EVIDENCE-BASED ASSESSMENT FOR SEVERE SPEECH SOUND DISORDERS, INCLUDING CAS

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The presenter’s financial interests consist of co-authorship of a test to be published in the next year and co-editing of two books that may be referred to in the course of her presentation.

Learner outcomes
1. List characteristics consistent with severe SSDs, including CAS, that can help with differential diagnosis
2. Describe formal and informal measures that may support differential diagnosis and treatment planning for severe SSDs, including CAS

Session organization to achieve those outcomes

Part 1. Severe speech sound disorders
- Definitions
- Similarities and differences

Part 2. Assessment and differential diagnosis
- Principles guiding overall assessment
- What formal tools are available for differential diagnosis
- What can we do now for differential diagnosis

What EBP is not and what it is

What it isn’t
- An all or nothing proposition
- A requirement that each clinical decision be based on a research finding
- A requirement that you need to conduct elaborate searches for non-existent research
- A view that discounts the value of clinical expertise or client involvement in decision-making

What it is
- Encouragement to be explicit with yourself about WHY you make individual assessment and treatment decisions
- Increasing encouragement to search for strong research evidence for decisions that are most important (affect the most children, have the biggest effect on a child)
- An area in which our professional association owes us the greatest possible support to make it feasible
Evidence-based practice and today’s content

- **EB Assessments**
  - with evidence of sensitivity/specificity

- **Expertise**
  - Knowledge (theories and facts)
  - Skills

- **Clinician’s expertise and experience**
  - Client’s preferences, values, and circumstances

Group exercise

How do the ideas just presented about EBP and its components fit with your own ideas about factors to balance in practice?

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**Definition of severe SSDs**

- **Speech Sound Disorders (SSDs)** = Challenges in speech production primarily related to difficulties in making speech sounds and/or using them appropriately for linguistic purposes
- **Severe** = those affecting intelligibility
  - // The Speech delay category from Shriberg’s work
- **Severe SSDs**
  - Phonologic disorders
  - Pediatric Motor Speech disorders
    - Childhood apraxia of speech &
    - Developmental dysarthria

Note: Others use this term more restrictively to refer to 50%-60% intelligibility (e.g., Binger, Kent-Walsh, Berens, del Campo & Rivera, 2008)

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**Part 1. Severe speech sound disorders**

- **Basic** -- definitions and background
- **Similarities and differences**

Severe Speech Sound Disorders - alternative definition

- Used more in the AAC research community
- Less concerned with particular etiology
- Often defined as intelligibility or comprehensibility 60% or lower when context is low

(Binger, Kent-Walsh, Berens, del Campo & Rivera, 2008; Gordon-Branman & Hodson, 2010)

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Severe speech sound disorders

<table>
<thead>
<tr>
<th>Severe phonologic disorders</th>
<th>Severe pediatric motor speech disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Related terms</strong></td>
<td><strong>Speech delay (Shriberg), Developmental phonological disorders</strong></td>
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Severe speech sound disorders

- Severe phonological disorders
- Severe pediatric motor speech disorders

<table>
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<th>Phonologic disorders</th>
<th>Motor speech disorders</th>
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<tr>
<td>Related terms</td>
<td>Speech delay (Shriberg), developmental phonological disorders</td>
</tr>
<tr>
<td>Presumed prevalence</td>
<td>~2.5% of children (~2 in 1000 children)</td>
</tr>
<tr>
<td>Processing breakdown</td>
<td>Cognitive-linguistic</td>
</tr>
</tbody>
</table>

Severe speech sound disorders

- Severe phonological disorders
- Severe pediatric motor speech disorders

| Presumed prevalence   | ~2.5% of children (~2 in 1000 children) |
| Processing breakdown  | Cognitive-linguistic |

Severe speech sound disorders

- Severe phonological disorders
- CAS only

For today's talk

Similarities among severe SSDs

Speech
- Reduced intelligibility
- Reduced phonetic repertoire, including some vowel errors
- Increased use of patterned errors (e.g., those well described using phonological processes)

Increased likelihood of related problems
- Oral language (receptive < expressive, but both are at risk)
- Literacy
- Social interaction/communication

A need shared by all severe SSDs:
Comprehensive assessment and intervention

Core deficits in severe SSDs

Additional problem areas often seen in severe SSDs

Larger, functional implications of both core and additional problem areas

Speech Production Needs

Needs Shared by all Severe SSDs
- Reduction in phonological simplifications
- Increased phonetic/phonemic inventory
- Generalization/Motivation

