The Vocal Mechanism: How Does It Work?

- Four subsystems
  - Respiration (Power)
  - Phonation (Source)
  - Resonation (Filter)
  - Articulation
- Respiration
  - The exchange of gas between an organism and its environment
  - Inhalation draws air into the lungs, exchange O_2 and CO_2
  - Respiration provides the air supply (power) needed to vibrate the vocal folds
  - Consciously monitor breathing for speech and singing to meet the demands of the situation
  - Muscles of Respiration
    - Diaphragm (lowers for inhalation, raises upon exhalation)
    - Intercostal muscles (external intercostals for inhalation, internal intercostals for exhalation)
    - Abdominal muscles (compresses abdomen for exhalation)
    - Many additional muscles for inhalation and exhalation
- Phonation
  - The production of sound by vibration of the vocal folds (AKA vocal cords)
  - Creates a sound wave
  - Exhale→vocal folds brought together (adducted)→air bursts through the closed vocal folds→pressure between folds drops, sucks folds back together (this is one vibratory cycle of the vocal folds)
    - Vibration occurs hundreds of times per second, produces voice
  - Anatomy
    - Larynx (voice box)
      - Suspended from hyoid bone
      - 3 functions:
        - Airway protection
        - Respiration
        - Phonation
      - 3 unpaired cartilages
      - 3 paired cartilages
    - Intrinsic laryngeal muscles

            - Muscles that lie within the larynx and connect the laryngeal cartilages
            - Make up the vocal folds
            - Elongate/tense and shorten/relax the vocal folds to create higher and lower pitches
            - Bring the vocal folds together or separate them
        - Extrinsic laryngeal muscles
            - Elevate and depress the hyoid and larynx, bring the hyoid forward during the swallow
- Resonation
    - The vocal tract gives individuals their unique voice
    - The sound created by the vocal folds is shaped by the pharynx, oral cavity, and nasal cavity
        - Different frequencies are amplified or dampened to enhance harmonics/overtones
        - Resonance can be altered by changes in anatomy or physiology (a cold or surgical procedure→hypo- or hypernasality)
    - Hypernasality is our enemy!
        - The only sounds which should be resonated in the nose:
            - M
            - N
            - Ng
            - Sounds surrounding the nasal sounds may be resonated in the nose (anticipatory or carry over nasalization)
                - The amount of nasality in traditionally non-nasal sounds can (and should) be modified, especially if the vowels are sustained
- Articulation
    - Once modified by the resonators, the sound is shaped by the articulators
        - Lips, tongue, and teeth are primary articulators