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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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How Much is Enough? The Intensity Evidence in Language Intervention

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1

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

2

To Appear in *Topics in Language Disorders 2009, 29*(4)

Along with:
Intensity for ASD
Lynne Hewitt
Bowling Green University

3

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?

4

The Inspiration for this Panel

Warren, S.F., Fey, M.E., & Yoder, P.J. (2007). Differential treatment intensity research: A missing link to creating optimally effective communication interventions. *Mental Retardation and Developmental Disabilities Research Reviews, 13*, 70-77.

5

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 mattter, 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)*

6

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)

7

"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

8

The Intervention Pill

Pharmacology applied to speech-language intervention

9

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)

10

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)

11

More is Not Necessarily Better and Other Considerations

- More is not necessarily better
- Massed versus distributed trials
- Differing dose forms
- Supplementary ingredients
- What should consitute 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"? ...

12

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)

13

So Let's Be Brave and Try It

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

14

Dosage and Distribution in Morphosyntax Intervention

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15

Active Ingredients/Teaching Episodes:

"procedures presumed ... to teach or enhance new learning and behavior"

Techniques

- Time-delay
- Models
- Recasts
- Expansions
- Mands
  - Questions
  - Imitation
- Direct Instruction

Procedures

- Milieu Treatment
- Enhanced Milieu Treatment
- Conversational Recast Intervention
- Focused Stimulation
- Drill/Drill-play

Morphosyntax 16

Techniques

What We Know

- Imitation > Models (Connell & Stone, 1992)
- Models > Imitation (Courtright & Courtright, 1976, 1979)
- Recasts > Imitation (Camarata & Nelson, 1992; 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., 2001, 2007; Saxton, 1997a; Saxton, 2000; Saxton 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?

Morphosyntax 17

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

Morphosyntax 18

Dose:

"number of properly administrated teaching episodes during a single intervention session"

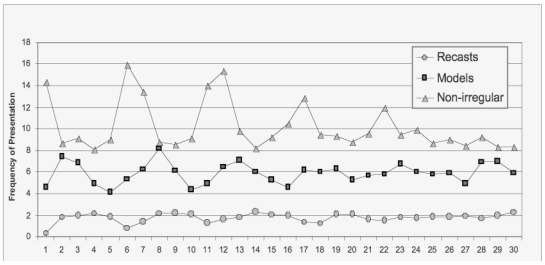
Massed vs. Distributed Practice:

"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

Study	Context	General Recasts	Target-Specific Recasts
Conti-Ramsden, 1990	Conversation	1.30	
Conti-Ramsden et al., 1995	Conversation	1.32	
Farrar, 1990	Conversation		.06 (.01 to .19)
Fey et al., 1999	Conversation	1.03 (.30 – 2.15)	
Proctor-Williams et al., 2007	Conversation		.20 (.12 – .37)
Proctor-Williams & Fey, 2007	Conversation		.2
Proctor-Williams & Fey, 2007	Intervention		.5
Camarata & Nelson, 1992	Intervention		.82
Camarata et al., 1994	Intervention		.70 – 1.40
Cleave & Fey, 1997 Fey et al., 1993	Intervention	2.13	
Leonard et al. 2004	Intervention		.80
Nelson et al. 1996	Intervention		1.56 – 1.78

Distribution of Teaching Episodes within Sessions



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

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

Dose Frequency

What We Know

- 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

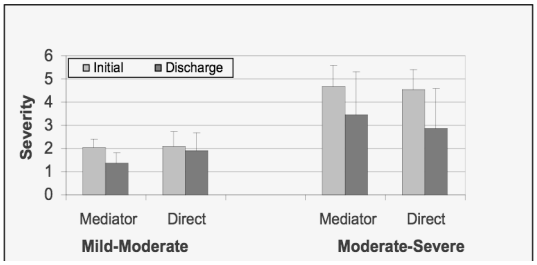
- The optimal distribution of dose frequency within and across sessions for:
  - different morphological forms and syntactic frames
  - for children with different etiologies
- Whether principles of distribution can be applied to techniques and procedures as well as specific targets