Additional Needs Specific to CAS
- Attention to Motor Learning*
- Attention to specific kinds of errors that are relatively rare in other SSDs
  - Vowels
  - Prosody

*Although children with other SSDs may benefit as well
Differences between CAS and other Severe SSDs

- Rarity of CAS frequently poses problems for understanding it
  - **Research** - Harder to conduct large studies; Greater controversies about what it is; how to identify it, etc.
  - **Clinical practice** – Harder to develop expertise in handling it
- Theoretically, the difference between CAS and other severe SSDs is thought to lie in the level at which a breakdown in speech production occurs.
Nature of the Deficit in CAS

Definition

- "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). . . .

(ASHA, 2007)

Three contexts for CAS

Idiopathic – Unknown origin

Syndromic - In association with complex neurobiological disorders of a genetic or metabolic nature – e.g., Fragile X, Galactosemia, Autism, Velocardiofacial syndrome (22q11.2)

Acquired – e.g., intrauterine stroke, infection, trauma

(ASHA, 2007)

Discriminative characteristics to help in CAS diagnosis

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

   • Definition: Similarity of word production across repetitions
   • What you might expect to see

2. Lengthened and disrupted coarticulatory transitions between sounds and syllables

3. Inappropriate prosody, especially in the realization of lexical or phrase stress

   (ASHA, 2007, p.2).

May be useful in diagnosis because they are thought to be sensitive and specific

Inconsistent errors in younger children on Cs and Vs

- In younger children, these will be seen more often in speech samples than in elicited productions
- However, inconsistent errors may show up even among very young children and children with little speech
  —That is, even if the child’s word shapes are largely V, CV, CVCV
- Vowel errors can be particularly valuable to note given the generally early age at which these are acquired

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

   • Definition: Similarity of word production across repetitions
   • What you might expect to see

- kangaroo [kan-gah-roo], [kan-gah-roo], [kan-gah-roo]
  - elephant [e-laf-onth], [e-laf-onth], [e-laf-onth]
  - dinosaur [dah-nah-sawr], [dah-nah-sawr], [dah-nah-sawr]
  - snow [snou], [snou], [snou]
  - umbrella [um-bre-lla], [um-bre-lla], [um-bre-lla]

(DeaD! 1995)
Vowel errors in CAS

- Tend to be more persistent and pervasive than seen in children with developmental phonologic disorders
- Yet vowel errors are now recognized as more common in moderate/severe SSDs than had once been thought (Karen Pollock’s work)
- Possible reasons for underestimations:
  - Dialect variation influencing our attention to vowels
  - Lack of attention to vowels on typically used measures for SSD identification/description

2. Lengthened and disrupted coarticulatory transitions between sounds and syllables

- Probably contribute to perceptions of stress and other prosodic abnormalities
- May be related to observations of
  - Groping
  - Syllable segregation = inappropriate pauses during speech
- Clinically may depend on observations during “difficult speaking conditions,”
  - Multisyllabic word production
  - Connected speech
  - Motor speech examinations in which a hierarchy of phonetically more complex stimuli are used (e.g., mom, mommy, hi, mom; hi, mommy)

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

- Recall that prosody relates to characteristics of speech affecting multiple segments. It includes phenomena such as phrasing, rate, and stress
- Most commonly observed abnormality: Equal-excessive stress (Shriberg, Aram, & Kwiatkowski, 1997)
- Frequently, assessment is relatively subjective, and would be based on examination of connected speech and/or multisyllabic words

Graphic representation of equal, excessive stress

<table>
<thead>
<tr>
<th>'banana'</th>
<th>'puppy'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>Excessive</td>
</tr>
<tr>
<td>Stress</td>
<td>Stress</td>
</tr>
<tr>
<td>buh NAE</td>
<td>buh NAE</td>
</tr>
<tr>
<td>nuh</td>
<td>BUH NAE</td>
</tr>
<tr>
<td></td>
<td>NUH</td>
</tr>
<tr>
<td></td>
<td>PUH pee</td>
</tr>
</tbody>
</table>

What additional problem areas have been reported?

