





## CURRENT CLINICAL PRACTICES FOR CHILDHOOD APRAXIA OF SPEECH

**Workshop**  
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Hearing Association



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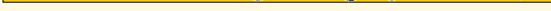

## A Controversial Diagnosis

- ◆ Inconclusive comparisons to apraxia of speech in adults
- ◆ Lack of clearly identified, *definitive* diagnostic characteristics
- ◆ Wide range of suggested diagnostic characteristics
- ◆ No consistently detectable locus of neurological damage
- ◆ Limited research with differing methodologies

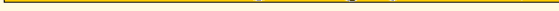

### ASHA Position Statement: Definition

“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). CAS may occur as a result of known neurological impairment, in association with complex neurobehavioral disorders of known or unknown origin, or as an idiopathic neurogenic speech sound disorder. The *core impairment in planning and/or programming spatiotemporal parameters of movement sequences results* in errors in *speech sound production and prosody.*” (p. 3)



### ASHA Position Statement: (cont.)

- ◆ “Symptom *complex* with no one validated list of differentiating symptoms
- ◆ Symptoms of some consensus (but not necessary and sufficient for diagnosis):
  - ◆ Inconsistent errors on consonants and vowels in repeated productions of syllables/words
  - ◆ Lengthened/disrupted coarticulatory transitions between sounds and syllables
  - ◆ Inappropriate prosody especially for lexical or phrasal stress
- ◆ Increased risk for persisting problems in speech, language, and literacy and possible need for AAC” (p. 4)
- ◆ Population prevalence (est.): 1 or 2 children/1,000


### ASHA Position Statement: Roles and Responsibilities

“The *diagnosis and remediation* of CAS are the *proper purview of speech-language pathologists with specialized knowledge, skills, and experience*, including differential diagnosis of childhood speech motor disorders, motor learning theory, cueing strategy usage, and other effective intervention techniques.” (p. 2)

### (sCAS): Historical Names

- ◆ Developmental apraxia of speech (DAS)
- ◆ Childhood apraxia of speech (CAS)
- ◆ Developmental verbal dyspraxia (DVD)
- ◆ Developmental verbal apraxia
- ◆ Suspected DAS/CAS (sDAS/sCAS)



### Frequently Cited Speech Symptoms: Young Children (ASHA, Caruso & Strand, Hammer, Strand, Velleman)

- ♦ Lack of early sound play
- ♦ Limited speech sound repertoire
- ♦ Inconsistent speech errors and speech capability
- ♦ Communicative pressure/stress → more difficulty
- ♦ Problems with sequencing/movement/combining sounds
- ♦ Longer utterances → less accurate
- ♦ Vowel errors
- ♦ Sound omissions: especially initial
- ♦ Prosodic problems
- ♦ Change over time

### Frequently Cited Speech Symptoms: Older Children (ASHA, Caruso & Strand, Hammer, Strand, Velleman)

- ♦ Inconsistent sound errors not due to immaturity
- ♦ Language understanding is much better than language production
- ♦ Difficulty in imitation of speech but imitated speech is clearer than spontaneous
- ♦ Possible groping in attempts to produce sounds or coordination of lips, tongue, and jaw for purposeful movement.

### Frequently Cited Speech Symptoms: Older Children (ASHA, Caruso & Strand, Hammer, Strand, Velleman)

- ♦ Longer utterances → less accurate
- ♦ More difficulty when anxious
- ♦ Hard to understand, especially to unfamiliar listeners
- ♦ May sound choppy or monotonous, stress wrong syllable or word (prosodic disturbances)
- ♦ Change over time
- ♦ More persistent difficulties in repeating nonsense words and sequencing syllables than children with non-CAS diagnosis (Lewis, et al., 2004).

