


## What the ASHA CAS Technical Documents Mean for Practicing Clinicians

Rebecca McCauley, Ph.D., CCC-SLP  
Professor  
Ohio State University

Shelley Velleman, Ph.D., CCC-SLP  
Associate Professor  
University of Massachusetts at Amherst




---

---

---

---

---

---

---

---

## Purpose of this presentation

- To introduce clinicians to the major clinical implications of the 2007 Position Statement and Technical Report prepared by an ad hoc Committee on Childhood Apraxia of Speech:
  - Lawrence Shriberg (Chair)
  - Christina Gildersleeve-Neumann
  - David Hammer
  - Shelley Velleman
  - Rebecca McCauley
  - Roseanne Clausen (ex officio)
  - Celia Hooper, then Brian Shulman (monitoring officers as VP for Professional Practices in SLP)
- Charge to that Committee: To assemble information about CAS that would be useful for caregivers, speech-language pathologists as well as other health care professionals.

---

---

---

---

---

---

---

---

## Your purpose for attending this talk

- Perhaps you hadn't realized the position statement and technical report existed so you'd like to find out about them
- OR perhaps you've found them on the asha.org website and have downloaded the 2 relevant PDFs.
  - Position statement – 4 pages
  - Technical report – 75 pages
    - And you feel you could use some help to get the most out of these documents

**Either way, welcome!**

---

---

---

---

---

---

---

---

### Committee Process

- Technical documents prepared by ASHA committees at the time of our work- position statements backed by technical reports, knowledge and skills, and practice guidelines
- CAS committee -
  - Undertook a comprehensive narrative review of the research literature (peer reviewed articles only) from 1995 to 2006
  - Used a template to standardize our review, with 2 or more readers for each article
  - Solicited widespread review of the document—from Sharon Gretz (founder of CASANA), Rob Mullen (Director of the National Center for EBP in Comm. Dis. at ASHA), ASHA membership as a whole, and apraxia experts in- and outside the profession

---

---

---

---

---

---

---

---

### Organization of the Technical Report

Constructed to answer 4 questions based on a review of scientific foundations and trends in professional practice

- Is CAS a recognized clinical disorder?
- What are its core characteristics?
- How should it be assessed?
- How should it be treated?

---

---

---


---

---

---

---

---



Is CAS a recognized clinical disorder?

**YES!!!!!!!!!!!!!!**

---

---

---

---

---

---

---

---

Is CAS a recognized clinical disorder?

**YES!!!!!!!!!!!!!!**

---

---

---

---

---

---

---

---

### Choice of CAS as the label

- ❑ **Childhood apraxia of speech (CAS)** proposed as a unifying cover term for "all presentations of apraxia of speech in childhood":
  - ❑ **Known neurologic etiologies**, such as interuterine stroke, infections, trauma
  - ❑ Primary or secondary sign in children with **complex neurobehavioral disorders** of genetic or metabolic origins
  - ❑ **Idiopathic neurogenic speech sound disorder**
- ❑ Term implies a shared core of speech and prosodic features, regardless of age of onset and specific etiology

---

---

---

---

---

---

---

---

### Rationale for preferring CAS to DAS/DVD

- ❑ Concerns about insurance coverage brought to our attention by CASANA and others
- ❑ Term has been misunderstood by insurance companies in 2 ways:
  - ❑ "Developmental" implied that the child would outgrow the problem and/or
  - ❑ That such a problem could always be adequately handled solely in an educational setting

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Definition of CAS**

**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.4

---

---

---

---

---

---

---

---

**Prevalence**

- ❑ No epidemiologically sound estimates of prevalence in the US or elsewhere, although increases in prevalence have been reported
- ❑ Best guesses
  - ❑ In a large metropolitan hospital, 516 cases of CAS = **3.4-4.3%** of 12,000 to 15,000 referrals for speech delay of unknown origin, reported from 1998 to 2004 and involving 15 SLPs (Delaney & Kent, 2004)
  - ❑ Population estimate (% of all children) = **.1 to .2%** (Shriberg, Aram, & Kwiatkowski, 1997a)
- ❑ Concerns about over-diagnosis

---

---

---

---

---

---

---

---

Three features consistent with a deficit in planning and programming speech movements

*And potentially useful for differentiating CAS from other childhood SSDs, including phonological disorders and dysarthrias*

