Objective:
- Describe the hallmark features of apraxia of speech as it presents at various points of chronicity and with varying severity
- Discuss how assessment and treatment methods are employed with patients experiencing apraxia of speech at various points of chronicity
- Employ tools to assist in identifying and evaluating the most relevant research findings to inform evidence-based practice

Outline
- Overview of AOS
  - Clinical features
  - Severity
  - Chronicity
  - Explanations of AOS
  - Neurologic substrates
- Assessment of AOS
  - Overview of assessment
  - Consideration of severity
  - Consideration of chronicity
- Treatment of AOS
  - Guiding frameworks
  - Consideration of chronicity
  - Consideration of severity
  - Standardized treatment protocols
  - Comprehensibility strategies

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

Disclosures
- Financial and non-financial conflicts of interest
  - Salary from Mayo Clinic (ask me about career opportunities!)
  - Book royalties received from Pro-Ed (book topic unrelated to this talk)
  - Grant support
    - National Institute of Neurological Disorders and Stroke
    - National Institute on Deafness and Other Communication Disorders
  - Speaking honoraria
    - ANCDS
      - Certification Board, Professional Affairs Committee
    - SIG 2
      - Coordinator
Most agree that...

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- 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
• Increased errors with more phonemes and/or more syllables (complexity)
  • Low frequency syllables
  • Syllables with more phonemes
  • Consonant clusters within syllables
• Volitional/purposeful utterances have more errors than automatic/reactive utterances

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

Causes of AOS
• Acute and Chronic
  • CVA
  • Neoplasm
  • Trauma
• Progressive
  • Primary Progressive AOS (PPAOS)
  • Primary Progressive Aphasia with AOS (PPA)
  • Broader neurodegenerative conditions
    • Corticobasal degeneration (CBD)
    • Progressive supranuclear palsy (PSP)
    • Amyotrophic lateral sclerosis (ALS)

Explanations for AOS

The DIVA model: A neural theory of speech acquisition and production

Neurologic Substrates

AOS in acute brain injury
- Left hemisphere
- Broca’s area
- Frontal and temporoparietal cortex
- Superior, anterior region of the insula
- Subcortical structures
  - Basal ganglia

Progressive Apraxia of Speech
FDG PET

Assessment of AOS

Differential diagnosis

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

Motor Speech Assessment for Differential Diagnosis
- History
- Perceptual assessment of continuous speech
- Speech-like tasks
- Examination of oral structure and function
Motor Speech Assessment for Differential Diagnosis

- History
  - Medical diagnosis
  - Site of lesion
  - Complaints

- Often complain of speech slowness, difficulty with enunciation, “tripping over words”

- Perceptual assessment of continuous speech
  - Oral reading
  - Picture description
  - Repetition
  - Conversation
  - Automatic sequences

  - Listen for auditory perceptual features of AOS
  - Watch for silent articulatory groping
  - Consider variability in performance across tasks

Motor Speech Assessment for Differential Diagnosis

- Speech-like tasks
  - Sustained phonation or prolonged vowel
  - AMR and SMR

  - Vocal quality typically normal if phonation is achieved
  - AMRs may be relatively spared
  - SMRs tend to be particularly challenging

  - In the absence of other diagnoses, examination may be quite normal
  - Right sided “central” facial weakness may be evident
  - Nonverbal oral apraxia may be evident

V. “Repeat these sentences”
1. We see several wild animals.
2. My physician wrote out a prescription.
3. The municipal judge sentenced the criminal.