25

Morphosyntax

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

Mediator vs. Direct Intervention Example



Morphosyntax

What We Know

- Intervention of more than 8 weeks seems more effective than those of less than 8 weeks (Law et al., 2004)
- Intervention of 4-12 weeks seems optimal (Nye, & Seaman, 1987)
- Intervention in the first 4.5 months resulted in greater gains than in the second 4.5 months (Fey et al., 1997)
- Children who attended a Head Start preschool more regularly produced more complex utterances and benefited more from LFC and LST (Justice, Mashburn, Pence & Wiggins, 2008)

What We Don't Know

- The outcomes we can expect based on length of intervention
- The optimal length of treatment for different techniques and procedures
- The effects of classroom-based curricula and programs on child language outcomes - immediate and long-term
- The consistency of attendance on individual treatment outcomes

27

Morphosyntax

What We Know

- No reliable correlations between length of time (5 sessions over 4-44 days) and verb accuracy at conversational or intervention recast rates
- The longer children with SLI (but not TL) were in the experiment the less accurately they produced the verbs.
- Gaps of 5+ days between any visits did not affect the children's verb accuracy (Proctor-Williams & Fey, 2007)

What We Don't Know

- How gaps in service and intervention affect language outcomes
- How length and distribution of treatment sessions affects children with different etiologies
- How goal attack strategies affect language outcomes

28

Morphosyntax

Cumulative Intervention Intensity=
dose X dose frequency X total intervention duration

Experiment 1: Rate

Low Rate Recast Condition:
.5 recasts/min X 10 min/day X 5 days = 25 teaching episodes

High Rate Recast Condition
1.5 recasts/min X 10 min/day X 5 days = 75 teaching episodes

Experiment 2: Distribution

Distributed
.4 recasts/min X 10 min/day X 5 days = 20 teaching episodes

Massed
2 recasts/min X 10 min/day X 1 session = 20 teaching episodes

29

Morphosyntax

Vocabulary Instruction

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30

Vocabulary

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?

31

Vocabulary

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:

I. Provide an **Overview** of the "More is Better" research.

II. Identify and **Critique** select studies examining vocabulary instruction and reading comprehension.

32

Vocabulary

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)

33

Vocabulary

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

34

Vocabulary

- Associative, definitional, mnemonic, and semantic relatedness approaches are effective for teaching word meanings (Baumann et al., 2003a)
- Students can be taught to employ morphemic and contextual analysis strategies to infer word meanings (Baumann et al., 2002, 2003b, 2007)

But, for Vocabulary Instruction to Affect Reading Comprehension…

- Research suggests that longer interventions, more word encounters, and more active processing are needed (Baumann et al., 2003a Graves, 1986; Mezinski, 1983)

35

Vocabulary

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* = .76 to .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)

36

Vocabulary

- 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

Vocabulary 37

Cool, but how much is enough?

- How much definitional and contextual information? What degree of depth of processing? How many exposures? How many words? How many lessons? What duration of lessons? How much attention to specific words?
- 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?

Vocabulary 38

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

Vocabulary 39

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

Conditions	Results
1. Many Word Exposures 2. Some Word Exposures 3. No Word Exposures 4. Uninstructed Controls	*Word meanings* 1 + 2 > 3 + 4 Or, teaching word meanings worked. *Comprehension* (recall & questions) 1 + 2 > 3 + 4 1 > 2 (recall only) Or, rich vocabulary instruction enhanced reading comprehension of stories with many taught words. But little was revealed about frequency in vocabulary & compreh.

Vocabulary 40

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

Vocabulary 41

Study 3 (McKeown et al., 1985)

Conditions	Results
1. Extended Rich Instruction (High & Low Exposures) 2. Rich Instruction (High & Low Exp.) 3. Traditional Instruction (High & Low Exp.) 4. Uninstructed Controls	*Word meanings* 1 + 2 + 3 > 4 1 = 2 = 3 H > L Or, any vocabulary instruction worked, with High better than Low *Comprehension* (recall) 1H + 2H > 4 3H = 4 Or, only Rich instruction with High numbers of encounters influenced comprehension of stories that included many taught words

Vocabulary 42

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?

