the emphatics are velarized ("velarisiert-gepresst", Kästner, 1981, pp. 42–43, 62).

The theory that emphaticness is realized as velarization creates a problem for the uvular consonant [q]: How can an uvular sound have a primary and a secondary articulation in the same area at the same time? Not all scholars realized the problem, but those who did, and who are in favor of velarization, have two simple answers: The first is that the [q] really should not be counted among the emphatic consonants. (As we shall see later, some scholars do not count the [q] among the emphatic group; for example, Sibawayhi, 1975.) The second solution does include the /q/ among the emphatics, but it defines emphaticness differently. According to this solution, the linguistic feature of emphaticness can be realized in two physiological ways: (1) as a secondary velarized articulation for the anterior consonants; (2) as a place of articulation difference – velar against uvular, as indicated by the notation – for /k q/.

The theory that emphaticness is realized as pharyngealization

Wallin (1855–58, p. 612) thought that the articulation for emphaticness is deep in the pharynx and larynx. He thought that the vocal folds adduct during the production of the emphatic sounds. He also theorized that the epiglottis participates in emphaticness. He assumed that the epiglottis falls on the glottis like a lid and partially closes it. According to Wallin the emphatics are the five sounds [t̴ s̴ d̴ z̴ q], with [t̴] and [q] showing the highest degree of emphaticness (p. 641).

Two years after Wallin's publication, Brücke (1860, p. 320) described the same consonants. He emphasized the role of the epiglottis in the production of the emphatics, even noting that for [t̴] and for [q] the epiglottis completely seals the passage of air. He continued to say (p. 324) that the vowels adjacent to emphatics are never pure-high or bright; they are rather low and muffled. Brücke believed that this muffled sound is caused mainly because of the role of the epiglottis and the arytenoids.

Haupt (1890) refers to the five emphatics as close consonants because, unlike Brücke, he believes that for all five of them there is a blockage between the epiglottis and the arytenoid cartilages. Haupt also mentions the change in the quality of a vowel following an emphatic consonant, although he thought that the change was due to a constriction made by the velum.

Meinhof (1921, pp. 88, 96–97) refers to three processes in the production of the five emphatics: (1) Raising of the back of the tongue towards the velum – the movement described by Sibawayhi; (2) compression that he described as a contraction of the musculature of the hyoid bone; (3) lowering of the epiglottis. Meinhof connects processes 1 and 2: He thinks that the velarization described by Sibawayhi is the cause of the contraction of the muscles of the hyoid bone. (To our mind the contraction of the muscles of the hyoid complex are likely to cause the 'opposite' of velarization!) Meinhof explains that Sibawayhi could have seen only the velarization, so that processes 2 and 3 are not excluded. Anyhow, according to Meinhof, emphaticness is caused by all three processes, namely: velarization, compression and pharyngealization by the epiglottis.

Panconcelli-Calzia (1924, pp. 48–49) agrees with the last two processes mentioned by Meinhof. On the whole he suggested 6 processes for the emphatic consonants: (1) Contraction of the muscles of the hyoid bone; (2) lowering of the epiglottis towards the glottis; (3) raising of the larynx; (4) constriction of the pharynx due to the actions of the constrictor muscles; (5) shorter bursts for the emphatics; (6) earlier voice onset after emphatics than after non-emphatics.

Tur-Sinai (1937, p. 12) believed that the Hebrew /ŧ/ is produced as a "[t] combined with swallowing" and that the Hebrew /q/ is a "[k] with swallowing". Later, he showed that this theory is in accord with the orthography of the ancient Hebrew alphabet. Tur-Sinai points out (1950, p. 155) that the shape of the Hebrew /ŧ/ in the old Hebrew script is '⊗', which is a combination of 'X', the old sign for Hebrew /t/, and 'O', the old sign for /ʕ/. The combination of these signs is to show that "the production of /ŧ/ is approximately the production of /t/ and /ʕ/ pronounced together". Tur-Sinai continues by "seeing the 'φ', the old sign for /q/, as a combination of the old signs for /ɡ/ and /ʕ/, in accordance with its old pronunciation – as an emphatic /ɡ/, as in the productions of some Yemenites and of the Acadians of ancient Babylon". (These quotations from Tur-Sinai are our translation. It is worthwhile to note that the Arabic /q/ was described as a voiced consonant by Arab grammarians – Ghazeli, 1977, p. 12, fn. 6. We also note that this theory of notation of Tur-Sinai cannot be applied to the third Hebrew emphatic, /ꞩ/.)

Jakobson (1957) claimed that emphatics are realized with pharyngealization, which is a contraction of the upper pharynx. Garbel (1958) also referred to them as pharyngealized sounds.

After discovering that the epiglottis is the articulator during the pharyngeal consonants /ħ ʕ/, Laufer (in a public lecture in 1980, which was published in 1986, p. 58) hypothesized that the emphatics are pharyngealized, meaning that the epiglottis performs a secondary articulation in their production. (The same hypothesis was also made by Ornan, 1983.)

Experimental evidence

All the sources reviewed above have in common the fact that they were expressions of beliefs and were not based on much experimental evidence. To sum up: Most of the scholars believed that emphaticness is velarization. Only a few (and we have mentioned here all we know) challenged the common theory of velarization, by saying the emphaticness has to do with some sort of pharyngealization.

Since the Second World War, there have been some studies of emphatics based on experimental data, mainly from x-ray film or spectrographic analysis. Marçais (1948, described by Morag, 1963, pp. 68–69, and by Giannini and Pettorino, 1982, pp. 17–18) examined the Arabic of the Maghreb (North Africa) using a kymograph, x-ray and photographic analysis. He found that, in the production of emphatics, the hyoid bone and the larynx are raised while the dorsum of the tongue is lowered and the root of the tongue is retracted, so much as to cause a considerable constriction in the pharyngeal cavity. Marçais found that this constriction is almost a complete closure.

Obrecht (1968; who, as we saw earlier, used the term 'velarization') based his study on acoustical analysis of a Lebanese dialect. He noted that the F2 locus of emphatics (i.e., the value of F2 at closure or release) is in the range 1000–1400 cps, while the locus of non-emphatics ("non-velarized" in Obrecht's terminology) is about 1800 cps. In spite of Obrecht's terminology, his acoustical analysis led him to conclude that emphaticness is produced by a constriction in the pharynx, at least in the dialect he examined (p. 22). Al-Ani (1970, pp. 21, 44; 1978), from an examination of x-ray pictures and spectrograms of Iraqi and Jordanian dialects, claimed that for the emphatics there is a constriction in the pharynx and a slight retraction of the main articulation. (For a criticism of the methodological basis of these studies, see for example, Ghazeli, 1977, p. 75; Laufer and Condax, 1981; Giannini and Pettorino, 1982, pp. 19–21.)

