Against Bracketing Erasure in English triconstituent compounds:

an investigation of acoustic constituent durations

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FOR 2373 workshop – project: EMB
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Today's talk

[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

Does the morphological structure of compounds have an effect on the acoustic durations of N1, N2 and N3?

Lexical Phonology (Kiparsky 1982)

Assumption:

strict division of

- the application of morphological and phonological rules to a lexical item

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Lexical Phonology (Kiparsky 1982)

Assumption:

strict division of

- the application of morphological and phonological rules to a lexical item → **lexical level**

- the embedding into a syntactic structure and the phonetic implementation of a lexical item → **post-lexical level**

Lexical Phonology (Kiparsky 1982)

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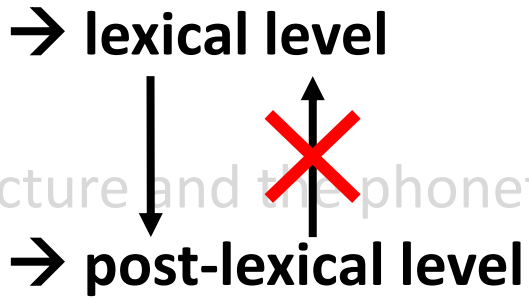
- the embedding into a syntactic structure and the phonetic implementation of a lexical item



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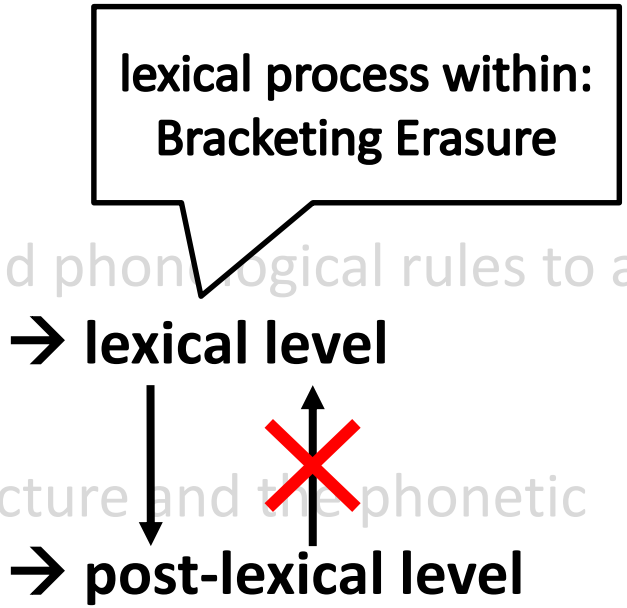

Bracketing Erasure

After each application of a morphological rule, the internal morphological brackets in the complex word are erased.

→ morphological structure is not visible
→ phonetic signal has no access to the morphological structure of the complex word
→ factors related to the morphological structure do not affect the phonetic signal

Bracketing Erasure

health$_{N1}$ care$_{N2}$ law$_{N3}$ **corner$_{N1}$ drug$_{N2}$ store$_{N3}$**

→ phonetic signal cannot reflect the morphological structure of the compound
→ relations (e.g. embeddedness) between constituents should be undetectable

Contrary assumption

The morphological structure is encoded in the phonetic signal.

Sproat & Fujimura (1993): gradient variation of /l/ realizations according to the morphological boundary they attach to

Hay (2007): *un*- shorter in words with weaker boundaries (less decomposable), and longer in words with stronger boundaries (more decomposable)

phonetic realization of segments at a morphological boundary is sensitive to the degree of boundary strength

Contrary assumption

The morphological structure is encoded in the phonetic signal.

Hay & Plag (2004): in suffixed words, inner boundaries are weaker than outer boundaries; suffixes with weaker boundaries are closer to the base

[aim-less]-ness [king-dom]-ful

morphological embeddedness of affixes correlated with boundary strength

Contrary assumption

The morphological structure is encoded in the phonetic signal.

health$_{N1}$ care$_{N2}$ law$_{N3}$ **corner$_{N1}$ drug$_{N2}$ store$_{N3}$**

→ the phonetic implementation of the three constituents should be different due to the different boundary strengths

Contrary assumption

Kunter & Plag (2016) present the **Embedded Reduction Hypothesis**

In a complex word with more than two constituents, the embedded constituents are acoustically shorter than constituents at higher derivational levels.

