Aspects of Effective Spoken Language Intervention

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Agenda

- Evidence Based or Evidence Informed Practice?
- Components of effective intervention
- Data Driven Instruction
- Teaching Vocabulary
- Questions
Learner Outcomes

- Participants will be able to describe the importance of and differences between evidence-based and evidence-informed practice.
- Participants will be able to describe a model of data-driven instruction.
- Participants will be able to explain the effects of data-driven instruction on preschool children with hearing loss.
- Participants will be able to describe a series of behaviors that can be observed in early word learning.
- Participants will be able to explain clinical and/or classroom applications of structured intervention vs. play-based vs. incidental vocabulary intervention.

Evidence-Based or Evidence-Informed?

Evidence-Based Practice

Best Research Evidence
Clinical Experience
Patient Values

A Shift

Evidence Based Practice

Evidence Informed Practice
Evidence Informed Practice

Patient Preferences & Values

Clinical Jazz

Clinical Experience Research Evidence

EVIDENCE
## Levels of Evidence

<table>
<thead>
<tr>
<th>Strength</th>
<th>Level</th>
<th>Design</th>
<th>Randomization</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Level 1</td>
<td>Randomized control trial (RCT)</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td></td>
<td></td>
<td>Meta-analysis of RCT with homogeneous results</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 2</td>
<td>Prospective comparative study (therapeutic)</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td></td>
<td></td>
<td>Meta-analysis of Level 2 studies or Level 1 studies with inconsistent results</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 3</td>
<td>Retrospective Cohort Study</td>
<td>No</td>
<td>Yes</td>
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<td></td>
<td></td>
<td>Case-control Study</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td></td>
<td></td>
<td>Meta-analysis of Level 3 studies</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 4</td>
<td>Case Series</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Level 5</td>
<td>Case Report</td>
<td>No</td>
<td>No</td>
</tr>
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<td></td>
<td></td>
<td>Expert Opinion</td>
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<td>No</td>
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<tr>
<td></td>
<td></td>
<td>Personal Observation</td>
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</table>
Evidence Informed Practice

Today's Presentation

EFFECTIVE COMPONENTS OF INTERVENTION
DATA-DRIVEN INSTRUCTION
TEACHING VOCABULARY
What we already know
INTRODUCTION

Human ear range VS. Cochlear implant range

20-20K Hz 100-8K Hz

(Ambrose, Fey & Eisenberg, 2012; Moog & Stein, 2008)
DATA-DRIVEN INSTRUCTION Accelerates Learning

Teach

Adjust

Progress

(Bambrick-Santoyo, 2012; Doman, Hickson, Murdoch, Houston & Constantinescu, 2010; Moog & Geers, 2010; Supovitz & Klein, 2003).

Data-Driven Instruction COMPONENTS

(Vescio, Ross & Adams, 2008; Shidler, 2008)
Data-Driven Instruction

- Diagnose Correctly
- Prescribe Activities
- Scaffold Lessons
- Give Clear Direction
- Deliver Feedback

(Moog & Stein, 2008)
Data-Driven Instruction
(Marsh, Pane & Hamilton, 2006)

Fidelity of Instruction

Treatment Integrity

Challenges

Teacher Attitude

Organizational Culture

NCLB

Privatized vs. Open Sharing

(Bianco, 2009, McLeod, 2014; Nelson, Powell, Bloom & Lignugaris/Kraft, 2014)

Data-Driven Instruction

(Bianco, 2009, McLeod, 2014; Nelson, Powell, Bloom & Lignugaris/Kraft, 2014)

(Black and William, 1998; McLeod 2014; Supovitz and Klein, 2003; DuFour, Eaker & DuFour, 2005)
Purpose

- Treatment Group: Children with HL
- Control Group: Children with HL

Data Driven Instruction

No Data-Driven Instruction

Standard Score Test Results

Methods
Participants - Retrospective Study
n=22 children with HL

11 children each group
 matched for:
 Intervention Age (2 years)
 Degree of Hearing Loss
 Gender
 Testing Age

