

Closure voicing in Danish stops

Phonetics, phonology,
variation, and history

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Does Danish have closure voicing at all?

Yes, as a reduction phenomenon.
But we propose that it used to be more widespread.



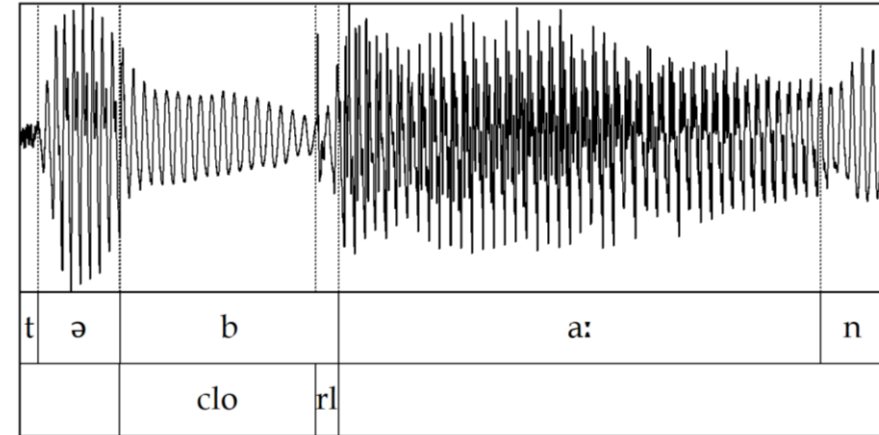
Roadmap

- Background on closure voicing in stops
- Danish closure voicing
 - Phonetics
 - Articulation
 - Acoustics
 - Variation
 - Focus on Jutland
 - History
 - Existing accounts
 - Our modified proposal



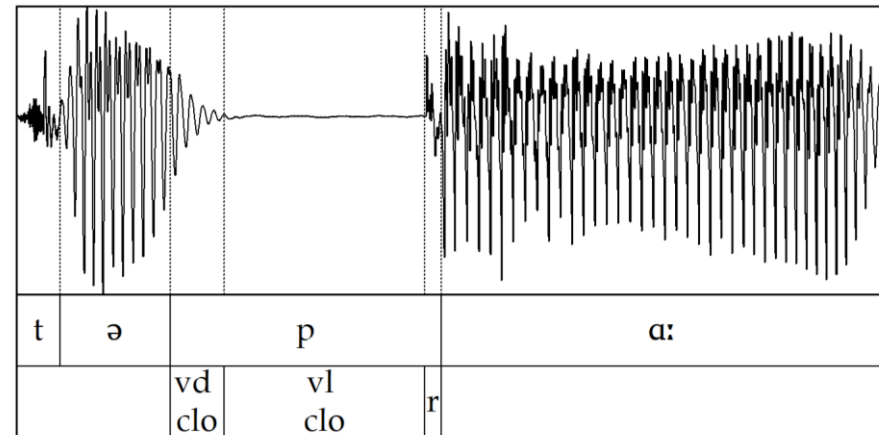
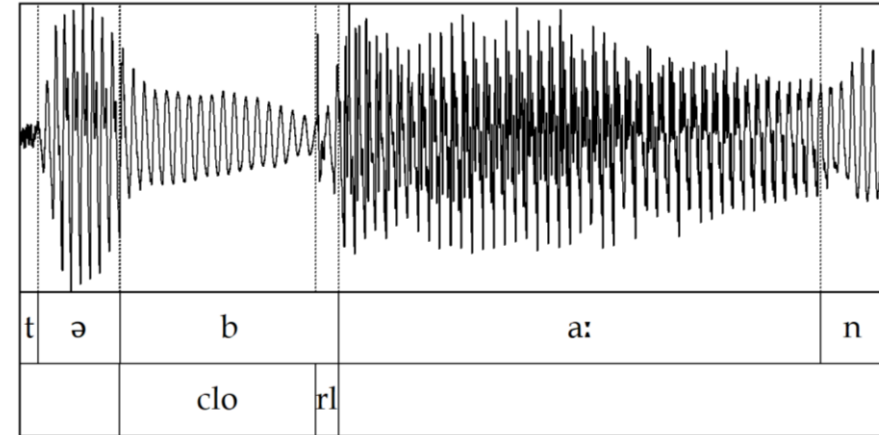
Closure voicing in stops

- Stop sounds are produced with a complete closure in the vocal tract
- A stop is *truly voiced* when the vocal folds vibrate during the closure
 - As in e.g. Dutch



