Routledge
Taylor & Francis Group

Journal of Research on Educational Effectiveness

ISSN: 1934-5747 (Print) 1934-5739 (Online) Journal homepage: www.tandfonline.com/journals/uree20

The Efficacy of Supplemental Early Literacy Instruction by Community-Based Tutors for Preschoolers Enrolled in Head Start

J. Ron Nelson, Elizabeth A. Sanders & Jorge Gonzalez

To cite this article: J. Ron Nelson, Elizabeth A. Sanders & Jorge Gonzalez (2009) The Efficacy of Supplemental Early Literacy Instruction by Community-Based Tutors for Preschoolers Enrolled in Head Start, Journal of Research on Educational Effectiveness, 3:1, 1-25, DOI: 10.1080/19345740903381031

To link to this article: https://doi.org/10.1080/19345740903381031

Journal of Research on Educational Effectiveness, 3: 1–25, 2010

ISSN: 1934-5747 print / 1934-5739 online
DOI: 10.1080/19345740903381031

Routledge
Taylor & Francis Group

INTERVENTION, EVALUATION, AND POLICY STUDIES

The Efficacy of Supplemental Early Literacy Instruction by Community-Based Tutors for Preschoolers Enrolled in Head Start

J. Ron Nelson
Lincoln, Nebraska, USA

Elizabeth A. Sanders
Washington Research Institute, Seattle, Washington, USA

Jorge Gonzalez
Educational Psychology, Texas A&M, College Station, Texas, USA

Abstract: The purpose of the current study was to test the efficacy of a supplemental phonological awareness focused intervention delivered by community-based paraeducators with preschool children ($M = 4.73$ years) in eight Head Start classrooms in the rural Midwest. Participating children were randomly assigned to small groups within classrooms, which were in turn were randomly assigned to receive either treatment or control (vocabulary-focused storybook reading) instruction in small groups for 20 min/day, 5 days/week, for 10 weeks (February–April). All instruction was delivered by community-based paraeducator tutors. At posttest, treatment students ($n = 41$) outperformed controls ($n = 47$) on measures of alphabetic knowledge ($d = 1.22$) and phonological awareness ($d = .62$). No significant differences between conditions were detected on print awareness or vocabulary. Overall, the results demonstrate that at-risk preschoolers benefit from community-based paraeducator implemented supplemental phonological awareness and alphabetic knowledge instruction.

Keywords: Phonological awareness, reading, emergent literacy, preschool, Head Start, multilevel modeling, randomized trial

A large body of evidence documents the presence of a cluster of phonological processing abilities (PPA) in preschool that are remarkably stable from the late preschool period onward and predictive of beginning reading (Lonigan, 2006; Wagner, Torgesen, Laughon, Simmons, & Rashotte, 1993). These

Address correspondence to J. Ron Nelson, 202 Barkley Center, Lincoln, NE 68583-0732, USA. E-mail: rnelson8@unl.edu

abilities are uniquely related to—and play a special role in—preschool children's emergent literacy even after controlling for other cognitive abilities (Anthony, Williams, McDonald, & Francis, 2007). It is now well established that deficits in PPA are a prominent feature of numerous reading problems (Smith, Simmons, & Kame'enui, 1998), and in the absence of intervention these problems become more difficult to remediate over time, beginning in kindergarten (Lonigan et al., 2009).

PPA is composed of three interrelated abilities: phonological awareness, phonological memory, and lexical access (Anthony et al., 2007; Burgess, 2006; Lonigan, 2006; Phillips, Clancy-Menchetti, & Lonigan, 2008; Smith et al., 1998; Wagner, 1988). Phonological awareness is defined as a child's ability to detect and manipulate the sound structures in oral language (Ehri, 1989) and is often measured by tasks that require matching, blending, deleting, or counting sounds in words (Lonigan, 2007; Lonigan et al., 2009). Phonological memory refers to the temporary storage of sound-based information and is generally measured by immediate recall of material presented orally (i.e., list learning). Finally, lexical access (e.g., rapid automatized naming) relates to efficiency in retrieving phonological codes from secondary (long-term) memory and is typically assessed by the speed at which an array of letters, colors, objects or digits can be named (Anthony et al., 2007; Wolf, 1984; Wolf, Bally, & Morris, 1986). Studies have documented that PPA are (a) distinguishable from other cognitive abilities, (b) distinguishable from each other, (c) covary with emergent literacy at different points in development, (d) are causally related to the acquisition of beginning reading skills, and (e) demonstrate remarkable longitudinal stability (Anthony et al., 2007; Lonigan, 2007; Stahl & Murray, 2006).

PHONOLOGICAL AWARENESS AND READING ACQUISITION

Among PPA, the most extensively researched has been phonological awareness (PA). Children who show facility in recognizing and manipulating the sound structures in spoken words learn to read earlier and better than less able peers, even after other variables such as receptive and expressive vocabulary, working memory, and socioeconomic status variables were controlled for (Lonigan, 2006; Share, Jorm, Maclean, & Matthews, 1984; Vellutino & Scanlon, 1987). Most recently, the National Early Literacy Panel's (National Institute for Literacy, 2008) extensive synthesis of research on predictors of early literacy found strong evidence for the role of PA in word reading and moderate evidence supporting the role of PA in later reading comprehension (Lonigan, 2007). Rigorously designed cross-sectional and longitudinal studies by Wagner and colleagues (Wagner, 1988; Wagner & Torgesen, 1987; Wagner, Torgesen, & Rashotte, 1994; Wagner et al., 1993) also show that from among the array of early literacy skills, PA is most predictive of individual differences in word reading.

