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Abstract
This study aims to provide some acoustic documentation of two unusual and variable allophones in Aswan Arabic. Although many rural villages in southern Egypt enjoy ample linguistic documentation, many southern urban areas remain understudied. Arabic linguists have investigated religion as a factor influencing linguistic variation instead of ethnicity. This study investigates the role of ethnicity in the under-documented urban dialect of Aswan Arabic. The author conducted sociolinguistic interviews in Aswan from 2012 to 2015. He elected to measure VOT as a function of allophone, ethnicity, sex, and age in apparent time. The results reveal significant differences in VOT lead and lag for the two auditorily encoded allophones. The indigenous Nubians prefer a different pronunciation than their Ṣaʿīdī counterparts who trace their lineage to Arab roots. Women and men do not demonstrate distinct pronunciations. Age also does not appear to be affecting pronunciation choice. However, all three variables interact with each other.
Ethnic Variation of */tˤ/ in Aswan Arabic

Jason Schroepfer

1 Introduction

This study aims to achieve two goals in the analysis of */tˤ/ in Aswan Arabic. First it provides some acoustic documentation of two unusual and variable allophones for */tˤ/ in Aswan Arabic. It also strives to investigate the extent of several social factors’ influence over the realizations of */tˤ/.

Egypt exemplifies a well-studied region in Arabic dialectology (cf. Behnstedt and Woidich 1985). However, the varieties of many major urban hubs that lie in the south like Luxor and Qena remain under-documented. Aswan, lying some 600 miles south of Cairo, also represents another overlooked urban center. In fact, the burgeoning city boasts a sizeable 1.3 million people (Aswan Census 2006). This article intends to contribute to Arabic dialectology by providing some acoustic descriptions for a sizeable southern Egyptian city.

Many studies show that religion and even sect can influence sociolinguistic variation (Bassiouney 2009, Blanc 1964, Holes 1987). Few Arabic sociolinguists investigate ethnicity’s influence on variation (cf. Hachimi 2007). This paper intends to add to this discussion by investigating the role of ethnicity in Aswan Arabic’s phonetic variation (following Eckert 2008).

Several studies have also investigated salient variables such as */q/ following Labovian methods (see Bassiouney 2009:90–127). However, few would doubt that much interest lies outside the most salient variables. This study contributes to the field by focusing on */tˤ/, which has long demonstrated socially conditioned variation in the literature, yet remains understudied from a variationist perspective.

1.1 */tˤ/ as a Sociolinguistic Variable

Although no scholar has studied */tˤ/ from a quantitative perspective, its variation has been described for an extended period of time. The first such example lies in the pre-eminent 8th century grammarian Sibawayh’s (1898) account of the different pronunciation of */tˤ/ in the Arabian peninsula. He actually posits that */tˤ/ is majhūr, which is usually interpreted as ‘voiced.’

In several villages just north of Aswan, scholars report the existence of a glottalized sound for */tˤ/. Behnstedt and Woidich (1985) claim that speakers produce a glottalized pronunciation from Asyut to just north of Aswan. Moreover, in the small villages of ’izbit il-būsa and il-’ukaliyya near Asyut, Khalafallah (1969) notes the following concerning glottalized pronunciation of */tˤ/:

[tˤ] and the glottalized [tˤ] are in complementary distributions in the following environments of [s] and [z]…On the basis of my corpus, the following observations may be made.

(1) [tˤ] and the glottalized [tˤ] are partially in complementary distribution.

(2) Whenever the glottalized [tˤ] occurs, it can be replaced with [tˤ] without the least distortion of speech.

(3) A Ṣaʿīdī speaker uses [tˤ] in all environments in certain social circumstances (e.g., speaking to lower Egyptians). If in the same circumstances he uses the glottalized [tˤ], it will be with the purpose of showing he is Ṣaʿīdī. The glottalized [tˤ], then is a stylistic allophone of [tˤ].

Khalafallah (1969:29)

It could not be any clearer that [tˤ] and its other realization are charged with sociolinguistic variation and indexicality.

In the mining town of Gift, which lies some 30 km north of Aswan, Nishio (1994) also indicates that */tˤ/ carries a phonological distribution: “The emphatic consonant /tˤ/ is sometimes realized with glottalization, especially when it occurs in the final position” (1994:29). This is an important piece of information. The word “sometimes” creates an ambiguity that can allow for variation between /tˤ/ and its glottalized pronunciation in virtually any context.

