Childhood Apraxia of Speech
A Multi-Sensory Approach to Achieving Speech Outcomes
David W. Hammer, M.A. CCC-SLP
Childhood Apraxia of Speech Association of North America

Disclosures

• I receive compensation for my role with CASANA.
• I receive ongoing compensation for my participation in the production of the CASANA DVD “Treatment Strategies for CAS.”
• I act as the ASHA CE Consultant for CASANA.
• I receive a percentage of the sale of my children’s book “Your Time Will Come”.

Trapeze Video

THE
“AHH”
MOMENT!

“CAS - A Multi-Sensory Therapy Approach” David W Hammer, MA CCC-SLP
Evaluation Questions

• How young is too young to diagnose childhood apraxia of speech (CAS)?
  [Video - Lilah, age 2]
• Do you have to be an apraxia "expert" to make a CAS diagnosis? [Email]
• Can a child be diagnosed with apraxia if he/she is nonverbal? [GF example]

Evaluation Questions

• What is the incidence of apraxia?
  [3-5% of children with speech deficits]
• [Video Clip - Ross, age 3-4]

How important is early babbling and sound play?

• Limited babbling ["Babbling" wondertime.com]
• Canonical babbling (CV syllables in a timing relationship) = better prognosis than marginal babbling (e.g. "ma" or "ba") or vowel repetitions
• Two types - reduplicated and variegated
• For most children, overlap for canonical babble and 1st words occurs at 10-12 mos.
How important is early babbling and sound play?

- For a percentage of children with CAS, “concurrent” babbling may not occur until 3!
- Babbling lays down the mapping between perception and production.
- Jargoning is “canonical babbling on prosody”!
- First word emergence/loss – “pop out” words

What are critical features in diagnosing CAS?

- Sound inventory restrictions – could be called late “developing” or late “mastered”
- Imitation much better than on-demand skills [Edy Strand’s “Dynamic Temporal and Tactile Cueing” Approach (DTTC)]
- Sequencing struggles [trapeze transition]
- Word/Sentence Complexity breakdown [Videos - Caleb, age 8]

Multi-syllable word Therapy Techniques

- Use Backward Chaining/Build-Up (“anatomy”)
- [Video – Johnny, age 6-3]
- Use spondees (baseball, popcorn, meatball) to demonstrate word not as complex as think.
- As syllable complexity increases, use cues, pictures/print, and signs to mark syllables
- [Video - Zachary, age 9  2:25-end]
Multi-syllable word Therapy Techniques


What are critical features in diagnosing CAS?

- Inconsistency in various forms - need to have child repeat words 3 times, and try words with similar sound features (e.g. initial /m/)
- LAT (Linguisystems Articulation Test) has built-in CAS screener – 12 target words said 3 times each plus “Tell-A-Story”
- [Video - Jacob, age 3]

What are critical features in diagnosing CAS?

- Sound harmony/variegation
- Vowel distortions/centralization
  - Having any vowel errors other than vocalic /r/ after age 5 is rare.
  - Vowel screener in the “No-Glamour Vowels” from Linguisystems. Looks at isolation through sentence level. (ages 4-12)
What are critical features in diagnosing CAS?

- Voiced/Voiceless sound errors
- Prosodic deviancies
- “Groping” behaviors [not always seen at level of evaluation]
- Sound omissions but...

ASHA AdHoc Committee’s 2007 3 Consensus Features

- Inconsistent errors on consonants and vowels in repeated productions of syllables or words
- Lengthened & disrupted coarticulatory transitions between sounds & syllables
- Inappropriate prosody, especially in relation to lexical or phrasal stress

ASHA AdHoc Committee’s Definition of CAS

- “Childhood apraxia of speech (CAS) is a neurological childhood (pediatric) speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g. abnormal reflexes, abnormal tone).”
Which children tend to be over-diagnosed or misdiagnosed?

- (1) the nonverbal child
- (2) the dysarthric child

How do you differentiate apraxia of speech from dysarthria?

- Per Edy Strand regarding motor speech disorders: “It is impossible to completely differentiate these disorders”.
- At least one reason is that the speech characteristics overlap.
- Per Ray Kent: “Our knowledge of dysarthria in children is woefully inadequate”.

Which children tend to be over-diagnosed or misdiagnosed?

- (2) the dysarthric child
  - [Handout – Comparison Chart]
  - [Video - Anna, age 8-1]
- (3) the severely phonologically disordered child
- (4) the confounding diagnosis child.
  - [Video - Zachary, age 6]
What are the challenges with other languages/dialects?

- Australia challenges with use of Amerind signs and vowel differences
- Spanish speakers (1) have more restricted vowels (2) tend to use glides (3) don’t enunciate final sounds.
- “Intervention for Bilingual Children with CAS” by Kohnert & Stoeckel on Apraxia-Kids.org - no evidence to “pick a language”

What about language processing & memory issues?

- Recent study by Shriberg, et al looked at “encoding” and memory as well as “transcoding”.
- Do children with CAS have “processing” deficits as well as speech planning/programming deficits? [Research findings (40 subjects)]

What does my evaluation include?

- For young children, most is informal, but formal tests available. [McCauley & Strand, 2008]
- New test being developed called the “Dynamic Evaluation of Motor Speech Skill” (DEMMS) by Strand, McCauley, Weigand, Stoeckel and Baas
  - Examines articulatory accuracy, inconsistency of errors across repeated trials (including vowels), and accuracy within prosodic elements like lexical stress.
  - [DEMMS Apraxia Assessment article]
What does my evaluation include?