- ❑ **Inconsistent errors on Cs and Vs in repeated productions of syllables or words**
- ❑ **Lengthened and disrupted coarticulatory transitions between sounds and syllables**
- ❑ **Inappropriate prosody, especially in the realization of lexical or phrasal stress**

---

---

---

---

---

---

---

---

**HOWEVER, limitations of this list**

- ❑ **Lack of validation**
- ❑ **Nature of features probably change** depending on the child's age, severity of involvement, and nature of the task used to elicit them
- ❑ **Features not included on the list** consisted of some that were controversial to members of the committee (and others!)
  - ❑ Ones related to input processing involving auditory, sensory and prosodic aspects of perception
  - ❑ Ones related to representational-level segmental and/or suprasegmental units

➔ **THEREFORE the list is seen as a consensus-based starting point**

---

---

---

---

---

---

---

---

Other important considerations

- ❑ CAS is seen as placing the child at risk for
  - ❑ Persistent problems in
    - ❑ speech,
    - ❑ expressive language, and
    - ❑ phonological foundations of literacy
  - ❑ Possible need of
    - ❑ AAC and
    - ❑ Assistive Technology

---

---

---


---

---

---

---

---



What are the core features of CAS?

---

---

---


---

---

---

---

---



How should CAS be assessed?

---

---

---

---

---

---

---

---

**Why do we care about this question?**

- In clinical practice –**  
 Assessment results guide access to resources and contribute to treatment planning
- In research practice –**  
 With little agreement regarding appropriate assessments, it's possible that much of the literature on this problem actually addresses several different disorders, which may vary

  - from study to study,
  - from participant to participant within a single study

---

---

---

---

---

---

---

---

**Who should diagnose CAS?**

- Certified speech-language pathologists with**

  - Specialized knowledge in motor learning theory
  - Skills in differential diagnosis of motor speech disorders in children
  - Experience with a variety of intervention techniques that may include augmentative/alternative communication and assistive technology
- NOT neurologists, other medical practitioners** (p. 53)
- Responsibilities of SLPs serving children with CAS include:**

  - Differential diagnosis
  - Design and implementation of individualized and intensive speech-language treatment programs...and for closely monitoring progress (pp. 40ff)

---

---

---

---

---

---

---

---

**Limitations on diagnosis**

- As with other developmental disabilities and disorders with many co-morbid conditions, diagnosis is particularly challenging, especially in children under 3**

  - However, more research is needed to indicate specific guidelines related to age of diagnosis
- Provisional diagnoses may prove helpful when diagnosis appears tenuous:**

  - "CAS cannot be ruled out"
  - "Signs are consistent with CAS"
  - "Suspected to have CAS"

---

---

---

---

---

---

---

---

Any specific test recommendations?

- ❑ Relevant tests that have been formally critiqued “have been found lacking in terms of important psychometric standards.” (p.54)

---

---

---

---

---

---

---

---

Review of 6 standardized tests of nonverbal oral and speech motor performance in children (McCauley & Strand, 2008)

- ❑ 6 published tests: Apraxia Profile, Kaufman Speech Praxis test for Children; Oral Speech Mechanism Screening Examination-3; Screening Test of Developmental Apraxia of Speech-2; Verbal Dyspraxia Profile; Verbal Motor Production Assessment for Children.
- ❑ We reviewed the adequacy of each test’s method of interpretation, reliability, and validity (content, criterion-related, construct)
- ❑ None met criteria for either test-retest or inter-examiner reliability
- ❑ The VMPAC met the criteria for the norms it provided and for content validity. No other criteria were met.

---

---

---

---

---

---

---

---

New tests that may prove helpful

Available, but un-reviewed

- ❑ DEAP – Diagnostic Evaluation of Articulation and Phonology (Dodd, Hua, Crosbie, Holm, & Ozanne, 2006)

In preparation

- ❑ DEMSS – Dynamic Evaluation of Motor Speech Skills (Strand, McCauley, Stoeckel, Baas)
- ❑ Early Motor Control Scales (Hayden, Wetherby, Cleary & Prizant)

---

---

---

---

---

---

---

---

*Remembering 3 core features and recognizing an absence of endorsed tests, what should you try to elicit or just observe using informal measures?*

**For purposes of differential diagnosis**

- ❑ Inconsistent errors on Cs and Vs in repeated productions of syllables or words
- ❑ Lengthened and disrupted coarticulatory transitions between sounds and syllables
- ❑ Inappropriate prosody, especially in the realization of lexical or phrasal stress