Identifying the origins and antecedents of PA has, however, proven inconclusive so far (Lonigan, 2007). Using data from a longitudinal epidemiological study, Shaywitz, Lyon, and Shaywitz (2006) found evidence for neurological basis of persistently poor readers. Furthermore, these readers were found to come from families with lower socioeconomic status and often attended more impoverished disadvantaged schools. As such, it follows that poorer readers are likely the product of a double disadvantage in both less rich home language experiences and ineffective reading instruction in more impoverished schools. Presumably, this disadvantage translates into differences in poorer levels of school readiness (Farver, Xu, Eppe, & Lonigan, 2006), especially at lower ability and income levels or culturally diverse backgrounds. In fact, Shaywitz et al. provided compelling evidence for an environmentally influenced type of reading disability that is also consistent with the growing evidence that many children labeled poor readers are in fact "instructional casualties."

Investigations in the primary grades do suggest, however, that at-risk children can benefit from developmentally appropriate instruction designed to teach PA through the use of meta-linguistic games and activities (e.g., rhyming words in songs, identifying or locating objects using letter-sound clues, clapping to mark syllables, sound segmenting; Craig, 2006). For example, Ehri and Wilce (1987) compared kindergarten novice readers (i.e., students who knew most letter names, some letter sounds, and between 3 and 15 words) who received "cue-reading" instruction (making explicit the visual formation of words) to those who received "cipher-reading" instruction (making explicit the letter-sound correspondences in orthographically correct nonsense words—a blend of PA and alphabetic training). At posttest, students in the cipher-reading group significantly outperformed their matched peers on decoding and spelling measures. Perhaps more convincingly, Ball and Blachman (1988) conducted one of the first randomized experiments on PA effects with kindergarten "pre-readers" (performance of less than three words on a standardized word reading test) and found that, after 7 weeks, kindergarteners in the PA group were significantly higher on PA and word reading than peers who received no training or language training (vocabulary building, story listening, letter-sound training). More relevant to the present investigation are studies of preschool children with phonologically based speech impairments treated in language, speech, and hearing settings. Although primarily single-subject or small sample size designs, and researchers-as-interventionists, this group of studies show impressive gains for phonological sensitivity, rhyme ability, initial sound, and phoneme awareness (Gillam & van Kleeck, 1996; Gillon, 2005; Laing & Espeland, 2005; Ziolkowski & Goldstein, 2008). Finally, in one of the few studies of PA training with preschool children, Byrne and Fielding-Barnsley (1991) assigned preschoolers to a treatment (i.e., recognition of phoneme identification activities) or control (i.e., semantic activities). The results showed that preschool children in the treatment condition showed improvements in PA and alphabetic knowledge relative to those in the control condition.

Despite the empirical support for the efficacy of PA instruction, recent observations of preschool classroom environments reveal, a paucity of such instruction occurring in practice (Phillips et al., 2008). It appears that effective early literacy instruction that includes a focus on PA instruction is often not a part of preschool instruction. This finding has important educational implications and suggests that it may be beneficial to provide preschool intervention that bolsters PA in children at-risk for reading problems.

COMPONENTS OF EFFECTIVE PA INSTRUCTION

In addition to demonstrating that PA training can improve children's early reading skills, much has also been learned about the structure and content of effective PA interventions. Studies show that the most effective interventions involve small groups (i.e., three to five children each); take place early in children's schooling; are relatively short; and focus on identifying, manipulating, and producing sounds (Leafstedt, Richards, & Gerber, 2004).

CURRENT STUDY

Broadly, the current study contributes to the growing body of evidence supporting the positive effects of PA interventions for preschoolers, demonstrating that PA instruction need not be postponed until kindergarten (Phillips et al., 2008). Specifically, the current study addresses the paucity of research on PA training in preschool by testing the efficacy of a supplemental cohesive and explicit PA-focused intervention (*Stepping Stones to Literacy*; Nelson, Cooper, & Gonzalez, 2004) that has been shown in previous studies to improve PA and alphabetic knowledge of at-risk kindergarteners (Nelson, Benner, & Gonzalez, 2005; Nelson, Stage, Epstein, & Pierce, 2005). *Stepping Stones* includes a number of instructional design principles to improve its effectiveness and feasibility. First, the PA concepts are organized into a sequential scope and sequence to ensure that perquisite and easy PA concepts are taught first. The easier PA concepts of rhyme identification and generation, word segmentation, syllable blending, and onset-rime blending are taught sequentially before more difficult PA concepts (e.g., phoneme deletion, identification, segmentation, change). Second, predictable instructional formats are used to ensure that both children and teachers become familiar with the routine and their respective roles. The format not only guides the way teachers present the PA concepts (i.e., suggested instructional prompts are provided) but also provides the necessary instruction stimuli needed to teach the lessons. Finally, the intervention includes an alphabet knowledge component designed to improve children's ability to accurately and fluently name letters. Accumulated research suggests that the ease or fluency with which children can name letters gives them an

advantage in learning to read (Speer & Lamb, 1976; Stanovich, Cunningham, & Cramer, 1984; Tunmer, Herriman, & Nesdale, 1988).

Second, the current study employs community-based paraeducator tutors as interventionists and, in so doing, extends other early K-1 reading research showing that paraeducators can deliver supplemental early reading interventions with a high degree of fidelity, particularly if the interventions are well scripted for noncertificated teachers' use (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Gunn, Smolkowski, Biglan, & Black, 2002; Vadasy & Sanders, 2008a, 2008b; Vadasy, Sanders, & Peyton, 2006). As previously noted, *Stepping Stones* includes such attributes. Indeed, Whitehurst (2002) argued that high fidelity to evidence-based curricula overpowers the effects of teacher background on student achievement.

