

**TREATMENT OF CHILDHOOD  
APRAXIA OF SPEECH (CAS):  
A PRACTICAL GUIDE**

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### CHILDHOOD APRAXIA OF SPEECH (CAS)

**ASHA AD HOC COMMITTEE**

Childhood Apraxia of Speech (CAS) is a neurological (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.

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### CHILDHOOD APRAXIA OF SPEECH (CAS)

**PRAXIS**

"THE CONCEPTION AND PLANNING OF A MOTOR ACT" (Stedman, 2005)

>> **Speech Motor Planning:** The movement that the articulators plan to do, to produce a target word.

>> **Speech Motor Programming:** The specification of that movement in regards to the right direction, speed, force, and muscle tension (Strand, 2020).

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### HOW DO WE HELP PARENTS UNDERSTAND WHAT THIS MEANS FOR THEIR CHILD?

"The brain may be less efficient than others and that is why they have apraxia." (Dr. Strand - Clinical Thinking in the Management of CAS, 2022).

>> Apraxia is not a medical term. It is a way of describing the child's speech sound disorder.

>> Apraxia is a difficult speech problem and we know how to fix it.

>> Based on the motor speech assessment, we can usually let parents know that their child will be a verbal communicator.

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### HOW DO WE MAKE A DIFFERENTIAL DIAGNOSIS OF APRAXIA?

- PHONOLOGICAL?
- CAS?
- DYSARTHRIA?



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### RED FLAGS FOR CAS



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\*(Brom Speech Informal Assessment Motor Speech Assessment, 2020)

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### CHARACTERISTICS OF CAS

#### OFTEN PRESENT

- >> Limited consonant and vowel repertoire
- >> Use of simple syllable shapes
- >> Frequent omission of sounds
- >> Numerous errors; poor standard scores on articulation test
- >> Poor intelligibility

#### MORE DISCRIMINATIVE

- >> Awkward movement from one articulatory configuration to another
- >> Gropping and/or trial and error behavior
- >> Vowel distortions
- >> Prosodic errors
- >> Inconsistent voicing errors
- >> Intrusive schwa
- >> Inconsistency of word or phrase production over repeated trials (Strand, 2020)

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### SPEECH SOUND DISORDER ASSESSMENT

- 01 Detailed Parent Interview
- 02 Oral Examination: Assess structure and function and non-verbal apraxia.
- 03 Standardized Testing or Other Phonetic Inventory Method
- 04 Speech/Conversational Sample
- 05 Motor Speech Examination

Alonna Bondar, M.S., CCC-SLP - Treatment of Childhood Apraxia of Speech: A Practical Guide Strand E., Appraising Apraxia, ASHA Leader (March, 2017)

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### WHAT TOOLS CAN BE USED TO DIFFERENTIATE CAS FROM DYSPHATHRIA?

- PROCAD (Profile of Childhood Apraxia of speech and Dysarthria Feature List and Rating System). (Luzzini-Seigel, et al 2022). Open access on ASHA.
- APRXIAKIDS.ORG Link to the chart is in the resource section. Links to resources and products

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Auditory-Perceptual Feature Rating Checklist (Iuzzini-Selgel et al., 2022)					
Speech Subsystem	Speech Feature	Severity on CAS*	Speech Task 1 Word	Speech Task 2	Speech Task 3
Resonance/ Phonation (R-P)	Volume	Disyllable**	0 1 2	0 1 2	0 1 2
	Low volume or loudness decay	Disyllable**	0 1 2	0 1 2	0 1 2
	Excessive loudness	Disyllable**	0 1 2	0 1 2	0 1 2
	Excess loudness variability	Disyllable**	0 1 2	0 1 2	0 1 2
	Speech breaking	Disyllable**	0 1 2	0 1 2	0 1 2
	Effortful vocalization (nasalization)	Disyllable**	0 1 2	0 1 2	0 1 2
Rapid Phrasing (Proc)	Short phrase groups	Disyllable**	0 1 2	0 1 2	0 1 2
	Abnormal voice quality (breathy, hoarse, strained)	Disyllable**	0 1 2	0 1 2	0 1 2
	Phonatory instability	Disyllable**	0 1 2	0 1 2	0 1 2
Articulation (Art)	Slow rate	Both**	0 1 2	0 1 2	0 1 2
	Abnormal prosodic modulation	Disyllable**	0 1 2	0 1 2	0 1 2
	Excessive vocal effort	Both	0 1 2	0 1 2	0 1 2
	Stuttering	CAS**	0 1 2	0 1 2	0 1 2
	Syllable segmentation	CAS**	0 1 2	0 1 2	0 1 2
	Imprecise articulatory precision	Disyllable**	0 1 2	0 1 2	0 1 2
Subsystems involved	Consistent distortions	Both**	0 1 2	0 1 2	0 1 2
	Voicing errors	Both**	0 1 2	0 1 2	0 1 2
	Voicing errors	Both**	0 1 2	0 1 2	0 1 2
	Devoicing errors	CAS**	0 1 2	0 1 2	0 1 2
	Glossing (articulatory switching)	CAS**	0 1 2	0 1 2	0 1 2

