Motor Speech Disorders

**Dysarthria**
Neurologic speech disorder reflecting abnormalities in the strength, speed, range, steadiness, tone, or accuracy of movements required for respiratory, phonatory, resonatory, articulatory, or prosodic aspects of speech production

Duffy, 2013
Flaccid Dysarthria
- Features relate to muscle weakness
- Often asymmetric
- Specific features depend on LMNs involved and/or pathophysiology
- Consistent features vs rapid fatigue/recovery with rest

<table>
<thead>
<tr>
<th>Cranial Nerve</th>
<th>Speech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Does not typically impact speech unless severe bilateral deficit</td>
</tr>
<tr>
<td>VII</td>
<td>Unilateral: unlikely to significantly impact speech, perhaps subtle</td>
</tr>
<tr>
<td>Xn</td>
<td>Hypernasality</td>
</tr>
<tr>
<td>Xn</td>
<td>Low pitch, monopitch</td>
</tr>
<tr>
<td>Xn</td>
<td>Breathiness, diplonia, short phrases</td>
</tr>
<tr>
<td>XII</td>
<td>Imprecise articulation</td>
</tr>
</tbody>
</table>

Spastic dysarthria

<table>
<thead>
<tr>
<th>Subsystem/Dominant</th>
<th>Speech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td>Short phrases</td>
</tr>
<tr>
<td>Phonation</td>
<td>Strained, strangled</td>
</tr>
<tr>
<td>Resonance</td>
<td>Hypernasality</td>
</tr>
<tr>
<td>Articulation</td>
<td>Imprecise</td>
</tr>
<tr>
<td>Prosody</td>
<td>Slow rate, Monopitch, monoloudness</td>
</tr>
</tbody>
</table>

Ataxic dysarthria

<table>
<thead>
<tr>
<th>Subsystem/Dominant</th>
<th>Speech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td>Excessive loudness variation</td>
</tr>
<tr>
<td>Phonation</td>
<td>May be harsh</td>
</tr>
<tr>
<td>Resonance</td>
<td>Often normal, otherwise may be variable</td>
</tr>
<tr>
<td>Articulation</td>
<td>Irregular articulatory breakdowns</td>
</tr>
<tr>
<td>Prosody</td>
<td>Slow rate, Scanning speech, Excess and equal stress</td>
</tr>
<tr>
<td>Other</td>
<td>“drunken” quality</td>
</tr>
</tbody>
</table>

Hypokinetic dysarthria

<table>
<thead>
<tr>
<th>Subsystem/Dominant</th>
<th>Speech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td>Reduced loudness</td>
</tr>
<tr>
<td>Phonation</td>
<td>Tight breathiness</td>
</tr>
<tr>
<td>Resonance</td>
<td>Often normal</td>
</tr>
<tr>
<td>Articulation</td>
<td>Imprecise, usually with reduced ROM during speech movements</td>
</tr>
<tr>
<td>Prosody</td>
<td>Rapid rate, Short rushes of speech, Monopitch, monoloudness</td>
</tr>
<tr>
<td>Other</td>
<td>Palilalia, “Mumbling” quality</td>
</tr>
</tbody>
</table>

Hyperkinetic dysarthria

<table>
<thead>
<tr>
<th>Subsystem/Dominant</th>
<th>Speech Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td>Interruptions, Excessive loudness variations</td>
</tr>
<tr>
<td>Phonation</td>
<td>Strain, Tremor, Voice interruptions</td>
</tr>
<tr>
<td>Resonance</td>
<td>Constant or variable</td>
</tr>
<tr>
<td>Articulation</td>
<td>Distortions, Interruptions</td>
</tr>
<tr>
<td>Prosody</td>
<td>Often slow</td>
</tr>
<tr>
<td>Other</td>
<td>Visual features often prominent</td>
</tr>
</tbody>
</table>
UUMN dysarthria

<table>
<thead>
<tr>
<th>Subsystem/Domain</th>
<th>Speech Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration</td>
<td>Reduced loudness*</td>
</tr>
<tr>
<td>Phonation</td>
<td>Weak, strained, or hoarse</td>
</tr>
<tr>
<td>Resonance</td>
<td>Hypernasal*</td>
</tr>
<tr>
<td>Articulation</td>
<td>Imprecise irregular breakdowns</td>
</tr>
<tr>
<td>Prosody</td>
<td>Slow (or normal) rate Reduced stress*</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

*Particularly in the context of reduced background physiologic effort

Can be perceptually similar to flaccid, spastic, and/or ataxic dysarthria

Mixed dysarthria

- Any combination of the above

Apraxia of Speech

- AOS is a disturbance in the programming of movements for speech
  - muscles are capable of normal functioning (right-sided weakness secondary to UMN dysarthria may be seen)
  - appropriate message has been formulated

Most agree that...

- AOS is distinct from dysarthria
  - Which involves impairments in speed, strength, coordination, or muscle tone affecting all movements
- AOS is distinct from aphasia
  - Which involves impairments in manipulation (comprehension & expression) of linguistic symbols
- AOS is distinct from nonverbal oral apraxia

Speech Characteristics (Duffy 2013)

- Articulatory
- Rate and Prosody
- Fluency
Articulatory Characteristics
- Consonant and vowel distortions (imprecise articulation)
- Distorted substitutions
  - Perseverative
  - Anticipatory
- Distorted additions
- Distorted sound prolongations
- Voicing errors
- Relatively consistent error type and location

Rate and Prosodic Characteristics
- Slow overall rate, especially for longer utterances
- Prolonged but variable vowel duration and inter-word intervals
- Syllable segmentation
- Errors of stress assignment
- Reduced words per breath group relative to MPT
- Decreased phonetic accuracy with rate increases

Fluency Characteristics
- Attempts to self-correct articulatory errors
- False starts and restarts
- Visible and audible groping for articulatory postures
- Sound and syllable repetitions

Influence of Task Variables
- Syllabicity effects
  - Increased errors
    - Low frequency syllables
    - Syllables with more phonemes
    - Consonant clusters within syllables
  - Increased errors with more phonemes and/or more syllables (complexity)
- Volitional/purposeful utterances have more errors than automatic/reactive utterances

Influence of Task Variables
- Higher error rates in nonsense syllables
- Higher error rates in consonant clusters
- Initiation of utterances is particularly difficult
- Imitation does not generally elicit more errors than are present in spontaneous speech of equal complexity

Severe AOS
- Limited repertoire of speech sounds
- Limited variety of utterances
- May be reflected by muteness
- Usually accompanied by severe aphasia and nonverbal oral apraxia
Motor Speech Assessment

