

# Speech Science

## WiSe 2024/2025

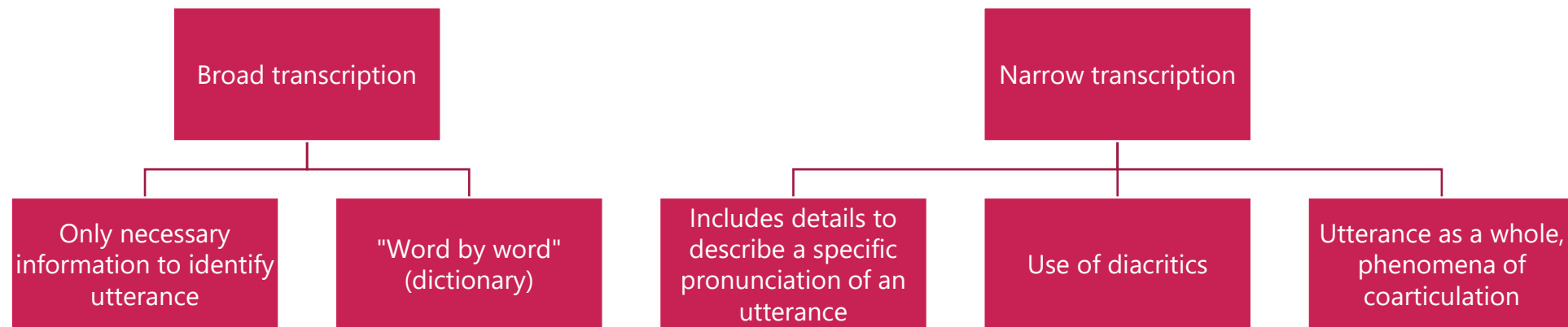
### Exercise 3: Phonation

Nov 11, 2024

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Language Science and Technology  
Saarland University

# Quick recap: Transcription



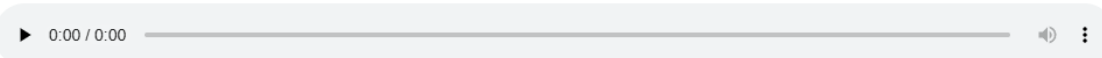
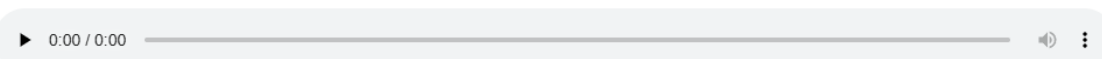
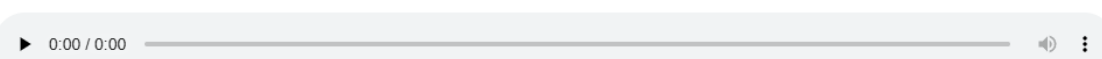
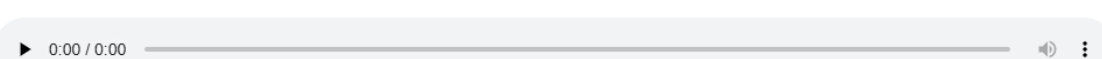
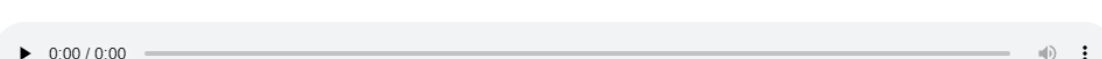
# Assignment 2

Please write a broad transcription of the first five sentences in exercise 5.

Please also write a narrow transcription of the first sentence (cats and dogs)

## EXERCISE 5.

Make both a phonemic (broad) and a phonetic (narrow) transcription of the following sentences.

1.   
Cats and dogs need to be loved and walked every day.
2.   
I lugged the suitcases all the way from the polished vestibule to the flats' antiquated old lift.
3.   
The atmosphere of the cosy studio was not at all conducive to the sort of thing the Armenian teenager had in mind.
4.   
The special vision which ocean birds have enables them to inspect chasms which we would miss.
5.   
The little nurse drew a deep breath,

<https://www.mq.edu.au/about/about-the-university/our-faculties/medicine-and-health-sciences/departments-and-centres/departments-of-linguistics/our-research/phonetics-and-phonology/speech/phonetics-and-phonology/transcription/transcription-exercises>

# Assignment 2

## EXERCISE 5.

Make both a phonemic (broad) and a phonetic (narrow) transcription of the following sentences.

1.

▶ 0:00 / 0:00

Cats and dogs need to be loved and walked every day. [kʰæts ən dɔgz ni:d tə bi: lʌvd ən wo:kt evri: dəi]

2. /kæts ænd dɔgz nid tu bi: lʌvd ænd wɔkt evəri dei/

▶ 0:00 / 0:00

I lugged the suitcases all the way from the polished vestibule to the flats' antiquated old lift.

3.

