

Introduction to Phonation Types

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HSS/CTP402: Spoken language and computers

Aims of this lecture

- What is meant by “Phonation”
- The laryngeal structures involved in phonation
- Describe the linguistic and social uses of phonation
- Describe the different types of phonation

States of the glottis

So far: voiced (vocal fold vibrating) and voiceless (vocal folds not vibrating)

Voiceless: no vibration

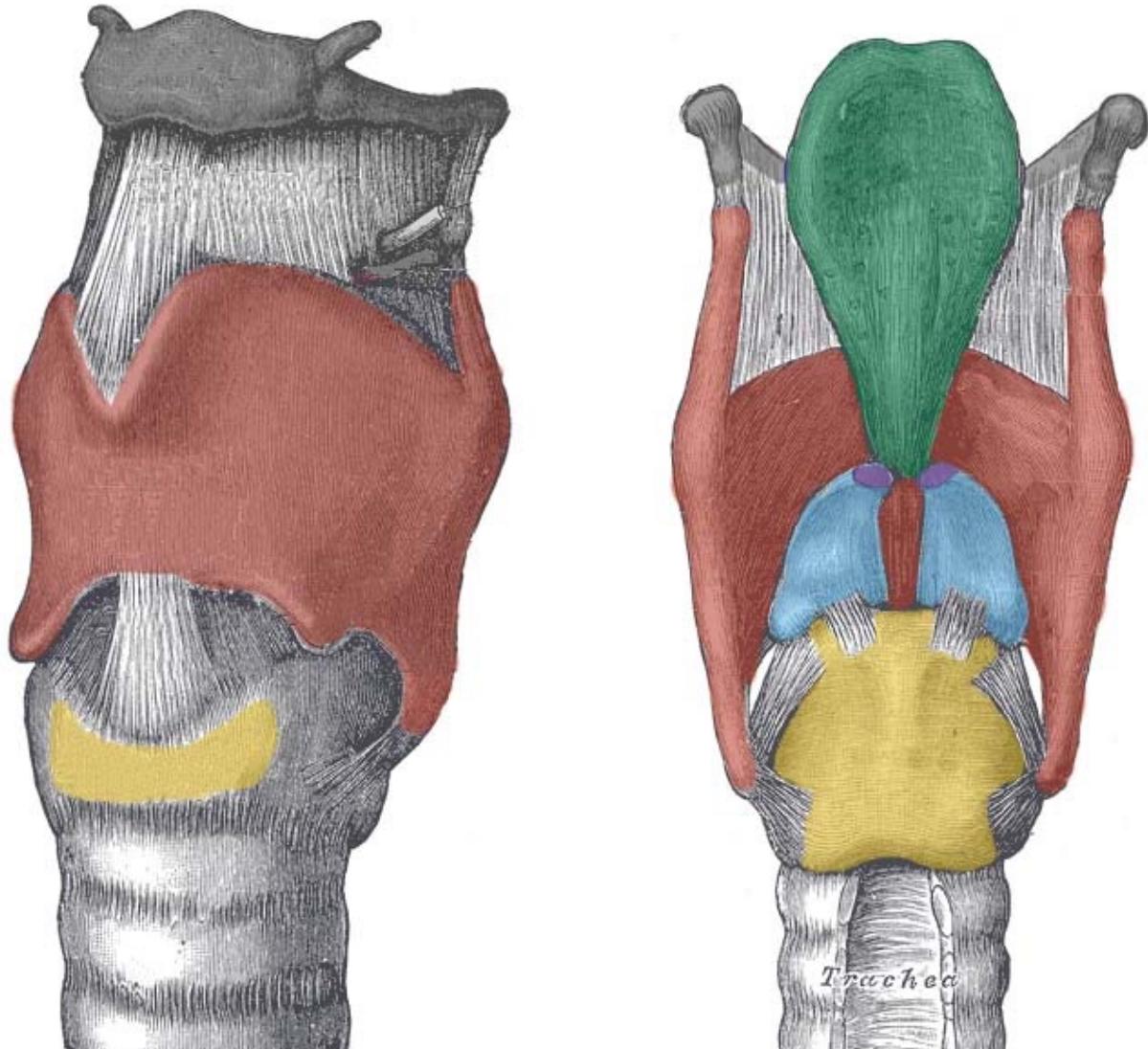
1. Glottis is completely open (pulmonic sounds) and for voiceless fricatives (and stops)
2. Glottis is completely closed (glottal stops) – still NO vibration