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	Increased difficulty with multisyllable words	CAS**	0 1 2	0 1 2	0 1 2
	Difficulty with initial artic. config(s)/ (translatory movement) distance	CAS**	0 1 2	0 1 2	0 1 2
Resonance (Res)	Fluctuating resonance	Both**	0 1	0 1	0 1
	Consistent hypernasality (with/without nasal emission)	Dysarthria	0 1	0 1	0 1
Dys-only features TOTAL					
CAS-only features TOTAL					
Subsystems involved			<input type="checkbox"/> R-P <input type="checkbox"/> Res <input type="checkbox"/> Proc <input type="checkbox"/> Artic	<input type="checkbox"/> R-P <input type="checkbox"/> Res <input type="checkbox"/> Proc <input type="checkbox"/> Artic	<input type="checkbox"/> R-P <input type="checkbox"/> Res <input type="checkbox"/> Proc <input type="checkbox"/> Artic

Rating scale: 0 = not present, 1 = occasionally present during task (i.e., noted in the notes but not pervasive throughout task), 2 = consistently present (i.e., pervasive throughout speech task; judged to be characteristic of CAS) \*only for Non-Resonance features and/or segment (R) present (I-I\* 2012; 2014\*\* \*Iuzzini-Selgel et al., 2012, 2017)

Child's Name \_\_\_\_\_ Clinician's Name \_\_\_\_\_ Date of Evaluation \_\_\_\_\_

Auditory-Perceptual Feature Rating Checklist (Iuzzini-Selgel et al., 2022)

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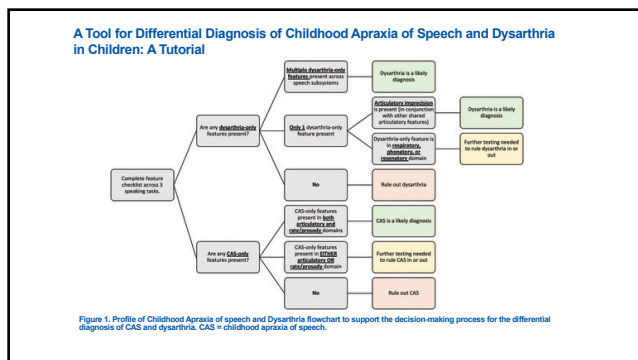
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**ASSESSING FOR NON-VERBAL ORAL APRAXIA (NVOA)**

Ask a child to perform oral movements on command.

4 = imitates immediately      3 = groping or sequential effort then success  
 2 = imitates after delay      1 = could not imitate

	BLOW	FUCKER	SMACK LIPS	COUGH	KISS
SCORE					

Dr. Edythe Strand, Clinical Thinking in the Management of CAS, 2022



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**THE DYNAMIC EVALUATION OF MOTOR SPEECH SKILL (DEMSS)**

It assesses vowel and articulatory accuracy at each level from CV and VC up to multi-syllabic words. Prosody is also assessed. Cueing is given at each level and scores are given for responses pre and post-cueing.

It is a criterion-referenced test.  
(Strand and McCauley, 2019)

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**BJOREM SPEECH INFORMAL MOTOR SPEECH ASSESSMENT**

- Comprehensive informal assessment tool
- Provides information on how to complete a full assessment for CAS
- Cueing techniques to elicit the target sound
- The assessment is comprised of words with target sounds at various levels of word complexity. Starts with simple CV and VC words and goes up to more complex CVCVCV (i.e. volcano).
- An early CAS red flags checklist is included.

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**MOTOR SPEECH ASSESSMENT**

- Assesses the child's ability to imitate utterances of increasing length and phonetic complexity
- Provides cueing guided by the principles of motor learning
- Assesses child's consistency on repeated production
- Assesses multi-syllabic words, which can highlight prosodic errors.
- Is the child placing stress on the correct syllable?

(Strand and McCauley, 2008)

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**INFORMAL PLAY BASED ASSESSMENT**

- Intake information
- Play with child with preferred toys
- Probe the sounds and words that child reportedly can say
- Probe new combinations of those sounds
- Probe sounds not in child's repertoire
- Write down the cueing that the child responded to for each word
- What movement sequences did the child have difficulty with

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**SPEECH SAMPLE AND TEST RESULTS**

- Normal developmental phonological pattern errors (i.e. fronting and stopping)
- Non-developmental errors (i.e. use of a favorite sound or initial consonant deletion)
- Children with CAS also use fewer vowels, simplify diphthongs, and produce vowel distortions.
- Inconsistent productions over repeated trials

(Strand and McCauley, 2008)

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**"BUY BOBBY A PUPPY"**



- Differentiates CAS from a phonological disorder
- The phrase is short and contains sequences of voiced and voiceless bilabials and vowels.
- It taxes vowels, voicing, prosody and coarticulation
- The SLP models the phrase "Buy Bobby a puppy" 5x while looking at a picture
- Record the child's productions and listen for inconsistencies

(Luzzini-Seigel, et al. 2017)

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**Proper diagnosis leads to effective treatment.**

If treated with a language-based therapy approach, the child will not progress.

Treat suspected CAS as a **motor planning** disorder.

Treat it with **principles of motor learning**.



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**DTTC CUEING HIERARCHY**

**Simultaneous Production:**

Child needs to look at you and say it at the same time as you. Stretch out the sounds and slow down the rate, as needed. Then work up to normal rate.



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### DTTC CUEING HIERARCHY

**Direct Imitation of the Word:** This will be difficult, as imitation skills are poor in children with CAS.

**Delayed Imitation of the Word:** This step helps the child take ownership of the word and rely less on cueing.

**Spontaneous Production:** Child can produce the word without any cueing. This can be in answer to a question (i.e. showing a picture and asking 'What is this?' or having the child fill in a sentence such as 'an airplane flies...up').

