Vowels can be shorter before voiced than before voiceless consonants: Reversed durations in two varieties of German

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The issue: interactions of vowel duration and consonant voicing

- Common interaction: vowels longer before voiced obstruents (*here*: lenis) than before voiceless obstruents (*here*: fortis); Lehiste (1970), many others
- Example from English: [luːːz] ‘lose’ vs. [luːs] ‘loose’
- Scheer (2017: 139): “The reverse pattern whereby vowels are longer before voiceless than before voiced consonants is unheard of.”
- **Our claim**: this is not an absolute (synchronic) universal
- But… violations discussed here follow from independent diachronic and synchronic principles

The reversal of a universal across German dialects

- Interactions of vowel duration and consonant voicing are phonetically reversed in two varieties of German, Aachen (Franconian) and Leer (Low German)
- **Leer**: long vowels longer before lenis obstruents than before fortis obstruents (expected)
- **Aachen**: long vowels longer before fortis obstruents than before lenis obstruents (unexpected)
- True for etymological and synchronic voicing
- Also see Purnell et al. (2005) for a comparable (but smaller) effect in Wisconsin English

Goal of this talk: Providing account of…

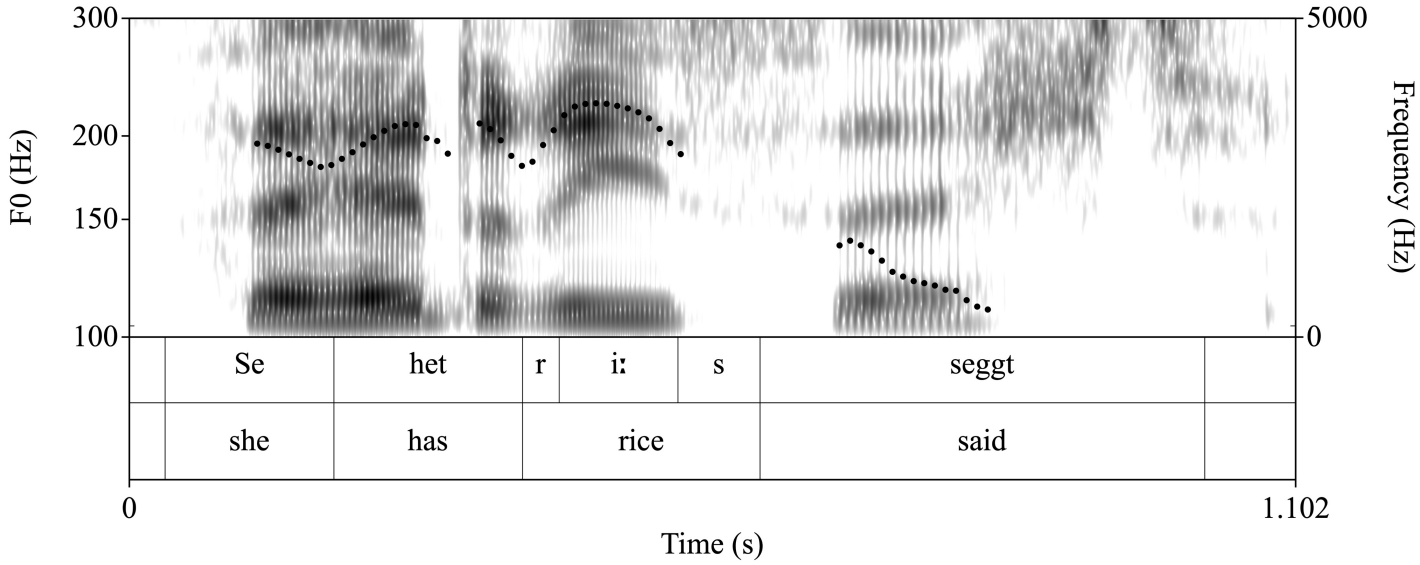
- How this happened: a diachronic analysis of the reversal
- (How speakers dealt with it: a synchronic foot-based analysis)

Leer Low German: ternary vowel quantity

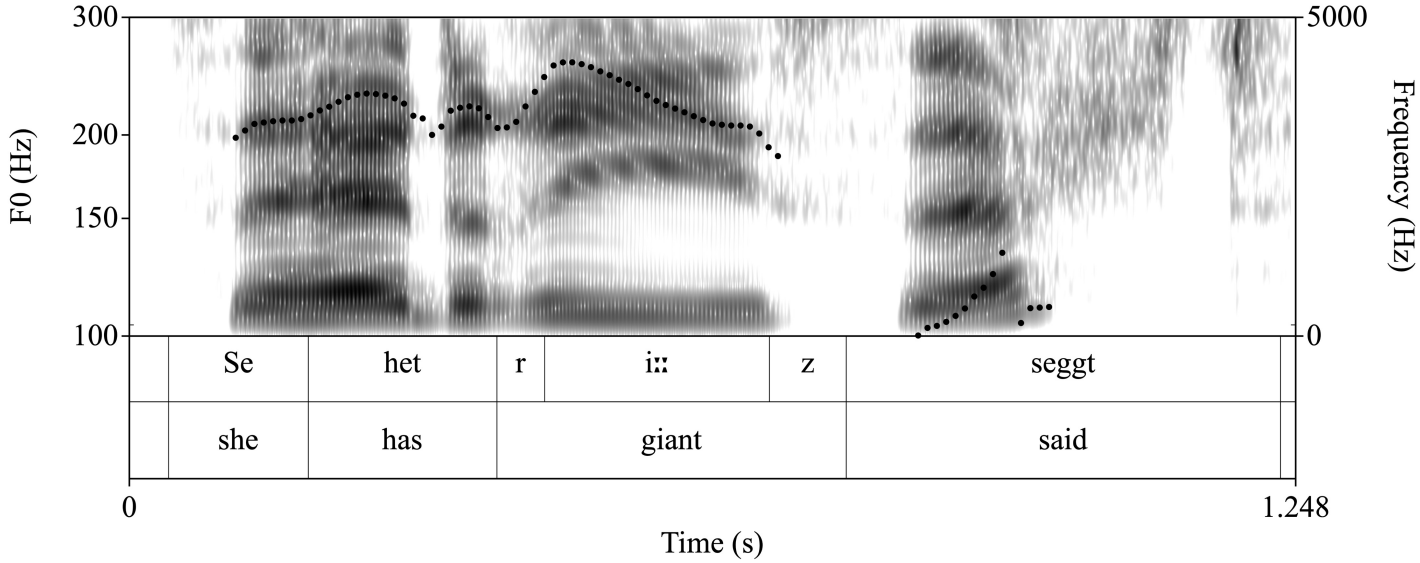
- Low German has a typologically rare opposition between three degrees of vowel quantity
  - Short (lax)
  - Long (usually tense / diphthong)
  - Overlong (usually tense / diphthong)
- Our focus today: the Leer dialect

Leer monosyllabic examples

Orig. *rîs* [riːs] ‘rice’

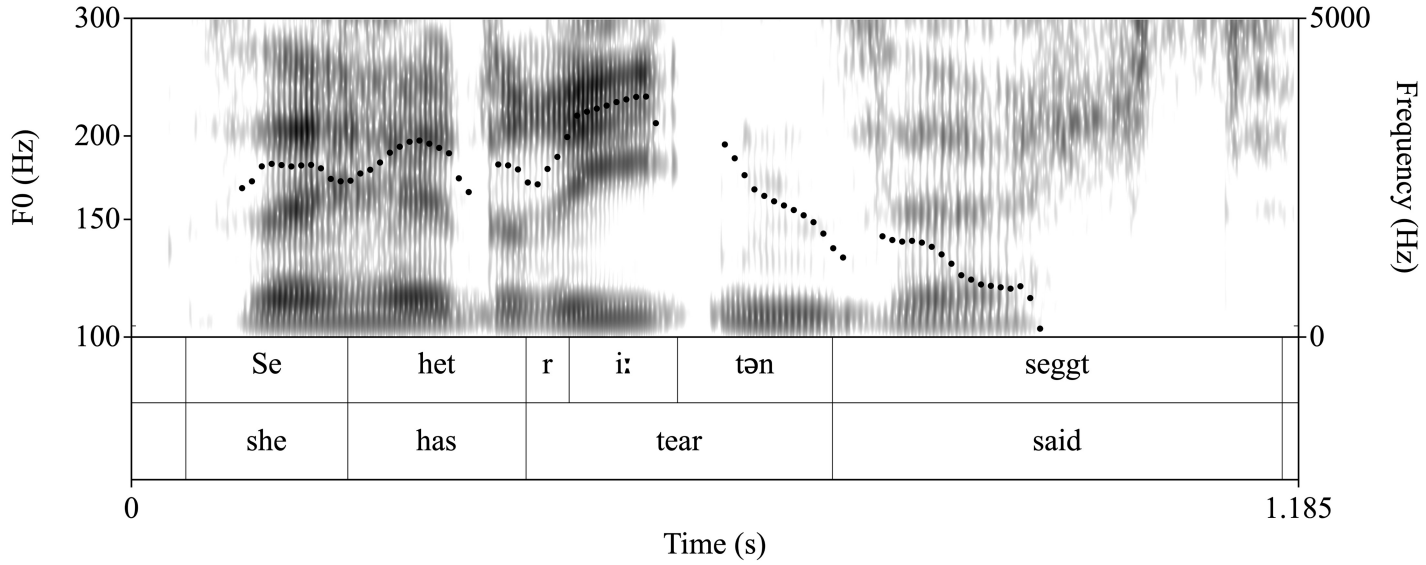


Orig. *rî[z]e* [riːːz] ‘giant’

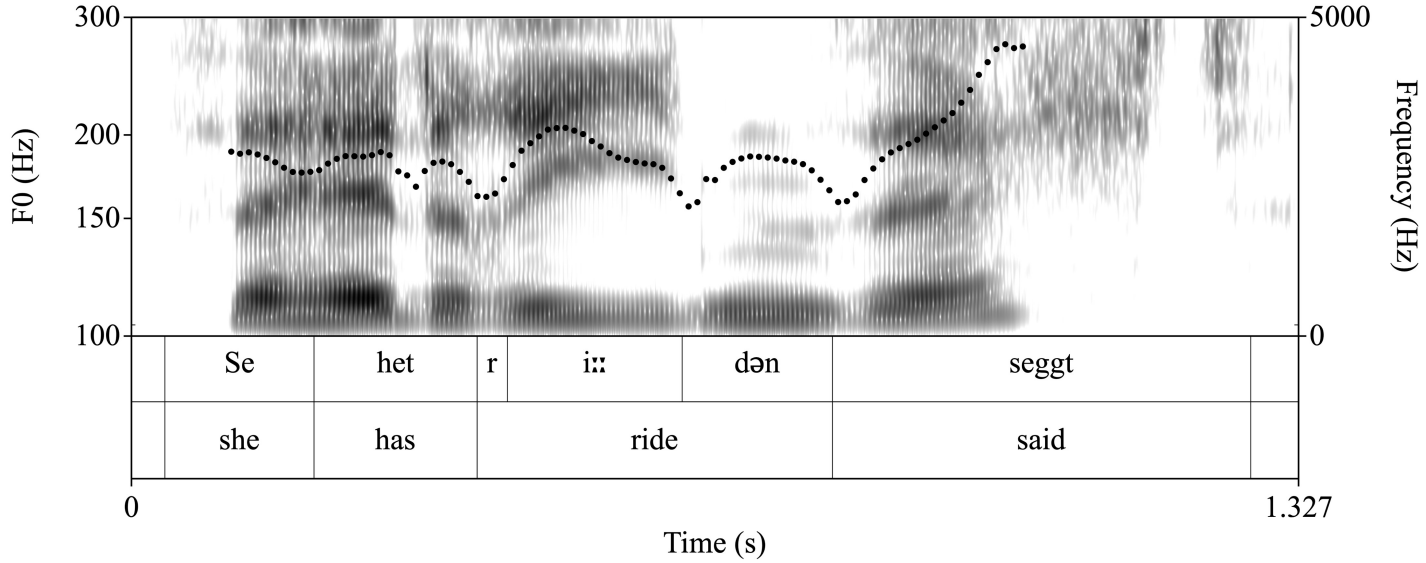


Leer disyllabic examples

Orig. *rîten* [riːten] ‘to tear’