Contrary assumption

Embedded Reduction Hypothesis tested with

a) experimental data
b) corpus data

Kunter & Plag (2016)

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[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

Predictions:
a. The embedded constituents are relatively short.

Kunter & Plag (2016)

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Predictions:
a. The embedded constituents are relatively short.
b. The free constituent is relatively long.

Kunter & Plag (2016)

[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

Predictions:
a. The embedded constituents are relatively short.
b. The free constituent is relatively long.
c. This effect is independent from the branching direction.

→ interaction between constituents and branching direction of the compound needed

Kunter & Plag (2016)

[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

-data set: experimental data (Kösling 2013, Kösling et al. 2013)
-477 English triconstituent NNN compounds

Kunter & Plag (2016)

- statistical analysis: lmer modelling

dependent variable	constituent duration
predictors	constituent number branching frequencies of each constituent bigram frequency N1N2 and bigram frequency N2N3 trigram frequency N1N2N3 accent pitch range phonological length
random effect	speaker
central interactions	constituent number * branching * bigramFreqN1N2 constituent number * branching * bigramFreqN2N3

Shortcomings

- across-boundary frequencies kept low

- across-boundary frequencies may not be informative

→ therefore: focus on embedded constituent frequencies

N1N2 for left-branching compounds
N2N3 for right-branching compounds

left-branching: [N1 N2] N3

N1N2 bigram frequency (=embedded constituent):

N1 is relatively short regardless of N1N2 freq.
N2 is relatively short regardless of N1N2 freq.
N3 is relatively long regardless of N1N2 freq.

left-branching: [N1 N2] N3

N1N2 bigram frequency (=embedded constituent):

N1 is relatively short regardless of N1N2 freq. EXPECTED
N2 is relatively short regardless of N1N2 freq. EXPECTED
N3 is relatively long regardless of N1N2 freq. EXPECTED

right-branching: N1 [N2 N3]

N2N3 bigram frequency (=embedded constituent):

N1 is relatively long with higher N2N3 freq.
N2 is relatively short with higher N2N3 freq.
N3 is relatively short regardless of N2N3 freq.

right-branching: N1 [N2 N3]

N2N3 bigram frequency (=embedded constituent):

N1 is relatively long with higher N2N3 freq. EXPECTED
N2 is relatively short with higher N2N3 freq. EXPECTED
N3 is relatively short regardless of N2N3 freq. EXPECTED

Results

		Kunter & Plag (2016)	**implications**
embedded constituent frequency	left-branching (N1N2)	N1 short N2 short N3 long	challenges Bracketing Erasure supports ERH predictions
	right-branching (N2N3)	N1 long N2 short N3 short	challenges Bracketing Erasure supports ERH predictions

Corpus Study

Corpus Study

[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

-data from BURSC (data set by Kösling & Plag 2009)
-451 English triconstituent NNN compounds

Corpus study

[health$_{N1}$ care$_{N2}$] law$_{N3}$ **corner$_{N1}$ [drug$_{N2}$ store$_{N3}$]**

Predictions:
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left-branching: [N1 N2] N3

N1N2 bigram frequency (=embedded constituent):

N1 is relatively short
N2 is relatively short
N3 is relatively long

left-branching: [N1 N2] N3

N1N2 bigram frequency (=embedded constituent):

N1 is relatively short	EXPECTED
N2 is relatively short	EXPECTED
N3 is relatively long	EXPECTED

right-branching: N1 [N2 N3]

N2N3 bigram frequency (=embedded constituent):

N1 is longer than N2, but shorter than N3
N2 is relatively short
N3 is relatively long

right-branching: N1 [N2 N3]

N2N3 bigram frequency (=embedded constituent):