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### PROMPT & DTTC

Providing Surface PROMPTS to guide her through all the movements sounds in the word.

Working on /k/ and the diphthong /ai/

Then provided parameter support by holding her jaw to allow her to access lip and tongue movements.



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### GOALS OF TREATMENT

01 Work on **movement between sounds** (not on isolated sounds!)

02 Build muscle memory

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**"SPEECH IS MOVEMENT MADE AUDIBLE."**

It involves the coordination of four movement subsystems.

Motor speech disorders can affect all subsystems.

- >> Articulation: control tongue, lips and jaw
- >> Phonation: control voicing
- >> Respiration: breath control for speech
- >> Resonation: oral or nasal sound



\*Quote from R.H. Stetson on Motor Phonetics (1928)

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**FRAMEWORK FOR TREATING CAS**

- >> Work with principles of motor learning
- >> Use multi-sensory cueing
- >> Practice target words during play or other functional activity.
- >> Do not repeat or bounce sounds.
- >> Do not use non-speech exercises to work on the motor planning of speech sounds.

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**PRACTICE CONDITIONS:  
PRINCIPLES OF MOTOR LEARNING**

**MASSED PRACTICE**

Practicing a given number of trials or sessions in a small amount of time.

**DISTRIBUTED PRACTICE**

Practicing over a long period of time. Spreading the sessions out.

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(Mass et al, August 2008)

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During massed or distributed practice, you must choose between the following methods:

**CONSTANT VS. VARIABLE**

**BLOCKED VS. RANDOM**

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**CONSTANT PRACTICE**

- Initially, constant practice will lead to quicker motor performance.
- >> Generally refers to the repetitive practice of a target word.
- >> The same target in the same context (i.e. /b/ in the initial position of CV words)
- >> Practicing the target sound with one or two vowels or consonants (i.e. *hat* and *hi* or *my* and *bye*, although for some children this would be difficult)
- >> Keeping the rate, pitch, and intonation constant

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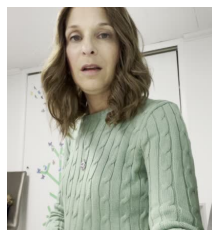
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Working on the word "I'm" in constant practice.

Practiced in a phrase

Same phrase throughout the activity

Large block of practice.



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**VARIABLE PRACTICE**

Variable practice will lead motor learning.

- >> Vary the rate, volume, pitch, and intonation of the targets. This is done at every level of the DTTC hierarchy.
- >> Practice the target with different communication partners in different settings.
- >> Use a larger number of sounds to build your target words.
- >> Practice similar words (i.e. *snap* and *snack*).

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**VARIABLE PRACTICE:**

Practicing a variety of /th/ words.



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**OVERGENERALIZATION**

The child produces the target sound or word in place of other sounds in other words.

- >> Can occur when a sound or word is practiced too much before bringing in other sounds or words
- >> Shows that the child's system is changing
- >> It's tricky to figure out when it's the right time to add more sound combinations to the target word list.
- >> Trial new sound combinations and see if they child can work on both simultaneously.

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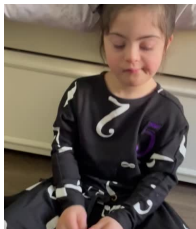
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>> Changing the vowel  
 >> Practiced each word in a short blocked practice  
 >> Practiced both words in the same activity  
 >> Can even add one more vowel to increase variability (i.e. through)



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**BLOCKED PRACTICE**

Practicing one target word in a separate successive block of time.

**RANDOM PRACTICE**

Random practice includes practicing several target words at the same time.

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**WHAT DOES A BLOCK OF PRACTICE LOOK LIKE?**

>> **Blocks of Practice:** practicing the word in a block of time  
 >> Each block can be made up of smaller blocks.  
 >> Edythe Strand recommends 20–40 repetitions of each word in each large block.  
 >> Those small blocks can look different for each child.  
 >> Can add in extra practice of a word by adding an extra block

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**WHAT DOES A BLOCK OF PRACTICE LOOK LIKE?**



- >> If the reinforcer is quick, I may only elicit one repetition per piece to the toy. Other times, I elicit 3-5 (or more!).
- >> Other times, I can hold up my hand and count my fingers to get (5) repetitions.
- >> Generally, it's optimal to elicit many repetitions in a row before the child gets distracted with play.

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**WHAT DOES A BLOCK OF PRACTICE LOOK LIKE?**

There is no set number of trials for each block. It will depend on the severity of CAS, difficulty with the particular target and how long the child is in DTTC therapy.

This chart is from Dr. Strand's course "Clinical Thinking in the Management of CAS" (2022).

TARGET UTTERANCES	PRACTICE BLOCK 1	PRACTICE BLOCK 2	PRACTICE BLOCK 3	PRACTICE BLOCK 4	PRACTICE BLOCK 5	PRACTICE BLOCK 6
HI	25-40 trials			25-40 trials		
BYE		15-20 trials				
MOM			15-20 trials			
MINE					15-20 trials	
NO						15-20 trials

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**HOW DO WE KNOW WHEN A WORD IS "DONE?"**

**We do probe testing.**

- Probe the target words at the same time each probe session.
- Elicit each of your target words 5-10 trials to test progress.
- The context in which you elicit the word should be consistent (i.e. direct imitation, spontaneous in answer to a question).
- Frequency of probing:
  - If treatment is 1-2x a week, then probe once a week.
  - If treatment is 3-5x a week, then every 3rd session.
- Discontinue word when child receives a score of 80-90% over 3 sessions

