


**Advocating for Reading Success for  
children with Speech Sound  
Disorders**

Oregon Speech Language Hearing Association | October 2017

Kelly Farquharson, Ph.D., CCC-SLP | Emerson College




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**Disclosures**

- Financial: OSHA has compensated me for today's presentation. I am a faculty member at Emerson College and receive a salary for that job.
- Nonfinancial: I am the director of the Children's Literacy and Speech Sound (CLaSS) Lab, faculty at Emerson College, and the President of the Massachusetts Speech, Language, and Hearing Association




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**Children's Literacy and Speech Sound (CLaSS)  
lab**

- [www.classlab.emerson.edu](http://www.classlab.emerson.edu)
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Observation from a school-based SLP: Subgroups of SSD????

		Remediates	
		YES	NO
Literacy Problems	NO		Motor Deficit?
	YES	Linguistic Deficit?	True phonological deficit

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Learning Objectives

1. Identify the role of phonological representations
2. Discuss the risk factors and outcomes for children with persistent or remediated speech sound disorders as well as those with dyslexia
3. Discuss the SLPs role in facilitating literacy skills for children with speech sound disorder and those with dyslexia

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Who is reading?

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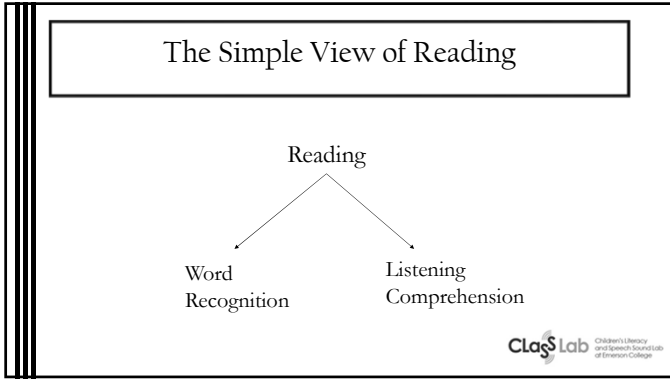
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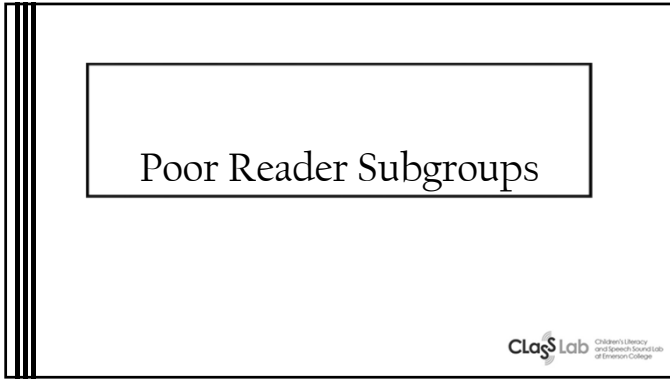
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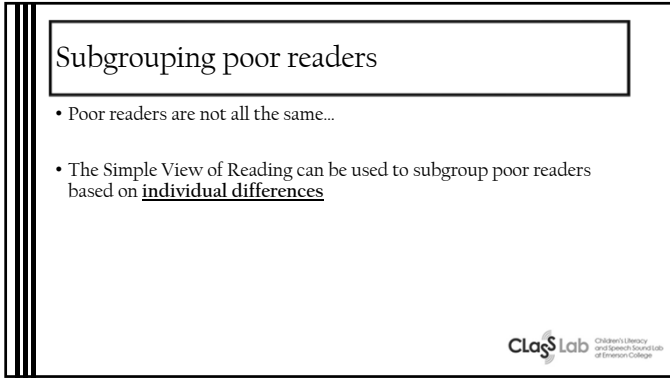
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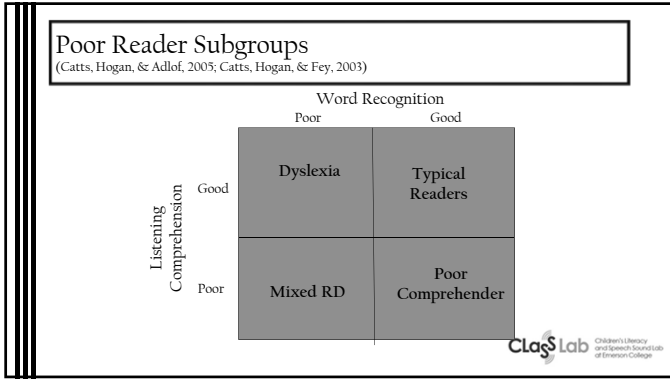
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**Poor readers can be subgrouped**

- Using components of reading, you can
  - Better understand individual reading deficits
  - Create targeted intervention leading to improved outcomes

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**'Reading' Changes Over Time**

The Simple View is not so simple...

