Reading-related phonological processing interventions for individuals who use AAC: A systematic review

APRIL M YORKE
CANDIDACY PROJECT
Research Questions

- What is the effect of instruction on the reading-related phonological processing skills of individuals who use Augmentative and Alternative Communication (AAC)?
- Which intervention methods are most effective?
- What intervention factors, if any, are associated with positive and negative outcomes?
How do Children Read?
Adam’s Model

- Orthographic Processor
- Phonological Processor
- Meaning Processor
- Contextual Processor

Adams (1994). *Beginning to Read*, p. 158

Accuracy and fluency of each processor
<table>
<thead>
<tr>
<th>Individual/ Intrinsic Variables</th>
<th>Literacy Skills</th>
<th>Environmental/ Extrinsic Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Vision</td>
<td>- Phonological Awareness skills</td>
<td>- Physical</td>
</tr>
<tr>
<td>- Hearing</td>
<td>- Letter-Sound Correspondences</td>
<td>- Functional</td>
</tr>
<tr>
<td>- Motor Skills</td>
<td>- Decoding/Encoding</td>
<td>- Language</td>
</tr>
<tr>
<td>- Cognition</td>
<td>- Sight Word recognition</td>
<td>- Social</td>
</tr>
<tr>
<td>- Language</td>
<td>or written production</td>
<td>- Cultural</td>
</tr>
<tr>
<td>- Speech</td>
<td>- Comprehension</td>
<td>- Instructional</td>
</tr>
<tr>
<td>- World Knowledge</td>
<td>- Written expression</td>
<td></td>
</tr>
<tr>
<td>- Motivation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The ability to use the sound structure of language when learning to decode written language (Wagner, et al. 1994).

Includes phonological awareness
- Phoneme segmentation, blending, blending onset and rime, rhyming, phoneme counting, phoneme deletion.

Letter-sound correspondences

Single-word decoding
Inclusion Criteria

- Studies published between 1980-2012
  - Peer reviewed journals or dissertations
- English
- Provided intervention to improve reading-related phonological processing
  - Phonological awareness
  - Letter-sound correspondences
  - Single word decoding
- Involved individuals who use AAC (aided or unaided)
Exclusion Criteria

- Unpublished studies (e.g. studies presented at conferences), except for unpublished doctoral dissertations
- Involved individuals who’s primary diagnosis was hearing loss
- Package treatments (e.g. taught listening comprehension, reading comprehension, sight words, and phonological awareness)
# Search Procedures

<table>
<thead>
<tr>
<th>Search Method</th>
<th>Search Terms</th>
<th>Yield</th>
<th>Warranted a detailed look</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Searches</td>
<td>(“Phonological Awareness or Phonemic Awareness” or “Decoding”) AND (“Augmentative and Alternative Communication” or “AAC” or “Complex Communication Needs” or “Severe Speech”)</td>
<td>797</td>
<td>40</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>Same search terms Item-by-Item (4 journals) Expedited (40 journals)</td>
<td>3862</td>
<td>62</td>
</tr>
<tr>
<td>Ancestral</td>
<td></td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>Author Searches</td>
<td>“Augmentative and Alternative Communication” and Author’s name</td>
<td>311</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4970</td>
<td>188</td>
</tr>
</tbody>
</table>
Coding

- Design of the study
- Participants (Gender, age, disability)
- Independent Variable (Intervention)
- Dependent Variable
- Time
- Outcomes: PND and Gain Scores
- Certainty of Evidence (Conclusive, Preponderant, Suggestive, Inconclusive)
  - Simeonsson & Bailey, 1991
  - Horner et al., 2005
Results: Participants

- **36 Participants**
  - 17 female, 15 male, 4 not specified
  - Ages 4-22

- **Diagnosis**
  - Down Syndrome (4)
  - Autism Spectrum Disorders (6)
  - Cerebral Palsy (17)
  - Severe Speech Impairment (3)
  - Multiple Disabilities NOS (1)
  - Brain Injury from a Stroke (1)
  - Mental Retardation (2)
  - Rare Disorders (2)
  - Cognitive delay or impairment: primary or secondary (13)
Direct or organized instruction approaches