Differential diagnosis

“When do you give an aphasia battery?
When you already know the patient has aphasia”
- Joe Duffy

Motor Speech Assessment

- History
- Perceptual assessment of continuous speech
- Speech-like tasks
- Examination of oral structure and function

Medical History

Information | Key Indicators or Findings | Relevance for Communication
--- | --- | ---
Current diagnosis and past medical history (PMH) | 1. Neurologic 2. Pulmonary 3. ENT | 1. Predict impairments and inform prognosis and tx plan
| 2. May account for respiratory impairments affecting speech
| 3. May account for voice impairments affecting speech
| 2. May affect vocal quality
| 3. Timing of medication may influence performance
Imaging | 1. Head CT or MRI | 1. Site of lesion may predict impairments and differential diagnosis
Reports from other disciplines | 1. Nursing 2. Physical medicine | 1. Usually indicate level of alertness and ability to communicate basic needs
| 2. May indicate ability to participate in therapeutic intervention

Interview – Onset & Course

<table>
<thead>
<tr>
<th>Question</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Describe the changes in your speech | Some descriptions occur more frequently in with specific motor speech disorders
- “Mumbling” – hypokinetic
- Slow and effortful – spastic dysarthria, AOS
- Tongue is thick – flaccid
- Can’t pronounce words, “trip” over words – AOS
- Sound drunk - ataxic |
| When did the problem start? | Gradual or sudden?
| Change since onset? | Improving or worsening symptoms suggests possible etiologies |
| Improvement with therapy | Responsiveness to intervention may suggest underlying impairment |

Interview – Associated Deficits

Duffy, 2013

<table>
<thead>
<tr>
<th>Question</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Other symptoms (beginning at the same time, prior to, or after development of speech difficulties)? | Cognitive/linguistic
| Swallowing/drooling
| Gait/balance
| Weakness/coordination |
| “Company it keeps” may suggest etiology |
| Changes in emotional expression | Flattened affect: hypokinetic dysarthria
| Pseudobulbar effect: spastic dysarthria |
Speech Functions - Tasks
- Connected speech
- Reading
- Picture description
- Conversation
- Repetition
- Single words
- Sentences
- Automatic sequences

Speech-like tasks
- Alternate motion rates (AMRs)
- Sequential motion rates (SMRs)
- Prolonged vowel (maximum phonation time/MPT)

AMRs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Relevance for Differential Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow and regular</td>
<td>Spastic</td>
</tr>
<tr>
<td>Irregular (slow or normal rate)</td>
<td>Ataxic</td>
</tr>
<tr>
<td>Rapid/blurred</td>
<td>Hypokinetic</td>
</tr>
<tr>
<td>Normal rate, imprecise</td>
<td>Flaccid</td>
</tr>
<tr>
<td>Voicing errors</td>
<td>Spastic</td>
</tr>
</tbody>
</table>
SMRs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Relevance for Differential Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better than AMRs</td>
<td>Ataxic</td>
</tr>
<tr>
<td>Worse than AMRs</td>
<td>AOS</td>
</tr>
</tbody>
</table>

Nonspeech Tasks

Nonspeech Tasks

Nonspeech Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Relevance for Differential Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in ROM</td>
<td>During isolated movements: can reflect weakness or spasticity</td>
</tr>
<tr>
<td>Reduced speed</td>
<td>Most apparent in spasticity Possible but not typical in flaccid</td>
</tr>
<tr>
<td>Atrophy</td>
<td>LMN</td>
</tr>
<tr>
<td>Fasciculations</td>
<td>LMN</td>
</tr>
<tr>
<td>Pathologic or exaggerated reflexes</td>
<td>LMN</td>
</tr>
<tr>
<td>Hypomimia</td>
<td>Hypokinetic</td>
</tr>
<tr>
<td>Adventitious movements</td>
<td>Hyperkinetic, functional</td>
</tr>
</tbody>
</table>

Assessment

Assessment across the continuum of care

- Timing/setting influences many aspects of assessment
  - Purpose
  - Time available
  - Patient and family insight
  - Nature of confounding factors

Assessment

Consideration of Chronicity
Assessment in Acute Care

Acute Care: Purpose
- Differential diagnosis
- Identification of reliable mode of communication
- Discharge planning

Acute Care: Time Available
- Patient available for assessment
- Patient awake and alert for assessment

Acute Care: Patient and family insight
- Description of the problem by patient and family not necessarily particularly helpful at this point
- May have identified an effective mode of communication
- Concern will be survival and (later) disability
- This may be the first time the patient or family has ever heard of dysarthria or AOS

Acute Care: Confounding factors
- Coma, delirium, encephalopathy, somnolence
- Baseline cognitive impairments
- Pain
- Hemiplegia
- Visuo-perceptual deficits
- Hearing loss
- Positioning
- Presence of NG, endotracheal tubes, trachs

Assessment in Chronic Phase
Purpose
• Confirm diagnosis
• Obtain a thorough characterization of the motor speech disorder
• Probe for facilitating contexts

Purpose
• Develop a prognosis for improvement with therapy and/or
• Develop recommendations for maximizing communicative effectiveness

Purpose
• The task is usually to address communication difficulties that
  • Have never been treated
  • Have been treated inappropriately
  • Have been treated appropriately but may benefit from a different approach
  • Have been treated optimally but patient and family have not effectively adapted to the “new normal”

Chronic: Time Available
• Often relatively extensive

Although probably never as much as is available in training settings

Chronic: Patient and family insight
• What have they been told the communication problem is called?
• Question is usually whether additional therapy could be helpful
• They may or may not have experience yet with ICF-guided therapy (more on this later)

Chronic: Patient and family insight
• Description of the problem by patient and family is invaluable at this point
  • Impact on work, personal, and social interactions
  • Effective strategies
  • Challenging contexts
Chronic: Confounding factors
• Concomitant deficits
  • Pain
  • Hemiplegia
  • Visuo-perceptual deficits
  • Hearing loss
  • Aphasia
  • Cognitive impairments
  • Fatigue
  • Maladaptive patterns

Chronic: Confirm Diagnosis
• Thorough motor speech exam and evaluation for common co-occurring difficulties
  • If you are confident about previously established diagnoses, it may be possible to screen for other deficits and then use most of the time for comprehensive assessment of motor speech
  • Consider the relative contribution of motor speech disorders to overall communicative effectiveness

Assessment of Progressive Motor Speech Disorders

Progressive: Purpose
• Differential diagnosis
• Characterization of concomitant communication disorders

Progressive AOS: Characterization
• Classifying Type of Progressive AOS
  • Articulatory distortions predominate
  • Segmentation predominates
  • Distortions and segmentation are of equal severity

Progressive: Time Available
• Initial session for differential diagnosis
• Subsequent sessions likely needed for further characterization
Progressive: Patient and family insight

Description of the problem by patient and family is **invaluable**

- Nature
  - Complaints of change in voice, difficulty with pronunciation or enunciation, “tripping” over words, “can’t get words out”
  - With or without complaints of aphasia
  - Gradual onset and worsening over time
- Impact on work, personal, and social interactions
- Effective strategies
- Challenging contexts

Progressive: Patient and family insight

- What have they been told the communication problem is called?
- They will want to know if therapy can reverse the problem.