The study by Ali and Daniloff (1972) used high speed lateral cinefluorography with three speakers of the Baghdad Arabic dialect. Each speaker produced 48 nonsense words and 8 meaningful words. The authors concluded: (1) The posterior pharyngeal wall and the velum contribute little or nothing to emphatic sounds. (2) The main active articulator involved in these sounds is the root of the tongue, which forms a constriction in the pharynx. (3) There is no constriction with the velum except for the emphatic [k] (pp. 100, 105).

Ghazeli (1977) based his study on cinefluorographic data from a Tunisian idiolect and on acoustic data from 12 speakers from 6 Arab countries. His conclusions are: (1) The pharyngeal sounds are articulated in the lower part of the pharynx. (2) The uvulars [q x ʁ] have a constriction in the upper oropharynx. (3) The emphatics have "a secondary tongue retraction midway in the pharynx between the place of articulation of uvulars and pharyngeals" (p. 174). Ghazeli did not include /q/ among the emphatics, and we will return to this point in our discussion.

Giannini and Pettorino (1982) examined one Arabic speaker of a Baghdadi dialect, and presented acoustic and radiographic data. They concluded that the emphatic/non-emphatic distinction is one of pharyngealization. Their acoustic results are that for the emphatics F1 and F2 approach each other: F1 rises and F2 lowers. F3 is almost unchanged. They interpreted their radiographic results as showing a constriction in the pharynx for the emphatic sounds.

The identity of the emphatics

The scholars agree that the Old Hebrew and the traditional Eastern Hebrew dialects have three emphatic consonants: /ᵵ ᵴ q/ (e.g., Morag, 1972). Concerning the identity of the emphatic sounds in Arabic, even in classical Arabic, ideas diverge. (For dialectal differences see our discussion below.) Those who include the fewest among the emphatic sounds in Arabic, count four emphatics: /ᵵ ᵴ ᵭ ᵶ/ (e.g., Sibawayhi, 1975). Some scholars include among the emphatics almost all possibilities: /ᵵ ᵴ ᵭ ð̴ x ʀ ʕ ħ ɫ ᵬ ᵯ ᵰ/ (e.g., Jakobson, 1957). Of course, the number of emphatics can vary from one dialect to another and presumably from one time period to another. We had to restrict our study, in agreement with most scholars (e.g., Rabin, 1972, p. 1154), and we include five emphatic sounds: /ᵵ ᵴ ᵭ ᵶ q/.

The main reason for including /q/ among the Arabic emphatics is that it is recognized as emphatic in the other Semitic languages. In Ethiopian languages, the Semitic emphatics are realized as glottalized (i.e., ejectives): The Semitic /ᵵ/ is realized as [t'] and /ᵴ/ is realized as [s']. Similarly, the Semitic /q/ is realized as [k']. Thus, for example, the origin of the Ethiopic-Ge'ez word [s'idk'] 'justice' is from the Semitic root 's–d–q' (which is /'ᵴedeq/ in Hebrew and /ᵴidq/ in Arabic). We conclude that Semitic /q/ is an emphatic, and it is reasonable to assume that /q/ may be an emphatic in Arabic, although it may not function as one in all dialects. On the other hand, we do not include sounds like /ᵯ/ or /ɫ/ because they are not emphatic in classical Arabic and because their phonemic status is not yet agreed upon (see, for example, Ghazeli, 1977, pp. 136–137).

Dialectology of Hebrew and Arabic

It is necessary to consider the dialectology of Hebrew and Arabic with respect to the emphatic and pharyngeal sounds. The historical Hebrew pharyngeals /ħ ʕ/ are realized as [ħ ʕ] in the Eastern dialects (and by speakers of the General Dialect who have learned to speak this way; on the term 'General Hebrew', see Blanc, 1964, pp. 134–136). The historical emphatics /ᵵ ᵴ q/ are realized by most Modern Hebrew speakers as [t t͜s k]. In the speech of the old Eastern generation, the emphatics are realized as [ᵵ ᵴ q], especially in liturgical reading (prayer and reciting the Holy Scripture; for further details on this issue, see Morag, 1972).

There is also diversity in the dialects of Arabic. (For a discussion of the dialectology of Arabic, see for example Blanc, 1953, and the review by Ferguson, 1955.) We can conclude that, for the five classical emphatics /ᵵ ᵴ ᵭ ᵶ q/, the differences are in three areas. First, dialects differ with respect to the degree to which the emphatic sounds are distinguished from their nonemphatic counterparts (e.g., Morag, 1963). Second, dialects differ with respect to the spread of influence of emphaticness. In some dialects, there is extensive left-to-right and right-to-left assimilation, while in others the emphaticness is more or less constrained to the original emphatic sound itself (Morag, 1963; Rabin, 1972; Ali and Daniloff, 1972; Ghazeli, 1977). Third, the realization of the emphatics varies. Of the five classical emphatics above, all the dialects preserve, to different degrees, the /ᵵ/ and /ᵴ/ but there are differences in the other three. Most Arabic dialects exhibit only one of the phonemes /ᵶ/ or /ᵭ/. Only a few dialects, like Egyptian and Lebanese, have both of them (Ghazeli, 1977, p. 68). Most dialects, if they have /ᵶ/, pronounce it as [ð̴]. The classical /q/ is realized as [q] in "prestige" reading of Classical Arabic and in ordinary speech, for instance, by Muslim Arabs in Northern Iraq and by Jewish Arabic and Christian Arabic speakers in all Iraq. The [q] is also pronounced by Druze and by South Arabian Arabs. It is pronounced as [ɡ] in Bedouin dialects. In some dialects, it is pronounced as a glottal stop [ʔ] or even as a voiced uvular trill [ʀ] (Ghazeli, 1977, p. 54, 64).

In summary, our main aim in this paper is to study the production of the emphatic sounds and to compare them with the pharyngeal consonants, /ħ ʕ/. Using video films of the pharynx, obtained with a fiberscope, as our main source of data, we examine the hypothesis that both the pharyngeal and emphatic consonants are consistently produced with a pharyngeal constriction, and that pharyngeal constriction is thus an articulatory feature associated with these sounds. We also refer to acoustic and radiographic data to examine this issue. Because we are interested in pharyngeal and emphatic sounds in general, rather than any one language, we study both speakers of Hebrew and Arabic whose dialects include these sounds.

