Modulation of the following segment effect on coronal stop deletion

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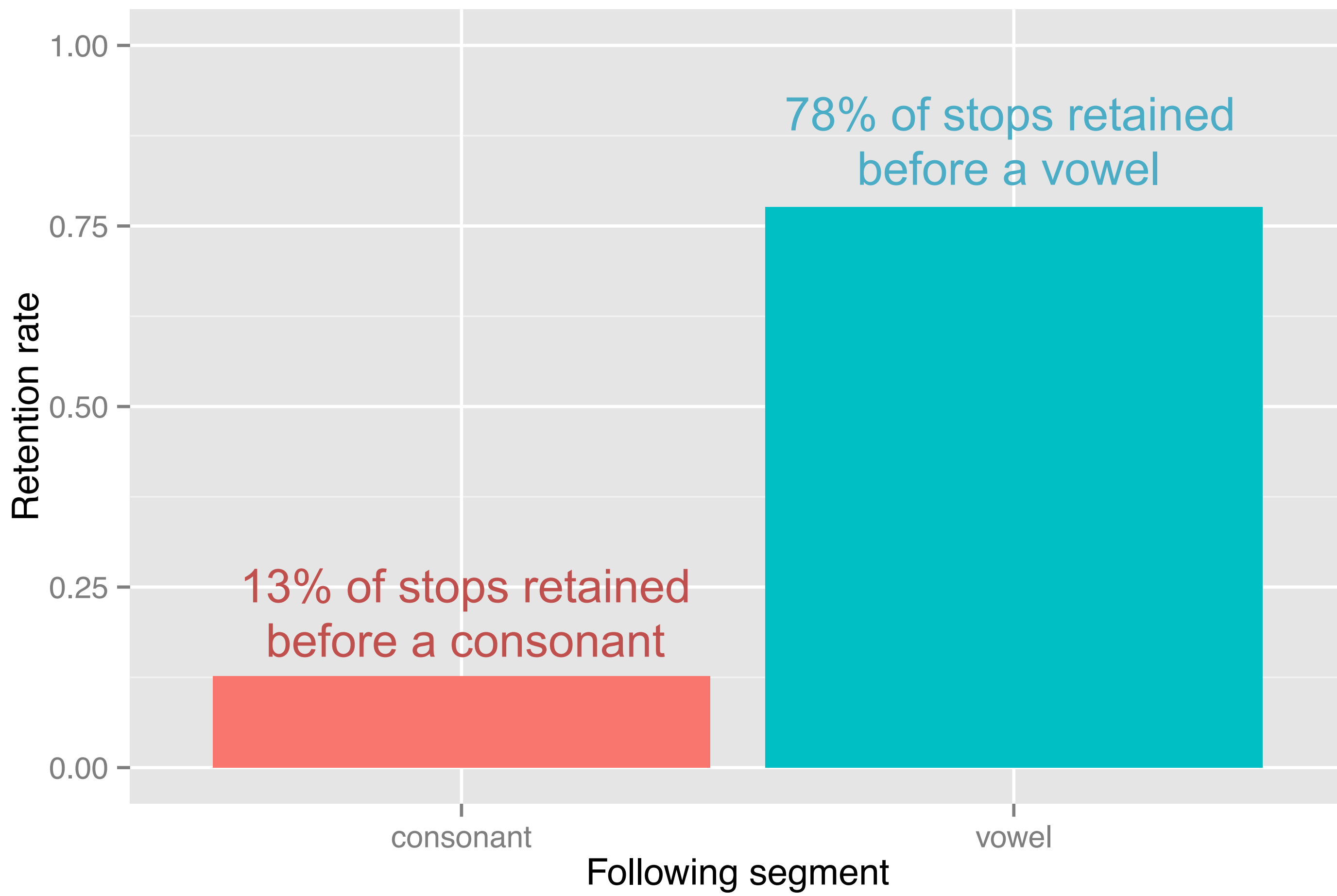
The following segment effect

…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

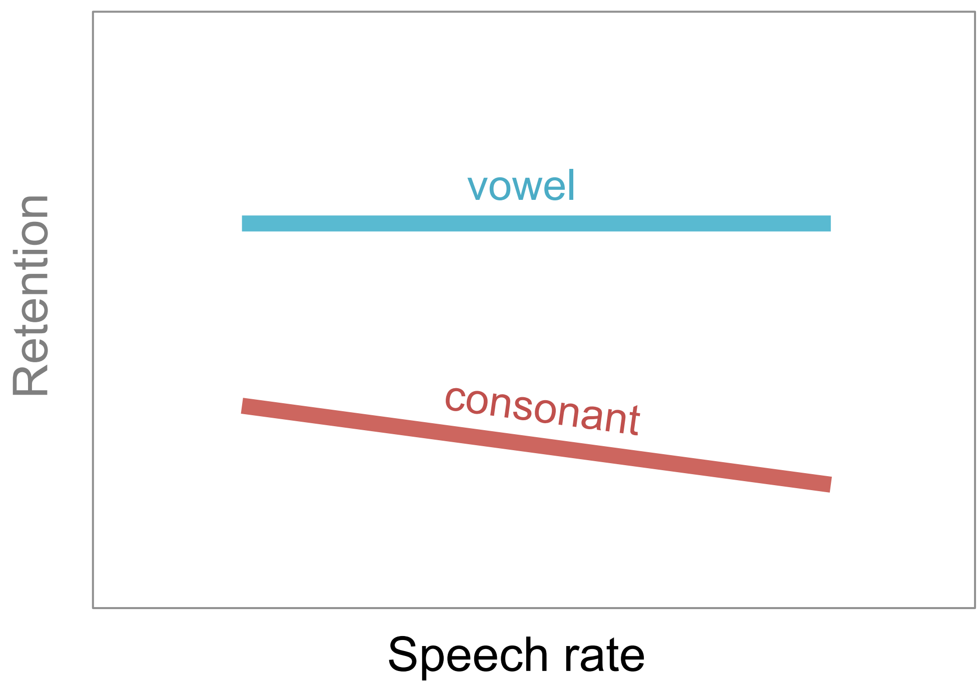
The following segment effect

- 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:

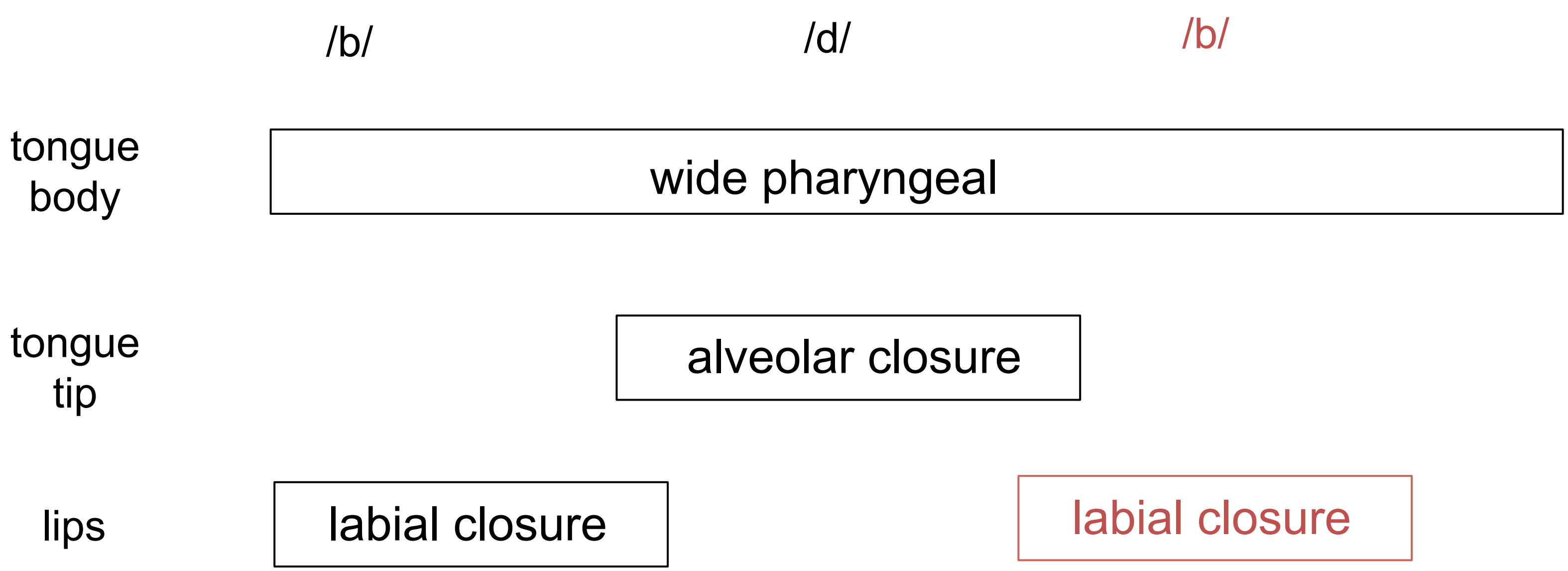
- Faster speech has more deletion
- Faster speech exaggerates the effect of a following consonant



Interaction with speech rate

Why?

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



Browman & Goldstein 1992

Interaction with speech rate

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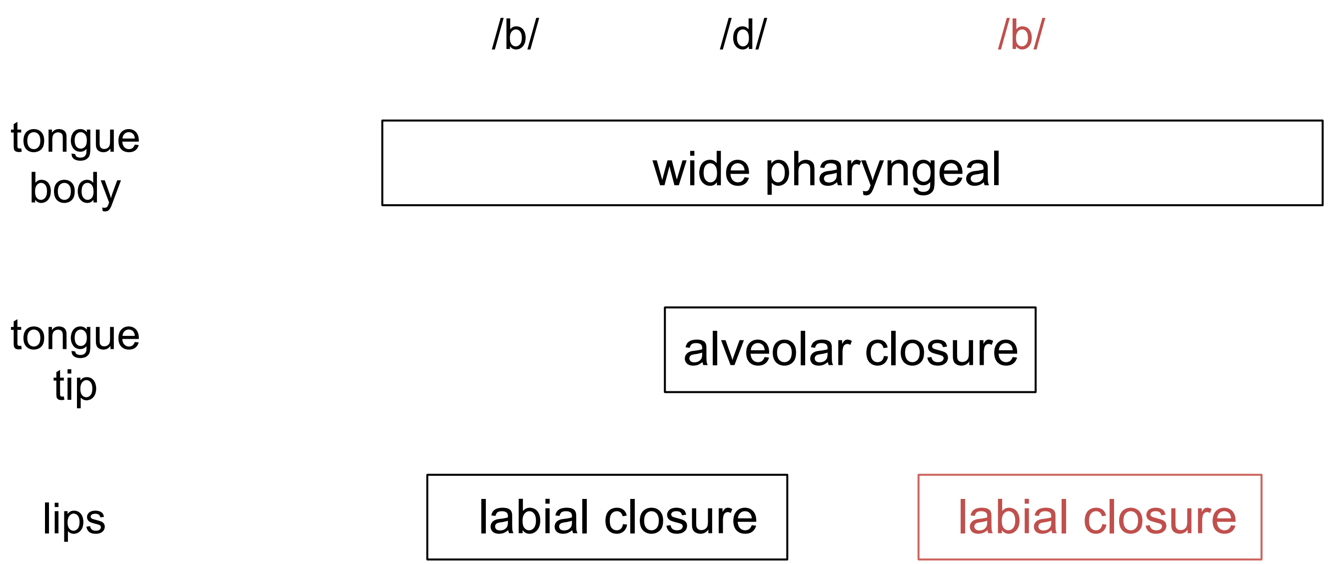

