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# DEBUCCALIZATION IN GULF PIDGIN ARABIC: OT PARALLELISM OR HARMONIC SERIALISM

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## Abstract

The current study examines debuccalization in Gulf Pidgin Arabic (GPA), which targets pharyngeal fricatives, /ʕ/ and /ħ/, based on the analysis of feature geometry and Optimality Theory (henceforth OT). This study relies on data elicited from interviews with 10 GPA speakers from two linguistic backgrounds, Bengali and Malayalam. This study concludes that /ʕ/ is debuccalized to [ʔ] and /ħ/ to [h] in onset position. Debuccalization is also seen as a step prior to the deletion of pharyngeal fricatives in the coda position. The process of debuccalization is shown through a feature geometric representation of which the Retracted Tongue Root [RTR], as an articulator feature dominated by the pharyngeal place node in pharyngeal fricatives is prone to inertness. [RTR] inertness and the loss of pharyngeal place node are peculiar to the deletion of pharyngeal fricatives in the coda position. Parallelism, as an OT model, is shown to be able to account for debuccalization in the onset in GPA while Harmonic Serialism, as another OT model, is capable of accounting for a serial derivation of which debuccalization of pharyngeal fricatives in the coda position represents the first step prior to consonant deletion.

## 1. Introduction

Gulf Pidgin Arabic (GPA) is a contact variety used for daily communication between the indigenous people of the Gulf States, who speak a variety of Arabic known as Gulf Arabic, and expatriate workers, mostly from the Indian subcontinent. GPA shares many features with other pidgin languages, such as being mostly used for limited functions (e.g., trade or giving instructions). Linguistically, it also features reduced lexicon and simplification. Yet, as argued in the

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literature review section below, most of what we currently know about the linguistic features of this pidgin relates to its morpho-syntactic features or its segmental phonology. To the best of our knowledge, no prior research has been conducted on the phonological processes in this pidginized form of Arabic. Hence, this study attempts to account for debuccalization, a phenomenon found in the speech of all the informants interviewed for this research project, whereby the Arabic pharyngeal phonemes are replaced with glottals. There are two groups of interviewees in this study: native speakers of Malayalam and native speakers of Bengali. All the interviewees are males who speak GPA as a second language. The results of this study indicate that debuccalization is attested in GPA, and two pharyngeal phonemes of the lexifier language, Arabic, are debuccalized (/ʕ/ to /ʔ/ and /h/ to /ħ/). Analysis of the elicited data would provide answers to the following research questions:

(1) To what extent is debuccalization seen as a phonological process that targets pharyngeal fricatives in GPA?
(2) How should we best account for debuccalization in GPA using Optimality Theory?

## 2. Literature Review

### *2.1 GPA*

Despite its relatively recent emergence, GPA is spoken over a wide geographical area. There have been reports of its use as a contact variety in the Arabian Gulf States such as the UAE (Smart 1990), Kuwait (Wiswall 2002; Salem 2013), Saudi Arabia (Hobrom 1996; Almoaily 2008, 2013), Oman (Naess 2008), and Qatar (Bakir 2010). The overall geographical area of these states is approximately 2.6 million square kilometres (see GCC Statistical Center 2015). According to Almoaily (2013), GPA is used as a lingua franca among Arabic-speaking indigenous people and Asian expatriate workers in the Gulf. Accordingly, there are millions of speakers of this pidginized form of Arabic from a variety of linguistic backgrounds, such as Arabic (the lexifier language) and an array of substrate languages: Bengali, Urdu, Pashto, Punjabi, Malayalam and Tamil, among others.

The first report on GPA that we are aware of is a descriptive account by Smart (1990). In his study, he provided a description of the segmental phonology of GPA, as well as some of its morpho-syntactic features based on written texts in GPA. One may question

the accuracy of such description, however, as GPA is a spoken pidgin. Using the Arabic alphabet leads to opaque orthography (i.e., an inconsistent grapheme-phoneme correspondence). The segmental phonology of GPA was described based on recorded interviews with GPA speakers and using naturally occurring data in later studies such as Gomaa (2007), Almoaily (2008), Naess (2008), and Salem (2013). Below are lists of GPA consonants (Table 1), adopted from Naess (2008). Given the large number of GPA speakers, who belong to different linguistic backgrounds, variation within this pidginised Arabic variety is attested (see Avram 2020). Indeed, as expected in pidgin languages, there is a great deal of variation when it comes to the actual production of phonemes in GPA, where the glottal stop in the word-final position can be omitted (e.g. [ʔis.ma] vs. [ʔis.maʔ] 'listen!'). In addition, phonemes can also serve as allophones of other phonemes, e.g. the phoneme /ʃ/ in the word /ʕa.ʃa.ra/ 'ten' can also be produced as an [s]. Yet, phonological variation is beyond the scope of this study, as the data is collected in a limited geographical area and from speakers from two linguistic backgrounds only.

**Table 1. GPA Consonants**
(adopted from Naess 2008:43).

| | **Bilabial** | **Labiodental** | **Dental** | **Alveolar** | **Alveo-palatal** | **Velar** | **Glottal** |
|---|---|---|---|---|---|---|---|
| Stops | p b | | t̪ d̪ | | | k g | ʔ |
| Fricatives | | f | s z | | ʃ | | h |
| Affricates | | | | tʃ dʒ | | | |
| Nasals | m | | | n | | | |
| Taps | | | | r | | | |
| Approximants | | ʋ | | l | j | w | |

Gulf Arabic consonants are difficult for speakers of many languages to produce. They tend to be replaced by the nearest counterparts in GPA speakers' L1 (Smart 1990; Næss 2008; Avram 2010; Salem 2013; Abed Al-Haq and Al-Salman 2014; Aljutaily 2018). For instance, according to Næss (2008), the unvoiced bilabial stop /p/ in GPA mainly occurs as a variant of /f/ in Gulf Arabic, whereas /p/ is rare in Gulf Arabic since it is found in certain loanwords, mainly from Persian. The interdental consonants /θ/ and /ð/ in Gulf Arabic are replaced by the dentals /t̪/ and /d̪/ in GPA (Næss 2008; Abed