Vocabulary 43

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

B & Mc Study	Dose	Dose Form	Dose Freq.	Total Interv. Duration	Cum. Interv. Intensity
Studies1 & 2 **Many** Exposures	Word Expos. Per Instruct. Day (30 min.)	Rich Instruction for 43 words	33 (Md)	Many = 75 Days	Many = **27.7** min./word
Studies1 & 2 **Some** Exposures		Rich Instruction for 61 words	14 (Md)	Some = 60 Days	Some = **17.3** min./word
Study 3 **High** Exposure	Word Expos. Per Instruct. Day (30 min.)	Rich and Extended Rich Instruction for 24 words	12	High = 14 Days	High **22.5** min./word
Study 3 **Low** Exposure			4 (NSD)	Low = 14 Days	Low = 7.5 min./word (NSD)

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

Vocabulary **45**

Select Vocabulary References

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Vocabulary **46**

Treatment Intensity: Phonology

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47

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.)

Phonology 48

Generally Speaking…

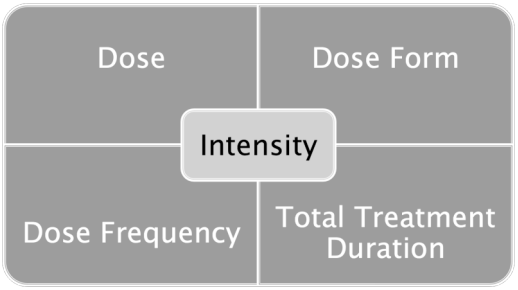
- Clear evidence that phonological interventions improve phonological skills (Williams, 2000a; Morrisette & Gierut, 2002; Gillon, 2000)
- Optimum treatment intensities
- Relative effects of differing intensities

We Know	We Don't Know

49

Phonology

Treatment Intensity Variables



Warren, S.F., Fey, M.E., & Yoder, P.J. (2007)

50

Phonology

Brief Literature Review

Research	Dose Form	Dose	Frequency	Duration
Williams (2000)	Multiple oppositions	20-50 responses	30 min. x 2	Varied (averaged 60.3 sessions)
Gillon (2000)	1. PA 2. Traditional	N/A	60 min. x 2	20 hours
Harbers et al. (1999)	Metaphon/Cycles	N/A	45 min. x 2	Varied (6-9 months)
Klein (1996)	Traditional Phonological	N/A	50 min. x 2/3	Varied (averaged 101 & 82 sessions)

51

Phonology

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?

52

Phonology

Research Questions

- 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?

53

Phonology

Participants

- 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

54

Phonology

Participants for Cohort 1: Descriptive Information

Group	Number	Age (months)	Severity (PCC)	TELD-3 Receptive (SS)
Phonology: 1 x per week	16	50.4	53%	92
Phonology: 3 x per week	15	51.1	53%	94
Control: Storybook	15	50.1	51%	90

55

Phonology

Research Design

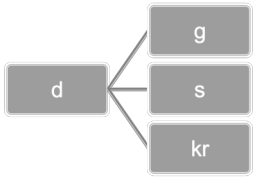
- Randomized experimental design
- Control for age and severity (randomized block)
  - Two treatment conditions- multiple oppositions approach
    - 1 time per week schedule
    - 3 times per week schedule
  - One control condition- storybook intervention
    - 1 time per week schedule

56

Phonology

Intervention: Treatment Condition

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



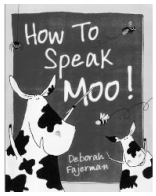
(Presented in Kamhi & Pollock, 2005, based on Williams, 2002)

57

Phonology

Intervention: Control Condition

- Storybook intervention- Increase print awareness
- Target prompts address the following constructs:
  - Print conventions
  - Concept of word
  - Alphabet knowledge