Finally, we chose to use a modified form of Interactive Book Reading (Wasik & Bond, 2001; Wasik, Bond, & Hindman, 2006) as our comparison (control) condition to (a) control for supplemental instruction time and consistency, and (b) provide an alternative intervention approach appropriate for preschoolers. Indeed, studies support the benefit of interactive storybook reading for building emergent literacy skills (Dickinson & Smith, 1994; Justice, Meier, & Walpole, 2005); however, supplemental instruction that focuses on vocabulary acquisition has not, to date, been tested against explicit supplemental instruction in PA-focused instruction with diverse (i.e., low socioeconomic, limited English proficiency) preschool children. Thus, this study also provides information regarding the relative impact of two approaches on preschoolers' PA and alphabetic and vocabulary knowledge.

The primary research questions for the current study were, (a) does a supplemental PA focused intervention implemented by paraeducators have a direct, positive impact on at-risk preschool children's literacy outcomes and (b) does the intervention have a unique impact on children's outcomes, after controlling for pretest skill, classroom and home literacy environments, and treatment fidelity?

METHOD

Participants

A cluster randomized trial research design was used to assess the efficacy of a PA-focused early literacy intervention program, *Stepping Stones to Literacy* (Nelson et al., 2004; treatment), compared to an alternative supplemental vocabulary-focused intervention (modified Interactive Book Reading; control). Eight Head Start classrooms from rural Midwest communities agreed to participate in the study. All children whose teachers believed the interventions were appropriate were recruited to participate. Our consent procedures allowed teachers to exclude those children they believed would not benefit from the

interventions. All children were recruited to participate with the exception of those experiencing significant learning and/or behavioral difficulties ($n = 4$). Parent consent was then obtained prior to pretest. Within classrooms, participating children were randomly assigned to small groups (there were 2 to 4 small groups per classroom), and then small groups comprising 2 to 6 children each (with an average of 3 preschoolers per small group) were randomly assigned to receive supplemental small-group instruction in either the treatment or the control program. After attrition of 11 children (5 treatment and 6 controls due to moving out of the program), there were 41 treatment children (across 13 small groups) and 47 controls (across 14 small groups).

Children were individually assessed prior to intervention (pretest) and just after intervention (posttest) on measures of print awareness, alphabetic knowledge, phonological awareness, and definitional vocabulary by trained research staff blind to experimental conditions. In addition to assessing children on literacy outcomes, we collected information on home and classroom literacy environments as well as treatment dosage and fidelity. Children averaged 57.08 months old ($SD = 4.28$) at pretest and included 46 (52%) male, 67 (76%) children of color, and 44 (50%) children whose parents spoke a language other than English at home. Intervention conditions did not significantly differ on any of these demographic characteristics (all chi-square test p values $> .10$).

Intervention Conditions

Tutor instruction was provided to children 20 min per day, 5 days per week, over 10 weeks, February to April. To reduce treatment diffusion, one tutor/tutor team per condition was assigned to each Head Start classroom; as such there were eight tutor/tutor teams. All tutors were recruited from each of the respective communities served by the Head Start centers via flyers and classified ads in local papers. All tutors were female, had completed high school, and had no teaching experience. As such, there were no detectible differences between conditions on tutor/tutor team characteristics.

Training. We used the same professional development procedures to train tutors to implement the instructional components of the treatment and control conditions correctly. The half-day staff development process was five-pronged: (a) research staff provided an overview of the theory, research base, rationale, and implementation format for the programs; (b) research staff modeled and practiced the implementation activities with tutors; (c) simulated practice conditions using the instructional materials were conducted to ensure that a high level of skill performance was obtained by staff; (d) research staff provided structured feedback to tutors on their proficiency; and (e) research staff monitored treatment fidelity and provided corrective feedback when applicable to ensure high-quality implementation. More specifically, the first two lessons

delivered by tutors were observed by project staff who provided corrective feedback to ensure treatment fidelity. The tutors were then observed by project three additional times (see the Intervention Fidelity section) to assess treatment fidelity. Following each observation, if applicable, project staff provided corrective feedback to the tutors.

Treatment (PA-focused intervention) condition. On average, 29.39 ($SD = 6.10$) instructional sessions were required to complete the 25 treatment lessons. The treatment program is a cohesive (i.e., sequential scope and sequence of skills, explicit instruction practices) and intensive supplementary early literacy intervention for young children who are at risk for developing reading difficulties. It consists of one lesson book and a separate section within the lesson book on serial rapid automatic naming (activities that provide children practice making quick visual–verbal associations of known sets of colors and numbers in a left-to-right format).

During daily sessions of 20 min in length, small groups of children were guided by a paraeducator through a set of instructional activities designed to promote children's PA and alphabet knowledge. Additional instructional activities are used in the initial 14 lessons to promote children's listening comprehension skills and understanding of the meanings of sentences/short stories (i.e., listen for who is doing something and what they are doing). Note that instruction in alphabet knowledge occurs over the entire instructional sequence. In addition, the instructional formats are held constant across the 25 lessons and guide the educator through each of the instructional activities (i.e., soft scripted) and all of the necessary instructional stimuli are included (see Figure 1 for example lesson).

Control (vocabulary-focused intervention) condition. On average, children participated in 31.06 ($SD = 4.89$) instructional sessions in the modified Interactive Book Reading (control) condition (the two treatments did not differ in the number of sessions completed, t test p value $> .10$). This program was based in part on Interactive Book Reading (Wasik & Bond, 2001; Wasik et al., 2006). Although storybooks linked to themes (e.g., weather) and the same three-step instructional sequence are used in both instructional approaches, pictures and guiding prompts were used in the control condition to introduce, engage and motivate, encourage explanations, and support independent use of word meanings (rather than a prop box as in the case of Interactive Book Reading).