Methods: Matched Pairs

<table>
<thead>
<tr>
<th>Unaided PTA</th>
<th>Age of initial device fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDI Group</td>
<td>Control</td>
</tr>
<tr>
<td>89R 83 L</td>
<td>88R 86 L</td>
</tr>
<tr>
<td>25.5 mths</td>
<td>30.2 mths</td>
</tr>
</tbody>
</table>

T-test .93 R and .85 L
No significant difference

T-test .34
No significant difference
Instructional Method: DDI Group
Instructional Method: Control Group

**Methods**

**DDI Process**

- Completed Weekly
- Sept. 2012-May 2014

**Measurements**

- Baseline
- Year one
- Year two
METHODS: Data Analysis

Standard Scores

Treatment & Control

<table>
<thead>
<tr>
<th>Articulation</th>
<th>Mean Age 62 mths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Language</td>
<td>Mean Age 67 mths</td>
</tr>
<tr>
<td>Expressive &amp; Receptive Vocabulary</td>
<td></td>
</tr>
</tbody>
</table>

T-Test on Ages Between Groups: p = 0.21

METHODS

Two-way ANOVA

Independent Variable | Dependent Variable
TASL Scale           | Standard Scores

All Pairwise Multiple Comparison (Holm-Sidak Method)

<table>
<thead>
<tr>
<th>Standard Score Achievement</th>
<th>Standard Score Achievement Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDI Group</td>
<td>Group</td>
</tr>
</tbody>
</table>
Results

Results: Data Driven Instruction Group

There was a significant effect of subject group $F(1, 3) = 12.921, p < 0.001$, TASL scale $F(1, 3) = 5.490, p = 0.002$, but no interaction $F(1, 3) = 0.799, p = 0.499$.

Standard Score “Average” Range = 85-115.

* Standard scores = an aggregate of formal articulation, vocabulary and omnibus language tests.
RESULTS: Post-Hoc Comparison

The DDI group achieved significantly higher scores than the control group for total language (t = 2.4, p = 0.02) and expressive vocabulary (t = 2.6, p = 0.01), but not for articulation (p = 0.57) nor for receptive vocabulary (p = 0.09).
CONCLUSIONS, Limitations, & Future Directions
Data-Driven Instruction

- Good Baseline Data
- Measurable Instructional Goals
- Frequent Formative Assessment
- Professional Learning Communities
- Focused Instructional Interventions

(Knight, 2013; McLeod, 2014; Supovitz & Klein, 2003)

Limitations

- Retrospective, Small study group, Single-center study

- Other factors that may have influenced progress
  - Individual histories
  - Classroom size, (Treatment group 2:1 – Control group 6:1)
  - Impact of coaching
Future Directions

- Replicate work prospectively on more groups and other centers.
  - Include cognitively disadvantaged

- Apply DDI methods to other aspects of language

- Measure potential effects DDI might have on staff enthusiasm, satisfaction and fulfilment.
What does a person, with or without hearing loss have to do to learn a new word?

(\text{e.g., Capone Singleton, 2012; Collins & Loftus, 1978; Nelson & Nelson, 1990; McGregor et al., 2002})

"Children with hearing loss are not normal hearing children who can't hear." – Marc Marschark

The Ear Is Connected to the Brain!
The Ear Is Connected to the Brain

“This phrase reflects our growing acknowledgment that [hearing loss] and associated interventions such as cochlear implantation affect not only hearing, speech perception, and spoken language development but also general neurocognitive and psychosocial development.”

(Houston et al., 2012)

Areas of Need Associated with Hearing Loss

**Linguistic**
- Auditory speech perception
- Audio-visual speech perception and integration
- Speech Production
- Morphology/ Syntax
- Vocabulary
- Pragmatic Development

**Cognitive**
- Auditory attention
- Auditory working memory
- Executive function
- Theory of mind and related skills (e.g., autobiographical memory)
- Sequence memory and learning
What does a person with hearing loss have to do to learn a new word?