/aɪ lʌgd ðə su:tkeɪsəz ɔl ðə wei fʌlm ðə pɔlɪft vestəbjʊl tu ðə flæts æntɪkwetɪd ɔʊld lɪft/

▶ 0:00 / 0:00

The atmosphere of the cosy studio was not at all conducive to the sort of thing the Armenian teenager had in mind.

4.

/ði: ætməsfi: ʌv ðə kəʊzi stʊdiəʊ wɔz nɒt æt ɔl kəndʊsɪv tu ðə sɔ:t ʌv θɪŋ ði: ɑ:mi:niən ti:neɪdʒə hæd ɪn maɪnd/

▶ 0:00 / 0:00

The special vision which ocean birds have enables them to inspect chasms which we would miss.

5.

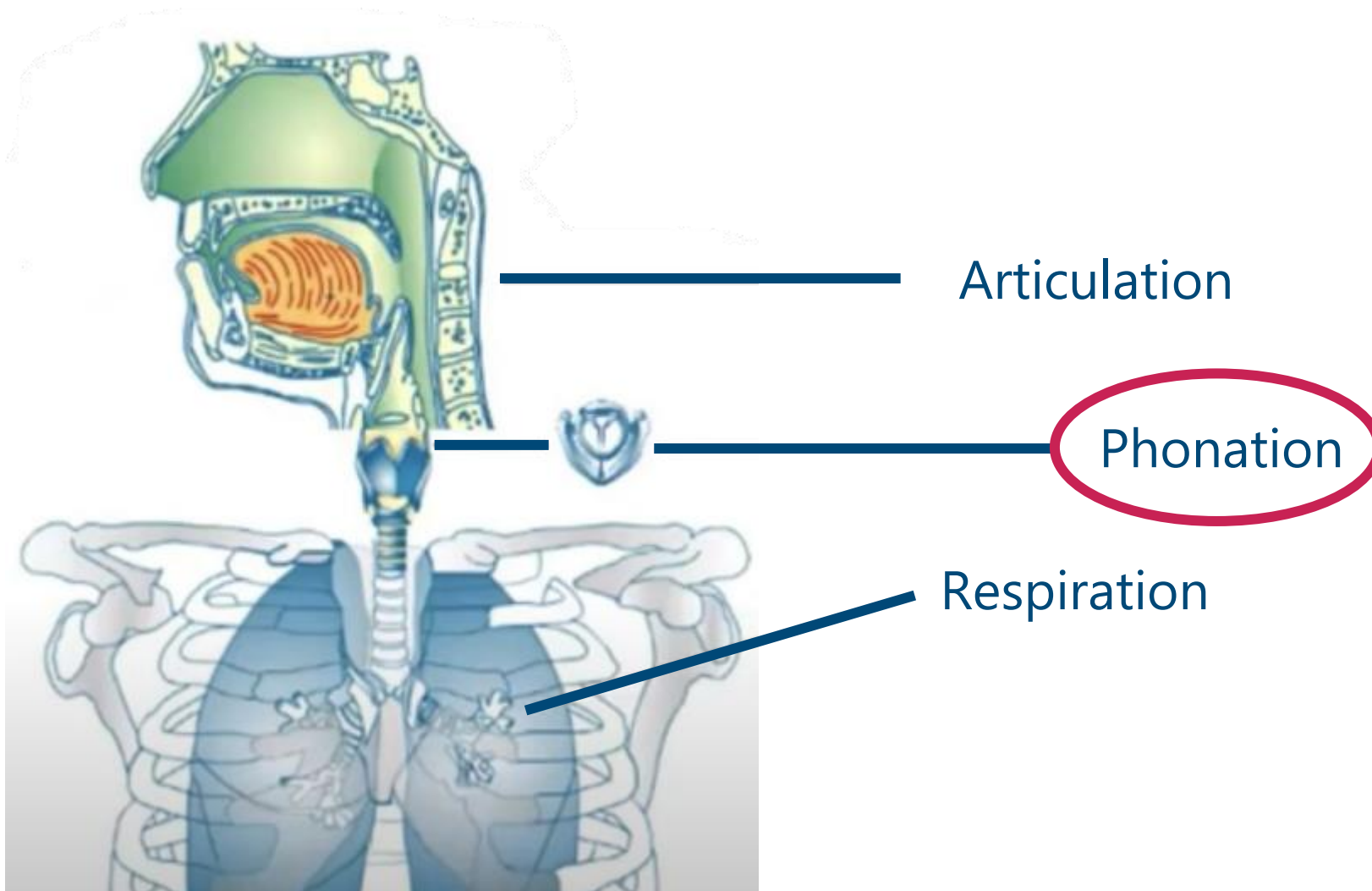
/ðə speʃəl vɪʒən wɪtʃ ɔʃən bædz hæv ɪneɪbəls ðem tu ɪnspekt kæzəms wɪtʃ wi wəd mɪs/

