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Affrication in Najdi Arabic: Application and Resistance

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Abstract

This paper examines affrication process in Najdi Arabic, Qassimi variety in particular, and proposes a rule of affrication that regulates this phonological process. It discusses the environments where the affricate [ts] is produced in this variety and explores the applications of the proposed rule. It also proposes that [k] and [ts] in NA are not only cases of allophones, but they are actually different phonemes; therefore, some cases of [ts] are not simply cases of affrication of [k], but in fact a phonemic representation of /ts/. The paper also examines various exceptions where affrication is expected but not active in NA and adopts a form of Obligatory Contour Principle (OCP) to provide a systematic explanation where resistance of the affrication rule arises.

Keywords: affricates, OCP, place assimilation, affrication, Arabic varieties

الملخص

يهدف هذا البحث إلى دراسة ظاهرة التعطيش الصوتي المرتبطة بالصوت الممثل صوتيا ب [k] و الصوت المعطش منه [ts] في اللهجة النجدية، واللهجة القصيمية بشكل أخص، ويقدم قاعدة لهذا التطبيق في اللهجة، ثم يستعرض التقطيع الصوتي والمكاني المطلوب لتطبيق هذه القاعدة وآلية عملها لدى متحدثي اللهجة، كما ويقترح الباحث أن التمثيلين الصوتيين ليسا فقط تمثيلان فرعيان لصوت /k/ بل أن الصوت المعطش منه هو صوت مستقل يمثل صوتيا ب /ts/ وذلك بعد استعراض عدد من الأدلة المعتبرة في تقسيم الأصوات المستقلة والفرعية، ويستعرض البحث كذلك أوجها من إغفال تطبيق القاعدة ويفسرها بالاستعانة بمبدأ الإجبار النغمي حيث يظهر من خلاله أن حالات عدم التعطيش منضبطة وفق هذا المبدأ الصوتي، مما يشرح الشواهد الصوتية ذات العلاقة سواء في تطبيق القاعدة أو إغفالها وفق ما تبناه البحث من قواعد وتفسيرات صوتية لها.

الكلمات المفتاحية: الإدغام الصوتي، مبدأ الإجبار النغمي، الأصوات الفرعية والرئيسة، اللهجات السعودية

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1. Introduction

The affrication process is cross-linguistically found, in related and unrelated languages such as Bantu, Polish, Russian, Korean, Japanese, and Danish, among many other languages (Clemetns,1999; Guion, 1998). It has also received a great attention in both phonology and phonetics as affricates represent an interesting case of mismatch between phonology and phonetics where a stop and a fricative are combined into a single phoneme. The case of affrication that will be closely investigated here is the affrication of the velar /k/ to [ts] in Najdi Arabic (NA, henceforth).

This paper investigates the affrication in Najdi Arabic (NA, henceforth), a region in central Saudi Arabia. Particularly, the paper will investigate this process in Qassimi Arabic (QA, henceforth), a sub-variety of Najdi Arabic. The choice of a particular sub-variety is called for to attain accurate phonological description and analysis due to the size of Najd region and its vast sub-varieties. The change from the voiceless dorsal stop [k] to the voiceless velar affricate [ts] will be the focus of this work, representing one case of affrication in this variety; a highly productive process in NA in general and in QA in particular.[1]The paper examines the distribution of the affricate [ts] in NA and presents a description of its various environments. An affrication rule will then be proposed and argued to account for a vast amount of affrication cases of [ts] in NA. While the rule will be shown to cover affrication data, some exceptions emerge. Cross-linguistic generalizations and findings will also be examined to explain these exceptions. The paper will conclude by proposing a working hypothesis that provides a systematic explanation for the apparent exceptions to the affrication rule in NA.

2. Background

Affrication process is always associated with vowels (Keating and Lahiri, 1993; Rubach, 1994; Clements, 1999, among many others). Affrication is cross-linguistically known to be particularly applied before front vowels (see Rubach, 1994; Clements, 1999; Mustafawi, 2006, 2011, among many others). It has been assumed that Gulf Arabic, including NA, affrication occurs when the /k/ is adjacent to /i(:)/ and /a(:)/ (Johnstone, 1967, Ingham 1994, Alshammri, 2015). In this respect, the vowel inventory in NA consists of six vowels: the high front vowel /i/ and its long counterpart /i:/; the central /a/ and its long counterpart /a:/; the high back vowel /u/ and its long counterpart /u:/. However, the status of /a/ is controversial. Some researchers consider it fronted in some environments. Ingham (1994:15) states that "/a/ is also generally central in quality, but does show fronting to a sort of e sound in front environments". Others, however, consider /a/ to be central or even back in some environments (Johnstone, 1967). In this paper, I follow Ingham in considering /a/ and /a:/ to be central.

Further, the affrication rule proposed in various Arabic varieties (Mustafawi, 2006; Youssef, 2005; Al-Mahmoud, 2020, among others) has been observed to be occasionally inactive even when the conditioning environments are met. In this respect, Johnstone (1967) notes that the affrication rule in Arabic varieties is not always applied. However, Mustafawi (2006) has shown that many cases of the non-application of the affrication rule can be accounted for. This can be attributed to either restrictions stemming from a phonological constraint or other derivational factors. In addition, it will be shown that the affrication rule in NA is generally optional due to the free variation of [ts] with /k/. This optionality will also be shown to underlie some exceptions that fall beyond the proposed treatment in this paper.