Voiced: vocal folds vibrating

But there are more ways in which the glottis (space between the vocal folds) can be modified: Phonation types

Laryngeal structures

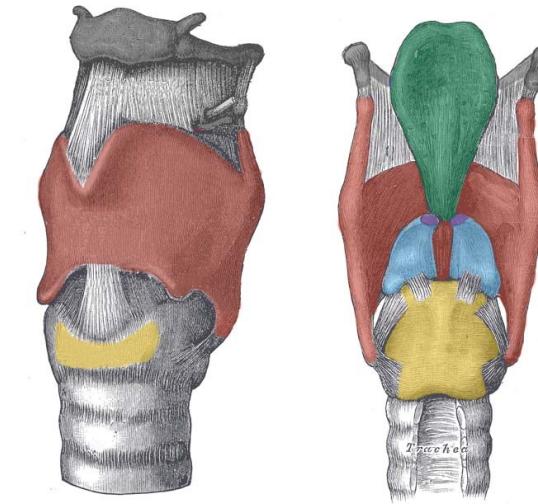
Larynx – laryngeal structures



- █ Epiglottis
- █ Thyroid cartilage
- █ Arytenoid cartilages
- █ Cricoid cartilage
- █ Corniculate cartilages

Laryngeal structures

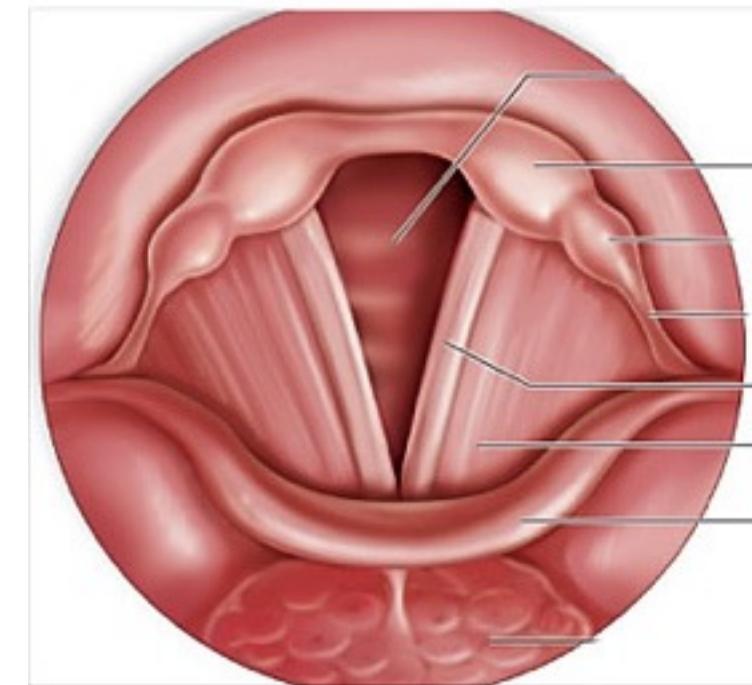
- Vocal folds are surrounded and supported by the **thyroid cartilage**
- The vocal folds are joined at the **front to the thyroid cartilage** and separated at the back by an attachment process to the **arytenoid cartilages**.



	Epiglottis
	Thyroid cartilage
	Arytenoid cartilages
	Cricoid cartilage
	Corniculate cartilages