**Table 2. Gulf Arabic Consonants**
(adopted from Naess 2008:28).

| | Bilabial | Labiodental | Interdental | Pharyngealized | Dental | Alveolar Pharyngealized | Alveolar | Alveo-palatal | Velar | Uvular | Pharyngeal | Glottal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stops | b | | | | t̪ d̪ | tˤ | | | k g | q | | ʔ |
| Fricatives | | f | θ ð | ðˤ | s z | sˤ | | ʃ | x ɣ | | ħ ʕ | h |
| Affricates | | | | | | | tʃ dʒ | | | | | |
| Nasals | m | | | | | | n | | | | | |
| Taps | | | | | | | r | | | | | |
| Approximants | | | | | | | l | j | w | | | |

Al-Haq and Al-Salman 2014; Aljutaily 2018). The emphatic sounds in Gulf Arabic also undergo replacement in GPA (Smart 1990; Næss 2008; Salem 2013; Abed Al-Haq and Al-Salman 2014; Aljutaily 2018). For instance, the Gulf Arabic emphatic/pharyngealized interdental /ðˤ/, according to Næss (2008), Abed Al-Haq and Al-Salman (2014), and Aljutaily (2018), is replaced by the dental /d̪/ in GPA. Likewise, Smart (1990), Næss (2008), Salem (2013), Abed Al-Haq and Al-Salman (2014) and Aljutaily (2018) unanimously agree that the emphatic/pharyngealized sounds /tˤ/ and /sˤ/ in Gulf Arabic are replaced by their non-emphatic counterparts /t/ and /s/ in GPA. The velar fricatives /x/ and /ɣ/ in Gulf Arabic are shifted to their velar stop counterparts /k/ and /g/ in GPA (Næss 2008; Avram 2010; Abed Al-Haq and Al-Salman 2014; Aljutaily 2018). Næss (2008) states that /ʊ/, which is not found in Gulf Arabic, is commonly produced by certain GPA speakers, especially Malayalam, as the replacement of /w/ in Gulf Arabic and belongs to the consonant inventory of GPA as an innovation. The replacement of the Gulf Arabic pharyngeal fricatives /ʕ/ and /ħ/ with glottal consonants /ʔ/ and /h/ in GPA is documented by Næss (2008), Avram (2010), Abed Al-Haq and Al-Salman (2014), Aljutaily (2018). This process is known as debuccalization which is the main focus in our current study in light of OT.

A number of other studies were conducted on GPA, concerning phenomena such as lexical borrowing (Wiswall 2002), the verbal system (Bakir 2010; Næss 2018), the multi-functionality of *fi* (Avram 2012; Alshurafa 2014; Bakir 2014), emergence (Avram 2014), language variation (Almoaily 2013), requests (Al-Ageel 2015), the role

of foreigner talk in the emergence of GPA (Avram 2017), and social attitudes towards GPA (Abed 2017). None of the studies mentioned above, however, has provided a detailed account of any phonological processes in GPA. The significance of the current study stems from a gap in the literature on this pidgin, where phonological processes such as reduction, deletion, and assimilation are, to the best of our knowledge, unexplored. In addition to being under-researched, GPA is a living and evolving contact variety that is spoken by many people over a wide geographical area.

### *2.2 GPA Substrate Languages*

GPA speakers come from various linguistic backgrounds (see section 2.1 above). Due to the large number of substrate languages, the focus here will be on only two languages: Malayalam and Bengali. These two languages are spoken by two of the largest groups of non-Arab immigrants in Saudi Arabia (see Almoaily 2013 and Global Media Insight 2020). Due to transfer from these speakers' L1s, the phonological systems of the substrate language may have an influence on the phonological patterns of GPA, a phenomenon known as substrate influence (see Siegel 2003). Tables (3) and (4) below list the phonemes of Bengali and Malayalam, respectively.

**Table 3. Bengali Consonants**
(adopted from Ud Dowla Khan 2010: 221)

| | **Bilabial** | **Dental** | **Alveolar** | **Alveo-palatal** | **Palatal** | **Velar** | **Glottal** |
|---|---|---|---|---|---|---|---|
| Stops | p b<br>bʱ | t̪ d̪<br>t̪ʰ d̪ʱ | t d<br>tʰ dʱ | | | k g<br>kʰ gʱ | |
| Fricatives | | | s | ʃ | | | h |
| Affricates | | | | t̪ɕ d̪ʑ<br>t̪ɕʰ d̪ʑʱ | | | |
| Nasals | m | | n | | | ŋ | |
| Laterals | | | l | | | | |
| Approximants | | | ɹ | | | | |

As shown in Tables (3) and (4) above, neither of the two substrate languages under investigation has the pharyngeal phonemes of

**Table 4. Malayalam Consonants**
(adopted from Jiang 2010:8)

| | Bilabial | Labiodental | Dental | Alveolar | Alveo-palatal | Retroflex | Palatal | Velar | Glottal |
|---|---|---|---|---|---|---|---|---|---|
| Stop | p b<br>pː bʱ<br>pʰ | | t̪ d̪<br>t̪ː d̪ː<br>t̪ʰ | tʰʲ | tɕ dʒ<br>tɕː dʒʱ<br>tɕʰ | ʈ ɖ<br>ʈː ɖʱ<br>ʈʰ | | k g<br>kː gʱ<br>kʰ | |
| Fricative | | f | | s | ɕ | ʂ | | | h |
| Nasal | m<br>mː | | n̪<br>n̪ː | n<br>nː | ɲ<br>ɲː | ɳ<br>ɳː | | ŋ | |
| Trill | | | | r | | | | | |
| Tap/Flap | | | | ɾʲ | | | | | |
| Central approximant | | ʋ | | | | ɻ | j | | |
| Lateral approximant | | | | l<br>lː | | ɭ<br>ɭː | | | |

Arabic, /ʕ/ and /ħ/. Hence, GPA speakers of these two languages are expected to employ phonological processes to replace the pharyngeal phonemes found in the lexemes of the superstrate language with phonemes from their first languages or with other phonemes which are easier to pronounce. One of the phonological processes evident in the data in this study is debuccalization. According to O'Brien (2012:1), debuccalization is 'a weakening phenomenon whereby various consonants with oral constriction reduce to laryngeal consonants'. Following this definition, the replacements of the voiced pharyngeal /ʕ/ with the glottal stop /ʔ/ and the voiceless pharyngeal /ħ/ with the glottal /h/ are treated as debuccalization in the current study (see section 4 below).

