How Much is Enough: The Intensity Evidence in Language Intervention

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How Much is Enough: The Intensity Evidence in Language Intervention

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How Much is Enough?  
The Intensity Evidence in Language Intervention

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The Plan
1. For morphosyntax, vocabulary, phonology, narrative, print knowledge, and phonemic awareness  
2. The research, clinical, and conceptual evidence on how much for how long  
3. Issues of defining, providing, and measuring the active elements of teaching and learning  
4. Clinical recommendations  
5. Next steps in research

The Inspiration for this Panel

Comparing Interventions without Intensity Evidence
• EBP involves providing evidence-based interventions and selecting interventions with strongest outcomes  
• However, relatively little attention has been paid to the issue of intervention intensity  
• Intensity based on convention, resources, & clinical craft  
  – But not on research evidence  
  – Nor even on systematic consideration of how much, how to measure, or equivalence across approaches  

How then can we say what works best?

Warren, Fey, and Yoder (2007)
• There is no standard or widely accepted definition of treatment intensity in the communication and language intervention literature, or, for that matter, the literature on early intervention in general (p. 71)  
• It is time to begin the creation of a systematic research base examining this critically important dimension of treatment efficacy (p. 71)
What is Intervention Intensity?

- The quality and quantity of services delivered in a given period of time (Barnett & Escobar), the number of hours of intervention over a specific time period (Lovaas), the ratio of adults to children (Graff et al.), the number of specific teaching episodes per unit of time (Guralnick)

- Duration (min or hr per day or week for months or years) is a constant dimension of intensity and sometimes the only dimension reported

Warren et al. (2007)

“Duration” as the Meaning of Intensity

≠ “active ingredients” of tx

- Active ingredients: procedures presumed to teach or enhance new learning and behavior
- Required
  - More molecular approach of teaching episodes
  - Define & quantify teaching episodes
- Density ratio of active ingredients for specified units of time

Quantifying Intensity

- Dose: Number of properly administrated teaching episodes during a single intervention session (e.g., 20 response opportunities in 30 min.)
- Dose Form: The physical manner in which the active ingredient is dispensed (e.g., In play format)
- Dose Frequency: Number of times a dose is provided per day or week (e.g., 2x per week)

The Intervention Pill

Pharmacology applied to speech-language intervention

Intervention Dosage

- Total Intervention Duration: Time period over which intervention is presented (e.g., 10 weeks)
- Cumulative Intervention Intensity: Product of dose x dose frequency x total intervention duration (e.g., 20 x 3 x 10 = 600 teaching episodes)

Warren et al. (2007)

More is Not Necessarily Better and Other Considerations

- More is not necessarily better
- Massed versus distributed trials
- Differing dose forms
- Supplementary ingredients
- What should constitute a teaching episode?
- How do episodes change across areas of communication?
- Teaching versus learning episode:
  - What are all the sources of learning in a session?
  - Between sessions?
  - Are there “sessions”? ...
This Sounds Really Difficult

- We readily acknowledge that defining teaching episodes can be a surprisingly complex task (p. 73)
- A benefit is that it requires clinicians and researchers to identify the specific essential aspects of their programs
- To examine what coinstitutes teaching/learning moments, contexts, and frequencies
- Leads to larger questions of what works and why

This is fundamentally important to the development of optimal interventions (p. 73) (Warren et al., 2007)

So Let’s Be Brave and Try It

For morphosyntax, vocabulary, phonology, narrative, phonemic awareness, and print concepts

Dosage and Distribution in Morphosyntax Intervention

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Techniques

What We Know
- Imitation > Models
  (Connell & Stone, 1992)
- Models > Imitation
  (Courtright & Courtright, 1976, 1979)
- Recasts > Imitation
  (Camarata & Nelson, 1990; Camarata et al., 1994; Nelson et al., 1996)
- Recasts = Models
  (Morgan et al., 1995; Farrar, 1990; Proctor-Williams et al., 2001)
- Recasts > Models
  (Farrar, 1992; Proctor-Williams et al., 2003, 2007; Saxon, 1997a; Saxon, 2000; Saxon et al., 1997)

What We Don’t Know
- How the most effective use of one technique compares to the most effective use of another technique
- Whether techniques are more effective when used in combination than in isolation
- If combinations of techniques are more effective, which ones presented in which order?