Browman & Goldstein 1992

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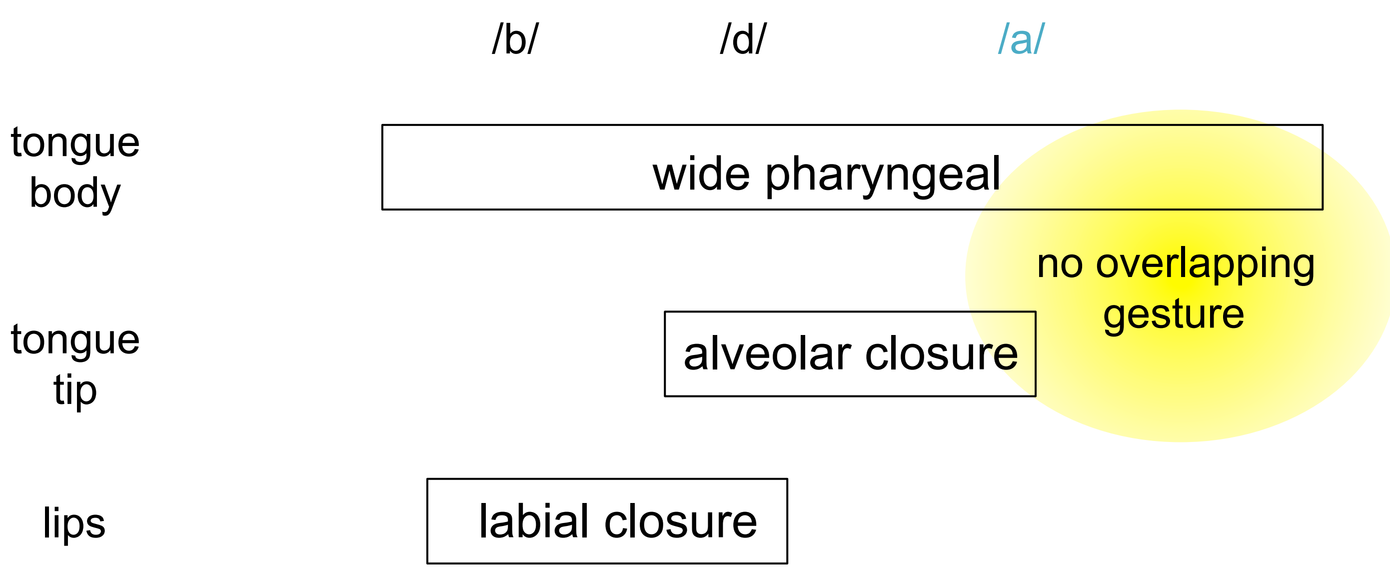
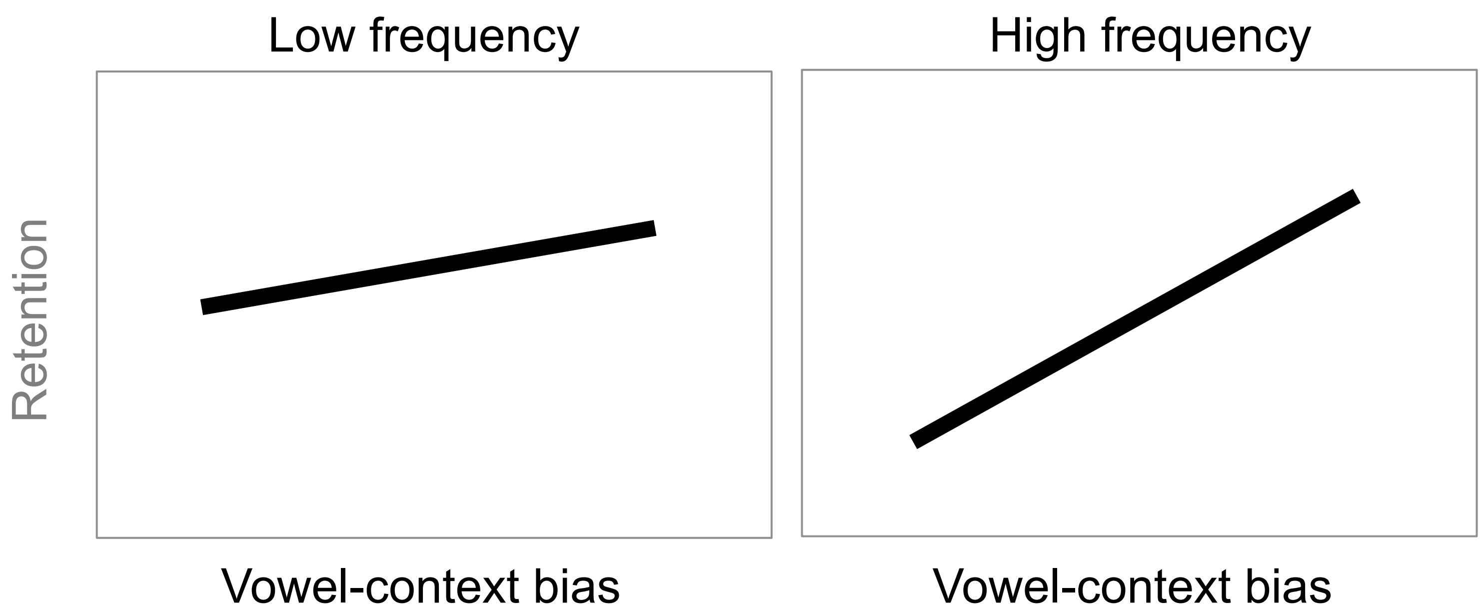


Browman & Goldstein 1992

Interaction with lexical frequency

Predictions:

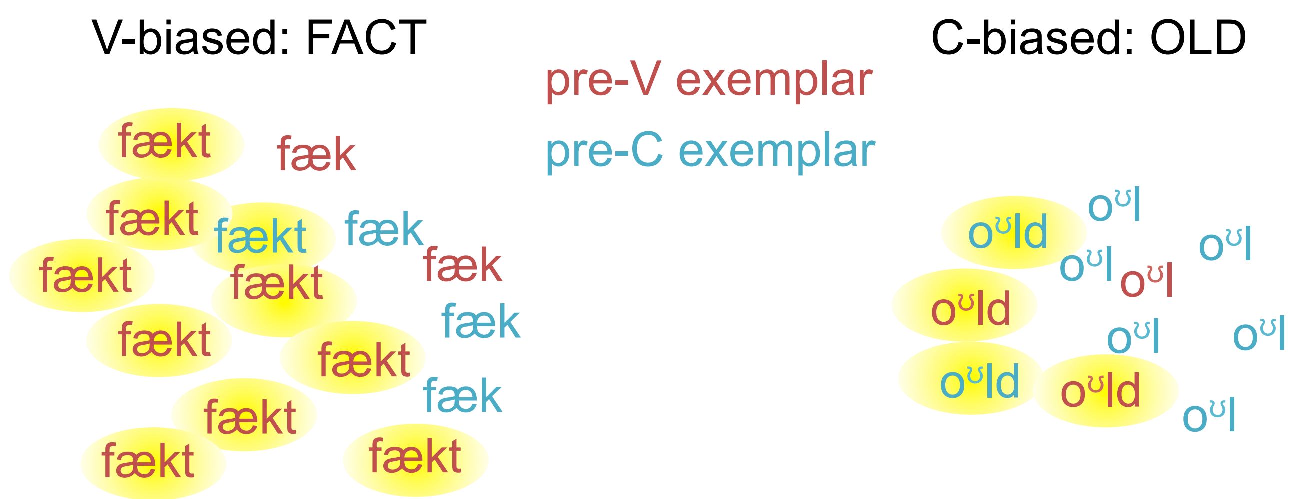
- Higher frequency words have more deletion
- Words that occur more before vowels have more retention
- Vowel-context bias is stronger in higher frequency words



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

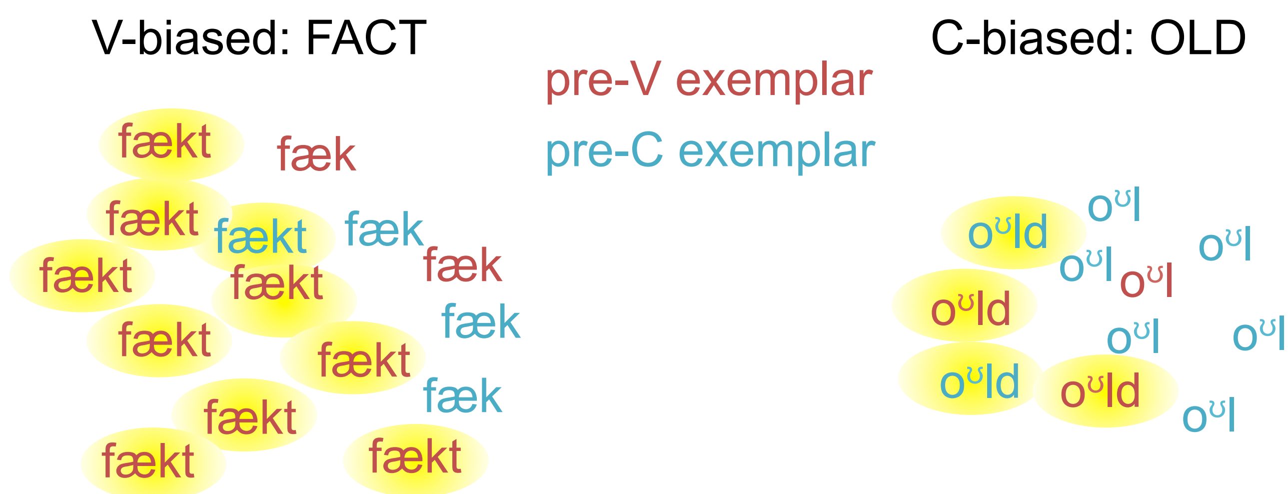


Pierrehumbert 2002

Interaction with lexical frequency

Why?