METHOD

Material

We prepared two lists, one for Hebrew and one for Arabic, containing nonsense utterances, real words, sentences, and connected speech passages. Nonsense utterances were of the form /CVCV/, where C is one of the set /t̴ t, s̴ s, q k, ʕ ʔ, ħ h/ for Hebrew. For Arabic, C was taken from the same set of sounds as well as /z̴ ð, d̴ d/. (Most dialects which have /z̴/ pronounce it as [ð̴]!) V was taken from the set /i e a o u/ for Hebrew and from /i a u/ for Arabic. Altogether, there were 50 combinations for Hebrew and 42 combinations for Arabic. For real words, we attempted to include the same contrasts as for the nonsense utterances. Our aim was to include minimal pairs containing the above consonants in initial, medial, and final position in the vicinity of the phonemic vowels of the languages. Not all the possibilities are represented in the languages. Our inventory included 135 different words in Hebrew and 85 in Arabic. The appendix lists words from these inventories. Word lists were constructed to contain place and manner contrasts among the emphatics and pharyngeals as well as between emphatic-nonemphatic and pharyngeal-nonpharyngeal pairs. Each inventory word was repeated several times. In addition, sentences and connected passages were included in order to verify the validity of the articulations of the sounds included in the lists.

Subjects

In total, nine subjects were used and approximately three hundred minutes of video recordings were obtained from them (see below). Information about the subjects is summarized in Table 1. Five of the speakers used Hebrew as their main language and were native speakers. (The dialect origin of two of them was from Yemen and of another two from Iraq. The fifth is from a General Dialect origin, but he taught himself to speak the Eastern dialect.) Three of them also served as informants for Arabic. The other four subjects were fluent speakers of Arabic. (They represent two Muslim dialects – Beirut, Lebanon and Nablus, Israel – and two Christian dialects – Baghdad, Iraq and Beer-Zeit, Israel.) Only two of them were native speakers of Arabic, and these two also served as Hebrew informants. In all, then, there were seven informants for Hebrew and seven for Arabic.

We would have preferred to use only monolingual native speakers of the two languages and at least two subjects for each dialect, but availability of subjects was a problem and we chose the best available. Nevertheless, we obtained consistent results on all subjects, and therefore strongly believe that our conclusions apply to all speakers who produce emphatics.

Equipment and procedures

Procedures were performed at Haskins Laboratories, New Haven. The subject was seated in a dental chair with his head supported in a comfortable position by an adjustable headrest. A flexible fiberoptic endoscope was inserted by an otolaryngologist through the nasal passage into the pharynx under light topical anesthesia. The fiber

TABLE 1

Summary of information about subjects

Speaker number	Main language	Dialect	Informant for Hebrew	Informant for Arabic
1	Hebrew	Yemen	X	
2	Hebrew	Yemen	X	
3	Hebrew	Iraq	X	X
4	Hebrew	Iraq	X	X
5	Hebrew	General	X	X
6	Muslim Arabic	Beirut		X
7	Muslim Arabic	Nablus	X	X
8	Christian Arabic	Baghdad		X
9	Christian Arabic	Beer-Zeit	X	X

bundle was held in place outside the nares, using a clip attached to a headband. Although the level to which the fiberscope was inserted varied somewhat, it was generally at about the level of the rest position of the uvula. The fiberscope was attached to a high-sensitivity color video camera, the output of which was recorded on ¾ inch video cassettes. Audio signals were recorded onto the video tape using a highly directional condenser microphone, as well as onto separate audio tape for purposes of acoustic analysis. During a run, a video monitor placed behind the subject provided a real time display of the fiberscope image. The monitor could not be seen by the subject, but was used by the experimenters to verify the placement of the fiberscope and the clarity of the image. When necessary, the position of the fiberscope was adjusted or the subject was asked to swallow or cough to clear the lens.

For analysis, the videotapes with simultaneous audio were examined using normal speed, variable speed (slow motion), and stopped modes. Stopped mode images consisted of a single field (representing 1/60 second). We were able to step through these, and could thus examine the pharyngeal behavior in detail with 1/60 second resolution. A coding signal that appeared on the video image and was also recorded on the second audio channel allowed us to synchronize the audio and video during analysis. It is well known that real physical dimensions cannot normally be measured in fiberscope images, since

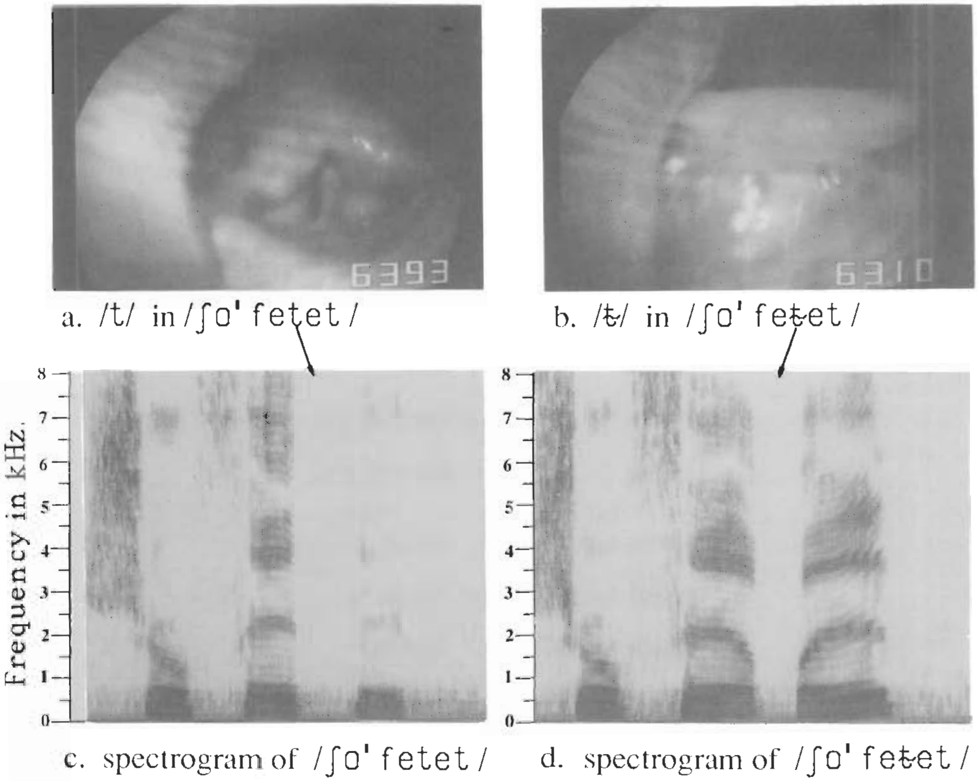


Fig. 1. Comparison between a nonemphatic consonant and its emphatic counterpart (Subject 1).

the image is a two-dimensional representation of a three-dimensional field and lens-to-object distances cannot be determined. Therefore, we limited our analyses of the videotapes to qualitative observations.

