

**Treatment of Severe Speech Sound Disorders In Children**



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**Learner outcomes**

1. List characteristics consistent with CAS and other severe SSDs
2. Summarize recent research developments for interventions specific to CAS
3. Describe motor learning principles to use in effective intervention planning
4. Create comprehensive treatment plans for children with severe SSDs across problem areas (communication, oral/written language, speech)

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**Session organization to achieve those objectives**

- I. Severe speech sound disorders
  - Distinguishing between major types of severe SSDs
  - Similarities and differences in treatment needs
- II. Tx planning for the shared needs of all children with severe SSD
- III. Tx planning for the special needs of children with Pediatric motor speech disorders
- IV. Group exercise in tx planning



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**I. Severe speech sound disorders**

**Basic--definitions and diagnosis**

**Similarities and differences**

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Definition of Severe SSDs

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

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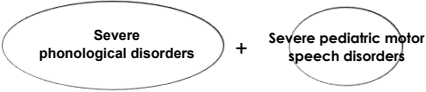
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Severe speech disorders



<b>Related terms</b>	Speech delay (Shriberg), developmental phonological disorders	Childhood apraxia of speech and Developmental dysarthria
<b>Presumed prevalence</b>	~2.5% of children	<1% (~ 2 in 1000 children)
<b>Processing breakdown</b>	Cognitive-linguistic	Motor planning and program, Motor execution

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### Severe speech disorders

Severe  
phonological disorders

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Severe phonetic motor  
speech disorders

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CAS

*For today's talk*

Related terms	Speech delay (Shriberg), developmental phonological disorders	<b>Childhood apraxia of speech</b> and Developmental dysarthria
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### Severe speech disorders

Severe  
phonological disorders

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Severe  
CAS

Related terms	Speech delay (Shriberg), developmental phonological disorders	Developmental verbal dyspraxia, DAS, sCAS
Presumed prevalence	~2.5% of children	<1% (~ 2 in 1000 children)
Processing breakdown	Cognitive-linguistic	Motor planning and programming,

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### Similarities among Severe SSDs

- **Speech**
  - **Reduced intelligibility**
  - **Reduced phonetic repertoire**, including some vowel errors
  - **Increased use of patterned errors** (e.g., those described using phonological processes)
- **Increased likelihood of related problems**
  - **Oral language** (*receptive < expressive, but both are at risk*)
  - **Literacy**
  - **Social interaction/communication**

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**Speech Production Needs**

<p><b>Needs Shared by all Severe SSDs</b></p> <ul style="list-style-type: none"> <li>• Reduction in phonological simplifications</li> <li>• Increased phonetic/phonemic inventory</li> <li>• Generalization/Motivation</li> </ul>	<p><b>Additional Needs Specific to CAS</b></p> <ul style="list-style-type: none"> <li>▣ Attention to Motor Learning</li> <li>▣ Attention to specific kinds of errors that are relatively rare               <ul style="list-style-type: none"> <li>• Vowels</li> <li>• Prosody</li> </ul> </li> </ul>
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**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" with age
- ▣ Presence of co-occurring/etiologically related problems at different levels of impairment
  - ▣ Almost always Phonological Impairment as well as CAS
  - ▣ Sometimes CAS and Dysarthria
  - ▣ Language and literacy problems are frequently co-occurring

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**Differences between CAS and other Severe SSDs**

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

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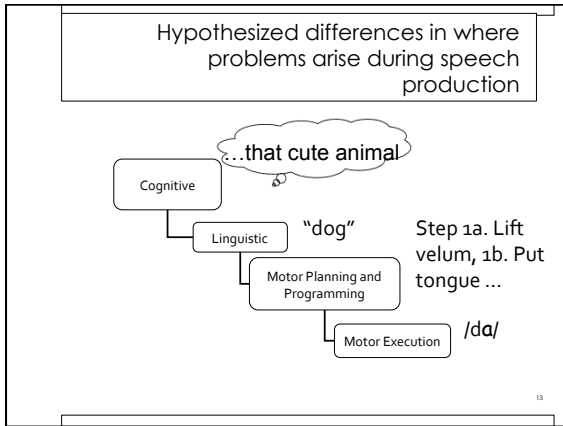
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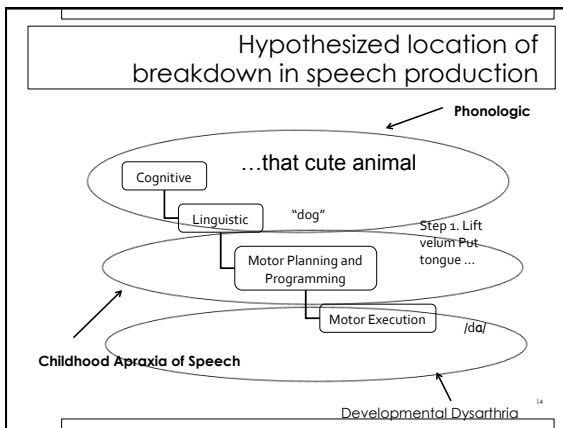
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Nature of the Deficit	
<p><b>Definition of CAS</b></p> <p>(ASHA, 2007)</p>	<ul style="list-style-type: none"> <li>• "a neurological childhood (pediatric) speech sound disorder,</li> <li>• in which the precision and consistency of movements underlying speech are impaired</li> <li>• in the absence of neuromuscular deficits (e.g., abnormal reflexes, abnormal tone). . . .</li> </ul>