## 3. Data and Methodology

### *3.1 Data*

The data used in this study consist of recorded interviews with six Bengali speakers and four Malayalam speakers. The interviews were

conducted and transcribed by the authors of this paper. Each interview was approximately 25 minutes long and all the interviews took place in Riyadh, Saudi Arabia. The participants' age ranged between 23 and 41 at the time they were interviewed. Their length of stay in Riyadh was between 2.5 years and 18 years. All the interviewees were males who work in low-income jobs (e.g., bakers, car mechanics, plumbers) that require daily interaction with locals (in GPA) and other immigrant GPA speakers. Determining the participants' attitudes towards GPA was beyond the scope of the current study. Yet, some interviewees have expressed positive attitudes towards learning Standard Arabic (for religious reasons), while others seemed to be satisfied with the use of GPA as a means of communication with locals and other GPA-speaking expats. It should be noted that most of the informants speak Urdu as a second language. Hence, both GPA and Urdu could be used as lingua franca among speakers belonging to different linguistic backgrounds (mostly Urdu with expats from the Indian subcontinent and GPA with locals). Since the interviewees, none of whom had prior acquaintance with the interviewer, had to meet certain criteria, such as being GPA speakers and being native speakers of either Malayalam or Bengali, snowball sampling[2] was employed to find participants for this study. This method, according to Babbie (2008), is used when individuals from the studied population are hard to locate. The interviews were structured to ensure the elicitation of natural data by GPA speakers. For example, the interviewers—who are fluent GPA speakers—asked the interview questions and took turns in the interviews in GPA. Additionally, the interviews were all held at the workplaces of the informants and were preceded by a friendly discussion with the interviewees. Another measurement to increase the accuracy of the collected data was to ask the informants to participate as volunteers. The payments they got in return for participating in the study were not discussed before conducting the interview. The interviews covered a range of topics pertinent to interviewees' childhoods, hometowns, daily activities and work duties. These are topics that the interviewees are expected to feel confident in discussing with a stranger. Such naturally occurring data provide authentic material for our phonological analysis of GPA. Indeed, it was impractical to ask our interviewees to read from word

[2] A form of non-probability sampling where the researcher collects data from available informants and then asks them to provide him/her with access to and/or information about other potential participants in the study (Babbie 2008).

lists because GPA is only a spoken variety. Even if written in Arabic script, most GPA speakers would not be able to read texts written in Arabic. After conducting the interviews, they were transcribed and examples of debuccalization were annotated with their place of occurrence in the audio files. Based on perceptual judgements by Flemming (2004), instances of debuccalisation were added to an Excel spreadsheet to help determine the frequency of occurrence of each token. The question of how the input is determined in GPA is addressed in the following subsection with reference to the foreigner talk theory and the principle of lexicon optimization.

### *3.2 How to Determine the Input in GPA*

There are a number of theories explaining the genesis of pidgin languages, some of which—such as European dialect origin—seem to have already fallen out of favour (see Almoaily 2013). In this article, we follow the view that pidgins emerge as a result of imperfect L2 acquisition. This view contrasts with the substratist influence view, which argues that pidgins emerge as the result of similar features in substrate languages (see Hall 1968 and Taylor 1971, 1977).

According to Winford (2006), foreigner talk serves as the main input based on the formation of the pidgin language. The term 'foreigner talk' was coined by Charles Ferguson in his 1971 article to refer to a simplified variety of language used by native speakers when dealing with non-native speakers or foreigners who have little or no knowledge of the language they encounter. Furthermore, Ferguson (1971) states that 'the initial source of the grammatical structure of a pidgin is the more or less systematic simplification of the lexical source language which occurs in the foreigner talk register of its speakers rather than the grammatical structure of the language(s) of the other users of the pidgin' (p. 288). In the case of GPA, Gulf Arabic (GA) is the lexifier language, which goes hand in hand with Winford's (2006) argument that the language of the dominant group serves as the input to pidgin languages. For further discussion, see Alghamdi (2014), who states that the foreigner talk theory provides a solid explanation of the origin of GPA, and Avram (2017) and Bizri (2018), who argues for the influence of foreigner talk on GPA.

Based on the foreigner talk theory, GPA, as a non-native variety of Arabic, is viewed as an independent system from which the input also stems. Moreover, the principle of Lexicon Optimization in OT

introduced by Prince and Smolensky (1993) serves to determine the correct underlying representation as stated below:

> Lexicon Optimization
> Suppose that several different inputs $I_1$, $I_2$, …, $I_n$, when parsed by a grammar G lead to corresponding outputs $O_1$, $O_2$, …, $O_n$, all of which are realised as the same phonetic form Φ – these inputs are all phonetically equivalent with respect to G. Now one of these outputs must be the most harmonic, by virtue of incurring the least significant violation marks: suppose this optimal one as labelled $O_k$. Then the learner should choose, as the underlying form for Φ, the input $I_k$ (Prince and Smolensky 1993: 192).

