# Practical Therapy Techniques for Persistent and Resistant Speech Sound Errors

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## Today is For You!

- Please consider turning on your camera
- Participate (Cameras, Unmute, Chat, Breakout rooms)
- Have fun!

2

1. Please let us know where you are from
2. What are your goals for today?

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## Today's Agenda

9:00 Central Time: Begin
10:30 Morning Break (announcements and 10 minute break)
12:00 - 1:00 Lunch
~2:10 Afternoon 10 minute break
~ 3:30 Seminar finishes

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Margo Kinzer Courter, MBA, MA, CCC-SLP, BCS-CL

*About your Presenter:*

- *35 years experience PreK-12th*
- *Board Certified Specialist - Child Language and Language Disorders*
- *Past: National Facilitator for LETRS*
- *Specialty Areas: Speech and Language Disorders and impact on learning*
- *Author of :*

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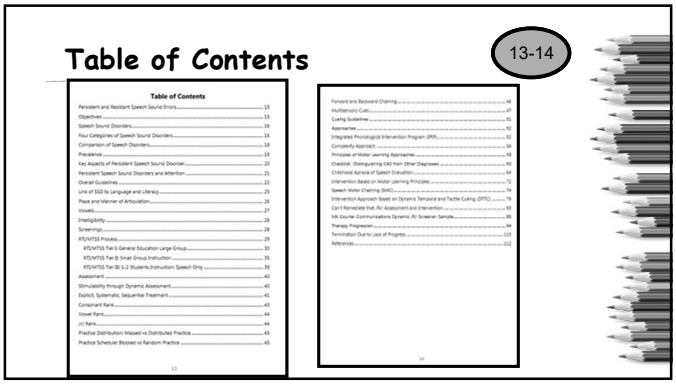


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## Breakout Room: Activity 1

1. In the breakout room, discuss the following
2. Assign a spokesperson to report out to the group.

Discussion:

1. What approach(es) do you use for SSD?
2. Are there particular diagnosis, sounds, processes, etc. that you see that become persistant and resistant?
3. When it is a persistent speech sound disorder, do you do anything differently with your intervention?

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## Overview

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- ✗ All of us have stories of students with persistent speech sound disorders
- ✗ Why? (developmental vs. neurological, attention, executive function, etc.)

This workshop will provide several systematic approaches to finally remediate those speech sounds.

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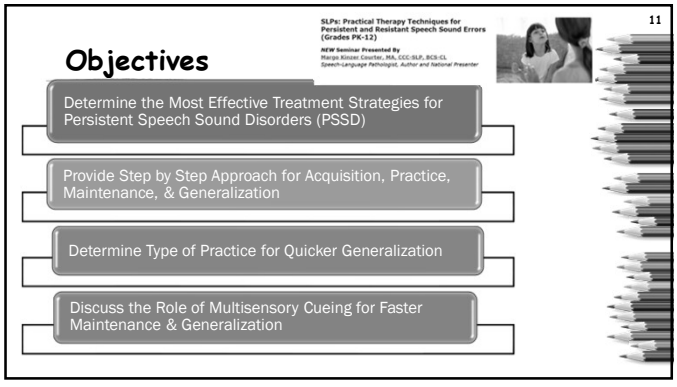


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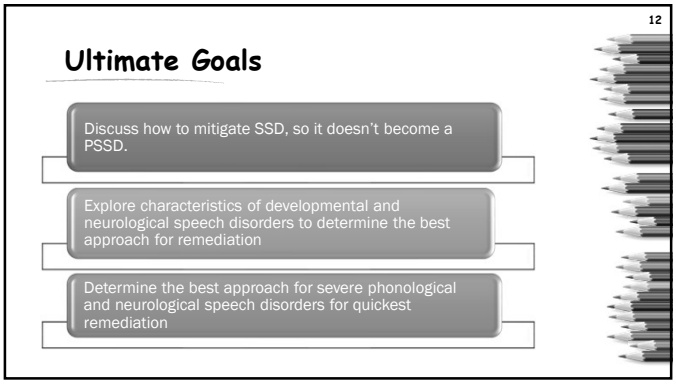


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## Speech Sound Disorders (ASHA)

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Any difficulty or a combination of difficulties with:

- ❑ Perception (ability to perceive the sound correctly),
- ❑ Motor production (ability to motor plan sequence of sounds), or
- ❑ Phonological representation (rules and patterns) of speech sounds and speech segments (i.e.: VC/CV/CVC),
  - ❑ including phonotactic rules governing permissible speech sound sequences in a language

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## Speech Sound Disorders can be

- ✗ Functional/developmental (no known cause) such as articulation (motor) and phonological processing (linguistic)
- ✗ Organic (developmental or acquired)
  - Neurological such as childhood apraxia of speech (CAS) (motor planning) and dysarthria (muscle weakness)
  - Structural such as cleft palate
  - Sensory/Perceptual such as with hearing impairment

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## 4 Categories

| Speech Sound Errors (Articulation) | Phonological Process |
|---|---|
| **Omissions:** Doesn't produce a sound in a word (ub for tub)<br><br>**Substitutions:** A very common speech sound error is the substitution (tun for sun) '<br><br>**Distortions:** Distortions are when a child uses a non-typical sound for a typically developing sound (i.e.: lateral and frontal /s/ and /z/) | **Substitutions**<br>• Backing (/k/ and /g/ for /t/ and /d/)<br>• Fronting (/t/ and /d/ for /k/ and /g/)<br>• Gliding (/r/or /l/ becomes a /w/ or /l/ becomes a /y/sound<br>• Stopping (fricatives and affricates are produced with a stopped consonant like /p/, /b/, /t/, /d/)<br>**Assimilation**<br>• Assimilation (bub for bus)<br>• Denasalization (dap for map)<br>• Final Consonant Devoicing (bat for bad)<br>• Prevocalic Voicing (gat for cat)<br>**Syllable Structure**<br>• Cluster Reduction (/n/ for /sn/, /b/ for /bl/, etc.)<br>• Final Consonant Deletion (do for dog)<br>• Initial Consonant Deletion (og for dog)<br>• Weak Syllable Deletion (nana for banana) |

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## 4 Categories

| Childhood Apraxia of Speech | Dysarthria |
|---|---|
| Limited repertoire of vowels | Slurred or distorted speech production |
| Variability of errors | Imprecise articulation |
| Idiosyncratic patterns | Uneven speech rhythm |
| Errors increase in longer words or utterances | Difficulty with pitch or loudness control |
| Voicing errors | |
| Prosody errors | |

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## Comparison of Speech Disorders

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| | Neurological | | Developmental | |
|---|---|---|---|---|
| Characteristics | CAS | Dysarthria | Phonology Disorder | Articulation |
| Inconsistent errors on consonants (repeated production) | ✓ | | | |
| Inconsistent errors on vowels (repeated production) | ✓ | | | |
| Decreased vowel production | ✓ | | | |
| Disrupted coarticulation transitions between sounds and words | ✓ | | | |

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| | Neurological | | Developmental | |
|---|---|---|---|---|
| Characteristics | CAS | Dysarthria | Phonology Disorder | Articulation |
| Increased errors in longer more complex sequences | ✓ | | | |
| Decreased strength of oral motor musculature | | ✓ | | |
| Motor control for chewing and swallowing | If oral apraxia is presented ✓ | ✓ | | |
| Articulatory precision | Inconsistent in the same word | Imprecision but consistent | Consistent errors but rule based | Consistent sound errors |

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| | Neurological | | Developmental | |
|---|---|---|---|---|
| **Characteristics** | **CAS** | **Dysarthria** | **Phonology Processing** | **Articulation** |
| Types of errors | substitutions, omissions, additions, repetitions. vowel distortions, voice/voiceless consonant errors | distortions | Rule based i.e.: final consonant deletion | Substitutions, omissions, additions, repetitions. |

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| | Neurological | | Developmental | |
|---|---|---|---|---|
| **Characteristics** | **CAS** | **Dysarthria** | **Phonology Processing** | **Articulation** |
| Errors based on length of utterance | ✓ | Less precise in connected speech | consistent | consistent |
| Receptive and Expressive Language | Could have gap with receptive higher | No discrepancy | Sometimes a difference | No difference typically |
| Prosody - lexical and phrasal stress) | Disrupted ✓ | Disrupted based on type (spastic, flaccid, etc.) | No disruption | No disruption |

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## Comparison of Speech Disorders

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|---|---|---|---|---|
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## Prevalence

1. In 8-year-old children, 3.6% were estimated to have persistent SSDs (Wren et al., 2016).
2. Persistent and residual speech sound errors are estimated in 1-2% of all children (Culton (1986)
3. In young adults, 1%–2% exhibit residual or persistent speech errors (Flipsen, 2015).

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## Prevalence

4. Reports estimated that SSDs are more prevalent in boys than in girls, with a ratio of about 2:1 in grade school children (McKinnon et al., 2007). There were no indications whether the data collected were based on sex assigned at birth and/or gender identity.

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## Persistent Speech Sound Disorders

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Persistent Speech Sound Disorder (PSD) is a speech sound disorder that cannot be easily remediated and resistant to traditional speech therapy methods that continue beyond the typical age of acquisition, often lasting into adolescence or adulthood.

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## Persistent Speech Sound Disorders

1. PSD may be due of a
   a. history of speech delays
   b. history of normal speech sound development but failure to achieve accurate production of one or two particular speech sounds, or history of motor speech impairment (e.g., Shriberg et al., 2010, 2017) and
   c. may have accompanying deficits in motor, language, and literacy skills (Cabbage, et al., 2016; Wren et al., 2016).

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## Persistent Speech Sound Disorders

2. Children with PSD demonstrate linguistic, literacy, and social deficits and have higher rates of LI than those children with resolved SSD (Bishop et al., 2003; Lewis et al., 2015, 2016)

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## Persistent Speech Sound Disorders

3. Early childhood factors that are associated with PSD include little or no babbling, unintelligible speech, limited morphology at 38 months, low cognition, neurobiological conditions (e.g., hearing loss, intellectual disability, cerebral palsy), and a history of coordination problems and poor motor skills and males (Bishop, 2002; Campbell et al., 2003; Eadie et al., 2015; Lewis et al., 2011; Wren et al., 2016; Wren, Roulstone & Miller, 2012).

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## Persistent Speech Sound Disorders

4. Children with PSSD at 7 years did NOT find SES, IQ, family history, language, or gender to be predictive of PSD; rather,

children with disordered speech (not delay) at 4 years were more likely to have PSD at 7 years than children with delayed speech (Morgan et al., 2017).

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## Key Aspects

- ✗ Variability
- ✗ Etiology
- ✗ Associated Difficulties
- ✗ Long Term Impact

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## Key Aspects

Variability

- ✗ Residual distortions (i.e.: /r/, /s/, /l/)
- ✗ Production of multisyllabic words
- ✗ Neurological impairments such as CAS

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## Key Aspects

Etiology

- Known (genetics, hearing loss, physical structure, neuromotor)
- Unknown (considered functional/developmental

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## Key Aspects

Associated Difficulties

- Motor
- Language
- Literacy

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## Key Aspects

Long Term Impact

- Motor
- Language
- Literacy

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## Persistent Speech Sound Disorders and Attention

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1. Children with moderate-severe SSD had
   a. higher ratings on the inattention and hyperactive/impulsivity scales as rated by their parents than children with no SSD.

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## Persistent Speech Sound Disorders and Attention

2. Listening to speech when our attention is divided across multiple tasks is typically referred to as listening under cognitive load. It can also affect the processing of acoustic cues to speech sound categories (Chiu et al., 2020; Feng et al., 2021; Mattys & Wiget, 2011).

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## Persistent Speech Sound Disorders and Attention

3. Under cognitive load, as evidenced by poorer discrimination of speech sounds across a category boundary (Chiu et al., 2020; Mattys & Wiget, 2011) or a shallower identification curve (Feng et al., 2021) under divided attention conditions than when attention is focused only on the relevant speech perception task.

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## Persistent Speech Sound Disorders and Attention

4. Norrelgen et al. (1999) found participants with ADHD exhibited speech discrimination difficulties as compared to neurotypicals only when exposed to two- to five-syllable nonword pairs, a pattern attributed to higher sensitivity to working memory load, but not in a discrimination task with monosyllables.

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## Overall Guidelines

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- ✗ Developmental Norms
- ✗ Impact
- ✗ Implications for Treatment Timing

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## Keep in Mind

**IT'S NOT ABOUT LEARNING THE SOUND YOU TARGET. IT'S ABOUT TRANSFORMING THE WHOLE SOUND SYSTEM**

Dr. Holly Storkel

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## Developmental Norms

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McLeod and Crowe (2018/2020) reviewed 60 articles describing 64 studies of consonant acquisition. This included 26,007 children from 31 countries in 27 languages. In all 27 languages, most consonants were acquired by 5:0 with at least 93% of consonants produced correctly. The following chart provides English consonant acquisition across the world (Australia, Republic of Ireland, Malaysia, South Africa, United Kingdom, and the United States) with correct production (https://pubs.asha.org/doi/10.1044/2018_AJSLP-17-0100)

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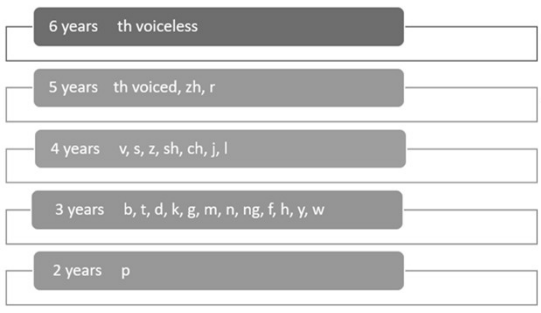


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## Previous Norms

Many SLPs used Sanders norms from 1972 which was actually a based on research from Wellman et al. (1931) and Templin (1957) which described "customary" versus "mastery" production of English consonants based on research, Sander defined customary production as "that point when a child is producing a sound correctly more often than [s]he is misarticulating or omitting it" (p. 56). This also included /r/ in place for 90% of children by age 6.

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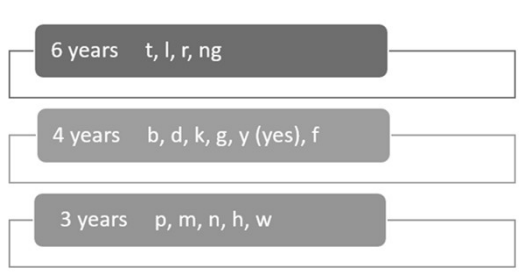


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## Impact

- ✗ Even mild SSD may reduce communication opportunities
- ✗ Teacher's expectations (academic, social, and behavioral
- ✗ Listener's negative reaction
- ✗ Communication Disorders:
  - Lower skills jobs
  - More likely to be unemployed (up to 43%)
  - 44% for speech disorders that impact intelligibility are in the lowest income strata

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## Implications for Timing

1. Social isolation & teacher perception and expectations
2. Children as young as 4-5 demonstrated success acquiring later developing sounds (Krueger & Storkel, 2023)

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## Implications for Timing

3. Regarding phonological disorders, there is a period of
   - ✗ accelerated change from 4 to 6 years old,
   - ✗ followed by a plateau from 6 to 7 years old.
   - ✗ period of accelerated change from 7 to 8.5 years old,
   - ✗ final stable plateau beginning at 8.5 years old

(Shriberg, Gruber, and Kwiatkowski, 1994)

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## Implications for Timing

4. Early intervention to reduce impact on language and literacy and overall negative educational outcomes
   - Phonological awareness can be impacted by SSD
   - Spelling and decoding

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## Implications for Timing

5. Children with persistent speech errors achieved lower educational attainment throughout adolescence based on standardized educational assessments when controlling for IQ (Wren et al., 2021).
   - One reason for these poor outcomes is that phonological awareness skills is often impacted in children with SSD which leads to difficulty with literacy acquisition (Hesketh, 2004).
   - At older ages are learning how to read and having difficulty with even one speech sound can impact their spelling and decoding abilities (Farquharson, 2019).

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## Link of SSD to Language & Literacy

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- ✗ Phonological/phonemic awareness, phonological memory, spelling, word reading
- ✗ Lower morphological awareness
  - Which is a unique predicter of spelling abilities

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## Place and Manner of Articulation

Place and Manner (including vowels) can support treatment decisions.