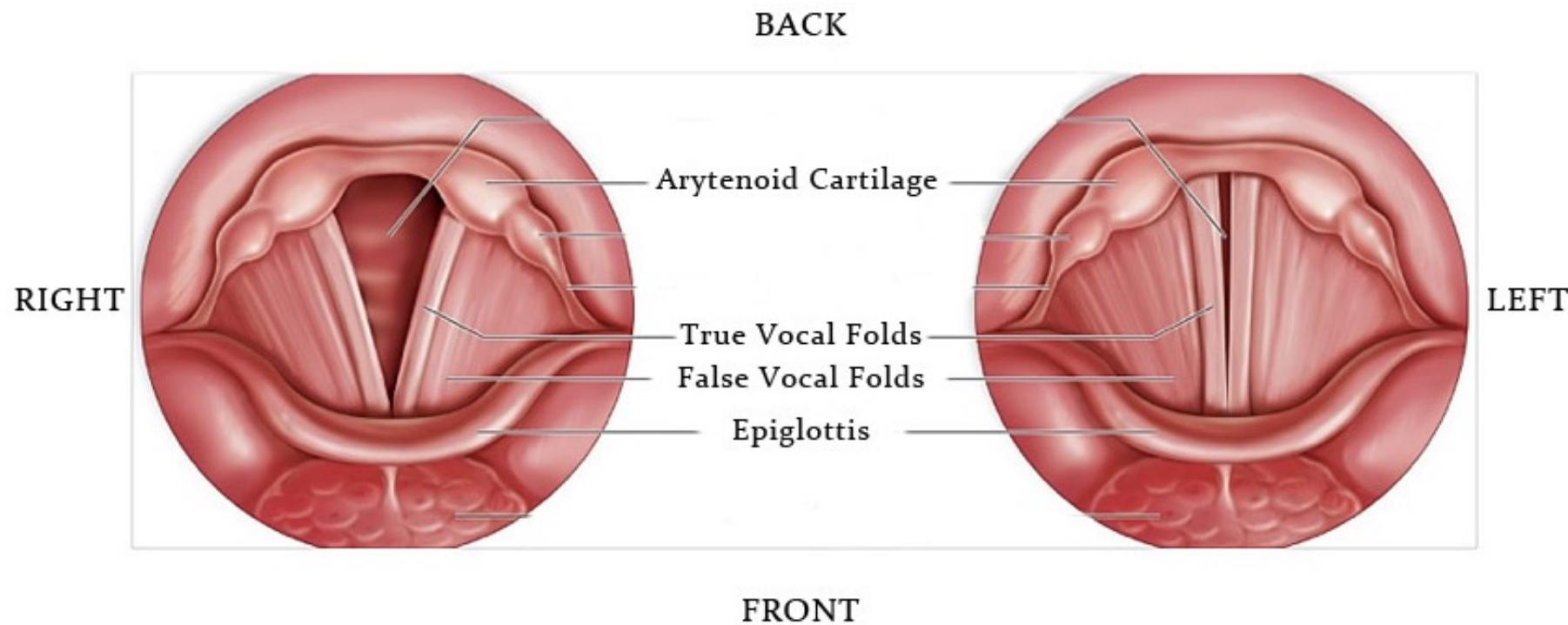
Laryngeal structures

- Vocal folds are surrounded and supported by the **thyroid cartilage**
- The vocal folds are joined at the **front to the thyroid cartilage** and separated at the back by an attachment process to the **arytenoid cartilages**.
- Through **muscular control** arytenoid cartilages can be swiveled to draw the vocal folds together.
- The length and tension can also be varied



Laryngeal structures

- **Phonation** is used to describe any sound generating process in the larynx.
- Ladefoged suggested that phonation types might be defined in terms of the aperture between the arytenoid cartilages – ranging from voiceless (furthest apart) to full glottal closure.