Following the cross-linguistically observed environment for affrication, I propose, following proposals for other Arabic varieties (e.g., Mustfawi, 2006; Youssef, 2014; Al-Mahmoud, 2020) that NA affrication applies when the voiceless velar /k/ is adjacent to the high front vowel /i/ and its long counterpart /i:/. I further propose that the affrication rule in NA requires /k/ in the onset position. The following statement in (1) represents the proposed affrication rule.

(1) *NA Affrication Rule:*
Affrication applies when:
(i) /k/ is adjacent to a high front vowel
(ii) /k/ is in the onset position

The phonemic status of affricate sounds in Arabic is debatable. Generally, it is assumed that affricates like [ts] or [tʃ] are allophones of /k/ (Johnstone, 1967; Mustafawi, 2006; Al-Mahmoud, 2020). For the contemporary varieties of Arabic, it has been assumed that diachronic affrication has occurred with the /k/ sound, giving rise to a realization of [ts] when adjacent to front vowels (see Youssef, 2014). However, I argue that [ts] has two statuses in NA at least. First, it is correct that it is an allophone of /k/. But this is only stem-internally. Second, it is also a separate phoneme /ts/ that contrasts with /k/. The latter case is morphologically realized, and I argue that this is the case for Arabic varieties that have an affricate [ts] of /k/, as well. The following data in (2) illustrate:

(2) a. a-kallim-k
I-call-you (M)
'I am calling you'

b. a – kallim-ts
I-call-you (f)
'I am calling you '

The invariant phoneme for 2nd person feminine suffix is [ts] regardless of the preceding vowel and of all environments. This is the case in Iraqi Arabic (Youssef, 2014), Kuwaiti Arabic and Qatari Arabic (Mustafawi,2006) and other varieties where affrication of the velar /k/ occurs.
Furthermore, various minimal pair cases exist for [ts] and [k] in NAas the data in (3) show.

(3)	a. ka:n[2]	'was'	~~b.~~ tsa:n	'if, then'
	b. yamlik	'own'	c. yamlits	'sign the marriage contract'
	d. ħar.ri:k	'move'	e. ħar.ri:ts	'stir'

The affricate counterpart was included above because it is well known that affricates can correctly be substituted with [k] stem-internally, but not the other way around (see Yousef, 2014; Mustafawi, 2006). It is obvious that in addition to the invariant form of [ts] in the feminine suffix, NA also has minimal pairs with /ts/ and /k/. The phonemic status of /ts/ in addition to its allophonic status of [ts] to the phoneme /k/ is thus very crucial in NA. That amounts to proposing that [ts] has the underlying form /ts/. This fact is important for the affrication in NA as many cases can be accounted for by following this line of reasoning. That is, we will see that some cases of [ts] in NA are not due to the affrication of /k/, but rather they are phonemically /ts/ as well. More discussion on this will be presented.

The paper is organized as follows. First, I discuss previous studies on affrication cross-linguistically and in Arabic varieties. I then present and discuss the data, examining the distribution of [k] and [ts] in the various possible word positions to examine the validity of the conditioning environment suggested in (1), followed by a discussion of the morphological suffix /-k/ and /-ts/. Next, I show the counterexamples to the conditioning environment and employ the analysis of the OCP. I also introduce a similarity system that should be integrated with the OCP to account for the non-application of the affrication rule in NA. The analysis of the affrication rule is subsequently presented. I end with a conclusion.

3. Previous Studies

The phenomenon of affrication has been discussed cross-linguistically, both in the descriptive and theoretical terms (Sagey, 1986; Lombardi,1990; Clements, 1999; Rubach, 1994; Pöchtrager, 2021; among many others). Further, studies on affrication in Arabic varieties (for example, Johnstone, 1967, 1978; Mustafawi, 2006, 2007, 2010; Al-Mahmoud, 2020; Mahzari, 2023) also examined this phenomenon and explored the phonological environments and proposals to capture its behaviour. Below, I will elaborate.

Cross-linguistically, affrication is a widely observed assimilation process in unrelated languages such as Korean, Brazilian Portugese, Polish, Arabic, and Turkish, among many others (see Clements, 1999; Rubach, 1994; Pöchtrager, 2021, among others). The nature of affricates, on the other hand, is also debatable. A long-standing proposal at the phonological level is that they are complex segments consisting of two sounds, a stop followed by a fricative (see Clements and Keyser 1983, Sagey 1986, Steriade 1993). A later proposal is that affricates should be considered single stops (see Clements 1999, Rubach, 1994).

Affrication in Arabic varieties has also been examined both descriptively and analytically. Johnstone (1967) surveys various Arabic varieties, mostly eastern Gulf varieties, including Abu Dhabi, Bahraini, Kuwaiti, and Qatari Arabic, among others. The general conclusion of his survey is that affrication is triggered by a stop adjacent to front vowels and that this rule is optional in these varieties.

Johnstone (1978) provides an analysis of affrication in the aforementioned varieties. He states that affrication is mainly triggered by front vowels and is less productive with back vowels. This proposal, however, has various issues, both in the generalization of non-homogeneous varieties (i.e., sub-varieties differ significantly in this matter) and in the scope of the proposed analysis (see Mustafawi 2006, 2007).