▶ 0:00 / 0:00

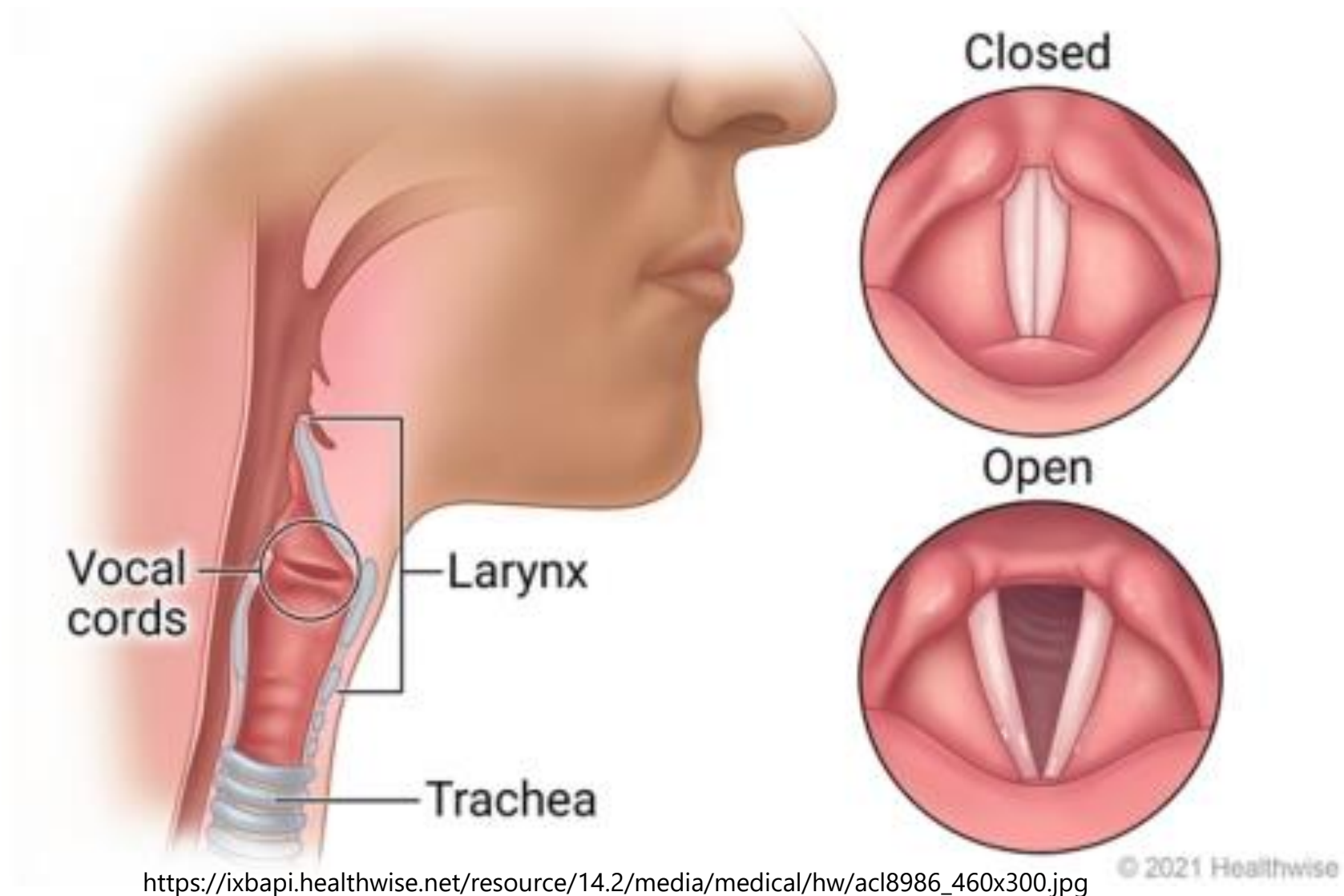
The little nurse drew a deep breath, /ðə lɪtəl nɜ:s drəʊ ə di:p brɛθ/

# Phonation

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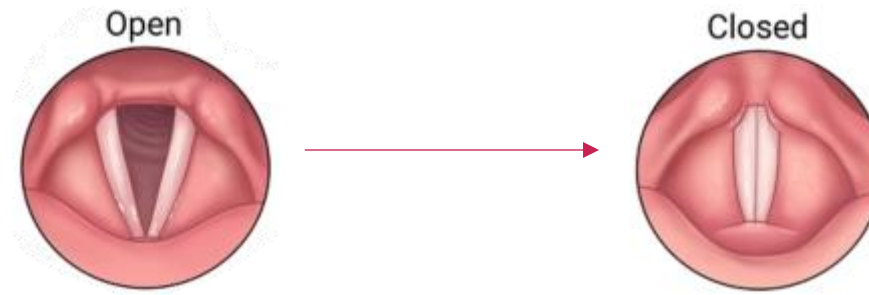