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1*/tˤ/ refers to the Old Arabic phoneme / tˤ/.
Similarly, */tˤ/* in Nigerian Arabic is also known to have a phonological distribution and sociolinguistic indexing. Owens (1993:19–23) indicates that speakers produce an implosive [ɗ] in place of */tˤ/* and it is devoiced in the pausal form. However, sometimes speakers with knowledge of Modern Standard Arabic will pronounce it as [tˤ] in careful speech, syllable initially. Thus, Nigerian Arabic shows possible prevocalic variation of [ɗ]–[tˤ] before vowels.

Similar to these dialects, Aswan Arabic demonstrates phonological and social variation for */tˤ/*. Phonologically, when [ɗ] occurs it only does so prevocically in Aswan Arabic. It also is of note that */tˤ/* is in variation with the implosive [ɗ] in the pre-vocalic position.

1.2 Large Ethnic Groups in Aswan

The Ṣaʿīdīs represent the largest ethnic group in Aswan. They trace their lineage to Arabs who have resided in Aswan from as early as the 7th century CE (Pratt 1983). They speak an unknown Upper Egyptian dialect of Arabic (Lewis et al. 2016). Most importantly, the Ṣaʿīdī consultants from this study report that they speak Arabic differently than their Nubian counterparts.

The Nubians are an indigenous people who have traditionally inhabited the region extending from Elephantine Island, Egypt to Wadi Halfa, Sudan since at least 700 BCE (Fahim 1983). They have customarily spoken varieties of the Nilo-Saharan Nubian language. However, Nubian is classified as an endangered language and the youngest generation of Nubians is shifting to Arabic as a mother tongue (Lewis et al. 2016). Aswan has also seen a large increase in Nubians due to resettlement after the completion of the High Dam project in the 1960’s (Fahim 1983, Reynolds 2013).

Following the work of seminal variationists such as William Labov (2001) and Penelope Eckert (2008), this study will investigate the role of social factors in the pronunciation choices of */tˤ/*.

These variables outlined in section 2.3 are Phone, Ethnicity, Sex, and Age in apparent time.

2 Method

The researcher conducted sociolinguistic interviews in Aswan Arabic (following Labov 1984). He gathered his data from several short trips to Elephantine Island, Aswan, and the University of Aswan from the spring of 2012 to the spring of 2015 (see Figure 1). He used Marantz and Tascam solid-state recorders with Shure head mounted microphones for optimal acoustic analysis. Thirty-three consultants participated for a total of approximately 30 hours of recordings and 1161 tokens.
2.1 Measurements

The implosive [ɗ̥] and the voiceless alveolar stop [tˤ] acoustically differ in the voicing dimension since [ɗ̥] is a voiced sound, while [tˤ] is a voiceless sound. Therefore, the researcher elected to measure all of the variables as a function of voice onset time (VOT). Voicing is defined as the first sign of periodicity in the waveform in relation to the stop release (Lisker and Abramson 1964).

2.2 Confounding Factors

Several factors can influence VOT measurement. Stress can influence VOT values in a laboratory setting by increasing the lag and lead of VOT (Lisker and Abramson 1964). The author tested the effect of stress on this data set by performing two, two-tailed t-tests, to investigate if stress affects VOT values for [tˤ] and [ɗ̥]. The [tˤ] results report no statistical difference \( t = .178_{(470.461)}, p = .859 \). The mean VOT values were nearly the same in stressed (M = 20.712, SD = 8.262) and unstressed (M = 20.720, SD = 9.355) contexts. The results for [ɗ̥] also revealed no statistical difference for stress \( t = .682_{(50.053)}, p < .499 \). The mean VOT values were also nearly identical in stressed (M = -25.280, SD = 15.903) and unstressed (M = -23.184, SD = 15.736) contexts. Thus, the author used all tokens for the analysis since stress does not affect this data set. Speech rate and syllable count can also affect VOT (Lisker and Abramson 1964). The author controlled for these by making his consultants as comfortable as possible during the sociolinguistic interviews. Inter-rater reliability of auditory encodings also can affect measurement results. Therefore, the researcher randomly chose 25 tokens and asked a colleague to evaluate phone encodings and VOT measurements. We reached a 100% consensus on the encodings and measurements.