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| | Manner of Articulation | Bilabial | Labio-dental | Dental | Alveolar | Palatal | Velar | Glottal |
|---|---|---|---|---|---|---|---|---|
| Obstruents (consonants produced with obstruction or turbulence) | Stop Voice | p | | | t | | k | |
| | Stop Voiceless | b | | | d | | g | |
| | Fricative Voice | | f | θ | s | ʃ | | h |
| | Fricative Voiceless | | v | ð | z | ʒ | | |
| | Affricate Voice | | | | | ʧ | | |
| | Affricate Voiceless | | | | | ʤ | | |
| Sonorants (relatively free & continuous airflow) | Nasal Voiced | m | | | n | | ŋ | |
| | Liquid Voiced | | | | l | r | | |
| | Glide Voiced | w | | | | j (y) | | |

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## Considerations

1. Continuants may be easier to perceive as correct or incorrect

2. ? Is the student having difficulty with a specific manner or place of articulation?

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## Considerations

3. Contrastive Therapy

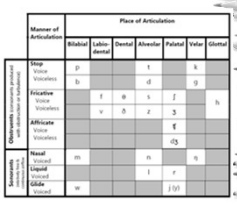
Minimal pairs for discrimination – consider place, manner, and voicing changes

Minimal opposition: 2 of the three may be the same (ring/wing, cape/tape manner and voicing are the same, place is different)

Maximal opposition: all three are different

(chain/main (i.e.: compare obstruent /f/ with sonorant /l/)

Example on next slide



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| | Liquid Voiced | | | | l | r | | |
| | Glide Voiced | w | | | | j (y) | | |

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## Considerations

4. Change of place of articulation (bilabial /b/ in bag to velar /g/ in gag)

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## Vowels

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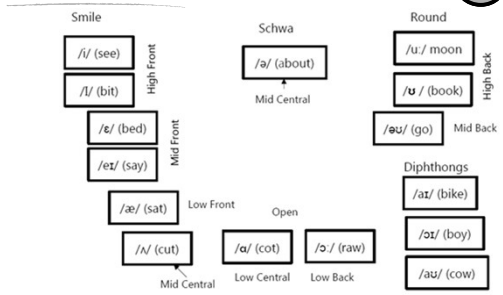


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## Intelligibility to Unfamiliar Listener

| Single Words | Multiword |
|---|---|
| 50% by 2;7 (31 months)<br>75% by 4;1 (49 months)<br>90% by 6;11 (83 months) | 50% by 2;10 (34 months)<br>75% by 3;10 (46 months)<br>90% by 5;2 (62 months) |

Hustad et al. (2021)

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## Screenings

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- ✗ All preschool and kindergarten should have speech, language, and hearing screening
- ✗ Kindergarten through 2nd grade
  - If new to the district
  - Teacher referral
- ✗ Dynamic assessment
  - ✗ Without cueing
  - ✗ Different cues with two occurrences for sounds in error

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## Screenings

- ✗ Imitates
  - Isolation
  - Multiple word positions
  - Multiple vowels
  - Multisyllabic

Consider: place and manner of articulation

- ✗ Stimulability
  - Can produce the target in 3 or more attempts correctly
- ✗ Nonstimulable
  - Less than 3
  - Multiple vowels
  - Multisyllabic

Phonemes that are stimulable are more likely to develop

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## Possible Screeners

- ✗ Fluharty
- ✗ Speech and Language Screener Quick Take Along (SuperDuper, $19.95)
- ✗ Little Bee Speech

https://drive.google.com/file/d/1UQ8AL55W5sTJilc12IeOWUw7Y2nBSfFa/view?usp=sharing (screen and PA)

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## Documentation

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**Hearing**
- ☐ WNL
- ☐ Rescreen

**Language**
- ☐ Developmentally appropriate
- ☐ Delayed
  - Rescreen
  - Tier I intervention (whole class)
  - Tier II intervention (small group)

**Speech**
- ☐ Intelligible
  - First time without cueing
- ☐ Unintelligible
  - Unintelligible with first level cue
  - Unintelligible with second level cue
  - Rescreen in _____months
  - Tier I intervention (whole class)
  - Tier II intervention (small group)

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## RTI/MTSS

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- ✗ Before referral for special education to determine if referral is warranted
- ✗ Cannot be used to delay or deny evaluation for special education services

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## RTI/MTSS

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includes:
- ✗ Universal screening
- ✗ High-quality instruction
- ✗ Interventions matched to student need
- ✗ Frequent progress monitoring, and
- ✗ The use of child response data to make educational decisions

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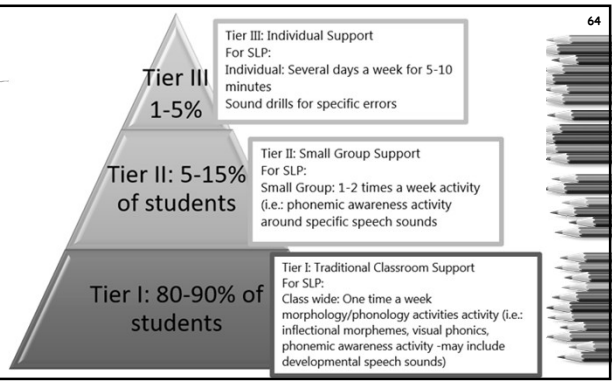


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## Tier I: General Education/Large Group

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- ✗ PreK, K, 1: Whole class morphology/phonology lesson one time per week by collaboration SLP/teacher

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## Tier I: Phonemic Awareness

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Kirk and Gillon (2007) provided an integrated speech, phonemic awareness, and letter knowledge intervention approach to children with SSD. They found that *children who received an intervention that facilitated phonemic awareness and letter knowledge in addition to speech sound production outperformed children who received an intervention for speech sound production alone*

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## Tier I: Phonemic Awareness

- Developmental Activity (Moats/Tolman) (Include developmental speech sounds for that age group in phonological/phonemic and morphological awareness activities)
- Great site for activities: https://fcrr.org/student-center-activities

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## Order of Acquisition: Phonological Awareness

| Age | Skill | Activities |
|---|---|---|
| 4 years | Rote imitation of rhymes and alliteration | https://sooperbooks.com/rhymes/ |
| 5 years | Rhyme recognition (which word does not belong) | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/vpk_phonological_awareness/PA1_cards_color.pdf |
| | Recognize phonemic change in a word (Brown Pear, Brown Pear, What do you see? ) | |
| | Clap out syllables (Target 2 and 3 syllables then move to 1) | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/vpk_phonological_awareness/PA7_cards_color.pdf |
| 5 ½ years | Can separate a word into its phonemes (segmenting sounds in a word) | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/k1_phonological_awareness/k1_phoneme_segmenting/k1_pa040_say_and_slide_phonemes.pdf |
| | Blend onset and rhyme (c at = cat) | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/vpk_phonological_awareness/PA24_cards_color.pdf |

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## Order of Acquisition: Phonological Awareness

| | | |
|---|---|---|
| | Tell the first sound in a word | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/k1_phonological_awareness/k1_phoneme_matching/k1_pa025_one_card_out.pdf |
| 6 years | Can delete (manipulate) part of a compound word or a syllable from a two syllable word | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/vpk_phonological_awareness/PA14_cards_color.pdf |
| | Blends 2 or 3 phonemes | |
| | Segment two or three phonemes in a word | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/23_phoneme_segmenting/23_pa014_phoneme_counting_sort.pdf |
| 6 ½ years | Segment three or four phonemes in a word | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/23_phoneme_segmenting_and_blending/23_pa017_phoneme_split_and_say.pdf |
| | Manipulate (substitute) a sound in a simple word to form a new word (Change the l in lip to /s/) | https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/23_phoneme_manipulating/23_pa025_sound_changes.pdf |
| 7 years | Delete sounds in the initial and final position (not including blends) | |
| 8 years | Delete initial sounds including blends | |
| 9 years | Sound deletion for medial and final sounds | |

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## Visual Phonics

https://drive.google.com/file/d/1hAG4rDimqa_KdpLqhk9t8RQLaQa-hV_i/view?usp=sharing (IC)

https://drive.google.com/file/d/1OLQw2HX9XHAnWni6u8M6soYNhIQhn_gv/view?usp=sharing

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## Morphological Awareness

Preschool children who demonstrate deficits in morphology and speech demonstrated better **morphosyntactic competence when it was targeted before speech sound errors** (Tyler, Lewis, Haskill, 2002).

Food for Thought:

- Fronting: difficulty producing -ing
- Backing: difficulty producing /t/, /d/, /ed/ for past tense
- Cluster reduction: plural and possessive /s/ that follows another consonant (cats, dogs, dog's, cat's), superlative -est

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## Brown's MLU

https://fcrr.org/sites/g/files/upcbnu2836/files/media/PDFs/student_center_activities/k1_phonics/k1_morpheme_structures/k1_p058_inflection_toss.pdf

| Inflectional Morpheme | Age of Acquisition | Example | Common Core State Standards |
|---|---|---|---|
| Present progressive (-ing) | 27-30 months | Baby cry**ing**. | 1st grade |
| Plural regular (-s) | 27-30 months | I want car**s**. | Kindergarten |
| Possessive ('s) | 31-34 months | Sam**'s** ball. | 1st grade |
| Past regular (-ed) | 35-40 months | She walk**ed** home. | Kindergarten-1st |
| Third person regular (-s) | 35-40months | Malcolm play**s**. | 1st grade |
| Past participle (-en) (uncontractible and contractible aux. verbs) | 41-46 months | She has spoken.<br>It is written. | 2nd grade (irregular past tense) |

| Inflectional Morpheme | Grade Level Standard |
|---|---|
| Comparative (-er) and Superlative (-est) | 3rd grade |

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## Activity

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## Activity

- **Today:** She is splashing in the puddle.
- **Today:** She splashes in the puddle.
- **Yesterday:** She splashed in the puddle.
- **Tomorrow:** She will be splashing in the puddle.
- **Possessive:** It is the girl's umbrella.
- **-er and –est:** The mommy bird is bigger than the baby birds.
- (Discuss plants).

The grass is bigger than the flowers.

The tree is the biggest plant in the picture.

- **-en:** One baby bird is hidden

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## RTI/MTSS II: Small Group Instruction

37

- Students would move to small group instruction (especially preschool and kindergarten) when they demonstrate speech sound disorders and /or language delays that have not shown progress in Tier I.
- Continue to incorporate phonological/phonemic awareness activities (i.e.: Integrated Phonological Intervention Program)

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## Tier II: SSD/Phonological Awareness

- Include the speech sounds or phonological processes to adapt each activity. Use the following activities to target speech sound disorders in order to provide the support for students for literacy development.
- Begin with VC, CV, VCV, or CVC first. For medial sounds, start with simple VCVC or CVCV words. Once the student can discriminate and segment these, move to CCVC or CVCC. Then move to 2 syllable words

77

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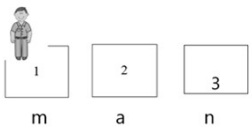
## Perceiving Phonemes



**Minimal Pairs for SSD**

| Articulation | | Phonological Processing |
|---|---|---|
| /k/ /t/ | | Fronting/backing |
| face/phase | peace/peas | bug/bud/but/buck |
| race/raise | once/ones | mug/mud/mutt, muck |
| bus/buzz | dose/does | knot/knock/nod |
| fuss/fuzz | foes/toes | tap/cap/gap |
| ice/eyes | base/bays | key/tea/ |
| place/plays | | |

https://drive.google.com/file/d/1kodXLyNHuBGIHhj8XZqQ5fvWNAPZfZTi/view?usp=sharing (dino)

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## Slide and Say

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## Tier II: Link SSD to Morphology

| | |
|---|---|
| write (wrote, written, writing, writes) | redo (redoes, redoing, redid) |
| ride (rides, riding, ridden, rode) | rain (rainier, rainiest, rains, raining, rained) |
| roam (roams, roaming, roamed) | raincoat (raincoats, raincoat's) |
| rip (rips, ripped, ripping) | robin (robins, robin's) |
| run (runs, ran, running) | |

**Inflectional Targets**

**Today:** She is writing about the rain.

**Today:** She writes about the rain.

**Yesterday:** She wrote about the fun in the rain.

**Tomorrow:** She will write about the fun she had.

**Possessive:** She writes about the rain's puddles.

**-er and –est:** It is a rainier day than yesterday. It is the rainiest day of the year.

**-en:** She has written about her day in the rain.

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| /s/ and /z/ | | Phonological process stopping |
|---|---|---|
| birds | skips | (see /s/ and /z/ list |
| grass | skipped | four leaves (how many did i color) |
| boots | sleeping | five _____ |
| coats | sleeps | flowers |
| rabbits | sleepier | the bird's worm |
| girls | sleepiest | the bird's next |
| girl's | slips | the boy's boots |
| sing | slipping | the girls' coats |
| singing | slips | this flower |
| sways | slide | them |
| swaying | slides | then |
| leaves | sliding | those |
| trees | | thick |
| glasses | | thin |
| flies | | hot |
| flying | | hotter |
| nest | | hottest |
| splashes | | the girl's chin (cheek, chapped) |
| splashing | | jump |
| flowers | | jumps |
| | | jumping |

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## RTI/MTSS Tier III: 1-2 Students Speech Only

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Sexton & Seth

| Speech Program | Total number of months in therapy | Minutes per month based on average sessions | Total number of minutes in therapy | Equivalent number of hours in therapy |
|---|---|---|---|---|
| Traditional Therapy | 18 | 210 | 3780 | 63 |
| 5-Minute Program | 9.6 | 45 | 432 | 7 |
| Differences Between Programs | 8.4 months | 165 minutes | 3348 minutes | 56 hours |

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## Assessment

Any assessment instrument (formal or informal) should be conducted as a dynamic assessment.

Any assessment instrument (formal or informal) should be conducted as a dynamic assessment. According to Rvachew, et al (2004), if a child is stimulable for the phoneme sound, they are more likely to develop the sound without intervention. Phonemes that are not stimulable are less likely to be acquired without intervention.

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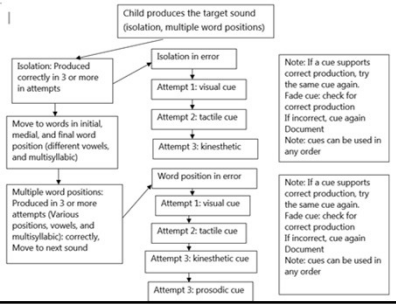
## Stimulability through Dynamic Assessment

41

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## Breakout Activity 2

Discuss the following.

Please assign a spokesperson

1. Are you currently involved in RTI/MTSS?
2. If yes, what is your involvement?
3. If no, what could you do to target SSD before adding to your caseload to attempt to remediate developmental speech sounds?

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## Explicit, Systematic, Sequential Intervention

- ✗ Explicit – Clearly defined, whatever is being targeted is clearly defined before targeting and students are informed what they are going to learn.
- ✗ Systematic– Preestablished routines that presents any element and the relationship to the whole (I Do, We Do, You Do)
- ✗ Sequential and Cumulative – Preplanned activities that build new skills on previously targeted and mastered skills
- ✗ Diagnostic – Gathering data, reviewing that data, using this data to drive what the student needs to target

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87

| | | |
|---|---|---|
| Explicit | Explain to the student what you are working on and why | cognitive–linguistic approaches seek to address how the child is thinking (cognitive) about how sounds in words affect meaning (linguistic) |
| Prepractice | Student judges production as correct or incorrect<br>Perceives the difference between minimal pairs | • May start with CV/VC<br>• Begin with continuant sounds to support understanding of concept (even if not the targeted sounds or processes)<br>• Use Multisensory cues<br>• Feedback: Phone Video, App: VowelViz/VowelViz Pro |

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| | | | |
|---|---|---|---|
| Practice Approaches:<br>* Complexity Approach<br>* IPIP<br>* SMC<br>*Based on Motor Learning | I DO: | Therapist demonstrates with several trials | • Explains<br>• Uses multisensory cues |
| | We Do: | Practice together with feedback | • Motor Planning: May start with CV/VC/CVC<br>• Phonological Processes (Complexity Approach) Start with most complex patterns (3 Cluster – if student has the 2nd and 3rd sound. 2 Clusters if not – start with /fl/ or /sl/. Once student is 80% at 2 Clusters, move to 3. |
| | YOU DO | Student practices with feedback and cueing as needed | Cueing fades as student is more successful |
| Assessment | Therapist is constantly assessing how the student is doing, what is working and not working. | | Ongoing assessment/progress monitoring. |

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## If More Than One Persistent Error: Where to Start

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- ✗ Determine frequency of occurrent in English
- ✗ Target more frequently occurring to improve intelligibility
- ✗ Consider influence of vowels

Note: If still only a couple of errors or processes, a traditional therapy approach (Minimal pairs, cycles approach may be appropriate. If multiple sound errors or processes, move to one of the approaches that we will discuss.)