# How does phonation work?



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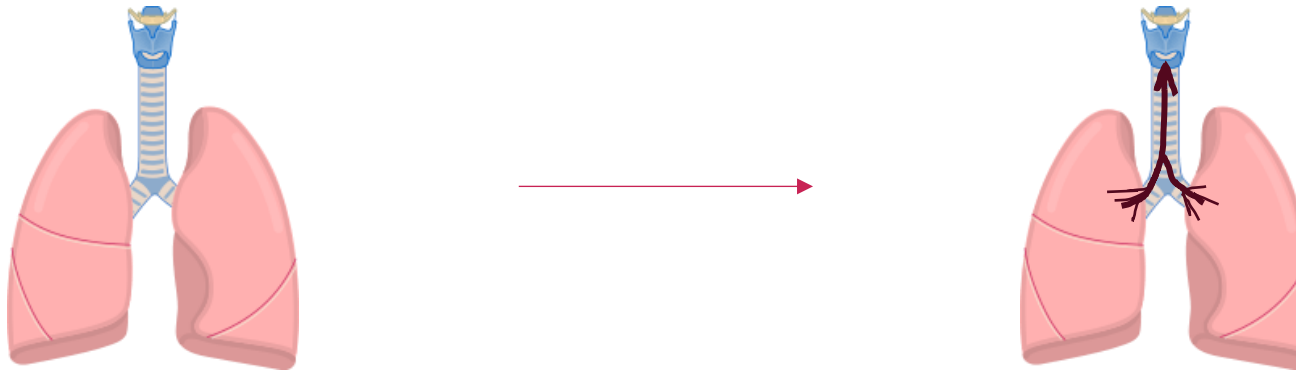
- We leave the vocal folds closed / We close the vocal folds





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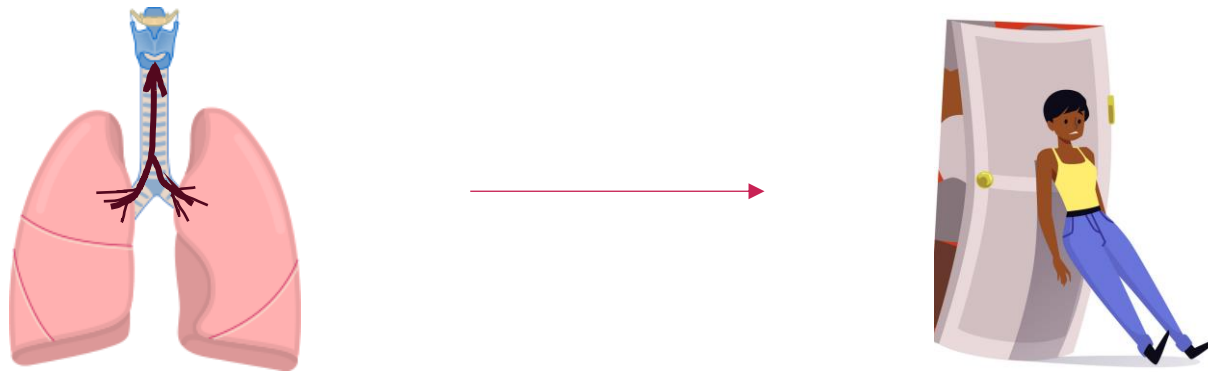
- We leave the vocal folds closed / We close the vocal folds
- Air is pushed from the lungs against the vocal folds



<https://www.getbodysmart.com/wp-content/uploads/2022/09/GBS-lungs.webp>

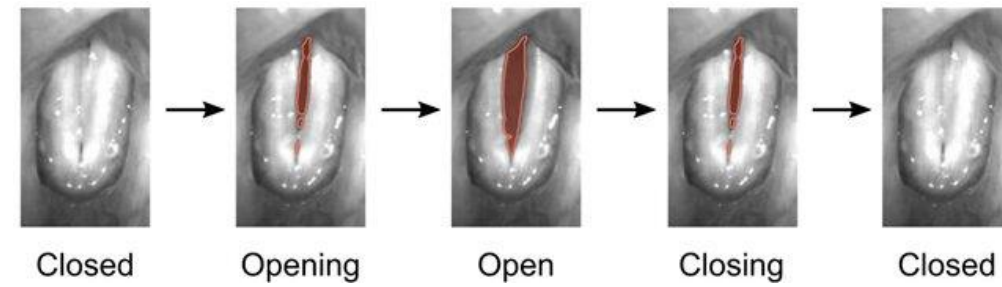
# How does phonation work?

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- Air is pushed from the lungs against the vocal folds
- Pressure gets to high → Vocal folds are pushed apart



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- Sudden heavy airflow creates a suction → Vocal folds get pulled shut again, only to get pushed apart once more
- Repeat → Vibrations → Sound/Voicing



Döllinger et al. (2022)

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- Modal voice:
  - Normal speaking voice
  - No noisy components
  - Regular vocal fold vibrations along entire length of folds



# Phonation types

- Breathy voice:
  - Voice with soft noise components
  - Moderate vocal fold tension
  - Glottis never completely closed



- Creaky voice:
  - Low voice without noise components
  - Small front opening of vocal folds
  - Irregular vocal fold vibration



# Phonation types

- Rough voice:
  - High vocal fold tension





- Falsetto voice:
  - High adductive vocal fold tension
  - Narrowing of vocal folds
  - Reduced vibrating mass → high frequency



