

# Exploring the presence and absence of inhalation noises when speaking and when listening

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## 1 Introduction

Informal observation: inbreath noises (inbrn) in speech occur

- during articulatory activity
- but not during articulatory inactivity, e.g. when listening [1]

*Is inhalation made audible only in active (or planned) articulation?*

Based so far solely on acoustic but not on physiological data

Aim of this exploratory study: to check this general impression

with speech data featuring synchronously recorded acoustic and kinematic (respiratory) signals

## 3 Comparing speaking and listening

Number of breath cycles: more breath cycles in LSTN than in SPK

Duration of the inhalation phase: substantially longer in LSTN

Dur. of exhalation phase: much longer & more variable in SPK

Inbrn: only *few* and very *soft* in LSTN but in SPK for *all* inhalations and *salient*

Time shift in SPK of AB phase in rel. to RC to 'the left'

Fast and deep inhalation in SPK favours inbrn (location of constriction in vocal tract yet unclear)

## 4 Inhalation: acoustics vs. kinematics

Typical for an inbrn: between short intervals of silence [1]

Duration of those "edges": c. 50 ms, of inbrn: 200 - 500 ms

*Link between timing of acoustic "edges" and respiratory activities?*

Temporal alignments (clearly for 2 speakers) between:

- end of articulation phase (1) with start of AB (7)
- start of an articulation phase (2) with end of RC (6)
- start of the inbreath noise (3) with start of RC (5)
- end of the inbreath noise (4) with end of AB (8)

## 5 Summary

Though very small data size support for the general assumption that:

- acoustics of inhalation observable for articulatory activity but not when inactive
- articulatory phases and inbrn closely coupled to the activity of RC and AB (short "edges" around the inhalation noise)

Future analysis:

- greater samples of acoustic and kinematic data to confirm observed patterns
- to contribute to explanations of current discussions on speech respiration

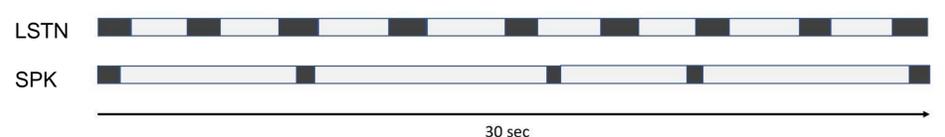
## 2 Material

Acoustic and kinematic data of 4 speakers of German engaged in 2 different tasks:

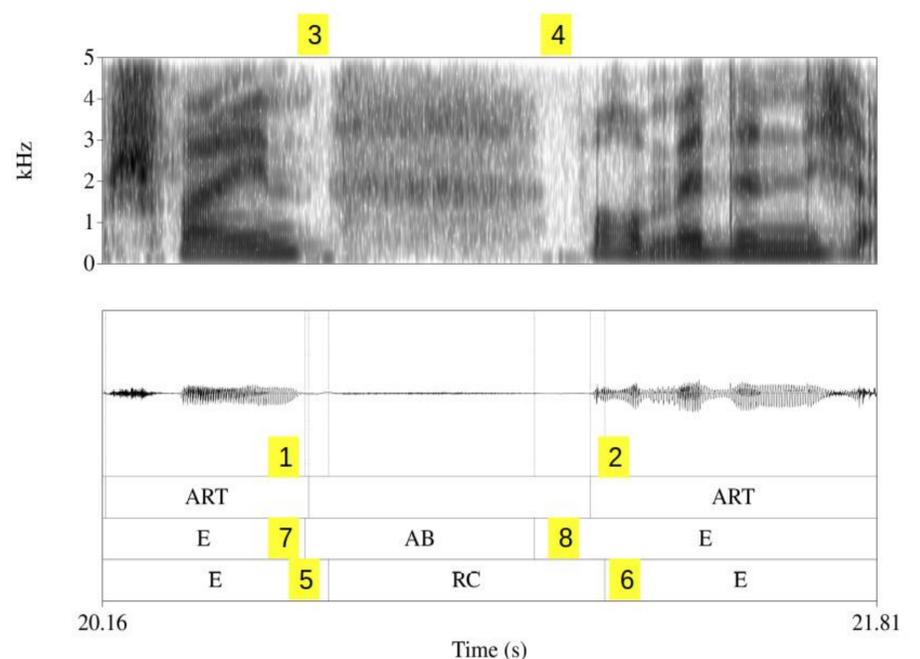
- listening to a fable (LSTN)
- re-telling this fable (SPK)

Kinematic signals recorded activities (for details see [2]) of:

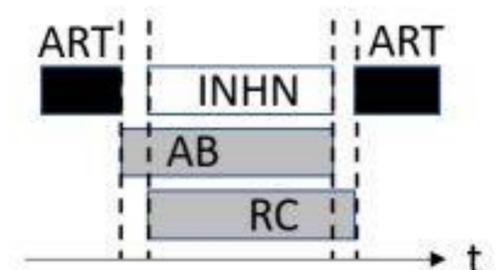
- the rib cage (RC)
- the abdomen (AB)



**Fig. 1:** Exhalation (light grey) and inhalation phases (black) of two 30-sec excerpts of the inspected kinematic data of one speaker in both conditions.



**Fig. 2:** The temporal alignment of articulation phases, inbreath noise (INHN) and AB and RC in an inhalation phase between two articulation phases (ART).



**Fig. 3:** Schematic drawing of Fig. 2.