Sound Evidence:
Updates in Treating Speech Sound Disorders in Children

A. Lynn Williams, Ph.D.
College of Clinical and Rehabilitative Health Sciences
East Tennessee State University
Disclosure statements

• Financial disclosure
  – Book
  – iPAD app

• Non-Financial disclosure
Workshop Objectives

Make it ACAP!

- **Assessment**
  - Relational “error” analysis (PVM)
  - Independent + Relational analysis (SPACS)  
  
  Morning

- **Target Selection**
  - Different Approaches to Target Selection
  - Another Look at Norms

- **Intervention Approaches**
  - Aligning Client Factors to Appropriate Approaches
  - Intervention Intensity

  Afternoon

- **Clinical Decision-Making**
  - Putting it All Together
Workshop Objectives

Systemic analysis → Systemic target selection → Systemic intervention

Match the treatment to the diagnosis
Did you know …

• Nearly 1 in 12 children 3-17 years old have a communication disorder?
  – Speech sound disorders (SSD) are the most prevalent communicative disorder
  – Highest among children 3-6 years
  – This means there are 2-3 students in every classroom who have a communication disorder

NIH (2012)
Did you know …

• Preschool children with SSD do not perform as well as their peers in literacy and learning during the early school years?
  – This continues until at least 9 years of age
  – Negatively impacts various aspects of children’s lives, such as their verbal communication skills, interpersonal interactions, ability to handle stress, and participation in daily life activities with long term consequences on their educational experiences and employment outcomes

• So SSD are not confined solely to speech or to early childhood!

McCormack, McLeod, Harrison & McAllister, 2010
Did you know …

• There is a critical age hypothesis for remediating unintelligible speech?
  – Unintelligible speech must be resolved by age 5;6 in order to significantly reduce academic problems associated with speech disorders
  
  – Given that many children do not come to SLP for treatment until age 4, there is a significant need for efficient and effective therapies to remediate the speech disorder within a short time period (e.g., 18 months!)

Bishop & Adams, 1990
Did you further know …

• Organization and time management is one of the 9 critical skills that we need to be teaching our graduate students in addition to the technical knowledge of the field?

And …

• It’s not uncommon for children with multiple sound errors to be on our caseloads for 5-6 years?

Long (2001)
Clearly …

Neither our clients or speech-language pathologists have time to waste!
Time Management

Work smarter, not harder!

Focus on PRINCIPLES of Assessment, Target Selection, and Intervention
What is the population of children with SSD?

DIVERSITY AND DEFINITION OF SSD
Diversity of SSD

- A child with severe speech sound disorder
- A child with inconsistent speech errors
- A child with concomitant speech and language (morphosyntax) impairment
- A child with concomitant speech and literacy impairment
- A young child with limited inventory and lexicon (late talker)
Defining Speech Sound Disorders

• Speech Sound Disorders (SSD) in children is a complex neurodevelopmental disorder that is quite diverse and ranges in both severity and type of disorder (Shriberg, 2010).
  – SSD include articulatory, phonological, and motor speech disorders and have been identified as one of the most prevalent types of communication impairment among children.
  – Further, SSD can co-occur with other impairments of communication, such as language impairment, literacy difficulties, or fluency.

• Given the complexity of SSD, differential diagnosis is essential to designing effective intervention.

• Sound clinical decision-making based on reasoned evidence-based practice is required to select the most appropriate intervention approach given the characteristics of the child's SSD and the clinician's expertise.
Classification of Children with SSD

Speech Sound Disorders

- Developmental Phonological Disorders
  - Speech Delay (intelligibility deficit)
  - Residual Errors
- Special Populations (MR, HI, CLP)
Classification of Children with SSD

Speech Sound Disorders

Developmental Phonological Disorders

Speech Delay (intelligibility deficit)

Residual Errors

Special Populations (MR, HI, CLP)
Assessment and Analysis
Principles to Assessment of SSD