- Securing in-depth parent information. (ProEFA's/specialized diets/"Speak Smooth")
- [Handout - additional parent questionnaire]
- Investigating other apraxic features.
- Looking at nonspeech oral skills. [May have mixed oral/verbal apraxia]
- Checking child’s response to cueing strategies
  - [Video Clip - Mark, age 7]

What do we need to talk with parents about at diagnosis?

- First, find a way to describe apraxia.
- Like trapeze – problem lies in letting go and transitioning - the “ahh” moment.
- [Discuss anticipated therapy intensity and type (individual/group)changes.
- Prepare them for the “plateau effect”.
- Discuss prognostic indicators [Handout].

What do we need to talk with parents about at diagnosis?

- AdHoc committee documents support “suspected apraxia” or “working dx”.
- Is a low percentage of children with CAS, so most therapists don’t see a lot of cases.
- “7 Things I Always Ask/Tell Parents During an Apraxia of Speech Evaluation” [Handout]
- Varied outcomes [Pilot Study - Tom Campbell]
Pilot Outcome Findings

- Pilot Outcome Study looked at “less than half” - “about 3/4” functional clarity change
- On average, ___ therapy sessions were needed to produce a “functional” intelligibility outcome for children with phonological disorders compared to an average of ____ sessions for children with apraxia!!!

How do we communicate CAS information with teachers?

- 1-page information flier for teachers of preschool-age children with CAS available on the Apraxia-Kids.org website.
- Left hand column of website at bottom has link to new resources including this one.
- 2-page “Letter to a Teacher” available also through Apraxia-Kids.org.
- Both can be modified and personalized.

What is the evidence?

- Principles of Motor Learning should drive our therapy (11/6/07 ASHA LEADER & Maas, 2008 article on reference list/CASANA webinar)
  - Repetitive practice
  - Constant vs variable practice
  - Blocked vs random practice
  - Massed vs distributed practice
**Principles of Motor Learning**
*Generalized Motor Programs (GMPs)*

- In CASANA webinar, Edwin Maas uses pancake flip example.
- Constant – same size pan (better for GMPs)
  Variable – S/M/L pan (better for motor learning)
- Blocked – 25 trials each with each pan size
  Random – no set amount of trials per size
- Knowledge of Results vs Performance
- Frequency of Feedback (low frequency = learning)

---

**What is CAS treatment research telling us?**

- Unfortunately not much. Only 4% of all pediatric communication disorder research includes pediatric motor speech disorder research - and that includes dysarthria.
- Most current research is focused on genetics (Fox P2 regulatory gene) and brain imaging.
- Likely are subtypes of CAS. Most children studied with CAS do NOT have Fox P2 gene mutation and brain imaging is non-conclusive.

---

**Zebra Finch Studies**

- Zebra Finch Songbird Study - Max Plank Institute in Germany, Duke & Northwestern
- Zebra finches have 2 distinct brain paths (1 for babble song & 1 for mature song).
- “Male tweet tutor” sits in middle of circle to teach male courtship song.
- Fox P2 knocked out of some “students”.
- Resulted in different “tweets” from tutor
### Zebra Finch Study Conclusions

- The Zebra Finch creates new sounds like instrumental music and may do that using the same genes as humans.
- Bird song learning may contain clues to human speech disorders, including CAS.

### What is CAS research telling us?

- No higher CAS among verbal children with autism.
- High rate of “soft” neurological signs - clumsiness, fine motor incoordination, etc.
- Children with apraxia perform more poorly on phonological awareness tasks.
- No significant difference in blocked/random or feedback frequency (4 children studied)
- Practice variability may be increased after very limited speech sound establishment.

### How does therapy for CAS differ from phonological/artic therapy?

- Foundation in Principles of Motor Learning.
- “Developmental” guidelines don’t dictate sound choice most of the time.
- More attention is paid to movement sequences than to isolated sounds.
- Need to increase multi-sensory cueing.
- Compensatory placements may need to be taught. [tongue-tip sound examples]
How does therapy for CAS differ from phonological/artic therapy?

- [Video Clip - Doug, age 5-6 with Mom]
- More intensive parent/caregiver involvement is needed.

What are important family considerations?

- Ensure parents observe tx some way!
- Teach parents speech (or cognates)
- Get whole family involved if possible.
- Make sure home practice is successful. [4-year-old “all motor” girl with dad]
- Talk about the struggle!! [take a vac]
- Don’t overwhelm parents! [Pledge]

What does “multi-sensory” mean in my approach?

- Using any sensory and motor input available to enhance verbal skills. (could also be called multi-modality)
- [Video-Ben, age 3]
What does a “multi-sensory” approach include?

- Touch cues, visual prompts (hand signals like from “Easy Does It”), PROMPT, PECS, AAC devices, and sign language.
- Sign language can:
  1. be held to the face
  2. be paired with visual(touch cues
  3. be used later to prompt functors
  4. support cue fading.
- Abandoning sign language

Don’t abandon sign language…

- because the child’s fine motor planning and precision are impaired/weak.
- because the child does not like to sign.
- because it is hard to learn.
- because the child starts to talk.
- [Video – Amanda, age 4 with sign usage]

What about AAC boards/devices?

- Certainly all levels from low tech to high tech can be used.
- Incorporate into a multi-sensory session.
- iPAD as therapy tool and as device
- [3 video segments, Brody age 3-8]
What does “multi-sensory” help facilitate?

- Helps child to experience sound sequences and suprasegmental features while engaged in motor activity.
- [Video - Connor, age 3]

How does “multi-sensory” therapy reduce frustration?

- Distracts child from the challenge of sound precision/sequencing
- [Video - Sean, age 6-9]