Mustafawi (2006, 2007) examines affrication in Qatari Arabic. She proposes an environment for affrication tied to the adjacency of /k/ or /g/ to high front vowels. However, various cases of non-application of the affrication rule arise. She proposes that these exceptions are not unexplained; rather, they follow the phonological constraints of the Obligatory Contour Principle (OCP), which restricts cases where very similar sounds are adjacent. Another case she successfully elaborates on is the optionality of affrication. She argues that many cases of optionality (i.e., when both the affricate and stop versions are available in a variety) are instances of doublets (i.e., where the affricate corresponds to an affricate phoneme and the stop to a stop phoneme). This assumption regarding the phonemic status of affricates in QA is important for the current paper. I will, following Musafawi (2006), propose that affricates in NA are also phonemes, not merely

allophones triggered in specific environments, as previously assumed by Al-Mahmoud (2020) and Mahzari (2023), among others.

Al-Mahmoud (2020) examines affrication in two Saudi Arabic varieties, particularly Najdi Arabic (NA) and Hijazi Arabic (HA). He also tracks the two varieties' behavior regarding affrication in comparison with both Classical Arabic (CA) and Modern Standard Arabic (MSA). The paper finds that NA, particularly the Riyadh variety, exhibits affrication of /k/ and /g/ to [ts] and [dz], respectively, when the conditioning environment is met. On the other hand, affrication of velar sounds does not occur in HA. Al-Mahmoud states, similar to Johnstone (1967) and others, that the conditioning environment for velar affrication in NA is adjacency to high front vowels. He attempts to analyze the discrepancy in the behavior of the two varieties based on OT constraints. While the study provides various insights into affrication in NA, the current work differs significantly. First, Al-Mahmoud examines the Riyadh variety of NA, which significantly differs from QA in terms of velar affrication. In addition, while I agree with his classification of [ts] as an allophone ana d free variant of [k], I further propose that [ts] is also a separate phoneme in the NA inventory. This will be demonstrated empirically based on various cases of minimal pairs. These findings indicate intra-variety differences, which warrant caution in discussing affrication in NA, as alluded to above.

Similar to Al-Mahmoud (2020), Mahzari (2023) examines affrication in the Riyadh variety of NA. He proposes that the conditioning environment for the affrication of /k/ to [ts] is tied to adjacency to /i/ and /a/, similar to what is found cross-linguistically. The affrication process is triggered by the feature [+coronal], which applies to both [ts] and the triggering vowels. He also provides acoustic analyses of the adjacent vowels of affricated sounds, focusing on duration and frequency in these contexts. He finds that /i/ exhibits a lower place of articulation when occurring with the affricated sound [ts]. The duration of /i/ does not significantly differ between [k] and [ts]. However, the frequency of F1 and F2 is notably lower with the affricate [ts]. He thus asserts that /i/ is more front when adjacent to the non-affricated consonant /k/. Similar to Al-Mahmoud (2020), the current study examines the QA variety of NA, emphasizing major empirical differences in affrication. Furthermore, the phonemic status of [ts] remains unaddressed in Mahzari (2023), as in Al-Mahmoud (2020), suggesting an even broader divergence in the theoretical treatment of affrication.

4. Distribution of [k] and [ts]

To understand the nature of affrication in NA, we need to consider the positions in which [k] and [ts] are found. In NA, the two sounds are produced in different word positions, i.e., initially, medially, and finally. I will investigate the proposed conditioning environment in (1) starting with the initial position, then the medial position, followed by the final position. Clusters and cases of geminates that consists of [k] will also be examined.

4.1. Initial [k] and [ts]

I find that /k/ is realized as [ts] when adjacent to the front vowels /i/ and /a/ and their long counterparts /i:/ and /a:/. On the other hand, the affrication of /k/ is blocked when adjacent to the back vowels /u/ and /u:/. The data in (4) show that when the phonemic conditioning for affrication is met, the realization of [ts] obtains. However, as stated above, [k] is always able to substitute [ts] and not the other way around. In the data below, both pronunciations are correct.

(4)	a. kiljih	tsiljih	‘kidney’
	b. kibi:r	tsibi:r	‘big’
	c. kiθi:r	tsiθi:r	‘many’
	d. kiðb	tsiðb	‘lying’
	e. kiða	tsiða	‘like that’
	f. kifan	tsifan	‘shroud’

The examples in (4) show that when /k/ is adjacent to the high front vowel /i/, it is affricated. It should be noticed, however, that affrication is almost always optional in NA. Both pronunciations for the words above are acceptable. In other words, the realizations of /k/ can be either [k] as in the first column or [ts] as in the second column. In many cases, they are in free variation. It is rarely found in NA that words produced with [ts] cannot be pronounced as [k] as well (except 2nd feminine morpheme where social and linguistic properties arise). However, we will show that caution should be observed and that some cases call for a fine-grained description and analysis.

4.2. Initial [k] and [ts] adjacent to [a]

I find words where the alternations between [k] and [ts] for /k/ does not occur not in the proposed environment for affrication in NA. In particular, /k/ seems to undergo the affrication rule when it is adjacent to the central vowel /a/. This pattern is similar to the data with the high front vowel /i/. The data are exemplified in (5).