• **System**
  – Symmetrical inventory of sounds that function contrastively in all word positions

• **Structure**
  – Rules and organization of the system that specify the distribution and combinations of sounds

• **Stability**
  – Predictability of a sound system; “order in the disorder”
Assessment as problem solving

- We will consider different types of information that can be gathered, as well as each how each piece of information links to intervention planning.
- Assessment is a process of solving problems (Miccio, 2002).
Basic speech assessment

- When a phonologic disorder is suspected, an accurate characterization of the child’s speech sound production problem is the most essential component of the assessment.
- The first step typically includes a single-word assessment test, e.g., GFTA-2
- Although SW tests elicit a representative sample of all English consonants, they are limited in size of the sample
  - They provide comparison to normative sample, but they don’t give sufficient information about systematic nature of child’s errors
Why Complete a Basic Speech Assessment?

• To determine eligibility
• To identify predominant error patterns
• To find the “order” in the “disorder”
• To make a differential diagnosis
• To evaluate severity and intelligibility
• To determine if additional in-depth probing is needed
• To establish intervention goals and objectives
• To design appropriate intervention
• To evaluate treatment outcomes and monitor intervention progress
Beyond basic assessment

• “Although phonological problems are relatively easy to identify at the outset, the nature and severity of the disorder and any underlying cause or contributing factors must be determined before appropriate recommendations can be made regarding treatment or prognosis for change” (Miccio, 2002)

  – What are the child’s perception skills?
  – What are the child’s stimulability skills?
  – What are the child’s motor speech skills?
Characteristics of a Phonological Disability

- Child’s system is smaller than the adult system
- One-to-many correspondence between child: adult systems
One To Many Correspondence
Characteristics of a Phonological Disability

• Child’s system is smaller than the adult system
• One-to-many correspondence between child: adult systems
• Relationship between the phonetic properties of adult target and child’s production
Phonetic Resemblance between Targets and Child’s Production

1:4 phoneme collapse
Phonetic Resemblance Between Targets and Child’s Production

Voiceless obstruents:
- fricatives: s, \( \sim \)
- stop: t, k
- affricate: tʃ
Systemic Phonological Analysis of Child Speech (SPACS)

- Child’s ENTIRE system is examined as a unique, independent system ("own language")
- Views child as ACTIVE and CREATIVE learner of the sound system
- Compares SYSTEM to SYSTEM (child:adult)
- Maps child:adult system in terms of phoneme collapses (one-to-many correspondence)
- Child-based rather than adult-based
Systemic Phonological Analysis of Child Speech (SPACS)

- Describes idiosyncratic errors not captured by common phonological processes
- Provides a holistic assessment of child’s speech
- Phoneme collapses (phonological rules) are seen as compensatory strategies that child uses to accommodate a limited sound system to the larger adult sound system
  - these compensatory strategies are organized according to particular aspects of adult system in terms of PLACE, MANNER, VOICE
- There is “order” in the “disorder”
GFTA-2
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(Adam)
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<th>P.V.M. Error Patterns</th>
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**Nasals** | **Stops** | **Fricatives** | **Affricates** | **Liquids** | **Glides** |

### Phonetic Inventory

- nasal clusters: nt, nd, ndg, mp
- sl clusters: pl, bl, kl, gl
- tr clusters: pr, br, tr, dr
- fr clusters: kr, gr, fr, jr, tr
- tw clusters: dw, kw, gw, sw
- sm, sn, sp, st, sk

### P.V.M. Error Patterns


Place - Voice - Manner
Error Pattern Analysis

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**nasal clusters**: p/bl
**/w/f/**: p/bl
**/g/l/**: p/bl
**/n/k/**: p/bl
**/m/p/**: p/bl