Phonation types

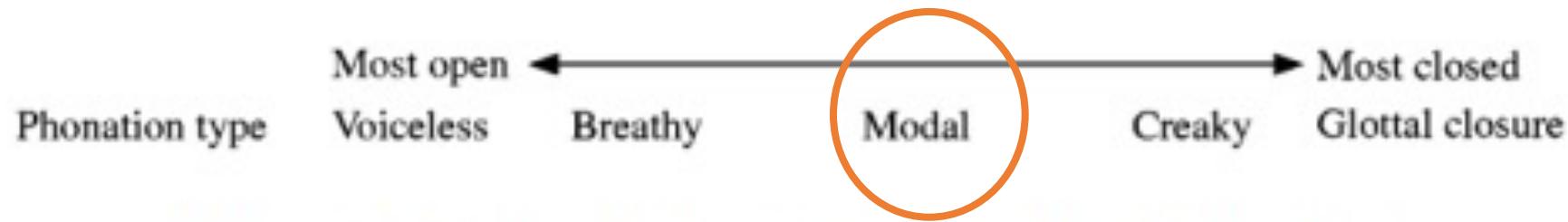
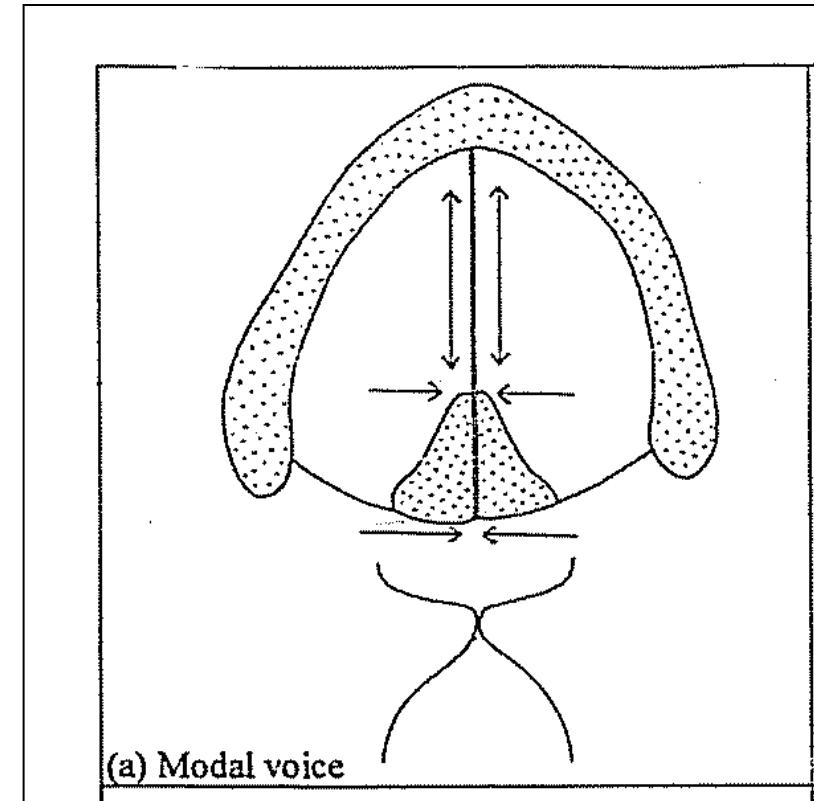


Figure 1. Continuum of phonation types (after Ladefoged, 1971).

Modal voice – aka ‘normal voicing’ is the main source of speech production in all spoken languages

Phonation types

- Phonation type refers to the **source**, or the type of vibration of the vocal folds, dependent on the formation of the larynx and vocal folds
- Different levels of **longitudinal tension, medial compression and adductive tension** give rise to different phonation types



- ✓ **Adduct:** to draw something towards or past the median axis of the body
- ✓ **Abduct:** to spread away from a position near or parallel to the median axis of the body

Figures from Hewlett & Beck (2006)

Linguistic and social uses of phonation

Linguistic uses of phonation

- Phonation and other laryngeal gestures can have linguistic functions:
 - Presence vs absence of phonation, e.g. voiced vs voiceless fricatives.
 - Sudden stop in phonation, e.g. glottal stop.
 - Relative timing of phonation start, e.g. Voice Onset Time (VOT) in plosives
 - Fundamental frequency change within words, e.g. lexical tone
 - Fundamental frequency change across utterances, e.g. intonation
 - Different phonation types (i.e., voice quality) can be meaningful (phonemic) in some languages.

Linguistic uses of phonation

- In some languages, the quality of vibration can signal a change in lexical meaning.