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Taken from Clinical Thinking in the Management of CAS, Edythe Strand

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**GUIDE GIVEN BY DR. GRIGOS FOR SCORING**

**MULTIDIMENSIONAL SCORING:**  
 0 = wrong  
 1 = close, mild vowel distortion or awkward movement  
 2 = correct

(S) STIMULI						SCORE
HI	0	0	0	1	0	1
BYE	0	1	0	0	1	2
MOM	1	1	2	1	2	7
MINE	0	0	0	0	0	0
NO	0	0	1	1	1	3

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 Taken from Clinical Thinking in the Management of CAS, Edythe Strand

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**DECISION MAKING PROCESS**

**ACQUISITION**

Massed  
Constant  
Blocked

**GENERALIZATION**

Distributed  
Variable  
Random

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**TARGET SELECTION**

- >> Look at the child's current sound repertoire and create a small set of target words.
- >> Developmental norms are not a criteria for target selection
- >> Meaningful and functional to the child
- >> Choose 5-10 words.
- >> Work on vowels!
- >> Work on words that have different syllable shapes.

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Teaching a new word with a consonant and a vowel that she already produces in another word.



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**MEANINGFUL WORDS**

- 01 Their name, siblings' names
- 02 Favorite toys
- 03 Upcoming events
- 04 Holiday words



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**TIPS FOR ELICITING REPETITIONS**

- POWER WORD/TOY LIST
- QUICK REINFORCERS
- TOYS WITH PIECES
- BOOKS WITH REPETITIVE WORDS OR PHRASES
- OPEN-ENDED TOYS

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### POWER WORD LISTS

<p style="text-align: center; background-color: #c8e6c9; margin: 0;"><b>HI</b></p> <ul style="list-style-type: none"> <li>Animal Bingo</li> <li>Present Toy</li> <li>Haystacks Toy</li> <li>Dear Zoo</li> </ul>	<p style="text-align: center; background-color: #c8e6c9; margin: 0;"><b>/E/ VOWEL</b></p> <ul style="list-style-type: none"> <li>Red: Magnetic Chips</li> <li>Head: Powerpoint</li> <li>Bed: Boom Cards</li> <li>Egg: Easter Eggs</li> </ul>
<p style="text-align: center; background-color: #c8e6c9; margin: 0;"><b>EAT</b></p> <ul style="list-style-type: none"> <li>Feed Animals</li> <li>Hunger Caterpillar Book</li> <li>Can Sort Eat &amp; Not Eat</li> <li>Boom Card Eating Deck</li> </ul>	<p style="text-align: center; background-color: #c8e6c9; margin: 0;"><b>/F/</b></p> <ul style="list-style-type: none"> <li>Four: Magnetic Chips</li> <li>Five: High Five</li> <li>Find: I-Spy Book</li> <li>Fly: Animals/Little People</li> </ul>

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### OPEN-ENDED TOYS



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### TOYS WITH PIECES



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**QUICK REINFORCERS**



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**BOOKS WITH REPETITIVE PHRASES**



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**HIDE PIECES IN SENSORY BOX**



**USE MOVEMENT**



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**MULTI-SENSORY CUEING TECHNIQUES**

- >> Visual, auditory/verbal, and tactile
- >> Gives the child information as to how the sound is produced
- >> Cues support the child through the movement sequence in the word.
- >> The type of cueing that is provided will depend on what level the child is at.



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**MULTI-SENSORY CUEING TECHNIQUES**

- Cueing is not a one-size-fits-all approach.
- The child's specific needs must be carefully assessed.
- Look and listen to how the child is producing the sounds.
- Each child may need different cueing:
  - Different syllable shapes
  - In the beginning of treatment vs. the end
  - In the beginning of the therapy session vs. the end
- The cues that can change even within the practice of a target word. **It's dynamic.**

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**VISUAL CUES**

- The child looks at the clinician's face
- Point to the specific parts of the face
- Work on initial configuration
- Sound cue cards
- Syllable pictures
- Dry erase markers
- Mirror
- Hand cues

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**AUDITORY / VERBAL CUES**

- >> Phonetic cue
- >> Phonetic placement cue
- >> Semantic cue
- >> Use a metaphor



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**USING SOUND CUE CARDS**

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**USING A MARKER BOARD WITH CUE CARDS**

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**USING SOUND CUE CARDS WITH POINTING TO FACE**

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**USE A PICTURE CUE**

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**USE A HAND CUES**

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GIVE A VARIETY OF VISUAL CUES

- >> My hands are on my face.
- >> My lip movements are exaggerated.
- >> "You are watching my face."
- >> Holding toys up to my mouth to show him that lips go together.



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TACTILE CUES

Children who have co-morbidities, such as dysarthria, or more severe apraxia, will need **increased tactile cueing**.

The tactile cueing provides more information to their compromised system about the placement of the articulators and the movement from one sound to the next.

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TACTILE CUES

- >> PROMPT: takes the child through all the sounds in the word
- >> Touch cue method
- >> Margaret Fish has a detailed list of tactile cues for each phoneme (Fish, 2016).
- >> Use a specific set of tactile cues for each sound

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**VERBOTONAL CUEING**

A system for stimulating speech sounds developed by Elizabeth Ying, M.A. CCC-SLP, co-director, Shelley and Steven Einhorn Audiology and Communication Center, at the Center for Hearing and Communication.