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

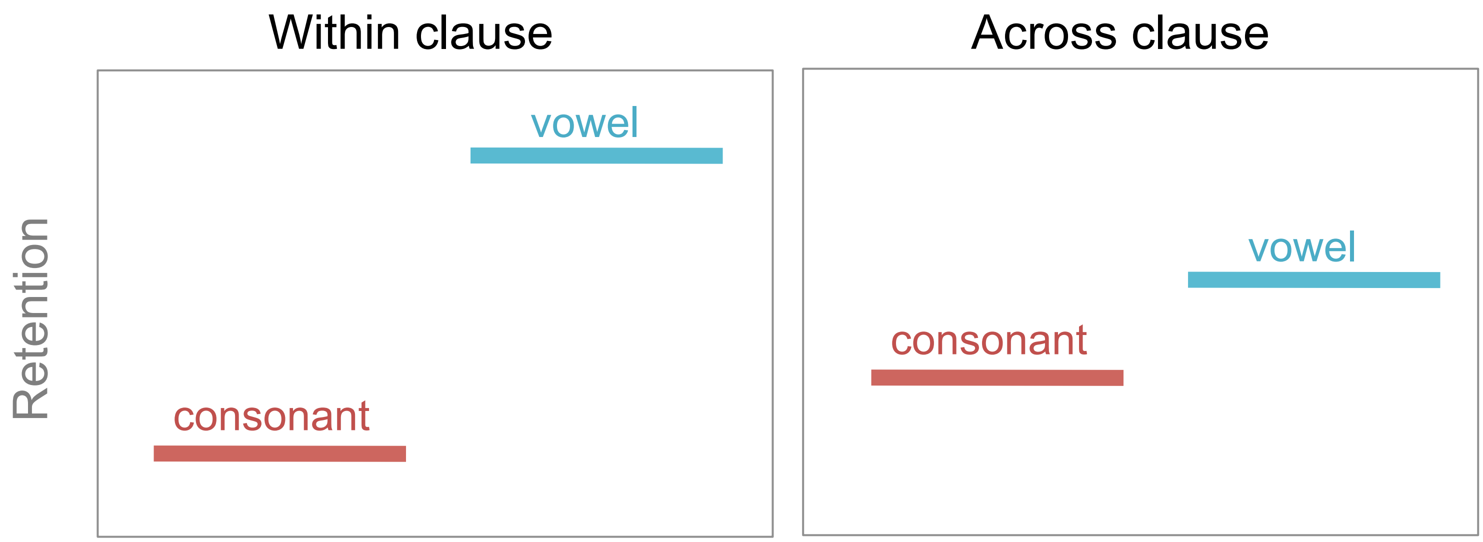


Pierrehumbert 2002

Interaction with syntactic structure

Predictions:

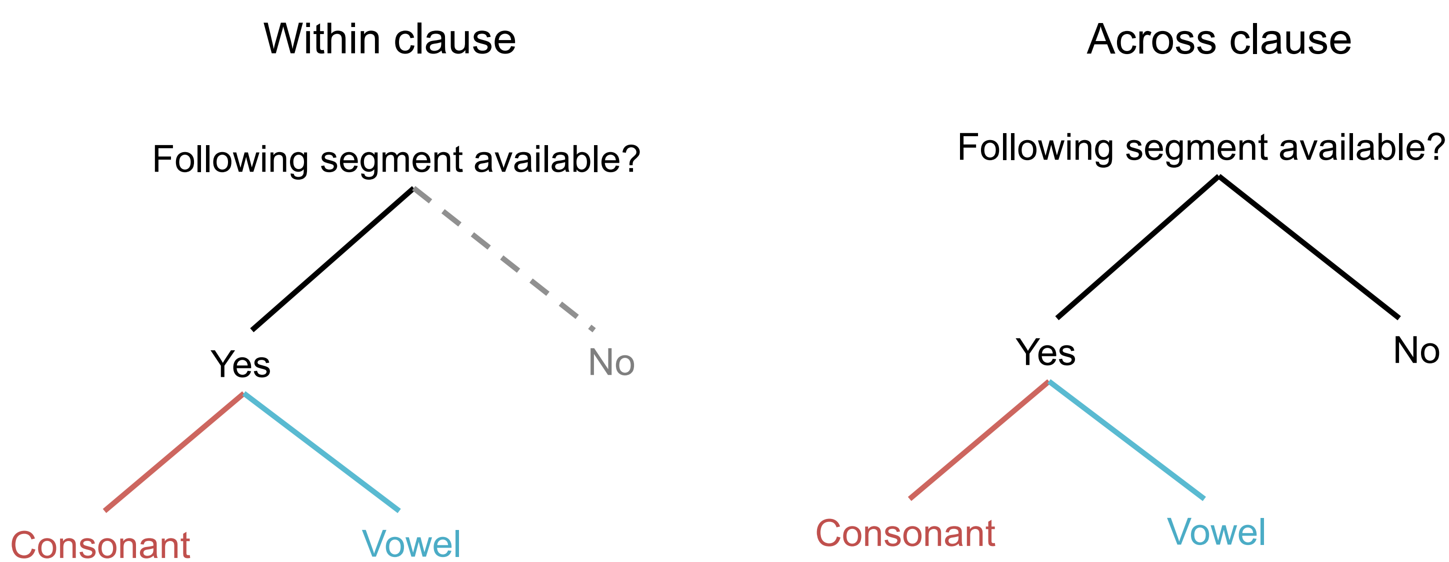
- Clause boundary reduces following segment effect