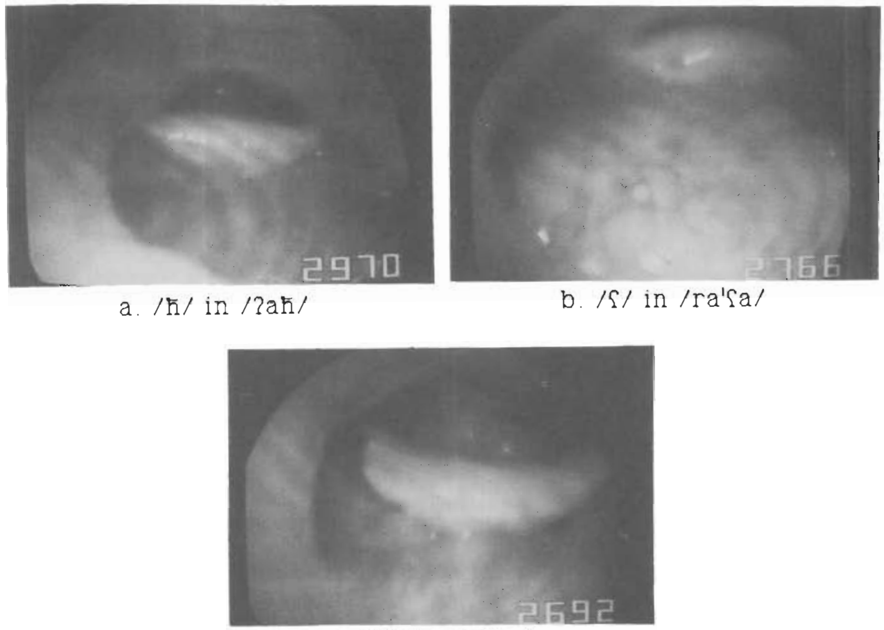
Results

Analysis of the video recordings showed that all subjects used a similar articulatory strategy when producing emphatics and pharyngeals. In particular, for both classes of sounds we found a constriction in the lower pharynx when compared with their nonpharyngeal (or nonemphatic) counterparts. In general, the narrowest constriction seems to be between the epiglottis, which tilts backwards, and the pharyngeal wall. This constriction also involves the root of the tongue. Figure 1 illustrates this comparison for /t ṭ/ produced by one of the Hebrew speakers. Fig. 1a shows the image during the closure interval for /t/ in /ʃo'fetet/. The full length of the glottis, which is open for the voiceless stop, is visible. The posterior pharyngeal wall is in the upper part of the image. The epiglottis fills the lower part of the image, and the root of the tongue is not visible. Fig. 1b shows the image during the closure interval for /ṭ/ in /ʃo'feṭet/. Here, the view of the glottis is completely occluded by the epiglottis, which is considerably tilted backwards towards the rear pharyngeal wall. The root of the tongue fills the lower part of the image, indicating that it has been retracted.

The acoustic consequences of these articulations are illustrated in Figures 1c and 1d, which show spectrograms associated with the two utterances. The arrows above the spectrograms indicate the closure segments for /t/ and /ṭ/. The transitions for /ṭ/ are far more extensive, showing marked lowering of F2 on both sides of the closure. This lowering of F2 extends into the steady state region of the vowels. The transitions also show some raising of F1 for /ṭ/ (indicated by darkening of the third harmonic and weakening of the second harmonic). Similar acoustic attributes have been reported elsewhere for emphatic sounds (Ghazeli, 1977; Giannini and Pettorino, 1982) and for pharyngeal sounds (Delattre, 1971; Laufer and Condax, 1981). These acoustic patterns have been shown to be consistent with pharyngeal constriction (Klatt and Stevens, 1969; Fant, 1970; Laver, 1980, p. 62).

As we have already noted, all the emphatic and pharyngeal sounds are made with qualitatively the same pharyngeal constriction. However, there is a great deal of variation in the degree of constriction. The greatest constriction is consistently observed for the pharyngeals /ħ ʕ/. Figures 2a and 2b show the video images obtained during production of these sounds. Consistent with the observations reported by Laufer and Condax (1981), the epiglottis, seen in the middle of Fig. 2a and near the top in Fig. 2b, appears to form the primary constriction during these sounds. To demonstrate that the constriction is directly associated with the pharyngeal segments, Figure 2c shows the image associated with production of the glottal stop /ʔ/ in the same phonetic environment as for /ʕ/. Because these segments are produced in the environment of the back vowel /a/, the epiglottis, seen near the middle of the figure, is tilted back and the pharynx is constricted even for /ʔ/. However, the degree of constriction is clearly greater for the pharyngeals.

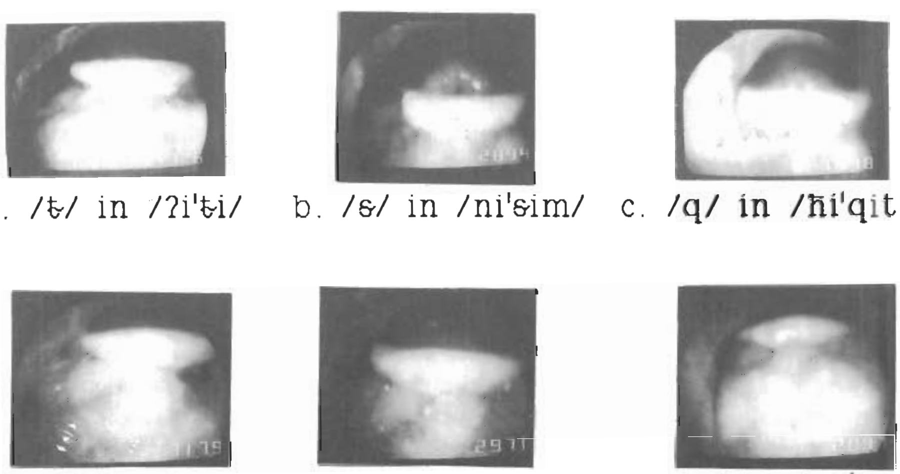
Our observations on the degree of pharyngeal constriction are consistent with our premise that this is the primary articulation for pharyngeal sounds while it is a secondary articulation for emphatic sounds. For the pharyngeals, the pharynx is highly constricted and the range of variation in the degree of constriction is small. Results of the present experiment are in accord with those reported by Laufer and Condax (1981). On the other hand, the degree of constriction is less extreme and more variable for the emphatics. Figure 3 shows examples of the pharyngeal configurations associated with different emphatic sounds in different phonetic environments for one subject. It can be seen that the range of constriction sizes is quite wide, and appears to be influenced both by manner of articulation and by vowel context. In particular, constrictions are more extreme for stops than for fricatives, and more extreme in an /a/ environment than in an /i/ environment. However, each of these emphatic sounds demonstrates a more constricted pharynx than its nonemphatic counterpart, as illustrated in Figure 1.



a. /ħ/ in /ʔaħ/ b. /ʕ/ in /raˈʕa/

c. /ʔ/ in /raˈʔa/

Fig. 2. The constriction in the pharynx during /ħ/, /ʕ/, and /ʔ/ (Subject 1).



a. /ᵵ/ in /ʔiˈᵵi/ b. /ᵴ/ in /niˈᵴim/ c. /q/ in /ħiˈqiti/

d. /ᵵ/ in /aˈᵵa/ e. /ᵴ/ in /aˈᵴa/ f. /q/ in /raˈqa/

Fig. 3. Pharyngeal configurations associated with three emphatic sounds in different environments (Subject 1).

