

## From implosives to ejectives - analysis of voicing processes in Swahili and Setswana

Jagoda Bruni (Universität Stuttgart)

This investigation deals with voicing and devoicing of post-nasal stop consonants in languages from Sotho-Tswana group, in particular Swahili and Setswana. Nasals preceding stop consonants are said to have appeared in Bantu languages in order to facilitate production of voicing during the stop segment and were lost later during language evolutionary changes in languages like Swahili, Sotho and Duala (Meinhof et al., 1932). Current studies of Tswana and Shekgalagari (Coetzee and Pretorius, 2010; Hyman, 2001; Solé et al., 2010), however, demonstrate that nasal segments remained in those languages – surprisingly not only before voiced stops but also before voiceless ones. Studies conducted by Coetzee and Pretorius (2010), and Solé et al. (2010), demonstrate that languages from the Sotho-Tswana group of Bantu languages exhibit unintuitive voicing behavior in devoicing of post-nasal voiced plosives (/mb/ → [mp]) – unintuitive in that greater articulatory effort is required to terminate voicing than to maintain it (Westbury and Keating, 1986).

From the phonological point of view, Pater (1999) accounts for the \*NT constraint, claiming that many languages demonstrate existence of prenasalized voiced stops but lack prenasalized voiceless stops. The rule penalizes consonantal sequences of [+nasal] followed by [–voice] and Pater (1999) claims that NC clusters seem to be uncommon in a variety of languages. He states that typological data, as well as phonetic evidence argue for a universal but violable \*NC<sup>o</sup> constraint. Many African languages cope with this requirement in several ways. In Venda, Swahili or Maore, the nasal in NC<sup>o</sup> has been deleted or, like in Oshikwanyama, the post-nasal obstruent has become voiced (Pater, 1999; Meinhof, 1932). In another study, Hayes (1997) claims that an \*NT constraint is phonetically driven, contrary to the corresponding \*ND, which rules out sequences of a nasal followed by a voiced stop. Moreover, Coetzee & Pretorius (2010) point out that given the phonetic naturalness of post-nasal voicing and phonetic unnaturalness of post-nasal devoicing, phonetic grounding of phonology would assume no language could exist with the phonological rule of post-nasal devoicing. Still, the phenomenon of post-nasal devoicing is clearly measurable and its diachronic spread in languages like Tswana has to be accounted for.

This work presents acoustic analysis from two ‘ecological’ (i.e. partially annotated) datasets: Swahili corpus (11 speakers) and NCHLT corpus (93 Setswana speakers; Barnard et al., 2014). The target of the investigation was to define differences in acoustic parameters (a. o. VOT, F0, duration, intensity, burst type) for Swahili between the prenasalized and implosived stops, whereas for Setswana to differentiate between post-nasal voiceless stops and ejectivized stops. As a result, classification of different voicing levels, enabled constructing phonological scale where as phonological weakening considered are stops of hyper-voiced status (implosives) and as phonological strengthening stops of hyper-devoiced status (ejectives).

### References

- Barnard, E., M. H. Davel, C. van Heerden, F. deWet, and J. Badenhurst, “The NCHLT Speech Corpus of the South African languages,” in Proc. of SLTU, St. Petersburg, Russia, 2014, pp. 194–200.
- Coetzee, A. and R. Pretorius, (2010). Phonetically grounded phonology and sound change: The case of Tswana labial plosives. *Journal of Phonetics* 38:3, 404–421.
- Hayes, B. (1997). Phonetically driven phonology. The role of optimality theory and inductive grounding. Manuscript written for the 1996 Milwaukee Conference on Formalism and Functionalism in Linguistics.
- Hyman, L.M. (2001). The limits of phonetic determinism in phonology: \*NC revisited. Hume, Elizabeth & Keith Johnson (eds.), *The role of speech perception in phonology*, Academic Press, New York, 141–185.
- Meinhof, C. (1932). Introduction to the phonology of the Bantu languages: being the English version of "Grundriss einer Lautlehre der Bantusprachen". Dietrich Reimer (Ernst Vohsen); Williams & Norgate, Ltd., Berlin; London. Ed. and trans. by Nicolaas Jacobus van Warmelo.
- Pater, J. (1999). Austronesian nasal substitution and other NC effects. Kager, René, Harry van der Hulst & Wim Zonneveld (eds.), *The Prosody-Morphology interface*, Cambridge University Press, Cambridge, 310–343.

Solé, Maria-Josep, Larry M. Hyman & Kemmonye C. Monaka (2010). More on post-nasal devoicing: The case of Shekgalagari. *Journal of Phonetics* 38:4, 604–615.

Westbury, J.R. and P. A. Keating (1986). On the naturalness of stop consonant voicing. *Journal of Linguistics* 22:01, p. 145.