"Popcorn" (e.g., Capone Singleton, 2012; Collins & Loftus, 1978; Nelson & Nelson, 1990; McGregor et al., 2002)

Consequences for Children with Hearing Loss Developing Spoken Language

And the deficit appears to continue into college...

(Convertino, Borgna, Marschark, & Durkin, 2014).
So... what do we do?

Teaching Process

Original Research

Teaching Vocabulary to Preschool Children With Hearing Loss

Emily Lund¹ and W. Michael Douglas²


EBP: Scientific Evidence

- Children can learn from computer stimuli and from voice
- Teaching vocabulary based on learning theory is generally effective
- Repetition and direct instruction promote learning
- Parents respond to feedback
EJP: Clinical Expertise

- Vocabulary lessons should be taught initially in “structured drill” format, and then the words should be incorporated purposefully in conversational activities throughout the day (Moog, Stein, Biedenstein, & Gustus, 2003).
- “[Educators should use] natural patterns of audition, speech, language, cognition and communication…” so vocabulary should not be taught via drill ever, and educators should present the word only in complete sentences. (AG Bell, 2015; Rosenzweig, 2014)
- The real problem is that children with hearing loss are hearing fewer words than children with normal hearing, so we primarily need to increase the number of words spoken to children with hearing loss (Project ASPIRE premise)

EJP: Scientific Evidence revisited

- Explicit instruction (e.g., Beck & McKeown, 2007; Coyne, McCoach & Kapp, 2007)
- Follow-in labeling/Parallel talk (e.g., Daugherty, Grisham-Brown & Hemmeter, 2001, Kaiser & Roberts, 2013)
- Incidental learning (e.g., Heal, Hanley & Layer, 2009)
A comparison of three approaches

- Explicit direct instruction
- Follow-in labeling
- Incidental exposure

Teaching Process

... Which one produces the most learning, and in which children?

Learning Process

Method

- Adapted alternating treatments single-subject design
  - Across behaviors (sets of words)
  - Across participants
### Table 1. Individual Child Profiles.

<table>
<thead>
<tr>
<th>Child</th>
<th>Chronological age (months)</th>
<th>Degree of loss</th>
<th>Age at HA (months)</th>
<th>Age at CI (months)</th>
<th>Devices (left/ right)</th>
<th>Language exposure</th>
<th>Age at start of intervention</th>
<th>Other diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63</td>
<td>Moderate to severe-profound</td>
<td>25</td>
<td>34</td>
<td>CI/C 8</td>
<td>English</td>
<td>18</td>
<td>Usher’s</td>
</tr>
<tr>
<td>2</td>
<td>57</td>
<td>Moderate-severe</td>
<td>43</td>
<td>NA</td>
<td>HA/HA English</td>
<td>42</td>
<td>Auditory neuropathy</td>
<td>Cytomegalovirus</td>
</tr>
<tr>
<td>3</td>
<td>57</td>
<td>Mild to profound</td>
<td>8</td>
<td>32</td>
<td>HA/HA English</td>
<td>15</td>
<td>Cytomegalovirus</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>53</td>
<td>Moderate to severe-profound</td>
<td>29</td>
<td>34</td>
<td>CI/C 8 English</td>
<td>21</td>
<td>Cytomegalovirus</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>68</td>
<td>Severe to profound</td>
<td>8</td>
<td>16</td>
<td>CI/H English, Spanish</td>
<td>8</td>
<td>Hypothyroidism</td>
<td></td>
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<tr>
<td>6</td>
<td>60</td>
<td>Mild</td>
<td>24</td>
<td>NA</td>
<td>HA/HA English</td>
<td>24</td>
<td>Hypothyroidism</td>
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<tr>
<td>7</td>
<td>64</td>
<td>Mild to profound</td>
<td>17</td>
<td>42</td>
<td>HA/CI English, Russian</td>
<td>18</td>
<td>Alpha-mannosidosis</td>
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<tr>
<td>8</td>
<td>67</td>
<td>Mild</td>
<td>40</td>
<td>NA</td>
<td>None/HA English, Urdu</td>
<td>48</td>
<td>Alpha-mannosidosis</td>
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<tr>
<td>9</td>
<td>59</td>
<td>Profound</td>
<td>7</td>
<td>13</td>
<td>CI/C 8 English</td>
<td>7</td>
<td>Alpha-mannosidosis</td>
<td></td>
</tr>
</tbody>
</table>