Progressive: Confounding factors

- Concomitant aphasia and/or cognitive communicative deficits
- Limb apraxia

Treatment of Motor Speech Disorders

General Considerations

- Concomitant conditions
  - NVOA may be present but likely will not warrant treatment
  - Nonspeech oral motor activities not used at all except to shape towards speech in the setting of muteness
- Severity
- Guiding frameworks

Management of Motor Speech Disorders

Considering Chronicity
Acute Care
- Goals
  - Identifying or establishing reliable mode of communication
  - Discharge planning
- For prolonged stays
  - On-going assessment as medical status fluctuates
  - May be able to move forward with rehabilitative goals

Early rehabilitation
- Goals
  - Restoration of function
  - Optimizing activity, participation, quality of life
    - Comprehensibility strategies
    - Home and work modifications
    - Conversation partner training

Chronic Motor Speech Disorders
- One task is to justify treatment
  - Involves identifying communication difficulties that
    - Have never been treated
    - Have been treated inappropriately
    - Have been treated appropriately but may benefit from a different approach
    - Have been treated optimally but patient and family have not effectively adapted to the "new normal"
  - Much of the highest quality evidence supporting treatment of dysarthria & AOS is the setting of chronic conditions

Chronic Motor Speech Disorders
- Goals
  - Restoration of function
  - Optimizing activity, participation, quality of life
    - Comprehensibility strategies
    - Home and work modifications
    - Conversation partner training

Progressive Motor Speech Disorders
- Goals
  - Restoration (?), maintenance, and slowed decline, of function
  - Optimizing activity, participation, quality of life
    - Comprehensibility strategies
    - Home and work modifications
    - Conversation partner training

Frameworks Guiding Decision Making
ICF
Frameworks Guiding Decision Making

International Classification of Function: ICF

Health Condition
Disorder or disease
Informs
- Prognosis
- Predicted comorbidities
- Tolerance for specific modalities
Treatment of motor speech disorders associated with neurodegenerative disease may differ from acute or chronic disease
- Goals
- Time course
  - Relatively frequent during establishment of skills or strategies
  - Relatively infrequent re-evaluation with updated recommendations

Body Functions and Structures
Underlying impairments of or changes to anatomical structures or physiologic functions
In motor speech disorders, impairments are often described at the level of muscle or nerve impairment (e.g., weakness) or at the level of subsystem (e.g., impairments of voice)

Activity and Participation
Describes the impact of health conditions, impairments, and contextual factors on performance of and participation in functional activities

Contextual Factors
Personal factors
- Age
- Life experiences
- Personality
- Co-morbidities
  - Speakers with dysarthria often have concomitant impairments in speech, prosody, language, cognition, and/or swallowing functions
Environmental factors
- Technology
- Geography
- Support and relationships
- Attitudes
- Services
- Systems and policies
Application: ICF

• Differential diagnosis
  • Mixed hypokinetic-hyperkinetic-spastic dysarthria
  • Apraxia of speech
  • Cognitive communicative impairment
• Medical diagnosis
  • Corticobasal syndrome

Recommendation | Rationale
--- | ---
Environmental modifications to maximize signal to noise ratio | • Increasing loudness exacerbated phonatory strain
Conversation partner strategies | • Cognitive deficits make it difficult for patient to use intentional strategies
  • Include strategies addressing reduced output related to cognitive deficits

Motor Speech Treatment Hierarchy

Frameworks Guiding Decision Making

Speech Subsystems

Articulation
Resonation
Phonation
Respiration
Prosody

Motor Speech Treatment Hierarchy

• The speech subsystems do not act independently
• Adequate respiratory support and velopharyngeal valving supports phonation
• Articulatory precision is supported by respiratory, resonatory, and phonatory competence

Motor Speech Treatment Hierarchy

Third Order Targets
Articulation
Prosody

Second Order Targets
Phonation

First Order Targets
Respiration
Resonation
First Order Targets:
- Respiratory support (diaphragmatic breathing)
- Loudness (e.g., LSVT)

Third Order Targets:
- Overenunciation
- Articulation
- Phonation
- Respiration
- Resonation
- Prosody

Application: Motor Speech Treatment Hierarchy

Strength
- Weakness
  - Maximum force (strength; 1R_max)
  - Sustained/repeated submaximal force (endurance)
  - Power (near maximal forces at high speed)
- Causes
  - UMN lesion (UUMN and spastic dysarthria)
  - LMN lesion (flaccid dysarthria)
  - Disuse atrophy & deconditioning (all dysarthrias)

Strength Training Principles
- Overload & Progression
- Intensity
- Recovery
- Reversibility
- Specificity of Training

Overload & Progression
- Overload
  - Taxing the muscles beyond typical functioning
  - Results in
    - Hypertrophy of muscle tissue
    - Increased motor unit recruitment
- Progression
  - Systematic overload
  - Implies need for regular reassessment of maximum performance

Intensity
- Strength training
  - 60-80% 1R_max
  - 10 repetitions per set
  - 2-3 sets
- Endurance training
  - 40-60% 1R_max
  - High number of repetitions (e.g., 60)
Recovery

- Optimal interval between training sessions to allow recovery yet avoid reversal
- In large muscle groups, optimal interval is > 24 hrs
- Tongue strengthening studies: 3-7 days/week
- Respiratory muscle strengthening studies: 3-5 days/week

Reversibility

- “Use it or lose it”
- Levels of strength must be used to be maintained

Specificity of Training

- The effects of strength training are highly specific to the trained behaviors
- Transference refers to the gains in function for tasks that do not perfectly match the exercise

Movement factors subject to specificity

- Force
- Contraction velocity
- Duration
- Dynamics
- Integration

Integration

- Results of motor learning experiments suggest that motor programs (specific patterns of motor unit recruitment) are highly specific
- Predicts that exercises that incorporate the entire movement pattern (e.g., all articulators) will result in greatest carryover

Contra-indications for strength training

- Hypertonia
  - Rationale: High resistance exercise presumed to increase spasticity, arose from principles of the Bobath approach
  - Evidence has failed to support this presumption
    - Stroke (Pax & Patten, 2008)
    - Cerebral palsy (Dodd, Taylor & Damiano, 2002; Scholtes et al, 2012)
    - MS (in combination with anti-spasticity medications; McDonnell, Snook & Hinkle, 2007)
    - ALS (Ashworth, Satkunam, & Deforge, 2012 Cochrane Review)
Contra-indications for strength training

- Fatigue Susceptibility
- Neuromuscular junction deficits: the impairment does not reflect reduced motor unit recruitment nor peripheral muscle weakness. Resistance exercise elicits the fatigue without inducing physiologic responses leading to increased muscle strength.
- Progressive neuromuscular disease
  - Rationale: resistance exercise induces fatigue without potential benefit of increased strength.
  - Evidence: Low to moderate intensity exercise may improve functional activity (Kjolhede, Vissing & Dalgas, 2012; White & Dressendorfer, 2004).