During daily sessions of 20 min in length, instruction was organized around an identified target and two conceptually connected words drawn from a storybook related to a classroom teacher-identified theme. Classroom teachers identified 20 different themes (e.g., *transportation*, *dental*, *emotions*, and *dinosaurs*) across the eight Head Start centers, and then research staff identified commonly used (and age-appropriate) storybooks for each theme. Thus, the

Phoneme Deletion

1. "Listen carefully. I'm going to say a word. Then I'll say the word again without the first sound."

   Model the pause between the first and last sounds of the word. Repeat the last sound of the word.

2. "Now it's your turn. I'm going to say a word slowly, and you tell me the word without the first sound."

   Repeat two to three times.

Lesson 15 – Page 89

Figure 1. *Stepping Stones to Literacy* (treatment) example lesson.
Reprinted with permission from Sopris West Educational Services. *Stepping Stones to Literacy*, by J. Ron Nelson, Penny Cooper, Jorge Gonzalez © 2004.

themes used across the Head Start centers varied depending upon those being used by each respective teacher during the study period. The target and conceptually connected words naturally occurred one or more times in the storybook. Two example themes (i.e., mail, shopping) and associated storybooks (including authors and page numbers), target and conceptually connected words, and associated word meanings are presented in Table 1. Tutors used the identified storybook and associated picture cards (5 × 8 index cards with pictures depicting the target and conceptually connected word meanings on the front and age-appropriate word meaning, suggested sentence using the word in context, and initial interactive prompt question on the back) in conjunction

Table 1. Example themes for control condition (enhanced interactive storybook reading)

Theme	Author	Book	Pages	Target Word: Definition	Connective Word: Definition
Mail	Brown, Marc	*Arthur Loses a Friend*	1–11	Mail: letters and cards	Send: to mail off Stamp: an imprint
			12–24	Forget: not to remember	Appointment: a set date Pal: a friend
	Kottke, Jan	*A Day with a Mail Carrier*	All	Letter: written message	Sign: write your name Paper: stuff you write on
Shopping	Sadler, Marilyn	*Money, Money, Honey Bunny!*	All	Buy: get by paying price	Market: where goods are sold Pay: to give out money
	Rau, Dana Meachen	*My Favorite Foods*	All	Count: tell how many	Number: how many; the total Favorite: best liked
	Maccarone, Grace	*I Shop with My Daddy*	All	Take: to accept	Put: to place Both: one and the other

with the below three-pronged instructional sequence. A separate card was used for the target word and conceptually connected words.

Paraeducators used an interactive dialogic reading approach across the three-pronged instructional sequence (see Whitehurst et al., 1994, for a more thorough description) to actively engage children and help them to develop an understanding of the target an conceptually connected word meanings. The three-pronged sequence included the following:

1. Paraeducators used the cards to introduce and define the target and conceptually connected words before reading the storybook,
2. Paraeducators asked open-ended questions connected to the target and conceptually connected words during and after reading the storybook, and
3. Paraeducators provided opportunities for children to use the target word and conceptually connected words independently after reading the storybook.

Intervention Fidelity

Each tutor ($n = 8$ per condition) was observed by research staff during an intervention session on three equidistant occasions (once per week). To record intervention fidelity, tutors in both conditions were rated on a 5-point behavior frequency scale ranging from 0 (*never*) to 4 (*proficient*) on each relevant instructional practice. The eight instructional practices rated for the treatment condition included the following: (a) Presentation manual was visible to all children during the lesson, (b) all children were actively engaged during the lesson, (c) positive praise statements were used during the lesson, (d) responses were modeled, (e) adequate practice opportunities were provided, (f) prescribed sequence of instructional activities was followed, (g) prescribed instructional directions for each activity were used, and (h) the use of a combination of group and individual responses. The nine instructional practices rated for the control condition included the following: (a) Storybook and pictures were visible to all children; (b) all children were actively engaged during the lesson; (c) pictures were used to introduce target and conceptually connected words; (d) initial prompt questions about the target and conceptually connected words were used; (e) responses of children around target and conceptually connected words were evaluated, rephrased, and expanded on during storybook reading; (f) the storybook was introduced using title and author; (g) the children were engaged about literacy related topics; (h) the children were engaged about the target and conceptually connected words; and (i) responses of children around literacy related concepts were evaluated, rephrased, and expanded on during storybook reading. Across instructional practice categories for each intervention, a mean was computed; these means were then averaged across the three observation occasions to obtain an intervention fidelity score, which was then applied to each respective small group.

Table 2. Classroom literacy environment means and standard deviations

Instructional Category	*M*	*SD*	Minimum	Maximum
Daily literacy instruction (minutes)	52.50	14.88	30	70
Word reading	19.38	14.25	5	45
Comprehension	15.00	10.69	0	30
Vocabulary	10.63	12.08	0	30
Writing	13.13	8.84	0	30
Listening	21.25	29.00	0	90
Spelling	7.50	6.55	0	15

Note. $N = 8$ Head Start classroom teachers, each with small groups in both intervention conditions; all data are self-report, and literacy instruction categories overlap.