Dose Form: “the typical task or activity within which the teaching episodes are delivered”

What We Know
- Client-Centered
  - Increased communication frequency and generalization particularly when caregiver training is involved
- Hybrid
  - Fastest route to generalized use
  - Can increase production of rare naturally-occurring forms
- Clinician-Directed
  - Rapid accurate production that is task-specific
  - Highest rates of use of rare naturally-occurring forms
  - Generalization must be specifically incorporated

What We Don’t Know
- How specific tasks and activities affect immediate success and generalization within each procedure
- Which procedures are most effective for which morphosyntactic forms and with which populations
Dose:
“number of properly administrated teaching episodes during a single intervention session”

Massed vs. Distributed Practice:
“given an equal number of exposures, distributed practice at skills is almost always superior to massed practice with a skill” (Childers & Tomasello, 2002).

Average Rate of Teaching Episodes/Time

<table>
<thead>
<tr>
<th>Morphosyntax</th>
<th>Morphosyntax</th>
<th>Morphosyntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
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<tr>
<td>10</td>
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<tr>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

What We Know
• Children with SLI require more exposures to specific forms that they are ready to learn than are available in typical conversation to acquire morphosyntactic forms at the same rate as children with TL
• Our best estimate is that they require twice as many recasts
• There may be a limit beyond which the input is no longer facilitative

What We Don’t Know
• The optimal doses of different techniques
• The optimal doses for different morphosyntactic structures
• The optimal doses for children with different etiologies

Distribution of Teaching Episodes within Sessions

Dose Frequency “number of times a dose of intervention is provided per day and per week”

What We Know
• Dose frequency may need to be calculated specifically for each morphosyntactic form that we target (Leonard et al., 2004):
  - “It was more beneficial to have a larger number of encounters with a single morpheme than to have fewer encounters with each member of a set of three related morphemes” (p. 1375).

What We Don’t Know
• The optimal dose frequencies required for specific morphological forms and syntactic frames

Expressive language outcomes are very similar for clinician- and parent-delivered intervention (Law, Garrett & Nye; 2004; Fey et al., 1993, 1997)
• This is as likely attributable to total frequency and distribution as it is to dose rates
• We can teach parents a wide variety of techniques and procedures (Girolametto et al., 1998; Hemmeter & Kaiser, 1994; Kaiser & Hancock, 2003; Kott & Law,1995; Wilcox 1992)

What We Don’t Know
• What is the dose frequency and distribution that caregivers use in the home/classroom and can we measure this?
• How can we help caregivers sustain and adjust their dose frequency as the child’s performance changes?
• The impact on children and their families when parents become intervention agents
What We Know

- Children more accurately produced and generalized a complex syntactic construction (e.g., It was the cup that the frog took) when exposed to it over 5 or 10 days than when exposed to it for 1 day (Ambridge, Theakston, Lieven & Tomasello, 2006).
- Children with TL (but not SLI) more accurately produced novel verbs when recasts were distributed across 5 sessions than when recasts were massed within 3 sessions (Proctor-Williams & Fey, 2007).

What We Don’t Know

- The optimal distribution of dose frequency within and across sessions for: different morphological forms and syntactic frames for children with different etiologies
- Whether principles of distribution can be applied to techniques and procedures as well as specific targets

Total Intervention: "the time period over which a specified intervention is presented"

Mediator vs. Direct Intervention Example

Cumulative Intervention Intensity = dose \times dose frequency \times total intervention duration

Experiment 1: Rate
Low Rate Recast Condition:
• .5 recasts/min \times 10 min/day \times 5 days = 25 teaching episodes
• 1.5 recasts/min \times 10 min/day \times 5 days = 75 teaching episodes

Experiment 2: Distribution
Distributed:
• .4 recasts/min \times 10 min/day \times 5 days = 20 teaching episodes
Massed:
• 2 recasts/min \times 10 min/day \times 1 session = 20 teaching episodes

Vocabulary Instruction

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University of Wyoming
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### Intensity in Vocabulary Instruction and the Effects on Reading Comprehension: Are 4 Enough? Are 12 too Many?