Closure voicing in stops

- Stop sounds are produced with a complete closure in the vocal tract
- A stop is *truly voiced* when the vocal folds vibrate during the closure
 - As in e.g. Dutch
- Closure voicing is relatively *unnatural* (e.g. Ohala 1983)
 - It requires free passage of air through the glottis
 - Intraoral air pressure increases during the closure
 - When a certain pressure threshold is reached, free passage is no longer possible (e.g. Ohala & Riordan 1979; Westbury & Keating 1986)
 - This is reflected in most Germanic languages

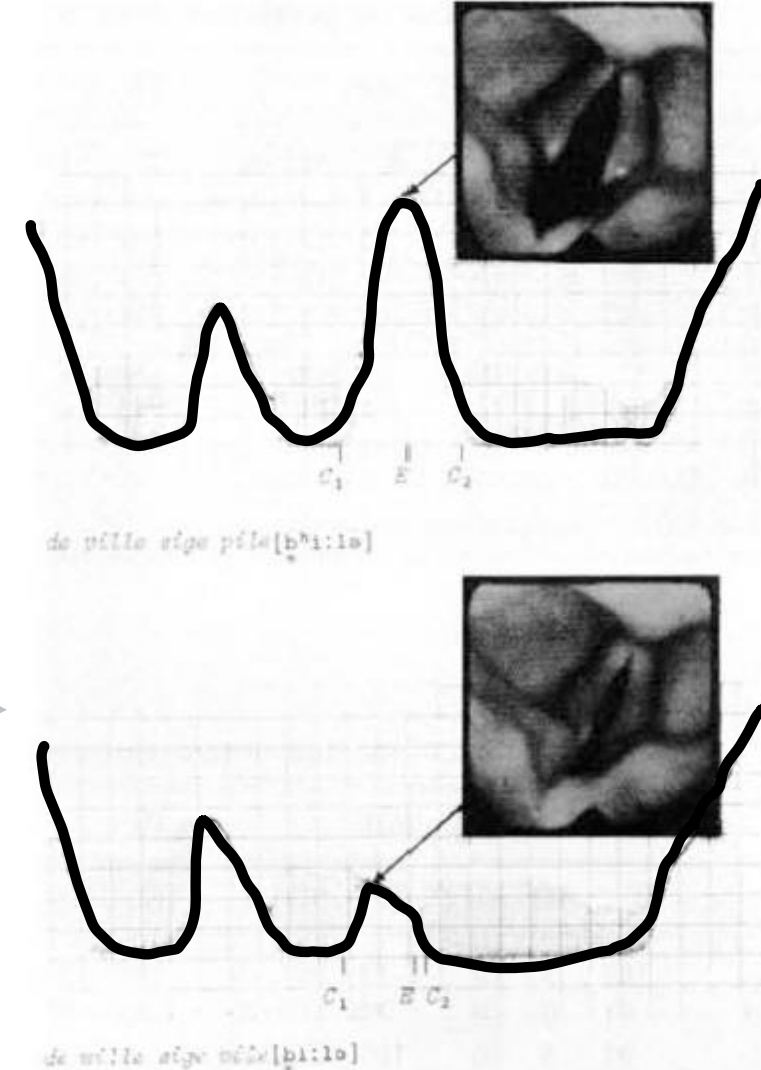


Closure voicing in stops

- This particularly affects **initial, post-pausal position** and **final position**
 - Closure voicing requires extra effort here
 - Strategies to increase the space above the glottis: lowering the larynx, slightly puffing the cheeks, raising the velum (Westbury 1983)
- CV is more natural in **intervocalic** position
 - Here, conditions are natural for CV, and it requires **no extra effort** (Westbury & Keating 1986)
 - Stops are often intervocalically voiced throughout (most of) the closure, even in languages with no CV otherwise (e.g. English; Davidson 2016)