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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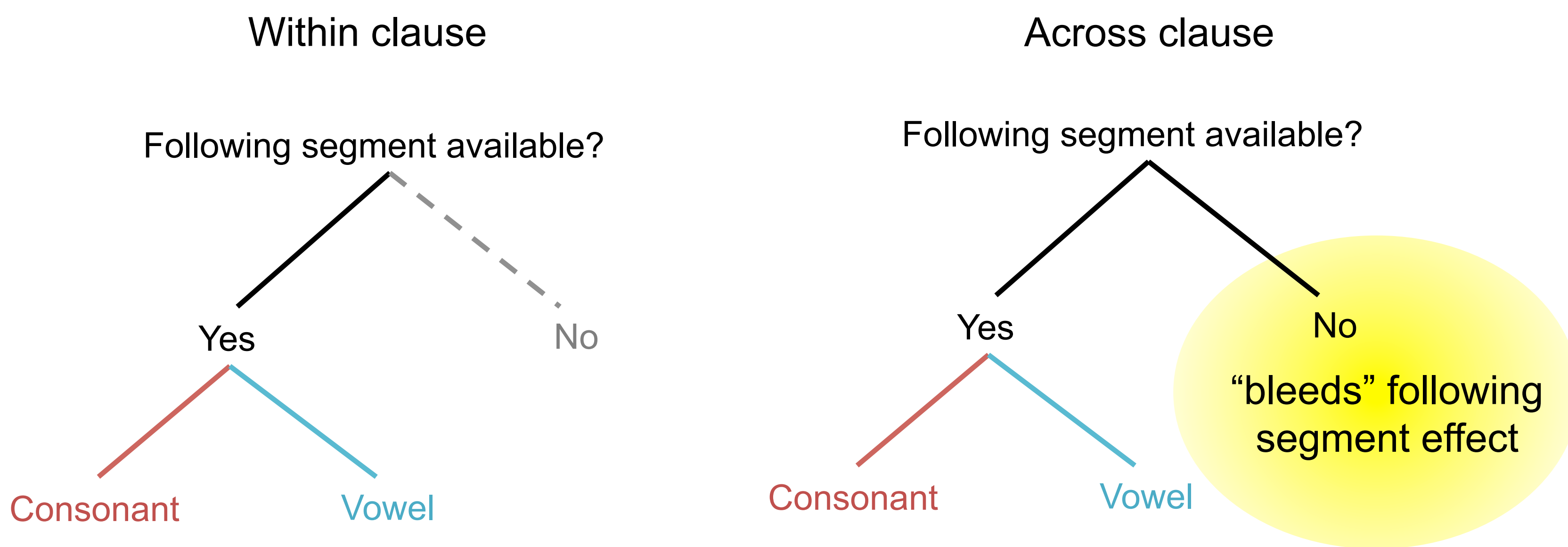
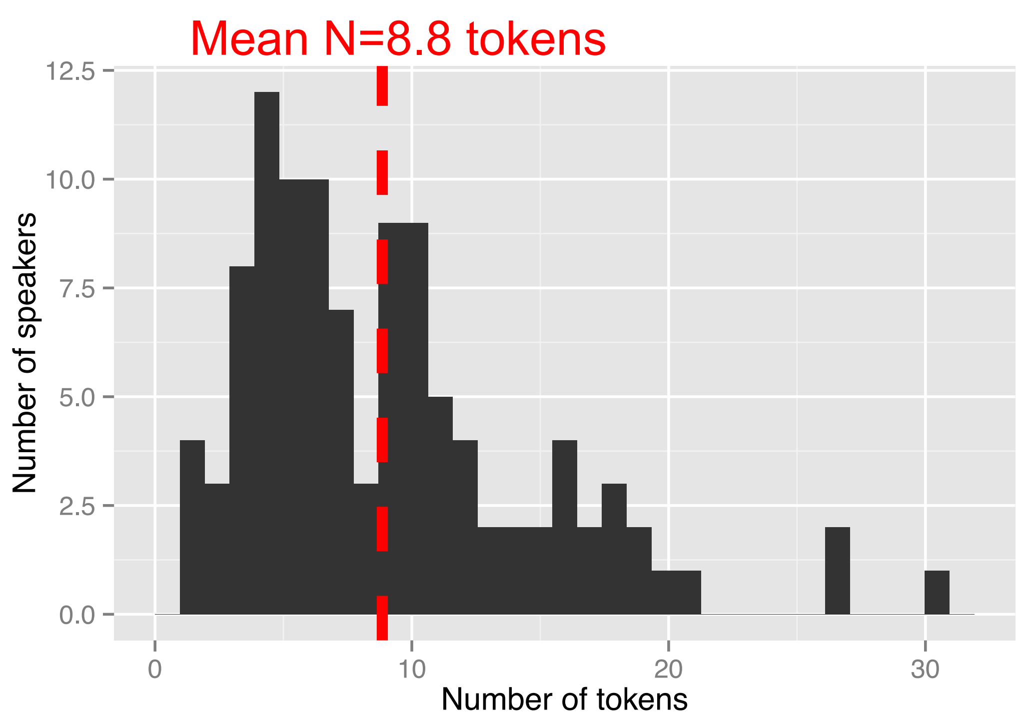


