Physiology of Phonation
Nonspeech Functions

- Coughing
- Throat clearing
- Abdominal fixation
- Swallowing reflex

Coughing
- response to Vagus (X) sensory response
- tight adduction of folds
- Raising larynx
- High pressure of muscles of expiration blows folds apart
- Repeated coughs irritate vocal folds

Throat Clearing
- Not as much effort but similar process

Abdominal Fixation
- Capturing air in thorax to push/pull

Swallowing Reflex
- Bolus of food triggers reflex as it passes tongue above larynx
- Larynx elevates
- Epiglottis drops down to cover aditus (opening to larynx from pharynx)
- Tight adduction of folds

These biological functions useful in therapy for adduction problems.
Speech Function

- Attack
  - Simultaneous
  - Breathy
  - Glottal
- Termination
- Sustained phonation
- Vocal register
- Whispering

**Attack** - process of bringing folds together for phonation, requires muscles

**Simultaneous** - adduction and onset of exhalation occur together

**Breathy** - airflow begins before phonation “Harry ate.”

**Breathy phonation** - failure to completely close folds

**Glottal** - used when word begins with stressed vowel, normal process

**Hard glottal attack** - damaging

**Termination** - process of fold retraction

**Sustained phonation** - requires maintenance of tonic (sustained tensing) of the musculature (actual phonation does not require repeated adduction and abduction)

**Vocal register** - differences in mode of vibration of the vocal folds

  - **Modal register** - pattern of phonation used in daily conversations
  - **Glottal fry** - (rough voice) Vibrating portion flaccid, lateral portion tensed resulting in strong medial compression with short, thick folds and low glottal pressure
  - **Falsetto** - long and extremely thin folds
  - **Whistle register** - turbulence on edge of vocal folds

**Whispering** - not actually phonatory because no voicing, folds partially adducted and tensed to produce turbulence, strenuous and fatiguing
Intensity - power of acoustic signal measured in dB
Vocal intensity - intensity of voice
Frequency & Pitch

- Optimal pitch
- Habitual pitch
- Average fundamental frequency

**Frequency** - number of cycles of vibration per second, determined by length, thickness and degree of tension of vocal folds

Increasing length will increase tension and decrease mass

**Pitch** - psychological correlate of frequency

Optimal pitch - frequency of vocal fold vibration that is most efficient for a pair of vocal folds (function of mass and elasticity)

Estimated to be 1/4 octave above lowest frequency by some

Others determine by cough or throat clearing

Habitual pitch - frequency of vibration habitually used by an individual
Intensity

Vocal intensity

- Medial compression
- Subglottal pressure

Intensity - magnitude of sound or sound pressure level (loudness - psychological correlate)
Vocal intensity - dealing with voice

Two significant factors:

- **Medial compression** - to increase intensity, speaker must increase medial compression through muscles of adduction
- **Subglottal pressure** - increased muscle force requires greater subglottal pressure which forces folds to remain in closed position longer
Clinical Considerations

- Frequency perturbation (vocal jitter)
- Maximum phonation time
- Diadochokinesis

Frequency perturbation (vocal jitter)- indication of how well folds are vibrating by measuring each cycle and determining the difference. Present in neuromotor dysfunction and fold abnormality. Variation of 1-2% is considered hoarse.

Maximum phonation time- /s/ vs. /z/

Diadochokinesis- single or multiple repetition of syllables