Orig. *rîden* [riːden] ‘to ride’

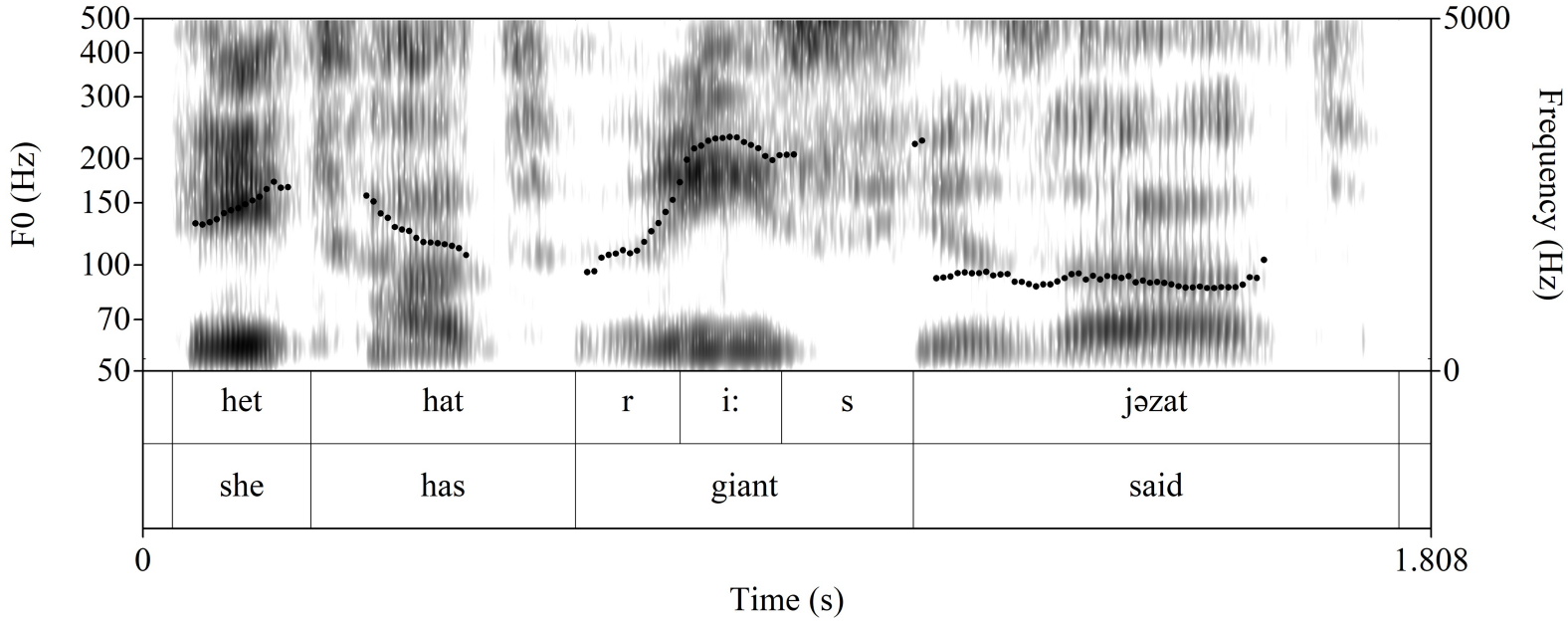


Aachen Franconian: tonal accent

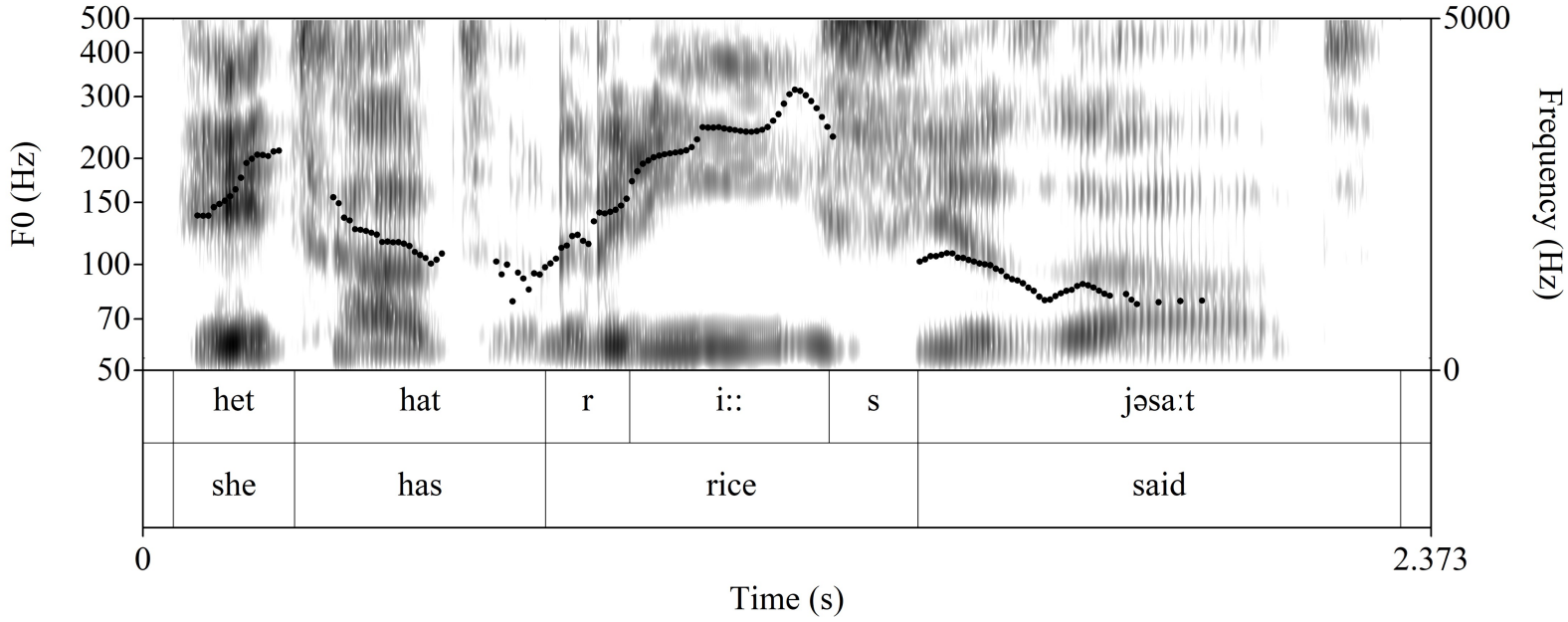
- The Franconian tone accents…
  - are two phonologically distinctive word accents (Accent 1 and Accent 2)
  - typically differ in terms of tone and duration
- Our focus today: the Aachen dialect
- Note: role of pitch in present-day Aachen unclear (but must have had it; see, e.g., Welter 1937)

Aachen monosyllabic examples

Orig. *rî*[z]e > [riː^{1}s] ‘giant’

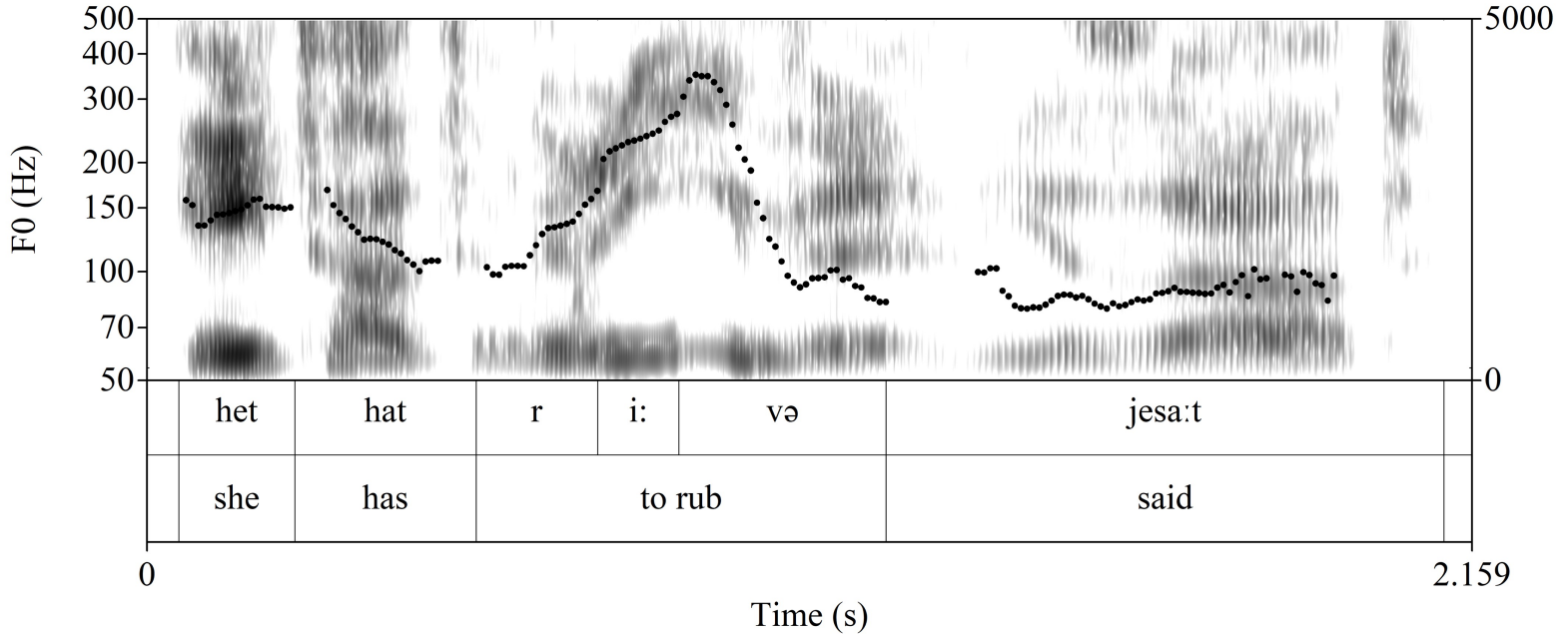


Orig. rîs > [riː^{2}s] ‘rice’

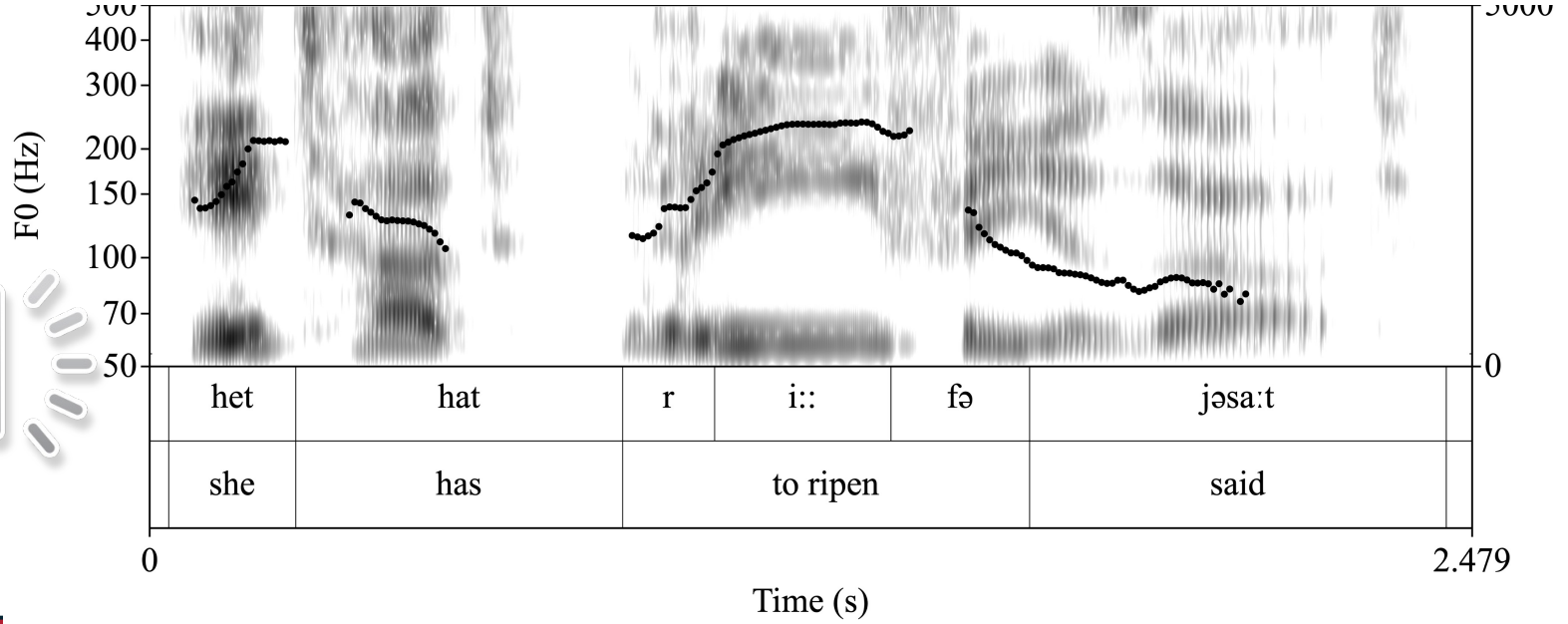


Aachen disyllabic examples

Orig. rîven [riː¹və] ‘to rub’