Contra-indications for strength training

- Inflammatory Myopathy
  - Rationale: resistance exercise thought to exacerbate inflammatory response.
  - Evidence: Case study of lingual exercise in IBM: strength, P-A scores, bolus clearance did not decline over course of 5 year progressive disease (Maladraki et al., 2012).
  - No clear evidence for harmful effects of exercise, but insufficient evidence for benefit, either (Voet et al., 2013; Cochrane Review).
- Absence of Weakness
  - This assumption is not under scrutiny.

Strength Training in Dysarthria (AJSLP, 2009)

Evidence-Based Systematic Review: Effects of Nonspeech Oral Motor Exercises on Speech

- Sensory stimulation plus orofacial exercise improved intelligibility of adults (Roy 2002) and children (Roy 2001). AMR rates were unchanged in both studies.
- Some studies failed to report any results.

Strength Training in Dysarthria

- Lower level evidence
  - A small number of “low n” controlled studies and/or case studies provide limited support.
  - Most authors caution against emphasizing strength training over speech-directed treatment, but acknowledge the potential benefit for specific patients when appropriate principles are incorporated (Dworkin, Linebaugh, Hageman, Duffy, Yokst, Love, Murdoch).

Flaccid dysarthria primarily affecting CN XII, subtle CN VII & X deficits

- Speech features
  - Mild nonspecific hoarseness with occasional fry
  - Imprecise articulation, particularly of lingual consonants
- Non-speech features
  - Lip retraction was full, but lip rounding was mildly reduced
  - Tongue
    - Asymmetric size R>L (subtle)
    - Mild-moderate weakness bilaterally

Flaccid dysarthria associated with myasthenia gravis

- Speech features
  - Reduced loudness
  - Hoarseness
  - Hypernasality
  - Articulatory imprecision
  - Short phrases
- Rapid fatigue
Strength training: Application
• Are either of these speakers good candidates for strengthening?
• Would strengthening be the only line of therapy?

Disrupted Muscle Tone
Neuromuscular Principles

Muscle Tone Defined
• Resistance of a resting muscle to passive stretch
• Influenced by tissue elasticity and resting motor unit activity

Muscle tone versus muscle strength
• Muscle tone is a characteristic of muscle at rest
• Muscle strength is a characteristic of activated muscle

Muscle Tone Regulation
• Peripheral Reflexes
  • Stretch (muscle spindles)
• Descending pathways
  • Indirect upper motor neuron pathways
  • Basal ganglia control circuit
  • Cerebellar control circuit

Tone Impairments
• Hypotonia
  • Flaccid: diminished signals in reflex arc
  • Cerebellar: mechanism unknown
• Hypertonia
  • Spastic: released inhibition from descending indirect pathway onto gamma motor neurons
  • Rigid: increased excitability of α motor neurons
• Variable Tone
Muscle Spindle Action in Speech/Swallowing Muscles

- Jaw closing muscles
  - High density muscle spindles
  - Strong stretch reflex
- Face & lips
  - Low density or lack of muscle spindles
  - Do not exhibit stretch reflexes

Muscle Spindle Action in Speech/Swallowing Muscles

- Tongue
  - Muscle spindle density similar to limbs
  - Do not exhibit typical stretch reflexes
    - (Neilson et al., 1979)
- Palate, Pharynx, Larynx
  - Presence of muscle spindles varies across muscles
  - No studies to date have demonstrated stretch reflexes in the human larynx (Ludlow, 2005) or pharynx

Assessment of Muscle Tone: Clinical

- Passive displacement of relaxed limb
- Modified Ashworth Scale (6-point scale)
- Muscle palpation
- Feel for resistance to tissue deformation

Clinical Assessment of Muscle Tone: Speech musculature

- Observation of resting position
  - Facial droop
  - Lip retraction
- Orofacial tone assessments
  - Dworkin & Culatta (1996)
  - Beckman (1988)

Proximal Muscle Groups

Velum and pharynx
- Slow, symmetrical movements may indicate hypertonia
- Droop, often asymmetrical, may indicate hypotonia
- Larynx
  - Hypertonicity typically has bias for hyperadduction (strained, strangled vocal quality)

Evidence for Tone Impairments in Dysarthria

<table>
<thead>
<tr>
<th>Dysarthria</th>
<th>Hypothesized (Daryle, Amsden, Brown, 1989)</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flaccid</td>
<td>Flaccid hypotonia</td>
<td>Flaccid: hypotonia (Solomon &amp; Clark, 2010)</td>
</tr>
<tr>
<td>Spastic</td>
<td>Spastic hypertonia</td>
<td>Spastic: No hyperactive stretch reflexes in the tongue in spastic dysarthria (Neilson et al., 1979)</td>
</tr>
<tr>
<td>Ataxic</td>
<td>Normal</td>
<td>None</td>
</tr>
<tr>
<td>Hypokinetic</td>
<td>Rigid hypertonia</td>
<td>Hypokinetic: Increased lip stiffness (Hunker, Abbs, &amp; Barlow, 1982; Chu et al., 2010)</td>
</tr>
<tr>
<td>Hyperkinetic</td>
<td>Dystonic/variable</td>
<td>None</td>
</tr>
</tbody>
</table>
Management of Tone Impairments

**Pharmacologic**
- Spasticity
  - Muscle relaxants (e.g., Baclofen)
  - Muscle paralytics (e.g., botulinum toxin)
- Rigidity
  - Levodopa

**Surgical**
- Spasticity
  - Rhizotomy
- Rigidity
  - Pallidotomy
  - Deep brain stimulation

*Effects on speech tend to be less dramatic than on postural and limb musculature*