28

---

---

---

---

---

---

---

**Inconsistent errors on Cs and Vs in repeated productions of syllables or words**

Sample shows Ralph Shelton with a child diagnosed with CAS during an informal diadochokinetic task

29

---

---

---

---

---

---

---

**lengthened and disrupted coarticulatory transitions between sounds and syllables**

30

---

---

---

---

---

---

---

Example of Inappropriate prosody, especially in the realization of lexical or phrasal stress

---

---

---

---

---

---

---

---

**Areas to be assessed for a complete description of the child's problems**

- Nonspeech Oral-motor Skills
- Speech Production
  - Prosody
  - Voice
- Speech Perception
- Language
- FOR OLDER CHILDREN - add
- Metalinguistic/Literacy Skills

---

---

---

---

---

---

---


---

**Other critical consideration during assessment**

Conduct a case history, to enable you to understand and respond to appropriately in your assessment

The child's cultural and linguistic background

At this point, most studies of CAS use English- or Dutch-speaking children; No studies of dialect or language effects on CAS




---

---

---

---

---

---

---

---

**Recommendations from clinically experienced researchers\* (p. 54)**

- ❑ **Examine children's performance under different conditions**
  - ❑ Functional/automatic vs. volitional actions
  - ❑ Single postures vs. sequences of postures in speech production
  - ❑ Simple vs. more complex or novel contexts
  - ❑ Repetitions of the same stimuli vs. repetitions of varying stimuli (i.e., sequential vs. alternating motion rates)
  - ❑ Various types of cueing (auditory vs. visual vs.. tactile vs. varying combinations of cues)
- ❑ **And in multiple contexts – elicited, imitated, spontaneous, syllable, single-word, phrase, sentence, discourse**

\*Caruso, Strand, Davis, Velleman, Hall, Hodge, Skinder-Meredith, Thoonen

---

---

---

---

---

---

---

---

**Clinical recommendations, cont.**

- ❑ **Look for differences in fluidity, rate, and accuracy under different conditions and trade-offs among them**
- ❑ **In preschool children, accuracy and consistency are more reliable measures of motor control than rate (Williams & Stackhouse, 1998, 2000)**

---

---

---

---

---

---

---

---

**What referrals may be relevant?**

- ❑ **Neurologist** for identification of etiology and interventions related to complex neurobehavioral disorders or neurological conditions;
 

and in cases where there are frank neurological indicators such as seizure activity
- ❑ **Occupational therapist** for management of related problems, including nonspeech, sensory-motor or fine motor issues
- ❑ **Physical therapist** for management of gross motor or overall muscle tone

---

---

---

---

---

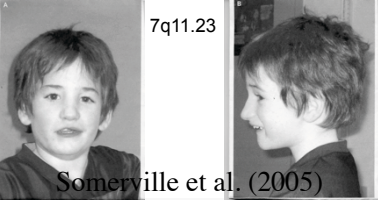
---

---

---

### What referrals may be relevant?

- Geneticist:
  - Genetic disorders associated with CAS: Fragile X, Galactosemia, Rett syndrome, Chromosomal translocations involving deletions and duplications, Autism, Epilepsy (Benign rolandic and autosomal dominant rolandic), Down syndrome
  - Genetic differences associated with CAS: FOX-P2, 7q11.23



Somerville et al. (2005)

---

---

---

---

---


---

---

---

### ALSO

- If you do not have the appropriate knowledge and skills, refer children for all or part of their services to another SLP*



---

---

---

---

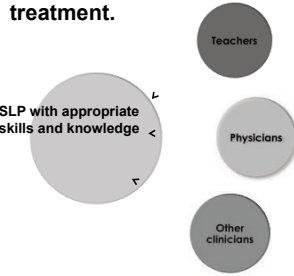
---

---

---

---

Finally, share information about CAS with possible referral sources to facilitate timely referrals and treatment.



---

---

---

---

---

---

---

---



How should CAS be treated?

---

---

---

---

---

---

---

---

How should CAS be treated?