VI. “Repeat as fast and as smoothly as possible”
1. /p/m/a/ /p/m/a/ /p/m/a/ /p/m/a/ /p/m/a/ /
2. /p/m/a/ /p/m/a/ /p/m/a/ /p/m/a/ /p/m/a/ /

VII. “Count from 1 to 5”
1. ______
2. ______
3. ______
4. ______
5. ______

VIII. “Say the days of the week”
1. Sunday ______
2. Monday ______
3. Tuesday ______
4. Wednesday ______
5. Thursday ______
6. Friday ______
7. Saturday ______

Duffy 2013

Duffy 2013

Duffy 2013
Motor Speech Assessment for Differential Diagnosis

• Apraxia of speech only rarely presents as the only neurogenic communication disorder
• Dysarthria
• Aphasia
• Cognitive communicative impairments

Apraxia of Speech Rating Scale (ASRS) Phonetic Features

<table>
<thead>
<tr>
<th>Phonetic Features</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sound distortions (excluding distorted substitutions or distorted additions)</td>
</tr>
<tr>
<td>2</td>
<td>Distorted sound substitutions</td>
</tr>
<tr>
<td>3</td>
<td>Distorted sound additions (including intrusive Schwa)</td>
</tr>
<tr>
<td>4</td>
<td>Increased sound distortions or distorted sound substitutions with increased utterance length or increased syllable/word articulatory complexity</td>
</tr>
</tbody>
</table>

Apraxia of Speech Rating Scale (ASRS) Prosodic Features

<table>
<thead>
<tr>
<th>Prosodic Features</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Syllable segmentation within words &gt; 1 syllable (Brief silent interval between syllables and/or inappropriate equalized stress across syllables)</td>
</tr>
<tr>
<td>6</td>
<td>Syllable segmentation across words in phrases/sentences (Increased inter-word intervals and/or inappropriate equalized stress across words)</td>
</tr>
<tr>
<td>7</td>
<td>Slow overall speech rate (apart from pauses for word retrieval and/or verbal formulation)</td>
</tr>
<tr>
<td>8</td>
<td>Lengthened vowel &amp;/or consonant segments independent of overall slow speaking rate</td>
</tr>
</tbody>
</table>

Apraxia of Speech Rating Scale (ASRS) Other

<table>
<thead>
<tr>
<th>Other</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Rate only for AMRs (alternating motion rates, as in rapid repetition of “push push”) - Slow and/or off-target (in place, manner, and/or voicing) 0: AMRs normal; 1: rare and mild, 2: frequent but mild; 3: moderate, 4: severe</td>
</tr>
<tr>
<td>10</td>
<td>Rate only for SMRs (sequential motion rates, as in rapid repetition of “push push”) - Slow (gap within sequences), incorrectly sequenced, and/or off-target (in place, manner, and/or voicing) 0: SMRs normal; 1: any one of the listed features, 2: any two of the listed features, 3: any three of the listed features, 4: four of the listed features</td>
</tr>
</tbody>
</table>

Apraxia of Speech Rating Scale (ASRS) Additional

<table>
<thead>
<tr>
<th>Additional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>One or both of the following: Consistently reduced words per breath group during phrase/sentence production relative to maximum vowel duration; reduced # of AMR repetitions per breath group in the absence of decreased respiratory capacity. Score an average number of syllables/repetitions per breath group across tasks: 0 ≤ more than 7; 1 ≤ 6–7; 2 ≤ 4–5; 3 ≤ 3–4; 4 ≤ 2 or less</td>
</tr>
<tr>
<td>12</td>
<td>Silent articulatory groping</td>
</tr>
<tr>
<td>13</td>
<td>Audible false starts/restarts or groping including sound repetitions, excluding fillers and unambiguous semantic false starts (e.g., stop...fork)</td>
</tr>
</tbody>
</table>
Features not attributable to (but often co-occurring with) AOS

- UUMN dysarthria
  - Weakness and/or tone disruption
  - Asymmetry
  - Improvement with high effort / loudness

- Other dysarthrias
  - Voice disturbance (hypophonia or strained)
  - Monopitch, monoloudness

- Nonfluent aphasia
  - Phonemic paraphasia
  - Agrammatism

Assessment Practice

- Articulatory
  - Consonant and vowel distortions
  - Distorted substitutions
  - Distorted additions
  - Distorted sound prolongations
  - Voicing errors