Jalapa Mazatec

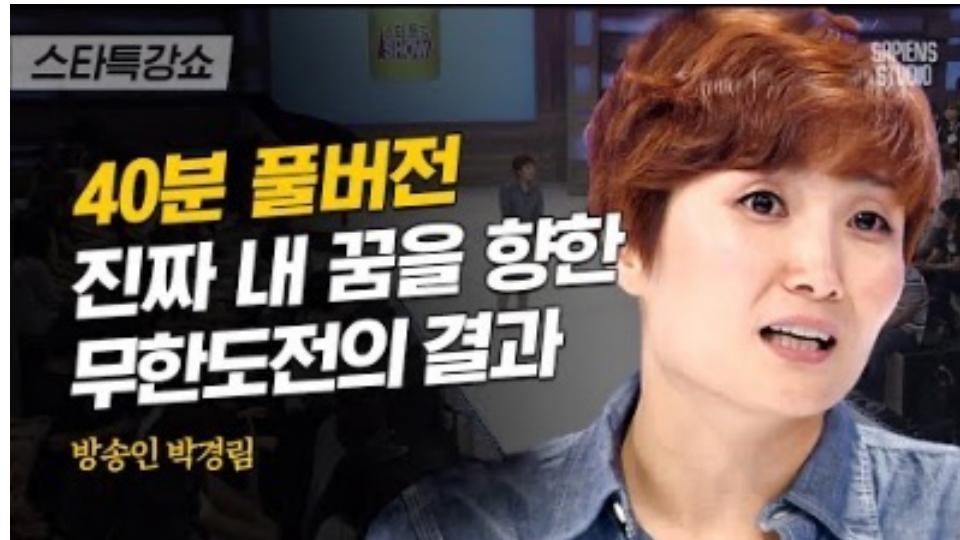
- breathy-voiced [ʰdæχ̥] ‘horse’
- creaky-voiced [ʱdæχ̥] ‘buttock’
- modal-voiced [dæχ̥] ‘seed’

Social/indexical uses of phonation

- Voice also communicates the mood, mental state and health of the speaker:
 - Voice quality varies with speaking style, often depending on the context of the communication. E.g. a friendly conversation, a lecture, a complaint.
 - Voice quality changes occur as a consequence of physiological or psychological changes such as mental strain, tiredness, emotional state or health.

Social/indexical uses of phonation

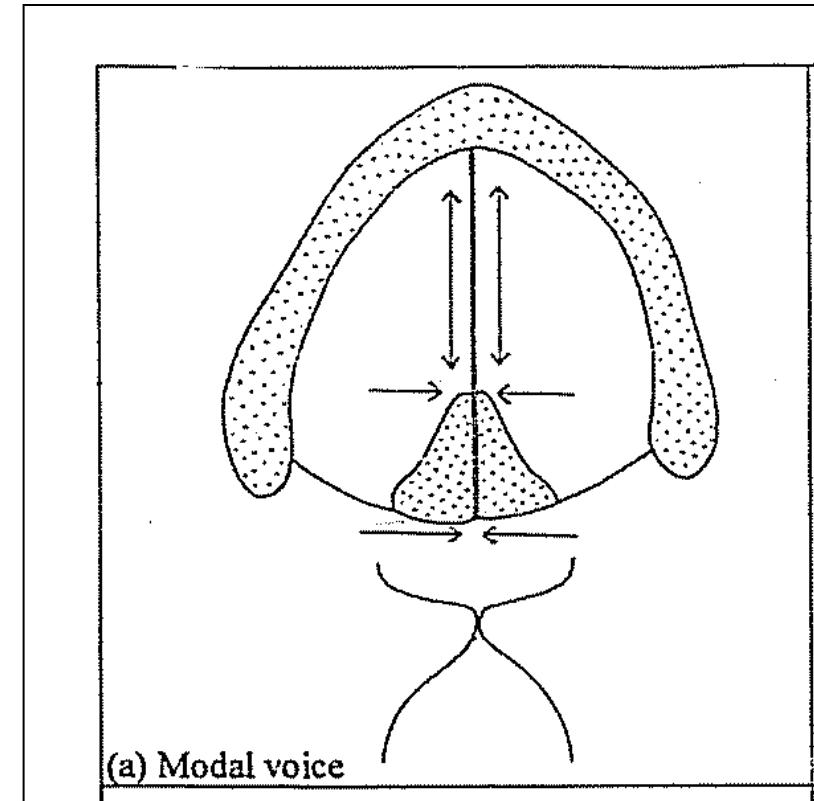
- Voice has a role to play in creating an identity for the speaker:
 - Voice pitch and quality are important features used by listeners to identify a speaker.
 - Research has shown we make judgements of personality or attractiveness based on the quality of a person's voice.