### Less-Distinguishing Speech Symptoms (Apraxia-Kids, ASHA, Garn-Nunn & Katz, Hammer, Velleman)

- ♦ Limited/no intelligibility
- ♦ Final consonant deletion
- ♦ Stopping
- ♦ Misarticulation of fricatives and affricates
- ♦ Syllable reduction
- ♦ Receptive language superior to expressive language
- ♦ Disordered language processes e.g., syntax, morphology, *a, an, the, is, are*

### Possible Associated Factors

(Apraxia-Kids, ASHA, Garn-Nunn & Katz, Hammer, Velleman)

- ♦ Weakness of lips, jaw, and/or tongue (dysarthria)
- ♦ Delayed language development
- ♦ Word order confusion and/or recall problems
- ♦ Difficulties with fine motor skills/coordination
- ♦ Sensory integration disorders: hyper- or hypo-sensitivity
- ♦ Family history of speech-language problems
- ♦ ADD/HD
- ♦ Word-finding problems
- ♦ CAP

### Considerations for Assessment: Methods:

- ♦ Diagnosis: "working" vs. definite
- ♦ Primary goal: identifying deficit areas
  - ♦ Cognition
  - ♦ Hearing screening/evaluation
  - ♦ Case history considerations
  - ♦ Motor considerations
    - ♦ Neuromuscular status
    - ♦ Oral mechanism evaluation
      - ♦ Structures
      - ♦ Function
  - ♦ Communication: DEGREE OF MATCH
    - ♦ Mode
    - ♦ Speech and Language

## Case History Considerations

- ◆ Concern: prerequisite skills and behaviors
- ◆ Pregnancy, birth history
- ◆ Medical history
- ◆ Family history
- ◆ Developmental history/milestones
  - ◆ Motor: speech and nonspeech
    - ◆ Awkwardness/clumsiness/muscle tone
    - ◆ Oral/limb apraxia
    - ◆ Feeding and/or swallowing problems?
    - ◆ Picky/fussy eater?
  - ◆ Speech/language
  - ◆ Social

## Assessment: Motor Considerations

- ◆ Neuromuscular status (*Strand & McCauley, 1999*)
  - ◆ Overall integrity of movement
  - ◆ Gait
  - ◆ Balance
  - ◆ Muscle tone in extremities
- ◆ Oral mechanism evaluation
  - ◆ Structures
  - ◆ Sensory function
  - ◆ Motor function
    - ◆ Range
    - ◆ Speed
    - ◆ Strength
    - ◆ Variation of muscle tension
    - ◆ Coordination

## Assessment of Nonspeech Tasks: Sensory and Motor Information

<u>Liquids</u>	<u>Semi-Solids</u>	<u>Soft Solids</u>
water	yogurt	banana
juice	pudding	canned fruit
	applesauce	cheese
		graham cracker
<u>Hard Solids</u>	<u>Chewy Solids</u>	
tortilla chips	fruit snacks	
pretzel rods	bagels	
carrot sticks	marshmallows	
apple wedges		

## Assessment: Signs of Oral Hypersensitivity (*Mackie, 1996*)

- ◆ Avoids certain food textures
- ◆ Dislikes mixed food textures
- ◆ Avoids/dislikes cleaning/touching of teeth, face, body
- ◆ Spoon/fork feeding with lips retracted, use of teeth only
- ◆ Liquid used to “wash down” food (rather than chewing)
- ◆ Avoids/dislikes “messy” sensory materials, e.g., finger paints

## Assessment: Signs of Oral Hyposensitivity (*Mackie, 1996*)

- ◆ “Messy” eaters
- ◆ “Stuffs” mouth or takes large bites in eating
- ◆ Unaware of food left around face
- ◆ May avoid mixed food textures
- ◆ Seeks oral stimulation and may mouth objects
- ◆ Food may be pocketed in cheeks
- ◆ Food may remain in mouth at the end of a meal
- ◆ Fails to chew food well before swallowing.

## Assessment: Motor Considerations

- ◆ Oral mechanism evaluation (continued)
  - ◆ Motor function
    - ◆ Nonspeech activities
      - ◆ Overall imitative, non-oral skills
      - ◆ Oral imitative skills
    - ◆ Speech production:
      - ◆ Body, jaw, lips, tongue: differentiation
      - ◆ Imitation of phonemes
    - ◆ Syllable repetitions
      - ◆ Maximum repetition rate (MMR): maximum repetition rate
      - ◆ Diadochokinesis (DDK): alternating syllables

### Communication Assessment: "DEGREE OF MATCH"

- ◆ How/how much do they communicate?
- ◆ Do receptive and expressive skills match?
- ◆ Are symptoms more indicative of:
  - ◆ Dysarthria (overall muscle weakness, incoordination)?
  - ◆ sCAS?
  - ◆ Linguistic problem (primarily phonology)
  - ◆ Overall language problem (cognition)?