**This was not developed for use with motor speech disorders.**

Pair gross body movements which have distinctive features such as time, intensity, tension, pause, space, and duration.

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Very useful for distinguishing between voiced and unvoiced sounds, and for vowels.

Difficult to use these cues to work on movement between sounds.



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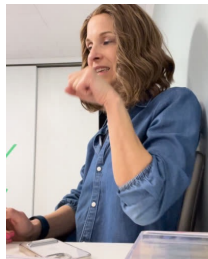
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**FOWARD CHAINING**

- >> The initial sound/syllable in the word is produced incorrectly.
- >> Pull that sound/syllable out of the word and practice it before putting back into the word.
- >> The downward fist for /d/ is a verbotonal cue.



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**BACKWARD CHAINING**

- >> The final sound/syllable in the word is produced incorrectly.
- >> Pull that sound/syllable out of the word and practice it before putting back into the word.



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**FEEDBACK**

- >> Important cueing technique
- >> Provides information about the production of the sound or word so the child can use that information when producing the word again
- >> Initially, we give the feedback right away and then delay it so the child can take ownership of the movement.

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**KNOWLEDGE OF PERFORMANCE**

Provides specific information as to the accuracy of the movements

(Tinklenberg, 4, 2011, p. 47 of 1992)

**KNOWLEDGE OF RESULTS**

Provides information as to the overall movement sequence

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<b>KNOWLEDGE OF PERFORMANCE</b>	<b>KNOWLEDGE OF RESULTS</b>
	
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**FADING CUES**

- >> Cues are necessary to facilitate imitation of the target word.
- >> Fade the cues as quickly as possible so the child does not become cue-dependent.
- >> You may need to fade and then bring back the cue within the same set of trials.

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**FADING CUES**

- When you are using a variety of different cues, you can fade one as you use a different cue to support the child.
  - Give the child a hint by holding up a sound cue card.
  - Point to the location on your face where the sound(s) are produced.
  - Provide the first sound of the word

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- >> Semantic cue "as?"
- >> Hold hand to my face
- >> Say the first sound



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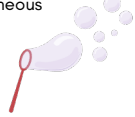
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As you start to fade cues you will work on spontaneous production of the word.

- Delayed Imitation (part of DTTC hierarchy)
- Spontaneous Productions:
  - Hold up the item (e.g. bubbles).
  - Ask the child - "What do you want?" or "What do you want me to do?"
- Use a carrier phrase such as "ready, set, \_\_\_\_."



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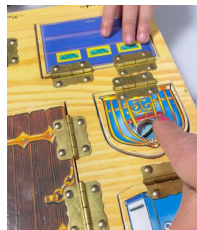
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**DELAYED IMITATION**



**ASKING A QUESTION**



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**CARRIER PHRASE**



**SELF-CORRECTION**



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**DELAYED FEEDBACK:**

She was looking at me to provide feedback.

I waited a second or two before commenting.



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**VOWEL PRODUCTION IN EARLY SPEECH**

- >> Infant babbling consists of consonant-vowel (CV) syllables.
- >> Use of jaw close-open movement
- >> This is the movement of a baby uses for sucking or mastication.
- >> The infant lacks control of independent movements of the other articulators (e.g. lips and tongue)

(Kim and Davis, 2021)



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- The infants produced these “intrasyllabic CV patterns” which consist of consonants and vowels that have “articulatory compatibility” or also known as **facilitative context**.
  - Labial consonants with front vowels (i.e. bʌ)
  - Alveolar or coronal consonants with front/high vowels (i.e. di)
  - Velar or dorsal consonants with back vowels (i.e. go)
- From 12-36 months, these preferences decrease.

(Kim and Davis, 2021)

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### VOWELS

>> Children with CAS often have difficulty producing vowels accurately.

>> Vowel errors are a more discriminative characteristic of CAS

>> It might sound like the child has an accent.

>> These errors are very common and can significantly impact intelligibility.

>> Errors include distortions, substitutions, and reduction of a diphthong.

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### VOWEL QUADRILATERAL

>> Shows the position of the tongue and jaw for pure vowels.

>> Vowels are not as visible as consonant sounds

>> Vowels need vocal fold vibration.

>> The changes in the motoric movement for most pure vowels are very subtle.

A diphthong is a syllable made up of two vowels. Jaw starts low for the first vowel and comes up for the second vowel. For example: the /aɪ/ sound as in the word “eye” are the sounds /a/ and /ɪ/ combined.

Courtesy of Dr. Kelly Farquharson

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**CORNER VOWELS:**

At the corners of the diagram and represent extreme tongue positions:

High/Front  
Low/Back

Courtesy of Dr. Kelly Farquharson

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**VOWEL CHART**  
GENERAL NORTH AMERICAN ENGLISH

i	ɪ	e	ɛ	æ
key	fish	gate	bed	cat
ɔ	ʌ	ɜ	ə	ɑ
quack	butter	bird	run	shoes
o	oʊ	ɔ	ɔ	ɑ
book	boat	caught	pot	ice
ɔ	ɔ	ɔ	ɔ	ɔ
cow	boy			

FRONT VOWELS: i e ε æ  
CENTRAL VOWELS: ʌ ə ɜ ə  
BACK VOWELS: u ʊ o ɔ ɑ  
DIPHTHONGS: ai əʊ ɔɪ oʊ eɪ

ROUNDED: ɔ o ɔ u  
UNROUNDED: i e ε æ a

HIGH: i ɪ ɜ ʊ u  
MID: e ɛ ʌ ə o ɔ  
LOW: æ ɑ

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Worked on distortion for /ε/ in again.