Orig. rîfen [riː²fə] ‘to ripen’



Methods

Leer

- **Participants:**
  - 10 native speakers (5 male, 5 female, age range: 50 – 76, mean age: 70.5); data collected with collaborator Maike Rocker
- **Materials:**
  - 3 near-minimal pairs of monosyllabic words
  - 3 near-minimal pairs of disyllabic words

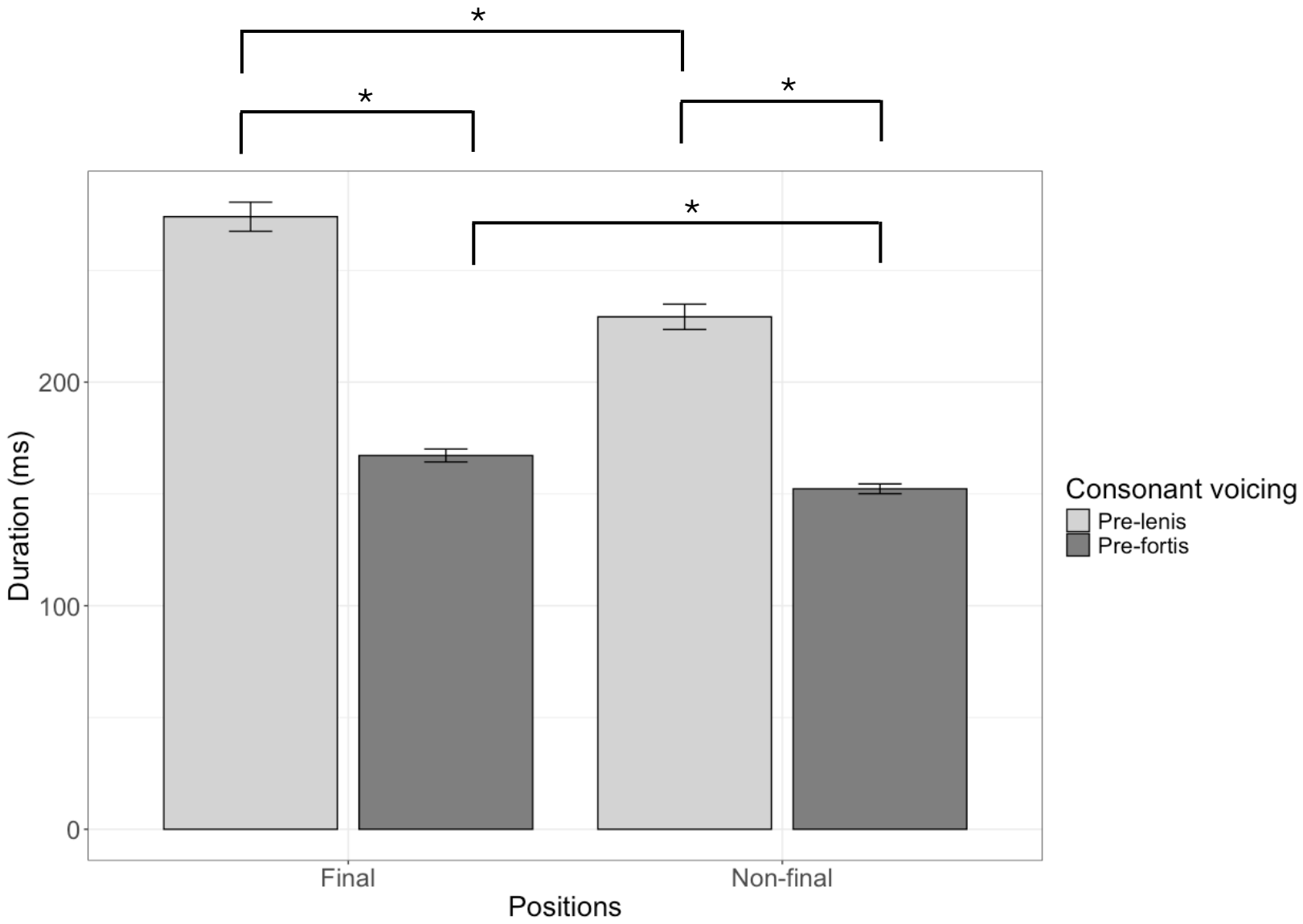
Aachen

- **Participants:**
  - 8 native speakers (5 male, 3 female, age range: 58 – 80, mean age: 72.5)
- **Materials:**
  - 6 near-minimal pairs of monosyllabic words
  - 4 near-minimal pairs of disyllabic words

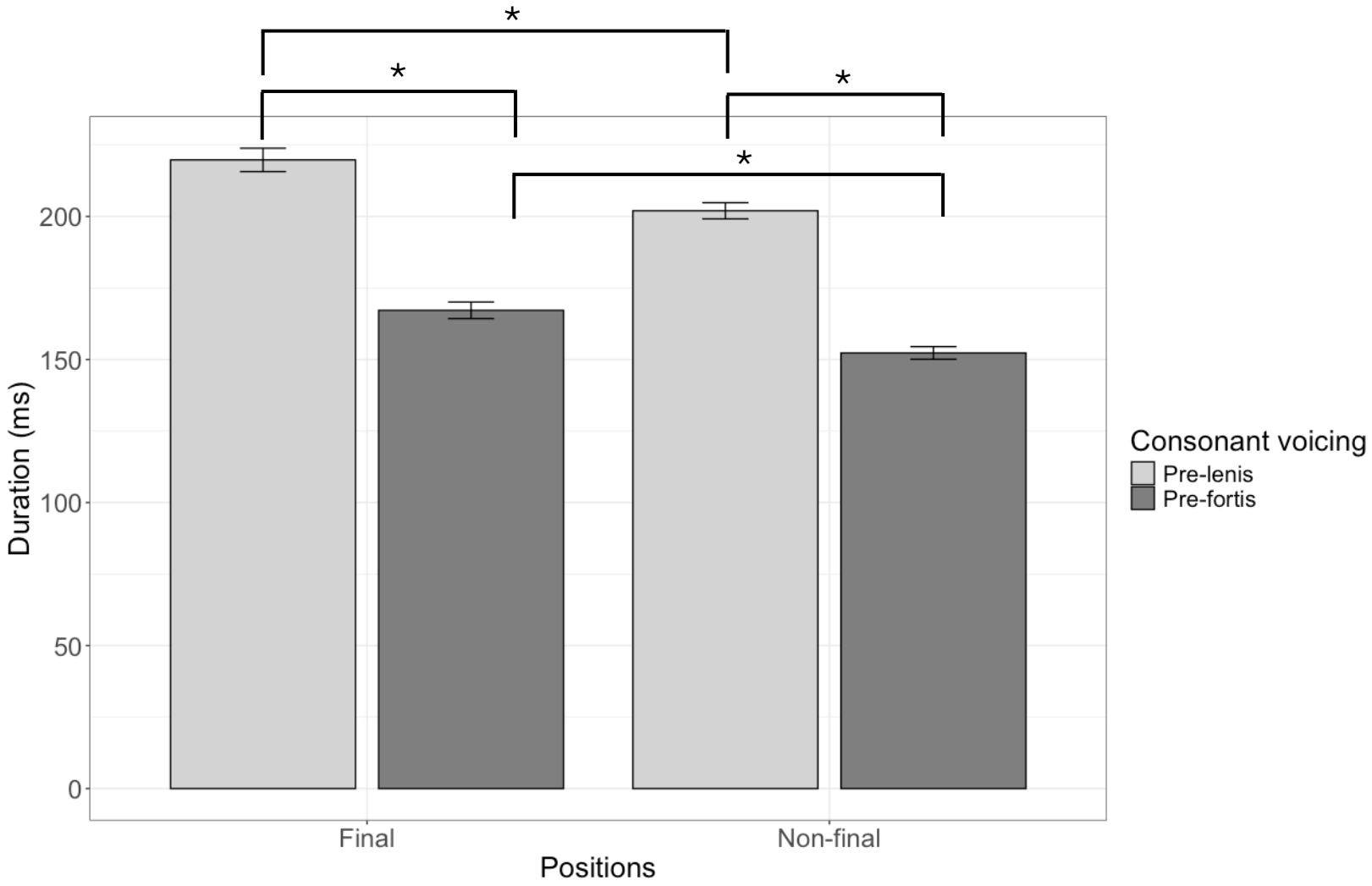
Methods

- **Carrier sentences**
  - 4 carrier sentences varying in sentence types (declarative vs. interrogative) and sentence positions (final vs. non-final)
- **Data collection**
  - Participants read the list of monosyllabic and disyllabic words embedded in four carrier sentences twice.
- **Statistical analysis**
  - Mixed-effects linear regression (DV: vowel duration, IV: positions & following consonant voicing, random effects for subjects and items)