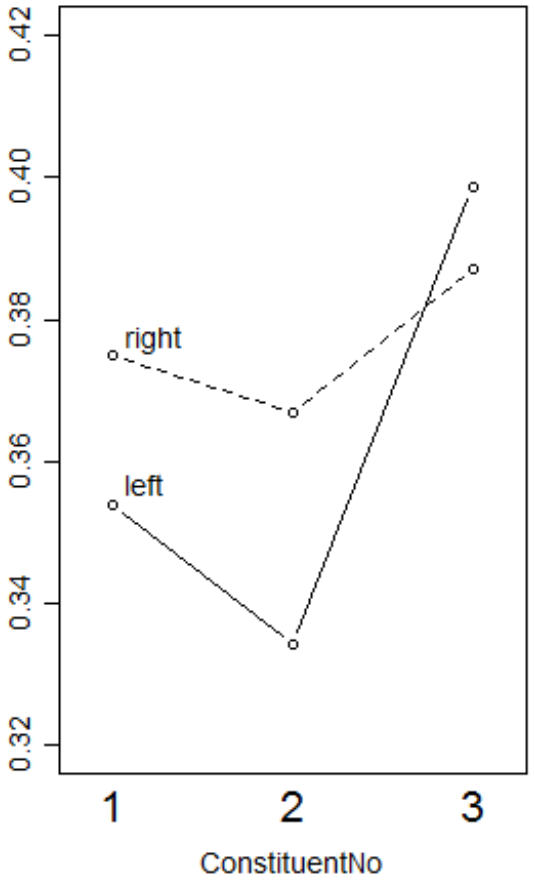
N1 is longer than N2, but shorter than N3	?
N2 is relatively short	EXPECTED
N3 is relatively long	UNEXPECTED

difference to Kunter & Plag (2016) analysis:

3-way interaction *constituent number * branching * bigramFreq N2N3* not significant

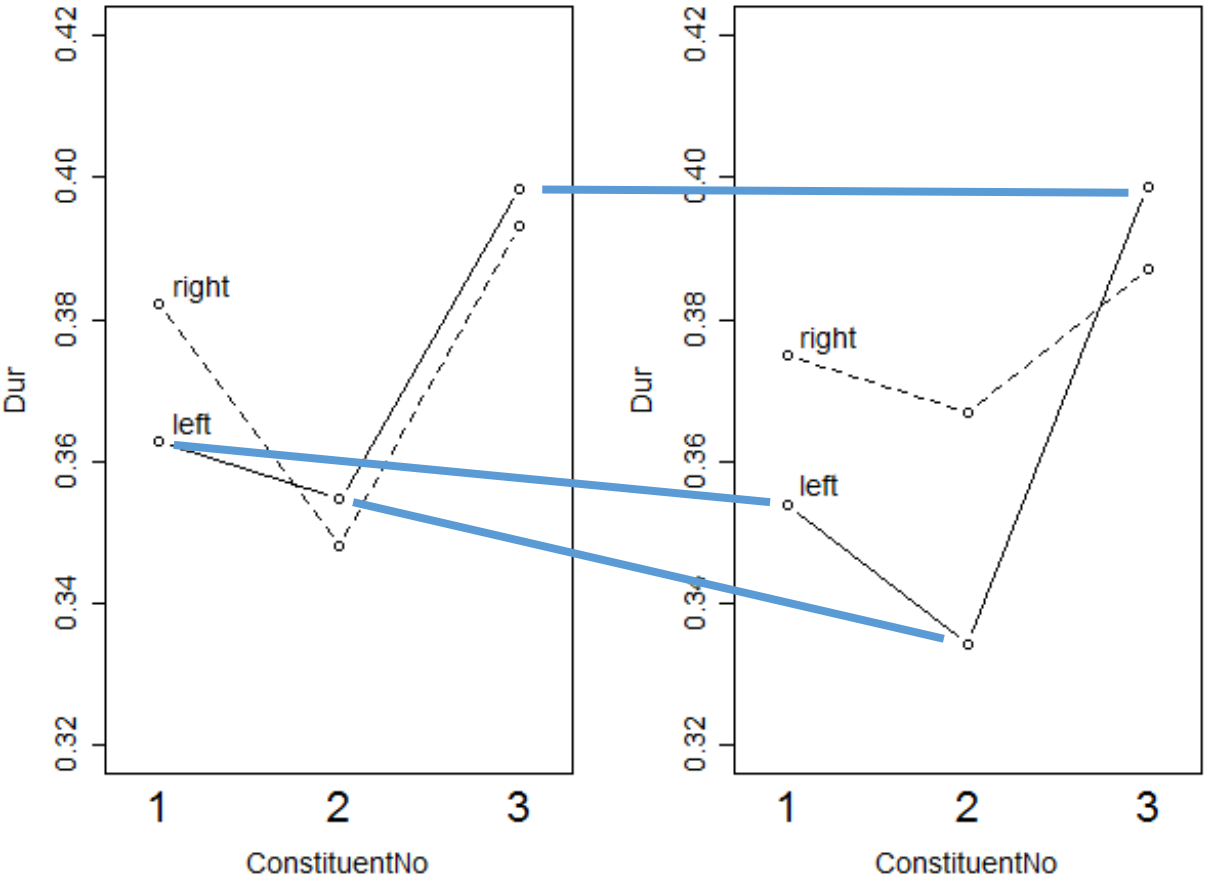
→ effect of N2N3 similar for left-branching