Different phonation types

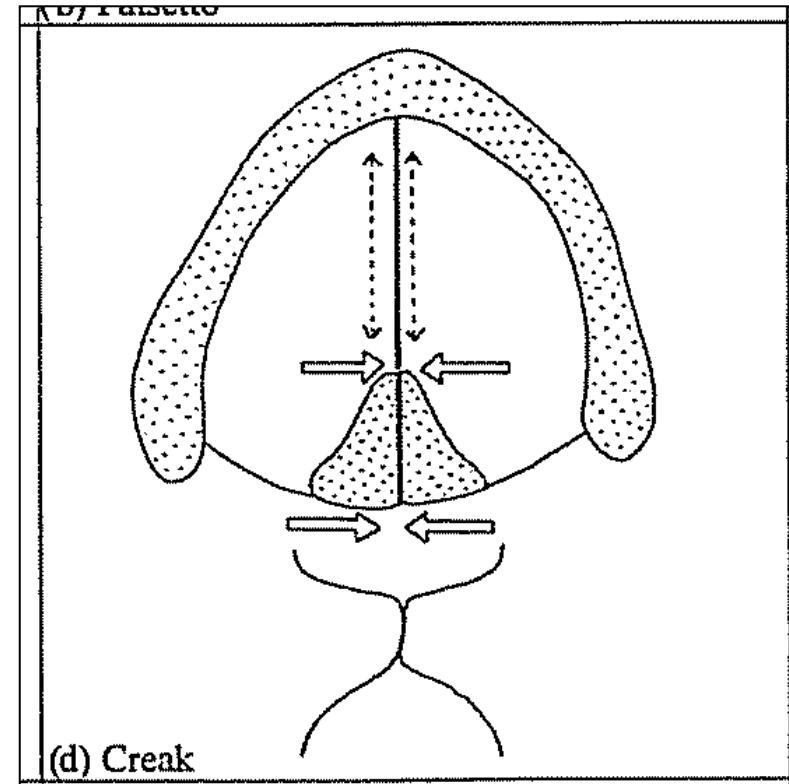
Modal voice

- Moderate degree of longitudinal tension, medial compression and adductive tension
- Regular and periodic vocal fold vibration
- “the norm”
- F0 typically measured in modal voice, unless otherwise specified



Creaky voice

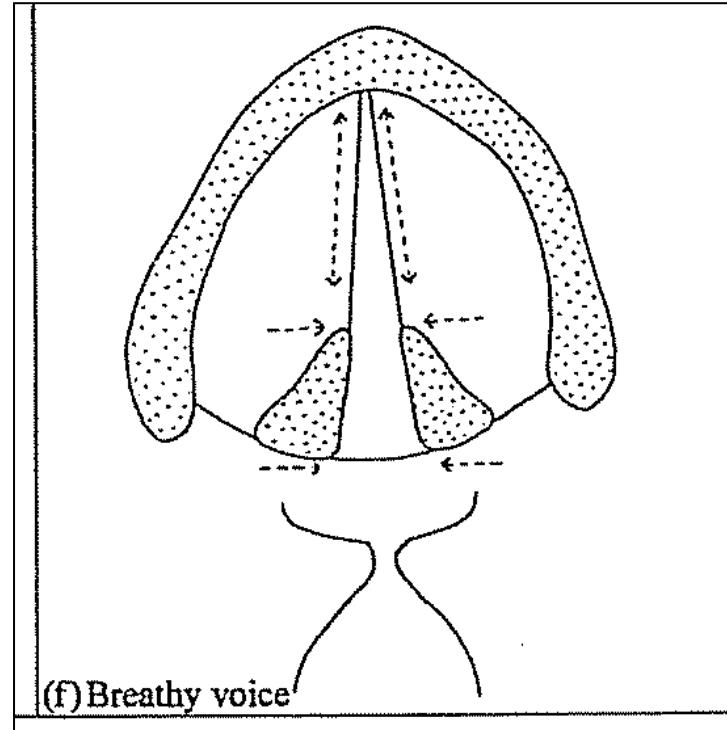
- High adductive tension and medial compression + low levels of longitudinal tension → thick cross section → lower frequency
- Each cycle heard a discrete sound
- Characteristic of some accents of English (e.g., American English)
- Sometimes called **vocal fry**
- Many speakers use creak intermittently, most often on falling intonation contours at the end of utterances.



Kim Kardashian!