Wagner 2012

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 +

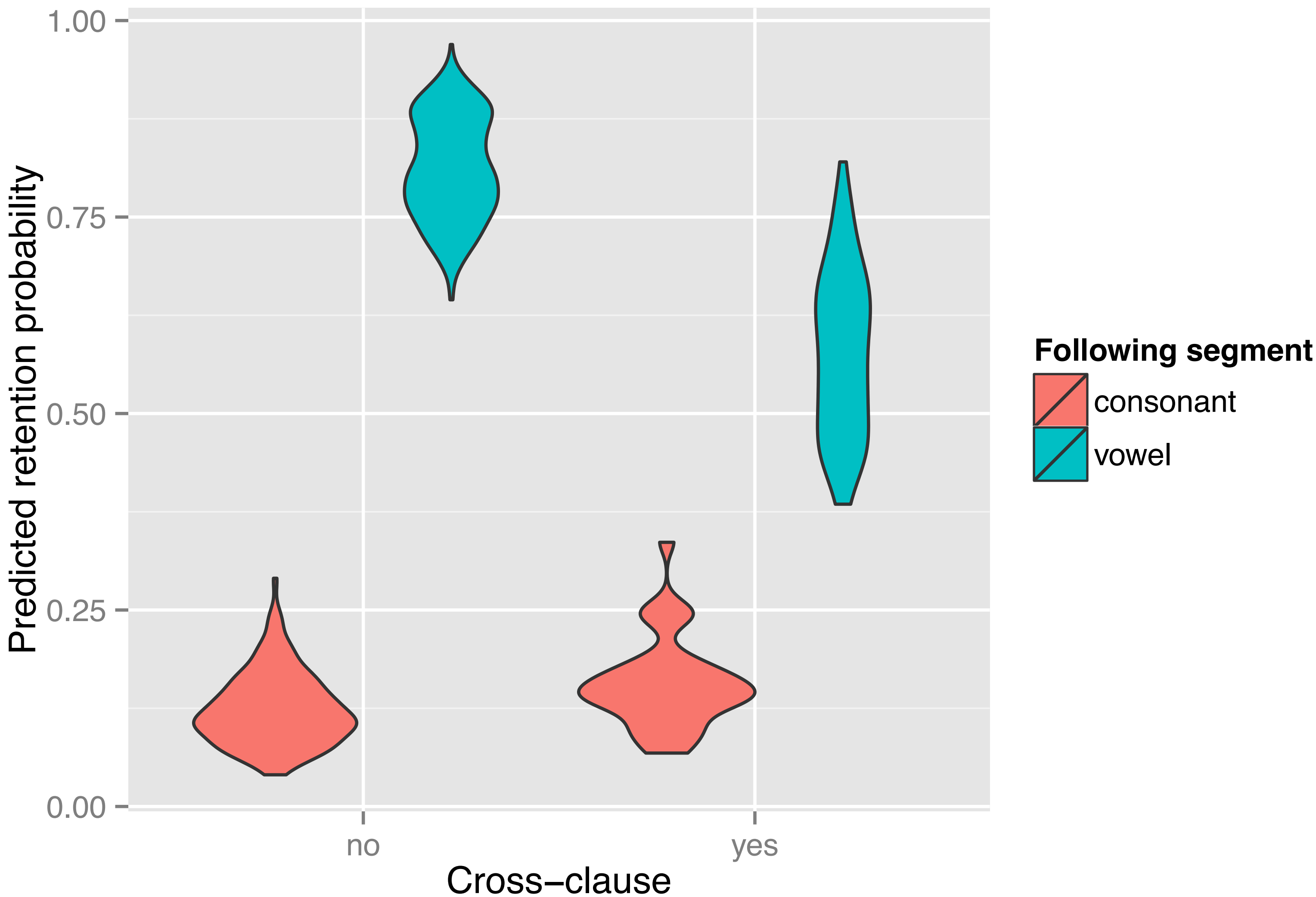
log word frequency +

following segment * clause boundary

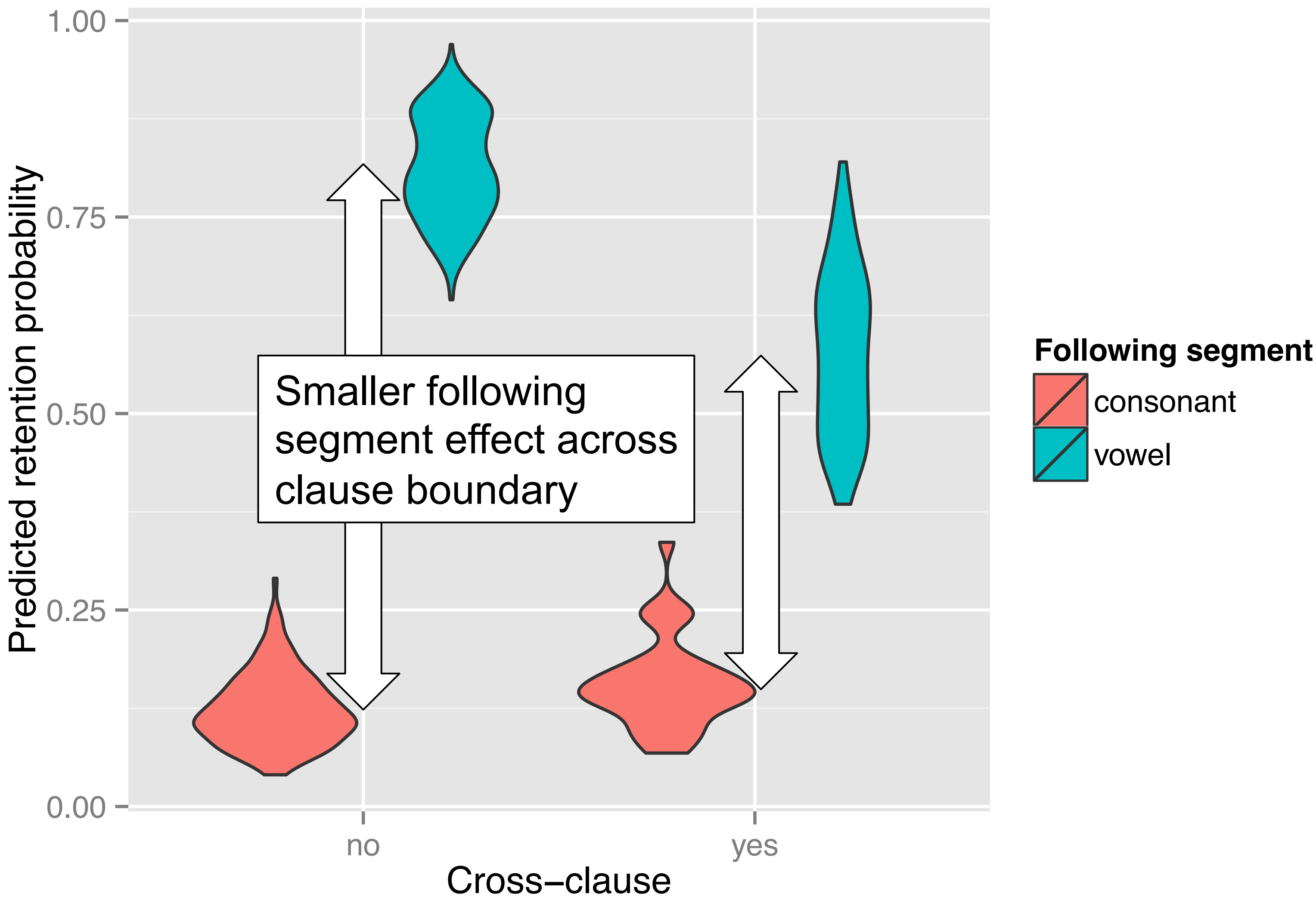
Regression modeling

	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

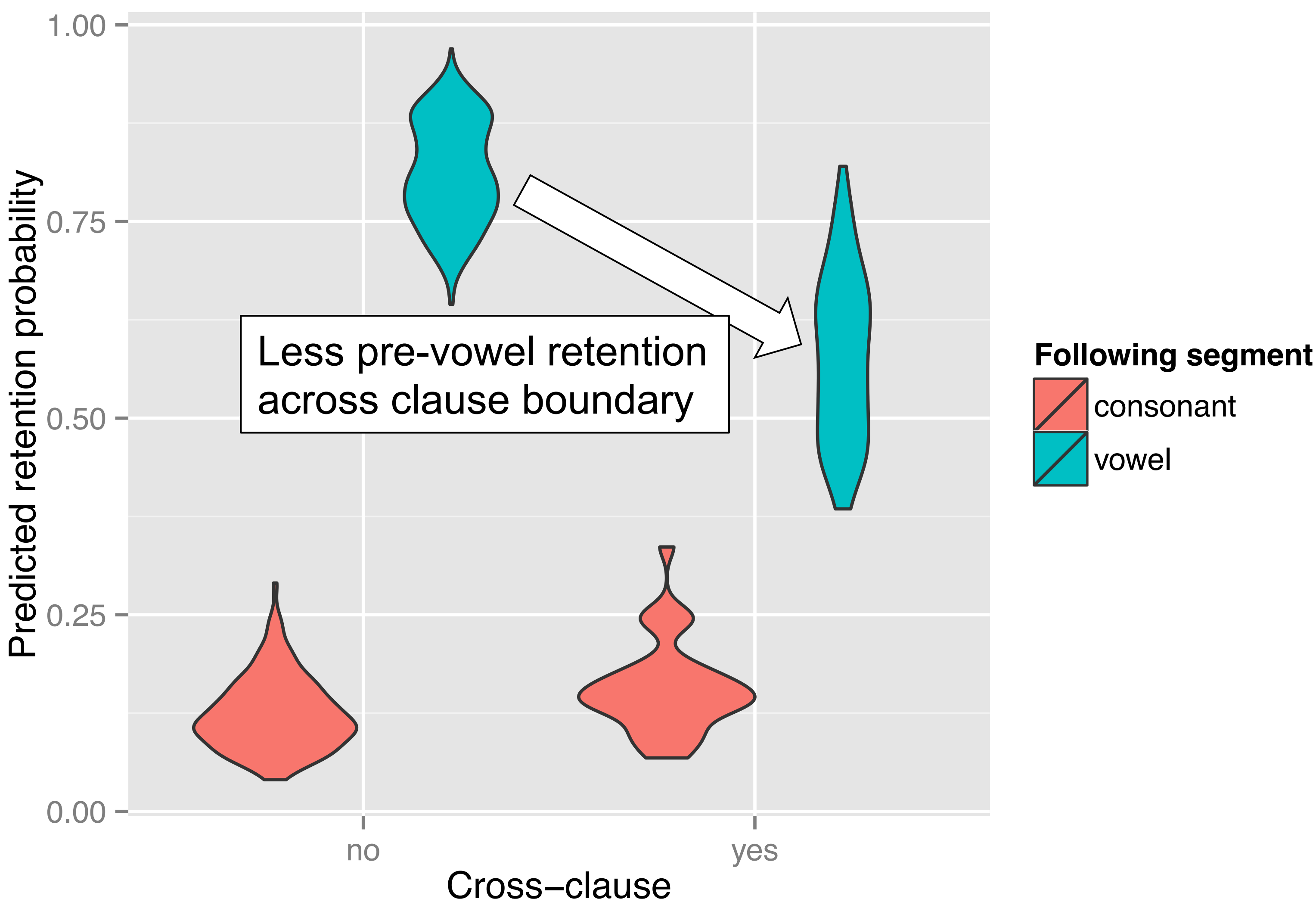