Regarding the above principle, according to Yip (1996), Kager (1999) and Kim (2002), the chosen underlying form is the one that maps onto the surface form with the least significant faithfulness violations. For more clarification, the tableau below evaluates the candidates of the inputs /dʒum.ʕa/ 'Friday' and /ʔal.ħiːn/ 'now' in GPA using the following OT constraints:

(1) OT constraints:

a. MAX (McCarthy and Prince 1995)
Assign violation for each segment in the input that is not present in the output.

b. DEP (McCarthy & Prince 1995):
Every segment of $S_2$ has a correspondent in $S_1$ ($S_2$ is 'dependent on' $S_1$).

c. *PHARYNGEAL
Assign violation for each pharyngeal consonant.

d. IDENT (McCarthy and Prince 1995):
No loss of input features in the output.

The faithfulness constraints of DEP, MAX, and IDENT are equally ranked and are being more highly-ranked than *PHARYNGEAL as a markedness constraint to eliminate candidates with epenthesis as well as other candidates with lack of segments due to deletion. Consider the following tableau:

**Tableau V. MAX, DEP, IDENT >> *PHARYNGEAL**

| | MAX | DEP | IDENT | *PHARYNGEAL |
|---|---|---|---|---|
| /dʒum.ʕa/ | | | | |
| a. ☞dʒum.ʕa | | | | * |
| b. dʒu.mu.ʕa | | *! | | |
| c. dʒu.ma | *! | | | |
| d. dʒum.ʔa | | | *! | |
| | | | | |
| /ʔal.ħiːn/ | | | | |
| a. ☞ʔal.ħiːn | | | | * |
| b. ʔa.li.ħiːn | | *! | | |
| c. ʔa.ħiːn | *! | | | |
| d. ʔal.hiːn | | | *! | |

Based on the principle of Lexicon Optimization discussed earlier, candidates labelled (a) in the tableau above are chosen as optimal due to the avoidance of violation of DEP, MAX, and IDENT as faithfulness constraints. Therefore, these candidates can be determined as the correct underlying forms. The next section surveys the results of this study and provides an analysis of the findings.

## 4. Results

This section is devoted to shedding light on how debuccalization occurs in GPA and to investigating whether this process is restricted to a certain environment in the syllable structure. Furthermore, this section addresses the main questions of this research paper regarding the reasons for debuccalization of /ʕ/ to [ʔ] and /ħ/ to [h] and the question of how to account for such a phonological phenomenon using OT as a framework. Before answering the main questions of this study, the first part in this section examines the environments where debuccalization occurs in GPA as follows:

(1) Debuccalization in GPA

| | Input | Output | No. of tokens | Gloss |
|---|---|---|---|---|
| (I) | a. /ʕa.ra.bi/ | [ʔa.ra.bi] | 19 | 'Arabic' |
| | b. /ʕa.ʃa.ra/ | [ʔa.ʃa.ra] | 18 | 'ten' |
| | c. /ʕa.la/ | [ʔa.la] | 7 | 'on' |
| | d. /ba.ʕiːd/ | [ba.ʔiːd] | 5 | 'far away' |

| | | | | |
|---|---|---|---|---|
| | e. /su.ʕu:.di/ | [su.ʔu:.di] | 5 | 'Saudi' |
| | f. /sa:.ʕa/ | [sa:.ʔa] | 6 | 'watch' or 'one hour' |
| | g. /tis.ʕa/ | [tis.ʔa] | 5 | 'nine |
| | h. /dʒum.ʕa/ | [dʒum.ʔa] | 3 | 'Friday' |
| | i. /mu.sa:.ʕa.da/ | [mu.sa:.ʔa.da] | 2 | 'help' |
| (II) | a. /ʔal.ħi:n/ | [ʔal.hi:n] | 8 | 'now' |
| | b. /wa:.ħid/ | [wa:.hid] | 2 | 'one' |
| | c. /fusˁ.ħa/ | [fus.ha] | 2 | 'Standard Arabic' |
| | d. /ʔit.ti.ħa:d/ | [ʔit.ti.ha:d] | 1 | 'union' |
| | e. /ħa.ra:.mi/ | [ha.ra:.mi] | 1 | 'thief' |
| | f. /ħu.ku:.ma/ | [hu.ku:.ma] | 1 | 'government' |
| | g. /ħadʒ:/ | [hadʒ:] | 1 | 'pilgrimage' |

## 5. Discussion

### *5.1 Feature Geometric Analysis*

As shown in the examples above, the debuccalization of a voiced pharyngeal fricative /ʕ/ to [ʔ] and voiceless pharyngeal fricative /ħ/ to [h] occurs in the onset position. For instance, the voiced pharyngeal fricative /ʕ/ in (I) undergoes debuccalization to a glottal stop.[3] The voiceless fricative /ħ/ is debuccalized to [h] in (II). The debuccalized consonants in onset position are immune to deletion due to the Onset Principle introduced by Itô (1989); hence, this principle militates against onsetless syllables.

The Pharyngeal Place node in the feature representations of pharyngeal fricatives has a dependent Retracted Tongue Root [RTR] distinguishing them from laryngeals (glottals) in Arabic, according to Paradis and LaCharité (2001), as shown in the representations below:[4]

[3] Batais (2013) confirms the similarity between a voice pharyngeal fricative and a glottal stop through the phonetic substitution of /ʔ/ for /ʕ/ in Arabic dialects spoken in Yemen and the southern part of Saudi Arabia. Likewise, Watson (2002) infers that merger of /ʕ/ with [ʔ] and /ħ/ with [h] may be attributed to a process of debuccalization that also occurs in the Arabic dialects spoken in Nigeria and Chad.

[4] Paradis and LaCharité (2001) adopt Rose's (1996) feature geometry model to distinguish among gutturals. Hence, laryngeals are different from other gutturals based on the presence of [RTR] under the Pharyngeal Place node which is absent in laryngeals (Rose 1996; Paradis and LaCharité 2001).