Classroom Literacy Environment

To describe and quantify the classroom literacy environment of children participating in the study, we briefly surveyed all participating classroom teachers ($n = 8$) on their teaching qualifications and their perceived classroom literacy practices at the beginning of the intervention in February. More than half ($n = 5$; 63%) reported having obtained a bachelor's degree (others reported having earned associate's degrees in early childhood education). Four of those who had obtained a bachelor's degree were also state certificated ($n = 3$ were certified K-8 regular education and $n = 1$ was certified special education). Teaching experience averaged 3.25 years ($SD = 2.38$). Means and standard deviations for reported classroom literacy instruction practices are provided in Table 2 (note that instructional categories are overlapping). Because we anticipated that Head Start preschool teachers would not be able to differentiate between literacy instruction categories well, we used teachers' total literacy instruction minutes as the best indicator of classroom literacy environment for our child outcome models (see Results section).

Home Literacy Environment

A parent questionnaire was used to assess family home literacy environment (Griffin & Morrison, 1997). Of the 88 children who completed the study, only 1 child's parent declined to participate in the survey. In Table 3 on the following page we report descriptive statistics, including response rates, for each survey item. When we compared the two intervention conditions on each item, we found no significant differences between groups (all *t*-test *p* values $> .10$). To create a single, standardized indicator of home literacy environment for our child outcome models, we grand-mean centered each of the 12 items (because

Table 3. Home literacy environment means and standard deviations

	Treatment[a]				Control[b]			
Survey Item	*M*	*SD*	*Min*	*Max*	*M*	*SD*	*Min*	*Max*
No. of times at library	0.65	0.83	0	3	0.60	0.97	0	4
No. of times reading newspaper	0.25	0.74	0	4	0.34	0.52	0	2
No. of magazines read by parent	0.35	0.74	0	4	0.43	0.74	0	4
No. of magazines read by child	0.20	0.46	0	2	0.26	0.57	0	2
Amount of reading weekly, mother	2.69	0.92	1	4	2.81	1.08	1	4
How often child is read to by adult	3.05	0.77	1	4	3.24	0.74	1	4
No. of books owned	2.18	0.73	1	3	2.12	0.79	1	3
How often child taught word reading	2.05	1.23	0	4	1.96	1.28	0	4
How often child taught printing	1.74	1.16	0	4	1.53	1.18	0	4
How often child asks to be read to	2.64	1.39	0	4	2.36	1.50	0	4
How often child pretends to read	3.18	1.17	0	4	2.81	1.39	0	4
How often child pretends to write	3.36	0.90	1	4	3.00	1.22	0	4

Note. $N = 87$ home literacy surveys returned (responses from one parent of child in the *Stepping Stones to Literacy* condition were entirely missing); all data are self-report rating scales.

[a]$n = 40$. [b]$n = 47$.

different rating scales were used across items) and then averaged across all items to maximize the information available.

Child Assessments

Abilities hypothesized to contribute to or correlate with the early reading skills were assessed at pretest (February) and posttest (late April) and included measures of print awareness, alphabetic knowledge, phonological awareness, and definitional vocabulary. Tests were individually administered by testers who were unaware of student group assignment. Testers were trained and supervised by research staff to administer assessments according to protocols. Training included explaining, modeling, and supervised independent practice on each measure. In the measure descriptions that follow, published reliabilities for each measure are provided, as well as sample reliabilities (internal consistencies are Cronbach's alpha). Raw scores (total number correct) were used in all analyses.

1. At pretest only (for the purpose of describing the sample) we measured *receptive language* using the Peabody Picture Vocabulary Test–IIIA (PPVT; Dunn & Dunn, 2006). Children are asked to select from a set of pictures a picture that best matches the meaning of an orally presented word. Testing

begins with the items set corresponding to the child's age and is discontinued after 8 of 12 items are missed within a set. Internal consistency reported in the test manual averages .94 for 3- to 5-year-olds; internal consistency for our sample was .97.

2. *Print awareness* was assessed using the total number of correct items on Section A from Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, & Torgesen, 2007) Print Knowledge subtest. This section asks children to select the picture/item (from a set of four) that matches an orally presented stimulus. For one item, as an example, the child is shown a set of four pictures (one of which shows a word) and is asked to "*Find the picture that has letters in it*." Most items involve discriminating the picture with letters or words from among pictures of numbers and/or symbols. Items are administered in increasing difficulty. Testing begins at Item 1 and continues until the child finishes all 12 items or until the child makes three consecutive errors. Internal consistency for our sample was .87 and .91 at pretest and posttest, respectively.
3. *Alphabetic knowledge* was assessed using the number of correct responses on Sections B and C from the TOPEL Print Knowledge subtest. In Section B, the child is asked to identify from a set of four letters the letter that matches orally presented letter names and sounds (e.g., "*Which one is 'M'?*" and "*Which one makes the /b/ sound?*"). Testing begins at Item 1 and continues until the child finishes all 10 items in the section or until the child makes three consecutive incorrect responses. In Section C, the child is asked to point to each letter arranged on a card and say either the name (10 items) or sound (4 items) of the letter. Again, testing begins at Item 1 and continues until the child misses three consecutive items or until all 14 items are administered. Items are administered in increasing difficulty. Across Sections B and C, there are 24 possible points. Across Sections A, B, and C, the average reliability for 3- to 5-year olds reported in the TOPEL test manual for this subtest is .95. Internal consistency for our sample was .96 and .97 at pretest and posttest, respectively.
4. *Phonological awareness* was measured using the TOPEL Phonological Awareness subtest, which includes both deletion and blending tasks. In the first half of the subtest, children are asked to listen to a stimulus word and then to either point to the picture that corresponds to the word without one part (i.e., deleting either a syllable for two-syllable words, or a single sound for one-syllable words) or say the word without one part (no picture cues are provided for this section). In the second half of the subtest, children are orally presented with two single-syllable words, or two or three sounds, separated by a pause, and are asked to either point to the picture that corresponds to the word represented by blending the syllables or sounds together, or to say the new word aloud (no picture cues are provided for these items). Items are administered in increasing difficulty. There are four sections, and for each section, testing begins at the first item and continues until the child

makes three consecutive errors or until all items are administered. The raw score is the number correct out of 27 possible points. Internal consistency reported in the examiner's manual for 3- to 5-year-olds averages .87. Internal consistency for our sample was .89 and .91 at pretest and posttest, respectively.