- Speech production problems similar to other children with speech sound (process use, residual articulation errors)
- Risk for genetic abnormalities
- Speech perception
- Attention
- Morphosyntax
- Phonological awareness
- Spelling, reading, writing, and other academic areas

Case study of long-term effects Keith from 2:8 to 17:0

**Age 4**
- first diagnosis of Developmental apraxia of speech & oral apraxia,
- general clumsiness and
- severe unintelligibility
- very restricted phonetic repertoire (/b/, /d/, /r/ & glottal stop in words and some V errors)

**Age 17**
- High average IQ
- Resolved fine motor problems outside of speech
- Speech errors on multisyllabic words
- Persistent reading and spelling problems

(Stackhouse, 1992)

Longitudinal study comparing 3 similar groups

• Participants
  • CAS (n = 10)
  • Speech sound disorder only only (n = 15)
  • Speech and language disorders (n = 14)
    • (both of the nonCAS groups had moderate to severe sp problems)
• All three groups examined at two ages (preschool and school age)
• Dependent measures - language tests, speech tests, syllable sequencing, nonsense word repetition, phonological awareness

Results at Preschool age (ages 4 to 6)

• The CAS group performed more poorly than the Speech Sound Disorder group on all measures
• Yet on most measures, the CAS group performed similarly to the group with both Speech and Language Disorders
• CAS group made more uncommon errors and had more difficulties in sequencing than the other groups

Results at School age (ages 8 to 10)

→ Considering the CAS group alone
  • For all 10,
    • word production skills improved more than speech production in connected speech
    • receptive as well as expressive difficulties persisted
  • 8 of the 10 children
    • showed some improvement in speech skills,
      • but continued to have difficulty with ddk, multisyllabic real and nonsense words,
    • Other diagnoses among the 10:
      • 6 - reading problems
      • 8 - spelling problems;
      • 4 - ADHD
→ CAS group made smaller gains in language than the group with Speech and Language disorders at time 1

Conclusions reached by the authors

• It’s hard to distinguish speech and language disorders from CAS prior to age 6
• Differential diagnosis seemed to depend on informal measures of syllable sequencing, metathetic errors, nondevelopmental errors, and abnormal prosody
• Noting problems in phonological awareness—>

Group exercise

(1) Do the specific speech differences described for CAS fit your experience with these children?
(2) Do the kinds of broader problems fit your experience?
(3) How is clinical management affected? By these broader problems?

The plan for this morning—where are we?

Part 1. Severe speech sound disorders
  • Definitions
  • Similarities and differences

Part 2. Assessment and differential diagnosis
  • Principles guiding overall assessment
  • What formal tools are available for differential diagnosis
  • What can we do now for differential diagnosis
Part 2. Assessment and differential diagnosis

- Principles guiding overall assessment
- Formal tools for differential diagnosis
- What we can do now with informal measures

Broader effects of all severe SSDs

- Body functions and structure ➔ Breakdown in speech production and Reduced intelligibility
- Activity ➔ Reduced communicative competence
- Participation ➔ Lack of peer acceptance; reduced access to teachers/information in classroom

➔ can serve as inspiration for thinking about broader needs in assessment

Be guided by the ICF

- Be comprehensive in your overall assessment planning

Comprehensive assessment

<table>
<thead>
<tr>
<th>Language /Cognition</th>
<th>Speech</th>
<th>Functional outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral language</td>
<td>History</td>
<td>Intelligibility</td>
</tr>
<tr>
<td>receptive/expressive</td>
<td></td>
<td>Comprehensibility</td>
</tr>
<tr>
<td>semantics/syntax/morphology/pragmatics</td>
<td></td>
<td>Academics</td>
</tr>
<tr>
<td>Written language</td>
<td>Speech Sound system description</td>
<td>Consistency</td>
</tr>
<tr>
<td>Phonological awareness/Reading/writing/spelling</td>
<td>Prosody</td>
<td></td>
</tr>
<tr>
<td>Other possible domains of interest</td>
<td>Structural functional exam</td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>Phonologic inventory</td>
<td></td>
</tr>
<tr>
<td>Cognition</td>
<td></td>
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<tr>
<td>Speech perception</td>
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<td></td>
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</tbody>
</table>

Our focus today

Part 2. Assessment and differential diagnosis

- Principles guiding overall assessment
- Formal tools for differential diagnosis
- What we can do now for differential diagnosis and description for treatment planning

Existing formal tools for differential diagnosis of CAS

- With the increasing interest in CAS, standardized tests with content related to motor speech skill have been developed
- This led to a colleague and I deciding to examine the psychometric characteristics of existing tests (McCauley & Strand, 2008)

Examination of existing tests

- Six tests that included motor speech items were examined using operational definitions designed to provide information about the test's
  - Reliability
    - Test-retest reliability
    - Inter-examiner reliability
  - Validity
    - Content
    - Criterion-related
    - Construct

Only 1 of the 6 tests met any of the operational definitions; Most of the tests did not even address any.

