Lexical stress in Yami: investigating penultimate and final prominence

Chun-Jan Young

University of California, Santa Barbara

This study investigates putative categories of lexical stress in Yami (Tao), a Philippine-type Austronesian language of Orchid Island, Taiwan. Yami has been previously described as having a default pattern of *final stress* for most content words, except for the class of stative verbs (adjectives) which exhibit *penultimate stress* ([1], [2]). However, this claim is based on impressionistic judgments of words uttered in isolation and has not yet been supported by empirical evidence. Furthermore, it has been shown by [3] that final stress in other Philippine languages like Tagalog behaves divergently from penultimate stress and suggest that final stress may in fact be phrasal, rather than lexical, in nature, thus calling for a reexamination of previous classifications of word stress in closely related languages such as Yami.

An experiment was carried out with 5 native speaker participants in field conditions. Participants were prompted with audio-visual stimuli of simple declarative sentences containing 25 embedded target words, comprised of 13 stative verbs (putative penultimate stress) and 12 nouns (putative final stress). Stimuli were accompanied with pictorial representation and a recording of a native speaker reading each stimulus. All target words were trisyllabic and were balanced in such a way so that the vowel phonemes /a/, /i/, and /u/ occurred at least three times each in the second and third syllables (all in CV structures) across both word classes (i.e. stative verbs (SV) and nouns (N)). Target words were embedded in the carrier sentence "*koan na am __ koan na*" (she said __ she said). Participants produced each sentence twice, one after the other. The vowels of the second and third syllables of each production of the target words (n=430) were segmented and coded using Praat [4]. Duration, intensity, and F0 measurements were extracted using VoiceSauce [5].

Individual linear mixed-effects models were fitted for: (1) *duration* (R^2_m = 0.232, R^2_c = 0.716), (2) *maximum F0* (R^2_m = 0.414, R^2_c = 0.605), (3) *mean F0* (R^2_m = 0.513, R^2_c = 0.744), (4) *maximum intensity* (R^2_m = 0.251, R^2_c = 0.421), and (5) *mean intensity* (R^2_m = 0.239, R^2_c = 0.481), using the package *lme4* in R ([6], [7]). A stepwise backwards model selection was carried out for each model, beginning with the following predictors and all possible interactions as fixed effects: (1) *word class* (SV, N), (2) *syllable position* (second (S2) or third syllable (S3)), and (3) *vowel* (a, i, u). Maximal random effects structures of *word* and *speaker* (with varying slopes for *speaker*) were also included for each model, prior to simplification via likelihood ratio tests. R^2_m and R^2_c values were computed using the package *MuMIn* in R [8].

The final models show that stative verbs exhibited significantly higher values in S2 than S3 for all response variables. However, nouns did not show significant differences between S2 and S3 for most response variables, although maximum F0 of all vowels and maximum intensity of /i/ were significantly higher in S3 than S2. Across word classes, the penultimate syllable (S2) exhibited significantly higher values for most variables in stative verbs as opposed to nouns. Mean intensity of all vowels and maximum intensity of /u/ were not significantly different. Finally, the final syllable (S3) did not show any significant difference for most variables regardless of word class (SV or N), except maximum intensity of /i/ (significantly lower for stative verbs than nouns).