left-branching & right-branching



average bigramFreq N1N2

left-branching & right-branching



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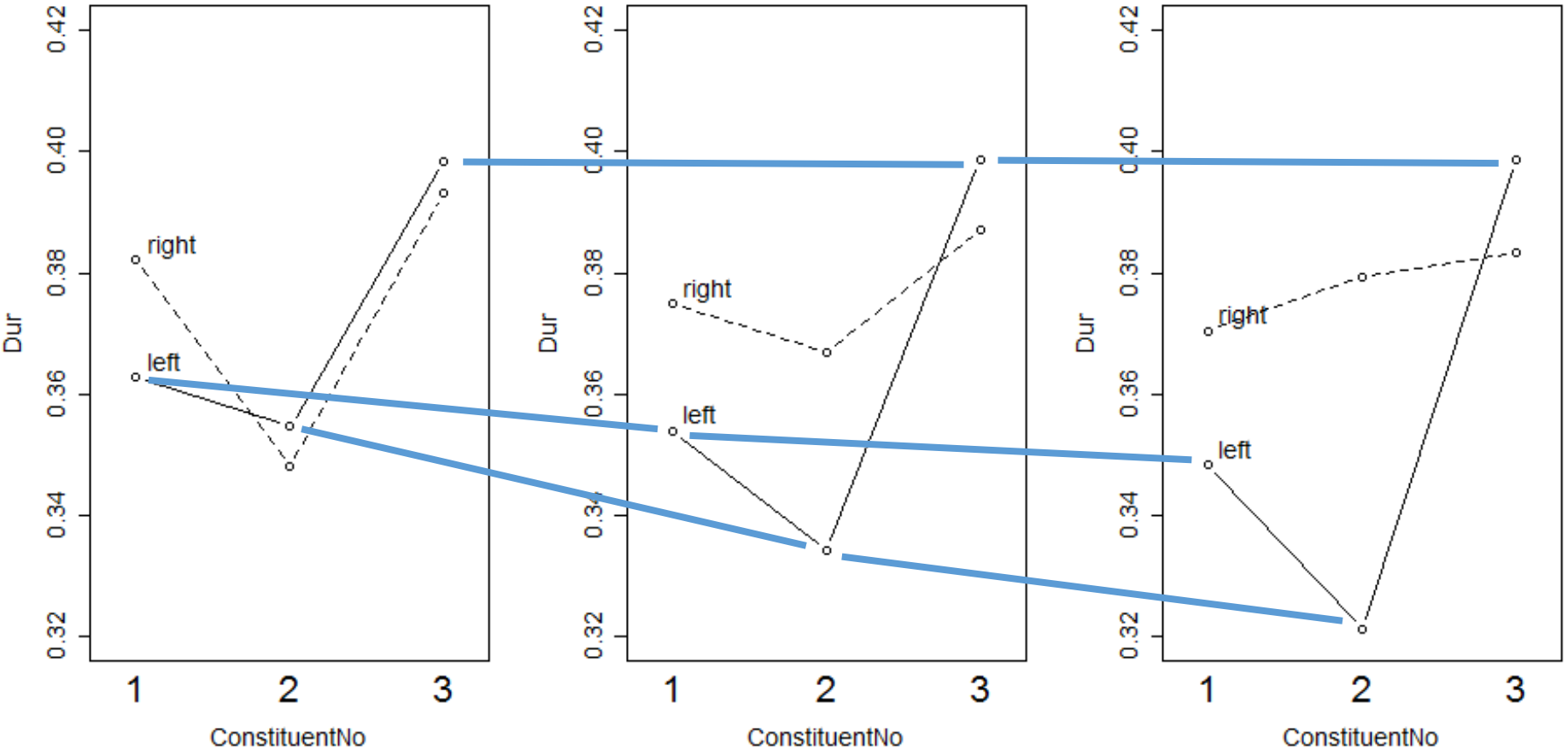