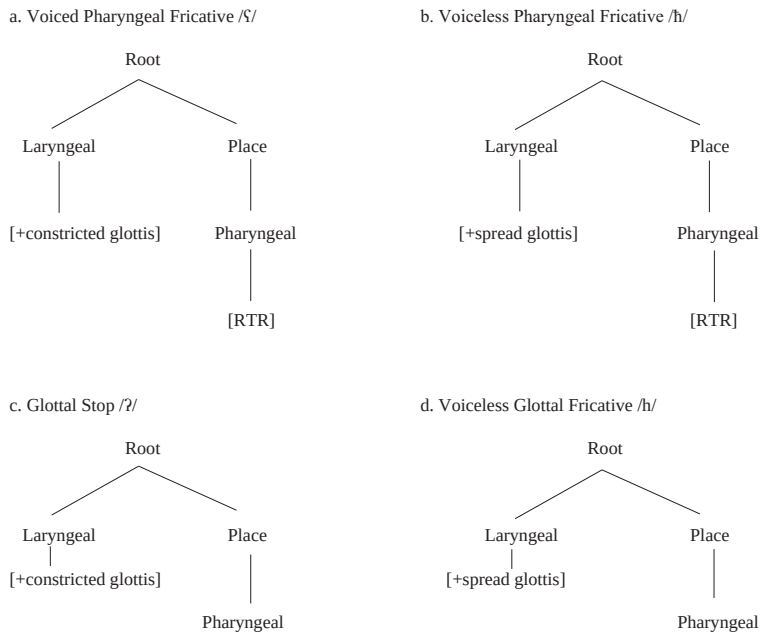



Figure 1. Paradis and LaCharité's (2001: 267)
Representations of Pharyngeal Fricatives and Laryngeals

With regard to the representations above, the debuccalization process stems from the non-treatment of [RTR]: the debuccalization of pharyngeal fricatives in GPA is simply indicated by circling [RTR], i.e. [RTR] inertness. Consider the following representations of the debuccalization of pharyngeal fricatives in GPA:

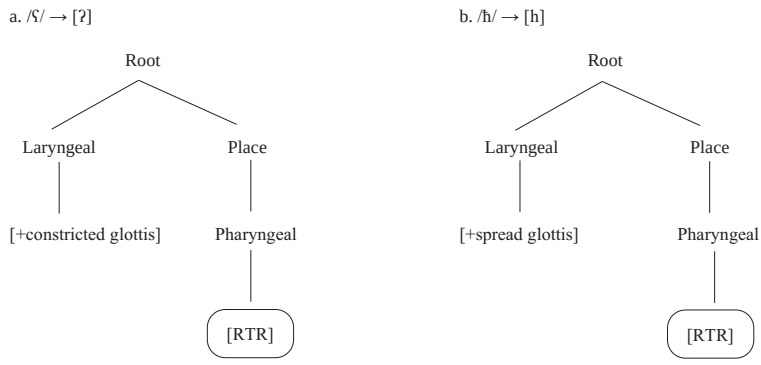



Figure 2. Debuccalization of Pharyngeal Fricatives in GPA
(Paradis and LaCharité 2001: 285)

The debuccalization of pharyngeal fricatives to glottals in the onset position rather than deletion reflects a restriction on syllable structure in Arabic, either standard or non-standard.[5] Scholars in Arabic phonology including Abboud (1979), Abdul-Karim (1980), Al-Mozainy (1981, 1982), Abu-Salim (1982), Abu-Mansour (1987), Abu-Haidar (1991), Al-Mohanna (1994, 1998), Bamakhramah (2009) and more agree that single onsets in Modern Standard Arabic and Modern Arabic dialects are obligatory, compared to codas, since onsetless syllables are not permitted. Note that GPA as well as other Arabic dialects conforms to the Onset Principle (Itô, 1989).

On the other hand, the debuccalization of pharyngeal fricatives in the coda position in GPA is prior to deletion (gradualness) since glottal consonants in the word-final position are weak allophones, i.e. placeless, compared to word-initial position (Garellek 2013). This behaviour is attested by Kaneko and Kawahara (2002) and McCarthy (2007) in Kagoshima Japanese coping with the deletion of the oral stop /t/ in the coda position in /pat.ka/ achieved by loss of place through debuccalization and then deletion, i.e. /pat.ka/→ /paʔ.ka/→ [pa.ka]. The following examples show how the pharyngeal fricatives are subject to deletion in the word-final position through debuccalization:

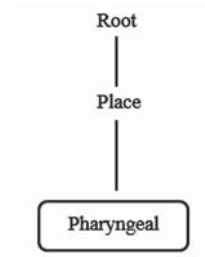
(2) Debuccalization plus deletion of final pharyngeal fricatives in GPA

| | | | | | **No. of tokens** | **Gloss** |
|---|---|---|---|---|---|---|
| /ʔir.taːħ/ | → | /ʔir.taːh/ | → | [ʔir.taː] | 1 | ‘rest’ |
| /ruːħ/ | → | /ruːh/ | → | [ruː] | 4 | ‘go’ |
| /ʔar.baʕ/ | → | /ʔar.baʔ/ | → | [ʔar.ba] | 8 | ‘four’ |

The examples above show a serial relation since the outputs are the results of the two-derivational step; hence, the first step is the pharyngeal fricatives in coda position are prone to debuccalization followed by the deletion of the debuccalized consonant, as the second step. The deletion of debuccalized consonants in coda is achieved by circling the Pharyngeal place node, as seen in the following representation:

[5] Garellek (2013) states that a glottal stop is found word-initially as an obligatory allophone in Arabic.