Behavioral Management of Tone Impairments

- Target sensory endings or afferent pathways of reflex loops
- Examples
  - Slow stretch – inhibit stretch reflex
  - Quick stretch/tapping – stimulate stretch reflex
  - Vibration – stimulate tonic vibratory reflex (stimulates agonist, inhibits antagonist)
- Related modalities
  - Cold
  - Massage

Muscle tone in the speech musculature: Summary

- Perceptual assessment methods have not been validated with instrumental measures
- Instrumental measures are under exploration but have not yet met validity standards even in the research setting
- Muscle tone in the orofacial muscles is regulated in ways unique from the limb musculature

Muscle tone in the speech musculature: Summary

- It is unclear how resting muscle tone affects speech movements
- Treatments described to address muscle tone in the limbs unlikely to affect speech muscles other than jaw closing muscles
- No evidence to demonstrate efficacy of tone altering treatments for speech

Motor Learning Principles

Framework for Guiding Decision Making

- Learning produces relatively permanent changes in the capability for performance
- Separate from factors that temporarily change performance (e.g., motivation, warm-up)
- Implications
  - Performance during training is not a measure of learning
  - Factors that result in better performance during rehearsal/training may not have the same effect on permanent learning and/or carryover
Select Principles of Motor Learning

- Skill presentation techniques
- Task sequencing
- Providing feedback

Schmidt & Lee, 2011

Evidence Supporting the Application of Motor Learning Principles in Motor Speech Disorders

- Measuring Motor Learning
  - Performance during the treatment session is not a sensitive measure of learning (retention/transfer)
  - To best serve our patients and our profession, we need to diligently report progress/treatment success based on outcomes obtained outside of rehearsal (treatment sessions or at least targeted practice)

- Many training factors that enhance learning result in slower acquisition
  - Random practice
  - Varied practice
  - Reduced feedback
  - The more movement trials the better
  - All evidence suggests that motor learning is highly specific
    - Underlying ability cannot be improved by drills targeting speed or coordination

Application: Motor learning

- Treatment targets
  - Loudness
  - Slow rate
  - Over-enunciation
  - Lexical stress

- Skill presentation
  - Direct and indirect modeling
  - "Loud" requires limited verbal description

- Practice
  - Random and variable (assuming the skill has been acquired but not generalized)

- Nonverbal feedback (sound level meter)

- Summary feedback

Take-home Messages on Motor Learning

- Excessive verbal processing will direct attentional resources away from motor control processing
  - Visual models
  - Reduced verbal feedback

- Reducing feedback allows the learner to attend to sensory consequences (more similar to the target context)
Read the phrase
• Go for it
• Are you sure?
• The cat’s out of the bag
• Enormous hippopotamus
• I’m in!
• Don’t count your chickens before they’re hatched
• Coffee?

Specific Dysarthria Treatments

Respiratory Impairments
- Reduced inspiratory capacity
- Reduced expiratory pressure
- Reduced control
  • Checking action
  • Involuntary movements
- Reduced overall loudness
- Loudness decay
- Excessive loudness variation

Supporting Respiratory Function
- Postural adjustments
  • Sitting upright or standing typically better than lying supine
  • Avoid excess flexion
  • Trunk/abdomen
  • Neck
- External supports
- Expiratory boards

Inspiratory Muscle Training
- Diaphragm is primary target (belly breathing)
- Discourage excess use of accessory muscles (shoulder breathing)
- Goal is to establish strong, quick inspiration followed by slow, controlled exhalation
  • Early training may incorporate slowed and controlled inhalation and exhalation, discussed on next slide
  • Strength training requires overload, which may be best achieved with an inspiratory training device

Diaphragmatic breathing
• Promotes solid respiratory support
• May help inhibit excessive activation of accessory inspiratory muscles and laryngeal musculature
• Visual and tactile feedback (“belly breathing”) often helpful
• Applications on hand-held devices can support independent practice

Controlled Expiration (Inspiratory Checking)
• Can be combined with diaphragmatic breathing
• Focus on quick, strong inhalation
• Followed by slow, steady exhalation

Expiratory Muscle Strength Training (EMST)
• Pressure threshold trainer
• Resistance set at 75% maximum expiratory pressure
• Rule of 5’s
  • 5 repetitions
  • 5 times per day
  • 5 days per week
• 4-8 weeks

Expiratory Muscle Strength Training (EMST)
• Training outcomes
  • Increased expiratory pressures
  • Reduced hypophonia
  • Improved intelligibility
• Patient groups studied
  • Parkinson disease
  • Multiple sclerosis
  • Ataxic disorders

Phrase Grouping
• Targets strategic pauses for inhalation
• Phrase length selected according to
  • Respiratory support
  • Syntactic boundaries

Resonatory Treatments
Resonatory Impairments

Impairments
- Velar weakness
- Slowness of velar elevation
- Reduced control
- Incoordination
- Involuntary movements

Associated Speech Changes
- Hypernasality
- Nasal emission
- Weak articulatory contacts
- Hyponasality
- Alternating resonance

Velopharyngeal Exercise

- Nonspeech exercise
  - Examples
    - Horn-blowing
    - Straw-sucking
  - No evidence for carry-over to speech tasks
- Speech exercise
  - Continuous positive airway pressure (CPAP)
  - Overloads the velopharyngeal musculature during speech tasks

Speech-based Resonatory Treatment

- Emphasis of appropriate oral and/or nasal resonance
- May incorporate augmented feedback
- Nasal mirror
- SeeScape
- Nasometry
- May incorporate progressive difficulty
  - Vowels
  - Liquids
  - Plosives and fricatives
  - Phonetic context

Prosthetic Management

- Palatal lift
  - Assessment and implementation in collaboration with prosthodontist
  - Will be most helpful for speakers with isolated hypernasality or nasality disproportionate to other features
  - Keeping in mind that adequate velopharyngeal valving may support the benefit of interventions targeting phonation or articulation
  - Behavioral intervention usually still needed

Prosthetic Management

- Nose plugs
- Nasal obturator
  - Occlude the nares to prevent excess nasal air escape
  - Short term solution while a palatal lift is being fabricated
  - Long term option for patients who are not candidates for palatal lift

Surgical Management

- Examples
  - Pharyngeal flap
  - Injection augmentation
- Candidacy issues
  - Stable velopharyngeal impairment
  - Patency of airway
  - Behavioral intervention may still be needed

Phonatory treatments


Phonatory Impairments

- Hypo-adduction
- Hyper-adduction
- Reduced flexibility
- Reduced stability

Associated Speech Changes

- Strained voice
- Breathiness
- Reduced loudness
- Monopitch/monoloudness
- Tremor
- Flutter

