1 Speech Mechanism

Physiological phonetics

- All sounds which come from the mouth and nose are the result of interruptions and/or modifications of a stream of air moving from the lungs through:
  - trachea
  - larynx
  - pharynx
  - oral cavity
  - nasal cavity

2 Airstream provides energy for speech production

- Any constrictions which create obstacles to free movement of air through larynx and/or above larynx create sound

3 A closer look

- 4 speech process
  - respiration
  - phonation
  - resonance
  - articulation
Respiration (See figure 3.1)

- provides airstream/energy for speech
- organs of respiration
  - trachea
  - rib cage
  - thorax
  - abdomen
  - diaphragm
  - lungs

How it works

- at rest, inhale and exhale with equal time
- speech begins with preparatory intake of air: 10/90%
- thoracic cavity expands secondary to lowered diaphragm
- lungs expand, creating negative pressure and air now available for speaking
- to speak, lungs deflate and rib cage contracts forcing air out
Phonation/laryngeal system

- occurs at laryngeal level
- primary structure is larynx - structure of cartilage and muscles situated atop the trachea
- major structure of larynx is vocal folds/cords
- phonation results from rapid opening and closing of space (glottis) between vocal folds
- accomplished by vocal fold vibration

How it works

- when airstream enters larynx, subglottic pressure builds up
- when pressure great enough, vf’s are pushed apart
- air flows through glottis
- reduction of pressure pulls vf’s back together
- aerodynamic principle related to pressure changes called Bernoulli effect

How to identify phonation (also
called voicing as a distinctive feature

- place fingertips on notch in thyroid cartilage
- prolong “zzzz” then prolong “ssss”
- prolong “ffffff” prolong “vvvvvvvvv”
- phonemes that are phonated are voiced: those without accompanying phonation are voiceless
- all vowels are voiced: some consonants are voiced, some are voiceless

More works

- when vfs are apart = abducted so opening is abduction
- when vfs together = adducted
- during phonation, vfs alternate between abduction and adduction
- during breathing, vfs are _____________?
- what if adducted?
Articulation/Suprasegmental System

- structures of pharynx, nasal and oral cavity
- way of modifying airstream
- articulation = joining together of speech organs for production of phonemes

How it works

- lips - supported by maxilla (upper jaw) and lower jaw (mandible)
  - Body function - receive and contain food
  - Speech function - varied movement: rounded, tensed: obstruct air flow
- teeth
  - body function - cut and grind food
  - speech function - anatomical obstacle for lips or tongue
- alveolar ridge (gum ridge of maxilla)
  - body function - none; houses teeth
  - speech function - point of contact/constriction
• hard palate - bony structure posterior to alveolar ridge
  – body function - contain food in oral cavity
  – speech function - point of contact; defines shape of oral cavity

• soft palate/velum - muscular structure posterior to hp
  – body function - separate oral cavity and nasal cavity
  – speech function - direction of air flow - open/close
  vp port: point of contact

• tongue - major articulator/ muscle and mobile
  – body function - direct food to back of oral cavity
  – speech function - direction of air flow: contacts other structures: approximates other structures; changes size of oral cavity

• mandible (lower jaw)
  – body function - chewing
  – speech function - change size of oral cavity

• Oral cavity - from mouth opening to posterior wall of pharynx (posterior pharyngeal wall)
  – body function: breathing, eating
  – speech: channels airstream: contributes oral resonance

• Nasal cavity - extends from nostrils (nares) to posterior
pharyngeal wall
  – body function: breathing
  – speech: contributes nasal resonance

• Pharynx - posterior portion of nasal cavity down through back of oral cavity to larynx

• Vocal cords/folds - in lateral walls of larynx
  – body function: respiratory protection
  – phonation