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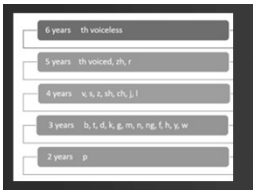
## Consonant Rank




| Rank | Phoneme | % |
|---|---|---|
| 1. | n | 11.49 |
| 2. | t | 9.88 |
| 3. | s | 7.88 |
| 4. | r | 6.61 |
| 5. | l | 6.21 |
| 6. | d | 5.70 |
| 7. | ð | 5.37 |
| 8. | k | 5.30 |
| 9. | m | 5.11 |
| 10. | w | 4.74 |
| 11. | z | 4.70 |

| Rank | Phoneme | % |
|---|---|---|
| 12. | b | 3.24 |
| 13. | p | 3.07 |
| 14. | v | 2.97 |
| 15. | f | 2.65 |
| 16. | h | 2.23 |
| 17. | g | 2.02 |
| 18. | j /ɣ/ | 1.87 |
| 19. | ŋ | 1.85 |
| 20. | r (alveolar tap - butter) | 1.76 |
| 21. | θ | 1.19 |

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## Vowel Rank

| Rank | Phoneme | % |
|---|---|---|
| 1. | ə (schwa) | 19.15 |
| 2. | I (short i) | 13.51 |
| 3. | i (long e) | 9.68 |
| 4. | ɛ (short e) | 8.41 |
| 5. | aɪ (long i) | 7.79 |
| 6. | æ (short )a | 5.91 |
| 7. | o (long o) | 4.85 |
| 8. | e (long a) | 4.13 |

| Rank | Phoneme | % |
|---|---|---|
| 9. | ʌ (short u) | 3.84 |
| 10. | ɑ (spa) | 3.75 |
| 11. | u: (oo) spoon | 2.97 |
| 12. | ɔ /au/ caught | 2.01 |
| 13. | ʊ (book) | 1.99 |
| 14. | au /ow/ | 1.69 |
| 15 | ɔi /oi/ | |

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## /R/ Rank

| Rank | Phoneme | % |
|---|---|---|
| 1. | ɚ (unstressed er) (father) | 79.61 |
| 2. | ɝ (stressed er) (sir) | 19.04 |
| 3. | ɾ (alveolar tap -butter) | 1.76 |
| | ɛr (hair) | |
| | ɑr (car) | |
| | ɔr (more) | |

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## Practice Distribution

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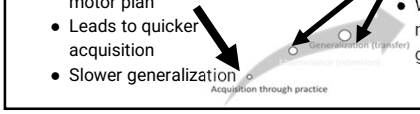
**Massed Practice**

- Practice of a certain amount of trials in a short period of time (fewer sessions/week)
- Effective to establish a motor plan
- Leads to quicker acquisition
- Slower generalization

**Distributed Practice**

- Practice is divided over time
- Spreading practice out over a longer period of time
- Works better for maintenance and generalization

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## Distributive Practice: Therapy Intensity

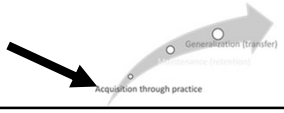
- Higher number of sessions and practice trials per session results in the greatest gains within one block of treatment.
  - Minimum intensity two sessions a week (Namasivayam, Pukonen, Goshulak, et al., 2015; Thomas, McCabe, & Ballard, 2014)
  - most articles employing sessions 3–5 times a week and 100 production trials per session (Edeal & Gildersleeve-Neumann, 2011; Murray et al., 2015). [Murray, E., and Iuzzini-Seigel, J. (2017).

95

## Blocked vs Random Practice

Blocked:

- 8-10 stimuli is presented in a block (e.g. you have 10 target words total and you practice target 1 10x, then move on to target 2 and practice 10x, target 3, etc).
- When establishing the motor plan, begin with a more blocked practice for acquisition (Shea et al., 2001) then move to random as movement accuracy improves.

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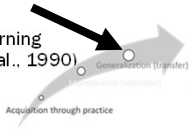
Random:

8-10 stimuli is practiced in random order (e.g. you have those same 8-10 target words, however the words are practiced in an unpredictable random order, alternate between words, phrases, sentences, structured tasks, intonation, etc).

Random practice leads to better motor learning maintenance and generalization (Shea et al., 1990)

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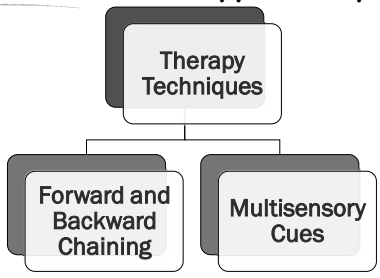
## Introduction to Therapy Techniques

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## Forward Chaining

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- Always keep the initial sound and the vowel together for coarticulation.
- Have the student state the first part
  - Provide multisensory cues
  - Could attempt simultaneous production (saying it together)
- Once the student is successful with the first part, have them state the second part
- Blend the two together.
  - May need to use cues initially
  - Fade cues as student is successful

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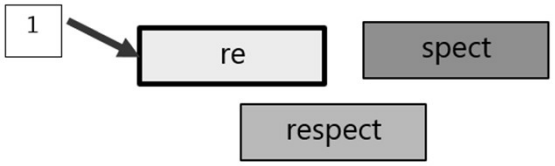
## Example: initial /r/



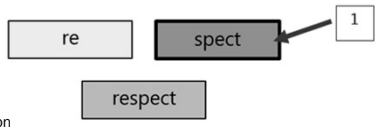

https://drive.google.com/file/d/1f61oivkTxQqTCwrJUo8mHdOkwIPqdiZ-/view?usp=sharing (cello)

https://drive.google.com/file/d/1SiwwFDd93sbDcKPaQ97rKYJJKqIfRAhx/view?usp=sharing (boat)

100

## Backward Chaining

- Consonants and vowels should be produced correctly
- Example: respect
- Re is produced correctly.
- spect is in error (i.e.: student states "spict" or "pect."
- Correct the error in the second syllable.
- Then add the first syllable. May need to continue to cue the second syllable and fade as soon as possible.




https://drive.google.com/file/d/1TlAze2ijc2hGjn3MpnuW5Yviw2xsDCIT/view?usp=sharing (stream)

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## Multisensory Cues

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- Prosodic Cues
- Tactile Cues
- Visual Cues
- Kinesthetic Cues

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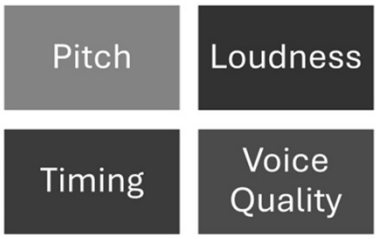
## Prosodic Cues

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## Tactile Cues

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## Tactile Cues

- https://drive.google.com/file/d/1fala_1c3lJXY0hysAaXIYgYSvYvQ6TWu/view?usp=sharing

106

## Visual Cues

https://drive.google.com/file/d/1OLQw2HX9XHAnWni6u8M6soYNhlQhn_qv/view?usp=sharing

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## Kinesthetic

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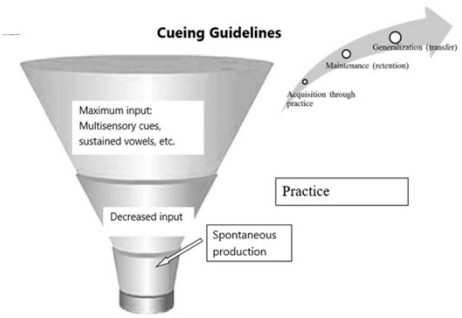
## Cueing Guidelines

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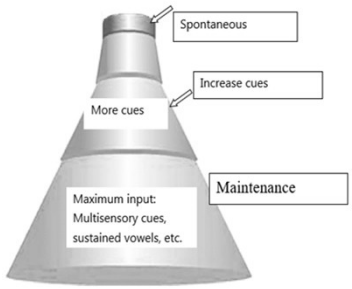
## Cueing Guidelines

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## Introduction to Therapy Approaches



Developmental/ Phonological

- ✗ Integrated Phonological Intervention Program
- ✗ Complexity Approach

Neurological

- ✗ Speech Motor Chaining
- ✗ Dynamic Temporal and Tactile Cueing
  - /R/ based on motor planning

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## Reminder

Regardless of the approach chosen intensity and number of productions is the key!

The **minimum intensity** that has been shown to work **is two sessions a week** (Namasivayam, Pukonen, Goshulak, et al., 2015; Thomas, McCabe, & Ballard, 2014) with **most articles employing sessions 3–5 times a week and 100 production trials per session** (Edeal & Gildersleeve-Neumann, 2011; Murray et al., 2015). [Murray, E., and Iuzzini-Seigel, J. (2017).

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## Integrated Phonological Intervention Program (IPIP)

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We know from the research that children with speech sound disorders are at greater risk for phonological/phonemic awareness delays, thus, delay in literacy development (Rvachew, Ohberg, & Grawburg, 2003; McCormack, et al, 2011; Tambraja, et al, 2022; Nathan, et al, 2004).

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## IPIP

Designed to facilitate speech production, phonological awareness, and sound/symbol in children ages 4-7 years with speech and language impairment. The intervention is based on activities implemented in the Gillon (2005), Moriarty and Gillon, (2006) and McNeill (2007) intervention studies.

The findings from these research investigations indicated that the program was effective in facilitating significant improvement in speech production, early reading, and spelling development in preschool children with speech impairment and in children aged 4-7 years diagnosed with childhood apraxia of speech.

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## Links: SSD to Language and Literacy

1. Reports estimated that 40% of children with SSDs had concomitant language impairment (Eadie et al., 2015).
2. Approximately 25% of children receiving school-based speech services may also qualify for reading-related services (Tambyraja et al., 2020).
3. Like children with dyslexia, a core deficit in the phonological system has been implicated in children with speech sound disorder (Anthony et al., 2011; Pennington & Bishop, 2009; Sutherland & Gillon, 2007).

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4. Studies indicate that at age 4, children with speech delay are at higher risk for impaired phonological awareness skills (e.g., rhyme matching, onset segmentation, onset matching) compared to children who are typically developing peers (Rvachew, Ohberg, & Grawburg, 2003).

5. Children whose speech production problems persist until age 6; 9 perform worse on tests of reading, spelling, and phonological awareness than controls matched for age and performance IQ (Nathan et al., 2004).

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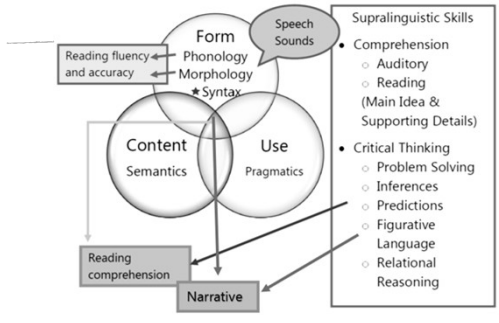


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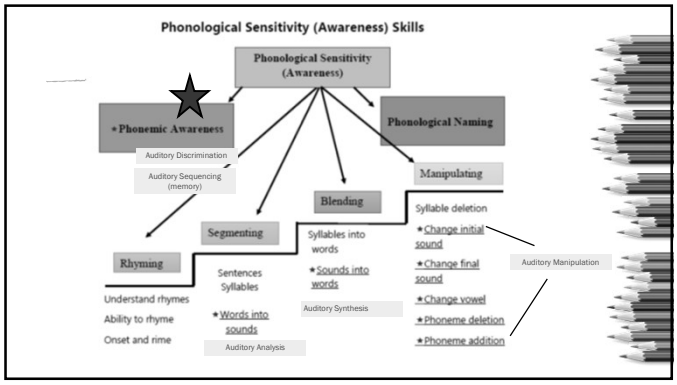


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## Program Structure

Each session in the intervention program should include activities to target speech production, phonological awareness, and sound/symbol

Shown Previously
https://drive.google.com/file/d/1hAG4rDimqa_KdpLqhk9t8RQLaQa-hV_j/view?usp=sharing (Cody)

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- The intervention should be administered twice weekly (2 one hour sessions) for a 6-8 week period or until 12 sessions are completed
- followed by a break in therapy of approximately two months and then a second 6 –8 week block of therapy.

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## Margo's Notes

- Due to the research on level of intensity recommendations, the twice weekly sessions may need to be adapted to 4 30 minute sessions/week or the amount of time needed for 100 productions
- Changes may need to be made for phonological processes vs. speech sounds vs CAS
- Add visual phonics
- Base phonological awareness activities around development as well as specific speech area
- Add multisensory cues

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## Complexity Approach

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- Approach by Gierut (2007)
- designed for children with **moderate-to-severe *phonological* impairments with low intelligibility and limited phoneme inventories**.
- by using a complexity approach during a period of accelerated phonological learning (4-6 years old), there is a greater chance to remediate multiple errors, thus, discharging before the students enter school

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## Complexity Approach

- Concentrates on nonstimulable and later developing sounds
- Concentrates on linguistically marked phonemes (i.e.: targeting affricates to increase stops and fricatives)

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## Complexity Approach

| Marked (More Complex) | Unmarked (Least complex) |
|---|---|
| Fricatives (/f/, /v/, /θ/, /ð/, /s/, /z/, /ʃ/, / ʒ/) | Stops (/p/, /b/, /t/, /d/, /k/, /g/) |
| Affricates ( /tʃ/ and /dʒ/) | Fricatives (/f/, /v/, /θ/, /ð/, /s/, /z/, /ʃ/, / ʒ/) |
| Liquids ( /l/ and /r/) and glide sounds (/w/, /j/) | Nasal (/m/, /n/, /ŋ/) |
| Small sonority difference clusters (/sm/. /sn/)<br>Sonority: loudness of the speech sound | Large sonority difference clusters (/tw/, /kw/, and /pl/) |

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| Two Clusters (in order of sonority high to low for onset clusters) | |
|---|---|
| **More Complex** | **Less Complex** |
| Voiceless stop + glide (/tw/, /kw/, /pj/, /kj/) | Voiced fricative + glide /vj/ |
| Voiced stop + glide /bj/ | Voiceless fricative + liquid (/fl/, /sl/, /fr/, /θr/, /ʃr/) |
| Voiceless stop + liquid (/pl/, /kl/, /pr/, /tr/, /kr/) | /s/ + nasal (/sm/, /sn/) |
| Voiced stop + liquid (/bl/, /gl/, /br/, /dr/, /gr/) | Nasal + glide /mj/ |
| Voiceless fricative + glide (/sw/, /fj/) | /s/ + stop (/sp/, /st/, /sk/) |
| Gierut (1999) provides evidence that treatment of marked clusters leads to greater system-wide change than treatment of unmarked clusters. | |

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| Three element clusters (most advanced phonological structure in English) | Two element clusters |
|---|---|
| /spl/ | to target /sp/, /sl/, /pl/ |
| /str/ | to target /st/, /tr/ |
| /skw/ | to target /sk/, /kw/, /sw/ |
| /spr/ | /spr/ to target /sp/, /pr/ |
| Three-element cluster should only be selected as a treatment target if the child "knows" the target stop and glide or liquid as a singleton (Gierut & Champion, 2001). | |

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Example From:
https://kuscholarworks.ku.edu/entities/publication/bab8818a-1065-4b48-809f-e98a354eaead

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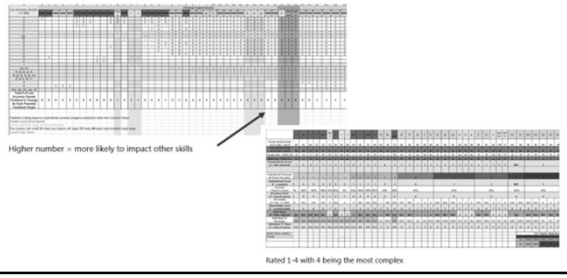