**A Vexing Issue**
- Conventional wisdom in vocabulary research is that more instruction is better.
- Assumed that even more teaching of word meanings is needed to affect reading comprehension.
- But what is "more"? More word repetitions? More or longer lessons? Richer instruction?
- We think we know the answers to these questions, but do we really?

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### The Purpose: Tease out of the research literature what we know (and don’t know) about the relationship between intensity in vocabulary instruction and its effects on reading comprehension.

### The Plan:
1. Provide an Overview of the "More is Better" research.
2. Identify and Critique select studies examining vocabulary instruction and reading comprehension.

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### OVERVIEW "More is Better"

**Exposure to Oral Language**
- Greater volume and complexity of adult language promotes vocabulary growth (Hart & Risley, 1995)

**Vocabulary During Read Alouds**
- Reading aloud results in vocabulary growth (Bus et al., 1995; van Kleeck et al., 2003)
- Re-readings (Senechal, 1997), word repetitions (Elley, 1989), reader-listener interactions (Wasik et al., 2006), and explicit instruction further promote word learning (Beck & McKeown, 2007; Juel et al., 2003; Biemiller & Boote, 2006)

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### Independent Reading
- School-age children develop vocabulary by just reading (Nagy et al., 1987), but repeated exposures produce more and deeper vocabulary knowledge (Anderson, 1996)
- Independent reading also predicts reading comprehension (Taylor et al., 1990)

**Teaching Reading Vocabulary**
- Explicit vocabulary instruction works in general education (Blachowicz & Fisher, 2000) and special education (Jitendra et al., 2004) classrooms

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### CRITIQUE
- OK, so "More is Better," but what do we know about intensity in vocabulary instruction?

**The Stahl and Fairbanks (1986) meta-analysis**
- Provided insight by revealing that:
  - Teaching words in context only works pretty well (d = 0.76 to 0.92) (d's compared to controls w/ no vocab exposure)
  - Teaching words through definitions only works quite well (d = 1.1 to 1.4)
  - Teaching words through definitions and in context works very well (d = 1.47 to 2.36)
• Multiple word repetitions or exposures ($d = 1.6$ to $2.3$) were more effective for word learning than were just 1-2 word exposures ($d = 1.0$).
• “Depth of processing” factor did not predict performance on vocabulary measures (compared to associational or contextual approaches), but was a distinguishing feature for passage comprehension ($d's = 1.5$ to $1.8$).
• For vocabulary instruction to affect comprehension, it had to (a) include both definitional and contextual information, (b) have high depth of processing, and (c) involve multiple word exposure.

**Cool, but how much is enough?**
• I.e., is there any common “Intensity” metric for judging efficacy of vocabulary research and effects on reading comprehension? Can we analyze any vocabulary studies according to the Warren et al. (2007) framework?

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**Exemplar Studies: Beck and McKeown trilogy of studies.** Studies 1 and 2 (Beck et al., 1982; McKeown et al., 1983): Does vocabulary instruction affect 4th graders’ word learning and text comprehension?
- 75 days of instruction across 5 months; 30 minutes/day; 104 words taught
- Some Exposure words: 10-18 exposures per word; 60 days; 1,800 minutes
- Many Exposure words: 26-40 exposures per word; 60 + 15 days; 2,250 minutes
- 43 No Exposure Words: pre- and posttested only

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many Word Exposures</td>
<td>Word meanings $1 + 2 &gt; 3 + 4$ Or, teaching word meanings worked.</td>
</tr>
<tr>
<td>Some Word Exposures</td>
<td>Comprehension (recall &amp; questions) $1 + 2 &gt; 3 + 4$ $1 &gt; 2$ (recall only) Or, rich vocabulary instruction enhanced reading comprehension of stories with many taught words. But little was revealed about frequency in vocabulary &amp; compre.</td>
</tr>
<tr>
<td>No Word Exposures</td>
<td></td>
</tr>
<tr>
<td>Uninstructed Controls</td>
<td></td>
</tr>
</tbody>
</table>