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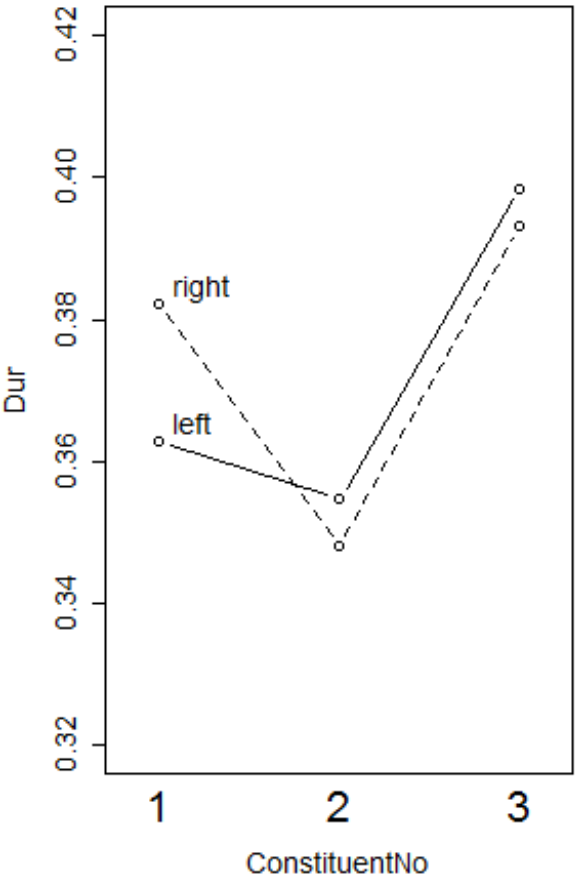

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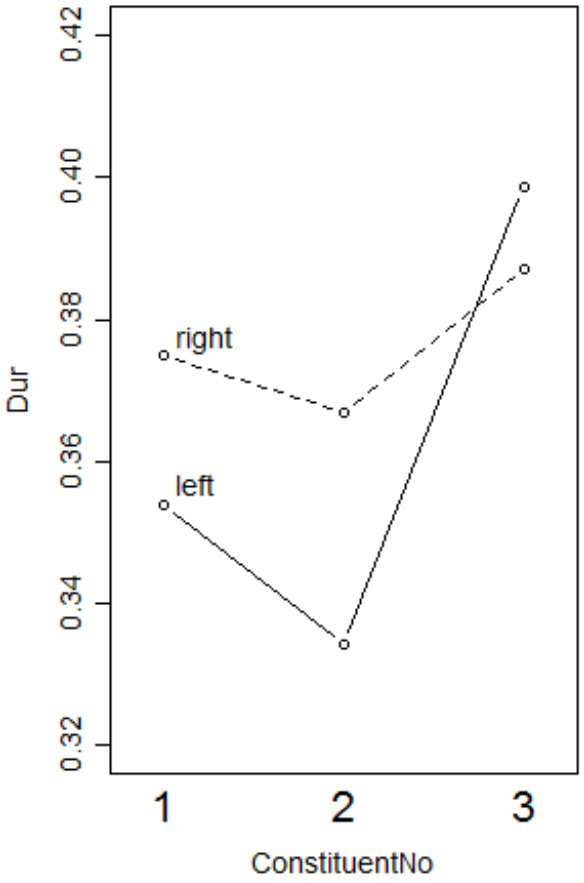