We next turn our attention to the timing of pharyngeal articulation in the emphatics and pharyngeals. For pharyngeal sounds, the constriction in the pharynx is the primary articulation. In contrast, the pharyngeal constriction is secondary in emphatics, and therefore we can consider the relative timing of the primary and secondary articulations for these sounds. There is a great deal of variability in the relative timing of the primary and secondary articulations for emphatics. In utterances that demonstrated both left-to-right and right-to-left assimilation, the videotapes showed that the movements associated with pharyngeal constriction began before the obstruent interval and the pharyngeal constriction persisted after the release of the obstruent. For example, the spectrogram in Figure 1d, in comparison to Figure 1c, shows that the acoustic effects of emphaticness extend both left and right around the /t̴/ stop interval. Correspondingly, the videotapes show that the backward movements of the epiglottis and of the root of the tongue begin during the preceding vowel and persist during the following vowel.

An example of where the pharyngealization lags the primary articulation is shown in Fig. 4. These 16 frames show the images at intervals of 1/60 second (i.e., every field), or in some cases 1/30 second (every second field) through the VCV sequence in the utterance /nis̴im/. The first two frames are during the first /i/. The following three frames show activity appropriate for nonemphatic /s/: The vocal folds abduct while the epiglottis remains tilted forward, at the bottom of the figure. Only in the 6th frame does the epiglottis begin to tilt backward (to the middle of the figure) for the emphatic sound. It continues to move backward during the following five frames, reaching its most posterior position in the 11th frame. The epiglottis then begins to tilt forward, and in the 13th frame, the vocal folds are seen to be abducted for voicing for the second /i/. The epiglottis continues to tilt forward until the final frame. Thus, the secondary articulation begins during the fricative /s/ and persists into the vowel /i/.

Acoustic analysis of /nisim/ and /nis̴im/ supports the above observation. Figure 5 shows some of the frames from Figure 4, along with spectrograms of these utterances. Arrows show the approximate correspondence between the video images and the spectrogram. It is obvious from both the images and the spectrograms that the pharyngeal articulation demonstrates extensive carryover but only minimal anticipatory effects of emphaticness in this example, in that the transitions from the preceding vowel look quite similar but the transitions into the following vowel show significant lowering of F2 and some raising of F1 for the emphatic member of the pair. (It is worthwhile to mention that Figure 1, which shows both anticipatory and carryover effects, and Figure 5, which shows only carryover effects, were from the same subject.)

Discussion

Our results clearly show that emphatic and pharyngeal consonants share the same type of articulation in the pharynx. During production of these sounds, we saw that the epiglottis forms a constriction with the pharyngeal walls and that the root of the tongue, at the bottom of the pharynx, also moves backward. As we expected, the main difference between the emphatics and the pharyngeals, as seen in the pharynx, is in the degree of

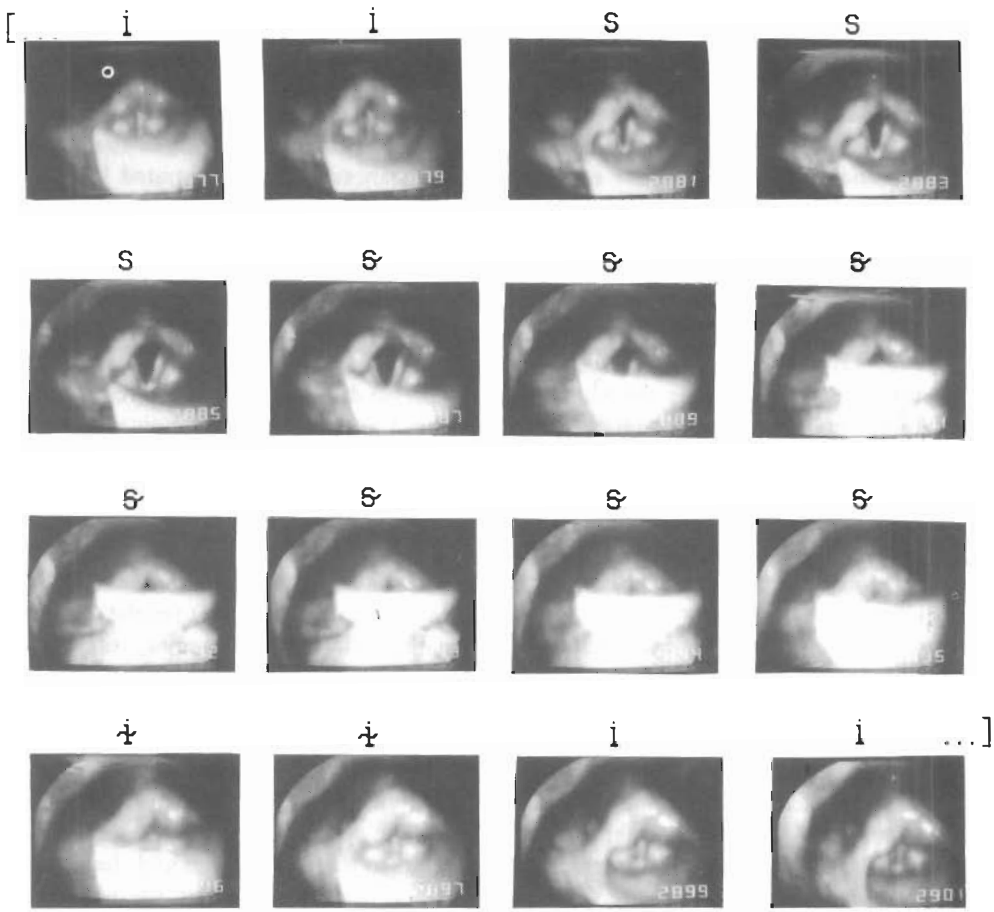


Fig. 4. A series of frames at 1/60th second or 1/30th intervals through /isˤi/ in /nisˤiin/ (Subject 1). The phonetic transcription associated with each frame is based on listening and on the configuration of the glottis and epiglottis.

constriction. For pharyngeals, there is a tight constriction at the epiglottis, consistent with its role as the primary articulator for these sounds. For emphatics, the degree of constriction is generally less (the pharynx is wider) and it is more variable than for pharyngeals. There are several factors contributing to this variability in emphatics: differences in vowel environment, differences among the consonants themselves (e.g., the fricative emphatics tend to show less constriction than the stops in a similar vowel environment; compare Figures 3b and 3a or Figures 3e and 3d), and differences between