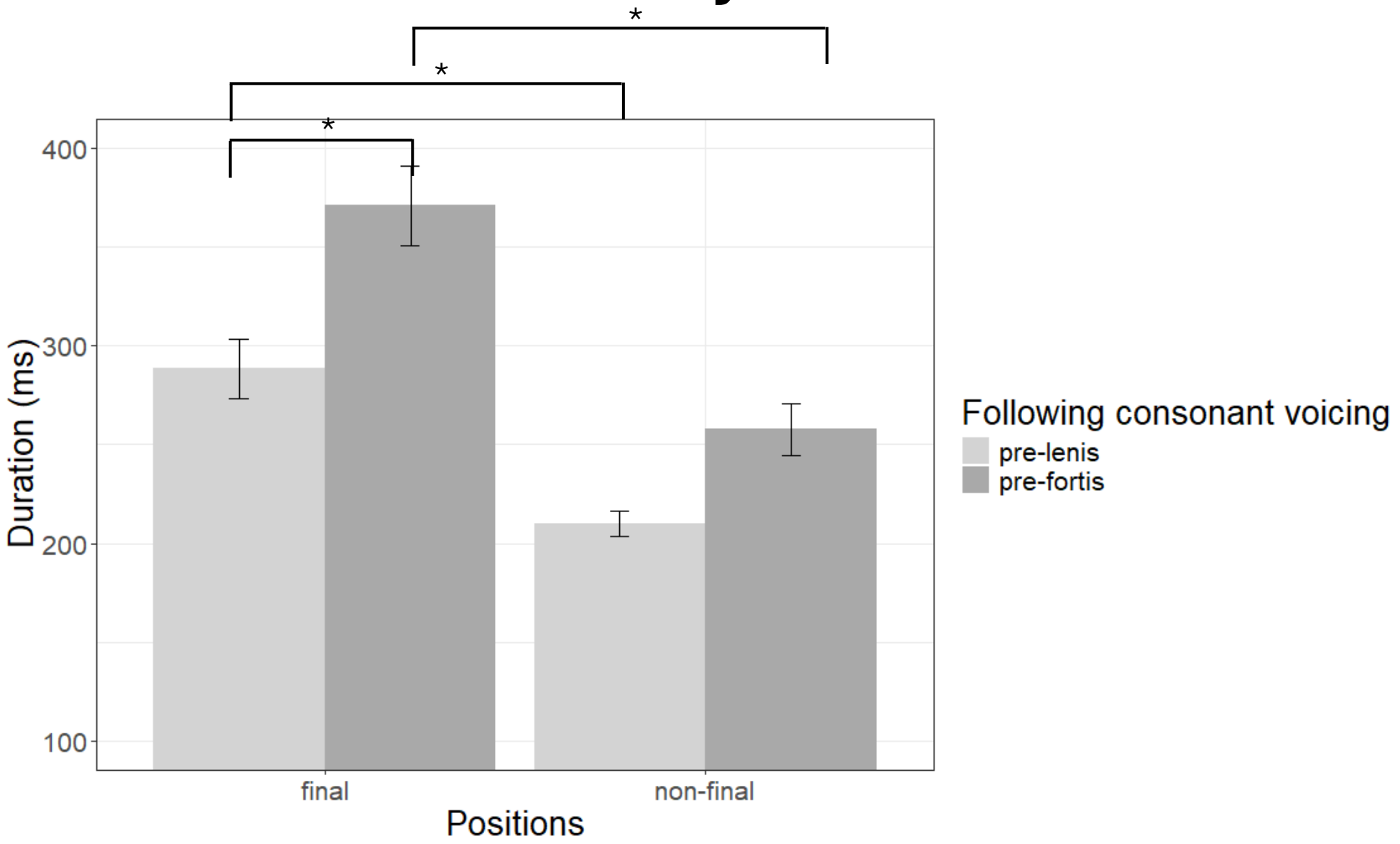
Results for Leer monosyllabic words



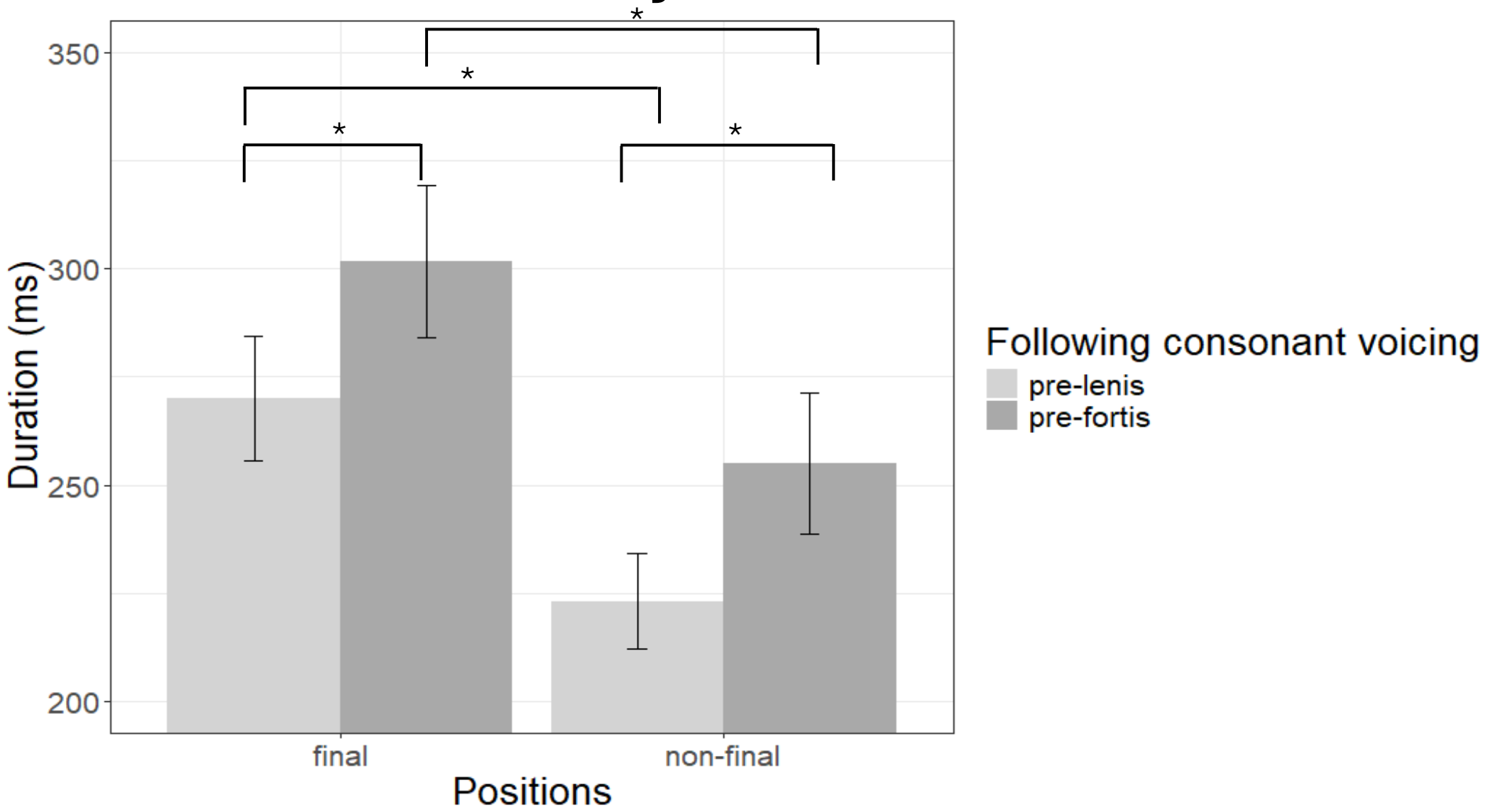
Results for Leer disyllabic words



Results for Aachen monosyllabic words



Results for Aachen disyllabic words



Comparison: word-medial obstruents in modern systems

Dialect	Predecessor	Overlong vowel	Predecessor	Long vowel	Vowel duration
Leer	*rîden*	[riːːdən] ‘to ride’	*rîten*	[riːtən] ‘to pull’	**VVV**D > VVT
Aachen	*rîfen*	[riːːˀfən] ‘to ripen’	*rîven*	[riːˀvən] ‘to rub’	**VVV**T > VVD

Comparison:
word-final obstruents in modern systems

Dialect	Predecessor	Overlong vowel	Predecessor	Long vowel	Vowel duration
Leer	*rî*[z]*e*	[riːːz̥] ‘giant’	*rîs*	[riːs] ‘rice’	**VVV**D > VVT
Aachen	*rîs*	[riːːs^{2}] ‘rice’	*rî*[z]*e*	[riːs^{1}] ‘giant’	**VVV**T > VVD

Diachrony of a reversal

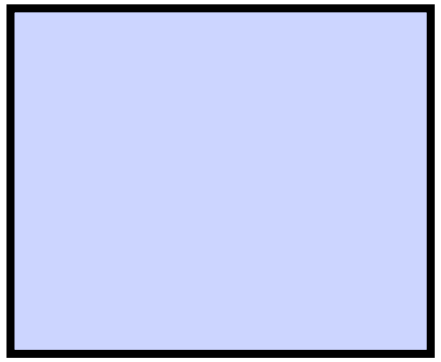
- Leer (Low German overlength) and
  Aachen (tonal accent): obvious distributional similarities
  - Leer overlength ~ Accent 1 (normal length)
  - Leer normal length ~ Accent 2 (overlength)
- Indicates similar origins of the phenomena
  - In line with duration-based tonogenesis scenarios for Franconian (Schmidt 2001, Köhnlein 2013, 2015, Köhnlein et al. to appear)
  - Not in line with a competing morphological account (Gussenhoven 2000 et passim)

Simpler scenario: Low German (Leer)

- Low German overlength is likely caused by pre-lenis lengthening in open syllables (remarked for LG in Kohler 2001, Kavitskaya 2001 for a general framework)
- Most notable in apocopated forms (higher functional load, salience, etc.) → notion of compensatory lengthening

Original situation

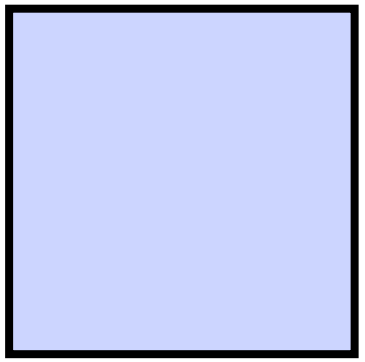
Pre-lenis



Box = stressed vowel

[z iː d ə] ‘silk’

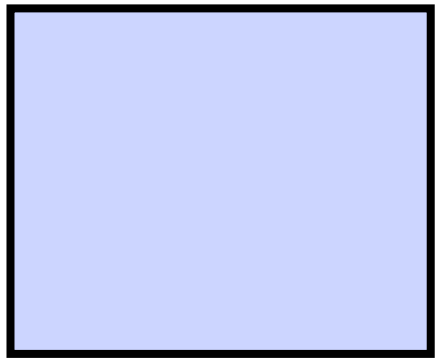
Pre-fortis



[z iː t ə] ‘baptism’

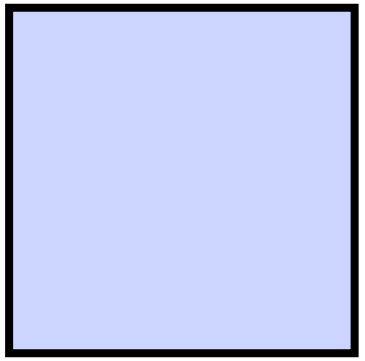
Apocope

Pre-lenis



[z i: d] ‘silk’

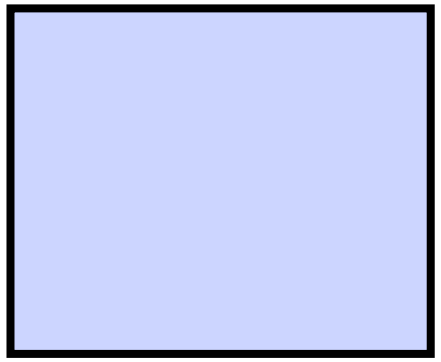
Pre-fortis



[z i: t] ‘baptism’

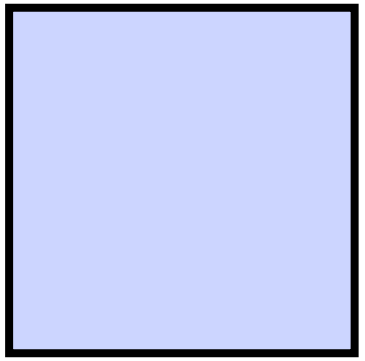
Tendency to devoice, duration cue strengthened

Pre-lenis



[z iː d/t] ‘silk’

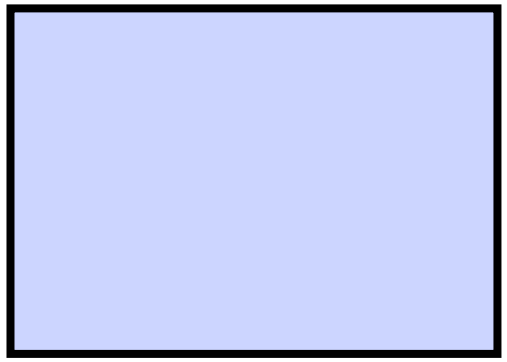
Pre-fortis



[z iː t] ‘baptism’

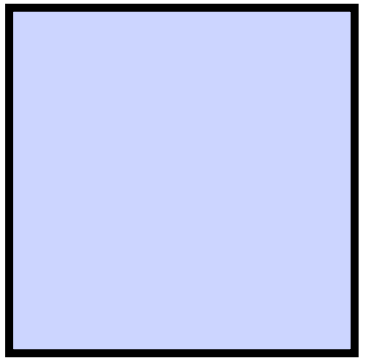
Exaggeration ~ ‘compensatory lengthening'

Pre-lenis



[z i: d/t] ‘silk’