**/w/6/1**: p/bl

**/g/6/1**: b/br
**/g/d/**: b/br
**/g/f/**: b/br
**/g/g/**: b/br
**/g/t/**: b/br

**/g/kw/**: g/kw
**/w/sw/**: g/kw

**/m/sp/**: m/sp
Phoneme Collapse

voiceless obstruents

\[ t \rightarrow \begin{align*}
& s \text{ fricatives} \\
& \emptyset \\
& k \text{ stop} \\
& \emptyset f \text{ affricate}
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Phoneme Collapse Worksheet

Child: ____________________________ Date: ______________________

Word-Initial: Phoneme Collapse

**Obstruents**
- p
- b
- t
- d
- k
- g

**Fricatives**
- f
- v
- θ
- s
- z
- š

**Affricates**
- tj
- dʒ

**Nasals**
- m
- n

**Glides**
- w
- j
- h

**Liquids**
- l
- r

**Clusters**
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Phoneme Collapse Worksheet

Child: Adam

Date: 4-09-07

Word-Initial: Phoneme Collapse

CHILD ADULT

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CHILD ADULT

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Obstruents
Sonorants

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# Phoneme Collapse Worksheet

**Child:** Jane  
**Date:** 4-09-07

## Word-Initial: Phoneme Collapse

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Phoneme Collapse Worksheet

Child: Jane

Word-Initial: Phoneme Collapse

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<td>r</td>
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Obstruents

Sonorants

A. Lynn Williams ©2007
Phoneme Collapse Worksheet

Child: Ivan

Date: 4-09-07

Word-Initial: Phoneme Collapse

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<thead>
<tr>
<th>CHILD</th>
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Obstruents

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<tbody>
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<td><strong>r</strong></td>
<td><strong>clusters</strong></td>
</tr>
</tbody>
</table>

Sonorants

A. Lynn Williams ©2007
Principles of Assessment

• Did we identify the:
  – System
  – Structure
  – Stability
Target Selection
Goals are the driving force behind intervention.
Selecting Targets for Intervention

• Target selection is the link between assessment and intervention
• Is an important variable in treatment efficacy
• The therapy goal, rather than the exact treatment approach employed in the therapy session, may be the instrument of change

(Gierut, 2005; Kamhi, 2006)
Target Selection Options

Phonetic (Articulatory)

- Traditional
  - Early sounds
  - Stimulable sounds
  - Most Knowledge

Phonemic (Phonological)

- Phonological Complexity
  - Later developing sounds
  - Non-stimulable sounds
  - Least Knowledgeable
- Distance Metric
  - Maximal classification
  - Maximal distinction

Characteristics of the Sound  Characteristics of the Sound  Function of the Sound
Principles of Target Selection

• **System-wide change**
  – Choose later developing, non-stimulable sounds (complexity)
  – Choose sounds that enlarge the frame of learning that needs to be achieved (distance metric)

• **Sound-learning**
  – Choose early developing, stimulable sounds (traditional)
# Traditional vs Phonological Approaches to Target Selection

## Traditional
- **Based on phonetic (subordinate) factors**
  - developmental norms
  - stimulability
  - consistency of error
- **Assumptions**
  - motoric basis of sound learning
  - ease of acquisition
  - sequential order of acquisition

## Phonological
- **Based on phonemic (superordinate) factors**
  - phonological complexity
  - distance metric (will discuss as third option)
- **Assumptions**
  - learnability is enhanced with the greatest amount of change occurring in the least amount of time
Influence of Phonological Complexity in Management Decisions

• Shift in traditional methods of target selection
  – Traditionally, select sounds that were assumed to be easier to produce and followed a developmental sequence
  – *Early, stimulable, and inconsistent sounds*

• Currently, new methods of target selection examine the role phonological complexity has on learnability
  – Specifically, select sounds that are more complex (later, non-stimulable, and absent sounds)
  – Shift from “sound learning” to “system shifting”
A Third Option for Target Selection

• The distance metric represents a different perspective to target selection that doesn’t rely on the dichotomous characterization of targets as early ~ late; stimulable ~ non-stimulable; known ~ unknown, etc.
A Third Option for Target Selection