- Whisper:
  - Strong frication without phonation
  - Moderate vocal fold tension
  - Vocal folds are generally closed, but:
  - Open "whisper triangle" between arytenoids



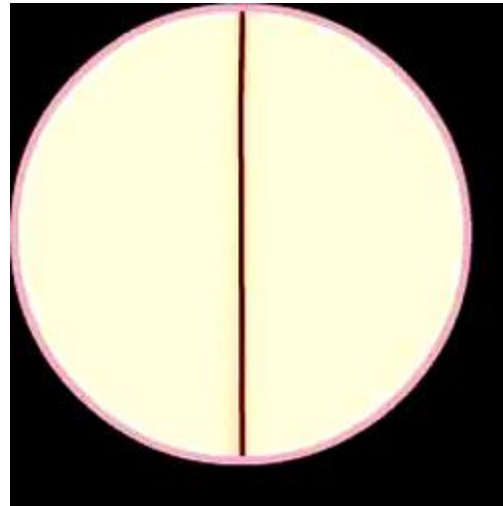
- Voicelessness:
  - No glottal voice source
  - Glottis wide open along entire length of vocal folds

# Exercise 1: Phonation types

- Which phonation type is shown in the illustration?

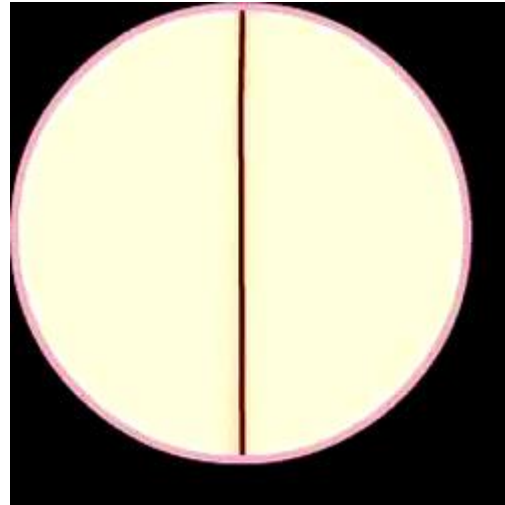
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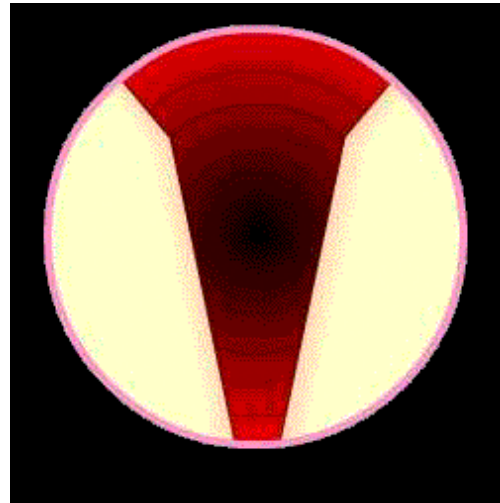
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Modal

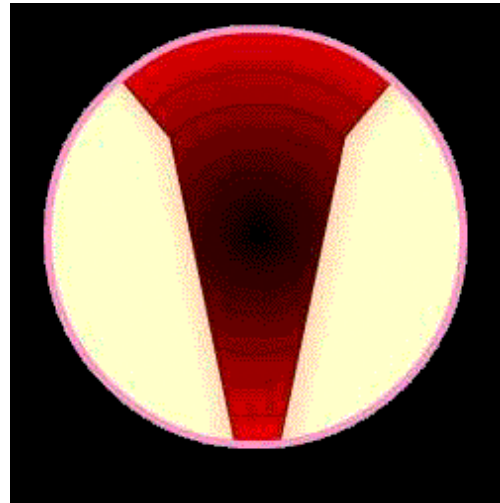
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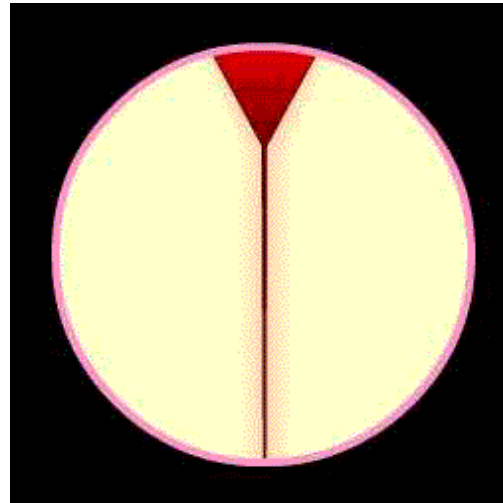