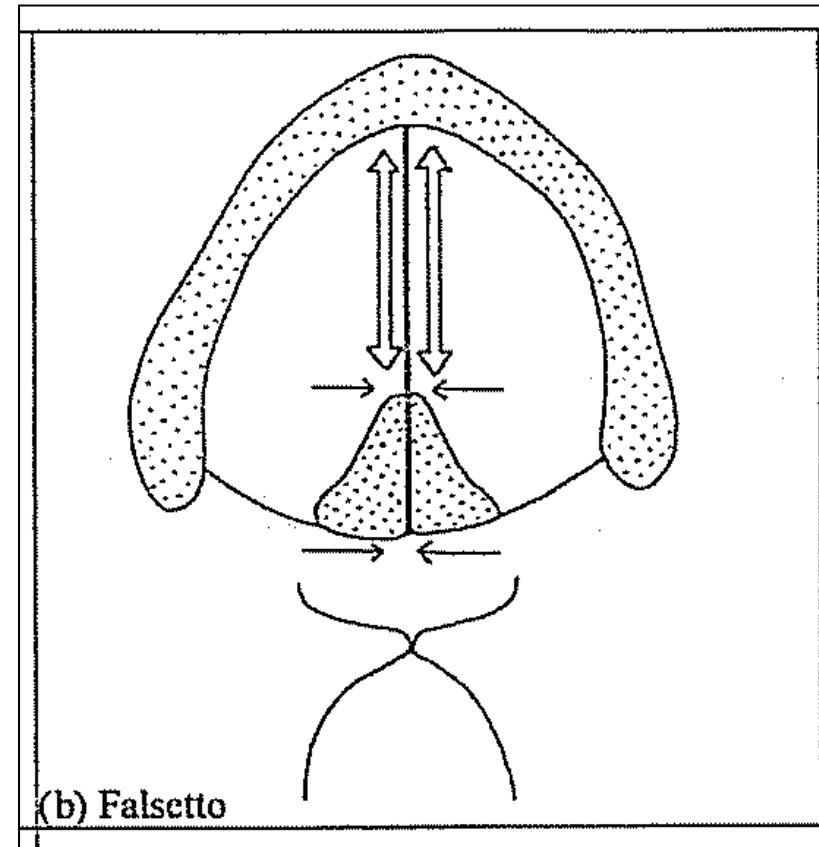
Breathy voice

- Modification of either modal voice or falsetto
- Characterised by low muscular tension, longitudinal, medial and adductive (i.e. “Marilyn Munroe” voice)
- The vocal folds are brought together, but do not make complete closure → a lot of air leakage
- Periodicity combined with friction
- Perceived as a sign of intimacy



Falsetto

- High longitudinal tension → thinning → higher frequency
- Moderate medial compression and adductive tension
- Use of falsetto in the Mayan language Tzeltal as an honorific signal.