Problems in Differential diagnosis of CAS vs. other Severe Speech Sound Disorders

- Changes in symptoms/signs with age
- Changes in ability to cooperate with testing, especially at younger ages
- Presence of co-occurring/etiologically related problems at different levels of impairment
  - Almost always Phonological Disorder as well as CAS
  - Sometimes CAS and Dysarthria
  - Any Severe SSD and Language and Literacy problems

Results

<table>
<thead>
<tr>
<th>RELIABILITY</th>
<th>Test-retest</th>
<th>Inter-Examiner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Attempted</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Not addressed</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
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  - Reliability
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  - Validity
    - Content
    - Criterion-related
    - Construct

Best developed of this group, with some validity evidence, but insufficient reliability evidence

- THE 6 TESTS
  - Apraxia Profile
  - Kaufman Speech Praxis Test
  - Oral Speech Mechanism Screening Examination- 3rd edition
  - Screening Test for Developmental Apraxia of Speech -2nd edition
  - Verbal Motor Production Assessment for Children(VMPAC)

McCauley & Strand, 2008
Verbal Motor Production Assessment for Children (Hayden & Square, 1999)

- Examines 5 areas
  - Global motor control - tone, respiration/phonation, reflexes, vegetative functions (chewing/swallowing)
  - Focal oromotor control - examining quality of movement
    - non-speech oromotor movements (single, double) and
    - speech movements (single phonemes - 4 Vs, 7 Cs; double/triple phoneme movements; production in word sequences and sentences)
  - Sequencing of multiple non-speech and speech movements with the focus on sequence preservation
  - Connected speech and language control
  - Speech characteristics

  - Children are given support through a hierarchy of elicitation conditions - auditory (instruction); visual (visual model added) and tactile (tactile cue added).

A by-product of this study

- Empowered us to take a motor speech examination that Edy had been using informally and develop it more fully → the Dynamic Evaluation of Motor Speech Skill

  - Also called the DEMSS

Purposes of the DEMSS

- Provide a well-developed motor speech examination for children (aka with evidence of reliability and validity)
- Facilitate differential diagnosis of speech sound disorders due to CAS (childhood apraxia of speech) from other types of speech sound disorders
  - especially for severely affected and/or younger children
- Help clinicians determine severity and prognosis for improvement

Dynamic Assessment in the DEMSS

- Uses more than a single attempt
- Entails the clinician providing varying levels of support (e.g., tactile cueing, slow simultaneous production) across repeated attempts
- Allows the clinician to observe
  - Whether such support is helpful
  - Which type of support is most helpful

(Bain & Olswang, 1995; Glaspey & Stoel-Gammon, 2005)

Hierarchy of support

- Direct imitation
- Modeling with visual and auditory cueing
- Tactile and gestural cues (e.g., gently closing jaw and lips to help child achieve bilabial closure)
- Phonetic placement cues (e.g., showing where to place tongue)
- Slowed rate and/or simultaneous production with the child

Structure of the DEMSS

- Focuses on motor speech skill (movement for speech)
- Real words are used that would probably be known by children
- Stimuli selected to vary in
  - length,
  - vowel content,
  - syllable shapes, and
  - prosodic content
Subscores focus on features associated with CAS

The test produces subscores reflecting four parameters:

- **Articulatory accuracy** (5 point rating)
- **Vowel accuracy** (3 point rating)
- **Prosody** (lexical stress) (binary)
- **Consistency of production** (binary)

Existing evidence supporting the DEMSS

**Reliability**
- Inter-examiner
- Intra-examiner
- Test-retest
- Internal consistency

**Validity**
- Evidence that children with CAS and mild CAS perform more similarly to each other than to other children referred to Mayo Clinic for SSD concerns
- **Diagnostic accuracy** - Sensitivity/specificity
  - Suggests that specificity is better than sensitivity, leading to a greater danger of under- than over-identification

Strategies described here

Based on examination of what researchers are doing right now AND what the literature suggests might be patterns to look for across a range of informal assessments

- **History**
- **Speech sound inventory**
- **Phonological process inventory**
- **Probe for consistency**
- **Probe for prosody**

Speech Sound System Description

**Typical elements**
- **Speech sound inventory**
- **Phonemic inventory**
- **Phonetic inventory**
- **Inventory of word/syllable shapes**
- **Developmental Process description (and nondevelopmental processes)**