- Rather, it is based on the function a particular sound has within a given child’s system
  - Using phoneme collapses that represent compensatory strategies developed by the child to accommodate a limited phonetic inventory, we can use a distance metric to select those targets that will result in the greatest amount of change in the least amount of time
Distance Metric
Williams (2003, 2005)

• Select up to 4 different target sounds from one rule set based on two parameters:

  – Maximal Distinction:
    select targets that are maximally different from child’s error in terms of PVM

  – Maximal Classification:
    select targets from each of the following:
    (a) different manner classes
    (b) different places of production
    (c) different voicing
    (d) different linguistic units
Target Selection Using Distance Metric

Maximal Distinction

<table>
<thead>
<tr>
<th>d</th>
<th>k</th>
<th>tj</th>
<th>f</th>
<th>s</th>
<th>f</th>
<th>st</th>
<th>sk</th>
<th>tr</th>
<th>kr</th>
<th>kl</th>
</tr>
</thead>
</table>

- stops
- affricate
- fricatives
- clusters

1:11 phoneme collapse
Targets Selected for Adam

- Stops
  - g
  - b
  - d
  - ð

- Fricatives
  - f
  - v
  - s
  - z
  - j
  - ŋ

- Affricates
  - tf
  - dʒ

- Clusters
  - gl
  - dr
  - fr
  - gr
  - tr
  - kw
  - kw

1:18 phoneme collapse
Distance Metric

By selecting targets that are more distinct from the child’s error (maximal distinction) and are representative of the sound classes collapsed across a phoneme collapse (maximal classification), the target sounds are more salient and therefore predicted to be more learnable.
Target Selection: The BIG Picture

With the distance metric, targets are the salient “corner puzzle pieces” that help the child put together the big picture of the adult sound system.
Intervention
Considerations: Intervention

- What intervention approaches do you typically implement with children on your caseload who have SSDs?
- What factors do you consider when selecting a treatment approach?
  - Match diagnosis with treatment
Principles of Intervention (Bowen, 2011)

1. Intervention is based on the systemic nature of phonology (order in disorder)
2. Intervention is characterized by conceptual rather than motor activities
3. Intervention has generalization as its ultimate goal, promoting intelligibility
Goal of Intervention

Goal is to align clinical characteristics of SSD to approach that has a strong evidence base that best meets the client’s needs.

- Match diagnosis with treatment
Interventions for Speech Sound Disorders in Children

Our Book:
Lynn Williams
Sharynne McLeod
Rebecca McCauley
Which one do you select?
Intervention Options Decision Tree

Unintelligible Speech

- PD (ABCD)
- CDPD (ABCDG)
- IDPD (EF)
- CAS (FEH)

Residual Errors

- AD (EGH)

Phonemic Approaches

- A: Young (2-4) Limited Sd Inventory
  - 1 STIM 2 PACT 3 Cycles
- B: Homonymy
- C: Phonological Literacy
- D: Integrated Language
  - 1 MPA 2 PLA
  - 1 MSA 2 NSIT 3 DS 4 NLPA

Phonetic Approaches

- E: Inconsistent Speech Errors
- F: Motor Planning
  - 1 DTCC 2 PROMPT 3 Nuffield
- G: Resonance
- H: Articulation
  - EMT-PE CPAP
  - TRAD EPG US

STIM: Stimulability Treatment
PACT: Parents and Children Together
MP: Minimal Pairs
MO: Multiple Oppositions
MaxO: Maximal Oppositions
ES: Empty Set
MPA: Metaphonological Approach
PLA: Psycholinguistic Approach
MSA: Morphosyntax Approach

NSIT: Naturalistic Speech Intelligibility Training
DS: Dynamic Systems
NLPA: Nonlinear Phonological Approach
DTTC: Dynamic Tactile and Temporal Cueing
EMT-PE: Enhanced Milieu Therapy - Phonology Emphasis
CPAP: Continuous Positive Air Pressure
TRAD: Traditional Articulation (Van Riper)
EPG: Electropalatography
US: Ultrasound