58

Phonology

Summary of Treatment Intensity Variables

Group	Dose	Dose Frequency	Total Intervention Duration	Cumulative Intervention Intensity
1 session per week	~80 episodes per 30 minutes	1 session per week	24 weeks	1,920 teaching episodes
3 sessions per week	~80 episodes per 30 minutes	3 sessions per week	8 weeks	1,920 teaching episodes
Control	~80 episodes per 30 minutes	1 session per week	8 weeks	640 teaching episodes

Dose x Dose Frequency x Total Intervention Duration = Cumulative Intervention Intensity

59

Phonology

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)

60

Phonology

Summary of Treatment Sessions and Testing Schedule

Week	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
TX1	T									T																T
TX3	T									T						T										
CON	T									T	Begin Phonological Intervention															

61

Phonology

Fidelity of Implementation

Phase 2				
Step	*Level of Implementation 0=no, 1=partial, 2=yes*			*Comments*
Focused Practice (5 minutes)				**Time:**
▪ Tells participants if they will imitate or "produce on own"	0	1	2	
▪ Presents 1-4 contrastive pairs	0	1	2	
▪ Presents 5-8 opposition contrast sets	0	1	2	
▪ Presents no more than 20 targets per session	0	1	2	
▪ Provides opportunities for 16-20 responses from each participant	0	1	2	
▪ Provides simple, direct feedback for each pair	0	1	2	
▪ Alternates turns between participants	0	1	2	
▪ Completes step in 7 minutes or less (but at least 3 minutes)	0	1	2	

Phonology

Acknowledgments

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63

Phonology

Narratives: Dosage & Intensity

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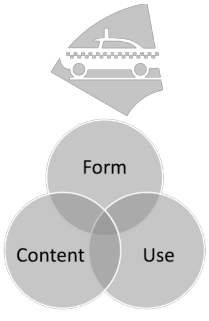
64

Narratives in Intervention

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



65

Narrative

Intervention Data*

	Year	LI Age	Teaching Episode	Session Length	Sessions per Week	Duration in Weeks
Davies, Shanks, & Davies	2004	5 to 7 yr		40 min	3	8
Hayward & Schneider	2000	PreK		20 min	2	4 to 6

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

*Limited to oral narratives & LI

66

Narrative

Intervention Data*

	Year	LI Age	Skill(s)	Session Length	Sessions per Week	Duration in Weeks
Gillam, et al	2008	6 to 8 yr		100 min	5	6
Justice et al.	2008	8 to 9 yr				6
Joffe et al.	2007	6 to 13 yr	Language Comprehension via mental imagery	30 min		3
Adams & Lloyd	2007	6 to 9 yr	Pragmatics		3	8
Swanson et al.	2005	7 to 8 yr		50 min	3	6
Steiger & Hoffman	2001	9 yr	Word Finding	15 min	5	3

*Limited to oral narratives & LI

67

Narrative

ILI: Literature-based Lang Tx

- Randomized Controlled Trial
- School age children, SLI
- Comparison of Language Intervention Programs
  - CCC-SLP
  - Each treatment designed to highlight its own critical feature
  - 3 computer-based treatment arms
  - *Individual Language Intervention*

68

Narrative

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

69

Narrative

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)
    - Scaffolding (Schneider & Watkins, 1996)
    - Mediation (Miller, Gillam, & Pena, 2001)

70

Narrative

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)

71

Narrative

ILI: Literature-based Lang Tx

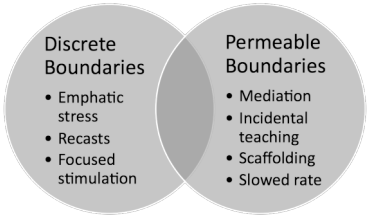
- Dose Frequency
  (# of times a dose is provided per day and per week)
  - 1 hour, 40 min / day
  - 5 days / week
- Total Intervention Duration = 6 weeks

72

Narrative

ILI Dosage Challenges

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



73

Narrative

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

74

Narrative

ILI Dosage Challenges

- Quantifying teaching episodes (Warren, Fey, & Yoder, 2007)
- 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

