

# Phonetic details of nonpulmonic stop release in German: inter- and intraindividual variation

Adrian P. Simpson

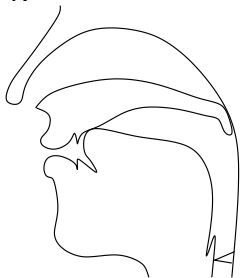
Institute of German Linguistics  
University of Jena

IAFPA 2007  
Plymouth, 23–25.7.07

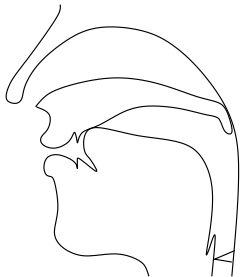
# Epiphenomenal nonpulmonic sound production

- ▶ temporal overlap of phonetic correlates from adjacent phonological elements
- ▶ articulatory movements made during two stop closures can give rise to positive or negative pressure changes, fuelling a burst on release of one of the closures
- ▶ experimental studies for French and Korea (Marchal 1987; Silverman & Jun 1994) and general predictions (Ohala 1995, 1997)

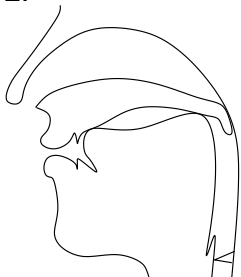
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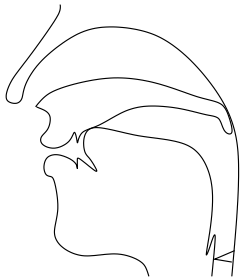
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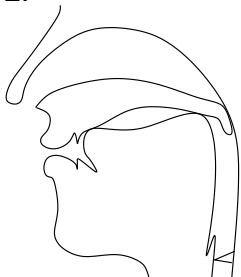
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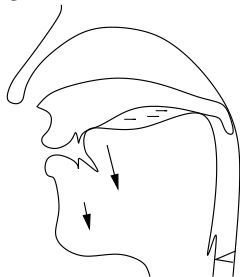
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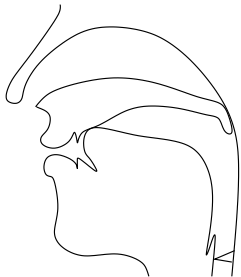
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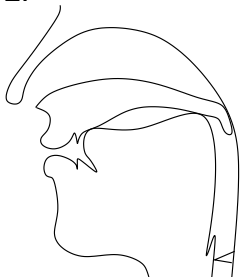
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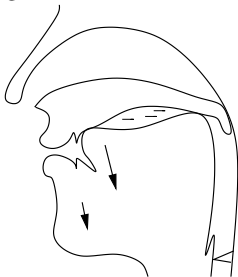
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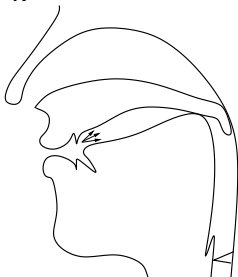
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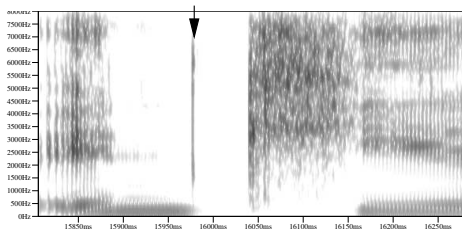
# Epiphenomenal nonpulmonic sound production in German

Simpson 2001, 2007

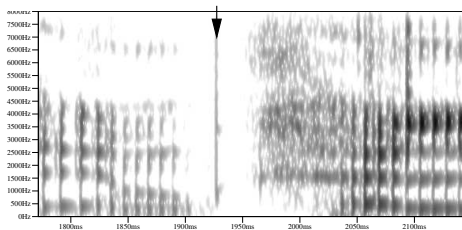
- ▶ database survey of read speech in German
- ▶ nonpulmonic airstream mechanism commonly found in sequences of stops in which the place of articulation of the first stop is anterior to that of the second:
  - ▶ **velaric** [tk] “acht kam”, [pk] “ab Köln”, [nk] “in Kiel”
  - ▶ **glottalic** [tʔ] “weht ein”
- ▶ not strictly velaric or glottalic initiation since movements which give rise to pressure changes not actively intended to do so
- ▶ differences in occurrence and shape (egressive vs. ingressive)

# $n/m + k$

(a) in Kiel (b) im Kalender



(a)



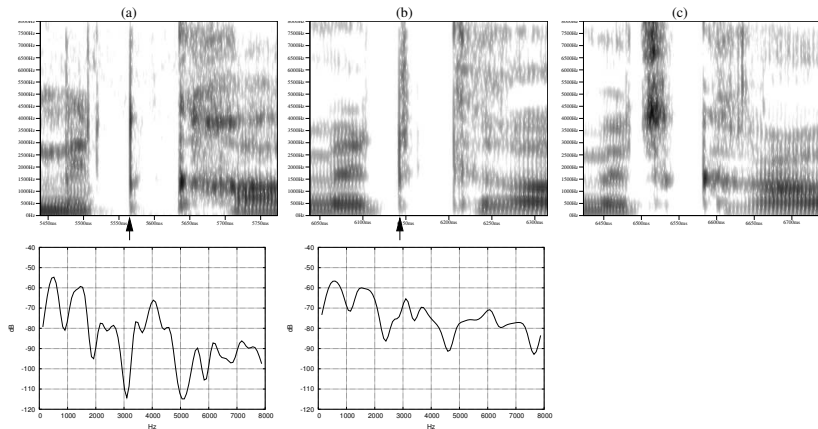
(b)

