Modulation of the following segment effect on coronal stop deletion

Meredith Tamminga
University of Pennsylvania

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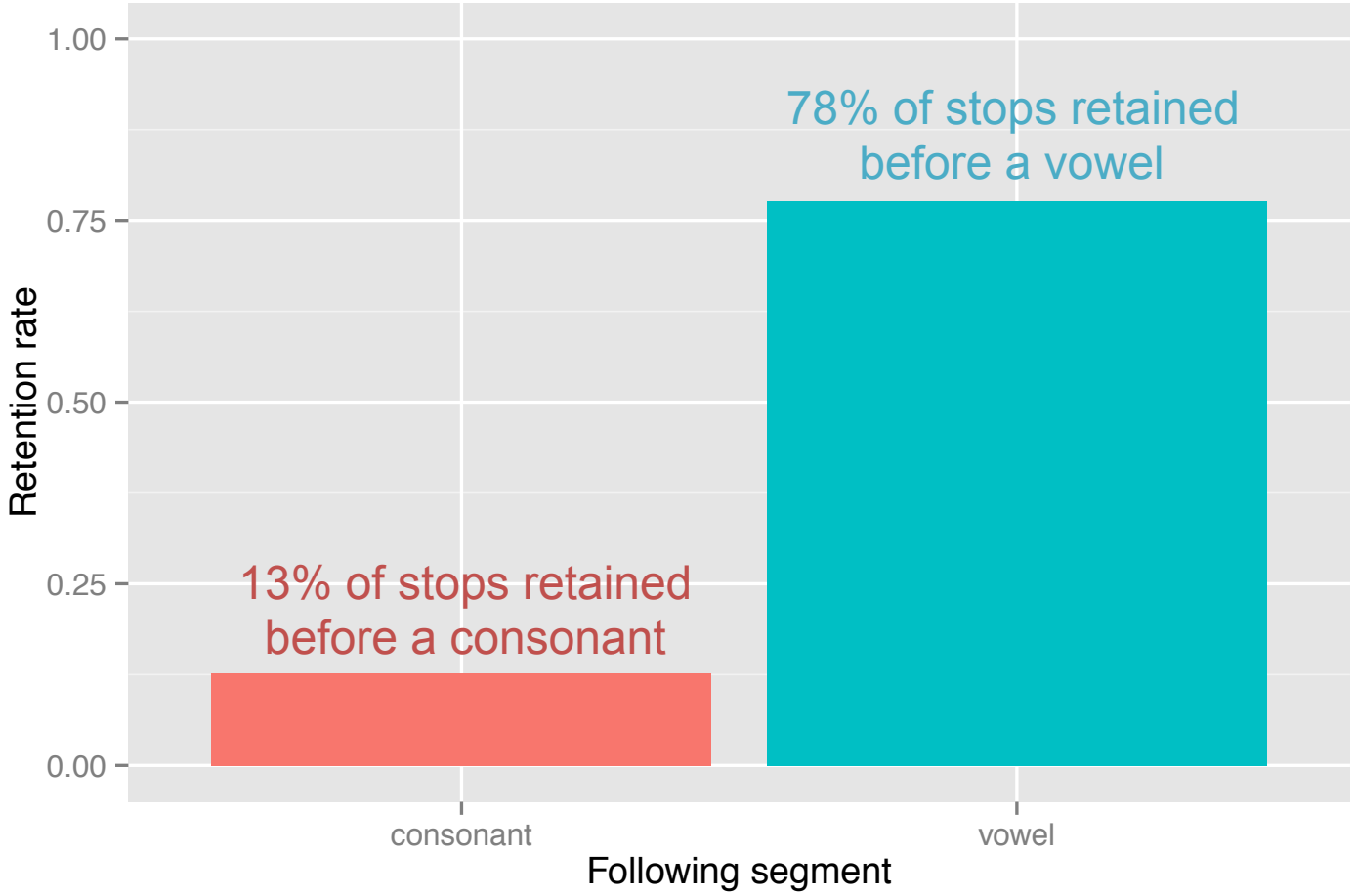
The following segment effect

…on deletion of word-final coronal stops in consonant clusters



The following segment effect

- Labov et al 1968; Wolfram 1969; Fasold 1972; Guy 1980, 1991a, 1991b; Santa Ana 1991; Jurafsky et al. 2001; Bybee 2002; Tagliamonte & Temple 2005; Hazen 2011; Fruehwald 2012; Tamminga 2014; Tanner et al. 2015
- Following Guy 1991a,b and Tanner et al. 2015: the following segment effect is malleable
- Different approaches to coronal stop deletion make different predictions about how other factors interact with the following segment effect

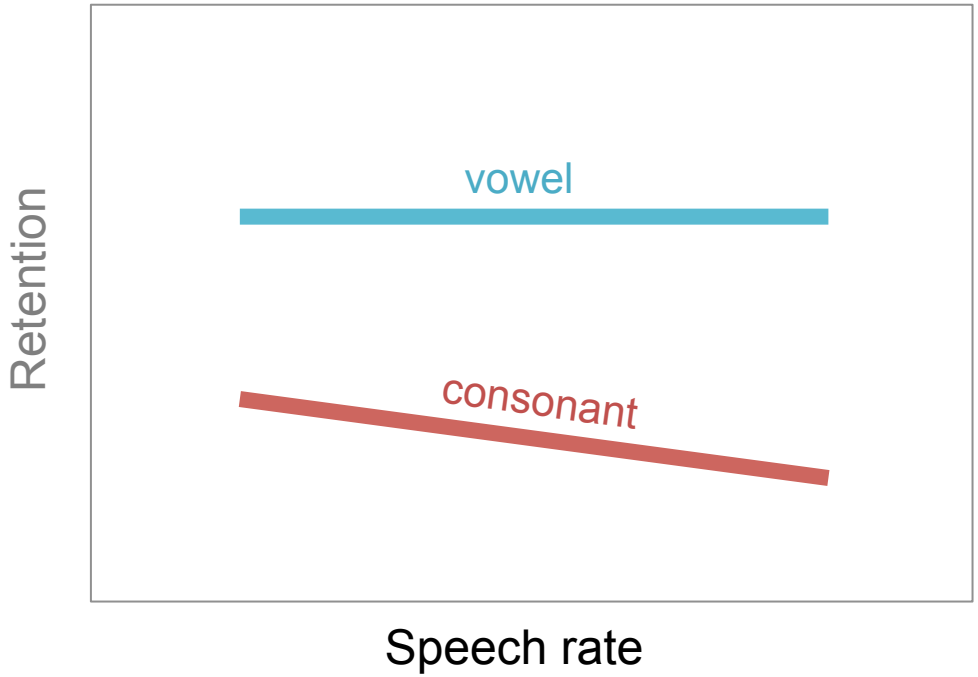
The following segment effect

- Assess three hypotheses that follow from different approaches to coronal stop deletion:
  - Following segment effect interacts with speech rate
  - Following segment effect interacts with lexical identity and frequency
  - Following segment effect interacts with syntactic structure