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Diversity of SSD

Children with speech sound disorder

- A child with severe speech sound disorder
- A child with inconsistent speech errors
- A child with concomitant speech and language (morphosyntax) impairment
- A child with concomitant speech and literacy impairment
- A young child with limited inventory and lexicon (late talker)

A young child with limited inventory and lexicon (late talker)
## Children with Homonymy: Contrastive Approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Classification</th>
<th>Characteristics</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal Pairs</td>
<td>Unintelligible Speech/Homonymy</td>
<td>Contrastive word pairs (error ~ target)</td>
<td>Preschool-school-age children with mild to moderate SSD (common phonological errors)</td>
</tr>
<tr>
<td>Multiple Oppositions</td>
<td>Unintelligible Speech/Extensive Homonymy resulting from phoneme collapses</td>
<td>Contrastive word pairs (error~targets)</td>
<td>Preschool-school-age children with moderate to severe SSD</td>
</tr>
<tr>
<td>Maximal Oppositions</td>
<td>Unintelligible Speech/Gaps in inventory</td>
<td>Contrastive word pairs (known~unknown)</td>
<td>Preschool-aged children with moderate to severe SSD</td>
</tr>
<tr>
<td>Empty Set</td>
<td>Unintelligible Speech/Gaps in inventory</td>
<td>Contrastive word pairs (unknown~unknown)</td>
<td>Preschool-aged children with moderate to severe SSD</td>
</tr>
</tbody>
</table>
Designing Treatment for Adam

**Minimal Pairs:** contrasts the *child’s error* with the *target sound*

error ~ target

e.g.,

example: g ~ d / #____

- go ~ doe
- gate ~ date
- gown ~ down
- Guy ~ dye
- game ~ dame
Notes on MP

• Pace: Model – Response – FB (focused and succinct)
• Keep pairs together – BRANCH steps
• Exaggerated models
• Switch order of presentation -- automaticity
Maximal Oppositions: Contrasts a “known”, independent, and maximally different sound with the target sound

Example:  
- m ~ d / #
- moo ~ dew
- more ~ door
- mate ~ date
- May ~ day
- me ~ Dee
Empty Set: Contrasts two target sounds that are unknown, independent, and maximally different from each other.

Target 1 ~ Target 2

Example:  r  ~  d / # _____

row ~ doe
ray ~ day
rye ~ dye
ran ~ Dan
ram ~ dam
Notes on MaxO / ES

• Shaping/approximation
• 5 word pairs

• ES: REMEMBER to give f/b on both targets
• Use set-ups/shadowing/physical prompts
• Add-on sounds
Multiple Oppositions: Contrasts child’s error with several target sounds from across an entire rule set.

error ~ targets

dew    dill
Fu      fill
chew    chill
stew    still

goo
daze    Dane
Fu      feign
chew    chain
stew    stain

gaze
daze    Dane
faze    feign
chaise  chain
stays   stain

gill
dill    gear
fill    fear
gear    cheer
chill    steer
still
Notes on MO

- Slower models / exaggerated models
- Physical prompts
- Shaping / approximations
- One-to-one contrasts
- VISUAL: imagery important in motor learning
- Seating arrangement
Multiple Oppositions

Assumes learning is facilitated by the size and nature of linguistic “chunks” presented to the child (*learning of the whole is greater than the sum of its parts*).

Assumes learning is a dynamic interaction between child’s unique sound system and intervention.