5. Vocabulary was measured with the TOPEL Definitional Vocabulary subtest. This subtest comprises two sections: In the first section, children are shown an illustration and are asked to name the object that the tester points to (e.g., "*What is this?*") and then provide the function of the object (e.g., "*What is it for?*"). The second section asks the child to provide the word that describes the common theme across a set of four pictures (e.g., "*What can all of these do?*" or "*What is a name for all of these?*") and then to provide the function associated with the word. Each item in both sections is worth 2 points (one for the object name and one for the object function). Testing begins at the first item and is discontinued until the child misses both questions of three consecutive items. With 35 items, the raw score is the total correct out of 70. Internal consistency reported in the examiner's manual for 3- to 5-year-olds averages .94. Internal consistency for our sample was .96 for both pretest and posttest.

RESULTS

Analytic Methods

Because of the complex nature of the child outcome data, we used multilevel modeling to analyze intervention condition differences. Because children received intervention in small groups within classrooms, two inherent nesting structures were present: Children within a given small group are likely to have more similar instructional experiences than children in other small groups, and small groups were more likely to be more similar to one another if they were drawn from the same classroom compared to other classrooms. Consequently, scores from children and small groups were not treated as independent (as assumed in classic *t* and *F* tests): To ignore this nonindependence would yield potentially biased parameter estimates as well as degrees of freedom that are too large, resulting in Type I error inflation (cf. Hox, 2002, pp. 5–6).

We thus used multilevel modeling to analyze child outcomes. Specifically, we used two models. First, we tested for direct effects using a simple three-level model in which children's scores (Level 1) are nested in small groups (Level 2), which are in turn nested in classrooms (Level 3). Intervention condition was dummy coded (1 = treatment, 0 = control) as a small-group level predictor. The general three-level model for testing the direct treatment effects (our first research question) is as follows: $Y_{ijk} = \gamma_{000} + \gamma_{010} * \text{Condition}_{jk} + u_{0jk} + u_{00k} + e_{ijk}$, where Y = test score of the *i*th child in the *j*th small group in the *k*th

classroom; γ_{000} = conditional grand mean test score, γ_{01} = *Treatment* effect, u_{0jk} = residual between the child's small group mean and the mean across small groups within classrooms, u_{00k} = residual between the child's classroom mean and the mean across classrooms, and e_{ijk} = unexplained residual. In our second set of models (to test for unique treatment effects), we simultaneously added four covariates, all grand-mean centered, including respective child pretest, child's home literacy environment (mean across 12 items on home literacy survey), small-group treatment fidelity, and classroom literacy environment (teacher report of total daily minutes afforded to literacy instruction). All multilevel analyses were conducted using *HLM 6* (Raudenbush, Bryk, & Congdon, 2004); all classic analyses were conducted using *SPSS 13* (SPSS Inc., 1989–2004).

Pretests

Observed pretest and posttest means and standard deviations are reported in Table 4 (intercorrelations among all measures by condition are provided in the appendix). The raw scores for receptive language (measured by the PPVT–IIIA), when converted to standard scores, showed that students in this sample ranged from 40 (< 1st percentile) to 111 (77th percentile), and averaged in the bottom 2nd percentile ($M = 70.41$, $SD = 19.22$).

Prior to testing our research questions, we wished to determine whether any pre-intervention differences between conditions existed. Thus, we estimated

Table 4. Child assessment means and standard deviations

	Treatment[a]				Control[b]			
	Pretest		Posttest		Pretest		Posttest	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Recept Lang	42.02	18.46			36.15	21.06		
Print Aware	5.30	3.56	5.40	4.18	4.10	3.35	5.60	3.92
Alphabetics	5.90	6.86	12.40	8.81	6.80	7.93	9.90	9.26
Phono Aware	11.46	5.31	15.00	6.28	10.60	6.30	13.38	6.23
Vocabulary	30.00	14.55	38.85	13.60	27.55	16.13	33.30	17.14

Note. Raw scores used for all measures. Recept Lang = receptive language measured using the raw score from the Peabody Picture Vocabulary Test IIIA; Print Aware = print awareness items from Section A of the Test of Preschool Early Literacy (TOPEL) Print Awareness subtest; Alphabetics = alphabetic knowledge items from Sections B and C of the TOPEL Print Awareness subtest; Phono Aware = TOPEL Phonological Awareness subtest; Vocabulary = TOPEL Definitional Vocabulary subtest.

[a] $n = 41$. [b] $n = 47$.

the effect of intervention condition on pretest scores (again, condition was dummy coded 1 = *treatment*, 0 = *control*) while accounting for small-group and classroom membership using three-level modeling. Model results showed that the treatment group was significantly higher than controls on one measure at pretest: print awareness, $t(25) = 2.13$, $p < .05$ (all other tests of treatment on pretest showed slope t-test p values $> .10$).