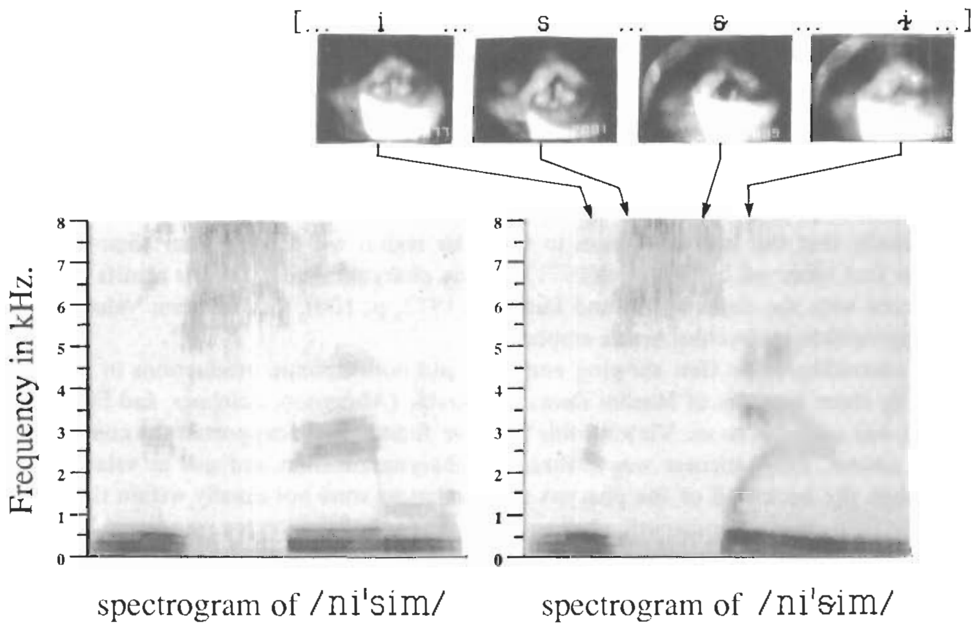


Fig. 5. Spectrograms and endoscopic images demonstrating a carryover effect of pharyngealization associated with /ſ/ (Subject 1).

subjects (and the dialects they speak). This variability is in accord with the role of pharyngeal constriction as a secondary articulation for these sounds.

Our physiological observations from the videotapes are supported by our analyses of the simultaneous acoustic signals. Observed constriction of the pharynx was always accompanied by lowering of F2 and raising of F1, which were clearly evident in the spectrograms. Variability in the degree of constriction for the emphatics was also evident in the extent of acoustic effects for these sounds. This correspondence between acoustic and articulatory data is expected on the basis of acoustical theory (Klatt and Stevens, 1969, pp. 212–213; Fant, 1970, p. 215). We also performed some informal experiments with an articulatory synthesizer (Rubin, Baer, and Mermelstein, 1981) to confirm that pharyngeal constriction leads to acoustic consequences similar to those we observed in this study.

With respect to the articulatory and acoustic results summarized above, all nine subjects gave qualitatively similar results: Whenever subjects had an emphatic sound in their dialects, all showed pharyngeal constriction for the emphatics in comparison to their nonemphatic counterparts in minimal pairs. In this regard, there was no distinction between Arabic and Hebrew speakers. The ubiquity of this result provides strong support for the theory that emphaticness, when produced, is realized as pharyngealization.

Our results can also be interpreted as providing evidence against the theory that emphaticness is realized as velarization. On biomechanical grounds, if there is a primary articulation at the front of the mouth (as there is for all the emphatic sounds except /q/) and the root of the tongue bulges backwards, then velarization cannot occur simultaneously, due to the fact that tongue volume remains constant. On the contrary, it is likely that the tongue dorsum in the velar region will lower rather than raise, as was in fact observed by Delattre (1971) for the pharyngeal sounds. Our results are also in accord with the claim by Ali and Daniloff (1972, p. 100), that the term 'velarization' is inappropriate to describe Arabic emphatics.

A cineradiographic film showing emphatic and nonemphatic productions in minimal pairs by three speakers of Muslim Damascus Arabic (Abramson, Zeichner, and Ferguson, 1962) was available to us. Viewing this film, we found that it supported the conclusions made above: Emphaticness was realized as pharyngealization and not as velarization. Although the back wall of the pharynx and the larynx were not usually within the radiographic field, it was consistently observed that the root of the tongue was drawn back for emphatics and that the tongue dorsum in the velar region was pulled down. (The film did not include /q/.) We also point out that the film provides evidence, from another dialect of Arabic, that when emphatics are realized they are produced in essentially the same way for all speakers, Hebrew or Arabic.

As we noted in the Introduction, there has been some controversy about whether /q/ should be considered an emphatic sound. At the outset of this study, we decided to include /q/ among the emphatics because of linguistic considerations, in agreement with a long list of other scholars (e.g., Wallin 1855–58; Haupt 1890; Meinhof 1921; Rabin, 1972 . . .). Our results show that this decision was justified on phonetic grounds, both articulatory and acoustic. Our videotapes and spectrograms showed that, as far as articulatory behavior in the pharynx is concerned, the distinction between the members of the pair /q k/ is qualitatively the same as the distinctions between /t̴ t/ or /s̴ s/, for example.

The observation that the /q/ in Hebrew and Arabic is realized as a pharyngeal secondary articulation causes us to use the symbol for pharyngealization [~] also with this velar emphatic. In IPA notation, [q] represents an uvular voiceless stop, while [k̴] can represent a pharyngealized velar voiceless stop. Thus, when the Hebrew or Arabic emphatics are pronounced, we should transcribe [k̴] instead of [q].

[1] The view that the difference between /k/ and /q/ in Arabic is in place of articulation – 'velar' versus 'uvular' – was held by Gairdner (1925), among other scholars. But Gairdner also thought that there was a difference in the place of articulation for /t d s z/ and /t̴ d̴ s̴ z̴/ – dental versus alveolar (velarized) (Gairdner, 1925, p. 15). This latter assumption has not been proven experimentally. Even if it were, we can still argue that, from the phonemic point of view, the place of articulation may be considered the same for both and called 'alveolar', as they are commonly classified. In the same way, we may consider the place for /k/ and /q/ to be the same and call it 'velar'.

Our videotapes do not show the primary place of articulation of the emphatic and nonemphatic consonants. However, if it can be shown that there is, in fact, a different place of articulation in the pair /k k̴/ (i.e., velar-uvular), we shall define the term 'velar' as including the area from the palate to the uvula, and consider both sounds as if they are produced in the same phonemic place of articulation.[1] We argue that the main cause for the distinction (when it is made in Hebrew and in Arabic) is the pharyngealization, and that the shift of place is of minor importance, due to coarticulation.