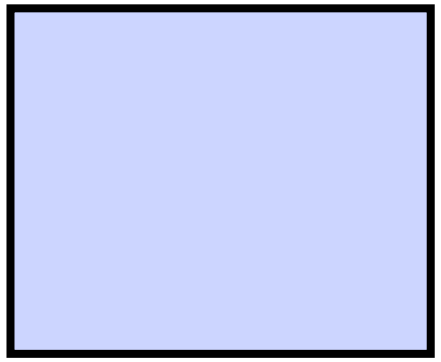
Pre-fortis



[z i: t] ‘baptism’

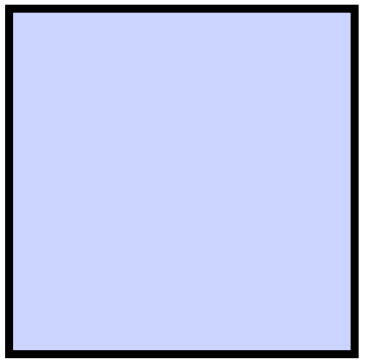
Disyllables preserve the original contrast (at least in some dialects)

Pre-lenis



[r iː dən] ‘to ride’

Pre-fortis



[r iː tən] ‘to tear’

More complex scenario: Franconian (Aachen)

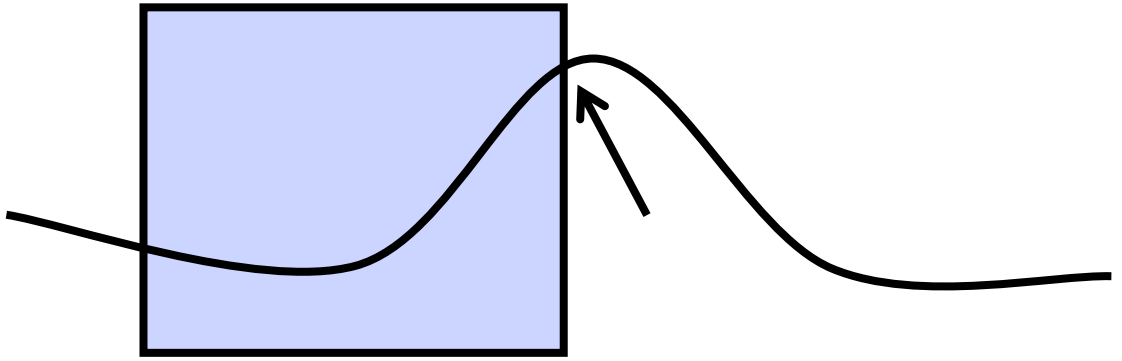
- Bach's Generalization (1921): Distribution of tonal accent reflects an original durational difference between two groups of vowels
- Relatively long: Accent 1 (often pre-lenis); relatively short: Accent 2 (often pre-fortis)

→ In line with Leer, but opposite of today's situation

- Basic idea used in Schmidt (2002), Köhnlein (2013, 2015), Boersma (2017), Köhnlein, Cameron & Coppola (forthcoming in *Language*)

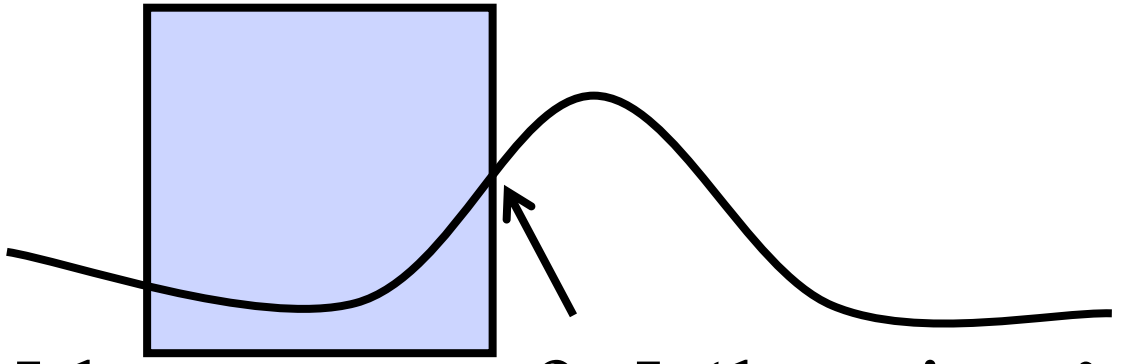
Original situation (e.g., Köhnlein 2015, Köhnlein et al. to appear)

Pre-Accent 1



[d a ʊ v ə] ‘pigeon’

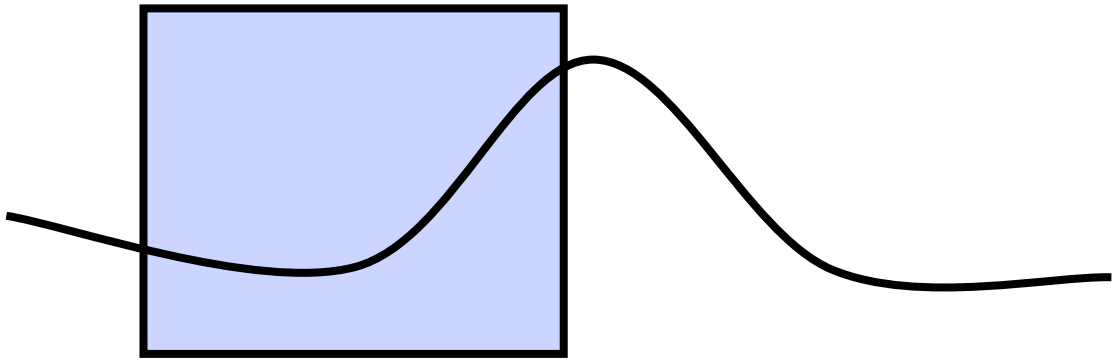
Pre-Accent 2



[d a ʊ f ə] ‘baptism’

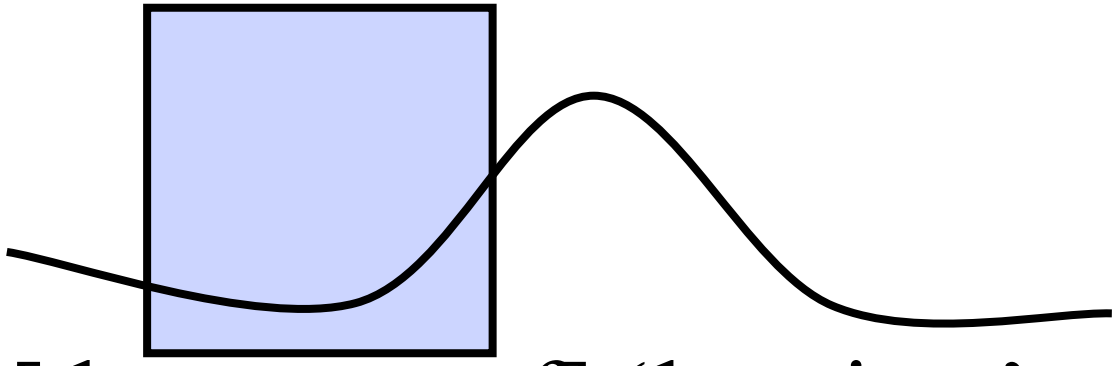
Apocope

Pre-Accent 1



[d a ʊ v] ‘pigeon’

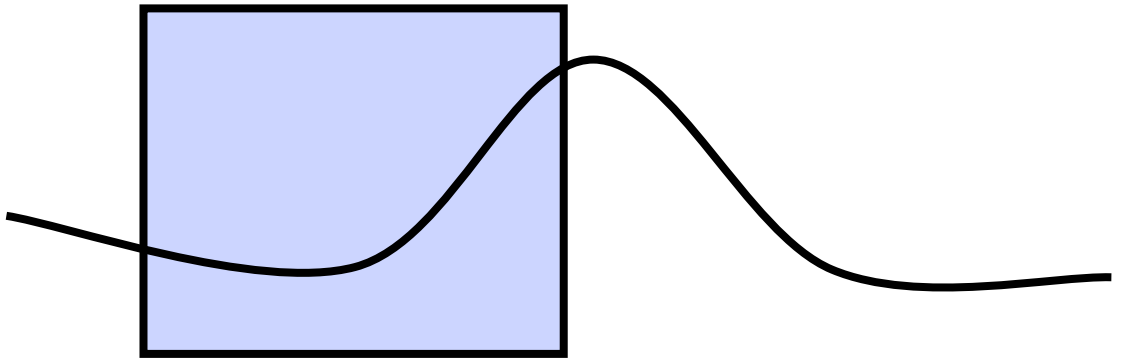
Pre-Accent 2



[d a ʊ f] ‘baptism’

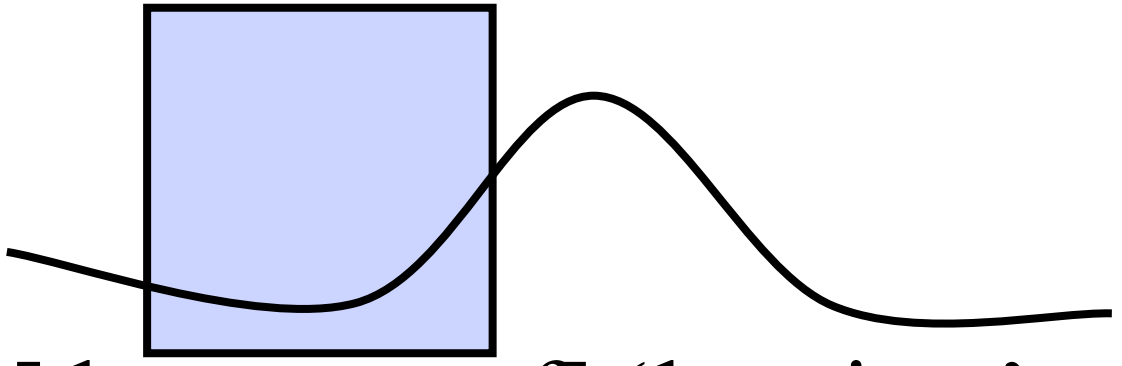
Tendency to devoice, pitch cue strengthened

Pre-Accent 1



[d a ʊ v/f] ‘pigeon’

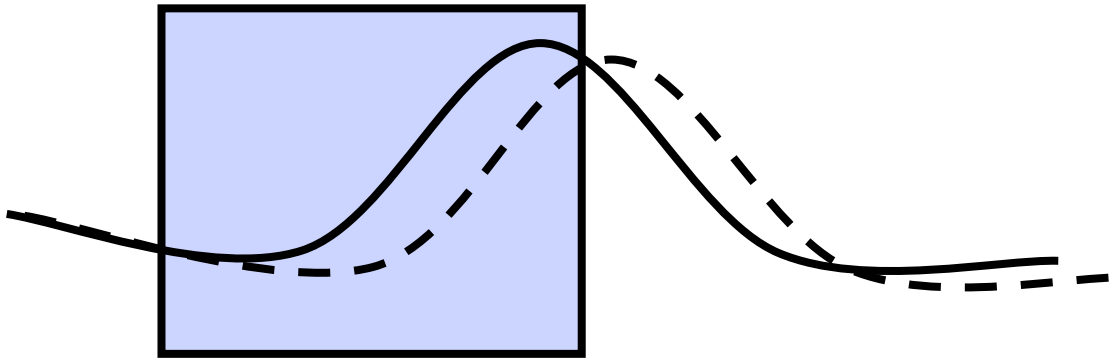
Pre-Accent 2



[d a ʊ f] ‘baptism’