Predicts learning will be generalized across a rule set (*i.e.*, *learning will generalize to obstruents and clusters collapsed to [g] in the 1:17 phoneme collapse*) and result in system-wide restructuring.
### Characteristics/Population for MO

<table>
<thead>
<tr>
<th>Comparative Factors</th>
<th>Specifications</th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>3;0-6;0</td>
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<tr>
<td><strong>Population</strong></td>
<td>Multiple speech errors and unintelligible speech</td>
</tr>
<tr>
<td><strong>Intervention Agents</strong></td>
<td>SLP; supplemental parental support</td>
</tr>
<tr>
<td><strong>Key Components</strong></td>
<td>Direct and focused intervention using meaningful words</td>
</tr>
<tr>
<td></td>
<td>• Some NSW that are given meaning</td>
</tr>
<tr>
<td><strong>Broad Goals</strong></td>
<td>Increase speech intelligibility</td>
</tr>
<tr>
<td></td>
<td>• Reduce homonymy</td>
</tr>
<tr>
<td><strong>Target Selection</strong></td>
<td>• Linguistic: distance metric</td>
</tr>
<tr>
<td><strong>Level of Focus</strong></td>
<td>• Speech output</td>
</tr>
<tr>
<td><strong>Session Type</strong></td>
<td>• Generally individual, but also group (30-45 min 2x/wk)</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>• Illustrations; SCIP™</td>
</tr>
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</table>
## Intervention for Adam: Multiple Oppositions

<table>
<thead>
<tr>
<th>Concept</th>
<th>Rationale</th>
<th>Specification</th>
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<tbody>
<tr>
<td><strong>Part-Whole Learning</strong></td>
<td>Phonologic learning is facilitated by enlarging the relevant frame of learning defined by a more diverse range of input structures from across a rule set (i.e., phoneme collapse)</td>
<td>2-4 target sounds are selected from a phoneme collapse and contrasted in larger contrastive word sets (i.e., multiple oppositions) with the child’s error substitute.</td>
</tr>
</tbody>
</table>
| **Systemic (Re)Organization** | 1. **Compensatory Strategies**: phoneme collapses are viewed as compensatory strategies developed by child to accommodate adult sound system with limited child system.  
2. **Phonetic Resemblance**: the collapses reflect child’s attempt to “match” his/her limited system to adult system along a particular phonetic dimension. | • Intervention is directed at phonological reorganization through manipulation of the child’s phoneme collapses.  
• The phoneme collapses become a “means to an end” in achieving phonological reorganization.  
• Targets are selected from across the phoneme collapse using a Distance Metric to create the greatest amount of change in the least amount of time. |
| **Child-Based Approach** | Intervention is directed to child’s phonologic strategies rather than to an a priori set of rules or processes, which will result in more efficient phonological change. | • Intervention is based on reduction/elimination of phoneme collapses  
• RESTRUCTURE sound system based on new and diverse set of linguistic input (“chunks”) presented to child. |
EBP and Apps

- Over 700,000 Apps available
- Generations Y and Z: digital learning
- Research: games engage the brain; learning through fun
- SLPs making increasing use of Apps for assessment and intervention
- Easy for parents to participate in therapy
- How can EBP be a tool for selection of and justification for the use of Apps in SLP?

EBP model provides strategies for selecting Apps.
How SLPs Select Apps

• Suggestions by other SLPs
• App Reviews by bloggers, lists, twitter, App store reviews, colleagues and parents’ opinions
• Descriptions by developers
• Trial and error

Schaber & Wakefield (2012)
What SLPs Want

• Single robust resource
• Comprehensive
• Critically examined
• Minimize biases

Schaber & Wakefield (2012)
## Phonology Apps

<table>
<thead>
<tr>
<th>Minimal Pairs Academy</th>
<th>Minimal Pairs for Speech</th>
<th>SCIP</th>
<th>SLP Minimal Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Minimal Pairs Academy" /></td>
<td><img src="image2.png" alt="Minimal Pairs for Speech" /></td>
<td><img src="image3.png" alt="SCIP" /></td>
<td><img src="image4.png" alt="SLP Minimal Pairs" /></td>
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</table>