**Study 1 (Beck et al., 1982) & Study 2 (McKeown et al., 1983)**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended Rich Instruction (High &amp; Low Exposures)</td>
<td>Word meanings $1 + 2 &gt; 3 + 4$ Or, any vocabulary instruction worked, with High better than Low</td>
</tr>
<tr>
<td>Rich Instruction (High &amp; Low Exp.)</td>
<td>Comprehension (recall) $1H + 2H &gt; 4$ $3H = 4$ Or, only Rich instruction with High numbers of encounters influenced comprehension of stories that included many taught words</td>
</tr>
<tr>
<td>Traditional Instruction (High &amp; Low Exp.)</td>
<td></td>
</tr>
<tr>
<td>Uninstructed Controls</td>
<td></td>
</tr>
</tbody>
</table>

**Exemplar Studies: Study 3 (McKeown et al., 1985):**
What is the relative contribution of instruction type and word frequency on 4th graders’ word learning and reading comprehension?
- 14 days of instruction across 3 weeks; 30 minutes/day; 24 words taught
- Extended/Rich Instruction: Elaborate vocabulary teaching with a home component (Word Wizard)
- Rich Instruction: Elaborate vocabulary teaching
- Traditional Instruction: Definitions & synonym.
- High (12 encounters) and Low (4) for preceding
- Uninstructed Control: Business as usual

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended Rich Instruction (High &amp; Low Exposures)</td>
<td>Word meanings $1 + 2 &gt; 3 + 4$ Or, any vocabulary instruction worked, with High better than Low</td>
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<tr>
<td>Rich Instruction (High &amp; Low Exp.)</td>
<td>Comprehension (recall) $1H + 2H &gt; 4$ $3H = 4$ Or, only Rich instruction with High numbers of encounters influenced comprehension of stories that included many taught words</td>
</tr>
<tr>
<td>Traditional Instruction (High &amp; Low Exp.)</td>
<td></td>
</tr>
<tr>
<td>Uninstructed Controls</td>
<td></td>
</tr>
</tbody>
</table>
What have we learned from the three studies?

- Most any kind of instruction (Rich or Traditional) in any kind of frequency (Many, Some, High, Low) results in word learning.
- To achieve comprehension effects, instruction must be Rich and involve Many, Some, or High word frequencies.

But what don’t we know?

- “How much” rich vocabulary instruction is enough to affect comprehension?
- Do we know anything about relative efficiency of approaches?

So, How much Vocabulary Instruction was Enough to Affect Comprehension?

<table>
<thead>
<tr>
<th>Study</th>
<th>Frequency</th>
<th>Instruction</th>
<th>Days</th>
<th>Total Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich</td>
<td>Many</td>
<td>43 words</td>
<td>33</td>
<td>Many = 75 Days</td>
</tr>
<tr>
<td>Rich</td>
<td>Some</td>
<td>61 words</td>
<td>14</td>
<td>Some = 60 Days</td>
</tr>
<tr>
<td>Rich</td>
<td>Low</td>
<td>24 words</td>
<td>12</td>
<td>Low = 14 Days</td>
</tr>
<tr>
<td>Rich</td>
<td>High</td>
<td>14 words</td>
<td>14</td>
<td>High = 14 Days</td>
</tr>
</tbody>
</table>

In Conclusion...

So, are 4 enough?

- Yes, for teaching word meanings.
- No, for comprehension, at least if you are talking about 7 minutes of instruction per word.

Are 12 too many?

- Probably, at least if you are talking about over 22 minutes of instruction per word.
- It looks like paring that back to about 17 minutes per word works just as well.

Lessons

- Keep in mind your instructional goal.
- Look beyond frequency, # of words, and duration.

Select Vocabulary References


Treatment Intensity: Phonology

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Phonological Disorder

- Definition- deficit in one’s ability to organize the phonemes (“speech sounds”) of one’s language.
- Prevalence- about 10% of preschool and school-aged populations (Gierut, n.d.)
We Know

• Clear evidence that phonological interventions improve phonological skills (Williams, 2000a; Morissette & Gierut, 2002; Gillon, 2000)

• Optimum treatment intensities

• Relative effects of differing intensities

We Don’t Know

Generally Speaking...