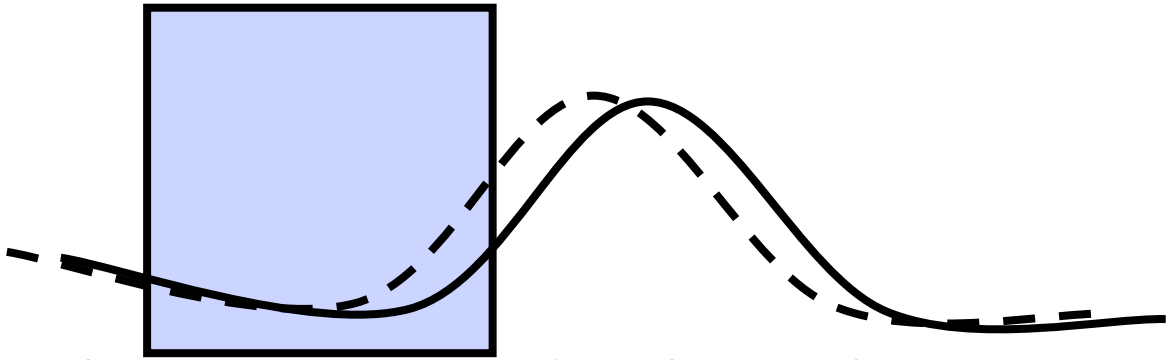
Exaggeration of tonal contrast

Pre-Accent 1



[d a ʊ v/f] ‘pigeon’

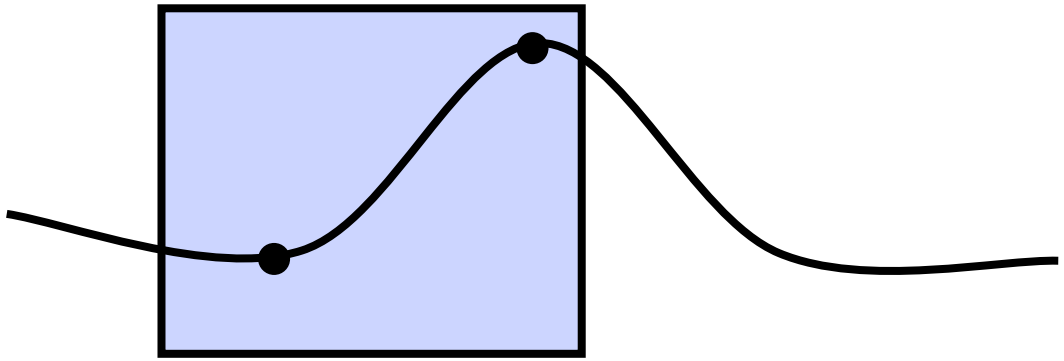
Pre-Accent 2



[d a ʊ f] ‘baptism’

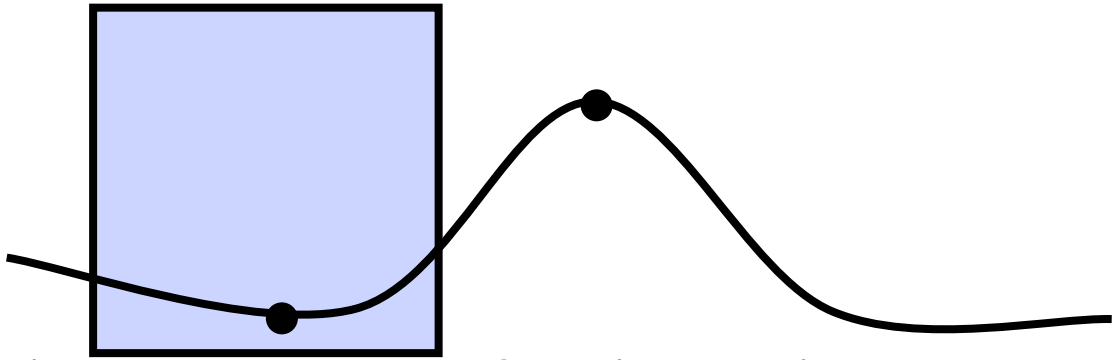
Genesis of tonal accent

Accent 1



[d a$_{L}$ ʊ$_{H}$ f] ‘pigeon’

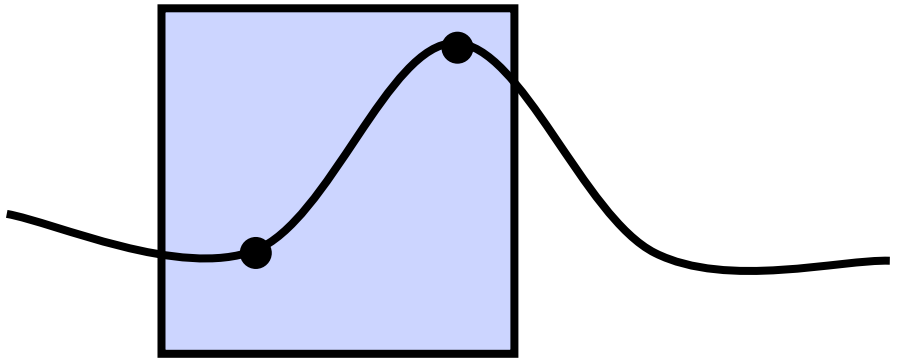
Accent 2



[d a$_{L}$ ʊ$_{L}$ f] ‘baptism’

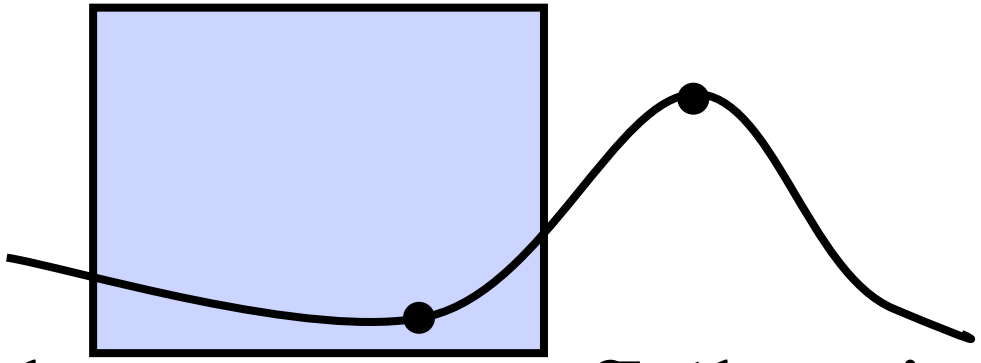
But: modern systems have reversed durations

Accent 1



[d a_L $ʊ_H$ f] ‘pigeon’

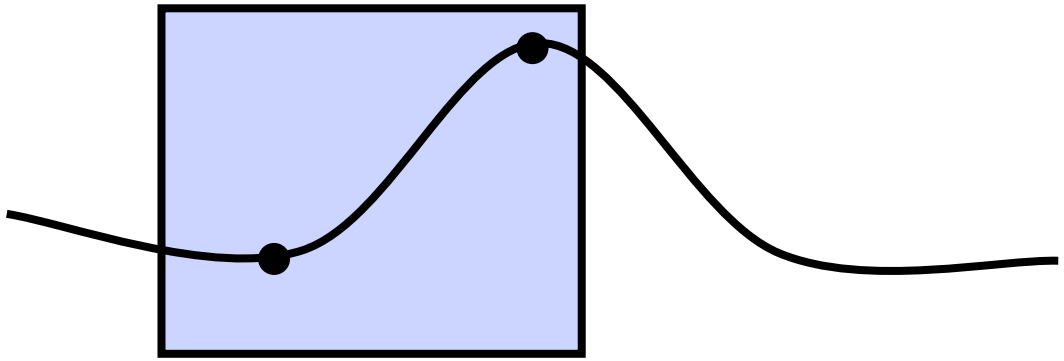
Accent 2



[d a_L $ʊ_L$ f] ‘baptism’

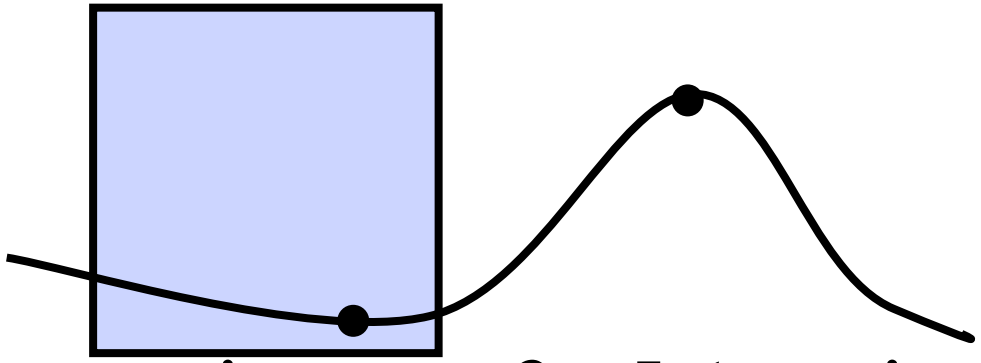
Extended to disyllables in Aachen-like dialects: Original

Accent 1



[r iːLH və] ‘to rub’

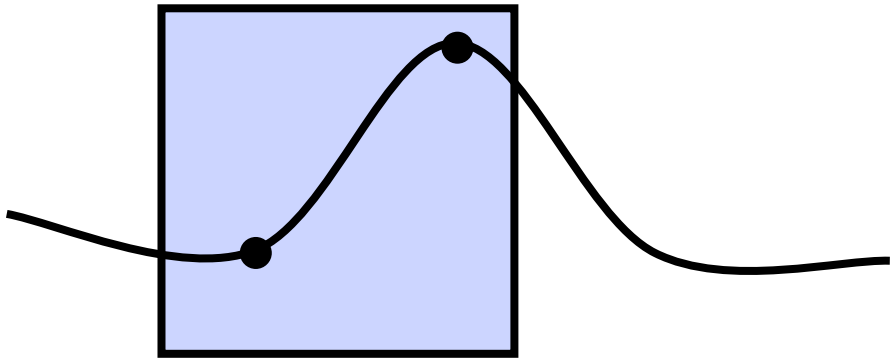
Accent 2



[r iːL fəH] ‘to ripen’

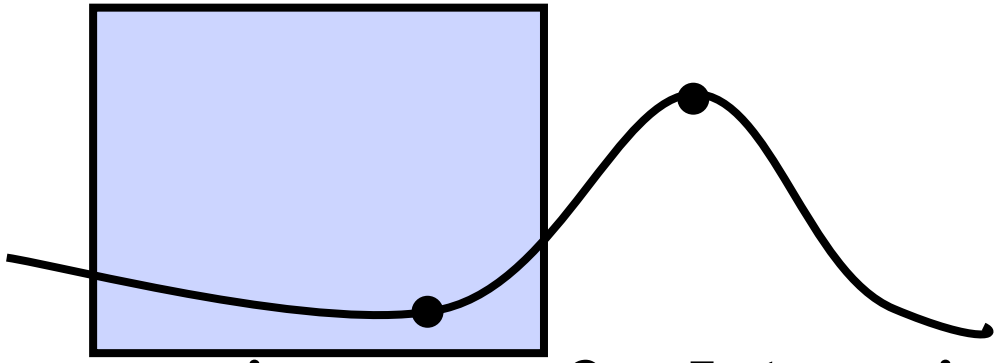
But: modern systems have reversed durations

Accent 1



[r iːLH və] ‘to rub’

Accent 2



[r iːL fəH] ‘to ripen’

Why the durational reversal?