Supporting Phonatory Function

- Hypo-adduction
  - Head turn to facilitate approximation of vocal cords
  - Manual lateralization of the thyroid cartilage
  - Surgical management
  - Vocal cord injection augmentation
  - Thyroplasty
- Hyper-adduction
  - Relaxation
  - Massage

Reducing Laryngeal Strain

- Direct speaker’s attention to somatosensory aspects of excess muscle tension
- Some aspects of laryngeal tension/strain may not respond completely to behavioral approaches
  - Dystonia in hyperkinetic dysarthria
  - Strain-strangled quality in spastic dysarthria — but may overcorrect!
- Excess laryngeal tension may result from poor respiratory support or poor coordination with respiration (see Respiratory Treatments)

Laryngeal Exercise

- Increasing medial compression (adduction)
  - Push-pull
  - Grunt
  - Cough
- Increasing pitch range and control
  - Pitch glides and/or steps
  - Pitch matching

Loudness Treatment

- Lee Silverman Voice Treatment (LSVT)
  - Systematic hierarchy of exercises, focusing on a single goal “speak LOUD!”
  - Targets respiratory, laryngeal and articulatory subsystems
  - Incorporates high intensity, high frequency practice
  - SPEAK OUT with LOUD Crowd
  - Non-standardized loudness treatment

Coordinating Respiration & Phonation

- Potential targets
  - Lung volume at onset of phonation
  - Initiating phonation at the top of inhalation
  - Phrase grouping (ceasing phonation before respiratory support wanes)
  - Rapid inhalation between phrases

Articulatory Impairments

<table>
<thead>
<tr>
<th>Impairments</th>
<th>Associated Speech Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakness and/or fatigue</td>
<td>Articulatory imprecision</td>
</tr>
<tr>
<td>Reduced range of motion</td>
<td>Slow rate</td>
</tr>
<tr>
<td>Reduced speed</td>
<td></td>
</tr>
<tr>
<td>Reduced coordination</td>
<td></td>
</tr>
<tr>
<td>Involuntary movements</td>
<td></td>
</tr>
</tbody>
</table>

Articulatory Treatments

- Exaggerated articulation (over-articulation)
- Alternative place/manner/voicing
- Coordination of complex phonetic sequencing
- Be mindful of task specificity
- Often targeted in concert with lexical stress (see Prosody treatment)
PROSODY TREATMENTS

Prosody Targets
• Speaking rate
• Lexical stress
• Sentential stress
• Phrase groupings (see respiratory treatments)

Speaking Rate
• Even for patients with slow rate, increasing overall speaking rate is almost never an appropriate target
• Reducing speaking rate, even for patients with normal or slow rate, typically improves intelligibility
• Speakers with hypokinetic dysarthria often have rapid rate, but may have difficulty intentionally reducing rate

Rate Reduction Strategies
• Pacing board/hand tapping
• Metronome

Rate Reduction Strategies
• Delayed auditory feedback
• Indirect strategies
  • Increased loudness (see phonatory treatments)
  • “Clear” speech (see intelligibility treatments)

Lexical and Sentential Stress
• Visual cueing/feedback
  • Hand gestures signalling change in loudness, pitch, and/or duration
  • Acoustic software
• Activities/stimuli
  • Contrastive stress
  • Metric pattern across various word lengths
  • Verbal repair
Standardized Treatments for AOS

AOS Treatment Programs
• Articulation Focused
• Prosody Focused
• Utterance Focused
• Gestural / Aug Comm

AOS Treatment
• Articulation Focused
• 8 Step Continuum
• DTTC
• PROMPT
• Sound Production Treatment
• Utterance Focused
• Prosody Focused
• Gestural / Aug Comm

8 Step Continuum
• AKA Integral Stimulation
• Designed to provide “threshold” level cueing so the patient receives stimulation just adequate to elicit a correct response without over-cueing

Suggested Cue Hierarchy
• (Tactile Cues)
• Simultaneous Production
• Mimed Production
• (Immediate Repetition)
• Successive Repetition
Suggested Cue Hierarchy

- Delayed Repetition
- Reading
- Reading with Delay
- Answering Questions
- Role Playing

Dynamic Temporal and Tactile Cueing

How does one focus treatment on movement?

- If the nature of the movement impairment is one of weakness due to spasticity or flaccidity, such as might occur in dysarthria, movement is treated by improving physiologic support.
- The movement disorder in apraxia, however, is characterized by difficulty achieving articulatory configurations and transitioning into and out of these configurations.

Dynamic Temporal and Tactile Cueing

Therefore

- Practice should focus on making those movement transitions, in the context of speech.
- At first, the clinician will provide maximum support by providing visual, tactile and auditory models, fading those cues over time.
- Because the goal of treatment is to improve movement accuracy, it is important to implement the principles of motor learning.

Dynamic Temporal and Tactile Cueing

Modifying the use of rate

- Produce the movements for the utterance very slowly at first (perhaps even in unison with the therapist) and then gradually increasing rate with continued practice trials until they are producing the movement accurately, at normal rate, and with normal prosody.
- Have the child stay in the initial articulatory configuration for a second or two before actually starting the movement gesture.
- The use of slower rate and staying in the initial configuration helps maximize proprioception

Dynamic Temporal and Tactile Cueing

Maintain coarticulation in movement

- Children with apraxia of speech need to maintain coarticulation between as well as within syllables.
- It is important to avoid pausing in voicing or movement gestures within syllables so that the child has the opportunity to practice the complete movement gestures in the correct coarticulatory context.
- For example, repeating the phonemes in the word “toy” to “bway,” and then having them try to blend movement gestures is very difficult for children with apraxia of speech.
- While this is often an appropriate technique for some children with phonologic impairment, it actually increases the difficulty for children who have difficulty with planning movement gestures and should not be included as a strategy for therapy for children with apraxia of speech.