75

Narrative

ILI Dosage Challenges

- Quantifying teaching episodes (Warren, Fey, & Yoder, 2007)
- Lit-based intervention designed to capitalize on multiple facets in an integrated process via
- Each factor must be parsed & measured to calculate dose using frequency counts
  - Discrete instances
  - # of strategies used
  - Or # per minute

76

Narrative

ILI Dosage Challenges

- Quantifying teaching episodes (Warren, Fey, & Yoder, 2007)
- Lit-based intervention designed to capitalize on multiple facets in an integrated process via
- Each factor must be parsed & measured to calculate dose using frequency counts
- *Frequency counts do not measure*
  - *ZPD*
  - *Scaffolding skill*

77

Narrative

Dosage Considerations Unique to Narratives

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

(= More facets to parse and measure)

78

Narrative

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

79

Narrative

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.

80

Narrative

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?

81

Narrative

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.

Narrative

Intensity in Phonemic Awareness Intervention

Teresa Ukrainetz, Ph.D.
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83

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

84

Phon Aware

Main Phoneme Tasks

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

85

Phon Aware

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

86

Phon Aware

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

87

Phon Aware

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.

88

Phon Aware

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

89

Phon Aware

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**

90

Phon Aware

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:
  - Ball & Blachman (1988): Say-it-and-move it blank/letter tiles; Segmenting: vs no-tx & letter tx, *d* = 1.85, *d* = 1.67.
  - Ukrainetz et al. (2000): Sound talk embedded in rhyming books and shared writing activities; Segmenting: *d* = 1.37

91

Phon Aware

Tx Intensity for Ch w/ Language Impairment

- 7 controlled group studies at phoneme level (incl. rhyme) for 4-7 yr olds
  - Warrick et al. (1993), van Kleeck et al. (1998), Gillon (2000, 2005), Segers & Voerhoeven (2004), Denne et al (2005), Hesketh et al. (2000)
- 4 included other speech/language objs
- Individual or small group, 3-20 hrs
- **Best results for 12-20 hours, large segmenting effect** (>*d* = 1)

92

Phon Aware

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?

93

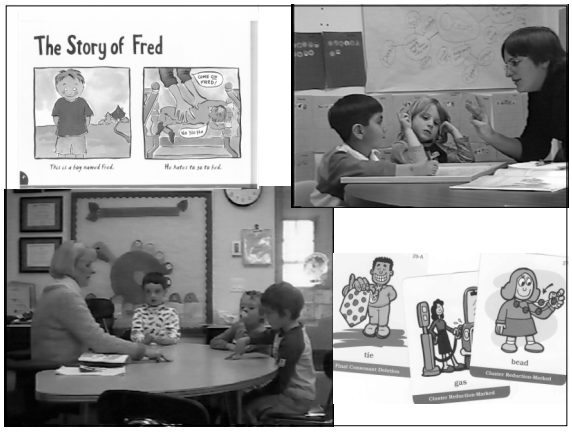
Phon Aware

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)..

94

Phon Aware



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

96

Phon Aware

Dose Form

Order	Horizontal
Tasks	First isolate, last isolate, blend, segment
Activities	Name, picture, object, book, & writing activities (fingers for segmenting)

97

Phon Aware

Dose Strength

Grouping	3 children
Session length	30 minutes
Episodes (IRE+)	≥ 5 per task per child = 20 + listening to 1/2 the 40 peer models /.. Session dose = 40 episodes

98

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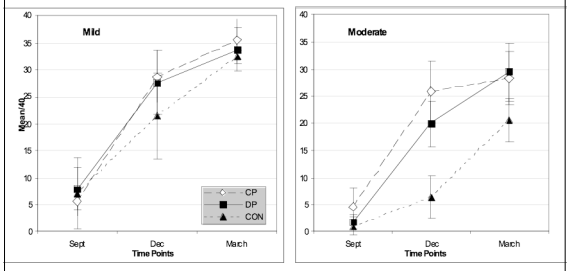
Dose Frequency & Duration

Frequency	1 or 3
Duration	8 or 24 weeks
Total time	12 hours of tx
Total intensity	960 teaching episodes