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'Reading' changes over time  
(Catts, Hogan, & Adlof, 2009)

Reading Comprehension

Word Recognition

Listening Comprehension

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Learning to read → reading to learn

Reading Comprehension

Word Recognition

Listening Comprehension

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Poor Reader Subgroups Change Over Time

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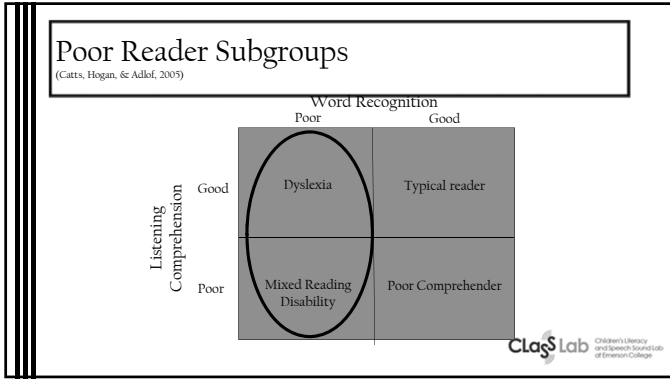
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### How does this apply to phonological impairments?

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- ### Phonological Impairments
- Speech sound disorders
    - Articulation
    - Phonology
  - Dyslexia
    - Word reading
    - Phonemic decoding
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Speech Sound Disorders

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<p style="text-align: center; font-size: small;">Speech sound disorders are characterized by a delay in the acquisition of appropriate speech sounds <small>(Lewis, Freebairn, Hansen, Shriberg, Stein, Taylor, &amp; Iyengar, 2006).</small></p>	<p style="text-align: center; font-size: small;">Children with speech sound disorders are the primary population treated by school-based speech language pathologists <small>(ASHA, 2014, 2013, 2012; NIDCD, 1994).</small></p>
<p style="text-align: center; font-size: small;">Even once the speech sound disorder has been remediated through speech therapy services <small>(Anthony, et al. 2007; Overby, Trainin, Smit, Berenthal, &amp; Nelson, 2012; Raitano et al., 2010).</small></p>	<p style="text-align: center; font-size: small;">50-70% of children with speech sound disorders require some level of special education services through the 12<sup>th</sup> grade <small>(Felsenfeld, Broen, &amp; McGue, 1994; Shriberg &amp; Kwiatkowski, 1988).</small></p>

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It is rarely “just artic”

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### Speech Sound Disorder

- More than half of children with SSD experience difficulties with reading (Bishop & Adams, 1990; Catts, Adlof, Hogan, & Weismer, 2004; Catts, 1986; Catts, 1991; Catts, Fey, Tomblin, & Zhang, 2002; McCardle, Scarborough, & Catts, 2001; Nathan, Stackhouse, Goulandris, & Snowling, 2004; Tomblin, Zhang, Backwalker, & Catts, 2000).
- Deficits in the phonological system often result in difficulty acquiring phonological awareness (PA) skills, a necessary pre-requisite for reading success (Larrivee & Catts, 1999).

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### Prevalence of SSD

- 11-13% of 9-11 year olds have speech sound disorder (Tomblin, 2009)
- Approximately 10% of children ages 9-11 have speech sound disorder (Tomblin, 2009)
- 18% of 8-year-olds in the UK have unresolved speech sound errors (Ronsavay, 2009)
- 1.4% of college freshman have persisting speech sound errors (Culnan, 1986)

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### Risk of Reading Difficulties

This likely includes children with dyslexia!

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    graph LR
      A[Typically developing] --> B[Speech Sound Disorders only]
      B --> C[SSD + Language impairment]
  
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Dyslexia is...

- A language-based problem
- A phonological processing disorder
- Neurobiological in origin
- Present from birth
- Usually experienced for life

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Dyslexia is...