Interaction with speech rate

Predictions:

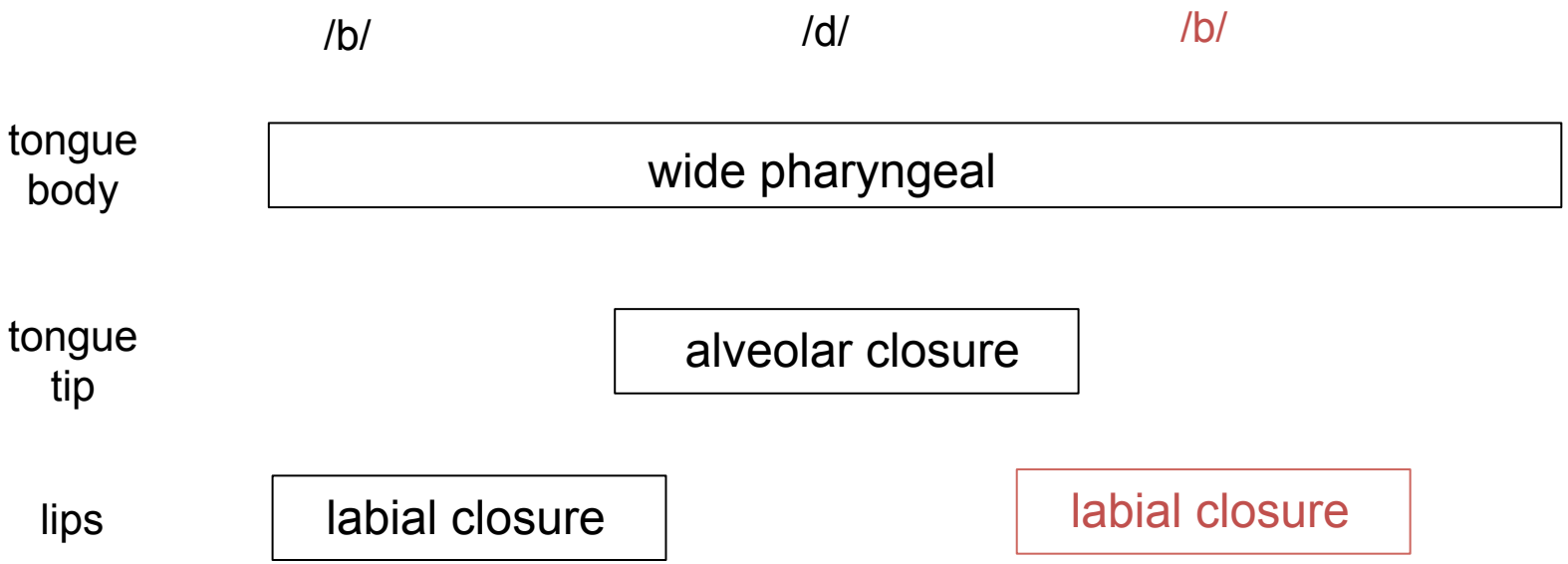
- Faster speech has more deletion
- Faster speech exaggerates the effect of a following consonant



Interaction with speech rate

Why?

- Fast speech compresses the time allotted to gestures, leading to overlap that is perceived as deletion



Browman & Goldstein 1992

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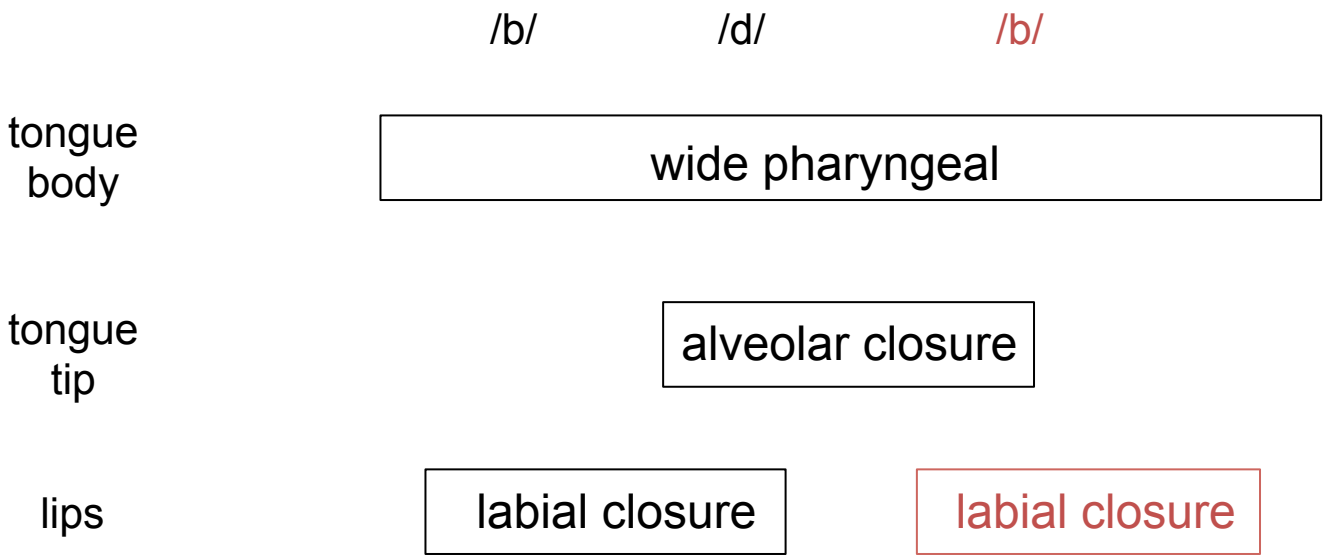