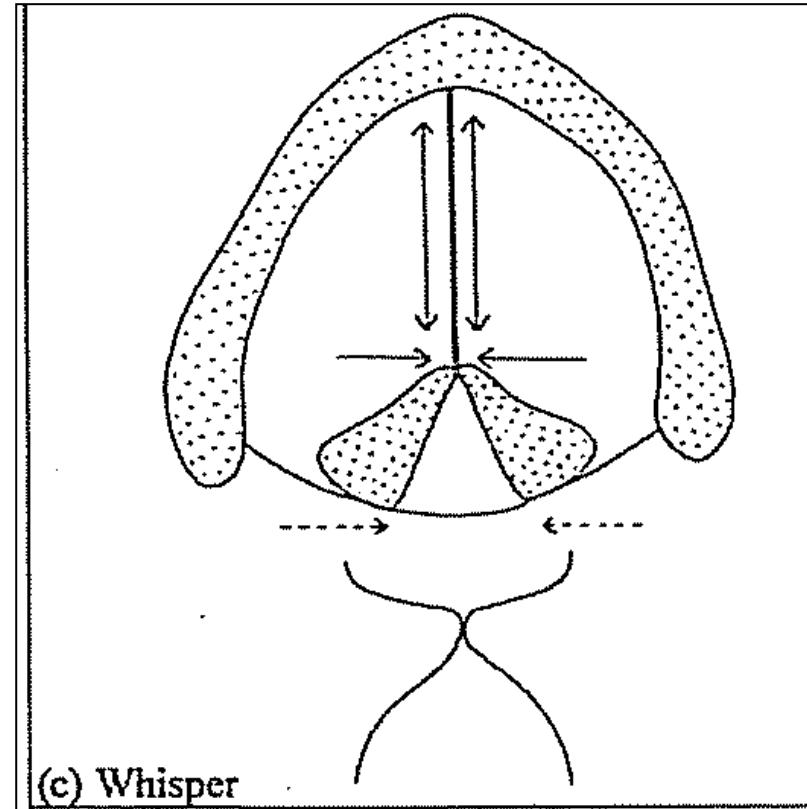
Falsetto

Mary, an indigenous Zapotec woman from southern Mexico, speaks in several voices during a day. To different people and for different social purposes she may use falsetto, breathy, whispered, creaky, or modal voice. Falsetto voice shows respect to her godparents and other ritual kin, and is the voice used in prayers. Important messages and instructions are whispered. Breathy voice drives animals, scolds children, and demands confirmation from another participant. Through creaky voice she seeks commiseration from her conversational partner. Her voice quality is shifted at different times both to assume situated social roles and to emblematically recognize the social categories present to a speech event. She also knows strategies for navigating and avoiding the voices required of her by some participant roles.

Sicoli (2010) "Shifting voices with participant roles: Voice qualities and speech registers in Mesoamerica"

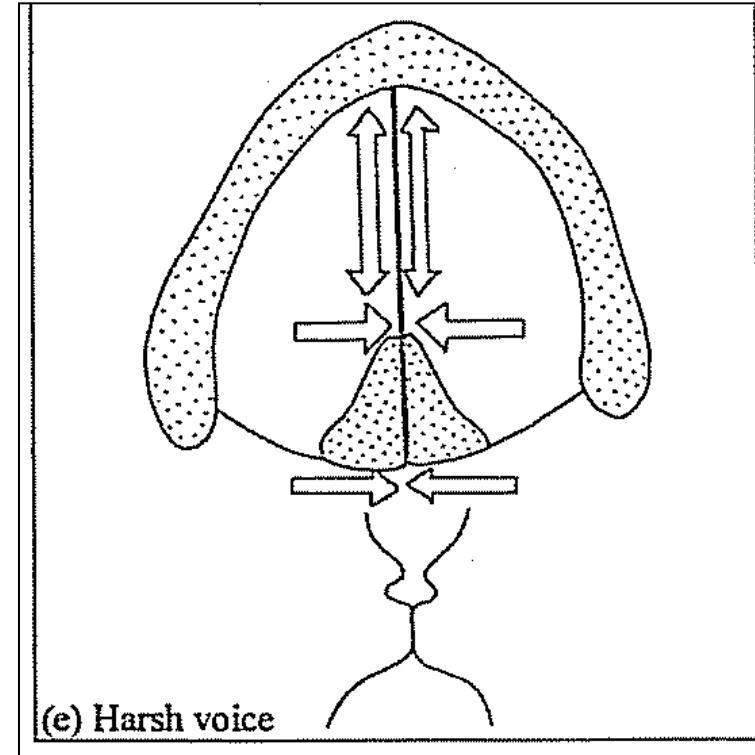
Whisper

- No vibration of the vocal folds because arytenoid cartilage portion of glottis is open
- Creates friction, can be combined with modal voice
- Paralinguistically, whisper is a sign of secrecy and confidentiality in many cultures.



Harshness

- Irregular vocal fold vibration
- Modification of either modal voice or falsetto
- Characterised by excessive muscular tension, longitudinal, medial and adductive (i.e. “army” voice)
- Perceived as a sign of aggression.



Stroboscopy video

https://www.youtube.com/watch?time_continue=5&v=9Tlpkdq8a8c

- Notice the processes of adduction/abduction which bring the vocal folds **together for phonation** and **apart for breathing**.
- Notice how the **change in length of the vocal folds causes changes in the repetition frequency of vocal fold vibration**.

SUMMARY

- Different levels of longitudinal tension, medial compression and adductive tension give rise to different phonation types
- Different phonation types give rise to linguistic functions, communicate a persons mood/mental state and health, play a role in creating a speaker's identity
- Main types of phonation type: modal, breathy and creaky
- Other phonation types: falsetto, whisper and harshness

Reading

A course in phonetics pp.156-159

Acoustic and auditory phonetics pp. 170-172

Additional: Overview paper on voice quality: “Theoretical achievements of phonetics in the 21st century: Phonetics of voice quality” by Marc Garellek (2022) *Journal of Phonetics*

References: Ch 18, Hewlett, N., & Beck, J. M. (2006). *An Introduction to the Science of Phonetics*. Mahwah, N.J.: Routledge