The temporal variability of velic aperture in Tupí-Karitiâna

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In Tupí-Karitiâna (K henceforth), word-medial nasals occurring between oral vowels may surface as circum-oralized, post-oralized, and completely oralized consonants. Consider the following eighteen tokens of three words with underlying nasal consonants:

1a.	[pe.ˈdndot]	‘wide’	2a.	[a.ˈbmbi]	‘house’
1b.	[pẽ.ˈndot]	‘wide’	2b.	[ã.ˈmbi]	‘house’
1c.	[pe.ˈdot]	‘wide’	2c.	[a.ˈbi]	‘house’
3a.	[se.ˈbmbok]	‘wet’	4a.	[e.ˈgŋgɨ]	‘to vomit’
3b.	[sẽ.ˈmbok]	‘wet’	4b.	[ẽ.ˈngɨ]	‘to vomit’
3c.	[se.ˈbok]	‘wet’	4c.	[e.ˈgɨ]	‘to vomit’
5a.	[ki.ˈdnda]	‘thing’	6a.	[a.ˈbmbo]	‘to climb
5b.	[kĩ.ˈnda]	‘thing’	6b.	[ã.ˈmbo]	‘to climb’
5c.	[ki.ˈda]	‘thing’	6c.	[a.ˈbo]	‘to climb’

While such surface variation is typologically unusual, the circum- and post-oralization of nasals evident in 1-6 does occur in a few languages, e.g. Kaingang (cf. D’Angelis 1999). The variation evident in 1-6 has been noted in the literature on K. (Cf. Storto 1999, Everett 2006, 2008, Demolin and Storto 2006) What has not been described is the extent to which such surface variation of K nasals is due to the highly variable duration of velic aperture. Previous research on other languages (e.g. Beddor 2007) has demonstrated that nasal allophones of this sort, e.g. post-oralized allophones, are typically the result of asynchrony between velic aperture and oral occlusion, both of which are relatively constant across tokens in terms of duration. In the case of K, however, the variation evident in forms such as 1-6 is due primarily to the unpredictable nature of the duration of velic aperture itself.

The author presents data supporting this claim, based on digital recordings of eight K adults producing ten words (including the three words in 1-6) three times each. A total of 240 tokens were examined in detail. Each of these tokens was excised from a carrier frame recorded via Praat (Boersma and Weenink 2007) onto a Mac G4 notebook computer, via a sampling rate of 44.1 kHz. The duration of velic aperture for each inter-oral nasal was ascertained via the methods suggested in Beddor and Onsuwan (2003). For each token, FFT-based spectra were created at 10 ms increments, and these spectra were tested for acoustic correlates of velic lowering, e.g. the presence of low-frequency nasal resonance and increased F1 bandwidth. Duration of velic aperture was found to be highly variable. For instance, for bilabial nasals, the average velic aperture across all speakers was 110 ms, with an average intra-speaker standard deviation of 60 ms. A one-way ANOVA revealed no significant differences ($p<1$) between the ranges of velic aperture durations across the three relevant places of articulation. In other words, velic gesture length was highly variable on an intra-speaker basis for each of the three nasal types examined, and similar extremely large ranges of velic movement durations were observed for all three nasal types. The author also notes that the dramatic intra-speaker variations in velic aperture durations obtained despite remarkably constant speaking rates across tokens of particular words. In short, the data presented clearly support the claim that the length of velic gestures in K is extremely variable, at least in the environment examined here.

This finding is relevant to phonetics more generally, since to my knowledge there are no other attested cases of such variable velic movement in the literature. It is also relevant to field work methodology, since this finding is essential to a careful documentation of nasality in K, and since it necessitates the utilization of acoustic data of the sort presented.

REFERENCES

BEDDOR, PATRICE. 2007. The phonetics and phonology of nasal gestures. Ms.

BEDDOR, PATRICE, AND CHUTAMANEE ONSUWAN. 2003. Perception of prenasalized stops. *Proceedings of the 15th International Congress of Phonetic Sciences*, eds. M. J. Solé, D. Recasens, & J. Romero, v. 1, pp. 407-410. Universitat Autònoma de Barcelona, Barcelona, Spain.

BOERSMA, PAUL and DAVID WEENINK. 2007. Praat: doing phonetics by computer (Version 4.6.16) [Computer program]. Retrieved November 2007.

D'ANGELIS, WILMAR DA ROCHA. 1999. Gradient versions of pre- and circum-oralized consonants in Kaingang (Brazil). *Proceedings of the 14th International Congress of Phonetic Sciences*, eds. Ohala, J., Y. Hasegawa, M. Ohala, D. Granville, and A. Bailey. San Francisco.

DEMOLIN, DIDIER, AND LUCIANA STORTO. 2006. Aerodynamic and acoustic evidence for the articulation of complex nasals. Revue Parole 40-43:235-268.

EVERETT, CALEB. 2006. Patterns in Karitiâna: Articulation, Perception, and Grammar. PhD dissertation, Rice University. Houston, Texas.

EVERETT, CALEB. 2008. Locus equation analysis as a tool for linguistic field work. *Language Documentation and Conservation* 2:2.185-211.

STORTO, LUCIANA. 1999. Aspects of a Karitiana Grammar. PhD dissertation, Massachusetts Institute of Technology.