Boundary Length Provides Evidence of Final-[h] in Tagalog

Overview: Previous accounts have debated whether word-final syllables in Tagalog can be truly open, or whether seemingly open syllables are closed with the consonant [h] (French 1988, Llamzon 1966). The potential coda does not appear well in recordings of bare roots, but [h] will appear under affixation, supporting the argument for a coda. If a coda does exist in seemingly open final syllables, then the surface forms of all words of Tagalog would close with a coda, representing an active case of the constraint FINAL-C (McCarthy 1993, McCarthy and Prince 1993). This study uses phonetic evidence to show that the degree of phrase-final lengthening in final-[h] words is explained by positing that these words close with a consonant at the surface.

Background: Seemingly open word-final syllables have been argued to close with [h]. Problematically, final-[h] does not always appear well in the signal due to its low amplitude (fig. 1). This makes it difficult to measure experimentally, but it does appear under affixation (1).

> (1) Possible [h]-final words after affixation (Schachter and Otanes 1972)
> a. tasa(h) 'cup' + -an → tasahan 'measure'   c. plantsa(h) 'iron' + -an → plantsahan 'to iron'
> b. punta(h) 'go' + -an → puntahan 'go to'   d. sabi(h) 'saying' + -in → sabihin 'say'

Whether these bare roots end in a coda or not makes different predictions about the degree of boundary lengthening they will undergo. Phrase-final lengthening is a well-attested phenomena found across the world's languages, and studies of pre-boundary lengthening have shown that it primarily targets the final rime—VC# in a closed syllable, and V# in an open one (Wightman et al. 1992). Measuring only the nuclear vowel of a closed syllable will therefore detect only a portion of the boundary effect. In this study, I test the hypothesis that the debated words of Tagalog do close with a coda – the "ghost segment" [h] – by measuring the length of the nuclear vowel in phrase-medial and -final contexts and comparing the lengthening effect to that in syllables closed by an oral consonant. The vowel should show a greater lengthening effect in an open syllable (…V#), relative to the lengthening effect in a closed syllable (…VC#), where the final C absorbs much of the effect.

Method: Ten words of the debated [h]-coda type and the ten words closed with an oral coda were pronounced in phrase-medial and -final position four times each. Four native speakers of Tagalog between ages 25 and 62 participated in this study. In debated words, the nuclear vowel was measured, and in words closed with an oral consonant, the final rime was measured for comparison.

Results: Words containing an oral coda showed a greater durational increase in phrase-final position than did words hypothesized to have [h] in coda (figure 2). Mean lengthening of word-final syllables in those with an oral coda was 95.097 ms and in the debated word type was 5.64 ms. A linear regression mixed effects model was applied, with speaker and iteration as random effects. A model including coda type was a significantly better fit than one that did not ($p < 0.001$).

Implications: Languages can require CVC over CV in word-final position, a trend that is captured in a constraint-based framework through FINAL-C. Analyzing Tagalog as requiring a final consonant in the surface forms of all words places it as a language with an active FINAL-C effect. This study finds that durational increases at boundaries in debated [h]-coda words are small compared to those in words closed with an oral consonant, a result that is predicted if these words truly close with [h], since measurement was of the nuclear vowel only. This analysis accounts for the observed difference in final lengthening and argues that Tagalog requires word-final syllables to be closed.
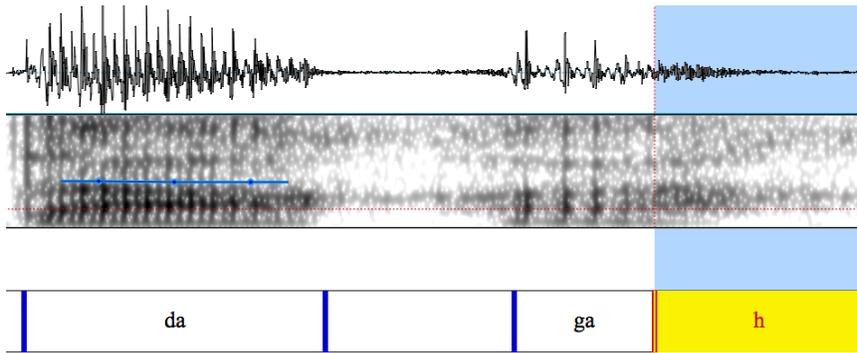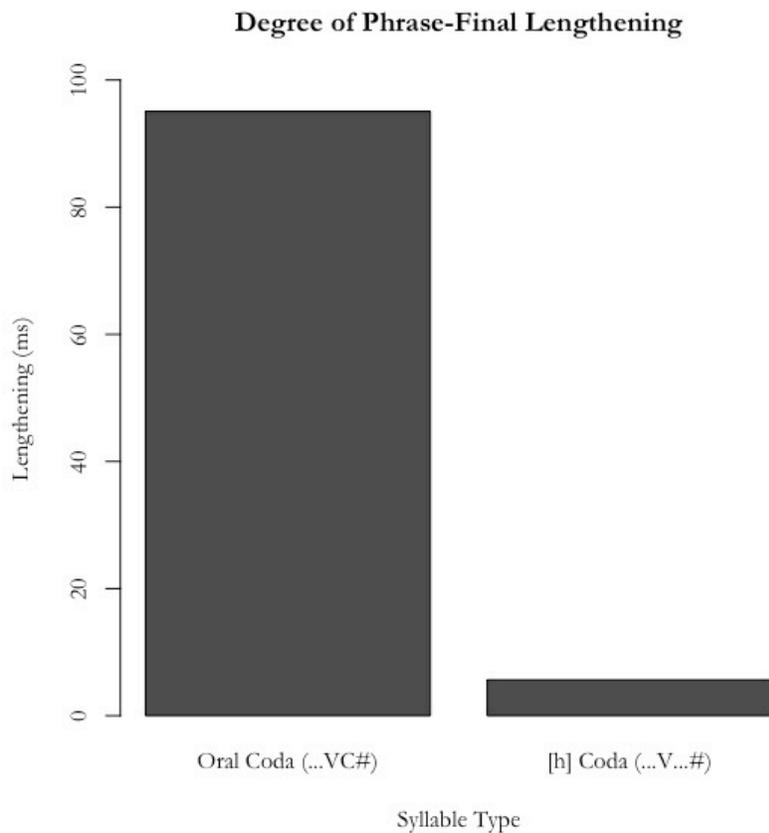
Figure 1: Example of word-final breathiness

| | da | | | ga | h |

Figure 2:

Degree of Phrase-Final Lengthening

(y-axis) Lengthening (ms)

(x-axis) Syllable Type — Oral Coda (...VC#) — [h] Coda (...V...#)

References: French, C. M. 1988. Insights into Tagalog Reduplication, Infixation, and Stress from Nonlinear Phonology. The Summer Institute of Linguistics at the University of Texas at Arlington.| Llamzon, T. A. 1966. Tagalog Phonology. *Anthropological Linguistics*, Vol. 8, 30-39. | McCarthy, J.J. 1993. A case of surface constraint violation. Constraint-Based Theories in Multilinear Phonology. *Special Issue of Canadian Journal of Linguistics* 38, 169-195. | McCarthy, J.J., and Prince, A. 1993. Generalized Alignment. *Yearbook of Morphology*, 79–153. | Schachter, P. and Otanes, F. 1972. *Tagalog Grammar*. University of California Press. | Wightman, C., Shattuck-Hufnagel, S., Ostendorf, M., and Price, P. 1992. Segmental durations in the vicinity of prosodic phrase boundaries. *Journal of the Acoustical Society of America* 91, 1707-1717.