99

Phon Aware

Effect of Intensity on Phonemic Awareness



Phon Aware

100

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 = classrm

101

Phon Aware

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 objs

102

Phon Aware

Phonemic Awareness References

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103

Phon Aware

Intensity Evidence: Print Knowledge

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104

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105

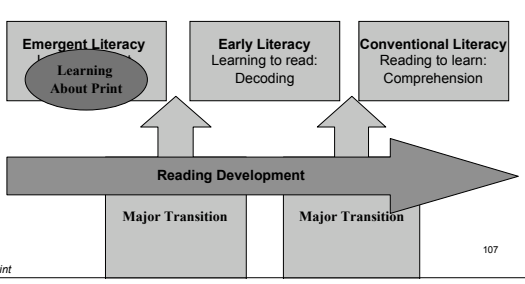
Print

Context

106

Print

Continuum of Literacy Instruction: Theoretically, Politically, Empirically



107

Print

Print Knowledge

- Writing one's name (emergent writing)
- Writing letters and words (emergent writing)
- Pretend writing a story (emergent writing)

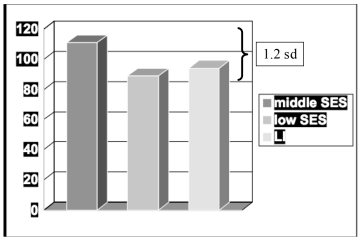
- Pretend reading from favorite books (print knowledge)
- Identifying major elements of a book (print knowledge)
- Naming words in environment (print knowledge)

- Knowing the letters in one's name (alphabet knowledge)
- Reciting all the letters (alphabet knowledge)
- Knowing some letter-sound correspondences (alphabet knowledge)

108

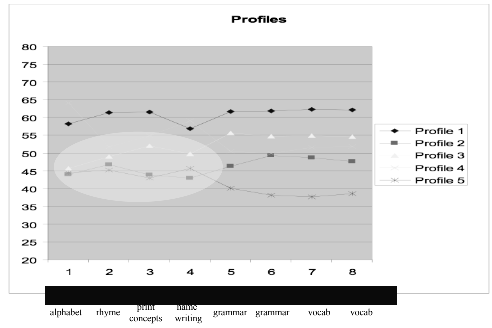
Print

Individual Differences in Print Knowledge at 4 Yrs



(Justice, Bowles, & Skibbe, 2006)

Print 109



Profile 2: 23%
Profile 3: 24%
Profile 5: 23%

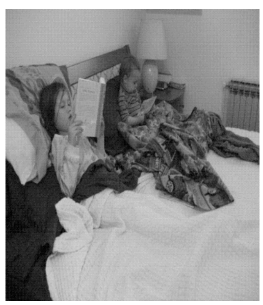
(Cabell, Konold, Justice et al, 2008)

Print 110

Print Referencing Intervention

Explicit, systematic referencing of print during storybook reading

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



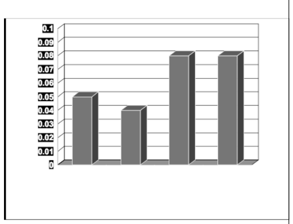
Print

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 ⬆ print contact

Print 112

- 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)

Print 113

Example of Child Outcomes Study in Head Start

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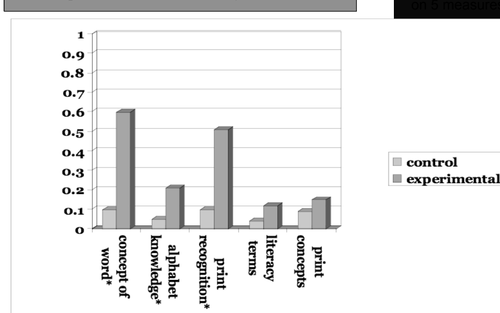