### Communication Assessment in Children with Limited Verbal Output

- ◆ Mode of communication
- ◆ Degree of "match"
  - ◆ Cognition
  - ◆ Pragmatics
  - ◆ Linguistic system: receptive and expressive
    - ◆ Vocabulary
    - ◆ Articulation and phonology
      - ◆ Sounds used
      - ◆ Syllable shapes
      - ◆ Imitation

### Communication Assessment: Children Using Multiword Utterances

- ◆ Receptive testing
- ◆ Expressive testing and language sampling
- ◆ Match of overall language-phonology
- ◆ Contextual testing

### Assessment: Commercial Tests for CAS

- ◆ Screening Test for Developmental Apraxia of Speech
- ◆ Kaufman Speech Praxis Test
- ◆ The Apraxia Profile
- ◆ Test of Syllable Sequencing Skills  
(in *Moving Across Syllables*)

### Assessment: Summary Evaluate All Possible Etiologies and Systems:

- ◆ Hearing screening
- ◆ Cognition
- ◆ Oral mechanism and oral motor skills
- ◆ Receptive and expressive language (nonverbal and verbal)
- ◆ Amount/level of verbal output
- ◆ Contextual testing (multiword clients)

### General Recommendations for Treatment (ASHA, 2007; Ruscello, 2007)

- ◆ Meet communication needs of child and family in a variety of ways.
- ◆ Provide multiple practice opportunities.
- ◆ Treatment should be provided 3-5 times per week (distributed practice→skill acquisition and automaticity).
- ◆ Limit stimuli to a small number of practice items→expand to other contexts.

## General Recommendations for Treatment (cont.) (ASHA, 2007; Ruscello, 2007)

- ◆ Target speech prosody
- ◆ Establish multiple goals → data-based decisions
- ◆ Involve parents/family and use home programs
- ◆ Treat coexisting problems as needed, e.g. language and literacy skills.

## Types of Treatment Approaches (ASHA, 2007)

- ◆ Linguistic approaches
- ◆ Motor programming approaches
- ◆ Combined linguistic and motor programming approaches
- ◆ Approaches using specific sensory and gestural cueing techniques
  - ◆ Tactile-kinesthetic stimulation
  - ◆ Rhythmic and melodic stimulation
  - ◆ Gestural cueing

## Motor Programming Approaches

- ◆ AKA articulatory or phonetic approaches
- ◆ Many commercially available programs
- ◆ Integral stimulation approach  
(Strand & Debertine, 2000; Gildersleeve-Neuman, 2007)
  - ◆ Modification from approach for adults with apraxia
  - ◆ Uses principles of cognitive motor learning
  - ◆ Multi-step hierarchy

## Integral Stimulation Approach: 6 Steps (Gildersleeve-Neuman, 2007; Strand & Debertine, 2000)

- ◆ Child watches and listens and simultaneously produces stimulus with clinician.
- ◆ Clinician models → child repeats while clinician mouths it simultaneously.
- ◆ Clinician models and provides clues → child repeats
- ◆ Clinician models → child repeats with no clues provided.
- ◆ Clinician elicits stimulus without modeling.
- ◆ Child produces stimuli in less-directed situations

## Integral Stimulation: Principles of Motor Learning (Gildersleeve-Neuman, 2007; Strand & Debertine, 2000)

- ◆ Precursors to motor learning: anything that enhances/deters motor learning
- ◆ Conditions of practice
  - ◆ Mass vs. distributed
  - ◆ Format: blocked vs. random
- ◆ Conditions of feedback: move from extrinsic to intrinsic
- ◆ Effects of rate: slow down to provide additional time to plan and program

## Integral Stimulation: Overall Focus (cont.)

- ◆ Learn how to make speech *movement* rather than perfect sounds/syllables
- ◆ Constantly increase the complexity of the motor task (no preset criterion)
- ◆ Motor learning requires extensive practice and experience with new information.
- ◆ Elicit numerous target stimuli in every treatment session → adaptable to functional situations