- All conclusive studies utilized direct instruction or organized instruction
  - Johnston et al (2009) taught sound-symbol correspondences using either a fixed (8 item) or gradual (1,2,4,6,8) array.
  - Found that fixed array is more time-efficient.
Direct Instruction

- Model- Prompt- Check

- **Model**= Task Introduced and Modeled
- **Prompt**= Opportunity for guided practice: structured steps to guide the participant through the task (prompts)
- **Check**= Immediately performs the task independently
Direct instruction and Organized instruction approaches

- Direct Instruction (Fallon, et al., 2004; Light, et al., 2004)


- 94% of participants had PNDs of 96% (highly effective treatment) at teaching single word decoding

- Very similar approaches
# Comparison of direct and organized instruction approaches

<table>
<thead>
<tr>
<th></th>
<th><strong>Direct Instruction</strong></th>
<th><strong>Organized Instruction</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Phoneme Matching and Blending Skills</td>
<td>Taught via Direct Instruction as part of each intervention session prior to decoding instruction.</td>
<td>Included in decoding instruction only.</td>
</tr>
</tbody>
</table>
## Direct instruction approaches: Decoding Steps

<table>
<thead>
<tr>
<th></th>
<th>Direct Instruction</th>
<th>Nonverbal Reading Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Modeled Task</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Guided Practice:</td>
<td>Yes- All letters visible, tracked with finger</td>
<td>Yes- Covered letters and revealed one at a time. Emphasized “Say it in your head”</td>
</tr>
<tr>
<td>Produced each phoneme</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and modeled blending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked for Accuracy</td>
<td>Yes, Immediately</td>
<td>No</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Match written word to picture (f=4)</td>
<td>Read written word. Identify a spoken word from 4 choices.</td>
</tr>
</tbody>
</table>
How do Children Read?

Adam’s Model

Contextual Processor

Meaning Processor

Orthographic Processor

Phonological Processor

Accuracy and fluency of each processor

Adams (1994). Beginning to Read, p. 158

Print

Speech

Print

Accuracy and fluency of each processor

Phonological Processor

Meaning Processor

Orthographic Processor

Print
Storybook Methods for teaching phonological awareness

- Banajee (2007) evaluated two different types of phoneme-loaded books
  - Alphabet Stories: emphasize a given letter
  - Phonic Faces: each page itself provides written symbol for the target letter (as part of the picture) and information re: how to produce the sound. Instructor pointed at letter while producing the phoneme.

  - Phonic Faces (highly effective). Alphabet stories (questionably effective).

- Often included with other instruction (direct, organized, or discovery learning teaching)
Combination Approaches

- Bailey, Angel, & Stoner (2011)
  - Suggestive
  - Phoneme-loaded books + discovery learning instruction
  - 10 different PA tasks
  - Unreliable to questionably effective

- Blischak (1999) Group study
  - Combination of stories + discovery learning instruction
  - Stories, games, poems
  - No significant improvement in rhyming skills
  - Synthetic Speech Group: Varied improvements in verbal speech (-31% to +57% change in % of natural speech used, mean of +23%)
Overall

- Still very little evidence
- Direct and Organized instruction approaches
  - Conclusive evidence: Highly effective
- Storybook methods
  - Phoneme-loaded books are questionably effective
  - Phoneme-loaded books that specifically teach sound-symbol correspondences in the text itself (ex. Phonic Faces) may be effective
- Combination approaches
  - Unreliable to questionably effective
  - No significant improvement
Future Directions

- Studies involved only 36 individuals
  - Cerebral Palsy (17), ASD (6), Down Syndrome (4), Severe Speech Impairment (3), Multiple Disabilities NOS (1), Brain Injury from a stroke (1), Mental Retardation (2), Rare disorders (2), Cognitive impairment as a primary or secondary deficit (13), Legally blind as a secondary diagnosis (1)
  - Replication within and across these groups is needed for further generalizability
- Group studies
- Comparative studies: direct instruction approaches
- Comparative studies: direct/organized phonological processing instruction vs sight words instruction
- Expand to a wider range of individuals with MR (both those who use AAC and those who do not)
References