Justice & Ezell, 2002

Print 114

Study	Participants	Dose Frequency	Dose
Ezell, Justice, & Parsons (2000)	4 children with communication disorders	**5 weeks (4 readings per week) 20 sessions**	**About 5 references**
Justice & Ezell (2000)	28 typically developing children	**4 weeks (4 readings per week) 16 sessions**	**No specific guidance**
Justice & Ezell (2002)	30 children from economically stressed homes	**8 weeks (3 readings per week) 24 sessions**	**9 verbal references**
Justice, Skibbe, McGinty, Piasta, & Petrill (2008)	29 children with language disorders	**12 weeks (4 readings per week) 48 sessions**	**9 verbal references**
Justice, Kaderavek, Fan, Sofka, & Hunt (2008)	106 children from economically stressed homes	**30 weeks (4 readings per week) 120 sessions**	**2 targets per book**
Lovelace & Stewart (2006)	5 children with language disorders	**13 weeks (2 readings per week) 26 sessions**	**Multiple times per book**

Print

Print Referencing Intervention: The Package

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

116

Print

Scope

Instructional Domain 1	
Book and Print Organization	
Objectives	Sample Print Reference
1. **Page Order**: Knows the order in which pages are read in a book.	I am going to read this page first and then this page over here next.
2. **Author:** Knows the role of the author.	The author, Eric Carle, wrote all the words in this book.
3. **Page Organization:** Knows that reading occurs from the top of the page to the bottom of the page.	This is the top of the page. This is where I begin reading.
4. **Title of Book:** Knows the role of the title of the book.	This is the title of the book. It tells us the name of the book.
5. **Print Direction:** Knows that reading occurs from left to right.	I start reading here and I read this way.
Instructional Domain 2	
Print Meaning	
Objectives	Sample Print Reference
1. **Print Function:** Understands the relationship between meaning and print.	Here are the penguin's words. He says, 'thank you.'
2. **Environmental Print:** Knows the purpose of print embedded within the environment.	This is a box of cereal. It says, 'Corn Flakes.'
3. **Metalinguistic Concept of Reading:** Understands the meaning behind reading and the contexts in which reading occurs.	We're going to read these words; what will these words tell us?
Instructional Domain 3	
Letters	
Objectives	Sample Print Reference
1. **Upper- and Lower-Case Letters:** Knows letters come in upper- and lower-case forms.	This M is an upper-case letter. See how its bigger than these lower-case letters?
2. **Names of Letters:** Knows the names of the majority of upper-case letters.	What is this letter?
3. **Metalinguistic Concept of Letter:** Knows that letters are a symbol used in written language.	Do you see a letter that is in your own name?
Instructional Domain 4	
Words	
Objectives	Sample Print Reference
1. **Word Identification:** Identifies some written words in familiar contexts.	This word is "the"—this word is in this book all the time, can you help me find it?
2. **Short v. Long Words**: Knows that words can contain various numbers of letters.	This word is lollapalooza. It is a long word. It has a lot of letters in it! Let's count all the letters.
3. **Letters v. Words:** Knows that letters make up words.	This is the letter K. K is in the words kangaroo and kick.
4. **Concept of Word in Print:** Represents the systematic relationship between spoken words and written words.	Let's point to each word as I read it. Ready?

117

WEEK	TITLE	PRINT TARGETS
1	My First Day of School	Environmental Print
		Metalinguistic Concept of Reading
2	There's a dragon at my school	Print Direction
		Concept of Word in Print
3	I Like it When…	Author
		Print Function
4	The Dandelion Seed	Upper-Case vs. Lower-Case Letters
		Top and Bottom of Page
5	Down by the Cool of the Pool	Title of Book
		Word Identification
6	"More, More, More," said the Baby	Metalinguistic Concept of Letter
		Top and Bottom of Page
7	Jamboree Day	Page Order
		Names of Letters
8	Rumble in the Jungle	Word Identification
		Metalinguistic Concept of Letter
9	David Gets in Trouble	Author
		Letters versus Words
10	The Way I Feel	Short Words vs. Long Words
		Print Function

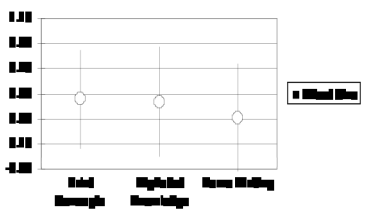
Sequence (10 of 30 weeks)