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Three contexts in which it occurs

- **Idiopathic** – Unknown origin
- **Syndromic** - In association with complex neurobiological disorders of a genetic or metabolic nature – e.g., Fragile X, Galactosemia, Autism
- **Acquired** – e.g., intrauterine stroke, infection, trauma

(ASHA, 2007)

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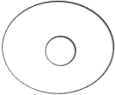
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*The core impairment in planning and/or programming spatio-temporal parameters of movement sequences results in errors in speech sound production and prosody."*

(ASHA, 2007, p. 2)

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**Discriminative characteristics to help in CAS diagnosis**

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

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

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

- kangaroo [kæŋgəʊ], [kæŋgəku], [kæŋgəwuk]
- elephant [ɛlɪzənt], [ɛlɛðɪŋk], [ɛlɛsɪŋk]
- dinosaur [daɪnəsɔː], [hɛlɛɪsɔː], [daɪnəsɔː]
- teeth [tiː], [tɪs], [tɪt], [tɛf], [tæf]
- umbrella [ʌmbrɛdə], [ʌnbɛlə], [ʌmbædə] (Dodd, 1995)

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### Observations of inconsistency in younger children

- Observations of speech samples will more often be available for judging than 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 will become particularly valuable to note given the generally early age at which these are acquired

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### 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
- Possible reasons for underestimations:
  - Dialect variation influencing our attention to vowels
  - Lack of attention to vowels on typically used measures for SSD identification/description

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2. Lengthened and disrupted coarticulatory transitions

- ❑ These characteristics probably contribute to perceptions of stress and other prosodic abnormalities
- ❑ Their identification in the ASHA Technical report due to the use of acoustic analyses in addition to perceptual ones in the literature
- ❑ Clinically depends 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)
  - ❑ May be related to observations of "groping"

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

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Graphic representation of equal, excessive stress

	'banana'			'puppy'	
Correct Stress					
Excessive Equal Stress					

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Let's listen to child with Shelley Velleman

- Production of several words and sentences
- Notice stress patterns

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Speech Production Needs

<u>Needs Shared by all Severe SSDs</u>	<u>Additional Needs Specific to CAS</u>
<ul style="list-style-type: none"><li>• Reduction in phonological simplifications</li><li>• Increased phonetic/phonemic inventory</li><li>• Generalization/Motivation</li></ul>	<ul style="list-style-type: none"><li>■ Attention to Motor Learning</li><li>■ Attention to specific kinds of errors that are relatively rare<ul style="list-style-type: none"><li>• Vowels</li><li>• Prosody</li></ul></li></ul>

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**II. Treatment Planning across Severe Speech Sound Disorders**

- Approaches with wide applicability

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Shared areas of concern for all severe SSDs

- Speech Production
- Oral Language
- Preliteracy skills (Phonological Awareness)
- Written Language
- Communication!!!!




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**Shared Speech Production Goals**

1. Minimizing phonological patterns that simplify speech
2. Increasing C and (V) inventory
3. Addressing motivational and generalization concerns

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**4 approaches for targeting phonological patterns**

- ▣ **Minimal pairs** (Baker, 2010)
- ▣ **Interventions based on complexity** (Baker & Williams, 2010) – *although these are less well-tried on children with severe speech sound disorders*
- ▣ **Cycles** (Prezas & Hodson, 2010)
- ▣ **Modified cycles** (Almost & Rosenbaum, 1998)

Chosen from 7 approaches with 6 or more intervention studies supporting them that primarily focus on process use (Baker & McLeod, 2011a)

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**Shared Speech Production Goals**

1. Minimizing phonological patterns that simplify speech
- 2. Increasing C (and V) inventory**
3. Addressing generalization concerns

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2 major steps to increasing the phonetic/phonemic repertoire