Voicelessness



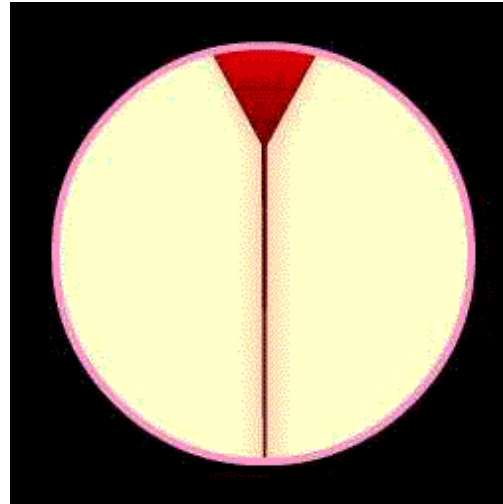
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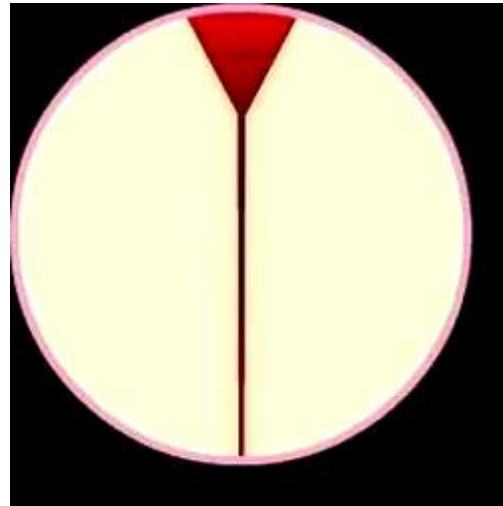
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Whisper

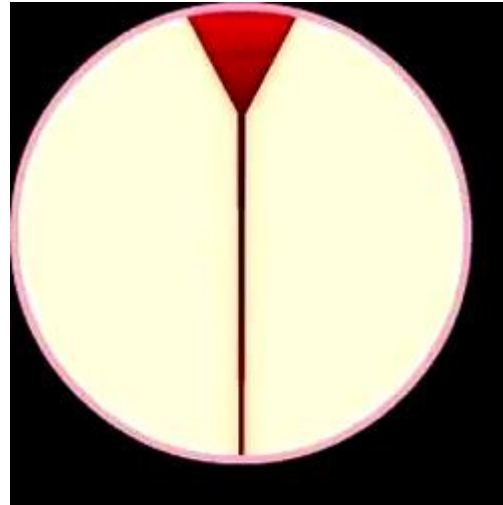
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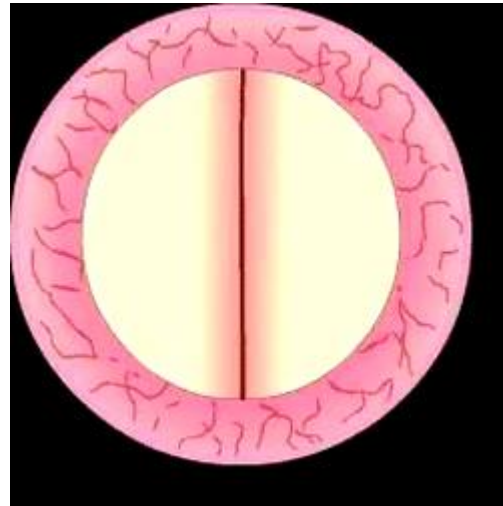
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Breathy