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## The Nitty Gritty ******

- Probe sounds
- Get a baseline for Percent of Consonants Correct (PCC).
  - Use this periodically for data collection and progress

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**Phonemic Inventory Probe: Targeting /p/, /t/, /k/, /w/, /l/, /r/**

Child Name _____

| Target | # Cons | Production | Target | # Cons | Production | Target | # Cons | Production | Phoneme(s) |
|---|---|---|---|---|---|---|---|---|---|
| 1. white | 2 | | 20. write | 2 | | 39. light | 2 | | |
| 2. hip | 2 | | 21. hear | 2 | | 40. hit | 2 | | |
| 3. lock | 2 | | 22. rock | 2 | | 41. walk | 2 | | |
| 4. talk | 2 | | 23. tall | 2 | | 42. wall | 2 | | |
| 5. wing | 2 | | 24. ring | 2 | | 43. king | 2 | | |
| 6. tea | 1 | | 25. pea | 1 | | 44. key | 1 | | |
| 7. tape | 2 | | 26. tail | 2 | | 45. whale | 2 | | |
| 8. snake | 3 | | 27. snail | 3 | | | | | |
| 9. toes | 2 | | 28. rose | 2 | | | | | |
| 10. page | 2 | | 29. cage | 2 | | | | | |
| 11. cave | 2 | | 30. wave | 2 | | | | | |
| 12. pie | 1 | | 31. Y/wa/ | 1 | | | | | |
| 13. pig | 2 | | 32. wig | 2 | | | | | |
| 14. cake | 2 | | 33. rake | 2 | | | | | |
| 15. cup | 2 | | 34. cut | 2 | | | | | |
| 16. boat | 2 | | 35. bowl | 2 | | | | | |
| 17. toe | 1 | | 36. low | 1 | | | | | |
| 18. bike | 2 | | 37. bite | 2 | | | | | |
| 19. pen | 2 | | 38. ten | 2 | | | /85 | | |

Stoel-Gammon (1986) stipulated that two occurrences are required for sounds to be included in the phonemic inventory. Circle sounds for which there are two occurrences on the above task: **p t k w l r**

Gierut & Champion (2001) indicated that a child must have the second **and** third consonants of a three-element cluster in his/her phonemic inventory to teach a three-element cluster. Circle permissible three-element clusters for treatment based on the phonemes indicated above:

/str-/ /spr-/ /skr-/ /skw-/ /spl-/

**Total # of Consonants = 85 (Correct # of consonants) _____/85 = _____ %**
Percentage Consonants Correct (PCC) = # correct consonants/total # of consonants

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https://slpath.com/docs/piplongform.pdf

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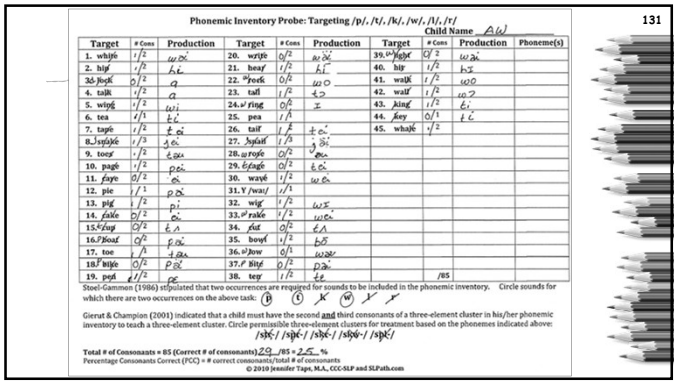

Phonemic Inventory Probe: Targeting /p/, /t/, /k/, /w/, /l/, /r/
Child Name Ali

| Target | # Cons | Production | Target | # Cons | Production | Target | # Cons | Production | Phoneme(s) |
|---|---|---|---|---|---|---|---|---|---|
| 1. white | 1/2 | wəi | 20. wrap | 0/2 | rəp | 39. [illegible] | 0/2 | wak | |
| 2. hit | 1/2 | hɛ | 21. hear | 1/2 | hɪ | 40. hit | 1/2 | hɪ | |
| 36. fork | 0/2 | a | 22. [illegible]fork | 0/2 | wo | 41. walk | 1/2 | wɔ | |
| 4. talk | 1/2 | a | 23. tall | 1/2 | tɔ | 42. wall | 1/2 | wɔ | |
| 5. wing | 1/2 | wi | 24. [illegible] ring | 0/2 | ɪ | 43. king | 1/2 | ti | |
| 6. tea | 1/1 | ti | 25. pea | 1/1 | | 44. key | 0/1 | ti | |
| 7. tape | 1/2 | tɛi | 26. tail | 1/2 | tɛi | 45. whale | 1/2 | | |
| 8. [illegible] | 1/2 | jɛi | 27. [illegible] | 1/2 | jəi | | | | |
| 9. toes | 1/2 | tou | 28. [illegible] | 0/2 | tou | | | | |
| 10. page | 1/2 | pɛi | 29. [illegible] | 0/2 | tɛi | | | | |
| 11. [illegible] | 0/2 | ɛi | 30. wave | 1/2 | wɛi | | | | |
| 12. pie | 1/1 | pɑi | 31. Y /waɪ/ | 1/1 | | | | | |
| 13. pig | 1/2 | pi | 32. wig | 1/2 | wɪ | | | | |
| 14. [illegible] | 0/2 | ɛi | 33. [illegible] rake | 1/2 | wɛi | | | | |
| 15. [illegible] | 0/2 | tʌ | 34. [illegible] | 0/2 | tʌ | | | | |
| 16. [illegible] | 0/2 | pou | 35. boy | 1/2 | bɔ | | | | |
| 17. toe | 1/2 | tou | 36. [illegible] | 0/2 | wɔɪ | | | | |
| 18. [illegible] | 0/2 | pɑi | 37. [illegible] | 0/2 | pɑi | | | | |
| 19. pen | 1/2 | pɛ | 38. ten | 1/2 | tɛ | | | /85 | |

Stoel-Gammon (1986) stipulated that two occurrences are required for sounds to be included in the phonemic inventory. Circle sounds for which there are two occurrences on the above task: (B) (t) X (w) X X

Gierut & Champion (2001) indicated that a child must have the second **and** third consonants of a three-element cluster in his/her phonemic inventory to teach a three-element cluster. Circle permissible three-element clusters for treatment based on the phonemes indicated above:
/spɹ/ /spk-/ /spɪ-/ /spw-/ /spl-/

Total # of Consonants = 85 (Correct # of consonants) 29 /85 = 2.5 %
Percentage Consonants Correct (PCC) = # correct consonants/total # of consonants

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## *** Target Selection

2. Check for stimulability
3. List sounds that are OUT of the phonetic inventory with 0% accuracy
4. Cross out stimulable sounds (will typically develop without intervention) (Powel and Miccio, 1996)
5. Next cross out all early developing sounds

Excerpted from the Phonological Assessment and Treatment Target Selection Barlow, Storkel & Taps, 2010)

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## *** Target Selection

6. Choose sounds that lead to greater system wide change based on language law https://slpath.com/docs/ImplicationalLaws.pdf
   a. Consonants imply vowels
   b. Affricates imply fricatives
   c. Fricatives imply stops
   d. Voiced obstruents (stops, fricatives, affricates) imply voiceless obstruents
   e. Liquids imply nasals

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## *** Target Selection

7. If multiple sounds remain, select sounds that occur most frequently in the sound system
   a. Attempt to use 3 clusters (if the students has the second and third member.
   b. If cannot use 3 clusters, start with two with a sonority of +3 (loudness of a sound compared to other sounds)– typically /sl/ or /fl/
8. Pick 3-5 targets (may start with CCV) (flee/flea, flew, flow, flaw or sleigh, slow, slew, slaw)

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## *** Most Complex to Least Complex

Clusters: 3 Elements
/str-/, /spr-/, /skr-), /spl-/, /skw-/

Clusters: 2 Elements (often the starting point) (+3 sonority difference)
/l/: sl, fl, bl, gl, pl, kl
/r/ fr, shr, thr, br, dr, gr, pr, tr, kr

Affricates
/ʧ/ and /ʤ/

Fricatives
voiceless /f/, /θ/, /s/, /ʃ/, /h/) or voiced /v/, /ð/, /z/, /ʒ/

Stops
Voiceless /p/, /t/, /k/ voiced /b/, /d/, /g/

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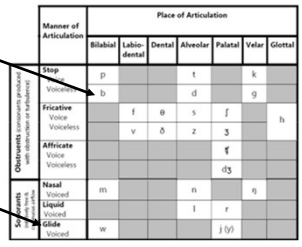
## ** Explanation of Most to Least Complex

The most sonorous sounds are (The highest given a value score of 0)

voiceless stops (7)
voiced stops (6)
voiceless fricatives (5)
voiced fricatives (4)
nasals (3)
liquids (2)
glides (1)
vowels (0)



| Manner of Articulation | Bilabial | Labio-dental | Dental | Alveolar | Palatal | Velar | Glottal |
|---|---|---|---|---|---|---|---|
| Obstruents (consonants produced with obstruction or turbulence) | | | | | | | |
| Stop Voice | p | | | t | | k | |
| Stop Voiceless | b | | | d | | g | |
| Fricative Voice | | f | θ | s | ʃ | | h |
| Fricative Voiceless | | v | ð | z | ʒ | | |
| Affricate Voice | | | | | ʧ | | |
| Affricate Voiceless | | | | | ʤ | | |
| Sonorants (consonants produced with little obstruction) | | | | | | | |
| Nasal Voiced | m | | | n | | ŋ | |
| Liquid Voiced | | | | l | r | | |
| Glide Voiced | w | | | | j (y) | | |

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## *** Gierut (1999)

- Gierut applied this principle to treatment. She identified an implicational relationship between clusters with small sonority distances and clusters with large sonority distances. (Sonority Sequence Principle)
- Research has suggested that it is most efficacious to teach clusters with a small sonority difference (+3 plus (+) indicates sonority is rising)

(Linguists do not consider /sp-/, /sk-/ and /st-/ to be true clusters. They do not follow the sonority sequence principle of sonority increase at the beginning from the first sound in the cluster to the second sound as the vowel is approached and falls at the end. Example: /s/ (5) voiceless stops (7). 5-7= -2)

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## *** Explanation of Most to Least Complex

Sonority Sequencing Principle For Clusters (Gierut, 1

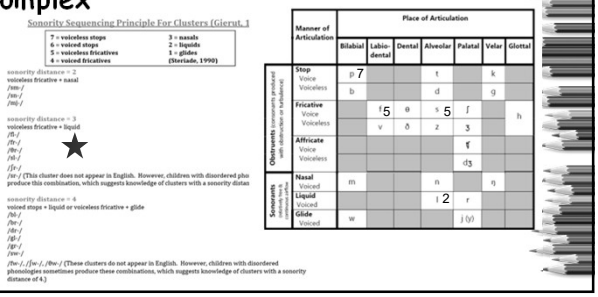
| | |
|---|---|
| 7 = voiceless stops | 3 = nasals |
| 6 = voiced stops | 2 = liquids |
| 5 = voiceless fricatives | 1 = glides |
| 4 = voiced fricatives | (Steriade, 1990) |

sonority distance = 2
voiceless fricative + nasal
/sm-/
/sn-/
/sn-/

sonority distance = 3
voiceless fricative + liquid
/fl-/
/fr-/
/θr-/
/sl-/
/sr-/
/sr-/ (This cluster does not appear in English. However, children with disordered pho produce this combination, which suggests knowledge of clusters with a sonority distan

sonority distance = 4
voiced stops + liquid or voiceless fricative + glide
/bl-/
/br-/
/dr-/
/gl-/
/gr-/
/sw-/
/fw-/, /ʃw-/, /θw-/ (These clusters do not appear in English. However, children with disordered phonologies sometimes produce these combinations, which suggests knowledge of clusters with a sonority distance of 4.)

| Manner of Articulation | | Place of Articulation: Bilabial | Labio-dental | Dental | Alveolar | Palatal | Velar | Glottal |
|---|---|---|---|---|---|---|---|---|
| Obstruents (consonants produced with obstruction or turbulence) | Stop Voice | p 7 | | | t | | k | |
| | Voiceless | b | | | d | | g | |
| | Fricative Voice | | f 5 | θ | s 5 | ʃ | | h |
| | Voiceless | | v | ð | z | ʒ | | |
| | Affricate Voice | | | | | ʧ | | |
| | Voiceless | | | | | dʒ | | |
| Sonorants (sonorants tend to be unlike the surface) | Nasal Voiced | m | | | n | | ŋ | |
| | Liquid Voiced | | | | l 2 | r | | |
| | Glide Voiced | w | | | | j (y) | | |



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Phonemic Inventory Probe: Targeting /p/, /t/, /k/, /w/, /l/, /r/
Child Name AW

| Target | # Cons | Production | Target | # Cons | Production | Target | # Cons | Production | Phoneme(s) |
|---|---|---|---|---|---|---|---|---|---|
| 1. whiŋ | 1/2 | wai | 20. wriŋ | 0/2 | wai | 39. wʲlight | 0/2 | wai | |
| 2. hiŋ | 1/2 | hi | 21. hear | 1/2 | hi | 40. hiŋ | 1/2 | hɪ | |
| 3. ~~jock~~ | 0/2 | a | 22. ~~rock~~ | 0/2 | wo | 41. walk | 1/2 | wo | |
| 4. talk | 1/2 | a | 23. tall | 1/2 | to | 42. wall | 1/2 | wɔ | |
| 5. wiŋ | 1/2 | wi | 24. ~~ring~~ | 0/2 | ɪ | 43. king | 1/2 | ti | |
| 6. tea | 1/1 | ti | 25. pea | 1/1 | | 44. key | 0/1 | ti | |
| 7. tape | 1/2 | tei | 26. tail | 1/2 | tei | 45. whale | 1/2 | | |
| 8. ~~snake~~ | 1/3 | sei | 27. ~~snail~~ | 1/3 | jai | | | | |
| 9. toes | 1/2 | tau | 28. ~~wrope~~ | 0/2 | tau | | | | |
| 10. page | 1/2 | pei | 29. ~~bcage~~ | 0/2 | tei | | | | |
| 11. ~~fave~~ | 0/2 | ei | 30. wave | 1/2 | wei | | | | |
| 12. pie | 1/1 | pai | 31. Y /wai/ | 1/1 | | | | | |
| 13. pig | 1/2 | pi | 32. wig | 1/2 | wɪ | | | | |
| 14. ~~fake~~ | 0/2 | ei | 33. ~~rake~~ | 1/2 | wei | | | | |
| 15. ~~zup~~ | 0/2 | tʌ | 34. ~~cut~~ | 0/2 | tʌ | | | | |
| 16. ~~boat~~ | 0/2 | pai | 35. bowl | 1/2 | bɔ | | | | |
| 17. toe | 1/1 | tau | 36. ~~low~~ | 0/1 | wau | | | | |
| 18. ~~bike~~ | 0/2 | pai | 37. ~~bite~~ | 0/2 | pai | | | | |
| 19. ~~pea~~ | 1/2 | pe | 38. tey | 1/2 | te | | /85 | | |

Stoel-Gammon (1986) stipulated that two occurrences are required for sounds to be included in the phonemic inventory. Circle sounds for which there are two occurrences on the above task: (p) (t) ~~k~~ (w) ~~l~~ ~~r~~

Gierut & Champion (2001) indicated that a child must have the second and third consonants of a three-element cluster in his/her phonemic inventory to teach a three-element cluster. Circle permissible three-element clusters for treatment based on the phonemes indicated above:
~~/sk-/~~ ~~/spk-/~~ ~~/sbk-/~~ ~~/skw-/~~ ~~/spk-/~~

Total # of Consonants = 85 (Correct # of consonants) 29 /85 = 25 %
Percentage Consonants Correct (PCC) = # correct consonants/total # of consonants
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## Recap

- Integrated Phonological Intervention Program
  - Designed for children 4-7 years
  - Children who received intervention that facilitated PA, letter knowledge and speech sound production outperformed students who just received SSD intervention
- Complexity Approach
  - Designed for children 3-6 years to reduce multiple errors
  - For limited sound system
  - Concentrates on later developing sounds and starts with clusters
  - Children must have the 2nd and 3rd member of a 3 Cluster in order to use it for treatment. If not, start with 2 with a sonority score of +3

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## Breakout Activity 3

- What are your thoughts on Integrated Phonological Intervention?
- Discuss the Complexity Approach
  - Do you currently use this approach for multiple phonological process errors?
    - If yes, what results have you seen?
    - If no, will you consider this approach for quicker remediation of multiple errors?