- From Köhnlein (2015): Tone as main correlate establishes its ‘own’ phonetic implementation
- Bimoraic level tones tend to be extra-long
  → Level VV lengthens before fortis w/ Accent 2
- Bimoraic contour tones tend to be of intermediate duration = not too short, not too long
  → Contour VV shortens before lenis w/ Accent 1
- Parallel development (minus voicing) discussed in Morrison (2019) for tonal accent in Applecross Scottish Gaelic (also Köhnlein 2015 for other cases)

Applecross Scottish Gaelic (from Morrison 2019)

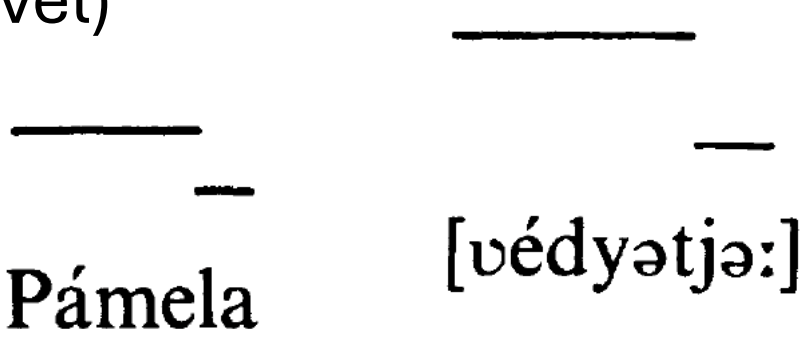
- Orig. disyllables with falling tone (Class 1) shorter than orig. monosyllables with level tone (Class 2)

(1)

		Applecross	
a. Class 1 Falling	*dubhan*	[t̪uan]	‘hook’
	bodha	[poː]	‘submerged rock’
	aran	[aran]	‘bread’
b. Class 2 Level	*uan*	[uaˈn]	‘lamb’
	bò	[poːˈ]	‘cow’
	arm	[araˈm]	‘army’

Two possible motivations for the durational reversal (not incompatible)

- **Perceptual** (Boersma 2017): Movement easier to perceive than constancy → favors longer level tones
- **Articulatory** (Köhnlein 2015): Extra-long level tones articulatorily more natural than extra-long contour tones (example: chanted calls always level)



Pámela

English

[védyətjə:]

‘widow + DIM’

Dutch

Chanted calls
from Gussenhoven (1993)

Some takeaways

- Synchronic violation of a universal (in Aachen) has a **predictable diachronic origin**
- **Pre-lenis lengthening remains a universal tendency** → important for our understanding of both Leer and Aachen
- Underscores importance of understanding **interactions of various processes in sound change** → independent pressures can override universal tendencies

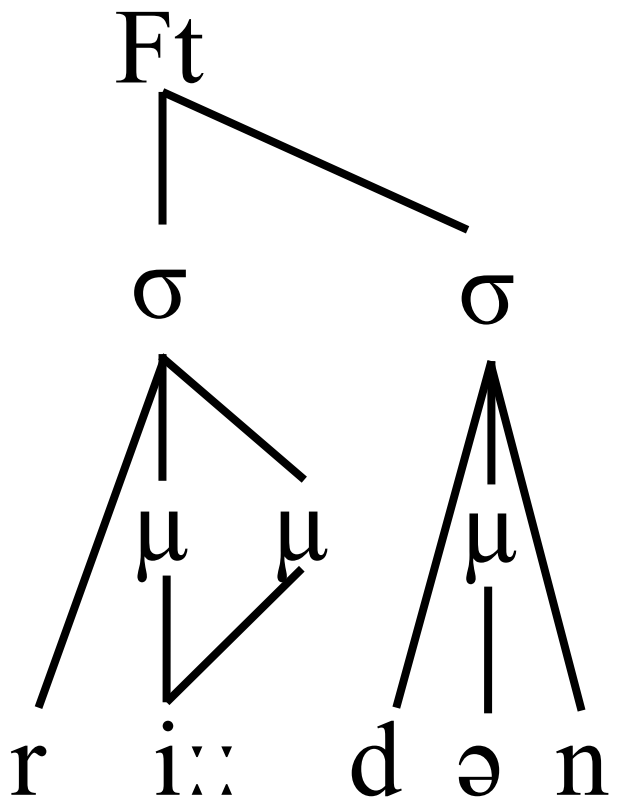
Mostly promissory note

- Synchronically, these interactions can be modelled with the same tools (foot structure) for both dialects
- Different lengthening mechanisms
  - Köhnlein & Cameron (2024) for Franconian
  - Ni et al. (2025) for Leer Low German

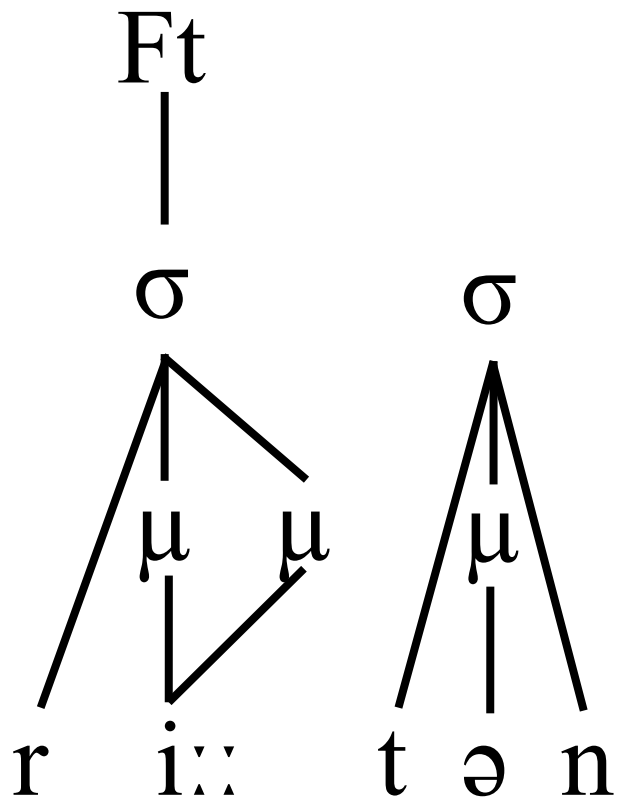
- See also: Morrison (2019) for Scottish Gaelic (including Applecross)

Feet in Leer: overlength = pre-lenis lengthening

‘to ride’

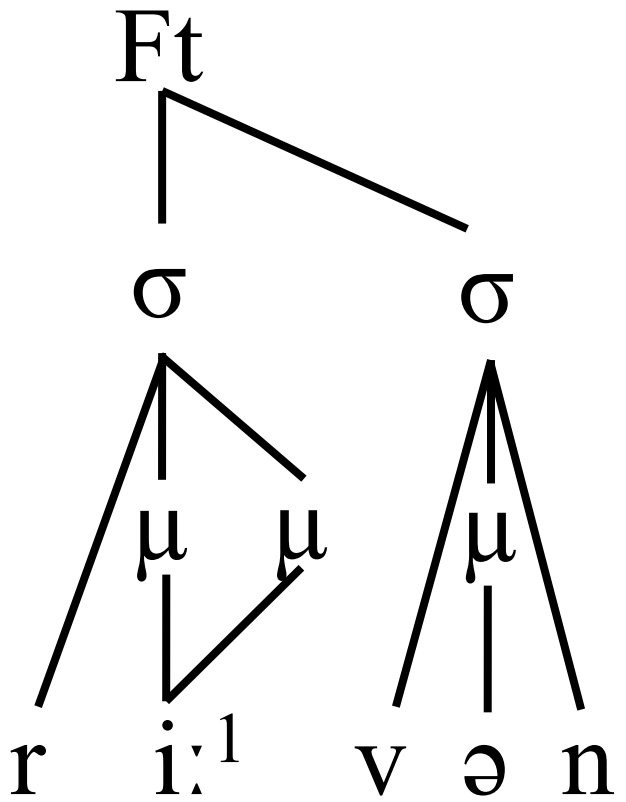


‘to pull’

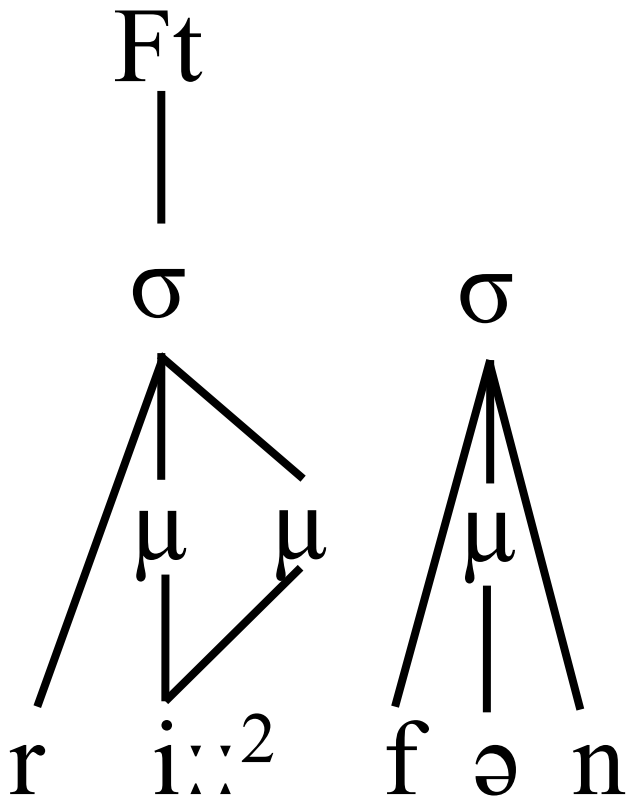


Feet in Aachen: overlength = foot-final lengthening (see Prince 1980 for Estonian)

‘to rub’



‘to ripen’



Thank you!

- A special thank you goes to Maike Rocker, our collaborator on Leer Low German

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Appendix

Towards the genesis

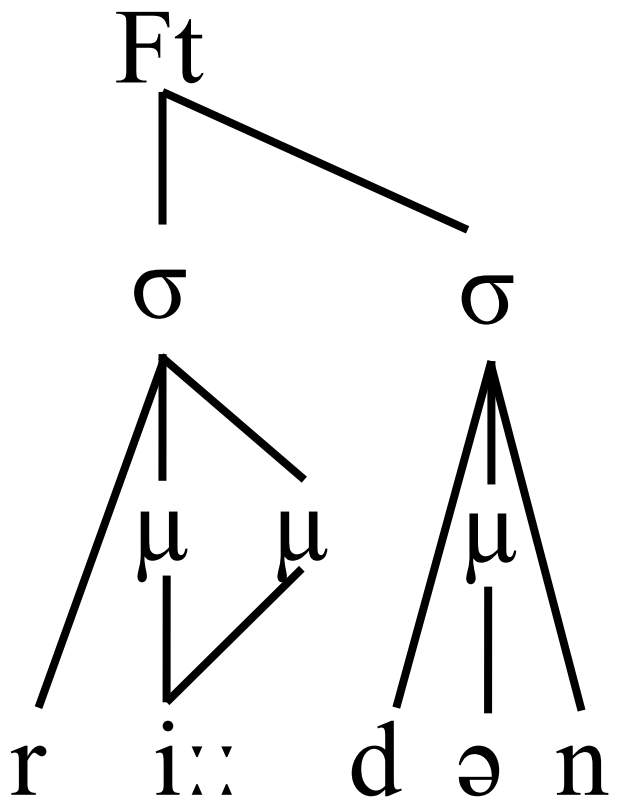
- Franconian originally had a rising-falling contour to mark focus (Köhnlein 2013, 2015)
- The initial rise started in the accent syllable
- The shape was influenced by the duration of the syllable rhyme
- Apocope triggered tonal accent (cf. Schmidt 2002; see also Hasenclever 1904)
- Details and distributional dialect typology discussed in Köhnlein, Cameron & Coppola (forthcoming)

A note on synchrony

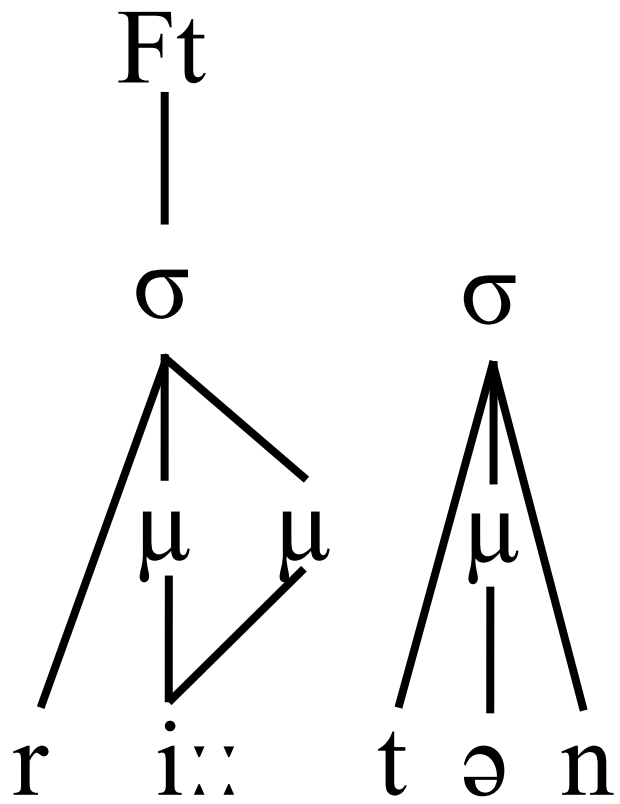
- It is possible to model the oppositions in Aachen and Leer with the same machinery – an opposition between (bi)moraic and (di)syllabic feet
  - Köhnlein (2016), Köhnlein & Cameron (2024) for Franconian
  - Ni et al. (2025) for Leer Low German
- Also captures distributional similarities – varieties are morpho-phonologically essentially identical