Research Question 1: Direct Effects Models

To review, our first research question asked whether a PA-focused intervention (treatment) implemented by community-based paraeducators had a direct, positive impact on at-risk preschool children's literacy outcomes. Our three-level models testing only the main effect of treatment on posttests showed one direct effect, on alphabetic knowledge. Specifically, treatment students were predicted to have a 2.34-point advantage ($SE = 0.97$) more than controls who predicted to average 10.11 points, $t(25) = 2.42$, $p < .05$, $d = .47$. (Note that the approximate Cohen's, 1988, d for treatment effects is calculated as the difference between the predicted value for the treatment group [the estimated treatment coefficient multiplied by +1] and the predicted value for the control group [the estimated treatment coefficient multiplied by 0], divided by the approximate pooled standard deviation; the approximate pooled variance is computed as the squared standard error multiplied by the sample size.)

Research Question 2: Unique Effects Models

To determine whether treatment had unique impacts on posttests after controlling for pretest, small-group treatment fidelity, and classroom and home literacy environments, we added the respective grand-mean centered covariates to our three-level direct effects models. (Again, zero-order correlations of all variables are shown in the appendix.) The model results (shown in Table 5) revealed, first, that treatment did have unique impacts on alphabetic knowledge ($d = 1.22$) and phonological awareness ($d = .62$) but not print awareness ($d = –.24$) or vocabulary ($d = .16$). Second, results showed that pretest significantly uniquely predicted posttest across all measures (average approximate effect of $d = .79$ when comparing 1 standard deviation above average to mean pretest performance). Third, home literacy environment had a significant positive impact on vocabulary, showing that children in homes with 1 standard deviation higher literacy practices have an average advantage of 2.94 more words (approximate $d = .30$). Finally, classroom literacy environment had a significant positive impact on alphabetic knowledge: preschoolers in classrooms whose teachers spent 1 standard deviation more time on literacy instruction were predicted to have 0.12 more letters correct (approximate $d = .85$).

Table 5. Multilevel model results for unique effects models

	Print Aware					Alphabetics					Phono Aware					Vocabulary				
Fixed Effects	*Coeff*	*SE*	*df*	*t*	*d*	*Coeff*	*SE*	*df*	*t*	*d*	*Coeff*	*SE*	*df*	*t*	*d*	*Coeff*	*SE*	*df*	*t*	*d*
Posttest *M*	5.83	0.44	6	13.37***		9.58	0.72	6	13.26***		13.19	0.59	6	22.28***		34.56	1.22	6	22.28***	
Treatment	−0.85	0.68	24	−1.27	−.24	3.06	0.48	24	6.33***	1.22	2.25	0.70	24	3.24**	.62	2.20	2.64	24	0.83	.16
Pretest	0.59	0.09	81	6.28***	.67	0.85	0.11	81	7.72***	.83	0.71	0.08	81	8.55***	.92	0.71	0.11	81	6.71***	.72
Home Lit	0.76	0.66	81	1.14	.12	−0.43	1.24	81	−0.35	−.04	0.94	0.91	81	1.04	.11	2.94	1.07	81	2.75**	.30
Class Lit	0.01	0.02	6	0.50	.18	0.12	0.05	6	2.41*	.85	0.05	0.04	6	1.25	.44	0.13	0.13	6	0.98	.35
Fidelity	0.19	1.83	24	0.10	.02	1.41	3.59	24	0.39	.08	−4.59	2.78	24	−1.65	−.32	1.46	7.14	24	0.20	.04
Random Effects	*Variance*	*df*	χ^2			*Variance*	*df*	χ^2			*Variance*	*df*	χ^2			*Variance*	*df*	χ^2		
Classrooms	0.00	6	4.34			0.04	6	7.33			0.01	6	5.97			13.69	6	23.70**		
Small groups	0.93	17	28.15*			0.00	17	19.31			4.19	17	38.23**			0.07	17	16.52		
Residual	10.49					33.19					15.71					75.41				

Note. $N = 87$ (data from one parent survey missing). Raw scores used for all measures. Recept Lang = receptive language measured using the raw score from the Peabody Picture Vocabulary Test IIIA; Print Aware = print awareness items from Section A of the Test of Preschool Early Literacy (TOPEL) Print Awareness subtest; Alphabetics = alphabetic knowledge items from Sections B and C of the TOPEL Print Awareness subtest; Phono Aware = TOPEL Phonological Awareness subtest; Vocabulary = TOPEL Definitional Vocabulary subtest; Treatment dummy coded (1 = treatment, 0 = control); Pretest = corresponding TOPEL subtest; Home Lit = composite rating scale value of home literacy practices (self report rating scales grand-mean centered and averaged); Class Lit = total daily minutes spent on literacy activities (self-report, grand-mean centered); Fidelity = composite 5-point rating scale value of intervention fidelity (mean of three observations, grand-mean centered).

*$p < .05$. **$p < .01$. ***$p < .001$.

DISCUSSION

The primary goal in this study was to test the direct and unique impacts of a supplemental PA-focused intervention implemented by community-based paraeducators on preschool children's early literacy outcomes. We specifically sought to intensify instruction in both PA and alphabetic knowledge through curricular organization and pedagogical explicitness, drawing from others' research on early intervention and phonological awareness (Phillips et al., 2008). We used a modified form of Interactive Book Reading (Wasik & Bond, 2001; Wasik et al., 2006) as our control condition to (a) control for supplemental instruction time and consistency and (b) provide an alternative intervention approach appropriate for preschoolers.