**Elements to add**
- **Consistency**
- **Prosody**
- **Intelligibility/comprehensibility**

History

- Clues from a retrospective parent report study comparing children with sCAS, specific language impairment (SLI) and typical development (TD)

- **Children with sCAS compared to TD children:**
  - Less vocal
  - Less likely to babble
  - Later in emergence of first words
  - Later in the emergence of 2 word combinations

- **Children with sCAS compared to children with SLI:**
  - Similar EXCEPT less babbling & later emergence of 2 word utterances (Highman, Hennessy, Sherwood & Leito, 2008)
What do you expect to see?

<table>
<thead>
<tr>
<th>Speech sound inventory</th>
<th>Phonological process analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Smaller sound inventories overall</td>
<td>• Many regularities will be // those in other SSDs</td>
</tr>
<tr>
<td>• Especially smaller vowel inventories in some children</td>
<td>• Non-developmental processes that may be noted</td>
</tr>
<tr>
<td>• Reduced variety of syllable and word shapes</td>
<td>• Use of a favorite sound</td>
</tr>
<tr>
<td></td>
<td>• Initial consonant deletion</td>
</tr>
<tr>
<td></td>
<td>• Addition to adult form (epenthetic schwa; nasal intrusions)</td>
</tr>
</tbody>
</table>

Inconsistency

- Similarity of word production across repetitions
- Related to older concept of stimulability yet now emphasis is on word, not single sound, integrity
- Considered valuable for the diagnosis of CAS

Informal procedure to assess consistency

- Obtain 2 spontaneous and 2 imitated tokens of selected words on a standard articulation test, particularly multisyllabic words
- Expectations:
  - Children without CAS will usually improve across trials and with model
  - Children with CAS are more likely to show degraded performance across trials

(Shriberg, Aram & Kwiatkowski, 1997)

Another strategy for assessing consistency - The consistency subtest on the DEAP

- The Diagnostic Evaluation of Articulation and Phonology
- Barbara Dodd, Zhu Hua, Sharon Crosbie, Alison Holm, and Anne Ozanne
- 3 to 8:11 years
- 40% inconsistency on this test is considered indicative of inconsistency (e.g., Thomas, McCabe, & Ballard, 2014)

Prosody

- Observations will usually be made from conversational speech
- Types of phenomena to look out for:
  - Abnormal word stress, especially excessive, equal stress
  - Abnormal pauses between syllables (syllable segregation) on multisyllabic words
    - (e.g., Gozzard, Baker & McCabe, 2006—although echidna and vegemite may not be good choices)

Multisyllabic words with varying stress patterns

1. kangaroo 18. escalator
2. bulldozer 19. zucchini
3. octopus 20. cauliflower
4. microwave 21. vegetables
5. pajamas 22. sausages
6. triangle 23. potato
7. washing machine 24. tomato
8. vacuum cleaner 25. hamburger
9. thermometer 26. dinosaur
10. caterpillar 27. rhinoceros
11. animals 28. computer
12. crocodile 29. spaghetti
13. umbrella 30. television
14. hospital 31. rectangle
15. mosquito 32. elephant
16. banana 33. ambulance
17. cucumber 34. stethoscope

(Taken from Gozzard et al. (2006) list)
Structural-Functional Exam

Purposes
(1) To identify **structural deficits** that may contribute to communication problems
(2) To identify the presence/absence of **oral apraxia**
(3) To help detect the presence of **dysarthria** since impairments would affect both oral nonspeech and speech movements

Components of a Structural Functional Exam

- Structure
- Motor control for oral movement
- Less often, sensory function *(helpful in highlighting the possibility of SENSORImotor problems, especially re: feedback related to movement)*

Elements of Motor Control = 5 Movement Parameters

1. **Range of motion**
   Can the child move the tongue so that it can touch the alveolar ridge, protrude between the front teeth?

2. **Speed**
   Can the child move the tongue with the rapidity needed for speech?

3. **Strength**
   Can the child create a secure closure at the lips?

4. **Ability to vary muscular tension**
   Can the child alternately tense and relax muscles?

5. **Coordination**
   Outside of the context of speech, can the child repeat
   - alternating oral movements,
   - rapid alternating movements?
   ===> Oral apraxia?

