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Voicing in Qatari Arabic: Evidence for prevoicing and aspiration

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Languages with a two-way voicing contrast in phonology usually contrast prevoiced b, d, g stops with voiceless unaspirated p, t, k stops or voiceless unaspirated stops with voiceless aspirated stops (Iverson & Salmons, 1995). It is very unusual to have a contrast between prevoiced and voiceless aspirated stops. This is typically assumed a consequence of the principle of economy as only one category of stops has to be specified with a phonologically feature. Beckman, Helgason, McMurray & Ringen (2011) argue that some languages, e.g. Swedish, can have a contrast between prevoiced and voiceless aspirated stops with both stops specified with a phonological feature. The type of the voicing contrast in a language can be diagnosed by changes of voice onset time (VOT, Lisker & Abramson, 1964) in response to speaking rate. These changes are asymmetrical: in slower speech, negative VOT (i.e. prevoicing) in voiced stops and long-lag VOT in voiceless aspirated stops increases but short-lag VOT in unaspirated stops does not (Kessinger & Blumstein, 1997). Beckman et al. (2011) claim that Swedish has two phonological features because both prevoicing and aspiration increase as speech slows. So far, Swedish is the only language for which there is evidence of two active features, which raises a question of naturalness of this pattern. In this study, we report the data from the vernacular Arabic dialect of Qatar. Unlike many dialects of Arabic that have a two-way contrast between voiceless unaspirated and aspirated stops (e.g. Saudi Arabic, Flege & Port, 1981) or between voiceless unaspirated and prevoiced stops (e.g. Lebanese Arabic, Yeni-Komshian et al., 1977), Qatari Arabic has both prevoiced and voiceless aspirated stops. We collected data from eight native speakers of Qatari Arabic. Four of them were affiliated with the Hadar and four with the Bedouin community. They read words (n = 50) with voiced (b, d, g) and voiceless (t, k) stops in a carrier phrase at two rates (slow, fast). The results show that 77% of voiced stops have lead voice (Mean VOT = –69 ms); voiceless stops are aspirated (Mean VOT = 55 ms). We measured four additional cues to voicing (SCG of burst, f0, F1 and duration of the following vowel). We found significant differences ($p < 0.01$) between the two categories in all cues: We examined the effects of rate on VOT and found that both categories significantly increase VOT in slow speech (MDvoiced = 23 ms, $p < 0.0001$; MDvoiceless = 11 ms, $p < 0.0001$). There is a significant relation between VOT

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and word duration, used as a proxy of speaking rate, in both categories (Voiced: R^2 change = .141, $p < .0001$; Voiceless: R^2 change = .073, $p < .0001$), which is illustrated on the charts A and B below. The results suggest that the pattern found in voiced Qatari Arabic stops is consistent with voicing in Dutch or Swedish. The pattern found in voiceless stops is consistent with aspiration in German or Swedish. Both lead voice and aspiration in Qatari Arabic stops change in response to speaking rate, but the magnitude of these changes is smaller than in Swedish. The findings provide further empirical support for the pattern of with two phonological features found in Swedish. The results also revealed that the voicing patterns were slightly different in the two communities as indicated in chart C below. Hadar speakers produced voiceless stops with longer aspiration than did Bedouin speakers (MHadar = 63 ms, MBedouin = 47 ms; $p < 0.01$). Duration of lead voice did not differ between the two groups. These findings suggest that aspiration may be a new social variable that helps to maintain speakers' identity.

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