Advocating for Reading Success for children with Speech Sound Disorders
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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

Children’s Literacy and Speech Sound (CLaSS) lab

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Observation from a school-based SLP: Subgroups of SSD?

- Remediated
- YES
- NO

- Literacy Problems
- YES
- Star
- NO

- Motor Deficit? True phonological deficit
- Linguistic Deficit?

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 SLP's role in facilitating literacy skills for children with speech sound disorder and those with dyslexia

Who is reading?
The Simple View of Reading

- Reading
  - Word Recognition
  - Listening Comprehension

Poor Reader Subgroups

Subgrouping poor readers

- Poor readers are not all the same...
- The Simple View of Reading can be used to subgroup poor readers based on individual differences
Poor Reader Subgroups
(Catts, Hogan, & Adlof, 2009; Catts, Hogan, & Fey, 2003)

<table>
<thead>
<tr>
<th>Word Recognition</th>
<th>Listening Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Dyslexia</td>
<td>Typical Readers</td>
</tr>
<tr>
<td>Mixed RD</td>
<td>Poor Comprehender</td>
</tr>
</tbody>
</table>

Poor readers can be subgrouped

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

‘Reading’ Changes Over Time

The Simple View is not so simple...
‘Reading’ changes over time
(Catts, Hogan, & Adlof, 2005)

Reading Comprehension

Listening Comprehension

Word Recognition

Learning to read → reading to learn

Reading Comprehension

Listening Comprehension

Word Recognition

Poor Reader Subgroups Change Over Time
Poor Reader Subgroups

- Word Recognition: Poor
- Word Recognition: Good

- Listening Comprehension: Good
- Listening Comprehension: Poor

Dyslexia
Mixed Reading Disability
Typical reader
Poor Comprehender

How does this apply to phonological impairments?

Phonological Impairments

- Speech sound disorders
  - Articulation
  - Phonology

- Dyslexia
  - Word reading
  - Phonemic decoding

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Speech Sound Disorders

Speech sound disorders are characterized by a delay in the acquisition of appropriate speech sounds (Lewis, Freebairn, Hansen, Shriberg, Stein, Taylor, & Iyengar, 2006).

Children with speech sound disorders are the primary population treated by school-based speech language pathologists (ASHA, 2014, 2013, 2012; NIDCD, 1994).

Even once the speech sound disorder has been remediated through speech therapy services, 50-70% of children with speech sound disorders require some level of special education services through the 12th grade (Lewis, Freebairn, Hansen, Iyengar & Taylor, 2004).

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It is rarely “just artic”
Speech Sound Disorder


- Deficits in the phonological system often result in difficulty acquiring phonological awareness (PA) skills, a necessary pre-requisite for reading success (Lattimo & Catts, 1999).

Prevalence of SSD

- Approximately 11-13% of children ages 5-7 years have a speech sound disorder (Shriberg, Tomblin, & McSweeney, 1999).

- 10% of children ages 9-11 have unresolved speech sound errors (Shriberg, 2002; Shriberg, Tomblin, & McSweeney, 1999; Wren, Roulstone, & Miller, 2011).

- 1.4% of college freshman have persisting speech sound errors (Culton, 1986).

- 18% of 8-year-olds in the UK have unresolved speech sound errors (Roulstone, Miller, Wren, & Peters, 2009).

Risk of Reading Difficulties

- This likely includes children with dyslexia.

- Typically developing

- Speech Sound Disorders only

- SSD + Language impairment
Dyslexia is...

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

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)

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
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

Identify the role of phonological representations

Phonological Representations
- spoken language
- written &
- blocks for
- Building
Phonological Representations

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

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.

How could this affect reading?

