The acoustic characteristics of voiced bilabials in Basaá: A three-way contrast of implosives, explosives and nasal elements

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Implosive consonants are characterised by substantial cross-linguistic acoustic variation. Although traditionally characterised by ingressive airflow and laryngeal lowering, they can occur without the former and share the latter with voiced plosives (Clements et al., 2002). Their variability suggests that they are abstract typological categories realised through various combinations of articulatory movements, airflow directions, timing and phonation types (Lindau, 1984). Previous research examined implosive-explosive contrasts, finding that implosives may exhibit shorter negative VOT than explosives, as well as higher amplitude and F0 during oral closure and at vowel onset (Mori, 2023). This exploratory study extends this line of research by investigating voiced (naso-)oral closure duration, intensity and F0 in a three-way bilabial contrast between the voiced implosive /ɓ/, the prenasalised explosive voiced stop /ᵐb/, and the syllabic nasal - implosive sequence /m̩ɓ/ in Basaá, a Northwest Bantu language spoken in Cameroon (Makasso & Lee, 2015).

The analysis included 144 word-tokens uttered by four adult L1 Basaá speakers (two male and two female) from the village of Ndjockloumbè (Sanaga-Maritime, Littoral Province), comprising nine word-items, with three items for each consonant category and four repetitions per speaker. The data was manually annotated on Praat TextGrids (Boersma & Weenink, 2019) and extracted with a custom-made Praat script. Duration was calculated from the onset of voiced oral or naso-oral closure to the consonant burst release. F0 and intensity were sampled at 21 intervals of 10 ms across a 200-ms window centred on the consonant burst. Because intensity is a relative measure, values were normalised by subtracting the intensity value of the 21st sampling interval (+100 ms into the following vowel) from all other intervals. Given the nature of the study and the small number of speakers, the results were analysed descriptively. Further statistical analyses are currently underway to assess the significance of the observed patterns.

As shown in Figure 1, the three consonant categories differed clearly in terms of closure duration. Across the combined data comprising all speakers, mean closure duration was shortest for /ɓ/ (77.42 ms, SD = 34.99), followed by /ᵐb/ (135.48 ms, SD = 31.16), while /m̩ɓ/ showed the longest closure duration (211.77 ms, SD = 46.26). The same ordering was also observed individually in each speaker, suggesting that a preceding nasal element contributes substantially to longer duration. Further, the considerably longer closure duration of /m̩ɓ/ may additionally reflect the syllabicity of the nasal element /m̩/, which functions as a tone-bearing unit in Basaá, distinguishing the syllabic nasal-implosive sequence from the prenasalised stop /ᵐb/.

In terms of intensity, the highest pre-release values were observed for /m̩ɓ/, followed by /ɓ/ and /ᵐb/, as reported in Figure 2. The relatively high intensity associated with /m̩ɓ/ may reflect sustained voicing during naso-oral closure. F0, on the other hand, provided a less consistent distinction between the consonant categories: the highest mean F0 at release was observed for /ɓ/, but the overall F0 trajectories varied across speakers. Instances of item-specific variation may also be associated with vowel height and tone, although these factors are not independently balanced in the present materials and therefore cannot be separated from consonant-category effects.

These findings contribute to the acoustic documentation of Basaá and to the cross-linguistic understanding of how implosives are realised within contrastive sets. In particular, the three-way comparison indicates that duration may provide a clearer distinction between /ɓ/ , /ᵐb/ and /m̩ɓ/ than F0 or intensity in the present data. Future research with a larger speaker sample, balanced tonal and vowel-quality conditions, and inferential modelling will be necessary to determine the contribution of these cues to the acoustic description of Basaá.