- Fluency
  - Attempts to self-correct
  - False starts and restarts
  - Groping for articulatory postures
  - Sound and syllable repetitions

- Prosodic
  - Slow overall rate
  - Prolonged/variable vowel duration and inter-word intervals
  - Syllable segmentation
  - Stress errors
  - Reduced words per breath group relative to MPT
  - Decreased phonetic accuracy with rate increases

Assessment across the continuum of care

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

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Not observed in any task</td>
<td>Infrequent</td>
<td>Frequent but not pervasive</td>
<td>Very often evident but not marked in severity</td>
<td>Marked absence evident and/or marked in severity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exceptions</td>
<td>No more than one occurrence</td>
<td>Noted more than once (but less than about 20% of words)</td>
<td>Noted about 20-50% of all words</td>
<td>Noted in the majority of words</td>
<td>Noted on nearly all words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score or higher than 3 if present only during repetition</td>
<td>Score or &quot;4&quot; if intelligibility is more than mildly reduced</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
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 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

Acute Care: Pearls
- The most difficult task will be distinguishing
  - AOS from aphasia when sound errors are prominent
  - Distorted substitutions
  - Vowel distortions
  - Segmentation
  - AOS from abulia when the patient is mute
  - Evidence of effort
  - Presence of responses in other modalities
Acute care: The mute patient
- Probing for any verbal/vocal output
  - Sustained vowel
  - Cough to vowel
  - Automatic sequences
  - Singing

<table>
<thead>
<tr>
<th>VII. “Count from 1 to 5”</th>
<th>VIII. “Say the days of the week”</th>
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<td></td>
<td>6. Friday</td>
</tr>
<tr>
<td></td>
<td>7. Saturday</td>
</tr>
</tbody>
</table>

IX. “Sing” (“Happy Birthday,” “Jingle Bells,” or another familiar tune)
1. How well is the tune carried?
2. How adequate is articulation?
3. Description of conversation and narrative speech

Assessment of Chronic AOS

Chronic AOS: Purpose
- Confirm diagnosis
- Obtain a thorough characterization of AOS
  - Type, frequency, severity of sound-level errors
  - Type, frequency, severity of prosodic errors
- Probe for facilitating contexts

Chronic AOS: Purpose
- Develop a prognosis for improvement with therapy and/or
- Develop recommendations for maximizing communicative effectiveness

Chronic AOS: 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 AOS: 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

• 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 AOS: Confounding factors

• Concomitant deficits
  • Pain
  • Hemiplegia
  • Visuo-perceptual deficits
  • Hearing loss
  • Aphasia
  • Cognitive impairments
  • Fatigue
  • Maladaptive patterns

Chronic AOS: Confirm Diagnosis of AOS

• 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 AOS
  • Consider the relative contribution of AOS to overall communicative effectiveness

Chronic AOS: Characterization

• General features: ASRS
• Type, frequency, severity of sound-level errors
  • Goldman-Fristoe
  • Dozens of stimuli in speech-sound disorder resources
• Type, frequency, severity of prosodic errors
  • Motor speech exam and ASRS well-suited for this purpose

Chronic AOS

• Administration of standardized tools is advantageous
  • Supporting need for therapy
  • Establishing baseline against which progress can be demonstrated
  • **Will not likely provide any assistance with differential diagnosis so make sure you already know it's AOS**
Assessment of Progressive AOS

Progressive AOS: Purpose
- Differential diagnosis
- Characterization of type and severity of AOS
- Characterization of concomitant communication disorders

Progressive AOS: Characterization
- Classifying Type of Progressive AOS
  - Phonetic
    - Articulatory distortions predominate
  - Prosodic
    - Segmentation predominates
  - Mixed

PPAOS Diagnostic Criteria
- Initial complaint of speech difficulty
- Unequivocal AOS
- No evidence of aphasia
- Normal neurological examination
- Normal neuropsychological testing

PPAOS
- Insidious
- Progressive
- Motor planning difficulty

Syndromes dominated by apraxia of speech show distinct characteristics from agrammatic PPA