(5)	a. kalb	tsalb	‘dog’
	b. kabd	tsabd	‘liver’
	c. kabrih	tsabrih	‘metal canopy’
	d. katif	tsatif	‘shoulder’
	e. kam	tsam	‘how much’
	f. ka:jid	tsajid	‘hard’

The words in (5) (a-f) are not expected to undergo the affrication rule according to the environment proposed in this paper since /k/ is not adjacent to the high front vowel /i/ but to the central low vowel [a]. However, I argue that even though they seem to undergo the affrication rule, they actually do not. Due to the limited number of examples found in NA, I suggest that the above words with [ts] are lexicalized as affricated forms as they are consistently appear in this form. That is, the above words have two underlying forms (URs); one UR is with /k/ and the other is with /ts/. This is actually not uncommon in other Arabic varieties. Mustafawi (2006) reports a rare set of words where [k] is in a free variation with [ts] adjacent to /a/. She argues that these are instances of doublets rather than affrication. She also mentions that having two underlying forms for one word is common in Classical Arabic (CA), which most Arabic varieties are descended from. Youssef (2014) also adopts the same idea for Baghdadi Arabic. He argues that the words found in Baghdadi Arabic where free variation is available between the affricate sound /tʃ/ and /k/ are actually two separate underlying forms.

Further, the typology of affrication indeed provides additional evidence for considering data in (5) as having two underlying forms. Cross-linguistic research has shown that high front vowels are the most common environment for triggering affrication (Clements, 1999). This phenomenon is found in Korean, Japanese, Danish, Bantu, and Romance, among others. Similarly, Hock (1991) states that there seems to be a typological hierarchy of conditioning environments for affrication.

Among front vowels, the higher the vowel, the stronger it is to trigger affrication. The typological reasoning supports the current proposed environment for NA affrication to be restricted to high front vowel /i/.

In addition, as stated above, the extremely limited set of words in which [k] and [ts] appear in a free variation adjacent to /a/ suggests that they are lexicalized as two URs for a single mapping of meaning and function. If /a/ were also proposed to be a conditioning environment for affrication in NA, numerous counterexamples would emerge. The plenty of such cases would, then, be difficult to account for and they will be implausible to be considered mere exceptions or doublets. Accordingly, the current proposal that affrication is conditionally tied to high front vowels remains well-supported.

4.3. Middle /k/ and [ts]

The affrication process is widely observed word-medially in NA. Almost all the cases of [ts] realizations in this environment occur when /k/ is in the onset position. This has also been suggested for Haili Arabic, a sub-variety of NA spoken mainly in northern Najdi region (Alrasheedi, 2015). The examples in (6) illustrate the distribution of [k] and [ts] in medial position. The syllable structures are also provided to highlight the onset position of /k/.[4]

(6)	a. fi.ri.kih	fi.ri.tsih	‘flour-bread traditional dish’
	b. si.ka.ki:n	si.ka.tsi:n	‘ knives’
	c. msi.ki:n	msi.tsi:n	‘poor. Diminutive’
	d. mil.kih	mil.tsih	‘engagement party’
	e. ʃbi.kih	ʃbi.tsih	‘net’
	f. ra:.kid	ra.tsid	‘stable/ considerate’
	g. ra:.kib	ra.tsib	‘ passenger’
	h. ði.kir	ði.tsir	‘mentioning’
	i. ba:.kir	ba:.tsir	‘tomorrow’

It is obvious that the affrication of /k/ is indeed triggered in the conditioning environment in the onset position. This is almost always the case. I find only one case where the affricate [ts] in the medial position is not adjacent to /i/ and appears in the code position. The word /makwa/ ‘iron’ can be pronounced as [mak.wa] or [mats.wa] in NA. However, since only one word is found, I consider it as a case of doublets; that this word has two underlying forms, and the affricate [ts] is not a result of affrication process.

4.4. Final /k/ and [ts]

It has been suggested above that the affrication conditioning environment requires /k/ in the onset position. Accordingly, it is predicted that the affrication of /k/ word-finally is not possible. This turns out to be generally true as shown in (7a-c). Only a few words are found where the affrication of /k/ is in the final position is produced, i.e., in the coda position, as shown in (7e-g).

(7)	a. ʃabk	* ʃabts	‘siege’
	b. ma.lik	*ma.lits	‘king’
	c. se.mak	*se.mats	‘fish’
	d. ʃi.bak	* ʃi.bats	‘connect’
	e. fi.ri:k	fi.rits	‘flour-bread traditional dish’

f. di:k	di:ts	'cock'
g. ħa.nak	ħa.nats	'jaw'

I argue that the above exceptions (7e-g) -though it is not a comprehensive list- are cases of doublets, i.e., the word has two URs. That is, the affricate is not a result of the affrication process, but rather a phonemic representation for the phoneme /ts/ in the UR. The example in (7e) should receive special consideration. This form, I argue, is derives from the form with the same meaning given in (6a) above, which is [fi.ri.kih] and [fi.ri.tsih]. It is important to note that Arabic has a lexical gender distinction, in addition to the suffix grammatical distinction realized by the suffix /-ih/. For instance, the *Sun* and the *Moon* [ʃams] and [qimar], respectively, are different in gender in Arabic. This can be observed by agreement realizations with the following verb or adjective. The two sentences in (8) illustrate the distinction.

(8) a. a- ʃams kibir-ih
the -sun big-F
'the sun is big'

b. al-qimar kbi:r
the-moon big
'the moon is big'

In (8a), *sun* is considered lexically feminine. That is, it does not need the feminine suffix /-ih/. Actually, if the feminine suffix were added, it is unacceptable. Agreement with the adjective provides evidence that it is feminine. On the contrary, *moon* is considered lexically masculine, and adding the feminine suffix to it is unacceptable.

