# Lengthening of VC intervals in Wubuy stress

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**Background:** Stress in Australian Indigenous languages has been the topic of descriptive (impressionistic) and instrumental examination, but has proven elusive to characterise acoustically. Most Australian languages are reported to have main stress initially in words or roots [1], although some northern Australian languages reportedly prefer penultimate main stress; none of these languages have been instrumentally examined, however. Quantity contributed by long vowels is common [1], but by closed syllables rare, and not instrumentally investigated thus far (though see preliminary results in [2]). Despite vowel duration being the most common correlate of stress cross-linguistically according to [5], vowel duration has not commonly been reported to play this role in Australian languages, and it is unclear whether vowel duration might conflict with phonemic vowel length distinctions. **The Study:** We examined the acoustic correlates of lexical stress in the highly endangered non-Pama-Nyungan language Wubuy (a.k.a. 'Nunggubuyu', Northern Territory, Australia), to investigate the afore-mentioned contribution of syllable weight, as well as position in word. Wubuy has previously been analysed in a metrical framework as having quantity-sensitive stress, where heavy syllables are defined as those with long vowels, or syllables closed by a heterorganic (but not homorganic) consonant cluster, but otherwise penultimate stress in words with light syllables [6]. We propose that Wubuy stress is indeed penultimate, but that stress shifts to the initial syllable when the initial syllable is heavy (long, closed). **Method:** Four female, literate Wubuy speakers produced 5-10 repetitions of a total of 40-50 trisyllabic noun roots with open (/CV/), closed (/CVC/) and long (/CV:/) syllables in first and second position in words, in both frame-initial and frame-medial position (here combined). Words were selected to include stops in as many syllable onsets as possible, to allow for consonant duration analysis. Recordings were auto-segmented and labelled in WebMAUS with hand-correction. Only syllables with stop-onsets were included in the analysis, resulting in 3498 syllables. We extracted stop constriction durations in syllables 2 and 3; VOT in Syllables 1-3; and all vowel durations (/a, i, u/ and long vowels /a:, i:/). **Results & Discussion:** A LME model with 'syllable number', 'stress', 'syllable weight' and 'vowel' as fixed factors and participant as a random effect indicate that vowel durations increase throughout the word (see **Fig 1**), presumably a domain-final lengthening effect [8]. Penultimate syllables were longer, except when the initial syllable was heavy, when the initial syllable was longest, suggesting that (a) our hypotheses about stress placement are correct and (b) that duration is a reliable cue for stress (see **Fig 2**). The fact that vowel duration appears to be the most consistent correlate for stress is despite the existence of phonemic vowel length. There was also a significant effect of vowel, predominantly driven by the long vowel /a:/, and an effect of syllable weight, again predominantly driven by 'long' syllables with the vowel /a:/ (all $p < .001$). Two additional LME models were fit to the data to test for the effect of preceding stress on the following onset stop duration (combined CD + VOT in ms in Syllable 2 and 3 respectively). Again, the results were consistent with our predictions: consonants are longer following stressed than unstressed syllables (both $p < .001$) (**Figs 3, 4**). We thus find similar correlates of vowel duration and post-tonic lengthening as have been described for other Australian languages, hence the VC 'interval' is lengthened. To our knowledge however, this is the first demonstration of these correlates in a language with penultimate stress and with quantity sensitivity of the kind described here.

**Figure 1.** Vowel duration (in ms) by vowel and syllable position. Error bars indicate SD.

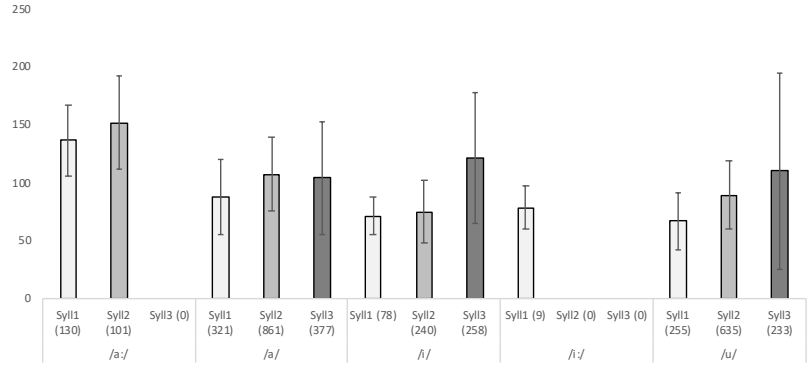



**Figure 2.** Vowel duration (in ms) by syllable position, predicted stress, and syllable weight. Error bars indicate SD.

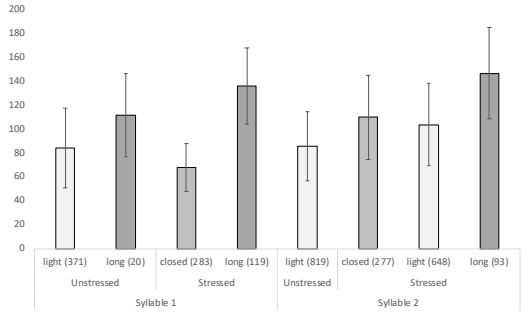



**Figure 3.** Syllable 2 stop duration (in ms).

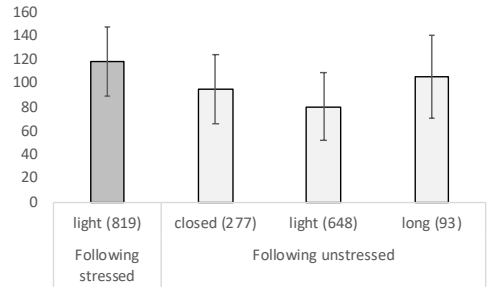
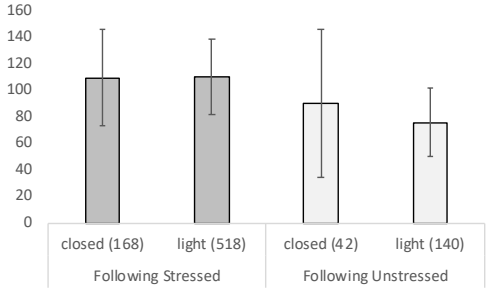



**Figure 4.** Syllable 3 stop duration (in ms).




## References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