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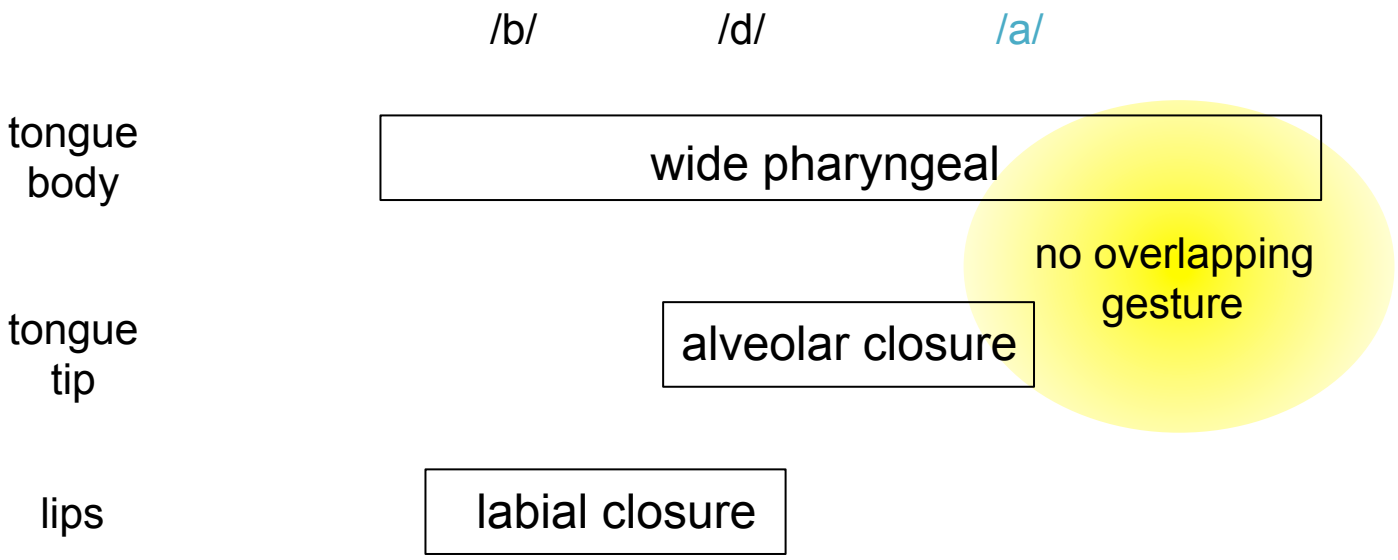
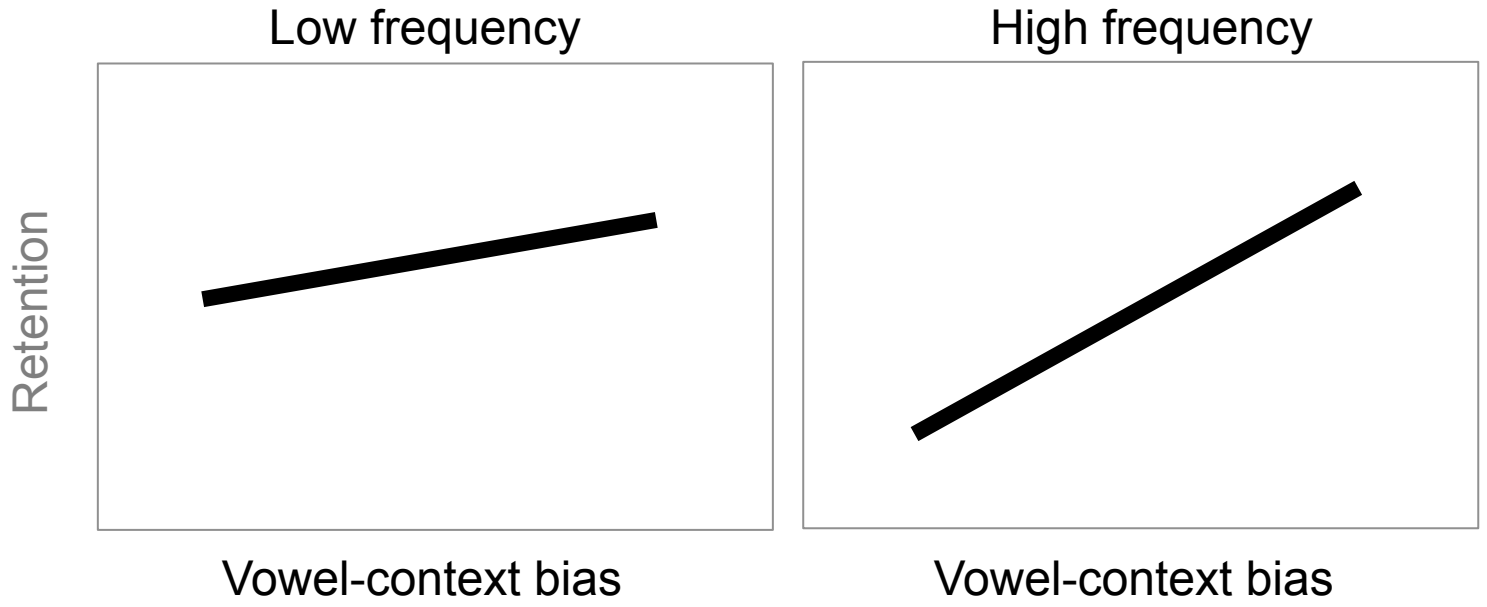


Browman & Goldstein 1992

Interaction with lexical frequency

Predictions:

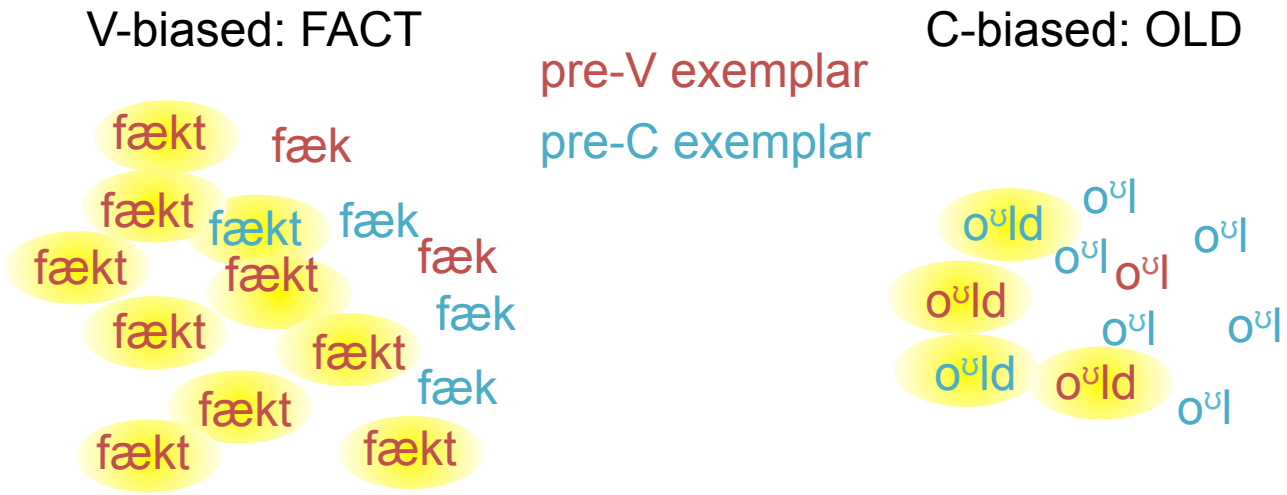
- Higher frequency words have more deletion
- Words that occur more before vowels have more retention
- Vowel-context bias is stronger in higher frequency words



Interaction with lexical frequency

Why?

- If a word has more pre-vowel than pre-consonant tokens in its exemplar cloud, and retention is higher before vowels, then overall the cloud will have more retention

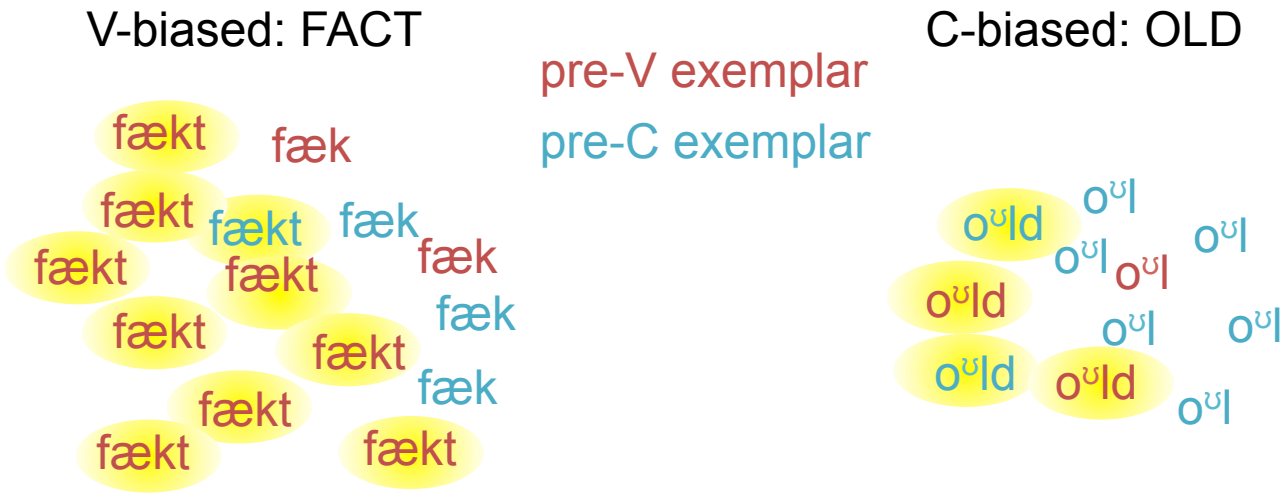


Pierrehumbert 2002

Interaction with lexical frequency

Why?

- In exemplar-theoretic models, allophonic biases accrue more rapidly in high-frequency words than low-frequency ones

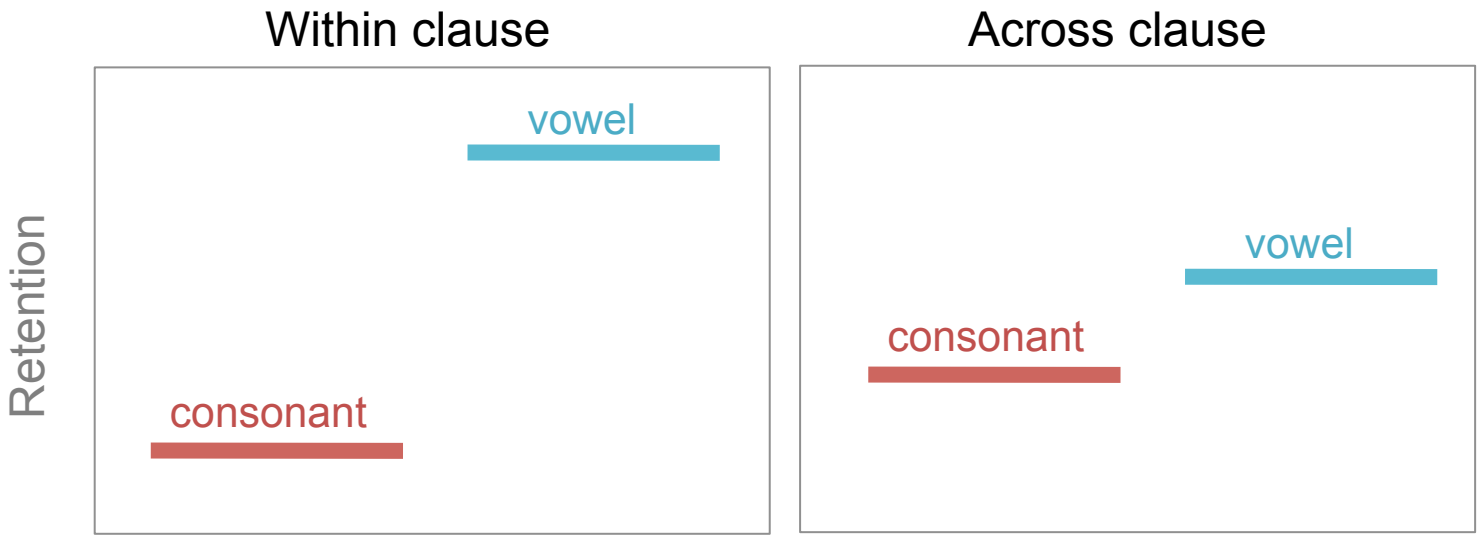


Pierrehumbert 2002

Interaction with syntactic structure

Predictions:

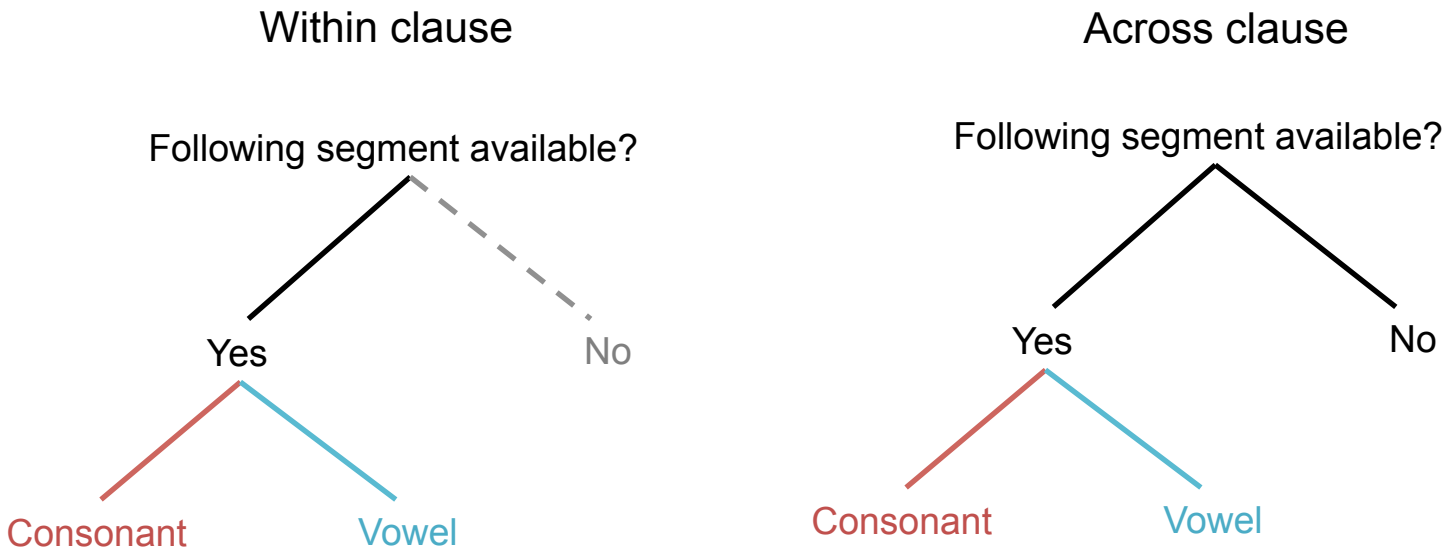
- Clause boundary reduces following segment effect



Interaction with syntactic structure

Why?

- New clause not always planned in time for the following segment to affect the variable outcome



Wagner 2012

Interaction with syntactic structure

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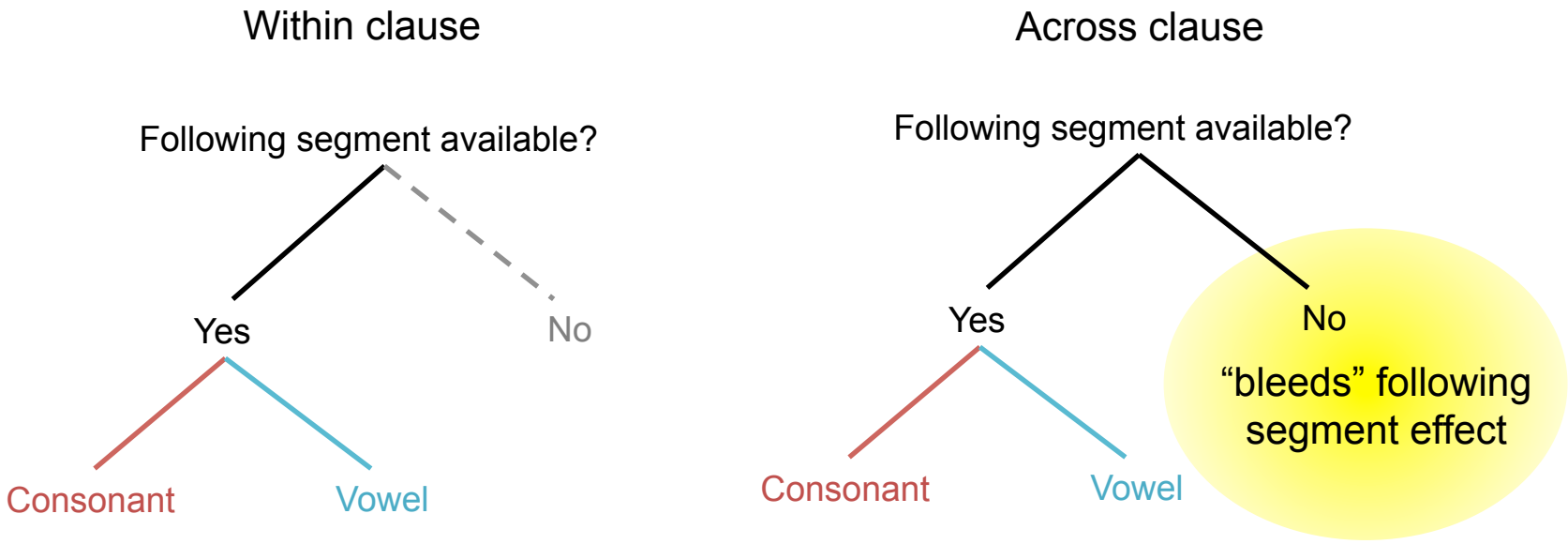
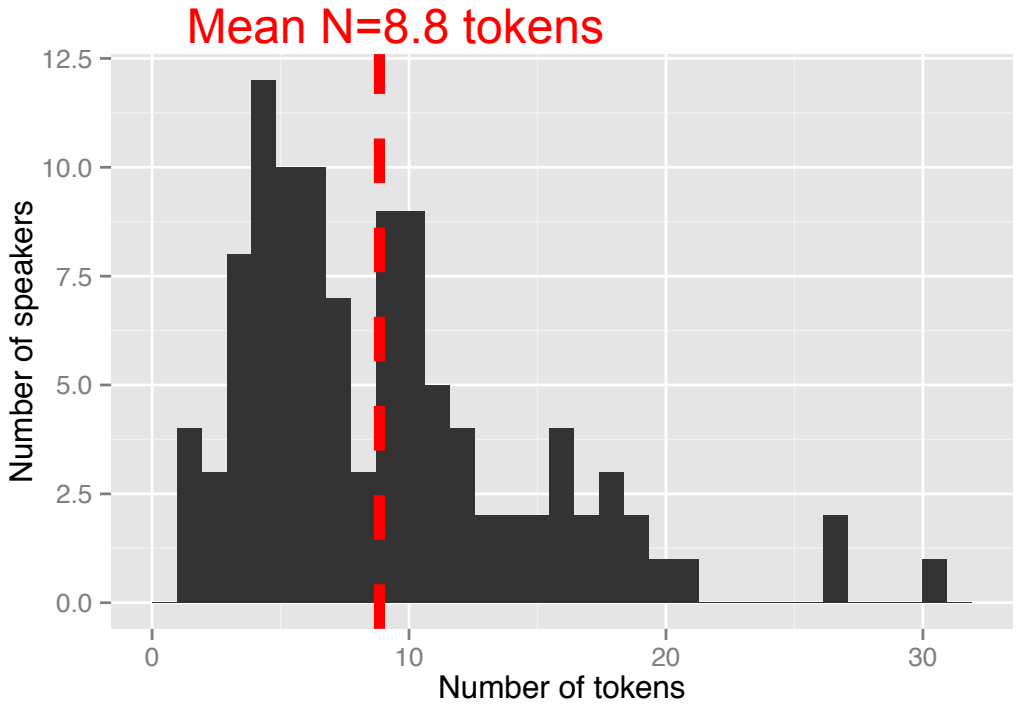