To sum up, there are several reasons why we prefer to use /k̴/ instead of /q/: (1) We can see that there is pharyngealization during the production of this sound. (2) We do not have enough evidence that there is a velar/uvular distinction when this sound is contrasted with /k/. (3) Even if there is a difference in place of articulation, we can argue that the difference is a secondary attribute. (4) The use of /k̴/ instead of /q/ retains the unity between all the emphatics and their nonemphatic counterparts.

Our observations provide experimental evidence for the assertions of Jakobson (1957, p. 515), who cites Trubetzkoy (1939, p. 125), that "the pair /q/ vs. /k/ carries the same opposition as the pairs /t̴/ vs. /t/ and the like". It also supports Delattre's claim that in Arabic the /q/ is "the emphatic counterpart of /k/" (1971, p. 133).

We can draw further evidence that there is a secondary narrowing in the lower pharynx during the Arabic /k̴/ from the radiographic study of Ghazeli (1977), who provides a schematic diagram of the x-ray image for this sound in Tunisian Arabic (p. 56), which he describes as a posterior movement of the back of the tongue, resulting in "the narrowest constriction (4 to 5 mm) taking place between the epiglottis and the back wall of the pharynx" (p. 55). (We note that his diagram of the x-ray image indicates that the main place of articulation for his /q/ is velar. He does not show a diagram for /k/.)

Despite his own observations, Ghazeli concludes that /q/ is counted as an uvular sound, and not as a pharyngealized sound (p. 171). This conclusion obviously is in accord with Sibawayhi's theory. However, Ghazeli's evidence does not support this conclusion. His x-ray tracings of /q/, /t̴/, /s̴/, and /z̴/ (pp. 56, 69, 70, 71) show a similar constriction in the pharynx: the narrowest constriction is always between the epiglottis and the pharyngeal wall.

In his conclusion, Ghazeli distinguishes three places of pharyngeal constriction: at the "lower pharynx" for the pharyngeals /ħ ʕ/; at the "upper oropharynx" for the uvulars /q x ʀ/; and "midway in the pharynx between the place of articulation of uvulars and pharyngeals" for the emphatics /t̴ s̴ z̴/. We cannot accept this conclusion. Our own data, from fiberoptic observations of nine subjects in contrast to Ghazeli's radiographic observation of one subject, does not show a different place of articulation in the pharynx. Furthermore, Ghazeli's own data do not support his conclusion. In all his x-ray tracings (pp. 38, 40, 56, 69, 70, 71) of his emphatics, /q/ and pharyngeals show the same kind of constriction, in accord with our data and conclusion: that the constriction associated with all of these sounds is in the lower part of the pharynx.

We also argue with Catford (1977) who distinguishes two types of pharyngeal articulation. The first he terms faucal, in which "the part of the pharynx immediately behind the mouth is laterally compressed, so that the faucal pillars move towards each other. At the same time the larynx may be somewhat raised. This appears to be the most common articulation of the pharyngeal approximants /ħ/ and /ʕ/". The second type of pharyngeal articulation is said to be where "the root of the tongue, carrying with it the epiglottis, moves backwards to narrow the pharynx in a front-back dimension" (p. 163). These definitions apply to pharyngealized sounds as well: "Pharyngealized sounds involve some degree of contraction of the pharynx either by a retraction of the root of the tongue, or by lateral compression of the faucal pillars and some raising of the larynx, or a combination of these" (p. 193). His second type of articulation is in accord with our results. But concerning his suggestion that lateral compression can be used independently from tongue retraction and tilting of the epiglottis, we could not find support in the speech of the nine subjects of this study, and not in the videotapes of the nine subjects described in Laufer and Condax (1981).

Our results do not seem to support the claim of Laufer and Condax (1981, p. 47) that the epiglottis is an independent articulator. However, whether or not the epiglottis is moved by its own muscles independently from the tongue, it still functions as an articulator. We argue this because our own data, as well as those from other studies (e.g., Ghazeli, 1977), show that the epiglottis can form the major constriction in the pharynx. The definition of an articulator is that it is the organ that moves closest toward the place of articulation (Smalley, 1967; Laufer, 1985, p. 9). Thus, whether the epiglottis moves by itself in speech or whether it is pushed around by the tongue is not relevant for deciding what the articulator is. The interesting question of whether the epiglottis can move independently can be best investigated using electromyography, and this is beyond the scope of the present study.

CONCLUSION

Our study rules out the theory that emphaticness is realized as velarization. The data provide evidence leading to the conclusion that emphatics in Hebrew and in Arabic (when they are produced as emphatics) are realized as pharyngealized, having a secondary articulation in the lower part of the pharynx.

Our data show that emphatic and pharyngeal sounds share, qualitatively, the same pharyngeal constriction. However, the pharyngeal constriction is the primary one for pharyngeals and a secondary one for emphatics. We also found that there is no essential difference between speakers of Arabic and of Hebrew in making these sounds.

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APPENDIX

Inventories of Hebrew and Arabic Words

Word lists were prepared from these inventories and were presented to the subjects in Hebrew or Arabic orthography. A word was presented several times in each list. A typical line in the list contained the sequence 1-2-2-1, where 1 represents a word with a pharyngeal or emphatic sound and 2 represents a counterpart word.

<u>Hebrew Words</u>

/ti'lim/	'small hills'	/ƚi'lim/	'missiles'
/ʔi'ti/	'with me'	/ʔi'ƚi/	'slow'

/ʃo'fetet/	'she boils'	/ʃo'fet̵et/	'judge (fem.)'
/sa'tar/	'contradicted'	/sa't̵ar/	'slapped'
/ʃo'tot/	'drinking (fem.)'	/ʃo't̵ot/	'fools (fem.)'
/pa'tur/	'solved'	/pa't̵ur/	'does not owe'
/si/	'summit'	/s̵i/	'fleet'
/se/	'lamb'	/s̵e/	'go out'
/sar/	'minister'	/s̵ar/	'narrow'
/so'ref/	'he burns'	/s̵o'ref/	'goldsmith'
/suf/	'reeds'	/s̵uf/	'honeycomb'
/ni'sim/	'miracles'	/ni's̵im/	'quarreling'
/'ʕesev/	'grass'	/'ʕes̵ev/	'sorrow'
/ma'sa/	'travelling'	/ma's̵aʕ/	'political platform'
/ħo'sot/	'they (fem.) are in shelter'	/ħo's̵ot/	'they (fem.) are crossing'
/mis/	'miss'	/mis̵/	'juice'
/les/	'less (a kind of soil)'	/les̵/	'jester, clown'
/ʃas/	'Talmud'	/ʃas̵/	'cantor'
/bos/	'boss'	/bos̵/	'mud'
/ħus/	'have pity'	/ħus̵/	'outside'
/ki/	'because'	/qi/	'vomit'
/ken/	'yes'	/qen/	'nest'
/kar/	'pillow'	/qar/	'cold, cool'
/kol/	'all, every'	/qol/	'voice'