Dynamic Temporal and Tactile Cueing

Prosody

- It is very important for children with apraxia of speech to begin to work on prosody very early.
- As the child becomes more accurate, the therapist is able to gradually increase rate toward normal, with repeated practice trials.
- It is also important to work on establishing correct lexical as well as phrasal stress early in treatment.
- Varying the prosody is also an important early on in therapy, to help the child establish some flexibility in their motor planning and programming.
PROMPT
Prompts for Restructuring Oral Muscular Phonetic Targets

- Tactile-kinesthetic approach
- Provides proprioceptive, pressure, and spatial information through the use of oral-facial cues and prompts
  - Training is required

Sound Production Treatment

- Emphasizes repeated practice of key sound targets
- Uses hierarchical cues
- Incorporates minimal contrast practice
  - Target sound paired with typical replacing sound
- Provides articulatory contrast
- Provides pragmatic boost - avoidance of homonymy
Selection of Treatment Targets

- Derived in the process of thorough characterization of speech sound accuracy
- Impact on intelligibility
  - % in error
  - Homonymy
  - Frequency of occurrence in language
- Level of success
- Trial therapy - stimulability

Selection of Exemplars of Targets

- 10 exemplars should be sufficient
- Real words when possible
- One word-position suggested
- Variety of vowels should be represented
- Minimal contrast word selected for each exemplar
  - Real word
  - Contains replacing sound or approximation
  - Key...tea
  - Cap...tap

Hierarchy of Cues (Word Level)

**Step 1** – Modeling/Imitation at Word Level
**Step 2** – Modeling + Written letter cue/Imitation
**Step 3** – Integral Stimulation
**Step 4** – Articulatory Placement + Modeling
**Step 5** – Production of target sound in isolation

Treatment Sequence

- Each Session (45 minutes to 1 hour)
  - hierarchy applied to each word pair
  - 10 words presented in random order = 1 trial
  - attempt to complete at least 7 trials (70 words) per session
- Three sessions per week recommended

Treating More than One Sound At a Time with SPT

- Select minimal contrast words across the sounds
  - “low” “mow” “know”
- Select the contrast word to reflect errors on all sounds (may need more than one)
  - “dough” “though”

Targeting Multiple Sounds

- Generally recommended only after single phoneme targets are produced with relatively high levels of accuracy (e.g., 40% +)
  - Number of trials is greatly reduced – probably would be difficult to “establish” sounds
- Recall Motor Learning Principles
  - Blocked trials - better for initial acquisition
  - Randomized trials - better for learning / maintenance
AOS Treatment
• Articulation Focused
• Prosody Focused
  • Metronome and Hand-tapping
  • Melodic Intonation Therapy
• Utterance Focused
• Gestural / Aug Comm

Metronome Training
• Focuses on rate reduction, not on accurate phonetic productions
• Multisyllabic targets
  • Benefit ↓ ___ ___
  • Spaghetti ___ ↓ ___
  • Represent ___ ___ ↓

Metronome Training – Multisyllabic Words
• Hierarchical levels vary the availability of a model, speed of metronome, and nature of rhythm
  • Level 1: Clinician Model, Unison Production, Patient Production
  • Level 2: Faded Clinician Model
  • Level 3: No Clinician Model
  • Level 4: Increased Production Rate
  • Level 5: Syncopated Rhythm

Feedback
• Tapping accuracy
• # syllables
• Production to the beat (not about sound production)

Why Might Rate Control/Pacing Facilitate Articulation?
• Increased time to reach articulatory postures
• Improved functioning of central pattern generators
• Decreased degrees of freedom in speech production
• Increased allocation of resources
• Motoric “spillover”
• Increased afference

Melodic Intonation Therapy
• MIT has been applied to the management of AOS and nonfluent aphasia
• Emphasizes both melody and rhythm of productions
Level 1
- Step 1: Humming
  - Clinical models melody and taps rhythm
  - Next adds word to melody and rhythm
- Step 2: Unison
- Step 3: Unison with clinician fading out
- Step 4: Immediate repetition
- Step 5: Response to probe question

Level 2
- Step 1: Clinician models target while tapping (no patient response required)
- Step 2: Unison with fading
- Step 3: Delayed repetition
- Step 4: Response to probe question

Level 3 (Speech Song)
- Step 1: Delayed repetition
- Step 2: Introduce speech song
  - Exaggerated rhythm and stress
- Step 3: Speech song with fading
- Step 4: Delayed repetition of normal speech prosody
- Step 5: Response to probe question

AOS Treatment Programs
- Articulation Focused
- Prosody Focused
- Utterance Focused
  - Response Elaboration Training
  - Voluntary Control of Involuntary Utterances
  - Script Training
  - Gestural / Aug Comm

Utterance Focused Treatments
- Emphasize effective volitional communication regardless of phonetic accuracy

Response Elaboration Training
Kearns and colleagues
- Loose training procedure designed to increase length and content of verbal productions
- Patient-initiated utterances
  - guided by pictures
  - NOT specified by therapist
- Modeling & forward chaining procedures
RET Sequence
1. Present picture stimuli & elicit a response
2. Repeat patient’s production & reinforce
3. Ask a question to elicit an elaboration of the original response
4. Repeat & reinforce the new production; model combined productions (1 + 3)
5. Model combined production and request a repetition
6. Reinforce repetition and model again

Modified RET
• Provision of 2 phrase level models (NP & VP) in the event of no response (initial response & elaboration)
• Provision of integral stimulation upon incorrect or no response (following previous models)
• Repeated practice of elaborated utterances
• Use of a time delay prior to final repetition

Modified Version of RET
1. Present picture stimuli & elicit a response
   • model 2 response options (e.g., “you could say NP or VP”)
   • model a 1-word response - request repetition
   • use integral stimulation
2. Repeat patient’s production & reinforce
3. Ask a question to elicit an elaboration of the original response
   • model as in step 1
4. Repeat & reinforce the new production; model combined productions (1 + 3)
5. Model combined production and request a repetition
   • if correct - 3 more productions
   • if incorrect - use integral stimulation to elicit multiple productions
6. Remove picture for 5 seconds - request repetition of description
   • Feedback as in step 5

Modified Version Cont.

RET Applied to Personal Recount
• no picture stimuli
• patient instructed to “Tell something about anything that you would like to talk about.”
• treatment hierarchy applied as before
• at least 14 topic attempts elaborated upon per session

Summary of RET
• Provides models and scaffolding to increase length and informativeness of verbal expression
Script training
• Goal is to produce islands of fluent speech in conversation
• Isolated or sequenced phrases and sentences with specific conversational purposes are practiced extensively

Voluntary Control of Involuntary Utterances (VCIU)
• For patients with limited verbal expression
• Attempts to expand the communicative uses of spontaneous productions

VCIU Sequence
• Clinician notes any spontaneous utterances and writes them each on a card
• Patient reads card
  • (spontaneous -> volitional)
• Utterances that can be produced volitionally are targeted in other contexts
  • Picture naming
  • Sentence completion
  • Discourse

VCIU Principles
• Target stimuli can be added continually
• Emphasis is on expanding use of spontaneous utterances, not on correct productions (either phonetic or semantic) during any given trial