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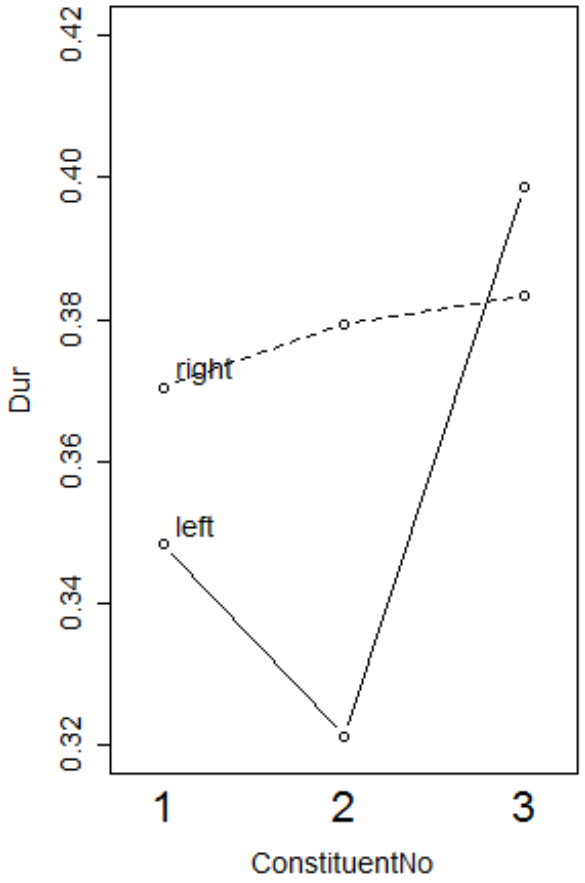

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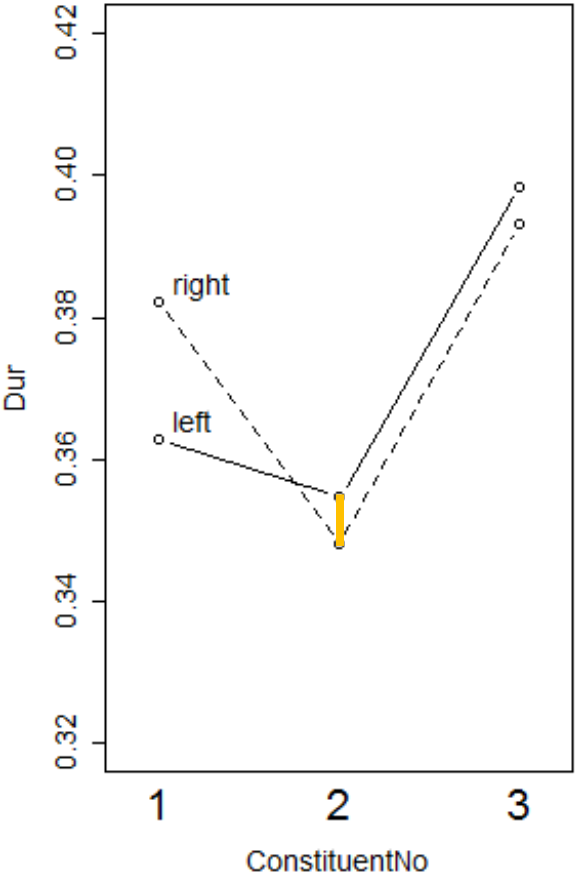