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From Developmental to Neurological Speech Sound Disorders

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## Principles of Motor Learning Approaches

- Used for students with neurological speech disorder (Childhood apraxia of speech)
- Students with neurological speech disorders
  - Higher likelihood of language, reading/spelling disorders
  - Language including morphology, phonological, syntax/grammar and vocabulary

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## Motor Learning Theory

1. Initial Condition: Articulatory placement, voicing, prosody, intonation, phrasing
2. Motor Commands Needed: Timing and amplitude of production
3. Sensory Consequences:
   a. Tongue and lip movement for production
   b. Tactile awareness of articulatory placement
4. Outcome: Were the speech sounds, voicing, intonation, and prosody correct?

(Schmidt, 1975, 2003; Schmidt and Lee, 2005)

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## Motor Performance and Motor Learning

Principles of Motor Learning

- Set of processes that facilitate the acquisition and retention of motor skills
- Lead to a permanent change
- Generalizes to other related but untrained tasks

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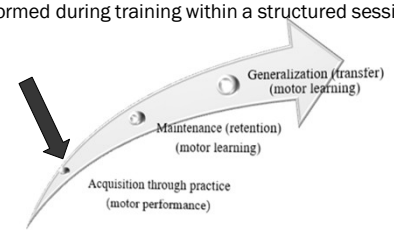
## Motor Performance

The ability to perform a motor task and how the movement is performed during training within a structured session.

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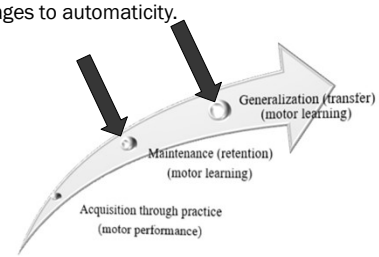
## Motor Learning

The stages to automaticity.

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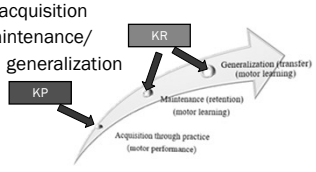
## Feedback

- Knowledge of Performance (KP) (motor performance) detailed feedback about movements, where to place articulators, etc.
- Knowledge of Results (KR) (motor learning) less specific
- Immediate feedback: acquisition
- Delayed feedback: maintenance/ generalization
- Appropriate support

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## Checklist: Distinguishing CAS

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☆ Indicates the top three characteristics of CAS (ASHA Technical Report, 2007)

### Vowels

- ☆Inconsistent use of vowels
- Limited repertoire of vowels
- Schwa additions/insertions to consonant clusters, within words and on the ends of words

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### Consonants

- ☆Inconsistent errors on consonants
- May produce a sound correctly in one word position but not in another (i.e.: ball, ba _ y)
- May use an initial sound correctly in one word and substitute a sound or omit the sound in other initial position words (i.e.: ball, _aby)
- May say a word correctly one time, change the sounds in the word the next, then change them again (bye, dye, mye)
- Substitution of voice and voiceless consonants

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### Consonants and Vowels

- Idiosyncratic error patterns
- Increase difficulty and decreased intelligibility with increased length or complexity
- Imitation more difficult
- Poor speech intelligibility
- Distorted substitutions
- Restricted sound inventory

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### Coarticulation

- Lengthened and disrupted coarticulatory transition between sounds and syllables
- Difficulty achieving accurate articulatory movement gestures when trying to imitate words not yet mastered.

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### Prosody

- ☆Inappropriate stress on syllables or words
- Equal stress or lexical stress errors (deleted po from potato, ba from balloon)
- Atypical prosody
- Altered and/or inconsistent suprasegmental characteristics (rate, pitch, loudness)

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### Language

- Reduced amount of babbling or vocal sounds from ages 7 to 12 months old
- Statistically significant discrepancy between receptive and expressive language
- Delayed onset of expressive language
- Loss of previous words

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## Other Characteristics

- Better performance on speaking tasks that require single postures versus sequences of postures (e.g., single sounds such as /o/ vs. words such as "no", or single words vs. phrases)
- Greater ease in producing automatic Impaired volitional nonspeech movement (oral apraxia)
- Trial and Error behavior
- Impaired diadochokinetic tasks

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## Breakout Activity 4

1. Discuss the difference between a phonological processing disorder and a neurological disorder (CAS).
2. How do you determine a differential diagnosis?
1. Why is a differential diagnosis important?

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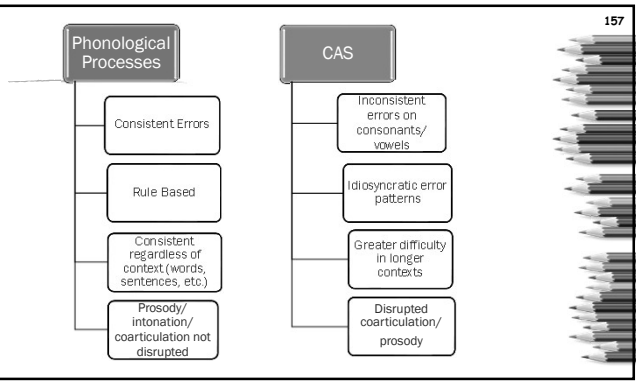


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## Keep In Mind: Motor Planning

- Speech production involves continuous movement of parts of the vocal tract at the level of syllables. There is no stopping of movement during the syllable shapes; therefore, we must think in syllable patterns (CV, VC, CVC, C1V1C1V1, C1V1C1V2, etc.) and not in specific speech sounds which are isolated movement.
- Assessment and treatment should be focused on the continuous movement within the syllable or string of syllables and not on specific speech sounds.

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- The student must first have an idea (cognitive function), then, retrieve information, map the sounds (phonological) as well as the morphosyntax (linguistic) before they can motor plan and program response (apraxia) (Strand, 2018).

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- According to Strand (2018), the motor planning parts of the brain must use a constant stream of information to determine articulatory placement and strength within the syllables for programming volitional movement to reach a specified temporal/spatial target. These include parameters of movement to include:

| | | |
|---|---|---|
| • Range of motion<br>• Direction of the motion | • Speech<br>• Force | • Amount of muscle tension |

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## Determining Severity & Prognosis

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| Mild | Moderate | Severe/Profound |
|---|---|---|
| Requires minimal cueing to obtain syllable production | Considerable cueing needed to produce syllable shape | With considerable cueing, cannot produce syllable shape |
| • Improvement is more rapid Prognosis: Good<br>• Larger stimulus set (8-10) and can include words from more than one syllable shape<br>• More random practice | • Prognosis is good but longer duration in therapy<br>• Larger stimulus set and can consider words from more than one syllable shape | • Prognosis is guarded<br>• Smaller stimulus set (3-5)<br>• May not be able to include words from other motor shapes<br>• More block practice<br>• Increased frequency and type of feedback |

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64-71

## Childhood Apraxia of Speech Evaluation

*(See Appendix A for more information)*

**Hearing**
- ☐ Passed a complete audiological assessment
- ☐ Failed a complete audiological assessment
- ☐ Hearing screening: Date: _____

The frequency and characteristics of early vocalizations can be affected by perceptual factors impacted by chronic otitis media (Petinou, et al 1999. Rvachew, et al 1999)

Results

| | 500 Hz | 1000 Hz | 2000 Hz | 4000 HZ |
|---|---|---|---|---|
| Right Ear | | | | |
| Left Ear | | | | |

**Preverbal**

Child has communication intent ☐ yes ☐ no
Child shows joint attention ☐ yes ☐ no

- ☐ Limited cooing and babbling
- ☐ Delayed onset of first words
- ☐ Limited vowel production

Cooing - 0-3 months Babbling – 3 months
4 months: consonants begin to emerge
7-8 months: "verbal turn taking"
Canonical babbling (7-10 months)
Variegated babbling (11-13 months)

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Vowels: Short: a e i o u Long: a e i o u
Other: oo (boot) oo (foot) au/aw oi/oy ou/ow

☐ Limited consonant production

Average percentage of vowels correct for children:18 and 23 months: 82%
24-29 months: 92%
30- 35 months: 94% By 36 months: 97% (Pollock and Berni, 2003)

Consonants
p b m w t d n f v
k g h s z sh ch j y l r th

Syllable shapes elicited: Give examples

| | |
|---|---|
| ☐ VC | |
| ☐ CV | |
| ☐ VCV | |
| ☐ C1V1C1V1 | |
| ☐ C1V1C2V2 | |
| ☐ C1VC1 | |
| ☐ C1VC2 | |
| ☐ Other | |

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## Video

https://drive.google.com/file/d/13984R2HU0t7KzVKyVVO23Ac5SmiUCVKh/view?usp=sharing (MC)

Please use CHAT to jot down what motor planning patterns you hear.

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Page 2: **Preverbal continued**
☐ Can make sounds in isolation but limited when sounds are combined into syllable shapes
Example: _____

Especially young children may show a significant gap between receptive and expressive language (receptive higher)

**Receptive and Expressive Language**
Test Given: _____
Results:

| | Age | Standard Score | Percentile |
|---|---|---|---|
| Receptive Language | | | |
| Expressive Language | | | |
| Significance | | | |

Comments: _____

Statistically significant difference between receptive and expressive language ☐ yes ☐ no

**Linguistic**

Age of emergent of first words: _____

**Language Sample:**
Does the student show communication intent? ☐ Yes ☐ No
Does the student show joint attention ☐ Yes ☐ No
☐ Free Play
☐ Structured Play (include toys and scenarios that would represent motor planning sequences (ie: syllables within specified motor planning patterns). Example: CV – bye VC – on C1V1C1V2 daddy, CVC – mom, dad, dog.
*(free analysis: https://www.sugarlanguage.org/)*

Comments: _____

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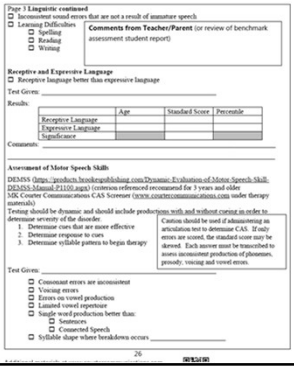

Page 3 **Linguistic continued**
☐ Inconsistent sound errors that are not a result of immature speech
☐ Learning Difficulties
- ☐ Spelling
- ☐ Reading
- ☐ Writing

**Comments from Teacher/Parent** (or review of benchmark assessment student report)

**Receptive and Expressive Language**
☐ Receptive language better than expressive language
Test Given: _____
Results:

| | Age | Standard Score | Percentile |
|---|---|---|---|
| Receptive Language | | | |
| Expressive Language | | | |
| Significance | | | |

Comments: _____

**Assessment of Motor Speech Skills**

DEMSS (https://products.brookespublishing.com/Dynamic-Evaluation-of-Motor-Speech-Skill-DEMSS-Manual-P1100.aspx) (criterion referenced recommend for 3 years and older MK Courter Communications CAS Screener (www.courtercommunications.com under therapy materials)

Testing should be dynamic and should include productions with and without cueing in order to determine severity of the disorder.
1. Determine cues that are more effective
2. Determine response to cues
3. Determine syllable pattern to begin therapy

Caution should be used if administering an articulation test to determine CAS. If only errors are scored, the standard score may be skewed. Each answer must be transcribed to assess inconsistent production of phonemes, prosody, voicing and vowel errors.

Test Given: _____
- ☐ Consonant errors are inconsistent
- ☐ Voicing errors
- ☐ Errors on vowel production
- ☐ Limited vowel repertoire
- ☐ Single word production better than:
  - ☐ Sentences
  - ☐ Connected Speech
- ☐ Syllable shape where breakdown occurs _____

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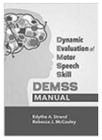
Dynamic Evaluation of Motor Speech Skill (DEMSS)
Dr. Edith Strand and Dr. Rebecca McCauley
Jslhr.pubs.asha April 2013

Ages 3-6.5

Movement accuracy

- Vowel Errors
- Consistency
- Prosody




Subtests

- Consonant-Vowel (me; hi)
- Vowel-Consonant (up; eat)
- Reduplicated Syllables (mama; booboo)
- CVC1 (mom; peep; pop)
- CVC2 (mad; bed; hop)
- Bisyllabic 1 (baby; puppy)
- Bisyllabic 2 (bunny; happy; today; canoe)
- Multisyllabic (banana; video)

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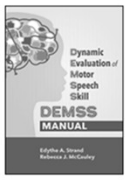
Brookes Publishing




**Dynamic Evaluation of Motor Speech Skill (DEMSS) Manual**

**Authors:** Edythe A. Strand Ph.D., CCC-SLP, Rebecca J. McCauley Ph.D., CCC-SLP

**ISBN:** 978-1-68125-309-1
**Pages:** 112
**Copyright:** 2019
**Availability:** Available Stock

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*Original on www.courtercommunications.com website*

**MK Courter Communications Dynamic CAS Screener**

This screener is designed to assess syllable shapes (motor plans) from the simplest to the most complex. It is designed to use as a dynamic assessment to determine consonant and vowel production without and with cueing to determine where to begin therapy and how the student responds to the cues utilized.

**Directions:**

1. Begin with consonant – vowel (CV )and move through the screener.
2. Have the student look at you when you say the word. Do not provide any other cueing for the first production. Score production as a 1 for correct or a 0 for incorrect.
3. If the student does not produce the correct consonants and/or vowels, repeat the syllable shape. Take notes on any changes.
4. If still not produced correctly, add cueing (of your choice) to measure change of production with cueing. Score again in the space provided next to each word.

**Scoring:**

| Overall Production | Vowels | Take Notes |
|---|---|---|
| **1 = correct 0 = incorrect** | **2 = correct**<br>**1 = mild distortion**<br>**0 = Incorrect** | ☐ Type of cue provided<br>☐ Voicing errors<br>☐ Inconsistent production<br>☐ Vowel distortions<br>☐ Prosody errors |
| 1. Score initial production with eye contact as correct or incorrect.<br>2. Score the second production<br>3. Score cued response as correct or incorrect. | 1. Score vowel in first production as correct, mild distortion, or incorrect<br>2. If vowel is distorted or incorrect, exaggerate the vowel and score again as correct, mild distortion, or incorrect.<br>3. Score the second production as correct or incorrect when cueing for the vowel occurs<br>4. Add additional words to assess vowels if errors are noted | Use the note section to indicate student responses including other characteristics of CAS. |

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**MK Courter Communications Dynamic CAS Screener**

| Stimulus | Attempt 1 or 0 | Vowels 2,1,0 | Notes |
|---|---|---|---|
| **CV** | | | |
| 1. pay | | | |
| 2. bee | | | |
| 3. my | | | |
| 4. boy | | | |
| 4. too | | | |

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Page 4: **Linguistic continued**

Additional Comments: _____

**Intelligibility**

| | Known Context | Unknown Context | Single Words | Sentences | Connected Speech |
|---|---|---|---|---|---|
| Familiar Listener | % | % | % | % | % |
| Unfamiliar Listener | % | % | % | % | % |

By 2 year: 20%-50% intelligible
By 3 years: 71%-80% intelligible
By 4 years: 100%
Coplan & Gleason, 1988, Weiss, 1982

**Preverbal and Linguistic**

**Oral Motor**
☐ Symmetry at rest
☐ Asymmetry at rest
Describe: _____

☐ Is able to imitate oral motor movements
☐ Is unable to imitate oral motor movements
☐ Grouping noted when attempting to imitate
☐ Suspected oral apraxia
Describe: _____

**Strength**
Lips
☐ Normal
☐ Abnormal
Describe: _____

Cheeks
☐ Normal
☐ Abnormal
Describe: _____

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https://cdn.csu.edu.au/__data/assets/pdf_file/0008/408356/ICS-instructions-VERSION-1-November-2012.pdf

**Intelligibility in Context Scale (ICS)**

(Mccaul, Hartman, & McCormack, 2012)

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Page 3: **Oral Motor continued**

Tongue
☐ Normal
☐ Abnormal
Describe: _____

Jaw
☐ Normal
☐ Abnormal
Describe: _____

**Overall Tone and Strength**
☐ Decreased tone (tension in a muscle at rest)
☐ Decreased muscle strength (muscle's ability to contract and create force in response to resistance. Muscle strength is what muscles do when *they aren't at rest.*)
☐ Suspected Dysarthria (decreased muscle strength)

**Diadochokinetic Rate**

| | | | Norms in seconds | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Task | Repetitions | Seconds | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| pʌ | 20 | | 4.8 | 4.8 | 4.2 | 4.0 | 3.7 | 3.6 | 3.4 | 3.3 |
| tʌ | 20 | | 4.9 | 4.9 | 4.4 | 4.1 | 3.8 | 3.6 | 3.5 | 3.3 |
| kʌ | 20 | | 5.5 | 5.3 | 4.8 | 4.6 | 4.3 | 4.0 | 3.9 | 3.7 |
| Standard Deviation | | | 1.0 | 1.0 | .7 | .7 | .6 | .6 | .6 | .6 |
| pʌ tʌ kʌ | 10 | | 10.3 | 10.0 | 8.3 | 7.7 | 7.1 | 6.5 | 6.4 | 5.7 |
| Standard Deviation | | | 2.8 | 2.8 | 2.0 | 2.0 | 1.5 | 1.5 | 1.5 | 1.5 |

Norms are from "Tune-by-Count Measurement of Diadochokinetic Syllable Rate," by S.G. Fletcher, 1972, *Journal of Speech and Hearing Disorders, 37*, pp. 763–770. Copyright by the American Speech-Language-Hearing Association.