Brief Literature Review

<table>
<thead>
<tr>
<th>Research</th>
<th>Dose Form</th>
<th>Dose</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams (2000)</td>
<td>Multiple oppositions</td>
<td>20-50 responses</td>
<td>30 min. x 2</td>
<td>Varied (averaged 60.3 sessions)</td>
</tr>
<tr>
<td>Gillon (2000)</td>
<td>1. PA 2. Traditional</td>
<td>N/A</td>
<td>60 min. x 2</td>
<td>20 hours</td>
</tr>
<tr>
<td>Harbers et al. (1999)</td>
<td>Metaphon/Cycles</td>
<td>N/A</td>
<td>45 min. x 2</td>
<td>Varied (5-8 months)</td>
</tr>
<tr>
<td>Klein (1999)</td>
<td>Traditional Phonological</td>
<td>N/A</td>
<td>50 min. x 2/3</td>
<td>Varied (averaged 101 &amp; 82 sessions)</td>
</tr>
</tbody>
</table>

Research Questions

• Does a phonological intervention provided at three times the intensity have a better outcome than a weekly schedule?

• Does a phonological intervention provided three times per week for 8 weeks have a better immediate outcome than when provided weekly for 24 weeks?

• Does a phonological intervention provided three times per week have a better outcome after a 5-week maintenance period than the immediate gains of a weekly schedule?

Inclusion criteria:
– Misarticulate at least 6 sounds across three manner classes as documented by a relational analysis
– Pass a hearing screening (file review)
– Present with typical speech structures and functions as measured by an oral-motor exam
– Receive speech services from STRIDE Learning Center

Participants

Research Questions
Intervention Intensity Panel

Participants for Cohort 1: Descriptive Information

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Age (months)</th>
<th>Severity (PCC)</th>
<th>TELD-3 Receptive (SS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonology: 1 x per week</td>
<td>16</td>
<td>50.4</td>
<td>53%</td>
<td>92</td>
</tr>
<tr>
<td>Phonology: 3 x per week</td>
<td>15</td>
<td>51.1</td>
<td>53%</td>
<td>94</td>
</tr>
<tr>
<td>Control: Storybook</td>
<td>15</td>
<td>50.1</td>
<td>51%</td>
<td>90</td>
</tr>
</tbody>
</table>

Research Design

- Randomized experimental design
- Control for age and severity (randomized block)
  - Two treatment conditions- multiple oppositions approach
    - 1 time per week schedule
    - 3 times per week schedule
  - One control condition- storybook intervention
    - 1 time per week schedule

Intervention: Treatment Condition

- Multiple oppositions approach- teach phonemic contrasts by presenting contrastive pairs

(Presented in Kamhi & Pollock, 2005, based on Williams, 2002)

Dependent Variables

- Sounds-in-Words subtest of the GFTA-2
- KLPA-2
- Percent of consonants correct (PCC)

Preschool Word and Print Awareness task developed by Justice and Ezell (2001)
Narratives: Dosage & Intensity

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Narratives in Intervention

- Macrostructure
  - Episodic elements
  - Episodic structure
- Microstructure
  - Cohesion & coherence
  - Dialogue
  - Creativity & Interest

Intervention Data*

<table>
<thead>
<tr>
<th>Year</th>
<th>LI Age</th>
<th>Teaching Episode</th>
<th>Session Length</th>
<th>Sessions per Week</th>
<th>Duration in Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>5 to 7 yr</td>
<td>40 min</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>PreK</td>
<td>20 min</td>
<td>2</td>
<td>4 to 6</td>
<td></td>
</tr>
</tbody>
</table>

- Discourse target(s) impact boundaries of teaching episode.

*Limited to oral narratives & LI
### Intervention Data*

<table>
<thead>
<tr>
<th>Year</th>
<th>LI Age</th>
<th>Skill(s)</th>
<th>Session Length</th>
<th>Sessions per Week</th>
<th>Duration in Weeks</th>
</tr>
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<tbody>
<tr>
<td>Gillam et al. 2008</td>
<td>6 to 8 yr</td>
<td>100 min</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Justice et al. 2008</td>
<td>8 to 9 yr</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joffe et al. 2007</td>
<td>6 to 15 yr</td>
<td>Language Comprehension via mental imagery</td>
<td>30 min</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Adams &amp; Lloyd 2007</td>
<td>6 to 9 yr</td>
<td>Pragmatics</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Swanson et al. 2005</td>
<td>7 to 8 yr</td>
<td>50 min</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Steiger &amp; Hoffman 2001</td>
<td>9 yr</td>
<td>Word Finding</td>
<td>15 min</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*Limited to oral narratives & LI