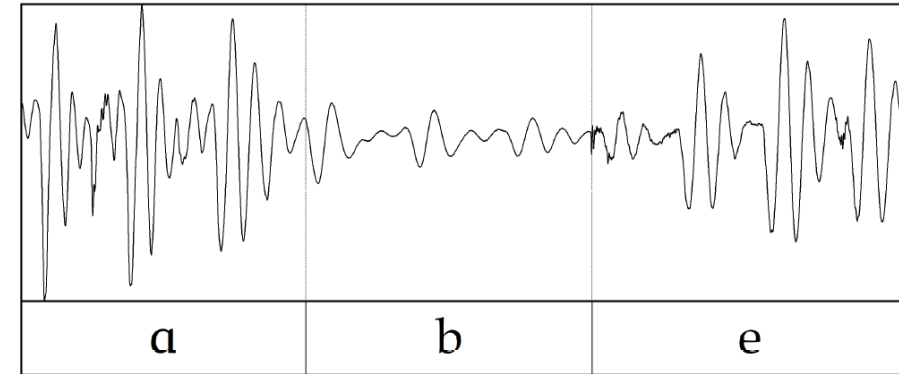
Danish CV: Articulation

- Danish distinguishes two sets of stops:
 - /p t k/ voiceless aspirated
 - /b d g/ voiceless unaspirated
- Cross-linguistically,
 - voiceless aspirated stops are produced with a glottal spreading gesture during the closure
- Especially in Danish,
 - voiceless unaspirated stops are produced with a (smaller, shorter) glottal spreading gesture
(Frøkjær-Jensen et al. 1973; Fischer-Jørgensen & Hirose 1974; Hutters 1985:5)

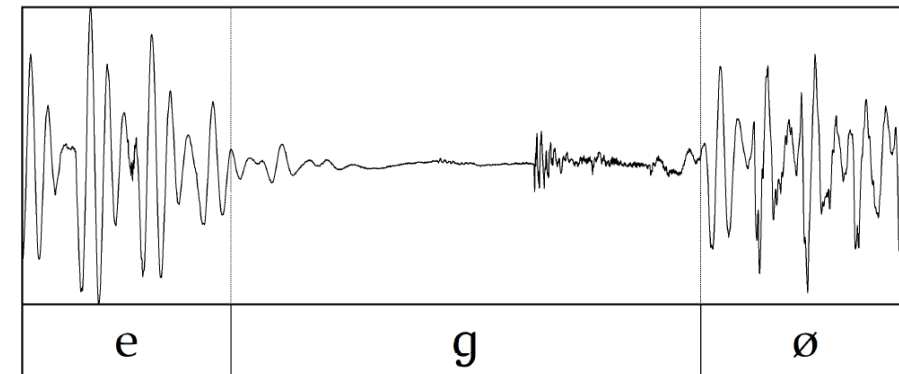


Danish CV: Acoustics

- As a result, (Modern Standard) Danish resists intervocalic CV more than related languages (e.g. Beckman et al. 2013)
 - In spontaneous Danish speech, voicing in intervocalic /b d g/ does not usually last throughout the closure (Puggaard-Rode et al. 2022)
 - When /b d g/ are fully voiced, it is usually in contexts prone to phonetic reduction
 - In unstressed syllables, before schwa, in quick speech, in frequent words, etc.
- /p t k/ are only very rarely voiced intervocalically



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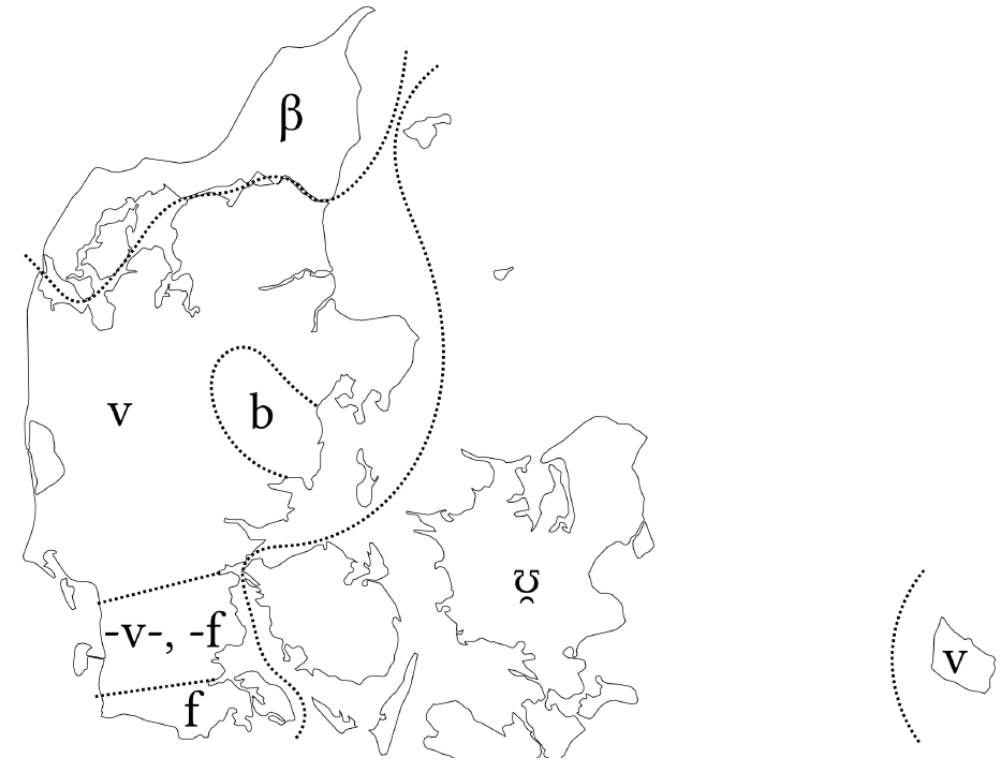