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**Apraxia Therapy**

Both diphthongs, /aɪ/ and /aʊ/, are reduced to the first vowel of /a/.



*sometimes I hear my but we gotta get mine*

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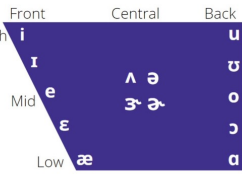
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**FACILITATIVE CONTEXT:**

Practicing the target sound in a context that can support the accurate production of that sound.

Pair vowels with consonants that have the same tongue position to facilitate correct production of either sound.



Courtesy of Dr. Kelly Farquharson

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**ASSESSMENT OF VOWELS**

- >> Standard articulation tests do not assess vowels.
- >> Assess the vowels in various syllable structures.
- >> Important to look at the movement of the lips, tongue, and jaw to determine their role in the vowel errors.
- >> Neutral rest posture is key to supporting proper movement.
- >> Be aware of dialectal differences.

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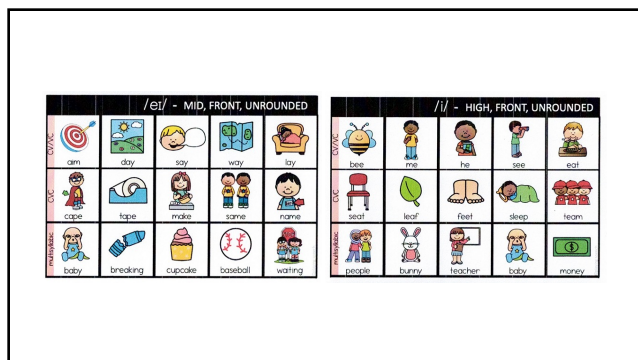
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### HOW TO STRUCTURE THERAPY FOR VOWEL PRACTICE

- >> Make a list of the vowel errors.
- >> Choose a small target word list with meaningful and powerful words.
- >> Combine the vowel with consonants already in the child's repertoire.
- >> Don't accept mediocre productions (i.e. muh vs. me).

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- Practice the target vowel using principles of motor learning and use multi-sensory cueing.
- How do we choose the target words (aside from meaningful)?
  - Initially, start with constant practice. Same vowel with one or two consonants (i.e. *hi* and *bye*) with the same syllable structure.
  - Then, add more consonants for variable practice (i.e. *mine*, *fine*, *nine*).
  - Then, increase the number of vowels

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**THERAPY TECHNIQUE FOR VOWELS:**

- >> Chaining is an effective technique to elicit a correct production in a syllable.
- >> Compare and contrast the target vowel with the error sound.
- >> Use minimal pairs to show the incorrect production.



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- >> Working on the neutral vowel /ɛ/ controlling the jaw movement
- >> Used chaining



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- >> Working on lip rounding in the phrase "new one"
- >> Used backwards chaining



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>> Both /i/ and /I/ are high, front vowels.  
 >> Contrast is in the lip movement and tongue tension.



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









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 Bell	 Bale	 Pop	 Pup
 Tell	 Tail	 Dock	 Duck
 Well	 Whale	 Cot	 Cut

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>> It may be necessary to teach vowels in isolation such as with sound effects (i.e. 'uh oh' in songs, Old MacDonald, *If All the Raindrops*, animal and vehicle sounds).\*

>> Pam Marshalla has a free video on Youtube where she demonstrates hand cues paired with lip movement to teach vowels.

>> Turtle vowels is a program from Easy Does it for Apraxia Preschool that teaches vowels through gross motor cues.

Fish, 2016 Alonna Bondar, M.S., CCC-SLP - Treatment of Childhood Apraxia of Speech: A Practical Guide

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**REPETITIVE SONG: SONG/VOCAL PLAY**

- >> Joint attention
- >> Pausing
- >> Motor movement to increase attention
- >> Holding object to my face
- >> Sound imitation
- >> Feedback
- >> Fun!



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*/w/ and /y/ are considered semi-vowels.*

Production of the sounds */w/* and */y/* are shaped by the vowel that follows it.

- >> The */w/* is facilitated by producing the */u/* sound and then blending into the vowel following it (i.e. *wet* is produced as 'oo-eh-t').
- >> The */y/* is facilitated by producing the */i/* sound and then blending into the vowel following it (i.e. *yes* is produced as 'ee-eh-s').
- >> Forward and backward chaining are useful cues for teaching these sounds.

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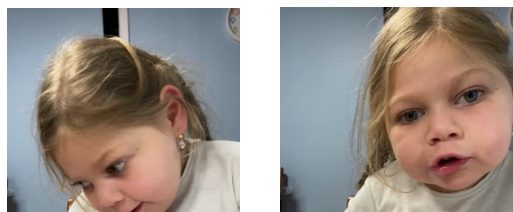
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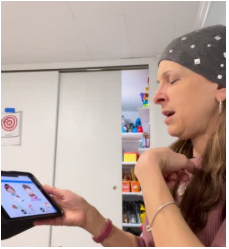
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Working on the phrase "you do it" with varied intonation.



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**THERAPY IDEAS FOR VOWELS AT THE PHRASE LEVEL**

Children with CAS will often break down more at the phrase level. It's important to practice phrases with the same words that you worked on in isolation.

The best way to figure out what phrases to use is to listen to the child during conversation.

Carrier phrases remove the cognitive load.