Williams, 2017
## Rating Chart for Speech/Language/Education Apps

<table>
<thead>
<tr>
<th></th>
<th>MP Academy</th>
<th>MP for Speech</th>
<th>SCIP</th>
<th>SLP MP Full</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Info</td>
<td>4.1</td>
<td>4.7</td>
<td>4.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Features</td>
<td>5.8</td>
<td>3.7</td>
<td>6.0</td>
<td>5.3</td>
</tr>
<tr>
<td>App Design</td>
<td>3.2</td>
<td>2.4</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Speech/Language Use</td>
<td>2.7</td>
<td>2.7</td>
<td>3.3</td>
<td>2.6</td>
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<tr>
<td>AVERAGE</td>
<td>15.8</td>
<td>13.5</td>
<td>17.1</td>
<td>13.8</td>
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<tr>
<td>Star Rating</td>
<td>4</td>
<td>4</td>
<td>5</td>
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## Evaluation Rubric for iPad Apps

<table>
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<th>SCIP</th>
<th>SLP MP Full</th>
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<td>Curriculum connection</td>
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<td>Authenticity</td>
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<td>7</td>
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<td>Feedback</td>
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<td>6</td>
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<tr>
<td>Differentiation</td>
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<td>6</td>
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<td>User friendliness</td>
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<td>4</td>
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<tr>
<td>Student motivation</td>
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<td>5</td>
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<tr>
<td>Reporting</td>
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<td>7</td>
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<td>Sound</td>
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<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Instructions</td>
<td>7</td>
<td>5</td>
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<td>Support</td>
<td>7</td>
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<td>5</td>
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<tr>
<td>AVERAGE</td>
<td>6.6</td>
<td>5.5</td>
<td>6.2</td>
<td>5.5</td>
</tr>
</tbody>
</table>
Unique features of app-based interventions (ABI)

• apps = ‘tool’ not a ‘type of intervention’
• Assists in *delivery* of intervention
• Consistent and controlled presentation of stimuli
• Reliable recording of performance
• Supports attention
• Can deliver a range of types of interventions
• Can be customized to child’s specific needs
Diversity of SSD

Children with speech sound disorder

- A child with severe speech sound disorder
- A child with inconsistent speech errors
- A child with concomitant speech and language (morphosyntax) impairment
- A child with concomitant speech and literacy impairment
- A young child with limited inventory and lexicon (late talker)
## Intervention Approaches for Young Children: Limited Sound Inventory

<table>
<thead>
<tr>
<th>Approach</th>
<th>Classification</th>
<th>Characteristics</th>
<th>Population</th>
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</thead>
<tbody>
<tr>
<td>Stimulability Approach</td>
<td>Limited Sound System</td>
<td>Increase inventory by making sound stimulable</td>
<td>Young children (2-4 years) with limited sound inventory</td>
</tr>
<tr>
<td>EMT-PE</td>
<td>Limited Sound System</td>
<td>Increase vocabulary and speech sound production using phonological recasting</td>
<td>Young children (18 mo-3 years) with limited sound inventory; cleft palate</td>
</tr>
<tr>
<td>PACT</td>
<td>Unintelligible Speech</td>
<td>Parent/family education; metalinguistic training; contrastive intervention</td>
<td>Preschool-aged children with moderate to severe SSD</td>
</tr>
<tr>
<td>Cycles</td>
<td>Unintelligible Speech</td>
<td>Address several goals in cyclical manner</td>
<td>Young children with limited sound inventory</td>
</tr>
</tbody>
</table>
Diversity of SSD

Children with speech sound disorder

- A child with severe speech sound disorder
- A child with inconsistent speech errors
- A child with concomitant speech and language (morphosyntax) impairment
- A child with concomitant speech and literacy impairment
- A young child with limited inventory and lexicon (late talker)
## Approaches Addressing Phonological Awareness/Literacy