(3)



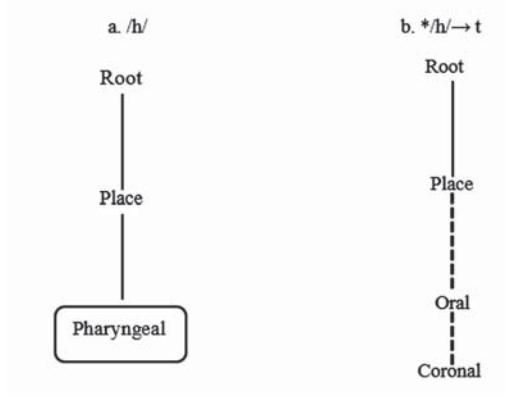

Based on the representation above, the Pharyngeal place node is immune to deletion to block the application of the *Default Coronal Articulator* as the redundancy rule (Paradis and Prunet 1991), as shown below:

(4) *The Default Coronal Articulator* (Paradis and Prunet 1991: 6):

[Ø Place] → Coronal

The same behaviour, according to Paradis and LaCharité (2001), is attested in French, Italian, and Portuguese where the Pharyngeal Place node is not prone to deletion to prevent the implementation of the redundancy rule in (4), as shown in the representations below:[6,7]

(5)




[6] The treatment of /h/ in English loanwords in French, Italian, and Portuguese (Paradis and LaCharité 2001: 264, 276).

| English loanwords | French | Italian | Portuguese |
|---|---|---|---|
| Hamburger [hæmbəɹgəɾ] | [_æmbəʁgəʁ]/ *[tæmbəʁgəʁ] | [_amburgɛr]/ *[tamburgɛr] | [_ãmburgɛr]/ *[tɑ̃mburgɛr] |
| Hobby [hɑbi] | [_ɔbi]/*[tɔbi] | [_ɔbi]/ *[tɔbi] | [_ɔbi]/ *[tɔbi] |

[7] The representations are cited from Paradis and LaCharité (2001: 289).

The representation (5a) shows that the Default Coronal Articulator, i.e. the redundancy rule, is blocked since the Pharyngeal Place node is not deleted while the deletion of the same place node in the representation (5b) facilitates the implementation of the Default Coronal Articulator, resulting in a coronal articulator. The next subsection provides an OT analysis of the most frequent tokens in the data.

### *5.2 OT Analysis*

Debuccalization of pharyngeal fricatives to glottals in onset position is accounted for using Parallelism, as an OT model, since no serial relation is shown in this case particularly. Before stepping into any further analysis, it is crucial to provide our readers with the list of OT constraints used to analyze debuccalization of pharyngeal fricatives plus how constraints are ranked. Let us consider the following OT constraints:

(6) OT constraints

a. ONSET (ONS) (Prince and Smolensky 1993):
Syllables must have onsets.

b. MAX (McCarthy and Prince 1995)
Assign a violation for each segment in the input that is not present in the output.

c. *COMPLEX$_{ONS}$ (Prince and Smolensky 1993):
A syllable must not have more than one onset segment.

d. CODA-COND (Goldsmith 1990; Itô 1989):
Syllable-final position does not license place of articulation specification.[8]

e. DEP (McCarthy & Prince 1995):
Every segment of $S_2$ has a correspondent in $S_1$ ($S_2$ is 'dependent on' $S_1$).

f. *PHARYNGEAL
Assign violation for each pharyngeal consonant.

[8] In the recent works of Ito and Mester (1997, 2003) and Smolensky (1995), this constraint has been formalized as the local junction of two or more markedness constraints:
CODACOND
[NOCODA & *PLACE]$_{seg}$

g. *ħ→ʔ
Assign a violation for the debuccalization of a voiceless pharyngeal fricative to a glottal stop.

h. *ʕ→h
Assign a violation for the debuccalization of a voiced pharyngeal fricative to a voiceless glottal fricative.

i. IDENT (McCarthy and Prince 1995):
No loss of input features in the output.

The following set of ranking constraints is used in the following tableaux to evaluate the candidates of the inputs /ʕa.ra.bi/ 'Arabic' and /ʔal.ħiːn/ 'now':

(7)

ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>CODA-COND>>
*ħ→ʔ,*ʕ→h>>DEP>>MAX>> IDENT

Based on the set of ranking constraints above, ONS is the most highly ranked constraint, it acts to eliminate candidates with vowel-initial syllables since the onset as a syllable constituent is as obligatory as the nucleus in Arabic. *COMPLEX$_{ONS}$ outranks the rest of the constraints; it functions against complex onsets that might be found in some candidates. *PHARYNGEAL is the third most highly ranked constraint; it functions against the existence of any pharyngeal consonant in any candidate. CODA-COND which ranks as a high constraint after *PHARYNGEAL, is against the specification of place of articulation in the syllable-final position. *ħ→ʔ and *ʕ→h constraints outrank DEP, MAX, and IDENT to eliminate candidates with the debuccalization of a voiced pharyngeal fricative to a voiceless glottal fricative as well as the debuccalization of a voiceless pharyngeal fricative to a glottal stop. DEP is ranked higher than MAX to eliminate candidates with epenthesis whether vowel or consonant epenthesis. Furthermore, this constraint, DEP, militates against prosthesis and contiguity. MAX, as another faithfulness constraint which outranks IDENT functions against any sort of deletion that might be shown in some candidates through the lack of some constituents, either consonants, vowels, or both. IDENT is the lowest-ranked constraint; it acts to ensure that candidates are fully faithful to the input. Consider the evaluation of

candidates of the inputs /ʕa.ra.bi/ 'Arabic' and /ʔal.ħi:n/ 'now' in the following tableaux:

**Tableau VI. Evaluating the Candidates of the Input /ʕa.ra.bi/:**
ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>CODA-COND>>*ħ→ʔ,*ʕ→h>>
DEP>>MAX>> IDENT

| /ʕa.ra.bi/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|
| a. ʕa.ra.bi | | | *! | | | | | | |
| b. ☞ʔa.ra.bi | | | | | | | | | * |
| c. ʔra.bi | | *! | | | | | | * | * |
| d. ʔar.bi | | | | *! | | | | * | * |
| e. a.ra.bi | *! | | | | | | | * | * |
| f. ha.ra.bi | | | | | | *! | | | * |