>> /ai/ sound can engage child in a hide and find game or I-Spy book.  
 >> /i/ sound: any toy with boxes or doors (i.e. "What's in?," "It's a \_\_\_\_.")

Turn-taking games such as Go Fish or Guess Who

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**VOWEL DISTORTIONS IN PHRASES**



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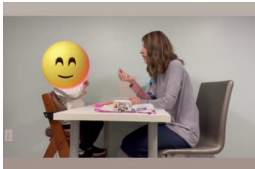
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/æ/ vowel is distorted.

"I can do it" is a common phrase.

Marble on our chins as a cue to open mouth wider



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**WORK ON RHYMING WITH THE TARGET SOUND**

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**WHAT DIFFICULTIES DO WE SEE IN SCHOOL-AGE CHILDREN WITH CAS?**

<b>01</b> Residual articulation errors	<b>06</b> More difficulty at the phrase level
<b>02</b> Phonological pattern errors	<b>07</b> Delayed language skills
<b>03</b> Vowel errors	<b>08</b> Prosody/robotic speech
<b>04</b> Voicing errors	<b>09</b> Reading difficulties
<b>05</b> Difficulty with multi-syllabic words (physically producing the word, prosody)	

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**ARTICULATION/PHONOLOGICAL ERRORS**

- >> Child demonstrates typical articulation errors (i.e. an /r/ distortion or a lisp).
- >> Child demonstrates phonological errors (i.e. stopping, fronting).
- >> Sometimes, it is atypical like initial consonant deletion or a sound substitution that is not a developmental phonological pattern error.
- >> The child may first be diagnosed with CAS when they come to you to work on articulation.

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**ARTICULATION ERRORS**

What does treatment look like for this child?

**USE PRINCIPLES OF MOTOR LEARNING**

- >> Blocked vs. random practice
- >> Constant vs. variable practice
- >> Facilitative context
- >> Multi-sensory cueing
- >> Carefully selected feedback
- >> Building in prosody work

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**VOWEL ERRORS**

- >> May not have been identified with a traditional articulation assessment
- >> The errors may not be consistent
- >> Parent will report that child sounds like they have an accent
- >> Affects intelligibility especially at the phrase level

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**MULTI-SYLLABIC WORDS**

- >> We may see more metathetic errors which are reversing sounds like *pasketti (spaghetti) or efelant (elephant)*.
- >> Syllable deletion in multi-syllabic words
- >> Places the stress on the wrong syllable which **changes the meaning of the word** (i.e. PREsent (noun) vs. preSENT (verb)).

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**LINGUISTIC ISSUES SEEN IN CHILDREN WITH CAS**

- >> Word sequencing errors, omission of function words (i.e. preposition, conjunction - *and, or, but*), and reduced mean length utterance
- >> Morphological errors (i.e. omitting plurals, past tense, present progressive form *-ing*)
- >> It has been suggested that the above errors are due to the child reducing the complexity of the word shape.
- >> However, other linguistic errors have been noted as well that are not linked to complex syllable shapes. (EXAMPLE: pronouns, auxiliary substitutions - *is* for *are*) and verb omissions in sentences.

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- Move from single words to phrases. Choose words that represent different parts of speech
- Work on grammatical morphemes (i.e. *-ing, plural nouns*). Choose targets that are easier for the child
  - For verbs, you can choose a verb ending that can be represented with a picture. For example, if the verb ends with *-wing* (such as *chewing*), you can cue with a picture of a wing.
  - For plurals: consider words without cluster i.e. *ducks* and words ending in */s/* sound vs. */z/* i.e. *cups* vs. *shoes*
- Match target words to the child's cognitive abilities i.e. higher level negation words

Fisk, 2016

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**OTHER CONSIDERATIONS**

- >> Child's language skills may be a mismatch for his motor planning skills
- >> Child may substitute a word when he has difficulty saying the target word or says "I don't know"
- >> Residual articulation or phonological errors can be addressed with a more traditional therapy approach
- >> Produces omissions of sounds when producing the word in phrases

Fish 2016

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**WHY DO CHILDREN WITH CAS HAVE DIFFICULTY WITH READING & SPELLING?**

POOR SPEECH MOTOR PLANNING

POOR PHONOLOGICAL SKILLS

DIFFICULTY SEGMENTING & DECODING WORDS

POOR LANGUAGE SKILLS

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**READING AND CAS**

Sixty-five percent of the children with SCAS had poor reading skills compared to 24% for children with SSD and no SCAS.

Miller & Lewis, 2019

Reading difficulties appear to be a combination of poor language skills and poor phonological skills.

Poor language representation and awareness skills:

- >> Possibly due to decreased vocalizations in infancy
- >> Children without SSD, who had reading difficulty, improved their phonological awareness skills by school age
- >> Many children with reading difficulty do not have phonological awareness deficits

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**WHAT SKILLS SHOULD WE WORK ON TO PREPARE CHILDREN WITH CAS FOR READING**

Phonological awareness is an awareness that the words that we speak can be taken apart. It is about hearing the sounds in the word.

Margie Gillis - readingrockets.org

- >> Work on **phonological awareness** which is the *ability to manipulate the spoken parts of words, including syllables and phonemes.*
- >> Phonological awareness is a critical skill for reading development.
- >> Children with CAS may have trouble with the perception-production link.