- A spectrum disorder than can range from annoyance to severe limitation
- More common than any other kind of learning disability
- Responsive to expert, informed instruction (Moats, 2008)

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Dyslexia is...

- Characterized by weaknesses in word reading, phonemic decoding, and spelling
- Surprising, because this weakness exists in the presence of normal intelligence
- Present in adults who have compensated but are poor spellers, are slow readers, and have difficulty with novel and complex phonological forms

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Dyslexia is NOT...

- Characterized or diagnosed by seeing letters backwards
- Indicative of "gifted" status
- A disorder that cannot be diagnosed until 3rd grade
- A visual problem
- Responsive to colored lenses and/or eye tracking exercises



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Identify the role of phonological representations

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Phonological Representations

spoken language  
written &  
blocks for  
Building

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Phonological Representations

- How phonological information – like speech sounds – is stored in long term memory

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Phonological Reps + SSD

- Underdeveloped in children with SSD (Catts & Larivee, 1999)
- May be difficult to access for children with SSD because working memory resources are limited
- May be the reason why some children with speech sound disorders experience difficulties with literacy and some do not.

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How could this affect reading?

- Learning decoding skills
  - Letter sound correspondence
- Learning sight words

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**What is a sight word?**

- The sight of the word immediately activates its pronunciation and meaning in memory
- To build sight words in memory, orthographic mapping, is required
- What is needed for orthographic mapping?

(Ehri, 2014)




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**Orthographic Representations**

- The storage of orthographic information in long term memory (Apel, 2011).
- Provides information regarding how to represent spoken language in written form.




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**Orthographic Mappings**

- Mappings from phonology to orthography occur early on in reading development.
- Parallel connections between orthography and phonology.
  - Phonological awareness appears to provide extra support. (Nilsen & Bourassa, 2008)




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**Code Focused**

- Phonological awareness
- Word recognition – scope and sequence
  - Letter sound correspondence
  - Decoding
  - Spelling
  - Advanced decoding
  - Sight words – fluency
  - Analogy
  - Context

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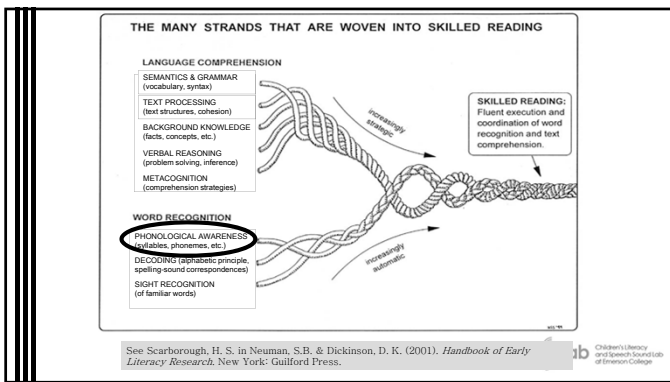
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**Phonological awareness**

- One's sensitivity to the sound structure of a word
- Measured by rhyming, blending, and deletion tasks
- Research supports causal link between phonological awareness and early reading
  - Good phonological awareness = good readers
  - Poor phonological awareness = poor readers

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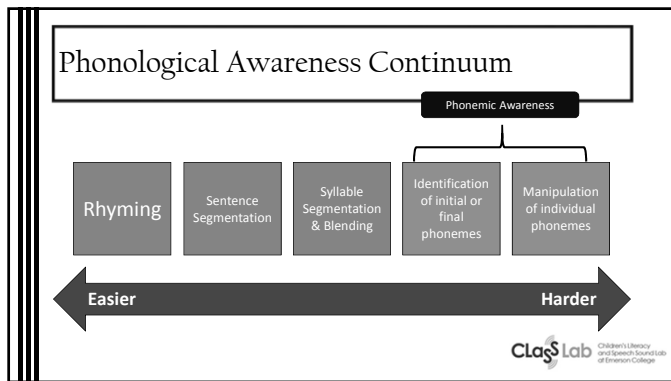
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Risk factors and outcomes for children with SSD and/ or dyslexia

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PA & SSD – Relations over time

Preschool:

- Preschoolers with SSDs are at increased risk for deficits with phonological awareness (Anthony et al., 2011; Bird, Bishop, & Freeman, 1995; Foy & Mann, 2011; Lewis et al., 2011; Lewis & Freubahn, 1992; Petersen, Pennington, Shriberg, & Boada, 2009; Raitano, Pennington, Tunkle, Boada, & Shriberg, 2004; Rvachew, Ohlberg, Grwaburg, & Heyding, 2003)
- Atypical speech sound errors and distortions in preschool are predictive of weak PA skills (Preston & Edwards, 2010)
- This is true even when language is normal (Bird et al., 1995; Overby, Trainin, Smit, Bernthal, & Nelson, 2012; Raitano et al., 2004; Rvachew et al., 2003)
- The proportion of speech sounds in error at age 5 is related to the likelihood of persistent errors at age 8 (Roulstone et al., 2009)

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### PA & SSD – Relations over time

School-aged:

- Children with persistent speech sound disorders (2-5<sup>th</sup> grade) have markedly weaker PA skills compared to same-age peers (Farquharson, 2012)
- Children with “residual” SSD, ages 8.5-10, exhibit cortical and subcortical differences during phonological processing tasks (Preston, Fehrerfeld, Frost, Menn, Fallergies, Gogorichis, Landa, Sels, & Pugh, 2012)
- Atypical speech sound errors in preschool are predictive of school-age PA abilities; if more than 10% of the child’s speech has atypical errors, the child is likely to have deficits in PA, reading, and spelling (Preston & Hall, 2012)




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### PA & SSD – Relations over time

Adolescents:

- 10-14 year old children with “residual” speech sound errors (no comorbid diagnoses) have weaker phonological processing skills compared to same-aged peers (Preston & Edwards, 2007)
- Phonological processing (word reading and phonological working memory) skills have been shown to be weak even once the speech sound disorder is remediated (Farquharson, 2015; Raitano, Tunick, Pennington, Boda, & Shriberg, 2004)




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### Early Indicators

- Problems in oral language and speech sound development are primary signs of risk for reading disorders

Nathan, Stackhouse, Goulandris, & Snowling (2004); Pennington (2005); Raitano, Pennington, Tunick, Boda, and Shriberg (2004)




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**Early signs of risk for Dyslexia**

- Family history of reading or language impairment
- Difficulty learning the letter names and sounds
- Consistent use of unusual or nondevelopmental errors
- Multisyllabic words especially difficult

(Catts, 1986; 1989; Dodd, et al., 1995; Magusson & Naucler, 1990; Larrivee & Catts, 1999; Leitao & Fletcher, 2004)

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**Not early signs of dyslexia**

- Reversing letters when writing
  - This is typical until -2<sup>nd</sup> grade
- Common errors on long words
  - æminəl/ æniməl
  - pøskerɪ/ spøgerɪ

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**New frontiers in early identification of dyslexia**

- Speech discrimination at 3-5 days old
  - Guttorm et al., 2005
- Babbling complexity in infants
  - Farquharson, Hogan, Hoffman, Green, Wang, & Green, (under review); Lambrecht-Smith et al., 2008

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### SSD and mapping

- Children with SSD often struggle to make the translation between phonology and orthography (Sutherland & Gillon, 2005)
- Long-term difficulties even after the sound is remediated (Farquharson, 2015; Felsenfeld et al.; Raitano, et al., 2004)




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### SSD and Literacy

- Children with SSD were found to have poorer performance on the following tasks:
    - Phonological processing
    - Phonological learning
    - Phonological awareness
    - Word recognition
    - Letter knowledge\*\*
- (Carroll & Nwoling, 2004)




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Shpe speech 3-28-06  
 Jenny  
 Hi! My name is Jenny and I'm in speech and I don't like it because first it is no fun but it teaches you how to talk right. If I want to be loud to talk I will go to class. Speech is like talking class but you have to talk right. It is for people who speak because they have problem with their speech. I am a girl like me because I like speech like I have to talk with my n and I like spelling words.

Kelly,  
 We did a journal free write - this is what Jenny wrote and I thought I would share.