Note: Age at HA = age at which child first received hearing aids; age at CI = age at which child first received a cochlear implant; HA = hearing aid; CI = cochlear implant; N/A = not applicable; ASL = American Sign Language.

### Table 2. Child Assessment Standard Scores.

<table>
<thead>
<tr>
<th>Child</th>
<th>Articulation</th>
<th>Overall language</th>
<th>Expressive vocabulary</th>
<th>Receptive vocabulary</th>
<th>Nonverbal intelligence</th>
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<tbody>
<tr>
<td>1</td>
<td>77</td>
<td>93</td>
<td>92</td>
<td>89</td>
<td>99</td>
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<tr>
<td>2</td>
<td>81</td>
<td>76</td>
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<td>100</td>
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<td>94</td>
<td>94</td>
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<td>120</td>
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<td>81</td>
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<td>9</td>
<td>95</td>
<td>73</td>
<td>95</td>
<td>94</td>
<td>96</td>
</tr>
</tbody>
</table>

Weekly Assessments

- Expressive naming task
  - 30 words taught via three intervention methods
  - Object or picture
  - Each set of ten words:
    - Contained five nouns, two verbs, one adjective, one concept word
    - Balanced number of high frequency sounds, average phonotactic probability, average word length in syllables
    - Teacher confirmed as "unknown" at the beginning of the week

Intervention

- Direct instruction
  - Introduction step
    - "Look, this is popcorn! Say popcorn. Great, popcorn! Popcorn is salty and crunchy."
  - Receptive step
    - Each child practiced pointing to the item in the midst of other distractors
  - Expressive step
    - Each child practiced naming the item throughout the course of the lesson (in the midst of naming other items)
Intervention

- Follow-in labeling
  - Two objects or pictures were within reach of the child
  - The child interacted with the objects and the teacher then named the object
  - The teacher waited for an imitation or used a mand to prompt imitation
  - The teacher expanded the imitation using the word again

Intervention

- Incidental exposure
  - Target words were represented around the room (pictures, objects, etc).
  - The teacher pointed out items as opportunity arose during the day.
Intervention: Number of words said

<table>
<thead>
<tr>
<th>Condition</th>
<th>Average number of times target used</th>
</tr>
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<tbody>
<tr>
<td>Direct Instruction</td>
<td>10.14</td>
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<tr>
<td>Follow-In Labeling</td>
<td>8.53</td>
</tr>
<tr>
<td>Incidental exposure</td>
<td>7.05</td>
</tr>
</tbody>
</table>

* No significant differences found between groups

Results

![Graph showing performance of monolingual participants by condition.](image)
Results

- Explicit instruction was most effective for our children with hearing loss, and incidental teaching was least effective.

Findings

- Explicit instruction is an effective way to teach words.
- Follow-in-labeling does result in learning, but not at the same rate as explicit, direct instruction.
- Incidental teaching resulted in minimal learning.

Figure 1. Performance of infants on the modified.
Clinical Implications

► “Explicit instruction paired with opportunities for use of new words throughout the day may better facilitate word learning for children with hearing loss than naturalistic input alone.”

Take Home Message:

► Frequent formative assessment leads to opportunities for adjustment and confidence in your own clinical jazz.
► Anyone can add to the evidence base!