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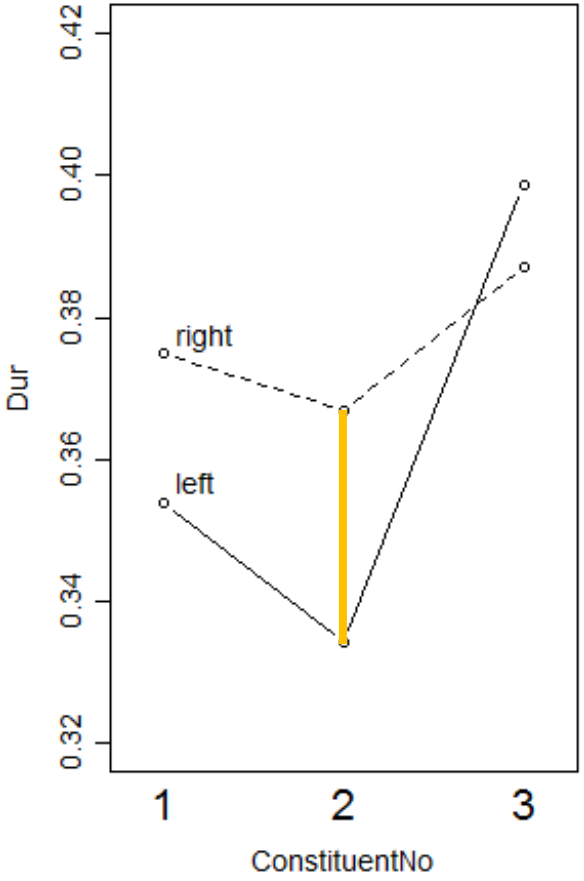

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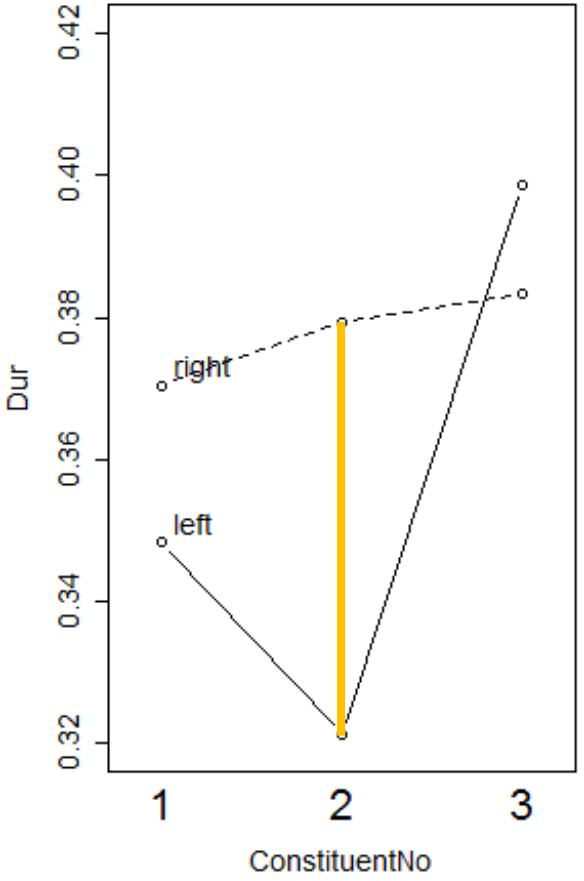