- Trisha ☺

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Hi! My name is Jenny and I'm in speech and I han't it because fist it is no fun but it teach you how to talk right. If I want to be bonged to death I will go to school. Speech is like talking class but you have to talk right that is hard for pople in speech because they have pomdem with there speech too from a girl like me because I'm in speech like I have to remember with my r and \*\*I sounder in\*\* words

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Hi! My name is Jenny and I'm in speech and I hate it because first it is no fun but it teach you how to talk right. If I want to be bored to death I will go to school. Speech is like talking class but you have to talk right that is hard for people in speech because they have problem with there speech too from a girl like me because I'm in speech like I have to remember with my r and \*\*I sounder in\*\* words

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Does Working Memory play a role?

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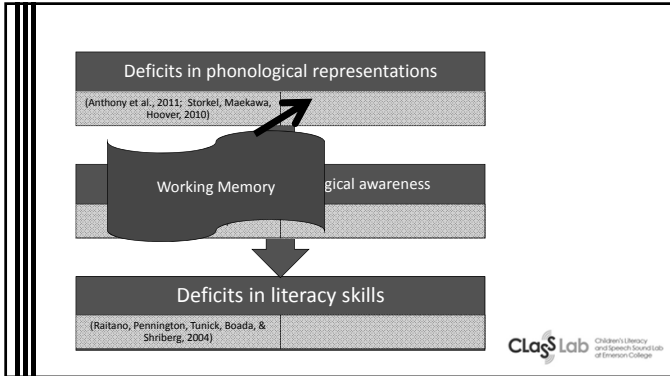
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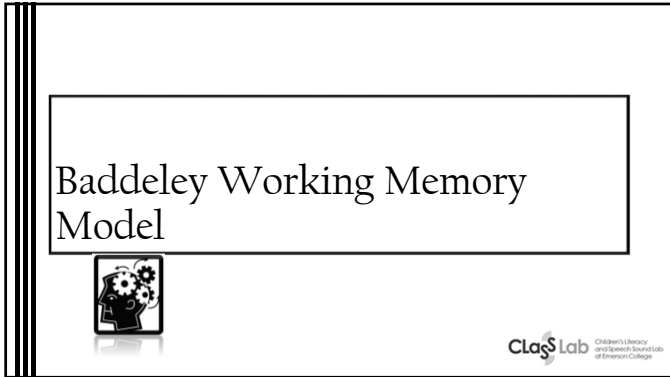
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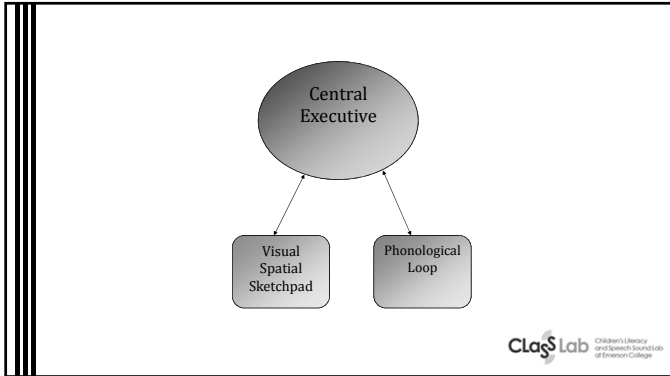
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**Central Executive**

- Allocates attentional resources to the appropriate sub-system (i.e., phonological loop or visual-spatial sketchpad)



Baddeley, 1992; Reisberg, 2010

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**Visual Spatial Sketchpad**

- Stores visually presented information, such as pictures or words

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**Phonological Loop**

- Stores auditorily presented information, such as speech sounds

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**Phonological Loop and SSD**

- 12-year old with remediated SSD had poor WM
  - Speidel (1995)
- Preschoolers with low WM had more speech errors than preschoolers with high WM
  - Nonword repetition
    - Adams and Gathercole (1995)
- Preschoolers with SSD had poor WM
  - Nonword repetition
    - Munson, Edwards, & Beckman (2005)

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**Research Question**

Are there differences in the working memory skills of school-aged children with persistent SSD and typically developing children?