Wagner 2012

The deletion data

Sociolinguistic interviews with 106 white speakers (61 f, 45 m) from Philadelphia Neighborhood Corpus



Labov & Rosenfelder 2011

The deletion data

938 auditorily-coded observations of 73 word types that:

- Contain a final homovoiced cluster (Wolfram 1969)
- Are monomorphemic (Guy 1991a,b)
- Are monosyllabic
- Are content words
- Have a following vowel or non-approximant consonant

Restricted to avoid many-way interaction terms

Regression modeling

First pass:

retention ~

speaker gender +
preceding segment +
following segment * normalized speech rate +
vowel-context bias * log word frequency +
following segment * clause boundary

Regression modeling

	Estimate	Std. error	z-value	p-value
Intercept	-1.34	1.77	-0.757	0.449
Male speaker	-0.11	0.16	-0.72	0.470
Following vowel	3.68	0.25	14.64	< 2e-16
Clause-final	0.27	0.54	0.51	0.610
Preseg…	…	…	…	n.s.
Norm. speech rate	-0.16	0.11	-1.42	0.155
V-context bias	1.45	2.23	0.65	0.515
Log word frequency	-0.08	0.20	-0.41	0.684
Fol.V : clause-final	-1.46	0.59	-2.49	0.013
Fol.V : speech rate	0.03	0.13	0.22	0.823
V-bias : word freq	-0.10	0.25	-0.41	0.679

Regression modeling

Take two:

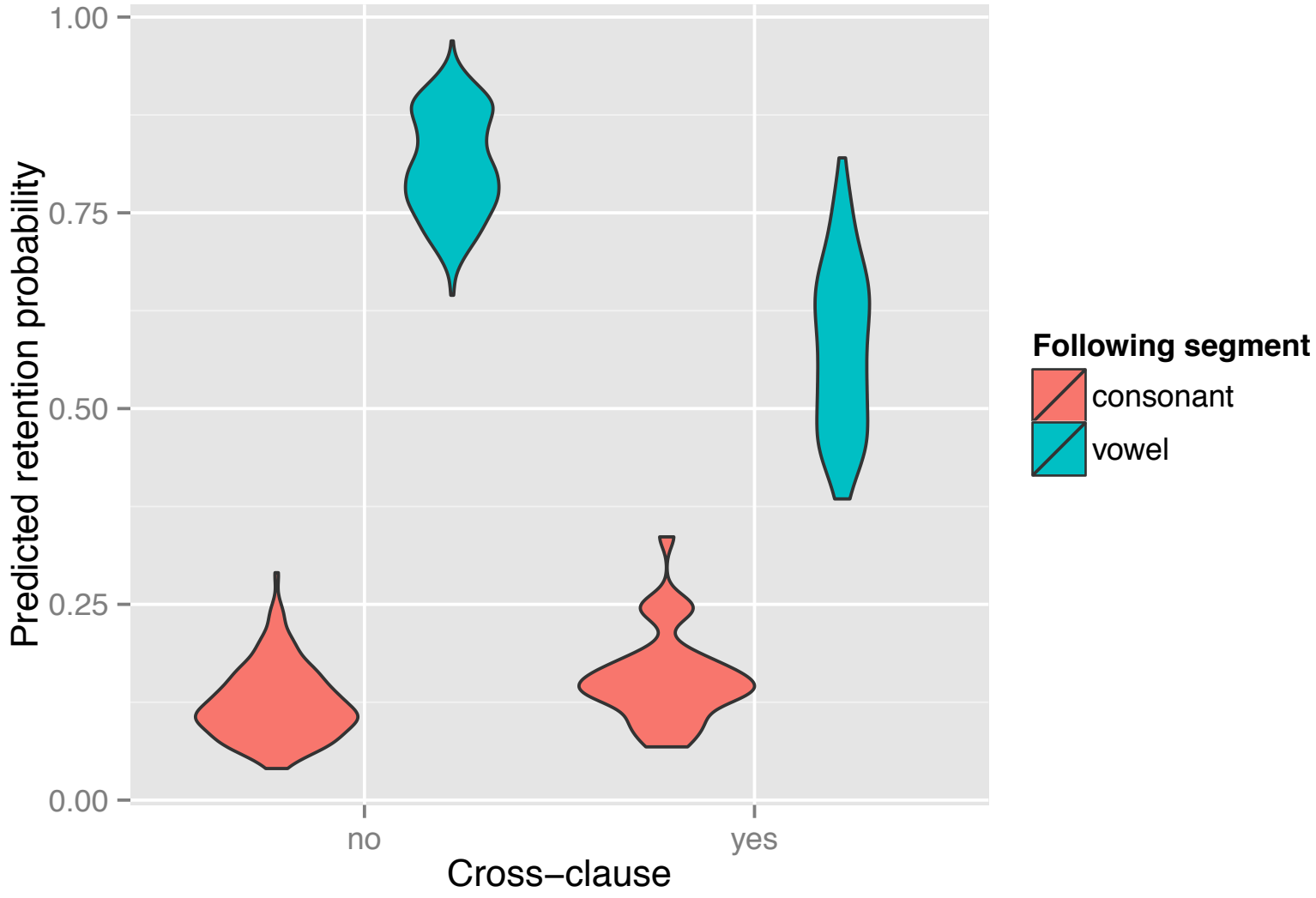
retention ~

speaker gender +
preceding segment +
normalized speech rate +
vowel-context bias +
log word frequency +
following segment * clause boundary