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### ILI: Literature-based Lang Tx

- **Teaching Context:** Storybook unit
- **Target domains:**
  - Phonological awareness
  - Semantics
  - Grammatical morphology
  - Clause structure
  - Narrative macrostructure
- **Each domain targeted at three ability levels**
- **Structured daily & unit activities**

---

### ILI: Literature-based Lang Tx

- **Dose (teaching episode):**
  - Functional and interactive exchanges between clinicians and children
- **Language facilitation strategies**
  - Slower rate (Weismer, 1997)
  - Emphatic stress (Weismer, 1997)
  - Growth-relevant recasts (Camarata, Nelson, & Camarata, 1994; Nelson et al., 1996)
  - Focused stimulation (Cleave & Fey, 1997; Fey, Cleave, Long, & Hughes, 1993)
  - Incidental teaching (Kaiser, Yoder, & Keetz, 1993)
  - Scaffold (Schneider & Watkins, 1996)
  - Mediation (Miller, Gillam, & Pena, 2001)

---

### ILI: Literature-based Lang Tx

- **Dose Form (typical task or activity):**
  - Story-based learning activities
  - Clinician-directed elicitation of target productions
  - Interactive formats:
    - Drill play
    - Barrier games
    - Exploration & construction
    - Discussion & conversation
  (each unit included activities and materials to target each domain at each of the 3 ability levels)

---

### ILI: Literature-based Lang Tx

- **Dose Frequency**
  - 1 hour, 40 min / day
  - 5 days / week
- **Total Intervention Duration = 6 weeks**
ILI Dosage Challenges

- Quantifying teaching episodes (Warren, Fey, & Yoder, 2007)
  - Discrete, observable and measureable

- "even the simplest treatments are fundamentally multi-faceted"
  - Following child’s attentional lead
  - Pacing
  - Engagement

- Lit-based intervention designed to capitalize on multiple facets in an integrated process via
  - Meaningful context
  - Integrating oral/written language modalities
  - Address multiple language domains

- Each factor must be parsed & measured to calculate dose using frequency counts
  - Discrete instances
  - # of strategies used
  - Or # per minute

- Frequency counts do not measure
  - ZPD
  - Scaffolding skill

- Reading & interest level match/mismatch
- Genre
- Episodic structure
- Discourse level teaching and learning
- Cultural context & morals teaching

( = More facets to parse and measure)
Clinical Implications

• Definition of teaching episodes
• Analysis of unique characteristics of narratives
• EBP:
  – Carefully controlled investigations that measure outcomes when varying each of these factors
  – Shape responsible & informed best practices

Future Directions

Language intervention may be more than the sum of its discrete instances:

Narrative ≠ 1 page (discrete instance) x # pages
Discourse is inherently a process
meaningfulness is developed within and throughout the whole

Language intervention is a contingent and dynamic process between two or more people.

Future Directions

Measures of intervention intensity should encompass contingent & dynamic aspects of tx:
“Process Quality Indicators”

• Engagement, pacing, scaffolding skill
  – How can these be defined and measured?
  – Do they impact outcome?
  – Are there differences among practitioners?
  – Are there practitioner / patient interactions that influence outcome?

Coda

Investigating discrete indicators of intervention intensity is a very good place to begin,
but we also need to keep our attention on the whole story.

Many Phonemic Awareness Tasks

• All the ways of manipulating the sounds in words, such as:
  – Generating words based on first sounds;
  – Isolating first or last phonemes in words;
  – Matching words on first or last sounds;
  – Blending phonemes into words;
  – Deleting and substituting phonemes
  – Segmenting words into phonemes
• Plus bigger-than-phoneme syllables and rhyme tasks

Intensity in Phonemic Awareness Intervention

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Main Phoneme Tasks
1. Isolating first sounds
2. Matching first sounds
3. Segmenting simple words
4. Blending simple words

An Overview of Phonemic Awareness Instruction
1. A hierarchy of environmental sound, word, syllable, rhyme, and phoneme activities
2. Phoneme tasks embedded in reading and writing activities
3. Phoneme tasks with manipulatives or letters in ordered drill/games

Teaching Episode
- Episode = Initiation, Response, Evaluation (IRE)
- But may also have
  - Clinician model without response
  - Peer response heard as model
  - Choral response belonging to whom?
  - Multiple task IRE

Combining Tasks in a Complex Teaching Episode
- Let’s see if sun and slow match. What is the first sound in sun?
- Let’s say the all the sounds in sun. You start, the first sound is --
- What am I holding in this bag? /P-i-ch/. Peach. Your turn. You say the sounds in the next word and I will guess.

