Childhood Apraxia of Speech (CAS): Treatment Techniques
Putting the Pieces Together

**Differential Diagnosis:**
- Identifying phonological vs motor speech problems
- If motor speech, identifying CAS vs dysarthria
- These disorders are not mutually exclusive, and have characteristics that overlap
- There may also be overlap with delays in language development

In the ASHA Technical Report on CAS, three potentially diagnostic characteristics were identified, based on best available evidence:
  1. inconsistent errors on consonants and vowels in repeated productions of syllables or words,
  2. lengthened and disrupted coarticulatory transitions between sounds and syllables, and
  3. inappropriate prosody, especially in the realization of lexical or phrasal stress.”

**Treatment**
Treatment for CAS is not the same as treatment for Phonological Disorder
- Phonological therapy addresses a systematic pattern of sound contrasts related to meaning
- CAS treatment emphasizes spatiotemporal parameters – movement patterns that include where articulators start, where they are moving to, and how those movements are timed to achieve intelligible production of sound sequences.
  - Movement patterns are treated using the principles of motor learning

**Examples of Treatment Methodology**
- Traditional" Listen-Watch-Do
- Phonetic Derivation
- Phonetic Placement
- PROMPT (Prompts for Restructuring Oral Muscular Phonetic Targets)
- DTTC (Dynamic Temporal and Tactile Cueing)

**Dynamic Temporal and Tactile Cueing (DTTC)**
- promotes high levels of success
- uses meaningful utterances
- maximizes proprioceptive input
- Incorporates principles of motor learning
Building a Treatment Plan: Principles of Motor Learning

Preparing for a session requires:

- **Motivation**
  - selecting relevant targets can increase motivation
  - Understanding the task
- **Stimulability for acceptable responses (to avoid frustration)**
  (Maas, et al., 2008' Strand & Debertine, 2000)

**Practice Distribution: Mass vs. Distributed Practice**

Practice distribution is the overall scheme into which you will organize practice variability and practice scheduling options

- **Mass practice** refers to minimal time between trials or sessions
  - Facilitates acquisition
- **Distributed practice** refers to a greater amount of time between trials or sessions.
  - Important to stabilize and generalize skills
- Within a session, mass practice can also mean a large number of repetitions of a single target, versus distributed practice that is fewer repetitions spread throughout the session.

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Dynamic Temporal and Tactile Cueing :DTTC
(Adapted from Caruso & Strand, 2000)

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<table>
<thead>
<tr>
<th>Incorrect</th>
<th>Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simultaneous production</td>
<td>Practice with varied rate and prosody</td>
</tr>
<tr>
<td>Slowed rate</td>
<td>If incorrect, try miming or go back to simultaneous</td>
</tr>
<tr>
<td>Add tactile or gestural cues</td>
<td></td>
</tr>
</tbody>
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After many simultaneous repetitions at normal rate and prosody, probe direct imitation
Practice Variability: Variable vs. Constant Practice
- Constant practice refers to working on one specific exemplar of the target,
  - Helpful early in therapy when problem is more severe
  - May facilitate learning relative aspects of movement
- Variable practice incorporates variations of the target, such as modifying rate, loudness, inflection, etc.
  - Helpful to transfer skills later in the therapy process
  - May facilitate learning of absolute aspects of movement

Practice Scheduling: Blocked vs. Random Practice
- Blocked practice means all practice trials of a given stimulus are practiced together before moving on to the next.
  - Facilitates improved performance
- Random practice means that the order of presentation of the stimuli are randomly mixed up throughout the session.
  - Facilitates retention/motor learning

Feedback: Knowledge of Results vs Knowledge of Performance
- Knowledge of results is information provided after completion of the movement that compares outcome to target
- Knowledge of performance relates to the nature or quality of the movement gesture
- Both types of feedback may be useful for speech motor learning
- Frequency and timing of feedback is different for children than adults (Sullivan, Kantak, & Burtner, 2008)

Summary Chart:

<table>
<thead>
<tr>
<th>Principle</th>
<th>Acquisition</th>
<th>Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice Distribution</td>
<td>Mass</td>
<td>Distributed</td>
</tr>
<tr>
<td>Practice Variability</td>
<td>Consistent context, consistent prosody, pitch, rate</td>
<td>Varied context, varied prosody, pitch, rate</td>
</tr>
<tr>
<td>Practice Schedule</td>
<td>Blocked, predictable order</td>
<td>Random unpredictable order</td>
</tr>
<tr>
<td>Feedback Type</td>
<td>Knowledge of performance</td>
<td>Knowledge of results</td>
</tr>
<tr>
<td>Feedback Frequency</td>
<td>Often, immediate</td>
<td>Inconsistent, delayed</td>
</tr>
<tr>
<td>Rate</td>
<td>Slow</td>
<td>Normal, varied</td>
</tr>
</tbody>
</table>
Coarticulation and prosody
- Children with apraxia need to maintain coarticulation between as well as within syllables.
  - Separating phonemes within a movement gesture may be helpful for some children with phonologic impairment, but may increase the difficulty for a child with CAS
- A child should be working on prosody contours (frequency, intensity, duration characteristics of segments) from the very beginning of therapy.