Taking this into consideration, I argue that (7a) is a case of overgeneralization of gender distinction found in Arabic varieties. Because the word originally ends with [ih] in /firikih/, some NA speakers assume that it is the feminine suffix. This form undergoes affrication as seen above in (3a). Only recently hasthe word (7e) [firits] been heard in NA, cutting off the last two sounds [ih], to produce a masculine form of the word. Accordingly, I argue that this affricate in word-final position of (7e) is only a result of the affrication of the stem. Another piece of evidence supporting this line of reasoning is that some sub-varieties in NA only have the word [firik], and the /k/ in the word does not go under affrication. This not only supports the proposed analysis for the affricate [ts] in the exceptional example found in (4a), but it also supports the conditioning environment requiring onset position of /k/ to undergo affrication.

So far, the distribution of [k] and [ts] has been shown to generally follow the conditioning environment for the affrication rule in NA. Before wrapping up the discussion of the distribution of these two sounds distribution, I will consider below if the affrication rule applies to the geminate [k] and to /k/ in clusters. Specifically, we aim to determine whether the adjacency of /k/ with /i/ triggers the affrication in these two cases.

4.5. Geminate /k/ and clusters

Hayes (1986) proposes that geminates exhibit resistance to phonological processes like assimilation and metathesis. He also distinguishes between true geminates and fake geminates. The former differs in that it is one sound associated with two C slots within the *Autosegmental* phonology (Hayes, 1986). The fake geminate, on the other hand, consists of two sequential identical sounds,

each of which is associated with only one C-slot. Two diagnostics have been proposed to determine the geminate type: *Inalterability* and *integrity.* Hayes argues that true geminates are not splitable. One half of the geminate cannot undergo an assimilation rule if it is indeed a true geminate. In accordance with Hayes' proposal about geminates, I find that geminate /kk/ does not undergo affrication in NA even when the conditioning environment is met. Affricating a true geminate is not acceptable even if various ways are followed, like affricating one half, or making the affricate geminate. Consider (9) below.

(9)	a. sik.kar	*sits.kar /*sik.tsir / *sits.tsar	'sugar'
	b. sak.kir	*sats.kir / *sak.tsir / *sats.tsir	'close. Imperative'
	c. fak.kir	*fats.kir / * tak.tsir/ * fats.tsir	'think'
	d. sik.ka:n	*sits.ka:n / *sik.tsa:n / *sits.tsa:n	'inhabitants'
	e. ruk.ka:b	*ruts.ka:b / *ruk.tsa:b / *ruts.tsa:b	'passengers'
	f. mak.kih	*mats.kih / *mak.tsih / *mats.tsih	'Mecca'

The examples above show that geminates do not undergo the affrication rule in NA even if the geminate is adjacent to /i/ and in onset position. This fact supports Hayes' proposal about true and fake geminates. In addition, it also indicates that the affrication rule is assimilation carried out by spreading; an analysis that I will discuss in the analysis section below.

In summary, the distribution for [k] and [ts] has been observed under the assumption that the conditioning environment for affrication in NA is /k/ being adjacent to the high front vowel /i/ and being in the onset position. When meeting the conditioning environment, /k/ has been observed to have a realization of [ts] alongside [k] word initially and word medially. Adjacency to other vowels, like /a/, is assumed not to trigger affrication and words contain [ts] in such environments are assumed to be lexicalized forms. In this respect, I argue that these instances have two underlying forms. In geminate and cluster, on the other hand, [ts] is rarely found and generally assumed to be lexicalized as well. Before analyzing the affrication process and lack of its application in some cases, the morphological /k/ shows a unique case of affrication that deserves a discussion.

4.6. Morphological /-k/

A unique case that has always been observed is the affricate [ts] and [k] as morphological suffixes in Arabic. These morphological suffixes for 2nd person descended from Classical Arabic. There are two 2nd person object suffix pronouns /-ki/ '- you (feminine)' and /ka/ 'you (masculine)'. The final vowels in these suffixes are commonly deleted in CA. Diachronically, many Arabic varieties eliminated this vowel altogether, creating a need to maintain gender distinction. In some Arabic varieties, there has been an insertion of a consonant after the vowel to block the deletion. For instance, some varieties insert [ʃ] yielding [kiʃ] (Musatafawi, 2006).

In NA along with many other Arabic varieties like Kuwaiti Arabic, Bahraini Arabic, QA, Iraqi Arabic and others (see Johnstone, 1978; Mustafawi, 2006), the 2nd person feminine suffix realized as an affricate. In NA, it is the affricate [ts]. The examples from NA are in (10) and (11) below illustrate.