**STEP 1.** Move sounds from unstimulable to stimulable

**STEP 2.** Have those sounds incorporated into words

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FOR STEP 1

**Stimulability Treatment**

- Child is presented with a cast of characters, a set of colored drawings, and a set of gestures paired with target phonemes
- Imitation of sounds in isolation is encouraged, but not demanded
- Examples
  - /s/ - Silly Snake "slinkily move finger up arm"
  - theta - Thinking Thumb "tap thumb on chin"
  - /p/ - Putt putt Pig "hands move in a skating motion"
  - /m/ - Munchie Mouse "Push lips together and rub tummy"

(Miccio & Elbert, 1996; Williams & Miccio, 2010)

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Session Organization



- ✓ Elicit 1/3 of stimulability probe (5 min)
- ✓ Review of characters and their sounds (5 min)
- ✓ Activity I: Go fish (10 min)
- ✓ Activity II: Guess my card (10 min)
- ✓ Activity III: Spinner game (10 min)
- ✓ Elicit 1/3 of stimulability probe (5 min)

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FOR STEP 2

Core Vocabulary

- ▣ Primarily developed for children with "inconsistent disorder" by Dodd et al.
- ▣ Idea is to stabilize productions
- ▣ So that phonological interventions can be more effective
- ▣ Identified as an intervention with at least 6 studies by Baker & McLeod (2011a)
- ▣ (Crosbie, Holm, & Dodd, 2005; Dodd, Holm, Crosbie & McIntosh, 2010)

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Core Vocabulary:

An informal implementation

- Identify a small set (3 to 10) of highly useful words
- Work to obtain "best possible" production
- Familiarize conversational partners with these so that the child is encouraged to use them

Benefits: improved intelligibility as well as practice of emerging sounds




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**Shared Speech Production Goals**

1. Minimizing phonological patterns that simplify speech
2. Increasing C and (V) inventory
- 3. Addressing generalization and motivation concerns**

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**Preventing/Coping with burnout**



- Make treatment relevant to intrinsically important activities
  - Curricular demands
  - Social demands
- Involve the older child in planning:
  - Goal selection
  - Stimuli
  - Reinforcement
  - Termination criteria
- Consider planned "vacations" away from treatment

Other ideas?

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**III. Special treatment planning issues in CAS**

- New & Developing Treatments for CAS
- Attention to Motor Learning
- Special Problems - Vowels, Prosody

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○ Speech Motor Learning

Recommendations from the motor learning & motor speech disorders literature

(Maas, Robin, Hula, Freedman, Wulf, Ballard, & Schmidt, 2008).

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**1. Provide many practice opportunities**

**Practice** - (i.e., trials or carefully organized repetitions)

// other skilled motor practice

“Practica hace al maestro”

“Practice makes perfect.”

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**(2) Use distributed versus massed practice, especially initially**

**Distributed** – many shorter sessions; rather than **massed** - longer, fewer sessions)

Probably the single most common recommendation re: CAS

// Development of difficult motor skills of any kind and difficult cognitive tasks of any kind –

“thou shalt not cram for tests”

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**(3) Initially, block trials of like stimuli; later, randomize trials**

Let's do a thought experiment, comparing the following mathematical tasks:

21/3 21/3 21/3 12/2 12/2 12/2 32/4  
32/4  
versus  
21/3 12/2 32/4 12/2 21/3 32/4 12/2  
32/4

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**4. Initially begin with a small stimulus set**

**5. Use facilitators**

- Choral/simultaneous production
- Tactile cues

**6. Slowed rate, that is then normalized and finally varied**

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**3. Modifications to the Cycles approach**

Components of the original approach

- Auditory stimulation (formerly "bombardment")
- Production practice opportunities for a given phonological pattern (e.g., final consonants) for a small number of words
- Cueing allowed, but generalization is expected; in part because words are chosen that are emerging in production

(Hodson & Paden)

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Adaptations to increase motor learning

- o Increase number of trials
- o Use a smaller set of words (a relatively small set is already recommended)
- o Carefully arrange timing between model and the child's attempt and lengthen if successful; shorten if not
- o Use other facilitators
  - o Slowed rate
  - o Tactile and gestural cues

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New/Developing Interventions

1. **Dynamic Temporal & Tactile Cueing**  
(Integral stimulation; Strand & Skinder, 1999)
2. **Combined Approach** (Iuzzini & Forrest, 2010)
3. **PROMPT** (Hayden, Eigen, Walker, & Olsen, 2010)

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*1. Dynamic Temporal and Tactile Cueing (DTTC)*

An articulatory approach designed to facilitate lots of movement practice

- Aimed at the most severe of the severe
- Demands ability to focus child on drill activity
- Focuses on functional communication