Print

118

General Effects

Daily reading vs Daily reading with Print Referencing

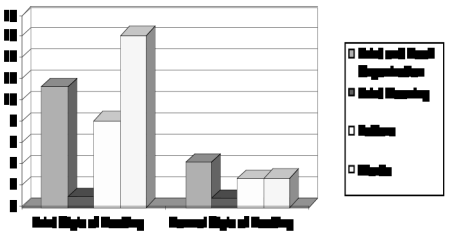


Print

Justice, Kaderavek, Fan, Sofka, & Hunt, in press

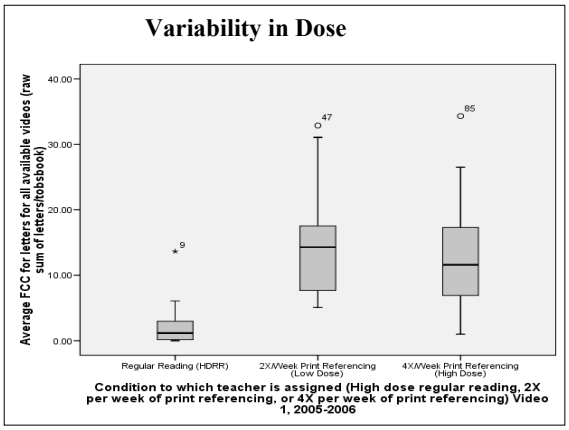
119

Variability in Dose



Print

120

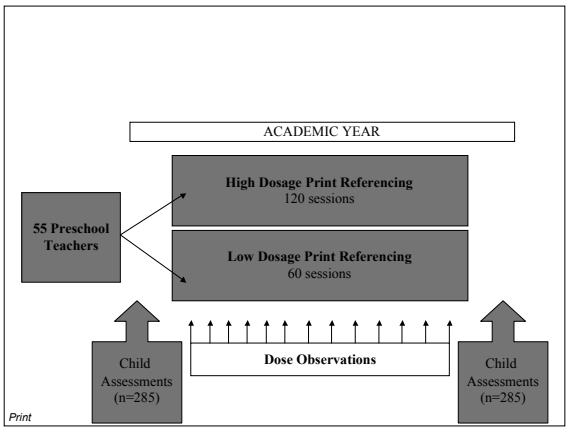


Dosage Study

- 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

122

Print



Print

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

124

Print

Analytical Approach

- Hierarchical Linear Modeling
  - Level 1- child characteristics
  - Level 2 – classroom characteristics

$$Yij = \beta 0j + \beta 1j\ (age) + \beta 2j(attendance) + \beta 3j(initial\ level\ ) + rij$$

$$\beta 0 = \lambda 00 + \lambda 01(dose\ frequency) + \lambda 02(classroom\ quality) + \lambda 03(dose) + \mu 0j$$

125

Print

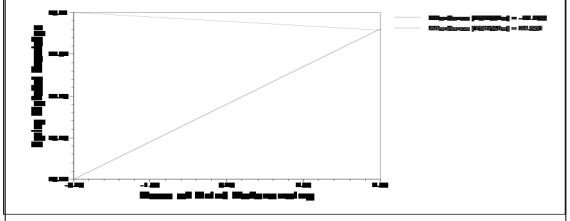
Findings

- **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**

126

Print

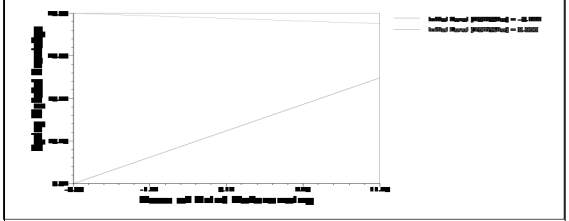
Interaction: dose, attendance, alphabet



Children with lower attendance have better outcomes with higher dose

127

Interaction: dose, initial level, alphabet



Children with lower initial skills have better outcomes with higher dose

128

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 min 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

129

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Thanks!

130