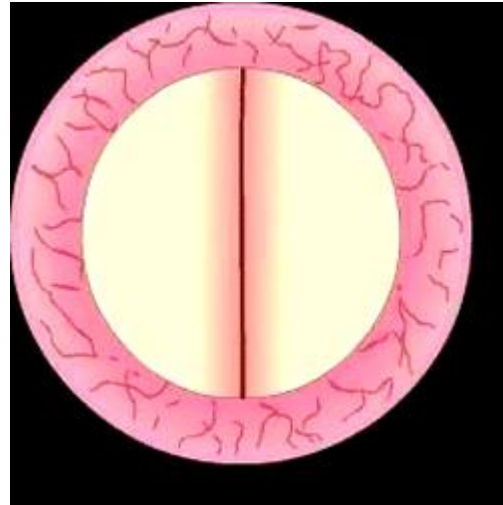
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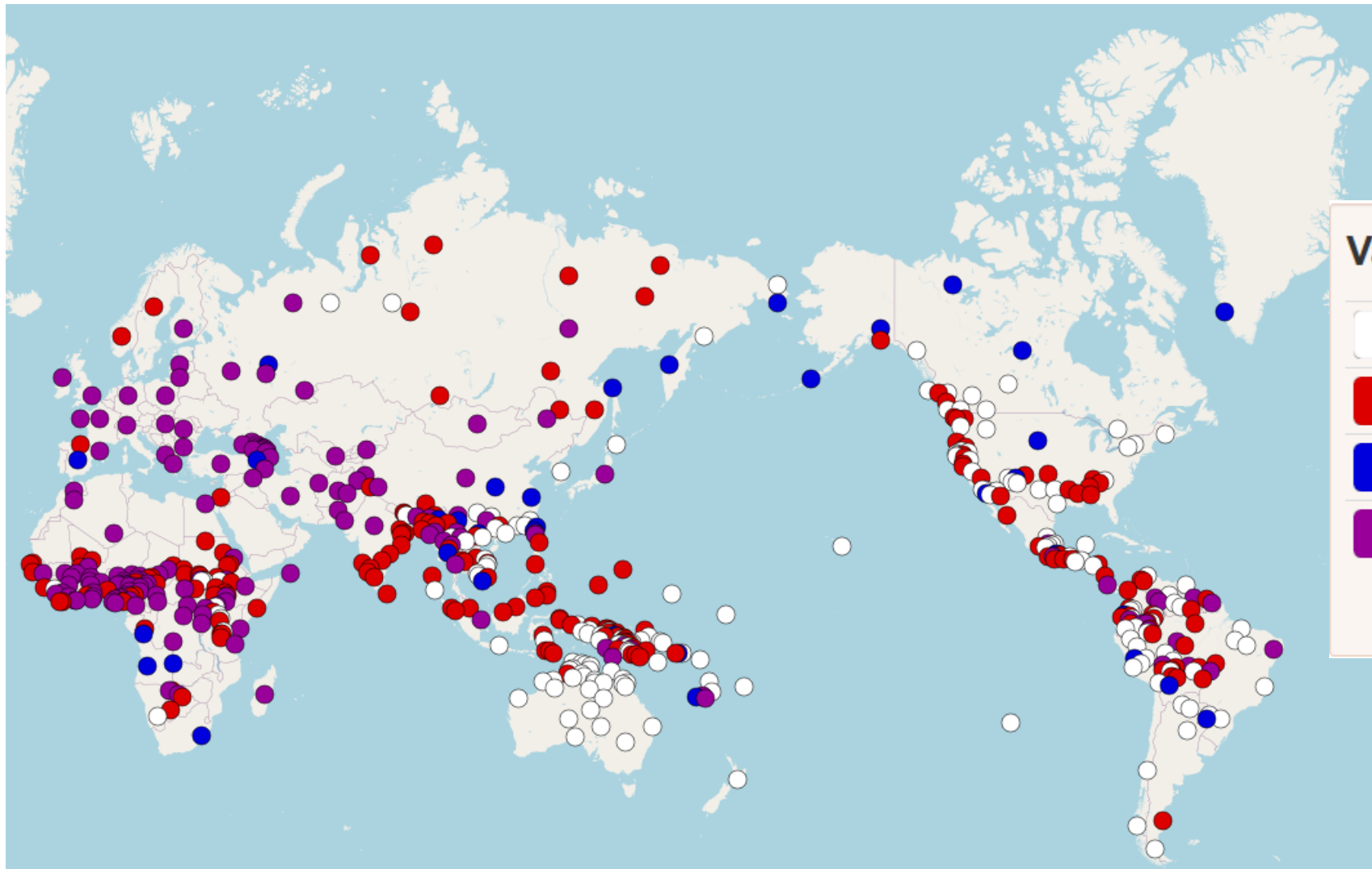


Creaky

# Functions of phonation types

- Paralinguistic: used as social markers
- Linguistic: in some languages, phonation types change meanings

# Phonation types: distinctive use



Voicing in plosives and fricatives

## Values

<input type="checkbox"/>	<input type="checkbox"/>	No voicing contrast	182
<input checked="" type="checkbox"/>	<input type="checkbox"/>	In plosives alone	189
<input checked="" type="checkbox"/>	<input type="checkbox"/>	In fricatives alone	38
<input checked="" type="checkbox"/>	<input type="checkbox"/>	In both plosives and fricatives	158

<https://wals.info/feature>



# Phonation types: distinctive use



Ladefoged & Maddieson (1996)

Breathy vs. modal  
distinction in:

- Hindi
- Maithili
- Telugu
- Newar
- ...

# Phonation types: distinctive use



Boas (1947)

Creaky vs. modal  
distinction in:

- Kwakw'ala
- Montana Salish
- Kashaya Pomo
- ...

# Phonation types: distinctive use



Three-way contrast between modal voiced, breathy voiced, and creaky voiced vowels in Jalapa Mazatec:

- /nt<sup>h</sup>æ/ → <seed>

<https://tinyurl.com/59xu9xdu>

- /ndæ/ → <buttocks>

<https://tinyurl.com/mr37xt8u>

- /ndæ/ → <horse>

<https://tinyurl.com/mr2uvs46>



Ladefoged & Maddieson (1996)

- Two components involved in shaping sounds:
  1. Source: Production
  2. Filter: Modification

- Two components involved in shaping sounds:

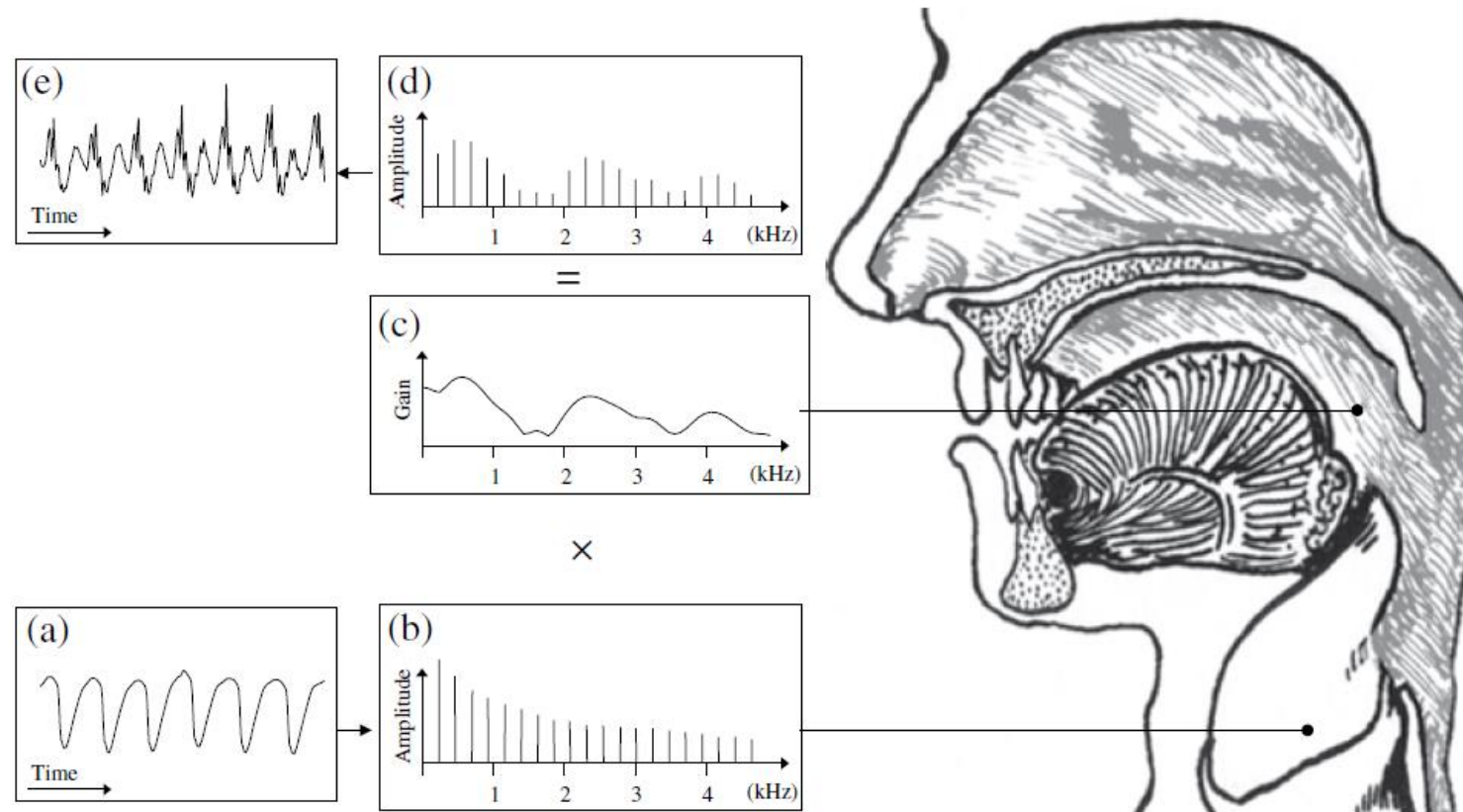
## 1. Source: Production

- Vocal folds in larynx
- Influence on: Pitch, Intensity

## 2. Filter: Modification

- Vocal tract (different constellations)
- Influence on: "Type of sound"

# Source-filter-model





**Figure 9.9** Larynx signal (a), its spectrum (b), vocal tract filter spectrum (c), speech spectrum (d), and speech signal (e).

# Useful / interesting links

- Audite vocem: [https://www.coli.uni-saarland.de/groups/BM/phonetics/audite\\_vocem\\_22/index\\_audit\\_e.html](https://www.coli.uni-saarland.de/groups/BM/phonetics/audite_vocem_22/index_audit_e.html)
- Ladefoged & Maddieson (1996):  
<https://theswissbay.ch/pdf/Books/Linguistics/The%20Sounds%20of%20the%20World%27s%20Languages%20-%20Peter%20Ladefoged%2C%20Ian%20Maddieson.pdf>

# Assignment 3

Please download Praat for next week.


**Praat: doing phonetics by computer**

**Download Praat:**

- \* [Macintosh](#)
- \* [Windows](#)
- \* [Linux, FreeBSD](#)
- \* [SGI, Solaris, HPUX](#)
- \* [the source code](#)

**Information on Praat:**


- \* Introductory tutorial: choose **Intro** from Praat's **Help** menus.
- \* Extensive manuals and tutorials: in Praat's **Help** menus.
- \* [Beginner's manuals by others](#).
- \* Paul Boersma's [publications](#) on algorithms and tutorials.



[Paul](#)

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[David](#)

<http://www.fon.hum.uva.nl/praat/>



Thank you for your participation!