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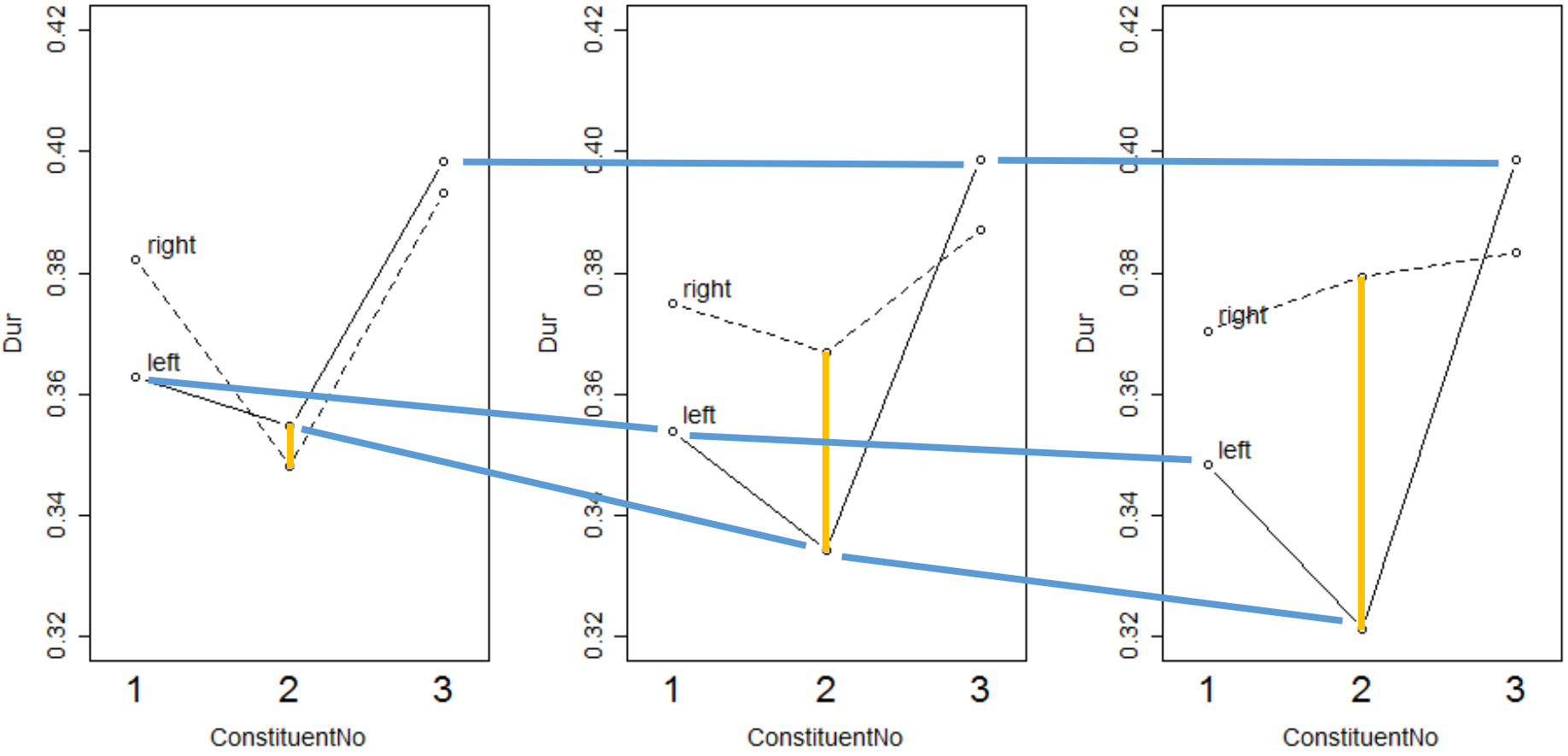

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Results

		corpus study	implications
embedded constituent frequency	left-branching (N1N2)	N1 short N2 short N3 long	challenges Bracketing Erasure supports ERH predictions
	right-branching (N2N3)	N1 short N2 short N3 long	challenges Bracketing Erasure no support ERH predictions

Kunter & Plag (2016) & corpus study: comparisons

Kunter & Plag (2016) & corpus study

		Kunter & Plag (2016)	**corpus study**
embedded constituent frequency	left-branching (N1N2)	N1 short N2 short N3 long	N1 short N2 short N3 long
	right-branching (N2N3)	N1 long N2 short N3 short	N1 short N2 short N3 long
across-boundary frequency	left-branching (N2N3)	N1 short N2 long N3 short	N1 short N2 short N3 long
	right-branching (N1N2)	N1 short N2 short N3 long	N1 short N2 short N3 long

Contrasting ERH and Bracketing Erasure

Bracketing Erasure claims

- no difference in acoustic durations among all constituents of a complex word
- no effect of branching direction on the acoustic duration of constituents

Embedded Reduction Hypothesis claims

- differences in acoustic durations among constituents of a complex word
- shorter durations with embedded constituents, longer durations with free constituents

Contrasting ERH and Bracketing Erasure

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Contrasting ERH and Bracketing Erasure

Bracketing Erasure

cannot explain the effects found in both studies.

Embedded Reduction Hypothesis

cannot explain all the effects, either.

More research needed:

experimental data, controlled for n-gram frequencies, not only duration but also phonetic reduction taken into account, …

References

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