Cross-word alternation: alternating segment and trigger for alternation are in different words. E.g.:

Coronal flapping:
/t,d/ $\rightarrow$ [ɾ] /V(_#)V

Two puzzles about cross-word alternations

<table>
<thead>
<tr>
<th>Locality</th>
<th>Inherent Variability</th>
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Locality of production planning

Proposal: the locality as well as the probability of cross-word phonological interactions are a direct consequence of the locality of production planning.


Speech production planning: Hierarchical and incremental

![Diagram of speech production planning]

Higher-level information is available before detailed segmental and featural information. Segemental information is planned in small window, which may not include the following word.

If information about next word/segment is not yet available, the cross-word alternation cannot apply.

The probability of two words being encoded within the same window can be affected by upstream factors like syntactic/semantic complexity, lexical frequency or other processing considerations.


Conclusions

Production planning effects provide:

- An explanatory mechanism for gradient syntactic and lexical frequency effects on phonological patterns
- New, testable predictions about the relationship between phonological variability and other cognitive factors.

Locality of production planning

Production experiment

- Target word: nonce verb ending in /t/
- Subjects read sentences with two clauses where target was either followed by direct object (No Clause Boundary) or subject of next clause (Clause Boundary)

"While you bit Ernie, Mike will be studying"

"While you bit Ernie, Mike will be studying"

- Duration of vowel $\rightarrow$ measure of lengthening

Statistical analysis

- Syntax: flapping 2.7 times more likely if no clause boundary ($\beta$ = 0.98, p = 0.032)
- Vowel duration: estimate negative, but effect was not statistically significant ($\beta$ = -0.919, p = 0.18)

- Syntax has effect above and beyond lengthening/duration
- Effect of syntax is gradient

Corpus study

- Buckeye Corpus of Conversational Speech
- Extracted 11,738 tokens from 255 speakers, 590 words
- Word frequencies from SUBTLEX-US

Statistical analysis

- Controls: lengthening (normalized word duration), pause, number of syllables, underlying voicing
- Following word frequency: significant positive effect ($\beta$ = 0.29, p = 0.003)
- Pause and underlying voicing were only other sig. effects.

Gestural overlap? The Syntax and Frequency effects still appear after controlling for duration, so probably not reducible to temporal effects. But production planning locality could be complementary to, e.g. AP account

Whalen (1990), Boersma & Glasberg (1992)

Probability driven reduction?

Good question – comparing to, e.g. Probabilistic Reduction Hypothesis, predictions are similar when considering joint probabilities. Need to check non-reductive processes: ongoing work!

Jurafsky, Bell & Gregory (2001)

orianna.kilbourn-keron@mcgill.ca | http://is.gd/oriana

1Linguistics Department, McGill University;
2School of Communication Sciences and Disorders, McGill University

85(2) properties of a word affect the realization of its final /t/: Studies at the phonemic and sub-phonemic level.


"While you bit Ernie, Mike will be studying"