Regression modeling

	Estimate	Std. error	z-value	p-value
Intercept	-0.71	0.89	-0.79	0.428
Male speaker	-0.11	0.16	-0.69	0.489
Following vowel	3.68	0.25	14.68	< 2e16
Clause-final	0.25	0.53	0.47	0.64
Preseg…	…	…	…	…
Norm. speech rate	-0.14	0.05	-2.66	0.008
V-context bias	0.56	0.45	1.22	0.221
Log word frequency	-0.16	-0.08	-2.07	0.039
Fol.V : clause-final	-1.42	0.57	-2.48	0.013

Clause boundary weakens following segment effect



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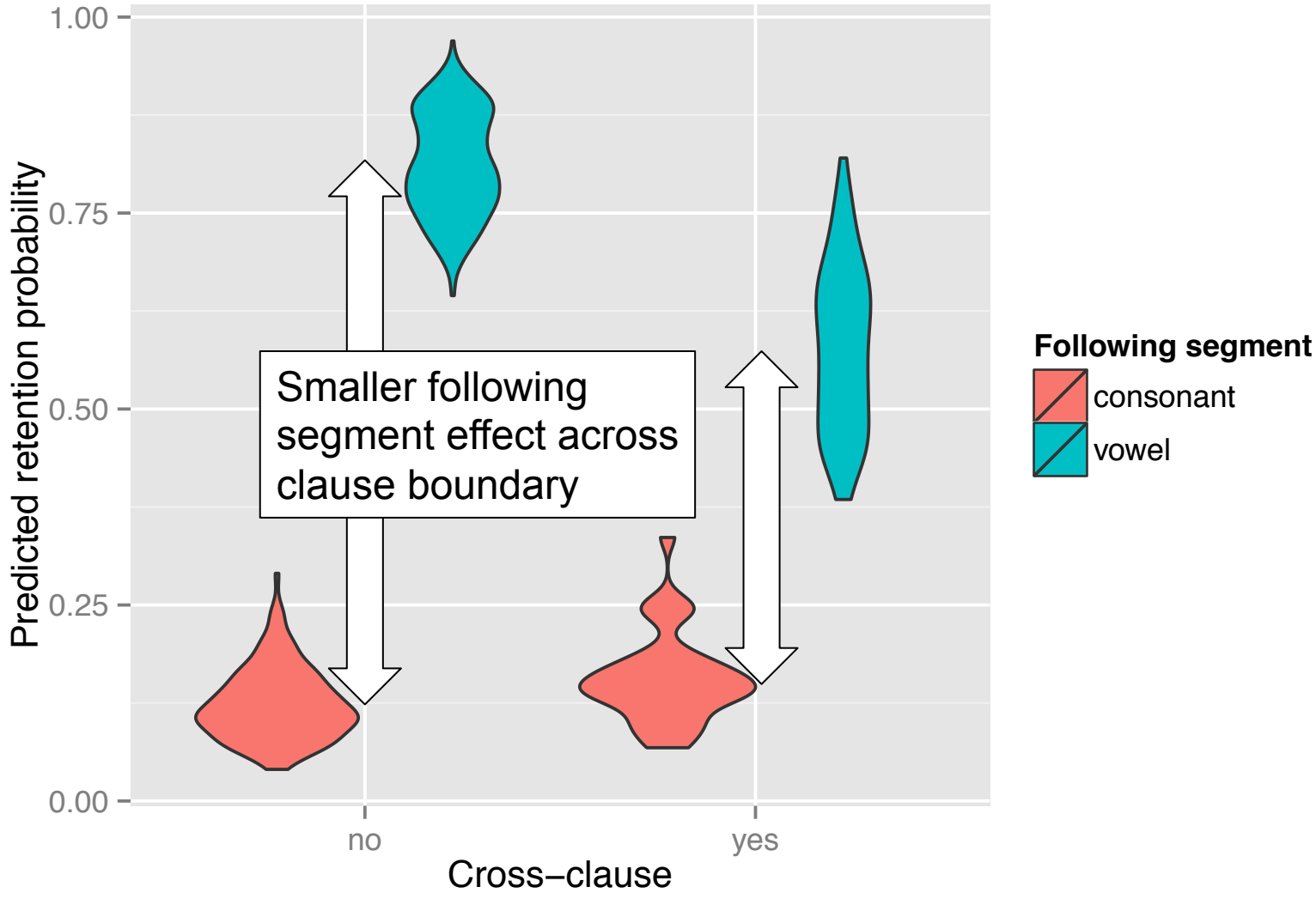
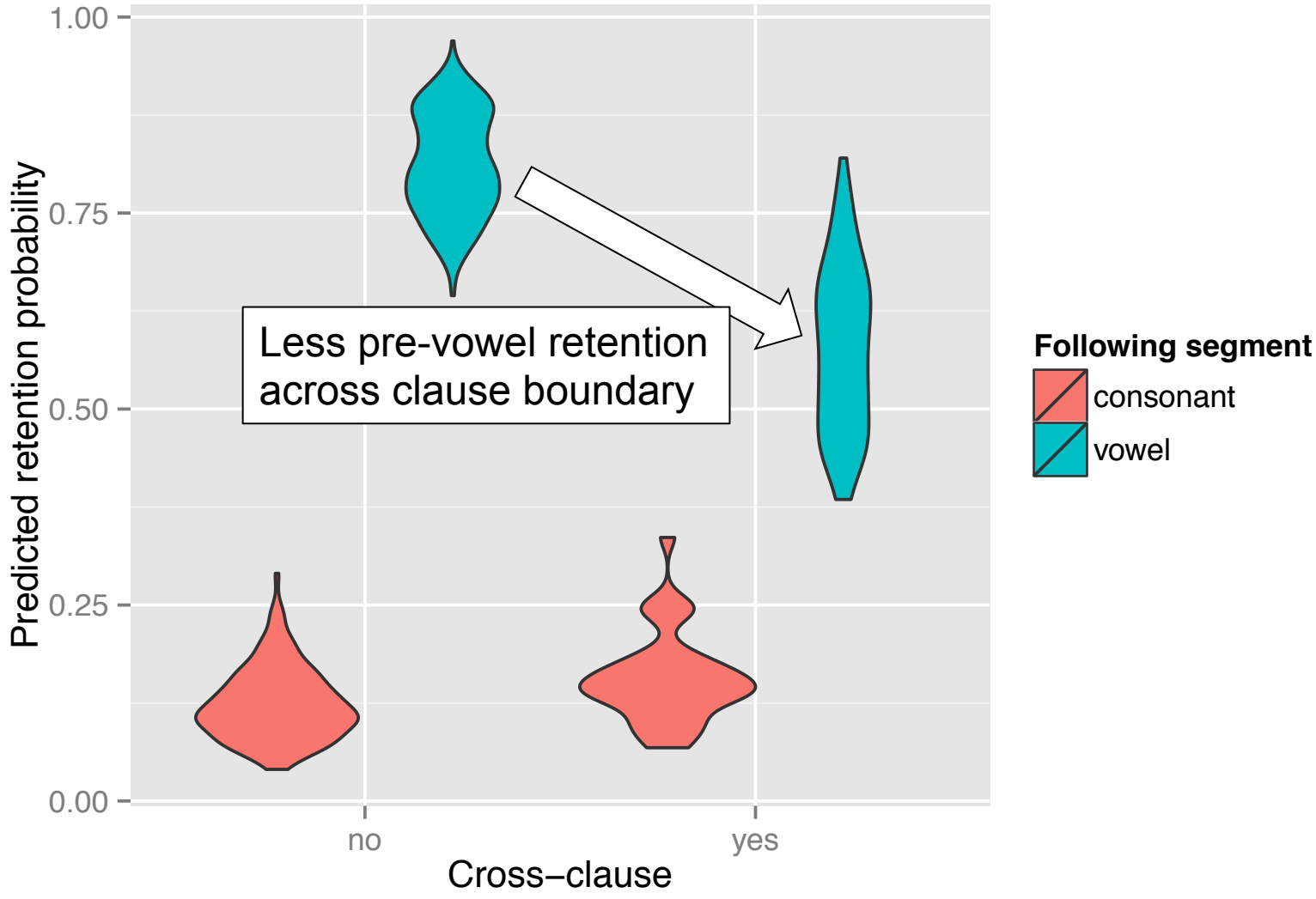