Lewis et al. (2004) found significant differences between preschool and school-age children with CAS and matched children with non-CAS speech defer in their ability to repeat nonwords and multisyllabic words, with the CAS group performing more poorly.

☐ Decreased diadochokinesis

Comments: _____

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## Diadochokinetic Rate

*Lewis et al. (2004) found significant differences between preschool and school-age children with CAS and matched children with non-CAS speech delay in their ability to repeat nonwords and multisyllabic words, with the CAS group performing more poorly.*

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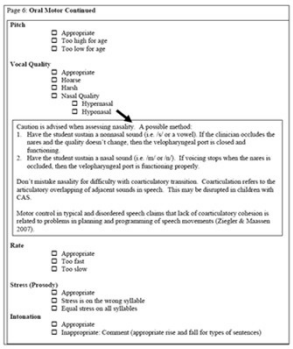


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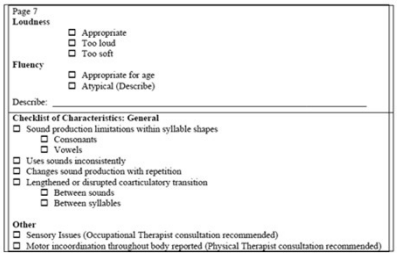


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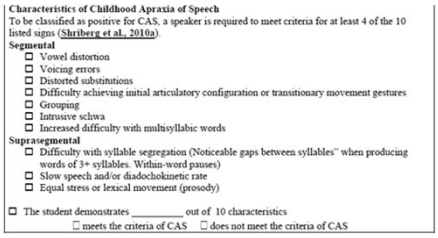


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## Intervention Based on Motor Learning Principles

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- The primary focus of intervention based on motor learning principles is the movement from one sound to another, one syllable to another, and one word to another with correct vowels, consonants, voicing, prosody, and intonation.

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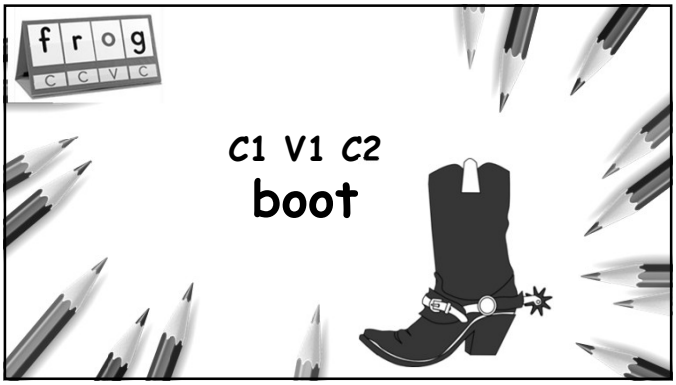


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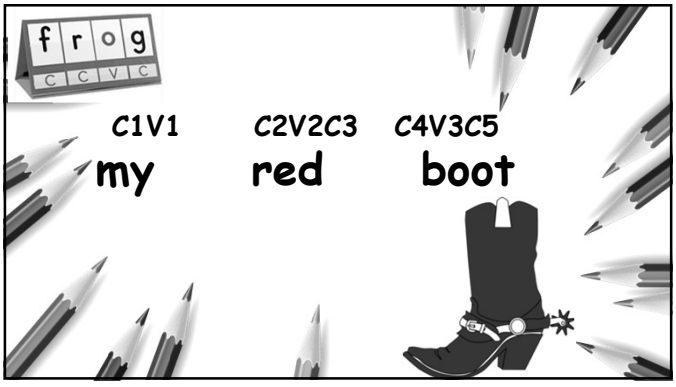


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## Breakout Activity 5

In Breakout Room, come up with a couple of words for each motor shape

| | |
|---|---|
| V/VV | (would not target vowels or VV outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| C | (I would not typically target a consonant by itself outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| CV | |
| VC | |
| VCV | |
| C1V1C1V1 | |
| C1V1C1V2 | |
| C1V1C2V2 | |
| C1V1C1 | |
| C1V1C2 | |
| CVCVCV | |
| CVCV + CVC | |

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## Intervention Approaches

The following two approaches are based on motor learning principles. Although these are designed for students with motor planning disorders, the concept and approach can apply to both developmental and neurological speech disorders.

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## Speech Motor Chaining

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- University of Syracuse (Preston)
- Designed to facilitate acquisition of simple speech targets through frequent and specific feed back
- Based on success, treatment is adapted through 5 levels.
- Procedure involves selection of a target sound in a syllable position (i.e.: /k/ in onset and /s/ is coda which is the final consonant or the final consonant part. (i.e.: "alt" is the coda in "salt".)

https://chaining.myspeechlink.com/Identity/Account/Login

Now requires a yearly membership: $55/year

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## Examples: Sounds can be in the onset or coda

dog — onset, nucleus, coda

pl a nt — onset, nucleus, coda

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## Procedure

1. Target sound in syllable position is selected (e.g., /k/ in onset or /s/ in coda,
   a. Appropriate targets are typically sounds that are below 50% accuracy in a particular syllable position when tested at the word level.
   b. Typically, two broad targets are treated per child for each session (e.g., onset /ɹ/ and coda /k/).

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## Procedure

2. Once the target sounds are selected, sound sequences of two phonemes (CV, VC, or CC) are chosen, which represent the target sound in syllable position.
   a. For example, the target of onset /ɹ/ could be addressed with four variants: two /ɹ/ singleton variants such as /ɹi/ and /ɹɑ/ and two /ɹ/ cluster variants such as /dɹ-/ and /kɹ-/.
   b. Coda /k/ could be addressed with four variants such as singletons /ek/ and /ʊk/ and clusters /-kt/ and /-sk/.
   c. In each session, two different chains are chosen per variant, resulting in 16 chains per session (2 sounds × 4 variants × 2 chains).

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## Example

Table 1. Examples of target sound/position and four possible variants (sound sequences) for practice across a range of phonetic contexts.

| Target sound/position | Variant 1 | Variant 2 | Variant 3 | Variant 4 |
|---|---|---|---|---|
| /ɹ/ onset | /ɹɑ/ | /ɹi/ | /dɹ/ | /kɹ/ |
| /s/ onset | /si/ | /so/ | /sk/ | /sn/ |
| /k/ rhyme | /ɪk/ | /æk/ | /sk/ | /kt/ |
| /ʧ/ rhyme | /ɪʧ/ | /æʧ/ | /ʌʧ/ | /nʧ/ |

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## Procedure

3. During practice, additional movements are gradually added before the target sequence (backward chaining) or after the target sequence (forward chaining).

a. For example, when training the target /s/ in onset, one representative sound sequence is /sn/.

b. Chaining for each sequence begins in a syllable (e.g., /snæ/),

c. followed by a monosyllabic word (e.g., snap),

d. a multisyllabic word (e.g., snapping, resnap),

e. a short phrase (e.g., resnap the jacket, or He was snapping), a

f. eventually a self-generated sentence (e.g., using the word ssnap or snapping in a sentence).

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## Procedure

4. Practice at the higher levels of linguistic complexity only occurs when there is success at the previous level.

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## Session: Prepractice

- ✗ Explicit Instruction: Correct or incorrect of variants with cueing as needed (knowledge of performance)
- ✗ Knowledge of response: cueing and immediate response for correct production.

Prepractice is continued until client achieves several correct productions (at least three of each variant in a simple motor plan such as CV, VC, CC)

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## Session: SMC Practice

- ✗ Target syllables, words, and phrases are elicited in blocks of 6 consecutive attempts
- ✗ Practice begins at the syllable level

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## Session: SMC: 5 Practice Levels

1. Syllables, which contain at least one consonant and one vowel: CV, CC(V), VC, or (V)CC

2. Monosyllabic words, which begin or end with the syllable and which contain both an onset and a coda;

3. Multisyllabic words, which include two or more syllables and which contain the monosyllabic word;

4. Phrases, which include two to five words and which contain the monosyllabic word or the multisyllabic word;

5. Self-generated sentences, in which the child uses either the monosyllabic word or multisyllabic word in a novel sentence.

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## Examples

Table 2. Examples of chains.

| Sound/position | Syllable | Monosyllabic word | Multisyllabic word | Phrase | Self-generated sentence |
|---|---|---|---|---|---|
| /ɹ/ onset | /ɹɑ/ | **r**ot | **r**otten | **r**otten food | ? |
| /ɹ/ rhyme | /ɔɹ/ | for | before | just before | ? |
| /k/ onset | /ki/ | **k**eep | **k**eeping | **k**eeping my money | ? |
| /k/ rhyme | /ʊk/ | boo**k** | boo**k**shelf | on the boo**k**shelf | ? |
| /s/ onset | /sɪ/ | **s**it | **s**itting | **s**itting down | ? |
| /s/ rhyme | /æst/ | ca**st** | broadca**st** | national broadca**st** | ? |
| /ʧ/ onset | /ʧæ/ | **ch**amp | **ch**ampion | world **ch**ampion | ? |
| /ʧ/ rhyme | /ɪʧ/ | wit**ch** | sandwi**ch** | eat a sandwi**ch** | ? |

*Note.* Observe that the target sequence (in bold) remains consistent throughout the chain.

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## Progression

- ✗ Advancing from one level of a chain to the next level requires at least five of six correct productions in a block.

For example, five correct productions of the syllable /ɹɑ/ are needed to progress to the monosyllabic word *rock*.

Table 2. Examples of chains.

| Sound/position | Syllable | Monosyllabic word | Multisyllabic word | Phrase | Self-generated sentence |
|---|---|---|---|---|---|
| /ɹ/ onset | /ɹɑ/ | **r**ot | **r**otten | **r**otten food | ? |

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## Progression

Failure to achieve at least five correct productions at any level results in moving to a new chain with a different variant of the target, returning to Level 1

Example: switching from a /ɹɑ/ chain to a /ɹi/ chain).

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## Progression

A chain is mastered when a child successfully progresses through all five levels of the chain on two separate occasions (i.e., at least five correct productions of a self-generated sentence).

Once the chain is mastered, a replacement chain with the same variant is used in the next session (e.g., replace *rock-rocket-my rocket ship* with a chain such as *rot-rotten-rotten food*).

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## Consideration

While using an approach such as Speech Motor Chaining, the severity of the student needs to be considered and whether they are able to move through multiple patterns. If yes, this is the best approach for quickest acquisition. If not, a more sequential approach that moves through each syllable shape would need to be considered.

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## Example: Complexity of Speech Chains from a Syllable Shape Perspective

Speech Chain Patterns /s/ Initial

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| V | | | | | | | | | |
| VV | | | | | | | | | |
| CV | see /si/ | si / | se | say | sa | su | so | saw | soo |
| VC | | | | | | | | | |
| VCV | | | | | | | | | |
| C1V1C1V1 | | | | | | | | | |
| C1V1C1V2 | | | | | | | | | |
| C1V1C2V2 | | | | | | | | | |
| C1V1C1 | | sis | set | safe | sad | suck | sock | saws | suit |
| C1V1C2 | seize | | | | | | | | |
| VC + CVC | | | | unsafe | | | | | |
| C1V1C2V2C3 | season | | | | | | socket | | |
| CVCVCV | | sister | | | | | | | |
| CVCVC | | | setup | | sadden | sucking | | | |
| CVCCV | | | | safety | | | | | |
| CVCCVC | | system | | | | | | hacksaw | lawsuit |
| CVCV + CVC | | | | | | | | | |

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## Example: Complexity of Speech Chains from a Syllable Shape Perspective

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 word phrases | | my sister system fail | the setup | safety first it's unsafe | sadden boy | sucking pipe | | | |
| longer phrases | | my sister in-law system fail done | setup the stage | always safety first it feels unsafe | boy is sadden | the pipe is sucking | | | |

C1V1 C2V2C3V4C5

The setup

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## Dynamic Temporal and Tactile Cueing

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Edith Strand developed DTTC based in Integral Simulation Therapy. This approach is based on the following core elements :

(a) the focus on the movement (rather than the sound or phoneme) in terms of modeling, cueing, feedback, and target selection; (b) emphasis on facilitating the child's intent to improve motor skills; and (c) attention to proprioception

https://pubs.asha.org/doi/10.1044/2019_AJSLP-19-0005
Strand (2020)

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## Dynamic Temporal and Tactile Cueing

79

Edith Strand developed DTTC based in Integral Simulation Therapy. This approach is based on the following principles:

1. Improve the efficiency of neural processing for the development and refinement of sensorimotor planning and programming.

https://pubs.asha.org/doi/10.1044/2019_AJSLP-19-0005

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2. Schema principles

a. One theory, from which much of the research in motor learning arose, is schema theory (Schmidt, 1975, 2003), which was intended to explain discrete actions (fast simple movements vs. Complex movements; Schmidt, 2003; Wulf & Shea, 2002).

b. A schema as a relationship between outcomes from previous attempts at executing motor programs and the specifications of movements used during those attempts.

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3. Motor Learning Theory as Related to Speech Production

a. Initial Condition: Articulatory placement, voicing, prosody, intonation, phrasing

b. Motor Commands Needed: Timing and amplitude of production

c. Sensory Consequences:

i. Tongue and lip movement for production

ii. Tactile awareness of articulatory placement

d. Outcome: Were the speech sounds, voicing, intonation, and prosody correct?

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4. Providing auditory and visual models, shaping the movement through slowed rate and visual and tactile cues, adding and fading cues as needed, providing specific feedback about the movement (knowledge of performance [kp]) early on, and fading to knowledge of results (kr) to facilitate learning and retention.

5. Modeling and provision of kp in which the child is given specific information about their errored movement helps the child refine the appropriate response specification (e.g., direction, range, speed, force) for the intended movement. The initially slowed rate and use of simultaneous production provide more time for the proprioceptive feedback

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Therapy, just at for Speech Motor Chaining, concentrates on syllable patterns and not specific phonemes. clinicians implementing therapy based DTTC are encouraged to also think about vowels (as vowels are often distorted in motor planning disorders), syllable length and shape, and errors in prosody (e.g., segmentation, equal or incorrect stress) in target selection (Strand, 2020)

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## Motor Shapes

| | |
|---|---|
| V/VV | (would not target vowels or VV outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| C | (I would not typically target a consonant by itself outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| CV | |
| VC | |
| VCV | |
| C1V1C1V1 | |
| C1V1C1V2 | |
| C1V1C2V2 | |
| C1V1C1 | |
| C1V1C2 | |
| CVCVCV | |
| CVCV + CVC | |

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## General Guidelines: Step 1 Stimulus

- ✗ 8-10 stimulus (less for more severe cases)
- ✗ Carefully selected
- ✗ May start with one syllable shape if more severe.
- ✗ Less severe: could start with current pattern with a few in the next pattern

| Mild | Moderate | Severe/Profound |
|---|---|---|
| Requires minimal cueing to obtain syllable production | Considerable cueing needed to produce syllable shape | With considerable cueing, cannot produce syllable shape |
| • Improvement is more rapid Prognosis: Good<br>• Larger stimulus set (8-10) and can include words from more than one syllable shape<br>• More random practice | • Prognosis is good but longer duration in therapy<br>• Larger stimulus set and can consider words from more than one syllable shape | • Prognosis is guarded<br>• Smaller stimulus set (3-5)<br>• May not be able to include words from other motor shapes<br>• More block practice<br>• Increased frequency and type of feedback |

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## General Guidelines: Step 2 Stabilize Existing Consonants and Vowels

Sounds may be produced correctly in certain positions or contexts and not in others. Stabilize the consonants and vowels that the student is able to produce in various motor shapes.