In Modern Standard Danish

- All stops are produced with a glottal spreading gesture, which generally serves to block voicing in all contexts
- Intervocalic voicing is occasionally found as a reduction phenomenon

Variation in consonant gradation

- Historically in Copenhagen Danish, post-vocalic singleton stops developed into semivowels
 - [t] → ‘soft d’ [ɰ]
 - [k] → variably [ɫ, ʊ, Ø]
 - ([p] → [ɰ] → [p])
- This is part of the **consonant gradation chain**
(see Horslund et al. 2022)
- The outcomes of consonant gradation varied significantly in different regional varieties

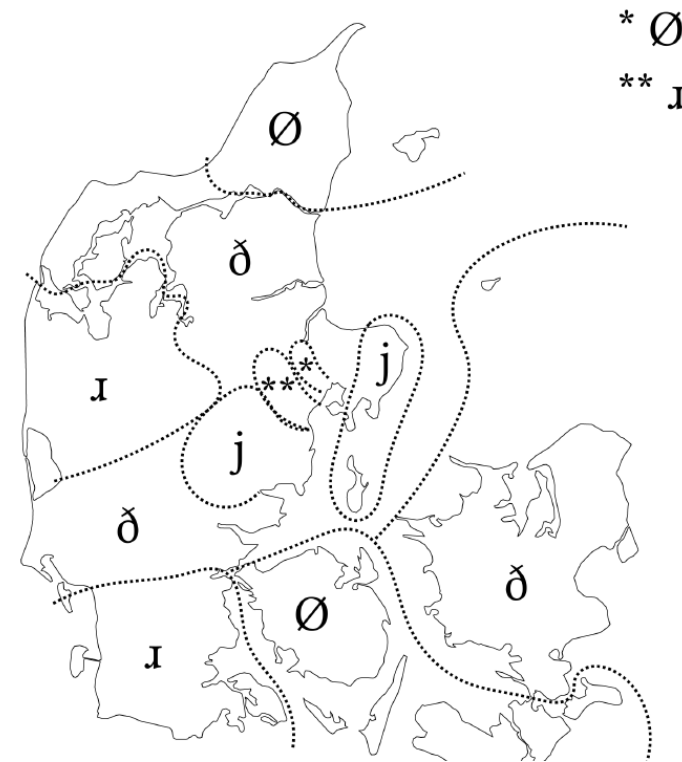


Development of [p]

(Bennike & Kristensen 1898–1912)