Clause boundary weakens following segment effect



Clause boundary weakens following segment effect



Clause boundary weakens following segment effect

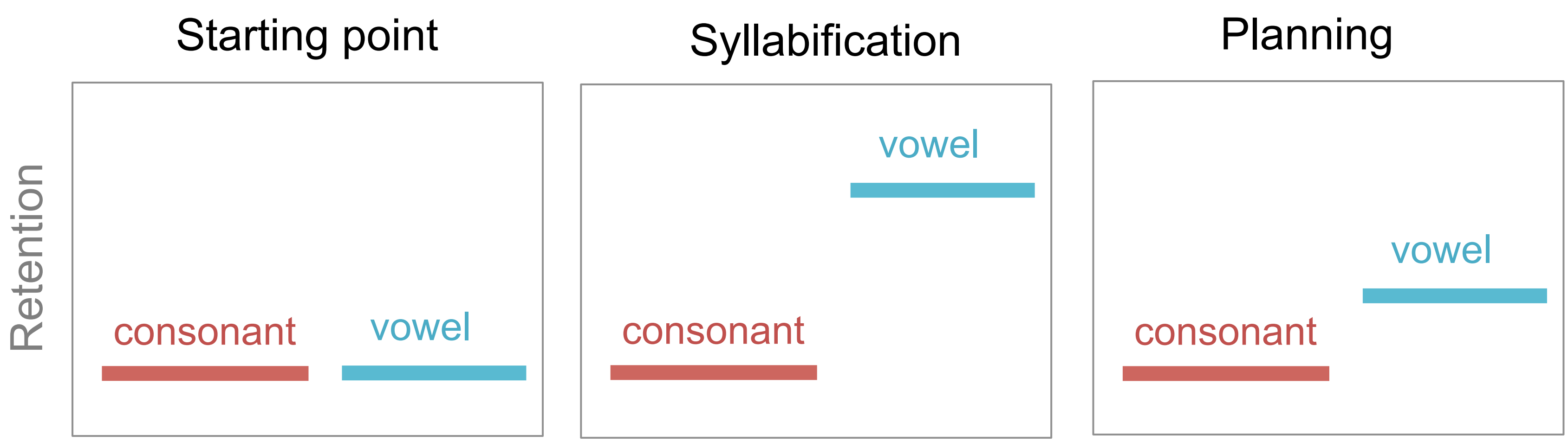


Clause boundary weakens following segment effect

- 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!

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