Primary Progressive Apraxia of Speech: Clinical Features and Acoustic and Neurologic Correlates

Clinical Progression in Four Cases of Primary Progressive Apraxia of Speech

Characterizing a neurodegenerative syndrome: primary progressive apraxia of speech

The evolution of primary progressive apraxia of speech

Characteristics of a neurodegenerative syndrome: primary progressive apraxia of speech
Progressive AOS: Time Available
- Initial session for differential diagnosis
- Subsequent sessions likely needed for further characterization

Progressive AOS: Patient and family insight
Description of the problem by patient and family is **invaluable**
- Nature
  - Complaints of 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 AOS: 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 AOS: Confounding factors
- Concomitant aphasia and/or cognitive communicative deficits
- Limb apraxia

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
  - ICF
  - Motor learning

Treatment of AOS
Management of Mild AOS

- Typical features
  - Sound distortions
  - Mildly slowed rate
  - Improved accuracy with slow rate
- Focus of treatment
  - Slowed rate
  - Targeted practice of functional multisyllabic words and/or complex utterances

Management of Moderate AOS

- Typical features
  - Slowed rate and segmentation
  - Distortions
  - Improved (but not perfect) accuracy with slowed rate
- Focus of treatment
  - Phoneme accuracy
  - Lexical and sentential stress

Management of Severe AOS

- Typical features
  - Difficulty initiating speech
  - Severe prosodic deficits
  - Severe articulatory distortions
- Focus of treatment
  - Volitional phonation (may need to move from reflexive to volitional laryngeal movements)
  - Functional words and phrases
  - AAC

Managing AOS: 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
Managing AOS: Early rehabilitation

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

Managing AOS: Chronic AOS

• 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 AOS is the setting of chronic AOS

Managing AOS: Progressive AOS

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

Managing AOS: Progressive AOS

• Phased model
  I. Restitutive (restorative)
  II. Shift toward aided approaches
  III. Environmental support and partner training

Treatment for apraxia of speech in nonfluent variant primary progressive aphasia

M.L. Henry*, M.V. Moore†, S. Tseng‡, M.C. Babcock‡, B.L. Miller‡ and M.L. Gross-Toth‡
*Memory and Aging Center, Department of Neurology, University of California, San Francisco, CA, USA
†歪 Bay Medical Center, D Cerrito, CA, USA
‡San Francisco State University, San Francisco, CA, USA
Managing AOS: Progressive AOS

• Goals
  • Restoration (?), maintenance, and slowed decline, of function

Documenting successful outcomes for Progressive AOS (Henry, 2016)

• Documenting successful outcomes for people with PPA (Henry, 2016)
  • Stability = progress
  • Production in any modality is acceptable
  • Frequency counts
    • behaviors of interest
    • amount of assistance or cues required to perform a task
    • number and type of errors made during an activity
    • caregiver communication behaviors

Management of AOS
Standardized Treatment Protocols

Treatment Programs

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
• Focus is on movement, not on phonemes
• To maximize proprioception
  • Movements are produced slowly at first with maximum support from the clinician
  • Sustain initial articulatory configuration
  • Move slowly with cues
  • Sustain final articulatory configuration
• Coarticulation and prosody are highlighted early

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

Supplement Article
Sound Production Treatment: Synthesis and Quantification of Outcomes
Dalin J. Bailey, Kelly Eatchel, and Julie Wernbaugh

American Journal of Speech-Language Pathology • Vol. 24 • 5798-5814 • November 2015
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

DTTC & SPT
- Emphasize principles of motor learning
- Targets a small number of exemplars with high numbers of repetitions

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

Combined Sound & Prosodic Tx
Rapid Syllable Transition Treatment (ReST)
- Developed for CAS
- Uses nonsense syllables to target
  - Sound production
  - Prosody
  - Coarticulation

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

Modifications to 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
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

Evidence-Based Practice Resources