Variation in consonant gradation

- Historically in Copenhagen Danish, post-vocalic singleton stops developed into semivowels
 - [p] → [ɥ] → [p]
 - [t] → [ɣ]
 - [k] → variably [ɭ, ɥ, Ø]
- This is part of the **consonant gradation** chain
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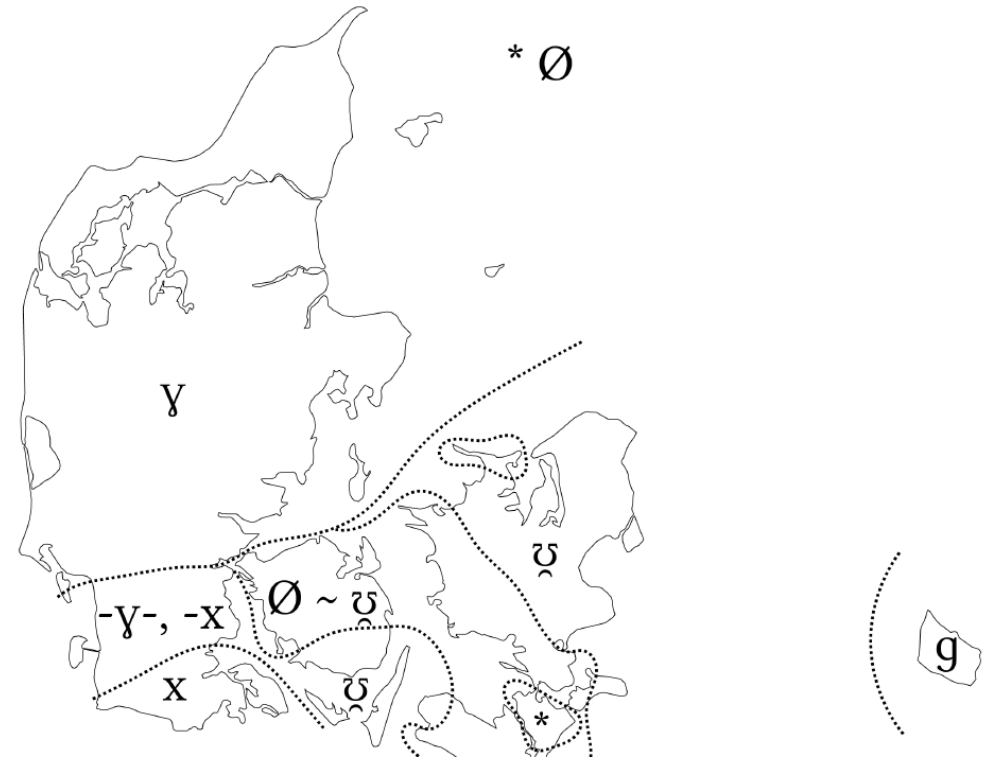


Development of [t]

(Bennike & Kristensen 1898–1912)

Variation in consonant gradation

- Historically in Copenhagen Danish, post-vocalic singleton stops developed into semivowels
 - [p] → [ɸ] → [p]
 - [t] → [ɧ]
 - [k] → variably [ɰ, ɸ, Ø]
- This is part of the **consonant gradation chain**
- The outcomes of consonant gradation varied significantly in different regional varieties

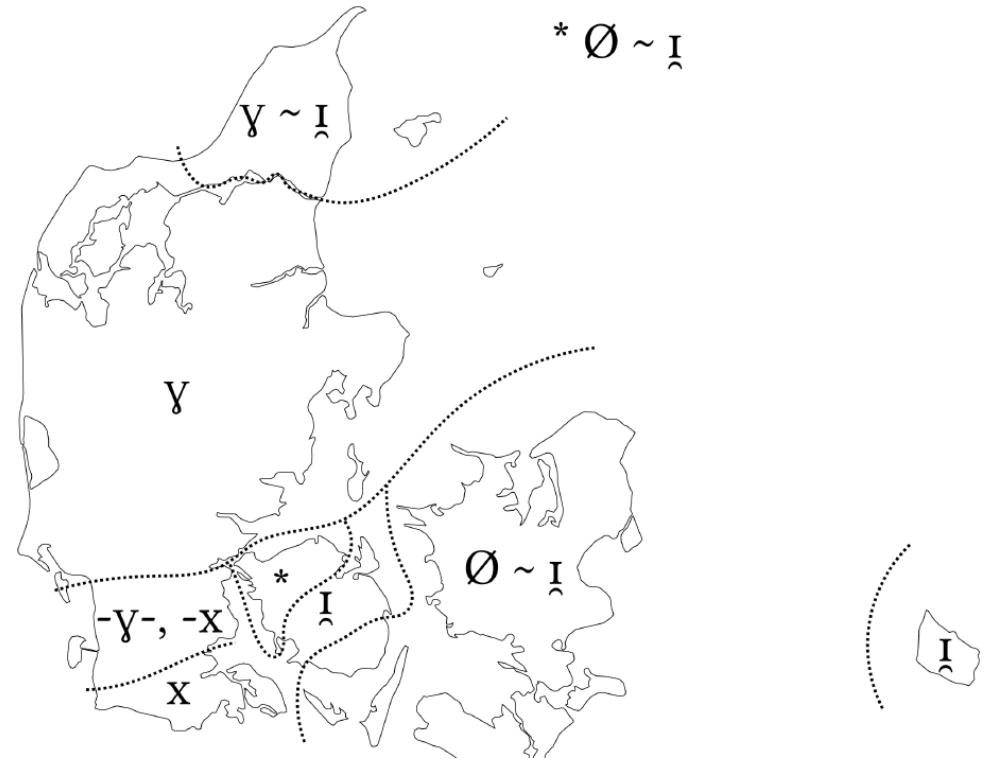


Development of [k]
before back vowels

(Bennike & Kristensen 1898–1912)