Feet in Leer: overlength = pre-lenis lengthening

‘to ride’

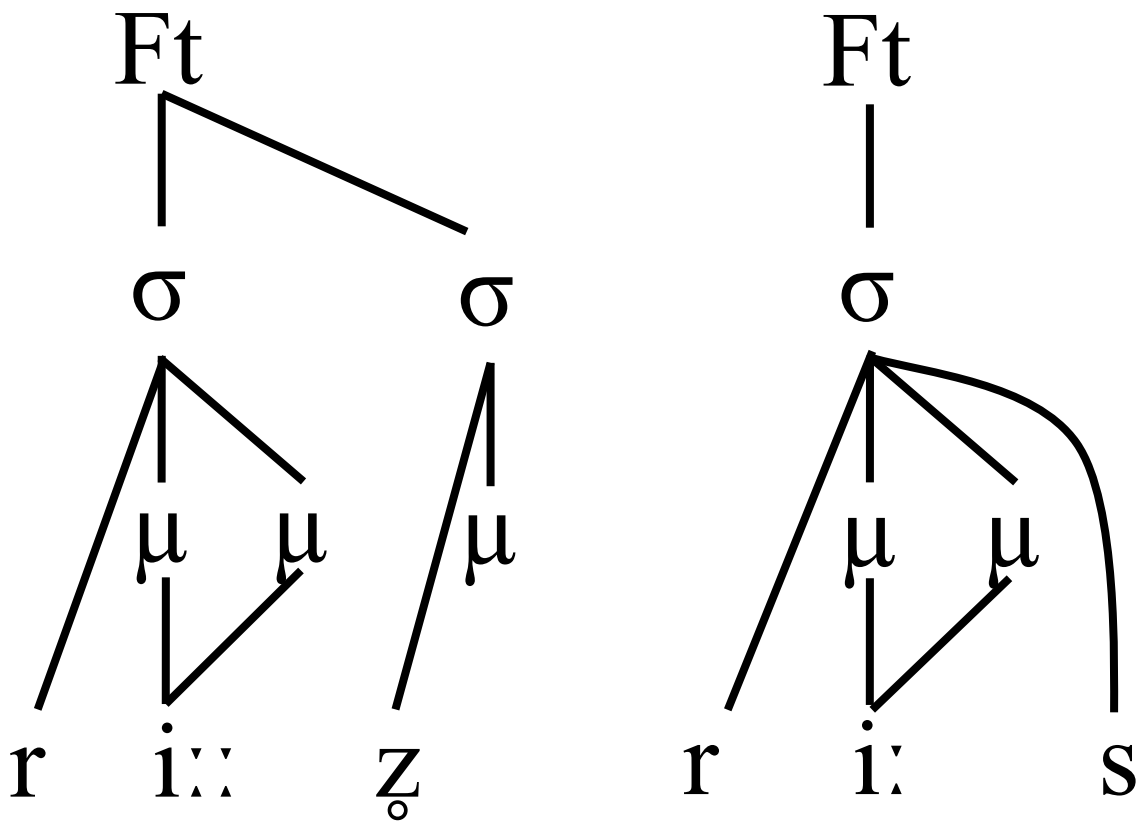


‘to pull’



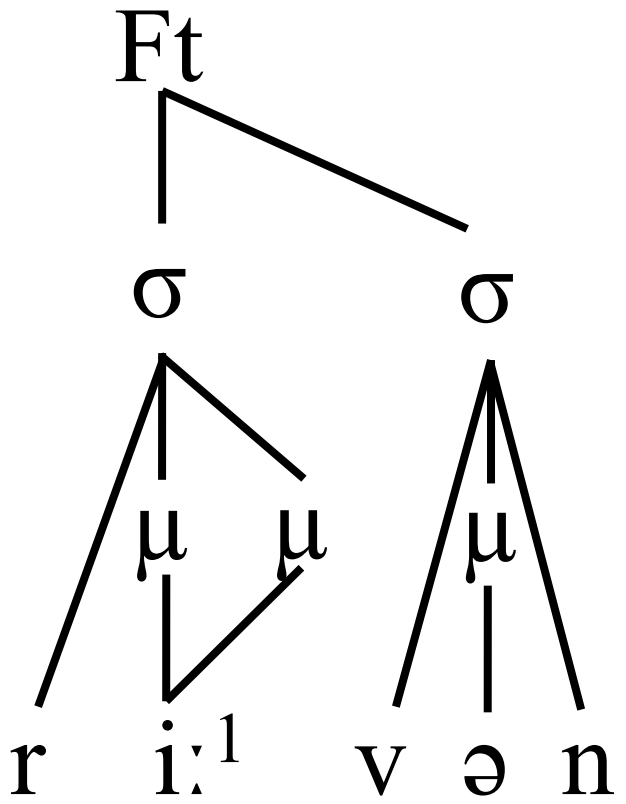
Feet in Leer: overlength = pre-lenis lengthening

‘giant’ ‘rice’

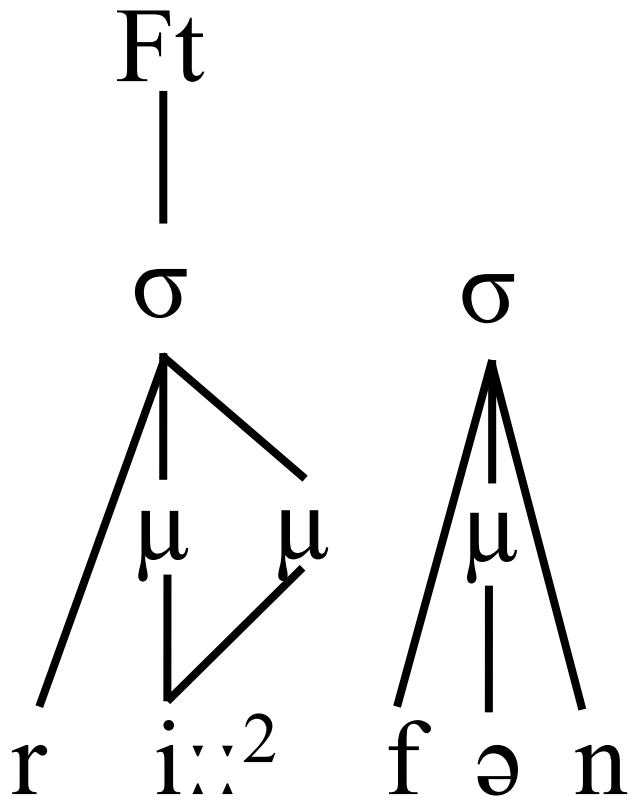


Feet in Aachen: overlength = foot-final lengthening

‘to rub’

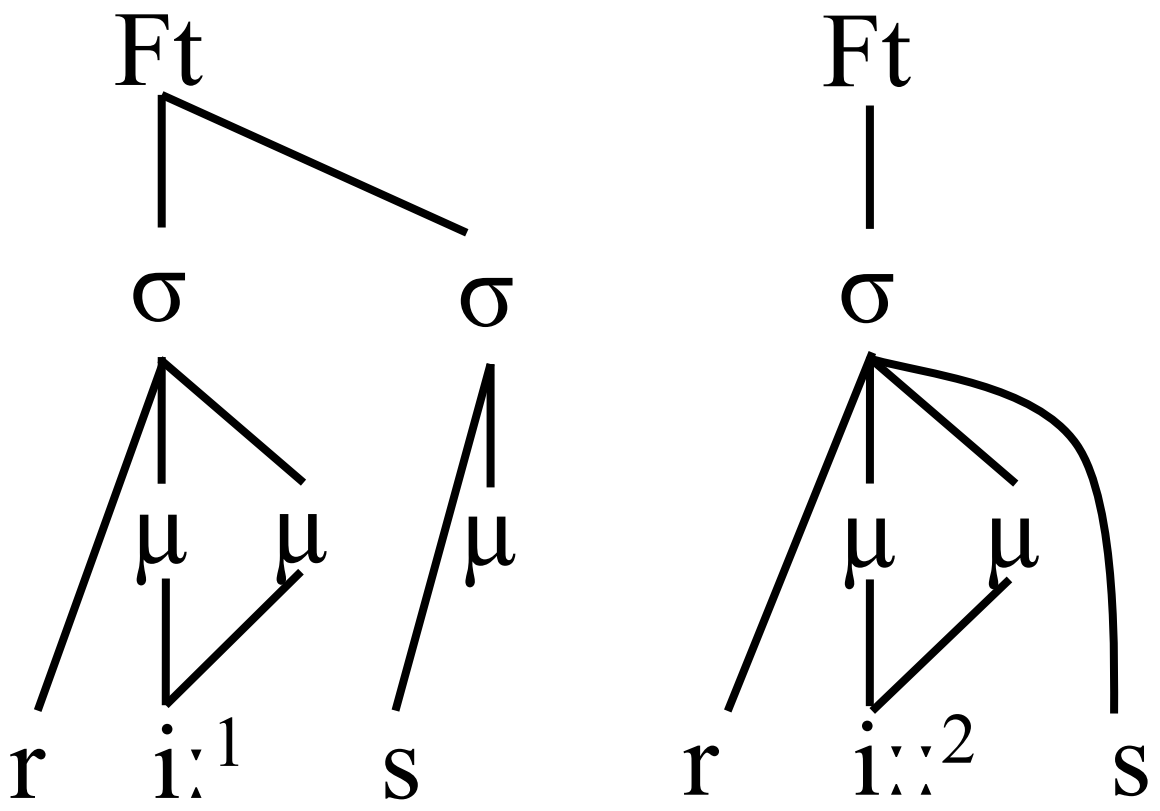


‘to ripen’



Feet in Aachen: overlength = foot-final lengthening

‘giant’ ‘rice’



Conclusions synchrony

- Patterns can be **synchronically** modelled by assuming independently motivated lengthening patterns (Köhnlein & Cameron 2024 for further discussion)

→ Informs understanding of interface between diachrony and synchrony and word-prosodic typology

Fives stages from Köhnlein (2015: Table 1), Franconian (Aachen) = 5, earlier stages elsewhere

Stage	Process	Description
1	Durational contrast	Bimoraic Accent 1 has a phonetically longer duration than bimoraic Accent 2
2	Pitch contrast	Longer Accent 1 correlates with stronger pitch movements than shorter Accent 2
3	Tonal contrast	Longer Accent 1 develops a contour tone, shorter Accent 2 a level tone
4	Durational adjustment	Accent 1 shortens under the influence of the contour tone, and / or Accent 2 lengthens under the influence of the level tone
5	Durational reversal	Originally longer Accent 1 is phonetically shorter than originally shorter Accent 2

Some dialects reduce the contrast to binary oppositions

- Extreme cases of vowel shortening and vowel lengthening are attested in Werth Franconian and Luxemburg Franconian
- Two notes on these varieties
  - Have given up the tonal contrast for a binary length contrast
  - Do not display the predictable vowel-voicing interactions found in Aachen (distributional differences)

From Heijmans (2003)

- **Lengthening of (former) Accent 2 vowels**

Weert	Baexem	gloss
[bæːrx]	[bærx^{2}]	‘mountain’
[hɑːnt]	[hɑŋc^{2}]	‘hand’
[æːrm]	[ærm^{2}]	‘arm’

- **Shortening of (former) Accenrt 1 vowels**

Weert	Baexem	gloss
[knin]	[kniːn^{1}]	‘rabbit-pl’
[mul]	[muːl^{1}]	‘mouth’
[yl]	[yːl^{1}]	‘owl’