Perceptual Development

Problems in Perception:

- Speech flows
  - no overt markings for word boundaries
- Speech sounds vary
  - men, women, children produce speech sounds differently in complex ways, also loudness and rate effect speech
- Articulatory gestures interact
  - coarticulation and allophonic variation

Perceptual Constancy – (def) Ability to identify the same sound across different speakers, pitches, and other changing environmental conditions; infants display this skill

Testing Infant Speech Perception

- High-amplitude Sucking Paradigm
  - infant sucks on a pacifier, record sucking rate
  - interested = relatively fast, rhythmic suck
  - habituated (or lost interest) = decreased rate
  - If the infant notices the new stimulus, the rate will increase again
  - A common variant is infant controls stimulus with sucking
    - (e.g., increased suck results in more of preferred stimulus)
- Head-turn Paradigm
  - visually-reinforced sound-field threshold testing
  - condition a head turn or localization to source given new stimulus using a reinforcing toy
- Limitations: age, interest, attention
- Event-related Potentials (ERPs) – EEGs that are noninvasive and require no response; measure brain wave responses to stimuli

Categorical Perception

- (def) listeners perceive speech sounds according to the phonemic categories of their language
- Example of Voice Onset Time (VOT)
  - /b/ - voicing onset occurs with release or 0 ms
  - /p/ - voicing of following vowel occurs approximately 40-100 ms after release
  - given /b, p/ variations on a continuum, listeners perceive distinct /b/ and /p/
  - English has 2-way contrast: voiced-voiceless
    - **Some languages have 2-way: prevoiced-voiced (voiceless unaspirated)**
    - **Some languages have 3-way: prevoiced, voiceless-unaspirated, and voiceless-aspirated**

Speech Perception Development Timeline

• 0-1 month	• Categorical discrimination of speech contrasts (native and nonnative) • Discriminates mother's voice Discriminates maternal language
• 1-4 months	• Detects changes in intonation pattern • Recognizes same syllable in different utterances
• 4-6 months	• Prefers infant-directed speech over adult-directed speech • Matches vocalizations to face shapes
• 6-8 months	• Uses prosody to distinguish native and nonnative words
• 8-10 months	• Decline in ability to detect certain, nonnative phonetic contrasts • Uses phonetic cues to determine foreign versus native contrasts
• 10-12 months	• Perceptual categories now reflect phonemes in native language

Early Speech Production

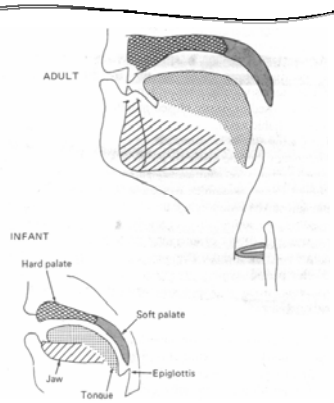
Tasks the child needs to learn:

- to produce a variety of vocal sounds
- to match sound patterns of adults to infant repertoire
- to associate adult sound patterns with situations or meaning

Speech Development is an outgrowth of (1) biological maturation with (2) social experience

Principles for Theories of Phonological Development

- Active hypothesis testing by child
- Produce words for communication purposes
- Children vary due to personality, environment
  - Evidence: selectivity in first words, regression
- Perceptual biases and motoric dispositions
  - Ex. raise/lower jaw can create babbling
- Babbling creates auditory-kinesthetic links
- maturation plus practice equals learning
- Self-organizing principle



Structural Changes Affecting Speech Development (BBF 2009, pp82-83)

- Infant vocal tract is 3X smaller than adult's
- Infant - single tube for breathing, sucking, and swallowing
- Adult – two tubes: an oral tube for articulations and a laryngeal tube for breathing and swallowing
- Infant larynx located between the 1st and 4th cervical vertebrae
- By age 6, adult location between 4th and 7th vertebrae
- Respiration for speech and breathing is differentiated by age 1 year and mature by age 7 years
- Critical neurological development – brain growth, myelination

Stark's Stages (see Box 3.1, p. 87 in BBF (2009) Early Speech Development

- 0-2 months
  - Reflexive Stage
    - reflexive crying and sounds
    - vegetative sounds
    - Quasi resonant nuclei "faint low-pitched grunt-like sounds with muffled resonance"
- 1- 4 months
  - Control of Phonation
    - Fully resonant nuclei "vowel –like sounds that have energy across a wide range of frequencies (not restricted to low frequencies)"
    - Closants – consonant-like segments
    - Vocants – vowel-like sounds (including fully resonant nuclei)

- 3-8 months
  - Expansion
    - Isolated vowels, vowel sequences, vowel glides
    - Ingressive sounds
    - Squeals and "marginal babbling," which consists of a series of closants and vocants
- 5-10 months
  - Basic Canonical Syllables
    - Reduplicated babbling
    - Variegated Babbling
    - "canonical" forms - structured, production templates
- 9-18 months
  - Advanced forms
    - Complex syllables (VC, CCV, CCVC)
    - Jargon

- Examples of pre-canonical, canonical, and post-canonical vocalizations

  web site http://vocaldevelopment.com/

Questions about Babbling

- Is babbling influenced by the ambient language?
- Is the babbling stage continuous with earlier pre-linguistic productions and later word approximations?
- Is babbling predictive of later speech/language development?