



Speech Error Evidence on the Role of the Vowel in Syllable Structure

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Background

- Theoretical Issues
 - What is the internal structure of the syllable?
 - What is the role of the vowel in syllable construction?
- Prior Research
 - Speech errors are used to illustrate how syllables are constructed (Dell 1984; Goldstein et al. 2007; McKay 1970; Shattuck-Hufnagel 1979; and others)
 - Previous studies of speech errors "caught" in natural language environments have found a lower rate of errors on vowels than consonants (McKay 1970)

Research Questions

- Do speakers produce C and V speech errors at unequal rates, or are V errors just less salient in natural conversation?
- Is there a model of syllable structure which can explain any differential error rates between syllable components.

Participants

- 10 adult native English speakers

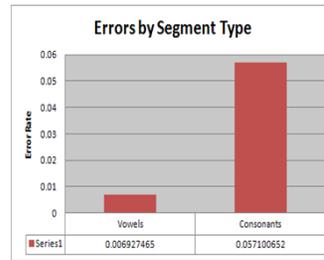
Experiment

- Fast, paced repetition of "phrases" of nonce CVC syllables
 - 45 4-syllable phrases repeated 6 times each
 - 10,800 total syllables produced

subject sees	vas pon dum fing
subject produces	1 self-paced repetition (not coded) 6 repetitions at 250 bpm

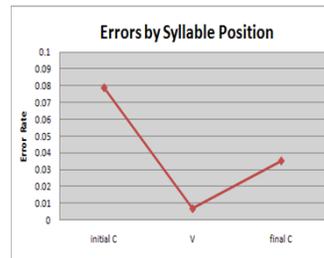
- 2 coders each coded half of the data and a 3rd coder coded 10% with a 95% agreement rate with the 2 primary coders.
- Coders were able to replay the data recordings as many times as necessary to ensure accurate coding, reducing the possibility of error salience confounding results.

Results



Significantly lower rate of errors on vowels than consonants

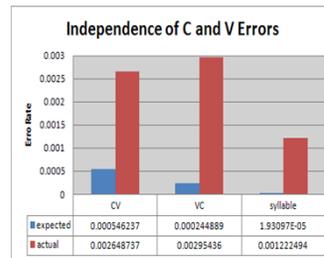
$$c2(1, N=1177) = 402.18, p < 0.0001$$



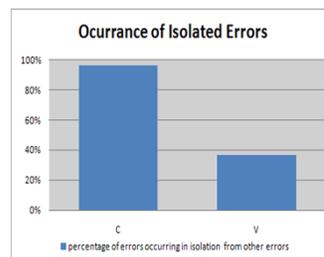
Significantly lower rate of errors on nuclei than codas

$$c2(1, N=415) = 187.57, p < 0.0001$$

Neither the sequential activation nor the hierarchical syllable models predict these asymmetries

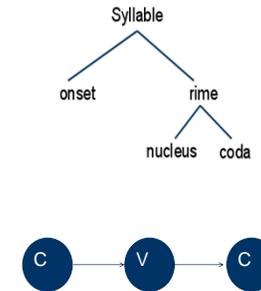


Errors in contiguous VC sequences occur more often than expected based on the rate of nucleus and coda errors, which is predicted by the hierarchical model, but errors in contiguous CV sequences also occur more often than expected, which the model does not predict.



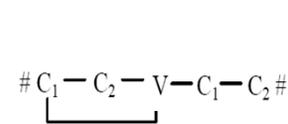
Errors on Cs frequently occurred as isolated errors, while errors on Vs occurred most often in conjunction with errors on one or both adjacent consonants.

Syllable Models



A hierarchical syllable model could predict a rate of contiguous VC errors higher than chance, but not the higher-than-chance rate of CV errors.

A sequential-activation syllable model could predict an asymmetry in the error rates of the onset and coda, since the coda is activated by the previous segments, but does not predict the other findings.



In the Articulatory Phonology model, onset and coda Cs are both coordinated with the vowel, which predicts asymmetries in the C and V error rates, as well as the higher-than-expected rates of both CV and VC errors.

Summary

- Speakers produced errors on vowels less often than on consonants, and on nuclei less often than on codas.
- Rates of errors on CV and VC pairs were above chance
- Errors on Vs most often occur with errors on at least one contiguous C, but not vice versa.
- The Articulatory Phonology model of syllable structure, with the additional feature of sequential activation, would best predict these observed asymmetries.

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