Structural-functional exam and oral apraxia

**Definition of oral apraxia**: Difficulty in planning sequences of volitional nonspeech oral movements
- Not diagnostic for apraxia of speech,
- But frequently co-occurring and important to know for planning treatment
- CLINICALLY DIFFICULT WORK because of variability across ages & individuals as well as dependent on comprehension and motivation

Motor Speech Examination -

*The Most Important Element of a DX Battery*

(1) To obtain information about motor planning for sounds and sound combinations across contexts (differing in length and phonetic complexity)
(2) To determine whether cueing can help improve performance
(3) Currently VMPAC comes closest, but DEMSS may be a good competitor soon
**Example of an utterance hierarchy** (Strand & McCauley, 1999)

<table>
<thead>
<tr>
<th>Utterance type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vowels in isolation</td>
<td>[o], [u], [i]</td>
</tr>
<tr>
<td>CVs and VCs, varying Vs</td>
<td>me, my, hi, up, on</td>
</tr>
<tr>
<td>CVCs with C1VC1 then C1VC2</td>
<td>mom, pop, cake, hit, cup, ball</td>
</tr>
<tr>
<td>Words of increasing length</td>
<td>come, compute, computer</td>
</tr>
<tr>
<td>Multisyllabic words</td>
<td>refrigerator, alligator</td>
</tr>
<tr>
<td>Phrases</td>
<td>I want, me too</td>
</tr>
<tr>
<td>Sentences</td>
<td>I want more. I want more milk. I want more milk please.</td>
</tr>
</tbody>
</table>

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**Summary of the sources of information for identifying discriminative characteristics**

- Identified in ASHA (2007)
- Used often as basis of operational definitions of CAS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Example</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inconsistent errors on Cs and Vs in repeated productions of syllables or words</td>
<td>&quot;teeth&quot; = /tis/; /tif/; /taet/; /tæf/</td>
<td>Speech sample • Motor speech exam • Multisyllabic word list • DEAP (Dodd et al.) consistency subtest (3 to 8:11) or other multisyllabic word list</td>
</tr>
<tr>
<td>2. Lengthened and disrupted coarticulatory transitions between sounds and syllables</td>
<td>Inappropriate pausing; Groping on initial and subsequent syllables</td>
<td>Speech sample • Motor speech examination • Observations during artic testing</td>
</tr>
<tr>
<td>2. Inappropriate prosody, especially in the realization of lexical or phrase stress</td>
<td>Excessive, equal stress • DIHN DIHN not &quot;banana&quot; • TE FO not &quot;telephone&quot;</td>
<td>Speech sample • Motor speech examination</td>
</tr>
</tbody>
</table>

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**Other descriptions of speech differences in CAS**

A checklist from the Mayo Clinic

**Segmental errors**

1) Vowel errors
2) Voicing errors
3) Distorted substitutions
4) Difficulty achieving initial articulatory configurations or transitory movement gestures
5) Groping
6) Intrusive schwa
7) Increased difficulty with multisyllabic words
8) Syllable segregation
9) Slow rate
10) Slow diadochokinetic rates
11) Equal stress or lexical stress errors

- At least 3 characteristics across 3 tasks
- Used for adults and children

(Shriberg, Potter, & Strand, 2011; Shriberg et al., 2012)

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**The plan for today--where are we?**

Part 1. Severe speech sound disorders
- Definitions
- Similarities and differences

Part 2. Assessment and differential diagnosis
- Principles guiding overall assessment
- What formal tools are available for differential diagnosis
- What can we do now for differential diagnosis

Part 3. Intervention Planning
- Principles guiding intervention
- Speech Interventions with wide applicability
- Speech Interventions particular to CAS

Part 4. Group exercise in Treatment Planning

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**Group exercise**

Imagine you’ve completed your differential diagnosis and find a child with:
- Low intelligibility
- Impaired language (receptive and expressive) & CAS

What factors will you consider in planning tx goals?
Factors to consider in goal setting based on assessment

- Does it increase the functionality of the child's communication in important contexts?
- By expanding speaker/listener strategies
- By expanding communication modes?
- Does it increase the child's intelligibility/comprehensibility?
- By focusing on a core vocabulary
- By diminishing variability of errors
- Does it advance the child's speech production skills?
- By targeting key deficiencies in planning/production
- By increasing available contrasts in the child's speech
- Does it diminish unexpected errors that attract negative attention?
- By targeting prosodic errors?

References


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**EVIDENCE-BASED ASSESSMENT FOR SEVERE SPEECH SOUND DISORDERS, INCLUDING CAS**

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