(Rosenbek et al, 1973; Strand & Skinder, 1999; Strand, Stoeckel, & Baas, 2006)

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- Uses imitation of productions that increase in length and complexity beginning at level where success is expected
- Cueing strategies include slowing rate, simultaneous production, and tactile/gestural cues
- More treatment data than others

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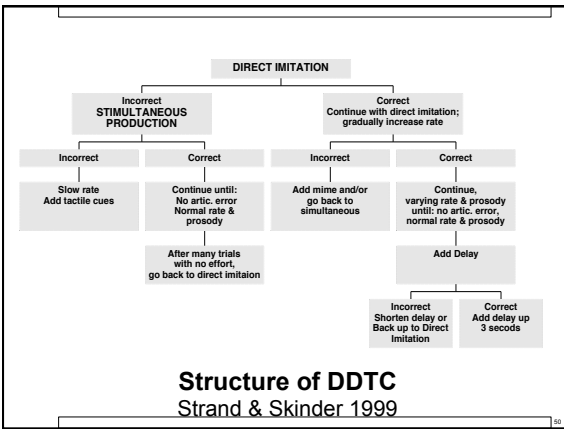
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Let's take a look at a video clip

- © Edythe Strand, Consultant at the Mayo Clinic
- © Child with severe CAS and some degree of dysarthria

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**2. Combined approach using stimulability and core vocabulary**

- **Stimulability (ST) + modified Core Vocabulary approach (mCVT)**
- **Feedback** – First immediate & continuous, then variable (every 3 trials on average)
- **Structure of sessions**
  - **Stimulability Treatment**– 10 min. –
  - **Modified Core Vocabulary Treatment**– 45 min.
  - Both components used imitation then spontaneous

(Tuzzini & Forrest, 2010)

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**More on each component**

- **Stimulability Treatment**
  - Used nonstimulable sounds
  - Taken off the list once 90% correct production; then that sound cued in the mCVT
- **mCVT**
  - Used 30 words containing target sound(s) – meaningful and commonly used by the child (names, family, action words, etc).
  - Target sounds – Used at least once IMF

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**Special speech production problems**

**Not common problems and may persist after sound system is intact**

1. Prosody
2. Vowels

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# 1. Prosody

- Suprasegmental characteristics of speech, including phrasing, rate, and stress
- Frequently assessment is quite subjective; however, better methods are emerging (e.g., PEP-C – Peppe, forthcoming)
- What are you most likely to see? **Equal-excessive stress** (Shriberg, Aram, & Kwiatkowski, 1997)

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- Sometimes thought to be a response to treatment, rather than an intrinsic aspect of CAS
- Recommendations for avoiding the problem in treatment
  - Avoid prolonged use of abnormal stress patterns, e.g., TI GER for “tiger” instead of Tiger
  - Vary prosodic features, e.g., pitch and loudness as soon as articulation is okay

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## Treating Lexical Stress

- Represent syllables with blocks and stressed syllables with a different color than unstressed syllables
- Work on stress identification  
rhi**NO**cerous
- Use backward chaining of multisyllabic words  
bik-->**A**-bic-->sy**LLA**bic--> tisy**LLA**bic—  
multisy**LLA**bic

Velleman (1998, 2002)

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Treating Sentential/Phrasal Stress

- Work on identification of stressed word in a sentence (beginning with exaggerated emphasis)
- Use blocks as for lexical stress and consider backward chaining for phrases & sentences
- Practice contrasting stress in words/phrases with contrastive stress (e.g., blackBOARD vs BLACKboard)

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## 2. Vowels

- Begin with stimuable vowels
- Auditory bombardment
- Treat one vowel at a time
- Consider facilitators such as
  - Choral production
  - PROMPT
  - Cued Speech

Gibbon & Beck, 2002; Hall et al., 1993

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- Follow a traditional hierarchy of activities, beginning with detection, discrimination through production in more difficult contexts
- Minimal pair therapy (after successful production)

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Visual aids to illustrate vowel contrasts

**Shapes**  
e.g., rounded vs. unrounded

**Movement**  
Monophthongs vs. diphthongs (truck standing still vs. moving)

**Color**  
All vowels; back vowels; front vowels, etc

**Computer programs**  
IBM Speechviewer includes 2 and 4-phoneme contrasts



(Gibbon & Beck, 2002; Hall et al., 1993)

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**IV. Small group exercise in treatment planning**

- Read over the case study in the handouts
- Discuss your initial ideas for planning treatment in a small group including the following topics:
  - How would you incorporate principles of motor learning
  - What special areas of speech production may you want to work on
  - What other areas seem to require attention?




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References of Special Interest

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