In the above tableau, candidate (b) is the optimal output that avoids the violation of most constraints. Candidate (a), which is the output most faithful to the input, fails to be optimal since it is immune to debuccalization of the onset, which results in the violation of *PHARYNGEAL. However, the violation of this same constraint, i.e. *PHARYNGEAL, is avoided by candidate (e) through the deletion of a voiced pharyngeal fricative in onset position, resulting in an onsetless syllable which violates ONS. The same repair strategy, i.e. deletion, is utilized by candidate (c) which targets a vowel in the antepenultimate syllable which yields a complex onset. The complex onset in candidate (c) incurs the violation of COMPLEX$_{ONS}$. Deletion targets a vowel in the penultimate syllable in candidate (d), leading to the violation of CODA-COND. Candidate (f), which is the most challenging output, fails to be optimal due to the violation of *ʕ→h. The candidates of the input /ʔal.ħi:n/ 'now' are subject to evaluation in the next tableau:

**Tableau VII. Evaluating the Candidates of the Input /ʔal.ħiːn/**
ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>CODA-COND>>*ħ→ʔ,*ʕ→h>>
DEP>>MAX>> IDENT

| /ʔal.ħiːn / | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|
| a. ʔal.ħiːn | | | *! | | | | | | |
| b. ʔal.hiːn | | | | **! | | | | | * |
| c. ʔa.lhiːn | | *! | | | | | | * | * |
| d. ☹ʔa.hiːn | | | | * | | | | * | * |
| e. ʔal.iːn | *! | | | * | | | | * | * |
| f. ʔal.ʔiːn | | | | **! | * | | | | * |

Candidate (c), as the wrong output, has been judged optimal since it avoids the violation of ONS, *COMPLEX$_{ONS}$, *PHARYNGEAL and CODA-COND constraints, compared to the rest of the candidates. For instance, candidate (e) permits the deletion of a voiceless pharyngeal fricative to avoid the violation of *PHARYNGEAL which, on the other hand, results in an onsetless syllable against the ONS constraint. A complex onset in candidate (c) incurs the violation of *COMPLEX$_{ONS}$. Candidate (b), as the desired output, fails to be optimal due to the violation of CODA-COND twice. The same goes with candidate (f), which also violates *ħ→ʔ due to the debuccalization of a voiceless pharyngeal fricative to a glottal stop. To determine candidate (b) as optimal, there should be a constraint which helps to eliminate the wrong output (d) whilst being satisfied by the desired output. Consider the following OT constraint:

(8) IDENT$_{lateral}$ (Neuschrank et al., 2015):[9]

Assign violation for the change of values typical of laterals.

The above constraint outranks CODA-COND in the following set of ranking constraints in order to determine candidate (b) as optimal.

[9] Neuschrank et al. (2015) state that the same constraint is violated by structures which are suitable in the presence of lateral liquids in coda and in onset.

ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>IDENT$_{lateral}$>>CODA-COND>>
*ħ→ʔ,*ʕ→h>>DEP>>MAX>> IDENT

The set of ranking constraints above is used to evaluate the candidates of the input /ʔal.ħiːn/in the following tableau:

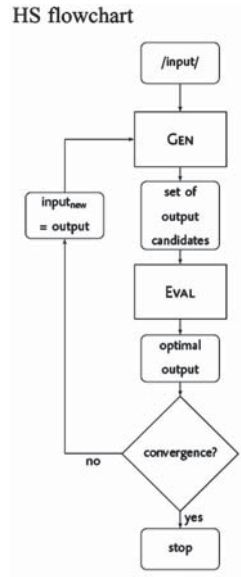
**Tableau VIII. Evaluating the Candidates of the Input /ʔal.ħiːn/**
ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>IDENT$_{lateral}$>>CODA-COND>>
*ħ→ʔ,*ʕ→h>>DEP>>MAX>> IDENT

| /ʔal.ħiːn / | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | IDENT$_{lateral}$ | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔal.ħiːn | | | *! | | | | | | | |
| b. ☞ʔal.hiːn | | | | | ** | | | | | * |
| c. ʔa.lhiːn | | *! | | * | | | | | * | * |
| d. ʔa.hiːn | | | | *! | * | | | | * | * |
| e. ʔal.iːn | *! | | | | * | | | | * | * |
| f. ʔal.ʔiːn | | | | | ** | *! | | | | * |

The IDENT$_{lateral}$ constraint successfully identifies candidate (b), i.e. the desired output, as optimal while candidate (d) fails to be optimal due to the violation of the same constraint. Although candidate (f) violates CODA-COND twice as does candidate (b), the debuccalization of a voiceless pharyngeal fricative to a glottal stop yields a fatal violation of *ʕ→h.

To reiterate, the debuccalization of pharyngeal fricatives to glottals in coda position is a part of a serial relation that can be accounted for using Harmonic Serialism, as an OT model, rather than parallelism. McCarthy (2016) states that Harmonic Serialism is a derivational variant of Classic OT where the input makes multiple passes through the same constraint ranking until the derivation converges, as shown in the following Harmonic Serialism flowchart:

(10) Harmonic Serialism flowchart (McCarthy 2016: 50):




Consider the evaluation of the output of /ʔar.baʕ/ 'four' in the following tableau:

**Tableau IX. Evaluating the Candidates of the Input /ʔar.baʕ/**
ONS>>*COMPLEX$_{ONS}$>>*PHARYNGEAL>>IDENT$_{lateral}$>>CODA-COND>> *ħ→ʔ,*ʕ→h>>DEP >>MAX>> IDENT

| /ʔar.baʕ/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | IDENT$_{lateral}$ | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔar.baʕ | | | *! | | ** | | | | | |
| b. ☞ʔar.ba | | | | | * | | | | | * |
| c. ʔa.rbaʕ | | *! | * | | * | | | | | * |
| d. ar.ba | *! | | | | * | | | | ** | * |
| e. ʔar.baʔ | | | | | **! | | | | | * |