Place of articulation (POA) is also known to affect VOT measurements (Lisker and Abramson 1964). This study controls for this factor by only measuring the alveolars [tˤ] and [ɗ̥]. Gemination and poor quality recordings can also affect VOT measurements. In order to control for this, the researcher omitted 210 geminate and poor quality tokens from the original token count of 1161, leaving 951 tokens for the final analysis.

2.3 Variables

The dependent measure for this study lies in VOT. Speaker sex is self-identified by each informant and no informant identified as both male and female. Speaker ethnicity is additionally self-identified by each consultant and no participant simultaneously identified as both Nubian and Ṣa‘īdī. Age is also self-reported by each speaker. The researcher auditorily encoded the different allophones of */tˤ/, which are [tˤ] and [ɗ̥]. This variable is also known as Phone.

3 Results

A two tailed t-test was employed to examine whether the auditory encodings of [tˤ] and [ɗ̥] differ in terms of VOT. It reveals a highly significant effect for Phone \( t = -35.569_{(181.105)}, p = 2.23^{-16} \).

![Figure 2: VOT for allophones of */tˤ/](image-url)
As the boxplot in Figure 2 illustrates, the voiceless [tˤ] phone demonstrates a VOT lag (M = 20.752ms, SD = 8.636) while [d] shows a VOT lead (M = -24.853ms, SD = 15.843). Thus, it is clear that [tˤ] and [d] differ quite significantly in voicing.

3.1 The Ethnicity Variable

The author stepped and calculated a generalized linear model to predict VOT based on Ethnicity, Age, and Sex (following Tagliamonte and Baayen 2012). A significant effect was found for ethnicity ($F_{(2, 950)} = -14.142, p = 2\times 10^{-16}$). The Ṣa‘īdis’ mean VOT is equal to -.910ms (SD = 23.845). Mean VOT increased 21.415ms to a total of 20.505ms (SD = 12.087) for the Nubians. In Figure 3 below, it is clear that many of the orange stars representing the Ṣa‘īdis lie below the perforated zero line, while relatively few blue triangles representing the Nubians, dip below the zero line. This indicates that Ṣa‘īdis prefer a mix of [d] and [tˤ], while the Nubians mostly pronounce a voiceless [tˤ]. It is also of note that any VOT lag for the Nubians constitutes outliers from the group’s distribution as Figure 4 shows.

Figure 3: Age vs. VOT for Nubians and Ṣa‘īdis.

Figure 4: Mean VOT values for Nubians and Ṣa‘īdis.
3.2 The Speaker Sex Variable

The results from the generalized linear model showed no overall main effect for the Sex variable \((F(2, 950) = 1.462, p = .144)\). As Figure 5 indicates, however, there are significant interactions between the Sex and Ethnicity variables. The Ṣaʿīdī females predicted VOT is equal to 7.8395ms while VOT decreased to -1.772ms for the Ṣaʿīdī males \((F(1, 332) = 2.288, p = .0228)\). The figure below indicates that female Ṣaʿīdīs prefer a voiceless \([tˤ]\), while their male counterparts prefer a blend of a voiced \([ɗ̥]\) and voiceless \([tˤ]\).

![Figure 5: Age vs. VOT for Ṣaʿīdīs.](image)

In order to tease this effect apart from the Age variable, a sample of 5 Ṣaʿīdī females and 7 Ṣaʿīdī males, 18–23 years old were selected for comparison using a two-tailed t-test. The results in Figure 6 show a statistical difference and support the claim that the young female Ṣaʿīdīs mostly produce the voiceless \([tˤ]\) \((M = 7.840ms, SD = 10.229)\) while the young male Ṣaʿīdīs more often than not pronounce the voiced \([ɗ̥]\) \((M = -16.965ms, SD = 23.038, t(39.072) = 5.787, p = 1.016×10^{-6})\).