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**WHAT SKILLS SHOULD WE WORK ON TO PREPARE CHILDREN WITH CAS FOR READING?**

**Phonemic awareness** is the ability to identify & manipulate individual sounds in a word.

- >> **Decoding:** sound to letter correspondence, develops by Kindergarten
- >> **Segmenting Words:** pulling apart the sounds in the word
- >> **Blending:** opposite of segmenting

The child needs to learn to take apart words in a sentence and break down multi-syllabic words.

- >> Counting out syllables in a word
- >> Counting out words in a sentence

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**WHAT SKILLS HELP WITH PHONOLOGICAL AWARENESS?**

**RHYMING**

Shelly Velleman gives some rhyming tasks that don't require verbal output:

- >> Point to a word that rhymes with *cat*
- >> Asking if (2) words rhyme (written word & listening)

Word Families

Identifying beginning, final, and then middle sounds in words

Adding, subtracting, and substituting sounds to make new words

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### WORKING ON PHONOLOGICAL SKILLS WITH CAS

- >> Can be challenging as we are supposed to work on the movement between sounds and not on individual sounds
- >> You can break apart the word and teach each sound and then blend it back together
- >> Using an integrative approach of phonological awareness skills with PML seem to help children in areas of speech, reading and spelling

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### ACTIVITIES THAT WORK ON BOTH PHONOLOGICAL SKILLS & SPEECH PRODUCTION

#### FINAL CONSONANT DELETION

- >> Use colored blocks to represent the sounds not letters (i.e. short & long vowels, diphthongs are two vowels, etc.)
- >> Use minimal pairs (i.e. go vs. goat)
- >> Use blocks to show the omission of the final sound

#### INITIAL CONSONANT DELETION

*Mall vs. Small                      Top vs. Stop*

#### WORKING ON /TΣ/ (CH) SOUND

This says *rain* make it say *train*.

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### RESOURCES

- >> **Reading Rockets:** The website has a mini-course on teaching phonological and phoneme awareness. You can receive a certificate of completion.
- >> **Word Families Word Wheels**
- >> **Allaboutlearningpress.com:** This blog has downloads and ideas for fun ways to work on phonological skills.

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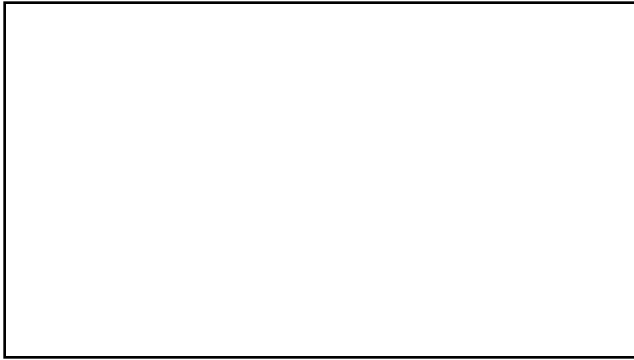
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**CASE STUDY**

Three year; 9 month old boy receiving speech therapy for almost (2) years.

- >> Poor attention to formal assessment
- >> Most productions were obtained informally
- >> Mom sent me videos before the assessment.
- >> Assessment tools: DEMSS, park scene and play

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**CASE EXAMPLE**

These were the errors that the child produced consistent with CAS:

- >> All diphthongs were reduced to the first vowel (i.e. /ai/ as in *hi* produced as *ha*).
- >> Several vowel distortions
- >> Inconsistent productions of the same words
- >> Atypical sound substitutions
- >> Equal stress in (2) syllable words

His attractor state was a high fixed jaw position with too little degrees of freedom demonstrated the phonological error pattern of stopping of the /f, s, z, sh/.

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**CASE EXAMPLE**

**INITIAL TARGET SELECTION:**

- >> *hi, bye, yummy, whee*
- >> He was stimulable for /y, w/ and they both occurred in his name and he was unable to produce his name.
- >> Use DTTC and PROMPT, he was saying his name within a few sessions.
- >> /o/ was the next target as he was distorting two power words - *no* and *go*
- >> Started addressing the phonological errors because “stopping” is a pattern that highly affects intelligibility

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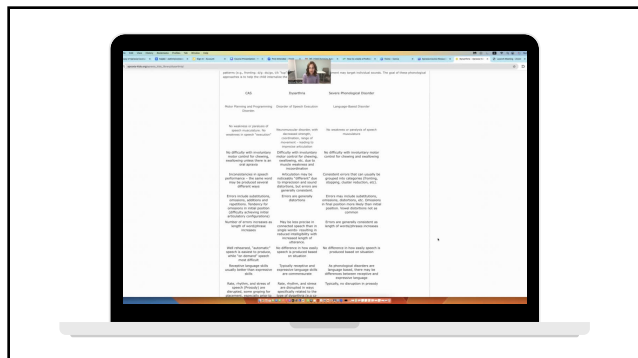
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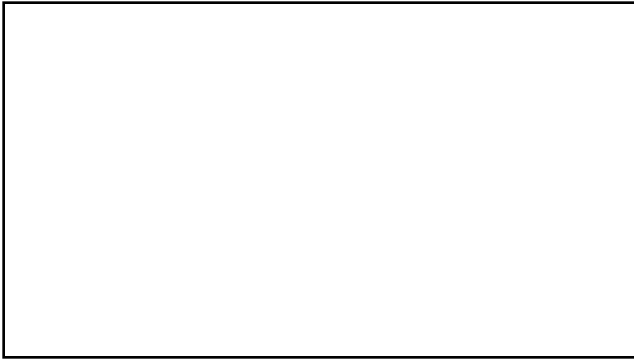
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