Although the tableau above identifies candidate (b) as an optimal candidate, it does not show how debuccalization is a part of a serial relation which leads to the deletion of the debuccalized consonant at the end. Therefore, this serial relation is accounted for using Harmonic Serialism in the following tableaux:

**Tableau X.**

Step 1: Debuccalization of Pharyngeal Fricatives in Coda Position: /ʔar.baʕ/→ /ʔar.baʔ/

| /ʔar.baʕ/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | IDENT$_{lateral}$ | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔar.baʕ | | | *! | | ** | | | | | |
| b. ☞ʔar.baʔ | | | | | ** | | | | | * |
| c. ʔa.rbaʕ | | *! | * | | * | | | | | * |
| d. ar.ba | *! | | | | * | | | | ** | * |
| e. ʔar.bah | | | | | ** | | *! | | | * |

In the tableau above, candidate (d) violates ONS due to lack of an onset. The complex onset in candidate (c) incurs the violation of *COMPLEX$_{ONS}$. This is why candidate (c) is also eliminated. The pharyngeal consonant [ʕ] in candidate (a) triggers the violation of *PHARYNGEAL. Candidate (e) fails to be optimal due to the violation of *ʕ→h constraint. Candidate (b) which is distinguished as optimal serves as the input in the following tableau, as the final step.

**Tableau XI.**

Step 2: The Deletion of Debuccalized Consonant in Coda Position: /ʔar.baʔ/→ [ʔar.ba]

| /ʔar.baʔ/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | IDENT$_{lateral}$ | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔar.baʔ | | | | | **! | | | | | |
| b. ☞ʔar.ba | | | | | * | | | | | * |
| c. ʔa.rbaʔ | | *! | | | * | | | | | * |
| d. ar.baʔ | *! | | | | * | | | | * | * |

Candidate (d) fails to be optimal due to the violation of ONS. The complex onset in candidate (c) leads to the violation of *COMPLEX-$_{ONS}$. Candidate (d), as the most challenging output, is eliminated due to the violation of CODA-COND twice, leaving candidate (b) to be chosen as optimal. Harmonic serialism is extended to evaluate the

candidates of the input /ʔir.ta:ħ/ 'rest' using the same set of OT constraints, as shown in the following tableaux:

**Tableau XII.**

Step 1: Debuccalization of Pharyngeal Fricatives in Coda Position: /ʔir.ta:ħ/→ /ʔir.ta:h/

| /ʔir.ta:ħ/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | IDENT$_{lateral}$ | CODA-COND | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔir.ta:ħ | | | *! | | ** | | | | | |
| b. ☞ʔir.ta:h | | | | | ** | | | | | * |
| c. ʔi.rta:ħ | | *! | * | | * | | | | | * |
| d. ir.ta:h | *! | | | | * | | | | * | * |
| e. ʔir.ta:ʔ | | | | | ** | *! | | | | * |

Based on the tableau above, the lack of an onset that results from the deletion of a glottal stop in candidate (d) incurs the violation of ONS. *COMPLEX$_{ONS}$ is subject to violation by candidate (c) due to a complex onset. The pharyngeal consonant [ħ] in candidate (a) yields the violation of *PHARYNGEAL. The debuccalization of the same pharyngeal fricative to a glottal stop in candidate (e) causes the violation of *ħ→ʔ. As a result, candidate (b) is chosen as optimal and is employed as the input of the final step in the next tableau:

**Tableau XIII.**

Step 2: The Deletion of Debuccalized Consonant in Coda Position: /ʔir.ta:h/→ [ʔir.ta:]

| /ʔir.ta:h/ | ONS | *COMPLEX$_{ONS}$ | *PHARYNGEAL | CODA-COND | SSP | *ħ→ʔ | *ʕ→h | DEP | MAX | IDENT |
|---|---|---|---|---|---|---|---|---|---|---|
| a. ʔir.ta:h | | | | **! | | | | | | |
| b. ☞ʔir.ta: | | | | * | | | | | * | * |
| c. ʔi.rta:h | | *! | * | * | | | | | | * |
| d. ir.ta: | *! | | | * | | | | | ** | * |

The tableau above determines candidate (b) as optimal where the coverage of derivation is accomplished.

In summary, the parallel relation which is formed by the debuccalization of pharyngeal fricatives in the onset position in rather a process of deletion in GPA is aligned with the Onset Principle (Itô, 1989); hence, this relation is successfully accounted for using the parallel OT. However, the pharyngeal fricatives in GPA are subject to deletion. This is achieved by two steps: first, both consonants are debuccalized to become weaker allophones in the coda position, unlike allophonic glottal consonants in the onset position. Second, these weaker allophones are liable to deletion. This the serial relation is successfully accounted for using Harmonic Serialism rather than parallel OT.

## 5. Conclusion

This paper has addressed how pharyngeal fricatives are debuccalized in the onset position without any further step of consonant deletion with reference to the Onset Principle (Itô, 1989); hence, pharyngeal fricatives are debuccalized to glottal consonants rather than being subject to deletion due to the obligatoriness of the onset in Arabic. This process is successfully accounted for using parallel OT. On the other hand, debuccalization is considered the first stage of the deletion of pharyngeal fricatives in the coda position in GPA, and, hence, the debuccalized consonants in this position become weaker allophones to undergo deletion as the final step. Harmonic Serialism is revealed in this paper as a competent OT model for addressing the serial relation that includes the debuccalization of pharyngeal fricatives in the coda position as the first step prior to consonant deletion. These findings open the door to accounting for the treatment of other gutturals such as emphatics, pharyngeals, and uvulars in Gulf Arabic by GPA speakers using a feature geometric approach or OT in future research. In addition, these findings grasp readers' attention to phonetic differences between lexifier languages and pidginized varieties using the framework of OT. In turn, this would broaden our understanding of how pidgin languages emerge. The acoustic account for the debuccalization of pharyngeal fricatives in GPA can be a further development of research for future work, building on the current findings.

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