Figure 1. *Duration of the contrastive consonant categories. /m.b/ = /m̩b/*

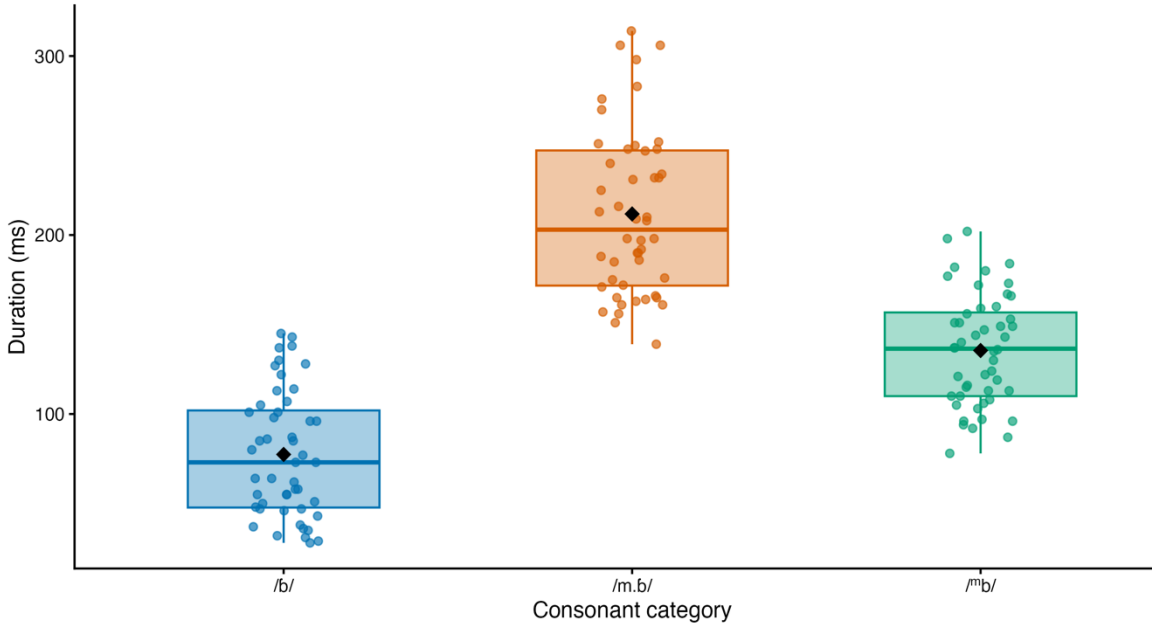
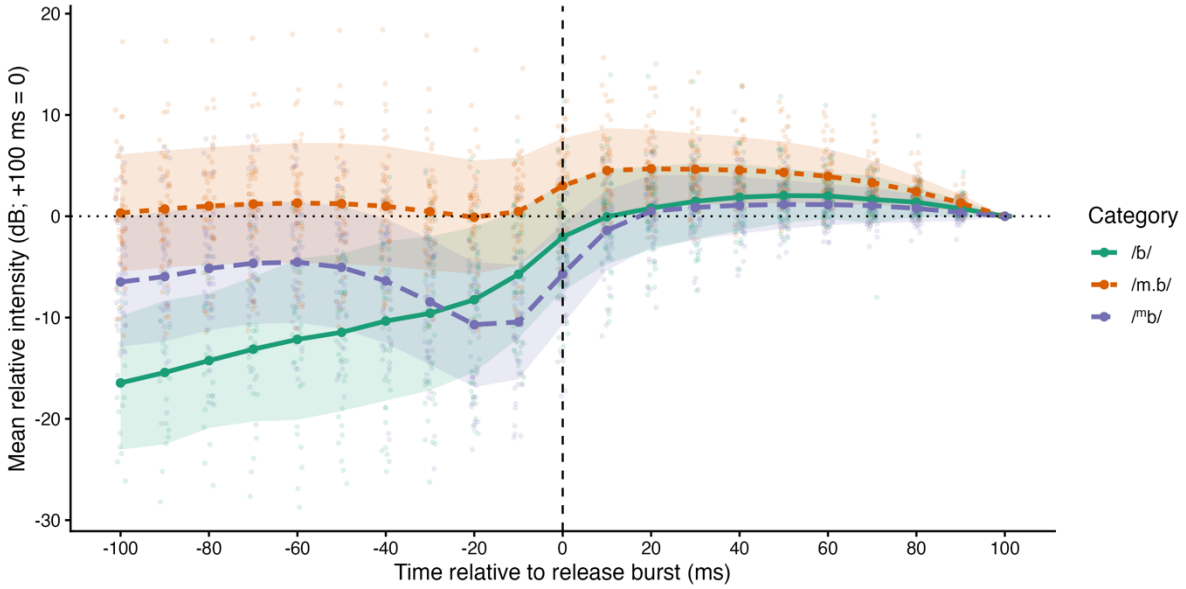


Figure 2. *Mean intensity trajectories by contrastive consonant, with ±1 SD and individual observations (faint points). /m.b/ = /m̩b/*



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