(10) a. a-kallim-k
I-call-you (M)
'I am calling you'

(11) a- kallim-ts
I-call-you (F)
'I am calling you '

The affricate [ts] is invariably the realization of 2nd person singular feminine suffix. This is also the case in many other varieties where [-tʃ] is used instead of [-ts] (Musatfawi, 2006). I argue that, in addition to having [ts] as an allophone of /k/ in stem (as previously proposed in Johnstone, 1967; Mustafawi, 2006; Al-Mahmoud, 2020; among many others), it is also a separate phoneme /ts/ as the morphological marker for 2nd person singular feminine in NA. It is always affricate regardless of the environment and the preceding sound. The affricate [ts] in this grammatical function cannot be a realization of an affrication rule, at least synchronically. Instead, it is lexicalized as a morphological feminine suffix. Similarly, Johnstone (1978) argues that the morphological feminine suffix in Emirati Arabic is a separate phoneme. Other researchers suggest the same phonemic status for other Gulf Arabic varieties (Mustafawi, 2006 for Qatari Arabic; Youssef, 2014, for Baghdadi Arabic, among others). Having shown that the morphological feminine suffix is not an output of affrication, we are now in a position to delve into the analysis for affrication and non-affrication in NA in stems.

5. Analysis for Affrication rule in NA: application and resistance

It has been shown above that the affrication rule applies when /k/ is in the onset position and adjacent to the high front vowel /i/. However, in many cases where it is predicted to undergo, it does not. In fact, I find that in various cases where it should apply, it does not. The examples given in (13) illustrate.

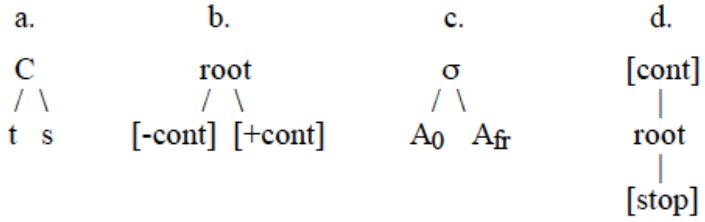
(13)	a. kirsi	*tsirsi	'chair'
	b. kirraθ	*tsirraθ	'leek'
	c. kid	*tsid	'work hard'
	d. kiri:m	*tsiri:m	'generous'
	e. kisar	*tsisar	'broke.$_{PAST}$'
	f. kill	*tsill	'eat'
	g. kitab	*tsitab	'wrote'
	h. kibar	*tsibar	'grow up (sg. m.)'
	i. ki.sal	*tsi.sal	'boredom'
	k. kis.rih	*tsis.rih	'a tiny portion'

Various reasons can be put forward to account for the non-application of the rule. It has been previously observed that the affrication rule in Arabic is not very active and that many exceptions are found even when the environment is met (Johnstone, 1967; Mustafawi, 2006). I argue, following Frisch et al., (2004), Mustafawi (2006) among others, that the Obligatory Contour Principle (OCP) blocks the application of the affrication rule in NA. The OCP (Goldsmith,1976; McCarthy, 1986; Frisch et al., 2001, 2004) prevents the occurrence of two identical sounds that have the same place of articulation. The OCP universality is controversial (McCarthy, 1988). However, it has been observed that the OCP is indeed active in Arabic (Mustafawi, 2006, 2007, 2011). The OCP has also been suggested to be gradient in Arabic in that the more the elements are

similar, the stronger the blocking effect (Frisch and Zawaydeh, 2001). It is important, however, before proceeding into the OCP analysis, to adopt a representation of the affricate.

Affricates have unique status in phonology and phonetics. They represent a mismatch between Phonetics and Phonology (Clements, 1999). The two phonetic representations of a stop and a fricative sound are characterized as one representation (i.e., phoneme) in phonology. Thus, various analyses have been proposed to incorporate their special characteristics. Clements (1999;4) summarized the main representations as provided in (14).

(14)



The representation in (14a) is *Contour segment* analysis, which considers "affricates as stop + fricative sequence linked to a single skeletal position." (Clements, 1994;4). The second one (14b) is the *Contour Feature analysis* which considers affricates as a contour features of [-cont] followed by [+cont]. (14c) is called *Aperture node* analysis which considers affricates as as a sequence of aperture nodes. The last one is called the *complex segment* analysis, which posits different tiers for the feature of fricative [+cont] and for the feature of stop [-cont]. Clements, also, introduces a more recent analysis known as *the Simple Stop Theory.* It basically posits that affricates are non-contoured. He argues that affricates are actually not contour features or sounds, but they can simply be analyzed as a simple stop sound. He argues that affricates can be assigned an independently-motivated feature such as [+strident].

Taking into consideration that the OCP is active in other varieties of Arabic (see above), I argue that NA affricates are represented as contour features, represented above as (14b). I will show that indeed both features of stops and fricative can block the affrication rule in NA, which requires a representation of the two features in an OCP-based system.

6. Blocked affrication rule and the OCP

As discussed above, the proposed affrication rule is not always active in NA as also observed in other Arabic varieties. This is exactly the case in (13) above. Adopting the contour feature representation of affricate given in (14), and assuming that the OCP is operative in NA, most of the counterexamples can be accounted for. [ts] is represented as a sequence of features [-cont] [+cont]. Accordingly, the OCP should block the affrication rule if the resulting affricate will violate the OCP due to adjacency of identical sounds. An essential feature for [ts] is [+coronal] and thus adjacency to another [+coronal] sound should interrupt the affrication rule. However, we have a couple counterexamples that show [+coronal] is not (always) problematic. These examples were given in (4) above and repeated here as (15).