- Very few studies of treatment efficacy
- Those that have been done have used primarily single- and multiple-case study methods
- Shared themes:
  - \* repetitive planning, programming, and production practice,
  - \* use of visual cues (pictures, mirror, gestures, written words),
  - \* early introduction of self-monitoring,
  - \* attention to stress production, and
  - \* facilitation of overall communication, including use of AAC

---

---

---

---

---

---

---

---

Intensity

- 3-5 sessions per week for young/severe children
- individual treatment
- as naturalistic an environment as possible to facilitate carry-over and generalization of skills

*“Although home practice [and carryover in the classroom] is critical for optimal progress, it [they] cannot take the place of individual treatment provided by a speech-language pathologist who has expertise in motor speech skill facilitation.” (p. 56)*

*“As long as the primary goal is to improve the motoric aspects of the child’s speech production (i.e., more time for motor practice), individual therapy should be the preferred approach regardless of age.” (p. 56)*

---

---

---

---

---

---

---

---

**Intensity**

- As
  - severity decreases,
  - therapy focus shifts to include more language, pragmatics (e.g., listener awareness, repair)

consider a combination of individual and small group sessions

- For children with additional therapy needs (e.g., OT, PT):
  - be sensitive to "therapy fatigue"
  - collaborate on creative problem-solving
  - consider co-treatment when appropriate, feasible

---

---

---

---

---

---

---

---

**Length of treatment sessions**

Given:

- the intensity of treatment recommended
- the effort required of the child to carry out motor speech treatment tasks

the Committee generally endorses the **"more sessions -- less time per session"** (Skinder-Meredith, 2001) recommendation

*e.g.,: 4 x 30 min. is better than 2 x 60 min. for a younger and/or more severely affected child*

when this is feasible within the treatment setting.

---

---

---

---

---

---

---

---

**Treatment strategies**

Principles of motor learning, including distributed practice:

- across a variety of activities, settings, and situations
- several exemplars per pattern

- Nonspeech oro-motor therapy is neither necessary nor sufficient for improved speech production

---

---

---

---

---


---

---

---

**Treatment strategies**

- Multisensory approach: sign language, pictures, AAC systems, visual prompts, touch cues
- Involve important people in the child's life, in a culturally appropriate manner, in carry over activities



46

---

---

---

---

---

---

---


---

**Funding treatment**

Prolonged, intensive treatment is likely to be required:

- Children with CAS need 81% more therapy to achieve same functional outcome as children with phonological disorders
- The cost of therapy is likely to be up to 5-6 times more

- SLP's working with children with CAS need more time for:
  - diagnosis
  - report-writing
  - educating funders (e.g., insurance companies)
  - assisting caregivers with advocacy



47

---

---

---

---

---

---

---

---

**Comorbid Conditions and Allocation of Resources**

- ❑ Language, reading, spelling, and written expression may also be affected
- ❑ Augmentative/alternative communication may be necessary
- ❑ Children may be receiving private as well as school-based speech therapy
- ❑ Integration and carry-over are vital

**COLLABORATION IS KEY!**

---

---

---

---

---

---

---

---

**Summary of Main Points**

- Key features include:
  - **Inconsistent errors on Cs and Vs in repeated productions of syllables or words**
  - **Lengthened and disrupted coarticulatory transitions between sounds and syllables**
  - **Inappropriate prosody, especially in the realization of lexical or phrasal stress**
- Diagnosis, assessment and treatment materials and research are insufficient

---

---

---

---

---

---

---

---

**Summary of Main Points**

- Diagnosis and treatment for Childhood Apraxia of Speech is complex and requires
  - an SLP
  - specialized knowledge and experience in motor assessment and motor learning
  - focus on functional communication strategies, language, and literacy as well as speech
  - extra preparation and therapy time and intensity
  - collaboration across fields, with researchers
  - keeping up with the literature for new developments.

---

---

---


---

---

---

---

---



**Questions??????????**

---

---

---

---

---

---

---

---

### Additional sources

- ❑ Flipsen, P. (2008). Understanding childhood apraxia of speech (CAS) for SLPs. <http://www.slpinfo.org/index.html> Accessed on 11/14/08
- ❑ Morgan, A.T. & Vogel, A.P. (2008). Intervention for childhood apraxia of speech. Cochrane Database of Systematic Reviews, issue 3. Article Number CD006278. DOI: 10.1002/14651858.CD006278.pub2.
- ❑ [speechBITE.com](http://www.speechbite.com) Evidence based practice website funded by Speech Pathology Australia and University of Sydney
- ❑ <http://www.apraxia-kids.org/> (a program of the Childhood Apraxia of Speech Association of North America)
- ❑ Working Guidelines for the Assessment and Treatment of Childhood Apraxia of Speech: A Review of ASHA's 2007 Position Statement and Technical Report. <http://speechpathology.com/>

---

---

---

---

---

---

---

---