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## General Guidelines: Step 3 Produce Stabilize Stabilized Consonants and Vowels

- VC (in)
- CV (no)
- VCV (oh no)
- CVCV (mama)

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## General Guidelines: Step 4 Target New Vowels and Consonants

- Choose sounds for which the child is most stimulable
- Select sounds that occur more frequently in English
  Schwa /a/, /s/, /t/, /r/, /o/, /e/, /a/
- Select sounds that are visible (i.e.: /p/, /b/, /m/)
- Select sounds that are developmentally appropriate

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## General Guidelines: Step 4 Expand Motor Shapes

| | |
|---|---|
| V/VV | (would not target vowels or VV outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| C | (I would not typically target a consonant by itself outside of a syllable shape) USE THIS SPACE FOR DOCUMENTATION |
| CV | |
| VC | |
| VCV | |
| C1V1C1V1 | |
| C1V1C1V2 | |
| C1V1C2V2 | |
| C1V1C1 | |
| C1V1C2 | |
| CVCVCV | |
| CVCV + CVC | |

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## General Guidelines: Step 6 Increase Variability

- Concentrate of current motor shape while adding another one in proximity (based on the severity of the disorder).
- New shape may require more cueing.

| | | |
|---|---|---|
| | C1V1C1V1 | |
| Current target → | C1V1C1V2 | mommy, daddy |
| Proximity target → | C1V1C2V2 | pony, happy |
| | C1V1C1 | |
| | C1V1C2 | |
| | CVCVCV | |
| | CVCV + CVC | |

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## General Guidelines: Step 7 Vary Prosody

- Once the student can produce the stimuli over several repetitions, begin to vary the production with rising and following intonation, louder/softer, etc. to support motor learning. (Example: no, no!, no?)

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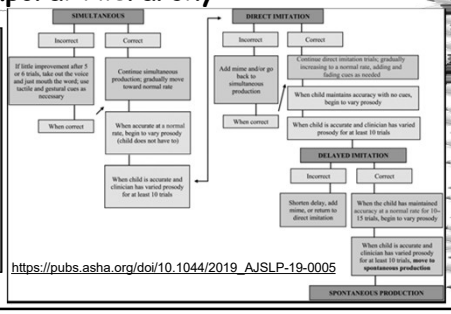
## *** Temporal Hierarchy

Goal: varying the amount of time between the clinician's model and the child's imitative response




https://pubs.asha.org/doi/10.1044/2019_AJSLP-19-0005

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## Can't Remediate that /R/: Assessment and Intervention

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## Questions

- Where is /r/ produced?
- How many /r/s in English?

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## Why is /r/ so difficult?

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- ✗ Articulatory placement (alveolar, to post alveolar, to palatovelar)
- ✗ Student hasn't responded to standard techniques
- ✗ Instruction regarding placement is the wrong motor plan for that student
- ✗ At least 21 different /r/s!

*No other sounds in English have so many place of articulation or variations.*

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## Dynamic /r/ Screener

**MK Courter Communications Dynamic /R/ Screener**

This screener is designed to assess /r/ from a motor planning approach.. It is designed to use as a dynamic assessment to determine /r/ production without and with cueing to determine where to begin therapy and how the student responds to the cues utilzed.

**Directions:**

1. State each word.
2. Have the student look at you when you say the word. Do not provide any other cueing for the first production. Score production as a 1 for correct or a 0 for incorrect.
3. If the student does not produce the word correctly, repeat the word adding a cue. Take notes on any changes.
4. If still not produced correctly, add a different cueing (of your choice) to measure change of production with cueing. Score again in the space provided next to each word.

ADD A FOOTER

225

226

**Scoring:**

| Production | Take Notes |
|---|---|
| **1 = correct**<br>**0 = incorrect** | ☐ Type of cue provided 1st attempt<br>☐ Type of cue provided 2nd attemt<br>☐ Inconsistent production<br>☐ Prosody errors<br>☐ Other |
| 1. Score initial production with eye contact as correct or incorrect.<br>2. Score the cued production if 1st attempt was not correct<br>3. Score cued response as correct or incorrect. | |

ADD A FOOTER

226

228

## MK Courter Communication Dynamic Assessment /R/ Screener

85-93

228

229

| Stimulus | Attempt Score: 1 or 0 | Notes |
|---|---|---|
| /ar/ | | |
| 1. art | | |
| 2. bark | | |
| 3. car | | |
| /er/ | | |
| 4. earn | | |
| 5. learn | | |
| 6. her | | |
| 7. father | | |

For Motor Planning, Imitation is the most difficult

229

236

| Summary |
|---|
| **Most Stimulable** |
| **Starting Point for Therapy** |

236

| Stimulus | Attempt<br>Score: 1 or 0 | Notes |
|---|---|---|
| Other | | |
| | | |
| | | |
| | | |
| | | |

https://drive.google.com/file/d/1F-rocp8A8l0r1UI0tBeRm2HOsO8Te_Jt/view?usp=sharing

237

## If Probe Does Not Yield a Correct /R/

*If motor planning, asking a student to produce a bunched or retro flex /r/ based on verbal directions would be contraindicated*

238

## Ways to Elicit /R/: Step 1

- ELICIT CORRECT PLACEMENT AND SOUND PRODUCTION
- PRODUCE /L/ OR /TH/ AND SLIDE BACK
- HARD /G/ AND SLIDE FORWARD FOR /GER/
- /Y/ AND RAISE TONGUE TIP TOWARD PALATE AND SLIGHTLY BACK
- *** MAY TRY OTHER CONSONANTS SUCH AS /SH/

239

## Step 2

Once Placement is Achieved

- ✗ The student produces a correct /r/, therapist taps student's arm and asks the student to hold the position
- ✗ Student describes tongue position

240

## Step 3: Right to Correct Position

- ✗ 1. Continue sliding from one sound to /r/ until the student can go right to the correct tongue placement
- ✗ 2. Once the student can produce the /r/ then have the student go to the correct /r/ placement
- ✗ 3. Therapist continues to tap to hold the place

*Reminder, if motor planning, asking a student to produce a bunched or retro flex /r/ based on verbal directions would be contraindicated*

241

## How to Begin to Remediate

- ✗ 1. Therapist chooses which /r/ to begin with (by using a mastered /r/ from the screener or choosing which /r/ if there are no mastered /r/s.
- ✗ 2. A mastered /r/ can be used to move to a unmastered /r/

242

## If /r/ is established by sliding from one phoneme to the /r/

1. Therapist chooses if no /r/ mastered
2. Greatest impact on intelligibility
3. Which /r/ will make it easier to get to the next /r/

243

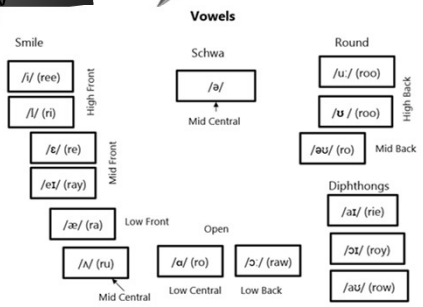
243

## Example: Initial /r/

- ✗ Therapist chose initial /r/ to target first

244

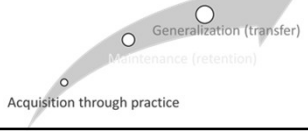
## Step 1: Vowel Circle with CV




245

## Premise

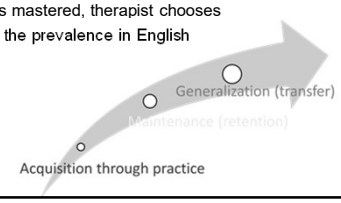
- ✗ Student may be stimulable for one or some but not necessarily all
- ✗ Target the ones that are correct (8-10 words)
- ✗ If more than one are correct, split the words between the correct ones
- ✗ Once maintained, rescreen (vowel + /r/)




246

## Premise

- ✗ 5. Once all /r/ + vowels + consonants are generalized, therapist would move to a new /r/ (vocalic /r/)
- ✗ 6. To determine which vocalic /r/ to target, rescreen all /r/s
- ✗ 7. If no vocalic /r/ is mastered, therapist chooses
- ✗ 8. Base next /r/ on the prevalence in English




247

## Example

| | | |
|---|---|---|
| ****ree | roo (root) | |
| ri | roo (roof, foot) | |
| re | roe | |
| ray | | rie |
| ra | | row |
| ru | ro raw | roy |
| | | rue (are you) |

248

## 8-10 Target Words

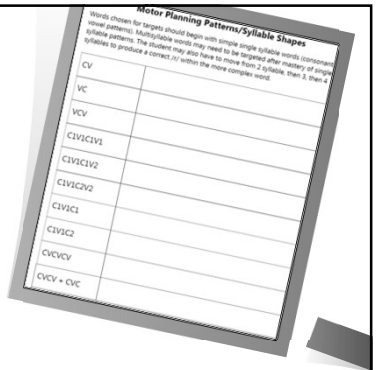
read
reef
reek
real
ream
reap

wreath
reach
respect
redo

249

**Step 2: Determine 8-10 Stimulus**

- respect
- regard
- response
- ripple
- radio
- ripped




250

****ree
****ri
re
ray
ra
ru

ro raw

roo (root)
roo (roof, foot)
roe

rie
row
roy
rue (are you)

251

## 8-10 Target Words

reed
reef
reek
real
ream
rib

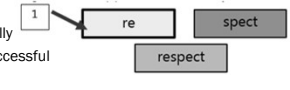
rid
rig
rim
rip

252

## Forward Chaining

97

1. Always keep the initial sound and the vowel together for coarticulation.
2. Have the student state the first part
   a. Provide multisensory cues
   b. Could attempt simultaneous production (saying it together)
3. Once the student is successful with the first part, have them state the second part
4. Blend the two together.
   - May need to use cues initially
- Fade cues as student is successful




253

## Backward Chaining

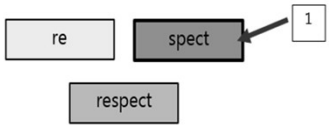
1. Consonants and vowels in the word must be produced correctly.
2. If the student is able to produce the first syllable correctly, but let's say, produced the vowel or another sound incorrectly in the second syllable (or any syllable in a multisyllabic word), backward chaining could be used to get the correct production of the incorrect syllable.
3. Use multisyllable cues to demonstrate the correct production of the incorrect sound.

256

Re is produced correctly.

spect is in error (i.e.: student states "spict" or "pect".

Correct the error in the second syllable.




Then add the first syllable. May need to continue to cue the second syllable and fade as soon as possible

257

Step 3: Therapy Progression from Practice to Maintenance

1. The student produces the targeted /r/ word(s) by repeating 8-10 targeted words one at a time (reek, read, reef, real, ream, reap, wreath, reach, respect, repeat).

2. The student then attempts 2 repetitions of the word (i.e.: ream, ream)

3. The student can repeat a targeted word 3 times (i.e.: ream, ream, ream)

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Therapy Progression from Practice to Maintenance

4. The student can repeat a targeted word 4 time.

5. The student can repeat a targeted word 5 time.

6. The student can repeat the targets rapidly with changing the word to another target (i.e.: ream, ream, ream, reap, reap)

259

Therapy Progression from Practice to Maintenance

7. The student can add another word (i.e.: ream, ream, reap, reap, real, real)

8. The student can alternate patterns (i.e.: ream, reap, ream, reap)

260

Step 4: Therapy Progression from Maintenance to Generalization

Once the student is able to alternate patterns with ALL C1V1C2 words, then, this motor planning pattern needs to move toward generalization before rescreening all /r/ patterns.

1. The student can produce the word with a carrier phrase. (re: one word + the target.

Then, 2 word phrases + the target, etc.)

2. The student can produce the word correctly in a given sentence.

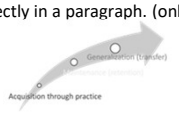
261

Therapy Progression from Maintenance to Generalization

Once the student is able to alternate patterns with ALL C1V1C2 words, then, this motor planning pattern needs to move toward generalization before rescreening all /r/ patterns.

3. The student can produce the word in a novel sentence.

4. The student can produce the words correctly in a paragraph. (only containing the /r/s that are mastered)




262

https://drive.google.com/file/d/1oIWR9Gx3sPPi8hkjaiw3eB__9ctpZaIK/view?usp=sharing

263

## Next Step: /R/ Therapy Progression

The goal is to use an /r/ that has been remediated, maintained, and generalized to target the next /r/.

99

**Moving to the Next /r/**

1. Once the next target is determined, the therapist can use a previous target to target the new /r/.

| New target | | /r/ initial word that is the easiest to produce |
|---|---|---|
| her | rrrrrrrr | rabbit |
| burr | rrrrrrrr | rabbit |
| sir | rrrrrrrr | rabbit |
| fur | rrrrrrrr | rabbit |

264

2. May have to delete the /r/ from the new word so that the student does not motor plan the incorrect /r/ first.

| | | |
|---|---|---|
| h ɔ | rrrrrrrr | rabbit |

265

## Goal

1. Get the student to think about the mastered /r/
2. May have to cover the /r/ of the new word
3. Tap the student as soon as you hear the correct /r/ sound
4. Once the student can say the new word without the mastered word, take the mastered word away, and move to multiple productions
5. *One the student can produce multiple repetitions, rescreen*

266

- ******* *May have to practice these as nonsense one syllable words in order to move to multisyllable nonstressed vocalic /r/*

267

## Example using /ar/ to get to /r/

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268

Final R to Initial R Practice

Use the word "_ar" in front of the following words. Hold out the /r/ sound at the end of _ar (ie: _ar rrrrrr) and add the words below.

Example

arrrrrrrr | eek

Judge your /r/ sound before you say the new word.

| Long /ee/ | Short /i/ | Short /e/ | Long /ae/ | Short /a/ |
|---|---|---|---|---|
| ar rrrr | _ar rrrr | _ar rrrr | _ar rrrr | _ar rrrr |
| eek | ib | ed | ake | ack |
| eef | id | ef | aid | ag |
| eal | iff | eck | age | am |
| eam | ick | ep | ail | an |
| eap | im | est | ain | ap |
| ease | ip | ev | ace | at |
| eath | ist | | ate | |
| each | | | ave | |
| | | | aise | |

269

## Moving to /r/ Medial: Using Forward Chaining

101

Example of Forward Chaining

C1V1C2V2 → rob, in, ro, bin

C1V1C2 → rea, ch

270

Once the final /r/ is mastered, the next position of that /r/ can be targeted.

| | |
|---|---|
| her | t |
| her | d |
| her | s |
| bur | n |
| bur | p |
| bir | d |

https://drive.google.com/file/d/1IL1XZqigTa-lwVZznUW9TyPA0fDGB96W/view?usp=sharing

271

## Goals and Objectives: SMART

101

**Specific**

- This is the specific goal or goals that are being targeted
- (Name of student) will produce initial /r/ and vocalic /r/

**Timely**

- This is the timeframe of your goal. Are you writing for an IEP cycle, calendar year, or shorter time increment?
- By _____ (date or timeframe)

272

**Realistic/Achievable**

- This is the opportunity to determine how realistic the goal is based on the student.
- Pick: at the single word level, with 5 repetitions, with alternating patterns, in phrases, sentences, structured tasks (reading sentences, reading paragraphs, spontaneous speech), unstructured tasks, or spontaneous speech

**Measureable**

- This is the data collection. How will the goal be measured? (# of trials, percent correct, etc)
- with 95% accuracy (over three consecutive sessions, in the classroom, in spontaneous production, etc)

273

Goal (Long Term)

By the end of the fourth quarter (timely), student will produce initial /r/ and vocalic /r/ in unstructured task such as spontaneous speech (specific and reasonable) with 95% accuracy while talking with peers or in class (measurable).