Decisions in DTTC

What type of stimuli and how many
- to improve effectiveness of communication, and
- to advance motor planning skills

How to incorporate the principles of motor learning
  e.g., frequency, structure of practice, feedback

Type of Stimuli
- Length: number of syllables
- Complexity
  - phonetic complexity
  - syllable shapes (CV, VC, CVC, etc.)
  - real words vs approximations

Number of Target Stimuli
- Fewer targets for younger or more severe children
- More targets for more verbal children

Number of Sessions
- ASHA Technical Report recommends 3-5 individual sessions
- The child’s age, developmental level, and severity of CAS need to be considered

Organizing Practice
- Each target may be at a different level
- Cueing is constantly changing within and between sessions, depending on the child’s responses

Getting Enough Repetitions
See Appendix A for a list of ideas to elicit repetitions in therapy
Other Treatment Considerations

Incorporating AAC
A review of the literature suggests that use of AAC facilitates verbal development. (Schlosser & Wendt, 2008)

Involving Parents and Caregivers

Recommending Alternative Treatments
- Know our scope of practice and where to make appropriate referrals
- ASHA handout “Questions Consumers Should Ask”

Using Packaged Programs
Fit the program to the child, not the child to the program

Addressing Oral-Motor Deficits
- We need to be clear whether we are talking about problems with speech production or non-speech oral movement (Ruscello, 2008)
- Non-speech oral motor treatment (NSOMT) = specific nonspeech exercises to
  1. increase strength or muscle tone and range of motion;
  2. modify tongue, lip, and jaw resting postures; and
  3. improve muscular control and function through sensory stimulation
- Response:
  1. By definition, strength is not an issue in CAS
  2. Resting posture is not relevant to speech output
  3. Sensory input (tactile or proprioceptive) unrelated to speech behavior is not likely to result in improved speech output

Based on the best available evidence, the way to learn to speak clearly is to practice speaking clearly

Adapting Treatment

CAS + phonological

Phonological + motor planning/programming

CAS + language + phonological

Bilingual children

Younger/nonverbal children

Older/more verbal children
Case Study
Boy, age 2:8

- Phonetic inventory includes /m,t,p,d/, “sh” in isolation and vowels “oh”, “ee”, “uh” (go, me, up)
- He likes Thomas the Tank Engine, Spiderman, mac and cheese, his dog Bobo, playdough, and building with Legos.

What stimuli would you consider working on with this child and why?
- Increasing his sound repertoire
- Advancing his syllable repertoire?

Two months later….

- Child is accurate with
  - “hi mom” in immediate imitation
  - needs simultaneous practice at normal rate for “I do”
  - slow, simultaneous practice for “Thomas” and “go home”,

How might you organize a session to practice these stimuli?

- “Thomas” 20-30X
- “Hi mom” 1X (attention for task completion)
- “I do” 10-20X
- “Hi Mom 1X (attention for task completion)
- “Thomas” 20-30X
- “Hi mom” (attention for task completion)
- “Go home” 20-30X (completion means time to go)

How do we know our treatment is working?

- Data collection is important
  - See Appendix B for some ideas for data collection
- Is the child’s functional ability to communicate improving?

Summary

- Treatment for CAS should incorporate principles of motor learning
- Treatment should change over time to accommodate progress
Appendix A
Therapy Ideas

✓ Hop/jump over cards or spots on the floor as you say each word
✓ Small sand/rice box, find small toys or cards buried
✓ Blanket and flashlight to go on a “cave hunt” to find pictures of targets
✓ Use repetitive story books, make up an model that works for the story and includes the child’s target word or phrase
✓ Drop toys in a bucket
✓ Link “baby links” together as each word is said or to represent a multisyllable sequence
✓ Use colored counting bears to designate number of repetitions
✓ Use magnet chips/magnet
✓ Toss beanbags at pictures or as reinforcement for saying targets
✓ Have action figures/toys use targets in “dialogue”
✓ Look for games with many pieces (pop-up pirates, “feed the animals” box from Super Duper, Mr. Potato Head, Tumblin’ Monkeys, Poppa’s Pizza Pile, Acrobats, etc.)
✓ Shoot a disk short or nerf rocket
✓ Toss a soft ball (“to me”, “my turn”, etc.)
✓ Send matchbox cars down a tube from table to a box on the floor
✓ See the article “How to Help Your Child with Speech Practice at Home” and “Some Ways to Elicit Multiple Repetitions from Children with Apraxia” in the Apraxia-Kids virtual library at www.apraxia-kids.org

Adapted from a panel presentation in 2007 at the national parent/professional conference of the Childhood Apraxia of Speech Association of North America (CASANA), Anaheim, CA.
Appendix B
Data Collection

Three-point system used in Strand, Stoeckel & Baas, 2006:
2 = correct production;
1 = mostly correct, with error in place, manner or voicing of 1 consonant sound in the syllable or phrase;
0 = vowel distortion and/or more than one error of consonant production.
  • Scores are awarded for child’s production in direct imitation over 10 trials (total possible score = 20)
  • Targets are probed on a regular basis (e.g., every 4th session) for scoring

Use the treatment protocol to track progress relative to the type of cueing required. For example, “(Child) produces ‘Thomas’ accurately in slow, simultaneous efforts; produces ‘go home’ in immediate imitation without additional cues; produces ‘I do’ accurately in delayed imitation.”