## Treatment: Children with Unintelligible Utterances / Reduced MLU

- ◆ Overall Suggestions
- ◆ Session Components (Velleman & Strand, 1998)
  - ◆ Warm-up
  - ◆ Flexibility drills
  - ◆ Building automaticity
  - ◆ Flexibility and automaticity
- ◆ Commercial Materials

## Overall Suggestions for Treatment: C.A. < 3 years

- ◆ Use a “total communication” atmosphere
- ◆ Enable child and family to communicate more successfully, ASAP
- ◆ Develop V and C repertoire with meaningful words, communication
- ◆ Key considerations:
  - ◆ Parental involvement
  - ◆ Pacing
  - ◆ Flexibility
  - ◆ Language + speech

## Overall Suggestions: Preschool and School-Aged Children-Multiword Utterances

- ◆ Make functional communication a priority
- ◆ Identify and target contexts which cause difficulty:
  - ◆ Number of syllables
  - ◆ Singletons and sequences
  - ◆ Place, manner, voicing transitions
  - ◆ Length of sentences
  - ◆ Speech rate
  - ◆ Prosody

## Combined Motor Programming and Linguistic Approach (Velleman, 2007; Velleman & Strand, 1998)

- ◆ Steps in treatment
  - ◆ Warm-up: increase flexibility through tactile stimulation and movement.
  - ◆ Build flexibility: syllable, word, phrase sequence drills with phonetic elements already mastered by the child
  - ◆ Build automaticity: core group of words/phrases (increase communicative effectiveness)
  - ◆ Fluency and automaticity: practice combining automatic elements into fluent utterances.

## Suggested Warm-Up Activities

(Velleman, 2007; Velleman & Strand, 1998)

To increase flexibility with tactile stimulation and movement, try:

- ◆ Tactile stimulation
- ◆ Imitate body or oral-motor sequences
- ◆ Practice varying:
  - ◆ Pitch
  - ◆ Loudness
  - ◆ Rhythm

## Suggested Flexibility Exercises Use Phonemes Already Mastered

(Velleman, 2007; Velleman & Strand, 1998):

- ◆ Produce repeated phonetic sequences (start with easy Cs and Vs)
- ◆ Change production across repetitions
- ◆ Increase number and types of change across repetitions
- ◆ Possible activities: play routines, books, flip books, rhyming, commercial materials

### Build "Automaticity": Work with Core Group of Words/Phrases Important for Communication

(Velleman, 2007; (Velleman & Strand (1998)

- ◆ Use simple but meaningful forms with definite suprasegmental pattern
- ◆ Progress from familiar CVs to more complex shapes
- ◆ Possible activities:
  - ◆ Social words: greetings, emotions
  - ◆ Typical classroom motor/verbalization classroom activities
  - ◆ Predictable books
  - ◆ Finger plays

### Additional Therapy Suggestions: Increasing Grammatical Skills

(Velleman, 2007, pp. 20-21)

- ◆ Order for stimulation of early morphology:
  - ◆ Early developing free morphemes
  - ◆ -ing
  - ◆ Irregular Ns and Vs requiring:
    - ◆ Significant vowel change
    - ◆ Syllable addition
    - ◆ Change of greater than one phoneme
  - ◆ Syllable forms of plurals, possessives, 3<sup>rd</sup> person singular, past tense
  - ◆ Non-syllable forms of morphemes such as /s/ /z/ /d/
  - ◆ Improve ability to build sentences

### Additional Therapy Suggestions:

#### Older Children (Velleman, 2007, pp. 21; Velleman & Strand, 2000)

- ◆ Work on prosody: comprehension and production
- ◆ Train child to focus on listener awareness
  - ◆ Use of topic sentences
  - ◆ Slow, careful production of new, difficult, or unexpected words or answers
  - ◆ Pause between subject and verb
  - ◆ Work on phonological awareness skills as needed
- ◆ Work on writing and narratives
- ◆ Work on spelling
- ◆ Integrate academic and speech goals

### Summary

- ◆ Unintelligibility ≠ apraxia
- ◆ Difficulty of Dx before C.A. 3
- ◆ Consider all aspects of development and history

### Summary (cont.)

- ◆ Individualize therapy for child's...
  - ◆ Current cognitive level
  - ◆ Current language level
  - ◆ Current phoneme repertoire
  - ◆ Functionality
  - ◆ Transition problems
  - ◆ Personality
  - ◆ School expectations
- ◆ Use multisensory input, as needed
- ◆ Monitor "changing picture" and adapt therapy as needed.