(15)	a. kiθi:r	tsiθi:r	'many'
	b. kiðb	tsiðb	'lying'
	c. kiða	tsiða	'like that'

/θ/ and /ð/ are coronal sounds, and the OCP does not block the affrication rule. This application also argues against Alshammari (2015) who claimed that the [coronal] feature is responsible for the OCP blocking. The application of the affrication rule is unsurprising, though, given that we argued for the gradient nature of the OCP. The two dental fricative sounds are [distributed], or *laminal,* while the affricate [ts] is not [distributed], or *apical* (Hayes, 2011). Furthermore, they differ in the [strident] feature where the [ts] is [+strident] while the dental fricatives are not. I ,thus, follow Frisch et al. (2004) and Mustafawi (2007, 2011) that the OCP is gradient and the more identical the sounds, the stronger the OCP blocking effect. I further propose a numeric calculating system of similarity of the affricate [ts] and any other consonant in the stem according to the 3 place features (strident +apical+ anterior). Every place of [ts] receives 2 points. Similarly, sounds sameness is measured by the number of points it receives relative to the place feature of [ts]. The system is schematized as follows:

Table1

Sound	Apical	Strident	Anterior	Total
ts	2	2	2	6
s	2	2	2	6
z	2	2	2	6
θ	0	0	2	2
ð	0	0	2	2

(Points system of the OCP restriction strength

The system proposed above predicts the strength of the OCP restriction on the affrication in NA. It is obvious from the data above in (15) that the major place feature like coronal does not yield the OCP blocking required in NA. Accordingly, we need to adopt a finer grained place features that accurately capture the similarity level of adjacent sounds with the affricate [ts]. This will, accordingly, make the OCP proposal of blocking the affrication rule work more successfully.

The Point system I propose above predicts the OCP blocking in NA affrication. First, it successfully predicts that the OCP does not block the presence of [ts] with the dental fricative sounds given in (15). Second, it correctly predicts that the presence of the /s/ or /z/ in the stem, the affrication rule yielding [ts] is blocked. This is exemplified in (16).

(16)	a. kir.si	*tsir.si	‘ a chair’
	b. ki.sar	*tsi.sar	‘broke.V’
	c. sikan	*si.tsan	‘accommodation’
	d. mis.ki:n	*mis.tsi:n	‘poor’
	e. ki.sal	*tsi.sal	‘boredom’
	f. kis.rih	*tsis.rih	‘a tiny portion’

It can be seen from (16), that the point system suggested for the strength of the OCP predicts the correct forms. That is, affrication with the presence of /s/ in the stem is blocked.

Similarly, the point system predicts the correct OCP blocking of affrication with the presence of /z/ as the following examples in (17) illustrate.

(17)	a. kiz	*tsiz	‘send’
	d. ri.kaz	*ri.tsaz	‘pin down’
	e. kiz.bi.rih	*tsiz.bi.rih	‘cilantro’

We are now left with a fewer counterexample in (13). Those non-affricated cases of /k/ have /t, l, r, d/ in the stem. Again, the OCP point system suggested above works well in predicting the OCP blocking effect, but to a less strong level than the one with /s/ and /z/. See the table below.

Table 2

Sound	**Apical**	**Strident**	**Anterior**	**Total**
Ts	2	2	2	6
T	2	0	2	4
D	2	0	2	4
L	2	0	2	4
R	2	0	2	4

We should see the OCP blocking of affrication, but since it is not at its strongest point (i.e., they do not get 6/6 in the similarity schema), we should expect reduced blocking effect of the OCP. The data in (13), which show counterexamples to the conditioning environment, are indeed now accounted for given the OCP points above. The data with these sounds are repeated below as (18).

(18)	a. kitab	*tsitab	‘wrote’
	b. kirraθ	*tsirraθ	‘leek’
	c. kid	*tsid	‘work hard’
	d. kiri:m	*tsiri:m	‘generous’
	e. kil	*tsil	‘eat’

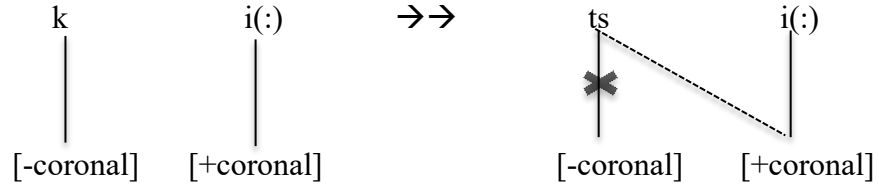
Now, we can argue for the non-application of affrication rule is due to the violation of the OCP. The closer the sound is to the points of [ts], the stronger the violation becomes. At the same time, we expect that there are cases where the OCP does not block the affrication rule with the sounds that are not very identical to the [ts], i.e., they do not have 6 points, which reflects the similarity across the three features adopted. Indeed, this is the case. This is exemplified in (19) where /t/ or /l/ are adjacent to /k/, and the affrication rule does apply.

