Oral Peripheral + Neuromotor Speech Examinations
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**Figure 18.10**
Examining the Speech Mechanism

• Clinical observations are judged or quantified to determine normality or abnormality of motor speech and phonatory mechanisms.

• To date, there are no psychometrically stable tests to differentially diagnose the motor speech and phonatory mechanisms.
Differential Diagnosis

• Voice → Phonatory Mechanisms
• Articulation → Sensorimotor Systems
• Cognition → IQ: verbal + non-verbal
• Language → Cognitive-Linguistic Processes
  – Phonology, semantics, syntax, etc.
  – Receptive vs. expressive abilities
• Subjective + Objective Measurements
• Clinician Judgment + Quantitative measurement
Assessment of the Speech Mechanism is a two-fold process

1. Determine the Structural Integrity of the speech mechanism:
   – administer an oral peripheral exam
   – determine size, shape, and adequacy of structures for non-speech + speech-related purposes
2. Determine the Functional Integrity of the Speech Mechanism:
   – administer the neuromotor speech exam
   – determine adequacy of system to produce non-speech and speech-related movements
   – articulatory + phonatory systems
Oral Peripheral Examination

• Assess the:
  – Size, shape, and adequacy of:
    – oral, lingual structures
    – resonatory, laryngeal structures
    – respiratory structures
• Determine if they perform their functions for:
  – non-speech + speech-related purposes
Exam the following:

- teeth and occlusion
- hard palate
- soft palate
- tongue
- face, nose, mouth
- neck, shoulders
- overall body and posture
- lungs or respiratory system
- muscular processes associated with above structures
Class II malocclusion

Class III malocclusion with underbite
This is a healthy tongue!
Neuromotor Examination

• assess sensori-neuromotor mechanisms
• assess cranial nerves related to speech
  – and articulatory components
• assess phonatory mechanisms
Assess CNS + PNS Integrity

• Inventory signs + symptoms
• Determine salient + confirmatory signs
• Interpret signs + symptoms with localization of lesion of breakdown
• Form a differential diagnosis
  – pattern recognition + associations
  – Rule-out/rule-in problems
• Confirm diagnosis
Relevant Cranial Nerves

- Cranial V: jaw
- Cranial VII: face
  - (lower face > contralateral UMN input)
  - (upper face → bilateral UMN input)
- Cranial VIII: auditory
- Cranial IX: pharynx
- Cranial X: soft palate, vocal folds, larynx
- Cranial XI: shoulders, neck
  - (some muscles > contralateral)
- Cranial XII: tongue (> contralateral UMN input)
3D-Visualization of the Cranial Nerves from MRI-Data (Ciss 3D)
Facial Asymmetry
Eyelid Weakness
Lingual Weakness

FIG. 17-3. Nuclear paralysis of muscles supplied by the hypoglossal nerve: atrophy and fasciculations of the tongue in a patient with amyotrophic lateral sclerosis.
Check for Neuropathological Reflexes

• Suck reflex → bilateral UMN involvement
• Gag reflex → Absent or reduced reflex

• See list of primitive reflexes for developing children and neonates
Phonatory Mechanisms

- Respiration: breathing
- Phonation: vocal quality
- Resonance: air flow
- Pitch: fundamental frequency (Hz)
- Loudness: volume (dB)
- Rate of speech: speed
Respiration

• General breathing pattern for speech/nonspeech
• s/z ratio, 1:1 ratio, 1:4 abnormal
• MPT: modal /a/ maximum in seconds
  – Maximum phonation time
• Pulmonary function studies (PFTs)
• Spirometry, pneumotachograph
Voice Assessment Instrumentation

- Computerized Speech Lab (CSL)
- Multispeech
- Visi-pitch
- Largyno-strobo-video-endoscopy
- Flexible Endoscopic Evaluation of Swallowing with Sensory Testing
  – (FEESST)
Phonation and Pitch

- Subjective rating scale
  - Clinician-based:
    - GRBAS, CAPE-V, Buffalo III, Duffy book
  - Patient-based:
    - V-RQOL, VHI-10, VHI-30
- Objective measurements:
  - Visi-pitch, CSL/MDVP, MultiSpeech, etc.
Resonation

- nasal resonatory
  - hyper- or hyponasality
- Subjective measurements: mirror clouding
- Objective measurements: Nasometer
Loudness

- Subjective measurements: volume
- Objective measurements:
  - SLM, dB measurement
Speech Rate

• AMRs (alternate motion rates) → norms
  – Diadochokinetic rates
• SMRs (sequential motor rates)
• WPM (words per minute)
• SPS (syllables per second)