![Figure 6: Mean VOT values for young Ṣaʿīdī females and males.](image)

The researcher also found a significant interaction \((F(1, 615) = 4.853, p = 1.54×10^{-6})\) for the Nubians. Figure 7 demonstrates that Nubian females exclusively pronounce \([tˤ]\), while the males mostly prefer \([tˤ]\) and occasionally produce \([ɗ̥]\). Moreover, Figure 8 shows that the Nubian females’ mean VOT is equal to 21.549ms \((SD = 7.05)\), while Nubian males’ is 15.353ms \((SD = 12.621)\).
3.3 The Age variable

The results from the general linear model did not reveal a main effect for Age ($F_{(2, 950)} = -0.212, p = 0.832$). Eighteen year-old speakers’ predicted VOT is equal to -.575ms. For every year older the informant is, her/his VOT increases by .575ms. The oldest informants, the 55 year-olds’ predicted VOT is 20.713ms, which can be seen in Figure 9. However, this misleading “age effect” can be attributed to the Ethnicity variable, as most of the Nubian informants tend to be older, while the Ṣaʿiddī consultants are generally younger.
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There is no interaction between Age and the Ṣa‘īdis ($F_{(1, 332)} = -0.852, p = .395$). Figure 10 demonstrates that the Ṣa‘īdis produce a mélange of [t'] and [d] regardless of age.

However, it is not clear from Figure 10 whether or not Ṣa‘īdi females may be contributing to the lack of the Ṣa‘īdi and Age interaction. Thus, the researcher just investigated VOT as a function of age for male Ṣa‘īdis (to test a Ethnicity * Age * Sex interaction). The results reveal that these three variables also do not interact ($F_{(1, 306)} = -0.119, p = .906$). Figure 11 reports that Ṣa‘īdi males mix [t'] and [d], with a slight proclivity towards [d].
The interaction between Age and Nubians was also not significant ($F_{(1, 615)} = .401, p = .527$). It appears that Nubians are more likely to produce [tˤ] with approximately 20ms of VOT lag regardless of age and as Figure 12 displays.

Unlike their Ṣa‘īdī counterparts, the male Nubians show a three variable interaction ($F_{(1, 511)} = 2.746, p = .006$). Eighteen-year-old Nubians’ predicted VOT is equal to 16.64ms. VOT increases by .1779ms for every year older the consultant becomes. For the oldest speakers, 54 year olds, their VOT is 23.044ms according to this model. In other words, the older male Nubians tend to pronounce a seemingly more aspirated voiceless [tʰ] with few [d] tokens. The younger Nubian males appear to produce a less aspirated [tʰ], with occasional [d] tokens as Figure 13 demonstrates.
A significant three-way interaction was also found for the Nubian females ($F_{(1, 102)} = -7.586, p = 1.59 \times 10^{-11}$). Although there are only one 46 year-old and one 54 year-old Nubian women, they appear to be increasing their aspiration with age. Both only produced [tˤ] tokens and the 54 year-old female’s mean VOT for [tˤ] ($M = 13.360 \text{ms}, SD 5.323$) is over 11ms less than the 46 year-old’s ($M = 24.272 \text{ms}, SD 7.062$) as Figure 14 displays.

Figure 13: Age vs. VOT for male Nubians.

Figure 14: Age vs. VOT for female Nubians.

4 Conclusions and Future Directions

This paper demonstrates [d] has a VOT lead of about -25ms, while [tˤ] productions show a lag of approximately 21ms. It also investigates the influence of social factors on pronunciation choices between [tˤ] and [d] for */tˤ/* in the Urban dialect of Aswan Arabic. This article also illustrates that ethnicity plays an integral role in variation for an Arabic dialect. The Ṣa‘īdīs prefer to mix [d] and [tˤ], while the Nubians choose [tˤ] in most cases. Speaker sex did not show any significant results. However, both the Ṣa‘īdī and Nubian women generally prefer [tˤ]. The Ṣa‘īdī males produce a blend of [d] and [tˤ], while the Nubian men mostly pronounce [tˤ] with an occasional [d]. Age was not a statistically significant as a factor. In terms of interactions with Sex, Ethnicity, and Age, the younger Nubian men appear to be producing a less aspirated [tˤ] than their older counterparts. The younger female Nubians show the opposite trend, pronouncing a more aspirated [tˤ] than the older Nubian women. Thus, it appears that for now, [tˤ] and [d] are currently in stable variation in As-
wan Arabic.

Future research is necessary to determine the indexicality of [tˤ] and [d] for each group of speakers in the researcher’s corpus. The researcher’s intent is to utilize metalinguistic commentary and ethnographic observations gathered during the sociolinguistic interviews to better understand the meanings associated with the different variants of */tˤ/.* This will provide the necessary framework for perception tests and matched guise tests that should furnish a more nuanced understanding of the meanings associated with pronunciation choice of */tˤ/ in Aswan Arabic.

References