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**Method**

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**Participants**

Persistent Speech Sound Disorder	Typically Developing
<ul style="list-style-type: none"> <li>• n = 20 (13 males)</li> <li>• M age = 112.3 months</li> <li>• M grade = 3.3</li> <li>• GFTA M Standard Score = 80.5</li> <li>• CTOPP M Standard Score = 91.6</li> </ul>	<ul style="list-style-type: none"> <li>• n = 20 (10 males)</li> <li>• M age = 113.3 months</li> <li>• M grade = 3.3</li> <li>• GFTA M Standard Score = 104.45</li> <li>• CTOPP M Standard Score = 105.25</li> </ul>

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**All Participants: Inclusionary Criteria**

- Monolingual
- Normal hearing
- Normal vision (corrected)
- Normal non-verbal intelligence
  - Reynolds Intellectual Assessment Scales (RIAS)

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**All Participants: Descriptive Measures**

- Receptive and Expressive Vocabulary
  - Receptive One Word Picture Vocabulary Test (ROWPVT)
  - Expressive One Word Picture Vocabulary Test (EOWPVT)
- Word Reading
  - Woodcock Reading Mastery Test-R (WRMT-R)

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Experimental Tasks



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Phonological Loop Tasks

- Sentence span task
- Nonword repetition task
- Henry Task

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Results & Discussion



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Research Question

Are there differences in the working memory skills of school-aged children with persistent SSD and typically developing children?



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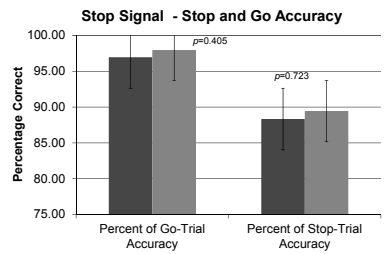
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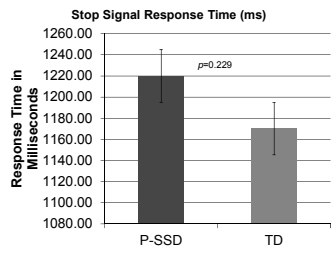
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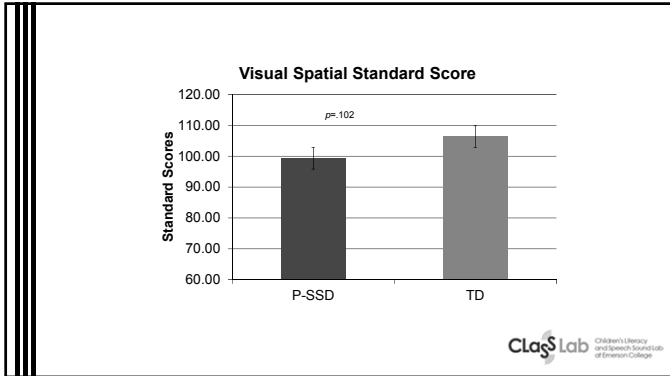
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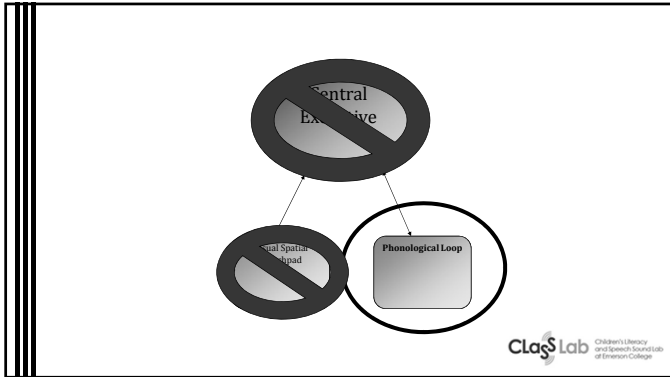
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- Tasks used for Analysis
- Phonological Loop:
    - NWR
    - Henry Task
    - Sentence Span
- Logo: Clas\$Lab Children's Library and Speech-Sound Lab of Emerson College

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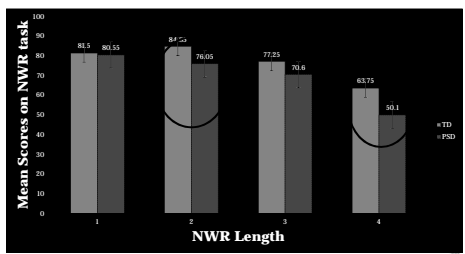
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### Nonword Repetition



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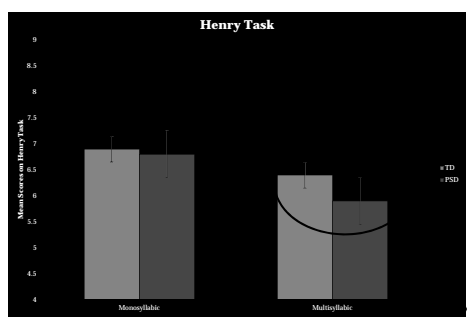
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### Henry Task