Variation in consonant gradation

- Historically in Copenhagen Danish, post-vocalic singleton stops developed into semivowels
 - [p] → [ɥ̥] → [p]
 - [t] → [ɣ̥]
 - [k] → variably [ɪ̥, ʊ̥, Ø]
- This is part of the **consonant gradation chain**
- The outcomes of consonant gradation varied significantly in different regional varieties

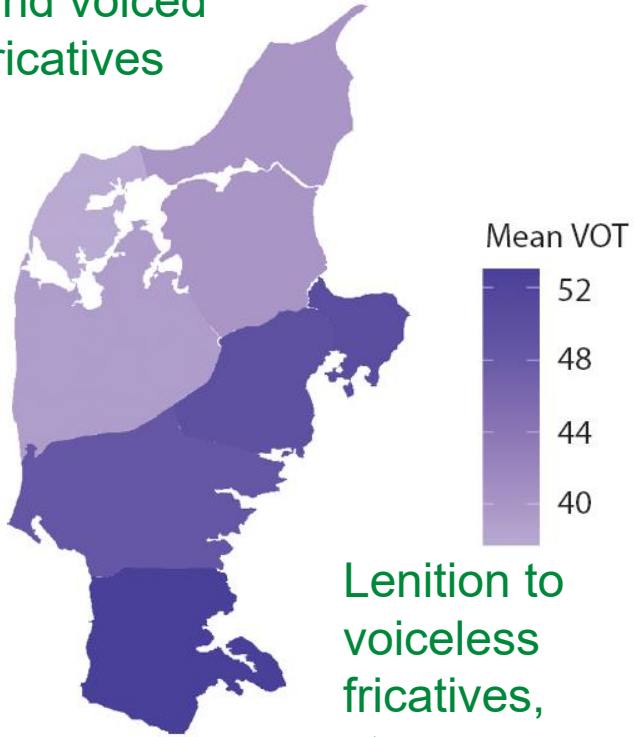


Development of [k]
before front vowels

(Bennike & Kristensen 1898–1912)

Variation in consonant gradation

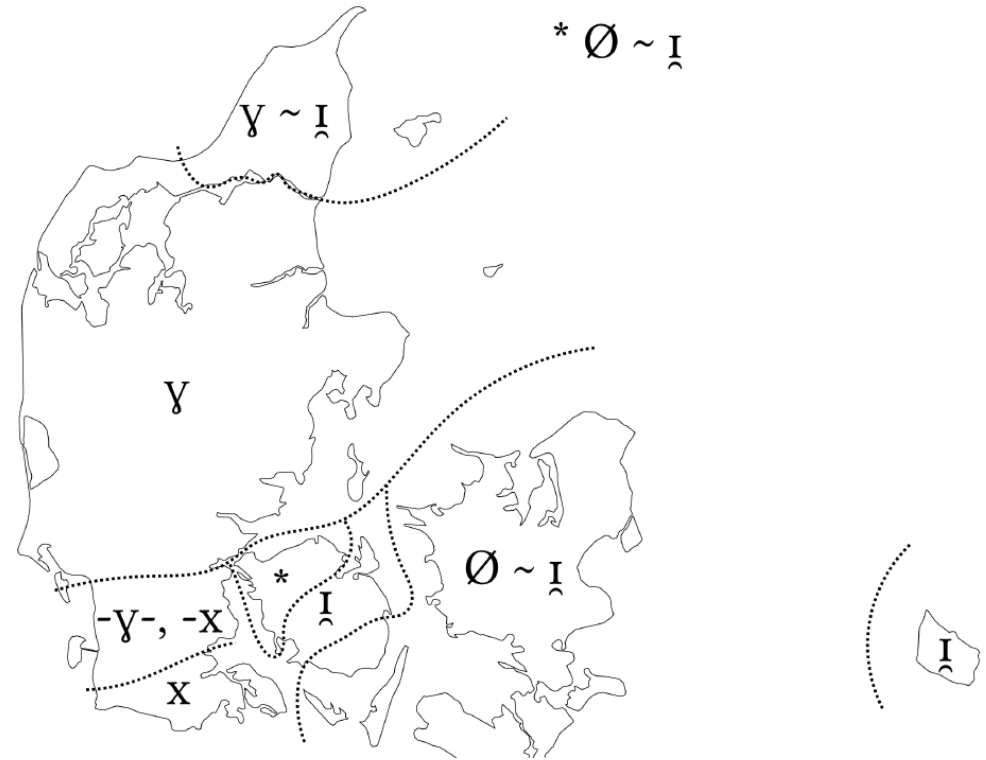
Strong
lenition to
semivowels
and voiced
fricatives