• Learning decoding skills
  • Letter sound correspondence

• Learning sight words
### 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)

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

### 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)
Code Focused

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

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
Phonological Awareness Continuum

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

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 & Freebairn, 1992; Peterson, Pennington, Shriberg, & Boada, 2009; Raitano, Pennington, Tunick, Boada, & Shriberg, 2004; Rvachew, Ohberg, Grawburg, & 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 persistant errors at age 8 (Kollock et al., 2014).
PA & SSD – Relations over time

School-aged:
• Children with persistent speech sound disorders (2-5th 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, Felsenfeld, Frost, Mencl, Fulbright, Grigorenko, Landi, Seki, & 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 & Hull, 2012).

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, Pennington, Tunick, Boada, & Shriberg, 2004).

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, Boada, & Shriberg, 2004).
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


Not early signs of dyslexia

- Reversing letters when writing
  - This is typical until 2nd grade
- Common errors on long words
  - æmmæl/æmmæl
  - pɔskæp sɔgæt

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
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)

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 & Snowling, 2004)
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 their 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.

Does Working Memory play a role?
Deficits in literacy skills (Raitano, Pennington, Tunick, Boada, & Shriberg, 2004)

Deficits in acquiring phonological awareness (Catts & Larivee, 1999)

Deficits in phonological representations (Anthony et al., 2011; Storkel, Maekawa, Hoover, 2010)

Baddeley Working Memory Model

Central Executive

Visual Spatial Sketchpad

Phonological Loop
Central Executive

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

Baddeley, 1992; Reisberg, 2010

Visual Spatial Sketchpad

• Stores visually presented information, such as pictures or words

Phonological Loop

• Stores auditorily presented information, such as speech sounds
Phonological Loop and SSD

- 12-year old with remediated SSD had poor WM
  - Speidel (1993)
- Preschoolers with low WM had more speech errors than preschoolers with high WM
  - Adams and Gathercole (1995)
- Preschoolers with SSD had poor WM
  - Nonword repetition
    - Munson, Edwards, & Beckman (2005)

Research Question

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

Method
Participants

Persistent Speech Sound Disorder
• n = 20 (13 males)
• M age = 112.3 months
• M grade = 3.3
• GFTA M Standard Score = 80.5
• CTOPP M Standard Score = 91.6

Typically Developing
• n = 20 (10 males)
• M age = 113.3 months
• M grade = 3.3
• GFTA M Standard Score = 104.45
• CTOPP M Standard Score = 105.25

All Participants: Inclusionary Criteria
• Monolingual
• Normal hearing
• Normal vision (corrected)
• Normal non-verbal intelligence
  • Reynolds Intellectual Assessment Scales (RIAS)

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)
Experimental Tasks

Phonological Loop Tasks

- Sentence span task
- Nonword repetition task
- Henry Task

Results & Discussion

$p < .05$
Research Question

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

Percent of Go-Trial Accuracy

Percent of Stop-Trial Accuracy

Percentage Correct

Stop Signal - Stop and Go Accuracy

$p = 0.723$

$p = 0.405$

Stop Signal Response Time (ms)

$p = 0.229$
Tasks used for Analysis

- Phonological Loop:
  - NWR
  - Henry Task
  - Sentence Span
Nonword Repetition

Mean Scores on NWR Task

NWR Length

TD

PSD

p = 0.858

p = 0.044

p = 0.200

p = 0.005

Monosyllabic

Multisyllabic

Mean Scores on Henry Task

Henry Task

TD

PSD

p = 0.006

Sentence Span Total Score

Number Correct

TD

PSD

p = 0.080
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.

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

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)
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.”

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

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 skill, must focus on written language outcomes

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!

The role of the SLP

- Some service delivery models
  - Member of a literacy team
    - Assessment
    - Early screenings
    - Treatment
    - Phonological underpinnings to reading
  - Model for teachers in classroom
    - Co-teach 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/ex1psv12ed6edez7ib0sln72srgxii
  - With commentary for classroom teachers: https://app.box.com/s/k77qltwlqagdzdywyjwhezoaljph2

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-2nd 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

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
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.

Thank you!

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