

High tone alignment in a Southern Bantu language

Sabine Zerbian

University of the Witwatersrand, Johannesburg

Sabine.Zerbian@wits.ac.za

1 Introduction

Intonational systems of Bantu languages are understudied prosodic systems. A number of case studies exist, but they are not comparable due to different methodologies used. Early studies on Bantu tone were based on data gathered by introspection and auditory impression. As a consequence, many inconsistencies can be detected (Roux 1995). The transcriptions available use an eventually idiosyncratic labeling system (though always using H and L) as the use of labels is not explained. This practice is still commonly used today (for a criticism of current practices in tone research see Xu 2006). The lack of detailed information with respect to tone alignment, tone shift/ spread, downdrift and downstep becomes apparent when intonational aspects are to be modeled in language technology (e.g. Govender, Barnard & Davel 2005). Most existing studies lack the precise phonetic details to allow computational modeling.

It becomes increasingly considered standard to conduct quantitative studies also on understudied languages. This is due to the technology being readily available, easily accessible and cheap. For Bantu languages, only a handful of studies follow this paradigm (Myers 1999, 2003, Downing et al. 2004). The current study presents an acoustic study of high tone in Sepedi, a Southern Bantu language, spoken in South Africa. The underlying two tones in this language are used for lexical and grammatical distinctions. The methodology follows standards in both experimental phonology and speech technology research, relating to various aspects such as segmental make-up of stimuli, controlled tonal context, and sociolinguistic background of the speakers.

The study

A quantitative production study investigates the alignment of high tones in Sepedi for four speakers. The results partly confirm prior results reported in the literature on

tone alignment in Bantu language, namely that the pitch peak target which is associated with an underlying high tone aligned is realized only on the following syllable (cf. Myers 1999), as in (1).

- (1) *re-rúmúla mokgalabje*
1stPL-provoke old.man
'We are provoking the old man.'

This tone realization pattern is transcribed in (1) following the tradition in Bantu linguistics with a high tone (marked by acute) both on the syllable that contributes the high tone (marked by underlining) as well as on the syllable that shows the high tone peak. This tone realization pattern is known as high tone spread in the literature.

Previous acoustic studies investigated the alignment of high tones originating on verb stems and reported a peak delay in short syllables (Myers 1999), as transcribed in (1). The current study, however, goes beyond the context in (1) and investigates the alignment of high tones which originate from different morphological constituents. Next to the verb stem in (1) these are subject agreement prefix, the object agreement prefix and aspect prefix. It is due to this design that the study reveals that it is important to consider which syllable the high tone originates from as not all high tones align similarly. A high tone originating on the object marker shows a considerably bigger peak delay (2a), contrary to what has been reported in the literature (Lombard 1976). As the pitch stays low on the tone-contributing syllable, this is mirrored in the transcription in (2a) by a shift in high tone realization by one syllable. High tones originating on other verbal prefixes (i.e. subject agreement prefix or aspect prefix) show less of a peak delay but nevertheless a high pitch plateau that continues into the following syllable. The transcription shows a high tone on the tone-contributing syllable as well as on the subsequent syllable. Though the difference between (1) and (2b) is obvious in the acoustic data (and the poster will show the results), a transcription of these different tone patterns are identical.

- (2) a. *re-lé-námóla lefsifsing*
1stPL-ObjAGR-rescue in.dark
'We are rescueing it in the dark.'
- b. *re-sá-námóla lefsifsing*
1stPL-ASP-rescue in.dark
'We are still rescueing in the dark.'

Thus, the current acoustic study reveals that there are considerable differences in the alignment of a high pitch target considering which morphological constituent the high tone originates from. The conventional transcription method marking syllables for high and low tones in a categorical manner cannot adequately captures these differences.

Similar differences can be found in contexts with two immediately adjacent high tones (so-called OCP contexts). Again, morphological constituency plays a role in

the realization and alignment of high tones. The morphosyntactic boundary in question is the one between the so-called auxiliary stem and the so-called macrostem (marked by]_{AUX} in the examples; for a motivation see Myers 1998). To give a brief summary of the results: Adjacent high tones which originate within the same morphosyntactic constituent, as within the auxiliary stem in (3a) are realized with a high pitch plateau. Adjacent high tones which occur across a morphosyntactic boundary, as in (3b), are realized with two pitch peaks separated by two low-pitched syllables. Adjacent high tones from which the first originates on the object agreement prefix are realized with high pitch plateau (as opposed to two pitch peaks) which is shifted by one syllable (cf. (2a)). Again, the poster will show pitch tracks by four speakers for illustration.

- (3) a. *ó-sá-loya lesogana*
 3rdSG-Aspect]_{AUX}-bewitch young.man
 ‘He is still bewitching the young man.’
- b. *ó-hula mókgalabje*
 3rdSG]_{AUX}-rob old.man
 ‘He is robbing the old man.’
- c. *re-le-mémá lefsifsing*
 1stPL-ObjAGR-invite in.dark
 ‘We are inviting him in the dark.’

The importance of morphological constituency and morpho-syntactic domains within the verbal domain has been reported in earlier studies on tone in Bantu (e.g. Myers 1998 for the neighboring language Shona). However, acoustic data are missing that would allow insight into the mechanism at hand as well as comparison across different Bantu varieties.

In carrying out acoustic studies on the alignment of high tones in a Southern Bantu languages, the present study wants to advance the investigation of tone in these languages as well as providing cross-linguistically comparable data.

References

- Downing, L.J., Mtenje, A. & B. Pmpino-Marschall (2004). Prosody and Information Structure in Chichewa. In ZASPiL 37: 167-187.
- Govender, N., Barnard, E. and M. Davel (2005). Fundamental frequency and tone in isiZulu: initial experiments. Paper presented at Interspeech 2005, Lisbon, Portugal.
- Lombard, D. (1976). Aspekte van Toon in Noord-Sotho. PhD thesis, University of South Africa.

- Myers, S. (1998). AUX in Bantu Morphology and Phonology. In *Theoretical Aspects of Bantu Tone*. L. Hyman & C.W. Kisseberth, eds., Stanford: CSLI Publications, pp. 231-264.
- Myers, S. (1999). Tone Association and F0 Timing in Chichewa. *Studies in African Linguistics* 28 (2): 215-239
- Myers, S. (2003). F0 Timing in Kinyarwanda. *Phonetica* 60: 71-97.
- Roux, J. C. (1995). Prosodic data and phonological analyses in Zulu and Xhosa. *South African Journal of African Languages* 15(1): 19-28.
- Xu, Y. (2006). Principles of Tone Research, In *Proceedings of International Symposium on Tonal Aspects of Language*. LaRochelle, France, pp. 3-13.