CASE STUDY: Client C.P.: age at start of Tx at our facility, 2-2

#### 1. Initial Summary

- History: referral from another SLP
  - History of ear infections, with 14 in 10 months
  - Milestones
- Cognition
  - Attending behaviors
  - Imitation
- Pragmatics
- Linguistic system
  - Receptive skills: WNL
  - Vocabulary: <25 words
  - MLU
  - Phonology
    - Phonemes used (parent report):  
/bu/ /ku/ /m/ /n/ ah
    - "Word" shapes: V CV

## 2. Treatment

- a. Primary focus: 1<sup>st</sup> semester
  - 1) Establish nonverbal turn taking behaviors
  - 2) Expand sound and syllable repertoire within meaningful communicative contexts
- b. Rationale
- c. Goals/emphasis and content
  - 1) Increase attention span
  - 2) Establish turn-taking in play activities
  - 3) Build functional oral vocabulary: variety of thematic activities
    - a) Parent suggestions
    - b) Important communications
    - c) Age-appropriateness
    - d) Phonetic characteristics: CV shapes with sounds in repertoire, expansion (/p b w m n k g/ and vowels)

## 1<sup>st</sup> Semester Treatment (continued)

- 4) Sample session: body parts
  - a) Point out and name body parts
  - b) Picture surprise activity/C's book
  - c) Craft activity: outline C's body, fill in and talk about parts
  - d) Rhyme/book/story re: body parts
  - e) Snack: food faces (set routine for snack)
  - f) Target words
    - i. Body parts: toes, mouth, knee, nose, eye, ear
    - ii. Functions: all gone, clean up, bye-bye, please, no, go, more uhoh

## Second semester progress and treatment

- c. Progress
  - 1) Utterances: 1- and 2-word
  - 2) Verbal and nonverbal turn taking
  - 3) Increased attention span
- d. Treatment
  - 1) Continued language oriented sessions with motoric emphasis
  - 2) Phonemes/shapes: previous targets + alveolars, vowel variety/CV, CVCV (special use of Miccio Stimulability Program, 1996)
  - 3) Work on increased attention span
  - 4) Oral motor imitative skills development
  - 5) Specific goals
    - a) Expand vowel repertoire
    - b) Expand consonant repertoire: place of articulation, contexts
    - c) Work on friction

## Fourth semester treatment

1. Progress
  - a) Number of imitated phrases/session increased from 9 to 17 with targets /f/ /g/
  - b) Spontaneous utterances: 170/session
2. Assessment: start of term
  - a) APP-R PDS 50 ("Severe") with excessive use of:
    - 1) Consonant Sequence Reduction
    - 2) Final Consonant Deletion
    - 3) Stridency Deficiency
    - 4) Velar Deficiency
    - 5) /l/ and /r/ Deficiencies
  - b) *Moving Across Syllables*

## Fourth semester treatment (cont.)

3. Treatment
  - a) Public school Tx
  - b) Clinic
    - a) Oral motor exercises
    - b) Expand strident phoneme repertoire
  - c) Movement sequences: alveolar-velar  
Bilabial-alveolar Alveolar-bilabial  
Alveolar-alveolar

## Fifth semester treatment

1. Progress
2. Treatment
  - a) Public school TX
  - b) Clinic

## Fifth semester treatment

- a. Progress
- b. Treatment
  - 1) Public school Tx
  - 2) Clinic

### Outcome: CP

1. Discontinued work at clinic and continued work at public school
3. Phone call from parent 9/02 (started Tx in '98)
  - a. Speech is almost always intelligible
  - b. Child is talkative but shy in new situations
  - c. Completed kindergarten with excellent achievement test scores
  - d. Has been reading for almost a year

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