There is thus considerable evidence for penultimate stress in Yami, with duration, intensity, and F0 serving as correlates. On the other hand, final prominence was only found for the specific measures of maximum F0 (in all vowels) and maximum intensity (for /i/), thereby casting doubt on the claim of final stress. However, there remains a small amount of evidence for some alternative form of final prominence, as the higher maximum F0 in final syllables of nouns (compared to penultimate) seem to suggest the presence of an accent with an HL contour. This possible final accent may instead be phrasal, as the quotative nature of the carrier sentence placed target words at a potential boundary; such a possibility presents a question for future research, in order to verify the exact source of the observed prominence effects (word or phrase).
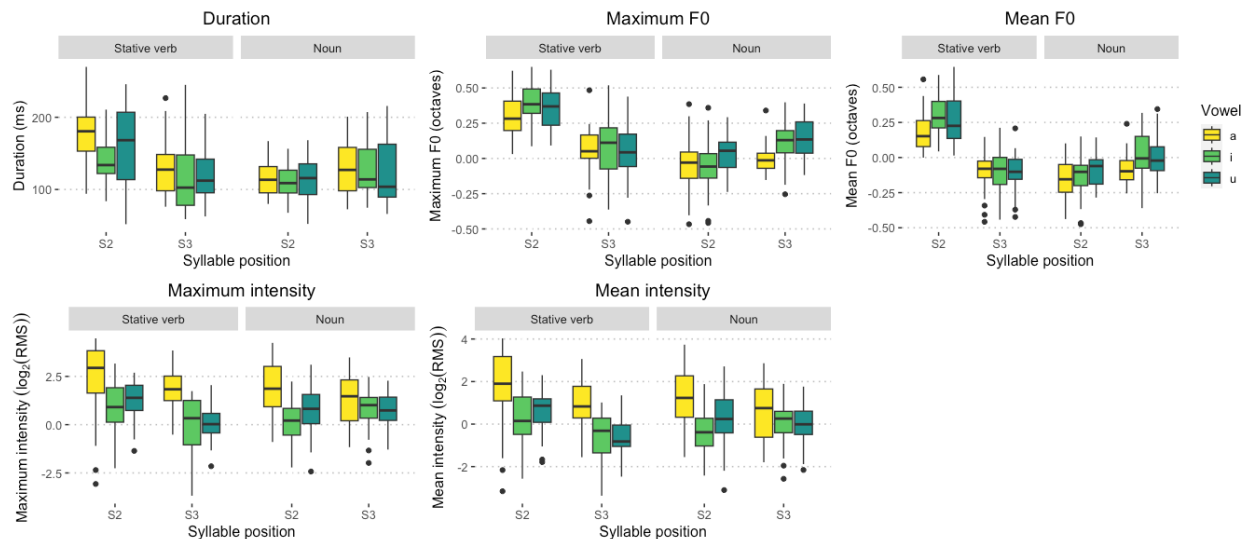
Fig. 1. Duration, maximum F0, mean F0, maximum intensity, and minimum intensity of vowels in each syllable position (S2, S3) by each word class (stative verb, noun)
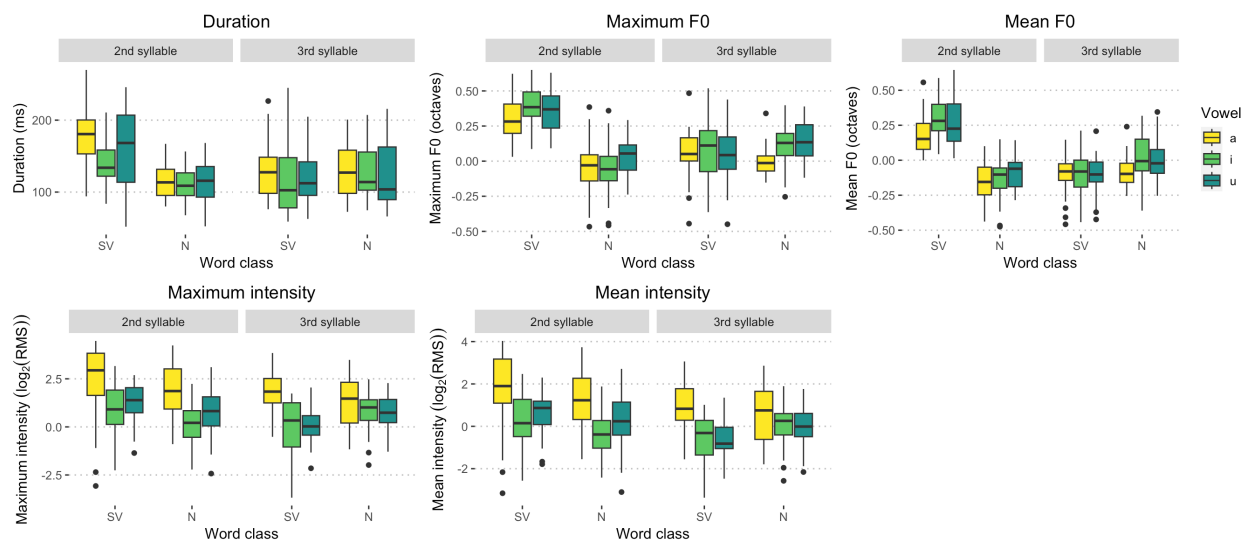

Fig. 2. Duration, maximum F0, mean F0, maximum intensity, and minimum intensity of vowels in each word class (stative verb, noun) by each syllable (S2, S3)

References

[1] D. V. Rau and M.-N. Dong, *Yami texts with reference grammar and dictionary*. in Language and Linguistics Monograph Series, no. A-10. Taipei: Institute of Linguistics, Academia Sinica, 2006.

[2] D. V. Rau and M.-N. Dong, *Dawu yu yufa gailun* 達悟語語法概論 *[Introduction to Tao Grammar]*. in Formosan Language Series 台灣南島語叢書, no. 14. New Taipei City: Council of Indigenous Peoples, 2018.

[3] N. P. Himmelmann and D. Kaufman, "Austronesia," in *The Oxford Handbook of Language Prosody*, C. Gussenhoven and A. Chen, Eds., Oxford University Press, 2020, pp. 369–383. doi: 10.1093/oxfordhb/9780198832232.013.28.

[4] P. Boersma and D. Weenink, "Praat: Doing phonetics by computer [Computer program version 6.4.01]." Nov. 30, 2023. [Online]. Available: http://www.praat.org

[5] Y.-L. Shue, P. Keating, C. Vicenik, and K. Yu, "VoiceSauce: A program for voice analysis," in *Proceedings of the ICPhS XVII*, Hong Kong, 2011, pp. 1846–1849.

[6] D. Bates, M. Mächler, B. Bolker, and S. Walker, "Fitting Linear Mixed-Effects Models Using lme4," *J. Stat. Soft.*, vol. 67, no. 1, 2015, doi: 10.18637/jss.v067.i01.

[7] R Core Team, "R: A language and environment for statistical computing." R Foundation for Statistical Computing, Vienna, Austria, 2024. [Online]. Available: https://www.R-project.org/

[8] K. Bartoń, "MuMIn: Multi-Model Inference [version 1.47.5]." 2023. [Online]. Available: https://CRAN.R-project.org/package=MuMIn