Intensity Evidence up to 2001
- Large number of controlled studies have obtained significant and large gains
- Intensity has varied considerably:
  - Session lengths of 15 to 90 minutes
  - Frequencies of 1 to 5 times weekly
  - Durations of 4 to 32 weeks
  - Individual, group, and whole class arrangements
  - Learners from 4 to 8 years, of a range of abilities
- No report of number of teaching episodes
- Rare tx fidelity or child attendance info

Ehri et al. (2001) Meta-Analysis
- Part of NRP (2000):
  - Evidence for phonemic awareness treatment effects
  - 52 studies with 96 treatment-control comparisons reviewed
    - Studies mixed supra-phonemic and phonemic
  - Results:
    - Small group better than individual or whole class
    - Typical learners had larger gains than weaker learners
    - 1-2 tasks better than 3+ phonemic/pre-phonemic tasks
    - 5 to 18 hours best, with no difference in this span
6 Months or 7 Weeks of Tx?

- **Maybe 6 months** if full phonological spectrum, whole K class 15-min daily tx:
  - Brady et al. (1994), moderate gains on segmenting: $d = 0.57$

- **Maybe 7 weeks** if phoneme-level only and small K groups, 3-4x/wk 20-30 min tx:
  - Ukrainetz et al. (2000): Sound talk embedded in rhyming books and shared writing activities; Segmenting: $d = 1.37$

**Tx Intensity for Ch w/ Language Impairment**

- 7 controlled group studies at phoneme level (incl. rhyme) for 4-7 yr olds
- 4 included other speech/language objs
- Individual or small group, 3-20 hrs
- Best results for 12-20 hours, large segmenting effect ($> d = 1$)

**But Does the Old Evidence Still Apply?**

- Past studies compared phonemic awareness tx to regular class instruction with no phonemic awareness
- BUT now, phonemic awareness is:
  - One of the 5 pillars of reading (NRP, 2000)
  - Part of K-1 standardized reading dx (DIBELS)
  - Often taught in RTI
  - Frequently present in the regular classroom
- So how much is enough for tx now with a background of classroom phonemic awareness instruction?

**A Study of Intensity**

- Ukrainetz, Ross, & Harm (in press)
- 41 5-6 year old kindergartners, including 22 English learners, with low letter and first sound knowledge on DIBELS
- 11 hours of tx in 3 conditions:
  1. Concentrated (CP, 3x/wk, Oct - Dec)
  2. Dispersed (DP, 1x/wk, Oct to March)
  3. Vocabulary control (CON, 1x/wk to March).

**Programming Intensity**

- ≥ 5 teaching episodes per task & child across 3-4 activities ≥ 20 episodes per session
- Number of teaching episodes roughly controlled in 3 ways:
  1. Maximum of 30 minutes for all sessions
  2. Consistent number and array of activities
  3. Minimum number of teaching opportunities per session
**Dose Form**

<table>
<thead>
<tr>
<th>Order</th>
<th>Horizontal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks</td>
<td>First isolate, last isolate, blend, segment</td>
</tr>
<tr>
<td>Activities</td>
<td>Name, picture, object, book, &amp; writing activities (fingers for segmenting)</td>
</tr>
</tbody>
</table>

**Dose Strength**

<table>
<thead>
<tr>
<th>Grouping</th>
<th>3 children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session length</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Episodes (IRE+)</td>
<td>5 per task per child = 20 + listening to 1/2 the 40 peer models / .. Session dose = 40 episodes</td>
</tr>
</tbody>
</table>

**Dose Frequency & Duration**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>1 or 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>8 or 24 weeks</td>
</tr>
<tr>
<td>Total time</td>
<td>12 hours of tx</td>
</tr>
<tr>
<td>Total intensity</td>
<td>960 teaching episodes</td>
</tr>
</tbody>
</table>