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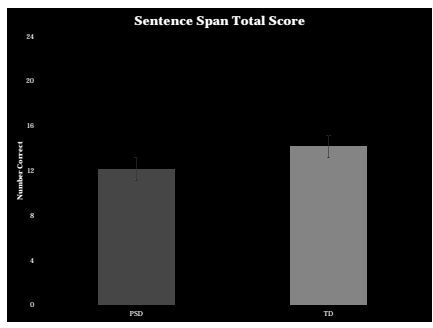
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### Sentence Span Total Score



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**Conclusions**

- Children with P-SSD appear to have deficits specific to the phonological loop of working memory
- Specifically, children with P-SSD struggle with complex word structures (e.g., multisyllabic words; longer lists of words)
- Indicates limited phonological representations as well as limited working memory

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**The SLPs role in facilitating literacy skills for children with SSD and/ or dyslexia**

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**ASHA guidelines (2000)**

- "It is the position of the American Speech-Language-Hearing Association (ASHA) that speech-language pathologists (SLPs) play a critical and direct role in the development of literacy for children and adolescents with communication disorders..."

(Ad hoc Committee on Reading and Written Language Disorders, 2000)

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### ASHA guidelines

- “SLPs’ knowledge of normal and disordered language acquisition, and their clinical experience in developing individualized programs for children and adolescents, prepare them to assume a variety of roles related to the development of reading and writing.”




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### ASHA guidelines

- Appropriate roles include (but are not limited to):
  - Preventing written language problems by fostering language acquisition and emergent literacy
  - Identifying children at risk for reading and writing problems
  - Assessing reading and writing
  - Providing intervention and documenting outcomes for reading and writing
  - Advocating for effective literacy practice
  - Providing assistance to general education teachers




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### The role of the SLP

- We have extensive knowledge of phonological processing
  - Theory
  - Assessment
  - Treatment
- Most likely *you* will know more about this than anybody else on a literacy team




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**The role of the SLP**

- SLPs have traditionally played a part in reading disabilities of individuals in a rehabilitation setting (i.e., TBI, aphasia, etc.)
- Why would we not contribute in the assessment and treatment of children with reading disabilities that are acquired naturally?
  - Language in school is written language
    - To affect change in child, must focus on written language outcomes

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**The role of the SLP**

- SLP is valuable member of literacy team
  - Have in-depth knowledge of phonological skills
  - Have knowledge of language
    - Some with word reading problems have language problems and they need word reading intervention too!

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**The role of the SLP**

- Some service delivery models
  - Member of a literacy team
    - Assessment
      - Early screenings
    - Treatment
      - Phonological underpinnings to reading
  - Model for teacher in classroom
    - Give PA tx for a year and then consult
  - Delivery of word reading instruction

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### International Dyslexia Association

- Knowledge and Practice Standards for Teachers of Reading:  
<https://dyslexiaida.org/knowledge-and-practices/>
- With commentary for dyslexia specialists:  
<https://app.box.com/s/ex1psv12zdq61vz7j4b6rsl7zsxtxii>
- With commentary for classroom teachers:  
<https://app.box.com/s/k77gltlwlwqawgdbdyywjvehzoalpah2>




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### How can you advocate for children with SSD?

- Test phonological awareness in all SSD evaluations
- Possibly add a nonword repetition test (see the Comprehensive Test of Phonological Processing-2<sup>nd</sup> Edition [CTOPP-2] for a possibility)
- Obtain material from classroom teacher that gives information on decoding, phonological awareness, or spelling skills
- Screen early and often; and don't screen "just" for speech sound production
- Obtain NVIQ if possible




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### How can you advocate for children with SSD?

- Include phonological awareness
- Try minimal pairs
- Include reference to orthography
- Partner with reading specialists and special educators
- Push in to the classroom
- Use curriculum based vocabulary




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How can you advocate for children with SSD?

- Children with SSD will likely have poor phonological representations
- SLPs are on the front lines of defense for these children
  - Early SSD and language impairments put children at risk for later literacy deficits... EVEN IF the issue has remediated
- Be mindful of the warning signs and open to collaboration or consultation




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Thank you!

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