# Speaker-specific characteristic

- ▶ presence vs. absence of audible release
- ▶ synchronization of articulatory movements
- ▶ complex interspeaker differences in possibilities for flow/pressure changes caused during movements:
  - ▶ in oral stops air pressure build-up behind first stop before second closure is made
  - ▶ in nasal stops no air pressure build-up behind first stop (velum lowered)
  - ▶ articulatory movement during double closure increasing / decreasing intraoral air pressure

# Different types of release (“mit grauem”)

(a) velaric suction (b) velaric pressure (c) pulmonic pressure



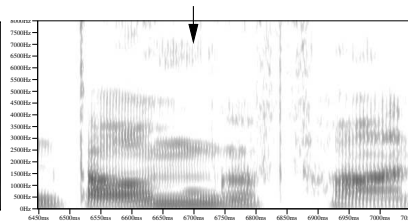
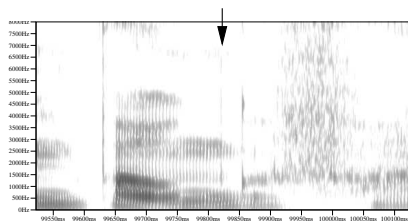
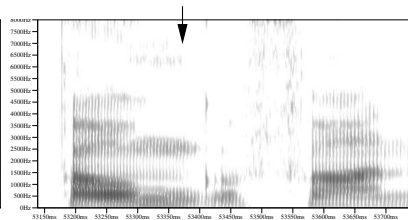
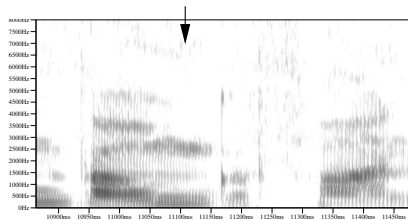
# Intra-speaker consistency

- ▶ consistency across repetitions of similar structures in same recording
- ▶ consistency across repeated recordings of the same text

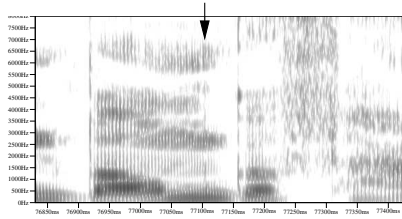
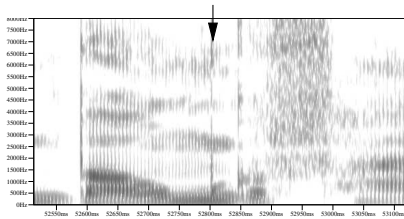
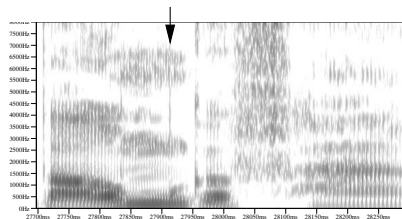
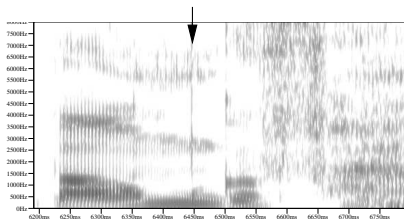
# Intra-speaker consistency

- ▶ data from *Kiel Corpus*
- ▶ speakers consistent in presence/absence and type of release across similar structures (e.g. “acht kam”, “mit grauem”):
  - ▶ consistent presence/absence of release
  - ▶ strength of release
  - ▶ type of release

# Two sisters – different behaviours

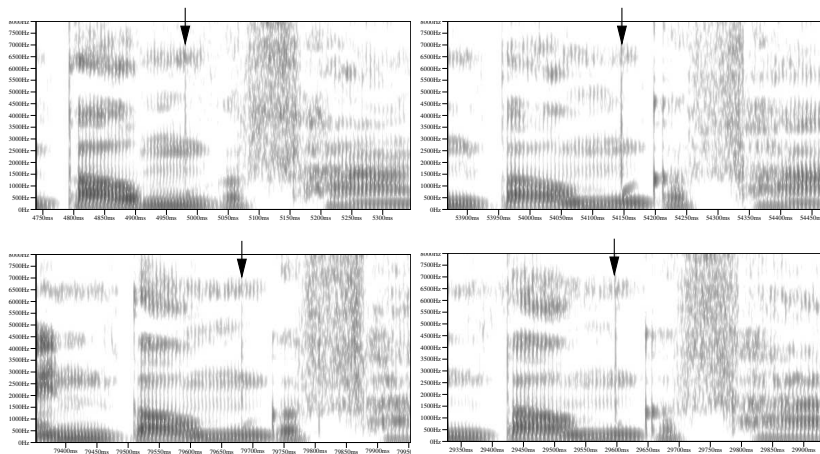


# Sister 2 – Recording 2003



Mean duration click → stop release: 48 ms

# Sister 2 – Recording 2007



Mean duration click → stop release: 51 ms

# Discussion

- ▶ epiphenomenal non-pulmonic sound production is a widespread phenomenon in German and presumably in other languages
- ▶ occurrence, shape and reproducibility of non-pulmonic sound production promising as a reliable speaker-specific characteristic
- ▶ robust in forensic context

# Future work

- ▶ long term study of different speakers
- ▶ pressure and flow investigation in different types of stop+stop configurations

# References

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