/ħi'kiti/	'I waited'	/ħi'qiti/	'I imitated'
/ra'ka/	'soft (fem.)'	/ra'qa/	'temple (on head)'
/nu'ku/	'they were deducted'	/nu'qu/	'they were cleaned'
/pa'riŧ/	'item'	/pa'riꞩ/	'nobleman'
		/pa'riq/	'detachable'
/pe'reŧ/	'he detailed'	/pe'req/	'he unloaded'
/pa'raŧ/	'he changed money'	/pa'raꞩ/	'he burst'
		/pa'raq/	'he unloaded'
/if'roŧ/	'he will change money'	/if'roꞩ/	'he'll burst'
		/if'roq/	'he'll unload'
/ʔimo/	'his mother'	/ʕimo/	'with him'
/ʔed/	'vapor'	/ʕed/	'witness'
/ʔaʃir/	'I'll sing'	/ʕaʃir/	'rich'
/ʔor/	'light'	/ʕor/	'skin'
/me'ʔir/	'shedding light'	/me'ʕir/	'comments (masc.)'
/re'ʔe/	'look!'	/re'ʕe/	'graze! (vb. masc.)'
/ra'ʔa/	'he saw'	/ra'ʕa/	'he grazed'
/ro'ʔot/	'they (fem.) see'	/ro'ʕot/	'they (fem.) graze'
/ra'ʔu/	'they saw'	/ra'ʕu/	'they grazed'
/ka'ra/	'he read'	/qa'raʕ/	'he tore'
/hi ho'diʕa/	'she informed'	/hu ho'diaʕ/	'he informed'
/hif'riʕa/	'she disturbed'	/hif'riaʕ/	'he disturbed'
/bo'leaʕ/	'he swallows'	/januaʕ/	'he'll move'
/ma'noaʕ/	'motor'		

/si'xa/	'oiling'	/si'ħa/	'talk'
/uve'xen/	'...though'	/uve'ħen/	'elegantly'
/ma'xar/	'he sold'	/ma'ħar/	'tomorrow'
/so'xer/	'he hires'	/so'ħer/	'merchant'
/ma'lax/	'he reigned'	/ma'laħ/	'sailor' or 'he salted'
/lax/	'to you (fem)'	/laħ/	'damp'
		/lah/	'to her'
/him'liaħ/	'he salted'	/him'liħa/	'she salted'
		/him'lixa/	'she salted'
/miʃ'loaħ/	'shipment'	/ʃo'leaħ/	'he sends'
/ʃa'luaħ/	'he is sent'	/ja'nuħu/	'they will rest'
/na'vaʕ/	'to gush out'	/na'vaħ/	'to bark
		/na'vaŧ/	'to sprout'
/pa'raʕ/	'he disarranged'	/pa'raħ/	'he blossomed'
/pa'ra/	'a cow'	/pa'ras/	'he spread'
/pa'raƨ/	'he burst'	/pa'raq/	'he unloaded'
/pa'ram/	'he teared'	/pa'raʃ/	'horseman'
/pa'rag/	'poppy'	/pa'rar/	'he broke into crumbs'
/pa'raŧ/	'he plucked an instrument'	/pa'ran/	'name of a place'
/rax/	'soft'	/raʕ/	'bad'
/raq/	'only'	/raƨ/	'he ran'

<u>Arabic Words</u> <u>(Modern Standard Arabic and Colloquial)</u>

/ti:n/	'figs'	/t̶i:n/	'mud'
/tarattaba/	'was arranged'	/tarat̶t̶aba/	'got wet'
/ta:b/	'he repented'	/t̶a:b/	'he was good'
/ʔaʕ't̶ini/	'give me'	/ma't̶a:r/	'airport'
		/su't̶u:r/	'lines'

/'si:di/	'sir'	/'s̶ i:di/	'you (fem.) hunt!'
/'sabba/	' he insulted'	/'s̶abba/	'he poured'
/'su:ra/	'sura (par. in Quoran)'	/'s̶u:ra/	'form'
/ba:s/	'he kissed'	/ba:s̶/	'bus'
/s̶i:'di:hi/	'hunt it!'	/'s̶a:da/	'he hunted'
		/lu's̶u:s̶/	'robbers'

/'ba:kin/	'crying'	/'ba:qin/	'staying'
/kalb/	'dog'	/qalb/	'heart'
/su'ku:t/	'silence'	/su'qu:t/	'falling'
/ʔis'qi:ni/	'give me water'	/'naqala/	'removed'
		/'su:qu:/	'drive! (a car)'

/'ra:diʕ/	'deterring'	/'ra:d̶iʕ/	'suckling'
/'ʕaddat/	'she counted'	/'ʕad̶d̶at/	'she bit'
/fa:d/	'benefit'	/fa:d̶/	'overflow'
/'ʔimd̶i/	'sign!'	/'mad̶a/	'he signed'
		/fu'd̶u:l/	'advantages'

/'ðafar/	'stench'	/'z̶afar/	'victory'
/ðu'ru:fan/	'shed (tears)'	/z̶u'ru:fan/	'envelopes'
/fi z̶illihi/	'in his shadow'	/mi'z̶alla/	'parachute'
		/z̶u'hu:r/	'backs'

/ʕala/	'on'	/ʔala/	'maybe'
/ʕarḍ/	'proposition'	/ʔarḍ/	'land'
/ʕamal/	'work'	/ʔamal/	'hope'
/ʕaj:ada/	'he celebrated'	/ʔaj:ada/	'he supported'
/saʕaf/	'he helped'	/saʔʔaf/	'he made a roof'
/raʕab/	'fear'	/raʔab/	'he looked'
/waʕad/	'he promised'	/waʔad/	'he set fire'
/waraʕ/	'he feared'	/waraʔ/	'paper'
/badaʕ/	'he did a nice thing'	/badaʔ/	'he started'
/baraʕ/	'to be skillful'	/baraʔ/	'he created'
/ħa:mil/	'a pregnant woman'	/ha:mil/	'a bad man'
/ħuru:b/	'fights'	/huru:b/	'escape'
/ħabba/	'he loved'	/habba/	'he blew'
/maħl/	'drought'	/mahl/	'slowly'
/waħl/	'mud'	/wahl/	'fright'
/jaħta:ʒ/	'he will need'	/jahta:ʒ/	'he will be angry'
/naħara/	'he slaughtered'	/nahara/	'to drive away'
/ʃabaħ/	'figure'	/ʃabah/	'image'
/balaħ /	'dates'	/balah/	'stupidity'