**Effect of Intensity on Phonemic Awareness**

**Results for Phonemic Awareness Intensity Tx**

Tx over a school year, along with class instruction:
1. English learners = native English speakers
2. Short intense tx = long weekly tx
3. Ks with mod deficit benefit from tx
4. Ks with mild deficit, tx = classroom

**Recommendations for Phonemic Awareness Intensity**

- Total intensity
  - 5-18 hours for typical ch
  - 12-20 hours for ch w/ lang imp
- Most of this can be in the regular classroom
- Additional tx?
  - 4 hrs of 20 episodes per child, concentrated or dispersed with other obj
Phonemic Awareness References


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Context

Emergent Literacy
- Learning about print and sound

Early Literacy
- Reading to learn: Decoding

Conventional Literacy
- Reading to learn: Comprehension

Continuum of Literacy Instruction: Theoretically, Politically, Empirically

Print Knowledge
- Writing one’s name (emergent writing)
- Writing letters and words (emergent writing)
- Pretend writing a story (emergent writing)
- Pretend reading from favorite books (print knowledge)
- Identifying major elements of a book (print knowledge)
- Naming words in environment (print knowledge)
- Knowing the letters in one’s name (alphabet knowledge)
- Reciting all the letters (alphabet knowledge)
- Knowing some letter-sound correspondences (alphabet knowledge)
Individual Differences in Print Knowledge at 4 Yrs

![Graph showing individual differences in print knowledge at 4 years.](image)

(Justice, Bowles, & Skibbe, 2006)

Print Referencing Intervention

Explicit, systematic referencing of print during storybook reading

Active Ingredients:
- Explicit targeting
  - Scope
- Systematicity
- Sequence
- Repetitive
  - Schedule-bound
- Meaningful

Mechanism:
Increase children’s contact with print

- Many children’s experience with print is at “little contact” end of continuum – at home and classroom
- Certain texts and behaviors may increase print contact

- 44 3- to 5-year-old children
- Very good preliteracy skills
- Four conditions
  - VERBATIM
  - VERBAL PICTURE
  - VERBAL PRINT
  - NONVERBAL PRINT
- Four print-salient books

(Justice, Pullen, & Pence, 2008)

Gain Scores (%correct) on 5 measures

Example of Child Outcomes Study in Head Start

Justice & Ezell, 2002
Print Referencing Intervention: The Package

- **Scope:**
  - print meaning, print organization, words, letters
  - cycles
- **Materials:**
  - trade storybooks with print-salient features
  - Intensity: highly variable
- **Dose:**
  - Dose frequency: 16 sessions to 120 sessions
  - Dose:
    - Targets hit per session (2-3 recommended)

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### General Effects

**Daily reading vs Daily reading with Print Referencing**

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### Variability in Dose
Dosage Study

- Randomized controlled trial
- Preschool teachers (N = 55) randomly assigned to two conditions:
  - High dosage print referencing (n = 31)
    - 120 sessions over 30 weeks
  - Low dosage print referencing (n=24)
    - 60 sessions over 30 weeks

Measures

- Child outcome measures:
  - Alphabet knowledge
  - Name writing
  - Print-concept knowledge
- Covariates
  - SES (mom ed)
  - Initial abilities
  - Classroom quality
- Dose
  - Attendance: number of days child was present
  - Dose frequency: group assignment (high or low dosage)
  - Dose: frequency targets hit averaged over observations

Findings

- Child attendance predicted spring name writing skills and alphabet knowledge
- Dose predicted spring print-concept knowledge
- Dose frequency predicted spring print-concept knowledge
- All effect sizes were small
- Not clear that more is better
**Interaction: dose, attendance, alphabet**

Children with lower attendance have better outcomes with higher dose

**Interaction: dose, initial level, alphabet**

Children with lower initial skills have better outcomes with higher dose

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**Concluding Thoughts**

- We know far less about dose frequency (intensity) than we think we do.
- Dose is not a one-size-fits-all construct; our findings indicate that the relationship between dose frequency/dose and child outcomes depend upon characteristics of child and contexts.
- We generally find good effects with four sessions per week (about 40 mins total) and moderate dose but know little about individual differences.
- Children with SLI show attenuated effects so intervention may need to be more intense or extend for longer periods of time.

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**Thanks!**