274

## Objectives (Short Term)

1. Student will produce _____ (initial /r/ or specific vocalic /r/ or other speech sounds being targeted) in (single, with 2, 3, 4, or 5 repetitions, alternating patterns,) words using 8-10 words (stimulus) with 100% accuracy (with cues, without cues) over three consecutive sessions.

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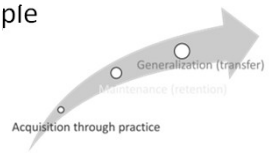
2. Student will produce _____ (initial /r/ or specific vocalic /r/ or other speech sounds being targeted) in structured tasks for generalization (phrases, sentences, reading) with 95% accuracy (with cues, without cues) over three consecutive sessions.

3. Student will produce _____ (initial /r/ or specific vocalic /r/ or other speech sounds being targeted) in unstructured tasks for generalization with 95% accuracy (with cues, without cues) while conversing with peers over three consecutive sessions.

276

## Initial /R/ Example

Practice




| Read | Reef | Real | Ream | Reek | Reap | Respect | Reason | Really |
|---|---|---|---|---|---|---|---|---|
| + | + | + | + | + | + | + | + | + |

278

## Targets and Documentation

Maintenance

| Read | Reef | Real | Ream | Reek | Reap | Respect | Reason | Really |
|---|---|---|---|---|---|---|---|---|
| ++ | +- visual/ tactile | +- visual/ prosodic | -- prosodic /visual | | | | | |

279

## Targets and Documentation

Maintenance

2 repetitions maintained without cuing

| Read | Reef | Real | Ream | Reek | Reap | Respect | Reason | Really |
|---|---|---|---|---|---|---|---|---|
| ++ | ++ | ++ | ++ | ++ | ++ | ++ | ++ | ++ |

Once the student is able to produce 2 repetitions without cuing, move to 3 then 4 repetitions

280

## Targets and Documentation

Maintenance

Once the student is able to produce 2 repetitions without cuing, move to 3 then 4 repetitions

281

5 Repetitions (not yet maintained)

| Read | reef | Real | Ream | reek |
|---|---|---|---|---|
| +++++ | ++— - | ——++ | - - +++ | - - +++ |
| | Visual/Tactile | Visual/tactile/ Prosodic | Prosodic/Visual | Visual/Tactile |

282

5 Repetitions (maintained without cuing)

| Read | reef | Real | Ream | reek |
|---|---|---|---|---|
| +++++ | ++++++ | +++++ | ++ +++ | +++++ |

283

**Repeat Word 3 Times Then New Word**

Once the student can do 5 repetitions **without cues or errors**, have the student repeat the same word three times then switch to another word.

| C1V1C1 | read | read | read | reap | reap | reap |
|---|---|---|---|---|---|---|
| 1 change | | | | | | |

change

284

**Repeat Two Times, Change, Repeat Two Times, Change**

Once the student can make the one change as the example above without cues or errors, then have the student make two changes. Repeat the same word a couple of times, then switch to a new word then switch again.

| C1V1C1 | read | read | reap | reap | reek | reek |
|---|---|---|---|---|---|---|
| 2 changes | | | | | | |

change change

285

**Alternating Patterns**

An alternating pattern may be more difficult than the above patterns.

| C1V1C1 | read | reap | read | reap | read | reap |
|---|---|---|---|---|---|---|
| alternate | | | | | | |

286

**Generalization**
**Pivot Phrases and Documentation**

| One syllable | 2 syllables | 3 syllables | 4 syllables |
|---|---|---|---|
| My _____ | Open _____ | Open the ___ | Can I have ___ |
| Help _____ | Put on _____ | Put on a ___ | I don't want ___ |
| No _____ | Take off ____ | Take off the ___ | Help me open |
| Help _____ | I want ___ | I want a ____ | |
| On _____ | Help me ____ | Help me on _____ | |
| Hi _____ | Begin ____ | | |
| Bye _____ | Enjoy _____ | | |
| Blue ____ | | | |

287

Next
4. Develop sentences of any complexity
5. Move to paragraphs with only mastered /r/
6. All maintained /r/ patterns should be included for practice

288

## Next Steps

Step 1:
Rescreen all /r/s

Step 2:
Pick the next /r/ and follow the above steps

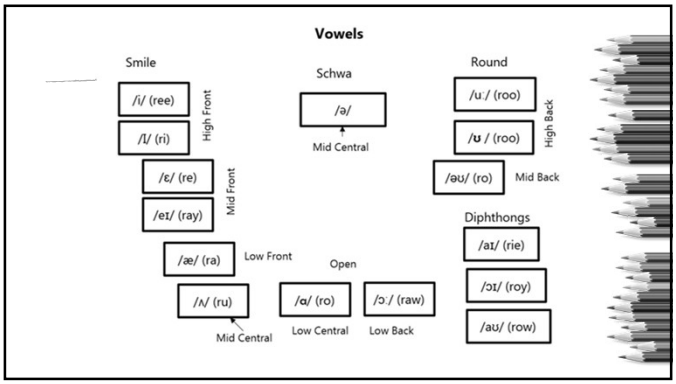
289

## Using /ar/ as a starting point

Student can produce /ar/ in the final position. How do you use this /ar/ to get to the next target?

| /ar/ | | /r/ initial in a CV pattern |
|---|---|---|
| car | rrrrrr | re |
| bar | rrrrrrr | ri |
| far | rrrrrrr | re |
| star | rrrrrrr | rae |

290




291

## Let's Chat

What if your student can only produce /ar/ in the medial position like in bark, park, farm, yarn, cart, large, march, heart. What would you need to do first?

292

## Generalization of Persistent Speech Sound Disorders

We often see difficulty with generalization with students with PSSD.

When attentional issues are added, the ability to generalize becomes a heavy burden for the student. The following section will provide some strategies for generalization for PSSD.

293

294

## Generalization of Persistent Speech Sound Disorders

- ✗ Goal Setting – Explicit Instruction
- ✗ High Interest Activities and Discussion
- ✗ Practice in a Variety of Contexts and Environments to lead to quicker generalization
- ✗ Introduce Distractions into Therapy – increase the cognitive load
- ✗ Invite a Friend to Therapy

295

## Generalization of Persistent Speech Sound Disorders

- ✗ Homework
  - Talking time: Ask parents to have the student share the best part of their day.
  - Talking time during a meal: Each person shares something about their day without interruption of other family members.

296

## Generalization of Persistent Speech Sound Disorders

- ✗ Choose a Word of the Day
- ✗ Collaboration with Classroom Teacher

297

## You Decide: Best Approach

The following case studies are designed for you to determine the best treatment approach.

298

## Case Study #1

- Age at evaluation: 5;9
- Background: normal pregnancy and birth history, no history of ear infections, physical development delayed, language development delayed. Significant family history for speech and language disorders

Clinical Evaluation of Language Fundamentals Preschool: Auditory Comp standard score: 93. Expressive: 83

299

## Case Study continued

Speech: Kaufman Test of Speech Praxis

Oral motor: standard score 12

Simple movement: below norms

Complex movement: below norms

## Case Study continued

Information reported:

- Difficulty with moving articulators on demand
- Difficulty maintaining the same speech patterns twice
- Difficulty imitating with increased complexity
- Difficulty with diadochokinesis
- Vowel distortions and errors
- Better production of singe words than longer utterances

Intelligibility: 90% unintelligible in connect speech

300

301

** You Decide

301

Diagnostic Statement: Case Study 1

This 5 year 9 month old child who is exhibiting average receptive language and low average expressive language skills, and a severe impairment in speech acquisition with the following characteristics:

- Difficulty moving her articulators on demand
- Difficulty maintaining the same speech movement twice
- Difficulty imitating speech patterns with increasing complexity
- Difficulty performing diadochokinesis
- Vowel distortions/errors
- Better production on single words than longer utterances

These are due to primarily difficulty with planning and programming movement gestures for speech production (CAS). There is no evidence of dysarthria. She is pragmatically and socially appropriate, attends to the speaker, and attempts most tasks.

302

## Case Study #2

- Age at evaluation: 3;6
- Background: Full term, uncomplicated birth
- Born with patent ductus arteriosus (PDA) required surgery at 2.6 years of age
- One diagnosed ear infection
- Developmental milestones on target for language development
- Family history of learning disabilities
- Language Sample: Using 6-8 word utterances. Could retell past events, verbal turn taking noted

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## Case Studies cont.

- Structured Photo Articulation Test
  - Final consonant deletion
  - Medial consonant deletion
  - Voicing errors
  - Substitutions (i.e.: /w/ for voiced /th/ in the initial position and /y/ in the medial, /y/ for /s/ initial, /f/ for /sw/, /d/ for /st/, /w/ for /br/ and /tr/
  - Blend reduction
  - Fronting
  - Could produce multisyllable words although sound errors or deletions were present

304

305

**Phonemic Inventory Probe: Targeting /p/, /t/, /k/, /w/, /l/, /r/**

Child Name AW

| Target | # Cons | Production | Target | # Cons | Production | Target | # Cons | Production | Phoneme(s) |
|---|---|---|---|---|---|---|---|---|---|
| 1. whiye | 1/2 | wai | 20. wrye | 0/2 | wai | 39. wiyer | 0/2 | wai | |
| 2. hiy | 1/2 | hi | 21. hear | 1/2 | hi | 40. hir | 1/2 | hi | |
| 3. jock | 0/2 | a | 22. rock | 0/2 | wo | 41. walk | 1/2 | wo | |
| 4. talk | 1/2 | a | 23. tall | 1/2 | to | 42. wall | 1/2 | wo | |
| 5. wing | 1/2 | wi | 24. ring | 0/2 | I | 43. king | 1/2 | ti | |
| 6. tea | 1/1 | ti | 25. pea | 1/1 | | 44. key | 0/1 | ti | |
| 7. tape | 1/2 | tai | 26. tail | 1/2 | tai | 45. whale | 1/2 | | |
| 8. snake | 1/3 | sai | 27. snail | 1/3 | jai | | | | |
| 9. toes | 1/2 | tau | 28. wrose | 0/2 | tau | | | | |
| 10. page | 1/2 | pai | 29. cage | 0/2 | tai | | | | |
| 11. faye | 0/2 | ai | 30. wave | 1/2 | wai | | | | |
| 12. pie | 1/1 | pai | 31. Y /wai/ | 1/1 | | | | | |
| 13. pig | 1/2 | pi | 32. wig | 1/2 | wI | | | | |
| 14. cake | 0/2 | ai | 33. rake | 1/2 | wai | | | | |
| 15. cup | 0/2 | tʌ | 34. cut | 0/2 | tʌ | | | | |
| 16. boat | 0/2 | pai | 35. bowl | 1/2 | bo | | | | |
| 17. toe | 1/1 | tau | 36. low | 0/1 | wau | | | | |
| 18. bike | 0/2 | pai | 37. bite | 0/2 | pai | | | | |
| 19. pen | 1/2 | pe | 38. ten | 1/2 | te | | /85 | | |

Stoel-Gammon (1986) stipulated that two occurrences are required for sounds to be included in the phonemic inventory. Circle sounds for which there are two occurrences on the above task: (P) (t) (k) (w) (l) (r)

Gierut & Champion (2001) indicated that a child must have the second and third consonants of a three-element cluster in his/her phonemic inventory to teach a three-element cluster. Circle permissible three-element clusters for treatment based on the phonemes indicated above:

/str-/ /spr-/ /skr-/ /skw-/ /spl-/

Total # of Consonants = 85 (Correct # of consonants) 29 /85 = 25 %

Percentage Consonants Correct (PCC) = # correct consonants/total # of consonants

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You Decide

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Diagnostic Statement: Case Study #3

This 3 year 6 month old child who is exhibiting average receptive and expressive language skills by evidence of a language sample but a severe impairment in speech acquisition, phonological impairment in medial and final consonant deletions, gliding, blend reduction, fronting, and voicing errors. She does not demonstrate difficulty with multisyllabic word production demonstrating consistent errors as seen in single syllable words, vowel repertoire, slow rate or prosody. There is no evidence of dysarthria or motor programming or planning. She is pragmatically and socially appropriate, attends to the speaker, and attempts most tasks.

307

## Case Study #3

- Age at evaluation: 6;2 (first grade)
- Background: normal pregnancy and birth history, no history of ear infections, physical development on time, language development delayed. No family history for speech and language disorders

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## Case Study #3

- Receptive and Expressive Language Skills: Low average range (Began receiving speech therapy services in preschool) for severe phonological impairment and expressive language delay
- Pragramtic/Social Language: Gets along well with peers but peers comment that he sounds like a baby
- Oral Motor: Structure and function adequate

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## Case Study continued

Intelligibility: Very low to familiar and unfamiliar listeners

Multiple phonological patterns:

Velar fronting: t/k, d/g, palatal fronting s/sh, s/ zh

Deaffrication s/ch, z/dʒ

Cluster reduction

Gliding

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You Decide

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Diagnostic Statement: Case Study 6

This 6 year 2 month old child who is exhibiting below average receptive language and low average expressive language skills, and a severe impairment in speech acquisition with the following characteristics:

- Oral motor structure and function: adequate
- Multiple phonological processing errors
- Decreased overall speech sound development
- Low intelligibility

The student presents with multiple errors that requires an approach (Complexity Approach) to increase accurate speech production due to moderate to severe phonological impairment with low intelligibility and limited phoneme inventory. Language skills will also be targeted with building phonological awareness, morphology, syntax, and semantics through articulation targets. He is pragmatically and socially appropriate, attends to the speaker, and attempts most tasks.

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What is Good Enough?

**Story of Jack**

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## SSD and Educational Impact: IDEA

Academic performance (i.e., class grades) is not the only factor that should be considered in making eligibility decisions (Dublinske, 2002; Posny, 2002).

- ✗ Academic
- ✗ Social-emotional (child's perceptions, feelings, and attitudes about how others view his or her communication, as well as the perceptions, feelings, and attitudes held by those who interact with the child.)

Great Resource: Wisconsin Department of Public Instruction: Considerations for Speech Impairment https://dpi.wi.gov/sites/default/files/imce/sped/pdf/sl-speech-rubric.pdf

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## SSD and Educational Impact: IDEA

Researchers have consistently found that having a communication disorder results in long-term negative academic outcomes (Lewis & Freebairn, 1992; Sices, Taylor, Freebairn, Hansen, & Lewis, 2007) and social interactions (McCormack, Harrison, McLeod, & McAllister, 2011; McCormack, McLeod, McAllister, & Harrison, 2009). Negative academic outcomes and social interactions may lead to a reduction in quality of life through adulthood (Feeney, Desha, Ziviani, & Nicholson, 2012).

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From ASHA

Termination Due to Lack of Progress

An apparent "lack of progress" is based on the assumption that the prescribed treatment goals, methods, data collection, and use are all appropriate for the individual with disabilities and their family. However, *it is possible that the perceived lack of progress is actually an indication that the procedures being implemented are not well-suited to the individual with disabilities. In other words, lack of progress might indicate that the intervention is a poor fit. It is important to examine whether the intervention itself is optimal for the individual, their family, and their other caregivers and educators.*

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**Before we go ...!**

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## Takeaways

- Differential diagnosis leads to the right approach!
- There are so many reasons for persistent speech sound disorders (developmental, neurological, hx of speech delays, hx of normal development but failure to achieve accurate production of 1 or 2 sounds, one syllable words OK but multisyllable difficult)
- PSSD 1-2% and can persist into adulthood causing possible lower skilled jobs and unemployment

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## Takeaways

- Perception of others regarding academic, social, and behavioral performance are impacted by SSD
  - Teachers have lower expectations
- Research shows that children as young as 4-5 were successful with treatment of later acquired sounds
- Strong link between SSD & phonology and morphology
- Explicit, Systematic, and Sequential instruction works!
- Generalization for PSD can cause cognitive overload

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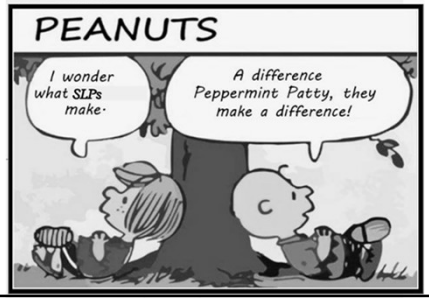
## Thank you for making a difference!