Management of Motor Speech Disorders
Comprehensibility Strategies & AAC

Operational Definitions
Intelligibility
The listener’s success in understanding the acoustic signal produced by a speaker
• Both intelligibility and comprehensibility are influenced by the communication environment and the behaviors of the speaker and listener.
• Comprehensibility strategies include behaviors that improve intelligibility

Comprehensibility
The listener’s success in understanding the message/meaning produced by a speaker
Helpful resources


Comprehensibility Strategies

- Seek to improve activity and participation
- Include
  - Optimization of environmental factors
  - Exploiting facilitating personal factors
  - Compensating for limiting personal factors

Introducing Comprehensibility Strategies

- Initial visit
  - Providing recommendations
  - In order to obtain history

  Motor Speech Evaluation Visit
  - For a consultation, this may be the only visit
  - Typical goals of motor speech evaluation
    - Description
    - Differential diagnosis
    - Developing treatment goals
    - Identifying treatment targets
    - Providing recommendations for immediate management

Comprehensibility Strategies

Optimizing the environment

- Speaker behaviors
- Listener behaviors

Reducing background noise

- Obvious, controllable sources
  - TV, radio, computer, etc

Reducing background noise
• Obvious, not-so-controllable sources
  • Crowd noise

  • Move away
  • Take advantage of barriers

Reducing background noise
• Not-so-obvious controllable sources
  • Appliances
  • Open windows

  • Turn 'em off
  • Close 'em
  • Move away

Reducing background noise
• Not-so-obvious not-so-controllable sources
  • Road/traffic noise

  • May require other strategies

Optimizing lighting
• Avoid backlighting
• Avoid dim lighting

Optimizing the environment
• Be in the same environment!

  • Avoid communication over a distance

Optimizing the environment
• Reduce distractions

  • Auditory and visual distractions
  • Multi-tasking
Optimizing the environment

- Choose the time and place for communication

Avoid important conversations when the speaking or listening will be difficult

Speaker Behaviors

Speaker behaviors

- Speech-focused
- Language-focused
- Communication-focused

Speaker behaviors: Speech-focused

- Speak slowly

Clinician Pearls

- Acknowledge this is challenging
- Suggest "tricks"
- Speak loudly
- Speak clearly

Speaker behaviors: Speech-focused

- Speak very slowly*
  - Pause briefly between each word
  - Pay attention to the small words
  - Do not separate syllables within words
  - Include every syllable
  - Maintain intonation (may have to slow even further)

*when intelligibility is more dramatically impacted

Instructions may focus on over-articulation (hyper-articulation), but effects are broader

Slow rate
Wider loudness and pitch variation


Instructions may focus on over-articulation (hyper-articulation), but effects are broader

Slow rate
Wider loudness and pitch variation

Speaker behaviors: Speech-focused

- Speak up!
- Not just for hypokinetic dysarthria
- Great in the context of reduced background physiologic effort
  - Often improves articulatory precision
  - May reduce rate

Speaker behaviors: Language-focused

- Use complete, simple sentences
- Use predictable wording

Speaker behaviors: Language-focused

- When repeating
  - The first repetition, say it exactly as you said it the first time
  - Rephrase, but make sure the listener knows you’re rephrasing

Speaker behaviors: Communication-focused

- Get the listener’s attention
  - Call his/her name
  - Wait until the listener is watching your face

Speaker behaviors: Communication-focused

- Help the listener predict what you’re going to say
  - Identify the general topic
  - Take advantage of contextual cues (point to objects in the environment, headlines, etc.)
  - Signal topic changes

Speaker behaviors: Communication-focused

- Use all modalities available
  - Speak
  - Point
  - Gesture
  - Facial expression
  - Pictures (points or draw)
  - Write
  - Text
  - Type
Speech Supplementation
- Incorporated during spoken expression
- Strategies provide listeners with additional information to help make sense of the spoken message
- Typically involves "signal-independent" information about the message
- Includes gestures

Alphabet Supplementation
- Point to initial letter of word as each word is spoken
- Also serves as a pacing strategy
- Identification of initial letter facilitates word prediction by listener

Example of alphabet board with vowels aligned on left margin.

Semantic/Topic Supplementation
- Identifies the topic of discussion to help listener’s word prediction and comprehension
- Topics can be identified through
  - Spoken expression
  - Written expression
  - Photographs/pictures
  - Other artifacts
    - Calendars
    - Souvenirs
    - Newspapers

Speaker behaviors: Communication-focused
- Interact
  - Use turn-taking signals
  - Visible
  - Audible
  - Conspirator
  - Let listeners know "the rules"

Listener behaviors
- Give your undivided attention
  - Move close to the speaker
  - Watch the speaker
Listener behaviors
- Know (ask for) the topic
- Watch for topic-changing signals

Listener behaviors
- Piece together the clues
  - Speech
  - Gestures
  - Facial expression
  - Pointing
  - Writing
  - Texting

Listener behaviors
- Signal to the speaker as soon as you don’t understand

A nonverbal signal is often best so the speaker doesn’t feel interrupted

Listener behaviors
- Avoid the least helpful question in the English language

Listener behaviors
- Avoid the least helpful question in the English language
  - How does the speaker signal a turn?
  - Should you “word predict”?
  - What is the back-up plan?

- Repeat the part of the message you heard
- Ask yes/no questions for clarification
Speaker & Listener Behavior

- Glossing
  - Listener repeats each word as the speaker says it
  - Speaker has to pause briefly between words so listener can repeat
  - Correct breakdowns as they occur
  - Combine with alphabet supplementation

Instruction in Comprehensibility Strategies and Developing Recommendations

Presenting Comprehensibility Strategies

- Explain that the goal is successful exchange of information, not word for word intelligibility
- Highlight the value of being understood *the first time*
- Emphasize that successful communication is the responsibility of all participants
- "Good advice for all of us" philosophy

Presenting Comprehensibility Strategies

- Allow speaker and family members to practice and respond
- Troubleshoot obstacles
  - Listeners who “can’t hear”
  - Listeners who only talk
  - “Fast talkers”
- Give feedback and additional guidance

Evaluate success

- Some patients may be proficient after initial session
- Some may need additional instruction
  - Follow-up consultation
  - Component of on-going therapy
  - Value of individual strategies may vary across recovery, progression, and/or context

AAC

- Augmentative and alternative communication (AAC) is an appropriate option for speakers with poor intelligibility
- Temporary as speech improves
- Introduced early in degenerative disease
Evidence-Based Practice Resources

- Clinical Aphasiology Conference Proceedings
  - www.clinicalaphasiology.org
- Conference on Motor Speech
  - http://www.madonna.org/res_conferences
  - Proceedings published in JMSLP
- ASHA
  - Special Interest Division 2
- UpToDate ®