<table>
<thead>
<tr>
<th>Approach</th>
<th>Classification</th>
<th>Characteristics</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metaphonological Approach</td>
<td>Speech and phonological awareness difficulties</td>
<td>Includes phonological awareness activities in addition to production activities</td>
<td>Preschool-aged children with moderate to severe SSD and phonological awareness weaknesses</td>
</tr>
<tr>
<td>Psycholinguistic Approach</td>
<td>Speech and literacy difficulties</td>
<td>Processing model: Input-Representations-Output</td>
<td>Preschool and School-aged children with moderate to severe SSD and literacy difficulties</td>
</tr>
</tbody>
</table>
Diversity of SSD

Children with speech sound disorder

- A child with severe speech sound disorder
- A child with inconsistent speech errors
- A child with concomitant speech and language (morphosyntax) impairment
- A child with concomitant speech and literacy impairment
- A young child with limited inventory and lexicon (late talker)
## Integrated Intervention Approaches: Language and Phonology

<table>
<thead>
<tr>
<th>Approach</th>
<th>Classification</th>
<th>Characteristics</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphosyntax Approach</td>
<td>Phonological and morphological difficulties</td>
<td>Cycles that target speech sounds and grammatical morphemes</td>
<td>Preschool children with mild to moderate SSD and morphological errors</td>
</tr>
<tr>
<td>Naturalistic Speech Intelligibility Training</td>
<td>Phonological and language impairments</td>
<td>Recasts of child productions during naturalistic activities</td>
<td>Preschool children with moderate SSD and language; also secondary populations of Down syndrome, ASD</td>
</tr>
<tr>
<td>Dynamic Systems (Whole Language)</td>
<td>Phonological and language impairments</td>
<td>Addresses discourse structure, semantic, syntactic, morphological, and letter-sound knowledge</td>
<td>Preschool children with concomitant speech and language impairment</td>
</tr>
<tr>
<td>Non-linear Phonological Approach</td>
<td>Phonological impairment</td>
<td>Addresses speech within syllable and phrase level</td>
<td>Preschool children with mild to moderate SSD</td>
</tr>
</tbody>
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Diversity of SSD

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## Motor Planning Approaches

<table>
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<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Vocabulary</td>
<td>Inconsistent speech errors; CAS</td>
<td>Consistent production of 50-70 functionally powerful words; sound-by-sound and syllable-by-syllable dense response drill</td>
<td>Preschool children with moderate to severe SSD</td>
</tr>
<tr>
<td>Dynamic Tactile and Temporal Cueing</td>
<td>Unintelligible speech; CAS</td>
<td>Addresses motor planning and programming</td>
<td>Preschool children with moderate to severe CAS</td>
</tr>
<tr>
<td>PROMPT</td>
<td>SSD; CAS</td>
<td>Addresses motor phonemes via auditory-tactual input</td>
<td>Preschool to school-age children with moderate to severe SSD; CAS; Dysarthria</td>
</tr>
<tr>
<td>Nuffield Centre Dyspraxia Programme</td>
<td>Unintelligible speech; CAS</td>
<td>Focuses on building speech processing skills from bottom up through establishment of motor programs for single sounds in isolation and increasing phonotactic complexity</td>
<td>Preschool to school-age children children with moderate to severe SSD; CAS</td>
</tr>
<tr>
<td>Developmental Dysarthria Intervention</td>
<td>Unintelligible speech: dysarthria</td>
<td>Bite block use followed by phonemic practice; voice intervention; EMG</td>
<td>Preschool to school-age children children with moderate to severe SSD and dysarthria</td>
</tr>
</tbody>
</table>
Wrap Up: Intervention

- What is the time investment for the SLP?
- What are the benefits for the client?
- Is one approach best?
Let’s Revolutionize Therapy!

- Hodson (1998) indicated that only about 10% of SLPs were incorporating phonological principles in their practice

- We can bridge the gap between research and practice with access to newer models of intervention

- And … decrease the time that children are on our caseloads
Sound Evidence:

Updates in Treating Speech Sound Disorders in Children

A. Lynn Williams, Ph.D.
Associate Dean and Professor
East Tennessee State University
williamL@etsu.edu