(19)	a. ki.ta:m	tsi.ta:m	‘dark’
	b. kil.jih	tsil.jih	‘kidney’
	c. mil.kih	mil.tsih	‘engagement party’

7. Affrication Analysis

It is widely assumed that affrication is a feature spreading, particularly [+continuant] of the high vowel /i/ to the stop sound like /t,k/ in what is called the *Continuant-spreading analysis* (Clements,1999). Clements argues for the simplex stop representation for affricates, and then argues against the spreading feature as a whole in the analysis of affricates. Instead, he claims that assimilation is a result of feature insertion of [+strident]. Here, however, I adopt the contour feature representation of affricates, and I argue that the affrication rule in NA is a place assimilation rule that is accounted for by spreading, as widely assumed (Hayes, 1986). It has been assumed that the coronal feature applies to both vowels and consonants (Youssef, 2006). The conditioning environment for affrication in NA is /i/ and /i:/ are thus coronal. They target the adjacent dorsal velar /k/ and spread their coronal feature to it. The result of this spreading for place assimilation is the change from /k/ to the coronal affricate [ts]. This can be schematized as follows:

(21)



The spreading of place feature [coronal] from the high front vowel(s) can be rightward or leftward, as affrication due to place assimilation can obtain in either direction. Notice that the aim of the paper is to provide a description of the velar affrication in NA and a system for the fluctuating nature of the application of the affrication observed in NA. This rule-based proposal is just to show how it theoretically works. A further theoretical proposal such as an OT constraint-based analysis will easily adopt the proposals put forward in this paper.[5] Space limitations restrict us from advancing an OT-based analysis here, but one can see proposals along these lines in Mustafawi (2006: 2007, 2011) for Qatari Arabic and Al-Mahmoud (2020) for Riyadh variety of NA.

8. Conclusion

This paper investigates the affrication in NA. It has been shown that based on the distribution of [k] and [ts], it is obvious that /k/ is the phoneme and [ts] is an allophone stem-internally. This allophone is produced in the conditioning environment of affrication proposed to be the high front vowels /i/ and /i:/ and when /k/ is in the onset position. A survey of the distribution of [k] and [ts] indeed shows that the affrication rule is better understood to be applied before the high front vowels. However, various cases of affrication were found in unexpected environments. I have argued that these are lexicalized as two underlying forms, one with /k/ and the other with /ts/ and that no affrication has occurred. This has also been observed in various Arabic varieties that have affrication rules. Given that it has been shown that [ts] is actually also a phoneme /ts/ in NA, the assumption of the lexicalization becomes conceivable. In this matter, /-ts/ is a phoneme as shown by the invariant form of 2nd person feminine suffix. Further, I also show cases where indeed we have minimal pairs between /k/ and /ts/ that contrast even stem-internally.

Furthermore, the affrication rule in NA does not always apply. In many cases where we expect the application of the rule, it does not. However, closer investigation shows that it is not arbitrary inconstancy, but rather that there is a derivational phonological constraint to the rule. I argue that the OCP is active in NA and that stems containing more similar sounds to [ts] such as /s/ and /z/ should block affrication. The OCP, accordingly, restricts the affrication rule even if the conditioning environment is met. In addition, I argue that the OCP is gradient. The more similar the two adjacent sounds are, the stronger the blocking effect is. Hence, I propose a point system of the OCP strength with respect to [ts] that can predict the blocking effect of affrication. Furthermore, I also analyze the affrication rule as a form of place assimilation of coronal feature form the front vowel to the dorsal stop /k/. Spreading has been adopted as the mechanism for this assimilation rule.

This paper has some limitations. Even though I successfully account for the affrication and non-affrication rule application in NA in a way that has not presented before, it seems less favorable to adhere to the lexicalization whenever the assumptions are not met. This has been seen in the literature because the affrication in Arabic varieties show inconsistency. However, I believe that further investigation is required on the nature of lexicalization of /ts/ and finding appropriate cross-linguistically criteria for it. In addition, advancing an OT-based analysis (Prince & Smolensky, 1993; 2004) would provide further theoretical insights in analyzing the affrication in NA as has briefly sketched over in terms of constraints ranking and place of articulation calculation. I leave this for future research.

Endnotes

[1] The other case of affrication in NA is the change of /g/ to [dz]; for further discussion, see Al-Mahmoud (2020) and Mahzari (2023). The current study will only investigate the affrication of /k/ due to space limitation.

[2] The same minimal pair has also been examined in Qatari Arabic (Mustafawi, 2006). Also, *kaan* can also mean 'if, then' but the affricate counterpart cannot mean 'was' in NA. More details will be discussed below.

[3] I would like to thank an anonymous reviewer for suggesting various references to this work.

[4] An anonymous reviewer shares his/her judgment on some of the data here suggesting marginal acceptance and absence of meanings in his/her own variety of NA. Again, the data here is in Qassimi Arabic and has been verified by various native speakers; the root of this variant judgement is due to differences among NA varieties; assuming that NA has the same pronunciations across its regions and communities is untenable for various reasons including the fact that NA has various sub-varieties that significantly differ in phonology and lexicon as well. This, in fact, calls for more studies on sub-varieties of NA and more controlled data in phonological works.

[5] An anonymous reviewer suggests putting forward an OT-based analysis; I agree that such a theoretical incorporation will be valuable; however, space limitation and focus of the paper to describe the phenomenon at hand prevent us from advancing this suggestion here.

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معلومات عن الباحث

د. ياسر بن عبدالرحمن البطي، أستاذ مساعد في اللغويات النظرية في قسم اللغة الإنجليزية وآدابها بكلية اللغات والعلوم الإنسانية في جامعة القصيم، المملكة العربية السعودية. حاصل على درجة الدكتوراه في اللسانيات من جامعة وسكنسن ملواكي عام 2019. تدور اهتماماته البحثية حول نظريات التركيب، والتركيب والدلالة، واكتساب التراكيب، وعلم الصوتيات، واللسانيات العربية.

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