Lenition to
voiceless
fricatives,
stops
retained

(Puggaard 2021:97)

In Jutland, we know that
there are certain
similarities between the
consonant gradation
patterns and variation in
/p t k/ VOT



Development of [k]
before front vowels

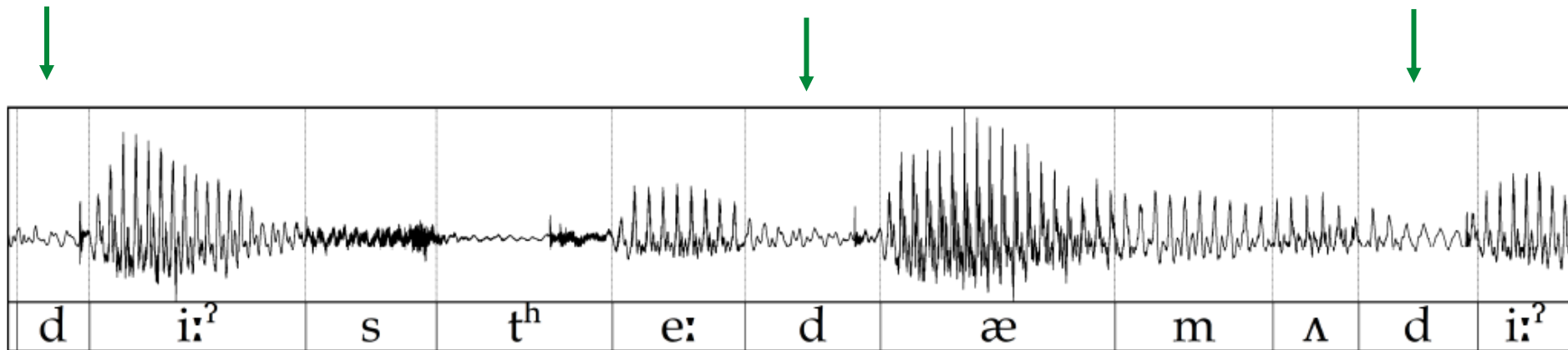
(Bennike & Kristensen 1898–1912)

Variation in closure voicing



Bindslev

- Jutland varieties with more reduction also have more closure voicing
 - Closure voicing is frequent in contexts where it is rare or non-existent in Modern Standard Danish
 - Stressed position:

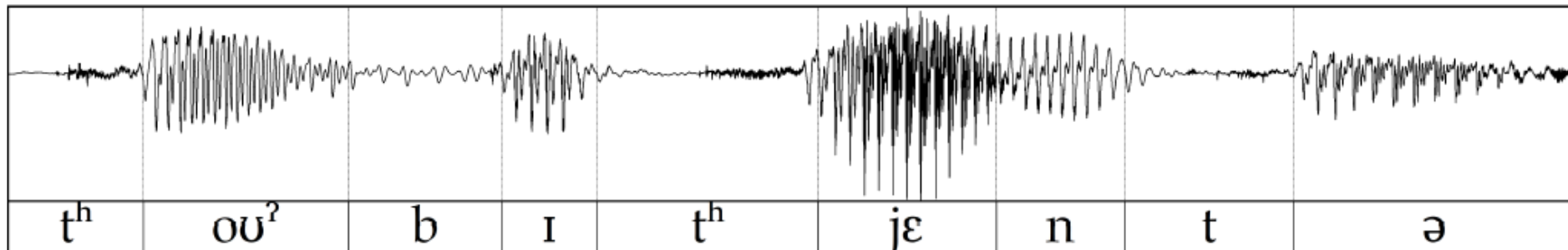


Variation in closure voicing

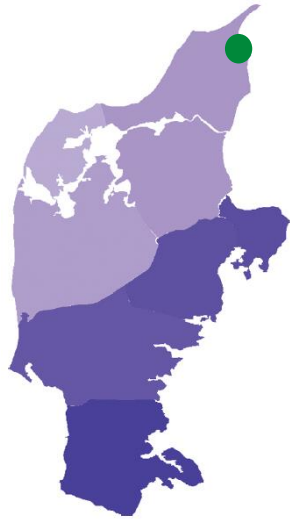


Asdal

- Jutland varieties with more reduction also have more closure voicing
 - Closure voicing is frequent in contexts where it is rare or non-existent in Modern Standard Danish
 - After stød:

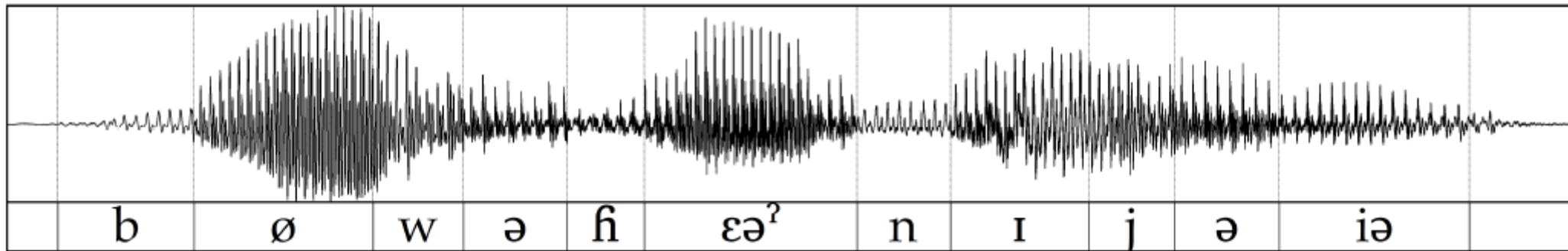


Variation in closure voicing



Elling

- Jutland varieties with more reduction also have more closure voicing
 - Closure voicing is frequent in contexts where it is rare or non-existent in Modern Standard Danish
 - Even post-pausally (although only /b/)



Danish CV: History

- Danish historical linguistics tradition
 - /b d g/ were voiced in earlier stages of Danish
(Brøndum-Nielsen 1928–1973; Skautrup 1944–1970; Hansen 1962–1971; Brink & Lund 1975)
- Other traditions of historical phonology
 - Essential agreement that voicing was lost sometime between PIE and PGmc
(Iverson and Salmons 1995; Honeybone 2002)
 - This accounts for why most Germanic languages contrast /b d g/ and /p t k/ using aspiration

Danish CV: History

- Germanic languages *with* voicing are assumed to have borrowed the feature
 - Dutch, Frisian, Afrikaans from Romance languages
 - Yiddish from Slavic languages
(Iverson & Salmons 2003)
- It seems unlikely that Danish would've borrowed voicing and subsequently lost it

Danish CV: History

- Germanic languages *with* voicing are assumed to have borrowed the feature
 - Dutch, Frisian, Afrikaans from Romance languages
 - Yiddish from Slavic languages
(Iverson & Salmons 2003)
- It seems unlikely that Danish would've borrowed voicing and subsequently lost it
- But note that voicing is more widespread in Germanic when variation is taken into account!
 - Some varieties of German and English have consistent closure voicing
(Flege 1982; Harris 1994; Braun 1996)
 - Swedish contrasts voiced /b d g/ with aspirated /p t k/
(Helgason & Ringen 2008)

Jutland: Radical lenition of historical [p t k] goes hand in hand with lower VOT and more widespread closure voicing

Modern Standard Danish has radically lenited [p t k] but also blocks closure voicing

→ Earlier stages of Copenhagen Danish used to have more widespread closure voicing!

Not necessarily a voicing-based contrast; could also have been a voiced–aspirated contrast as in Swedish, or could simply mean that the glottal spreading gesture in /b d g/ is a relatively new development.



Again, does Danish have closure voicing at all?

In Modern Standard Danish, only as a reduction phenomenon. But it's more widespread in some traditional regional varieties, and we propose that this used to be the case in Copenhagen Danish as well.



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Rasmus Puggaard-Rode

**Stop! Hey, what's that
sound?**

The representation and realization of
Danish stops



LUDWIG-
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Tak for opmærksomheden!

[t^h][k] [p] [k] [ʁ]

Spørgsmål? Kommentarer?

[p] Ø [k^h] [t^h]

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