Clause boundary weakens following segment effect

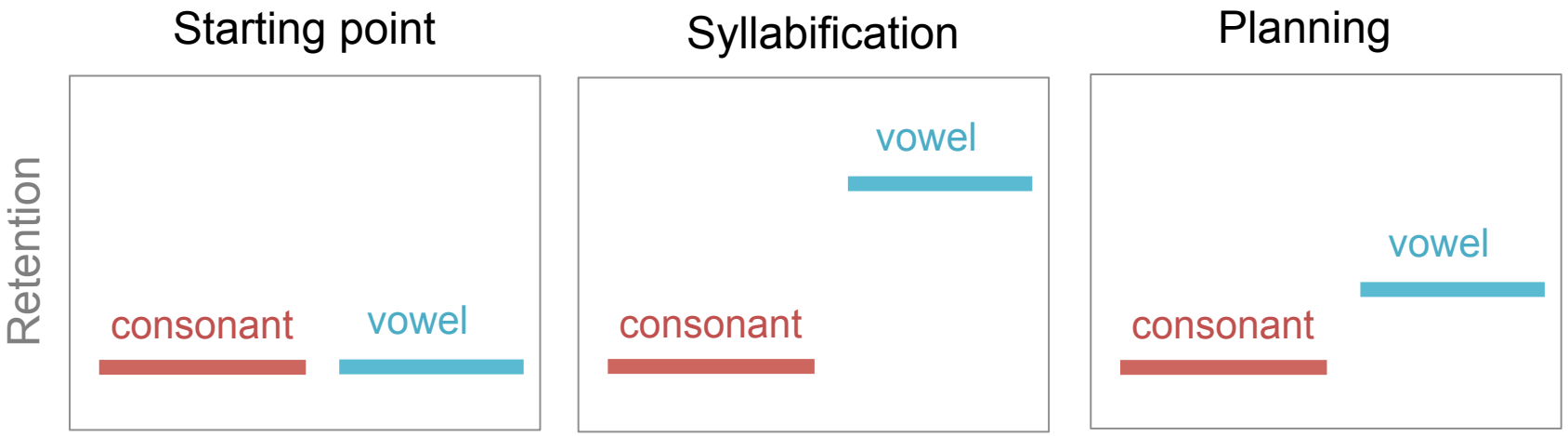


Clause boundary weakens following segment effect

- Why the asymmetry between pre-V and pre-C contexts?
- Suggests syllabification as the source of the following segment effect (Guy 1991a)
- Can't be captured as clause boundaries blocking syllabification because other processes require syllabification across clause boundaries
- Consistent with predictions based on production-planning effects on phonological variation (Wagner 2012, MacKenzie 2012, Tanner et al. 2015)

Clause boundary weakens following segment effect

- Syllabification prevents deletion, giving rise to at least part of the following segment effect
- Unplanned clauses sometimes prevent syllabification, facilitating deletion by forcing the stop to remain in a coda position



Clause boundary weakens following segment effect

- Fun speculation: if the following segment effect is entirely a product of syllabification, then the difference between retention rates in pre-V and pre-C contexts across clause boundaries could represent an estimate of the rate at which the following clause is not yet planned…

Conclusions

- Production planning is neither a social constraint nor an internal linguistic one
- Rather, what Tamminga, McKenzie & Embick (forthcoming) call a "p-conditioning" factor: psychological and physiological effects
- Understanding why the following segment effect is sensitive to syntactic boundaries requires making reference to psycholinguistic processes

Thank you!

And thanks to Bill Labov and Dave Embick
for their comments on this analysis.

Email me: tamminga@ling.upenn.edu

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