The results of our multilevel models showed, first, positive direct treatment effects on alphabetic knowledge, and moreover, positive unique treatment effects on PA and alphabetic knowledge once classroom literacy instruction, treatment fidelity, and child pretest skill and home literacy practices were controlled for. Further, the impacts were not small: In our unique effects models, we found that children who received the PA-focused intervention were 3.06 points higher on alphabetic knowledge and 2.25 points higher on PA compared to children in the control condition who received a vocabulary-focused storybook intervention. These results, in our view, are impressive on several levels, namely, (a) the PA and alphabetic knowledge–based supplemental instruction was delivered by community-based paraeducator tutors instead of highly trained researchers or classroom teachers, which is promising for preschool programs that have far fewer funds than regular schools; (b) the intervention was conducted in small groups and was relatively brief, lasting only 10 weeks, which again lends well to real-world applications; (c) the treatment, although supplemental, was compared with another literacy oriented intervention rather than business-as-usual, and as such cannot be simply thought of as "added" instruction); and (d) the intervention took place prior to kindergarten, a developmental period that is often overlooked as a time for academic growth.

Although there is limited research on supplemental PA instruction programs in preschool settings, our findings are supported by previous research documenting improvements in PA in older children at risk of reading problems (e.g., Nelson, Benner, et al., 2005). Results are also consistent with the National Institute for Literacy's (2008) comprehensive scientific synthesis documenting that most interventions with PA training either alone or in combination with instruction related to alphabetic knowledge (e.g., letter-name instruction) is likely to produce positive, moderate-to-large, and reliable effects across a range of key skills related to later reading regardless of a child's age or developmental level of children. The treatment condition in this study likely contributed to PA advantages (over vocabulary-focused storybook reading) because of its use of instructional activities designed to promote explicit reading-related phonological-processing abilities (i.e., identification, manipulation, memory of

environmental sounds, letter names, sentence meanings, phonological awareness, phonemic awareness and rapid automatic naming).

More relevant to the present study, our findings confirmed and extended impressive effects of preschool PA explicit instruction on phonological awareness with a speech, language, and hearing impairment foci. Although our findings, albeit with limited power, provide support for age-appropriate systematic preschool PA instruction, it substantially improves upon threats to the external validity of these studies. Studies reviewed (e.g., Bernhardt & Major, 2005; Gillam & van Kleeck, 1996; Gillon, 2005; Laing & Espeland, 2005; Ziolkowski & Goldstein, 2008) were primarily single-subject, small sample size designs with language-impaired children as treatment groups and often conducted in noninclusive settings. In addition, most of the research utilized convenience samples with researchers-as-interventionists and little or no evidence of treatment fidelity. Most studies were unique to the work of speech-language pathologists serving preschool with a wide variety of communication disorders, thus limiting the generalizability to other more inclusive settings. Despite the promising finding that children who received treatment were significantly enhanced in their phonological awareness and alphabetic knowledge, it was not sufficient to completely overcome the *Matthew effect* (Stanovich, 1986) regardless of condition or outcome. Pretest scores predicted posttest scores children regardless of experimental condition, confirming previous research that children with higher entry-level skills generally outperform those with lower entry-level skills. As other researchers have also found (e.g., Penno, Wilkinson, & Moore, 2002; Robbins & Ehri, 1994), children with higher pretest scores outperformed children with lower scores at posttest. It is possible that children with less well-developed phonological sensitivity and vocabulary definition knowledge did not benefit sufficiently in either condition because they were less developmentally ready to learn. Another possibility is that the intervention length was not sufficient to meaningfully alter performance on print awareness and vocabulary for children from impoverished language backgrounds (as most in the current study were). Clearly, this area of research warrants further investigation.

The effect of the home literacy environment also merits discussion. The home literacy environment can be thought of as interrelated resources and opportunities provided to children, combined with the parental skills, abilities, and dispositions that govern the provision of these opportunities (Burgess, Hecht, & Lonigan, 2002). The present finding is not surprising given that the home literacy environment's importance rests on the fact that the home is the setting where children first encounter language and literacy (Weigel, Martin, & Bennett, 2006). The home literacy environment experiences such as shared-reading experiences provide significant opportunities for children to develop early language opportunities essential for skilled reading (Foy & Mann, 2003). Specifically, shared-reading and other home literacy experiences provide exposure to spoken language and increases the opportunities to build

competence in learn new and challenging vocabulary (Umek, Podlesek, & Fekonja, 2005).

Limitations and Directions for Future Research

As with all studies, the present investigation is not without limitations. First, the sample of children was drawn from Head Start centers servicing one geographic location and may not be representative of the general population of prekindergarten children served by Head Start centers nationwide. Future research should replicate these findings across varied contexts. In a similar vein, the children in the current study were mostly from language-impoverished backgrounds (averaging in the lower 2nd percentile on the PPVT, our receptive language measure). As such, future research may use a larger range of child abilities to determine the optimal conditions of intervention use. Third, the sample size in the current study is small: With only 27 small groups, power to test the impact of treatment effect is limited to moderate-to-large effects. (Power was estimated at 23% for detecting small treatment effects [$d \leq .30$], 52% for detecting moderate effects [$d \geq .50$], and 90% for large effects [$d \geq .80$] using *Optimal Design for Multi-level and Longitudinal Research* [Liu, Congdon, & Raudenbush, 2001; Raudenbush & Xiao-Feng, 2001]; for this estimate we assumed a two-level model with 3 students per small group, 27 small groups, an intraclass correlation of .07, and an alpha level of .05.) Clearly, future studies would do well to test effects on a larger scale. Fourth, the treatment intervention is a multicomponent program and thus we cannot tease apart specific component effects (e.g., segmenting, blending, letter naming) on children's outcomes. It is possible that components of the treatment intervention could have been excluded, whereas others may be necessary to produce treatment effects. Finally, the outcomes of this intervention should certainly be followed-up to determine if effects are maintained in later grades.

Despite these limitations, the current study contributes broadly to the idea that teaching early literacy skills need not wait for kindergarten, let alone first grade. On a more practical level, this study demonstrates that supplemental PA-focused instruction can be provided with high fidelity by paraeducators, an often underutilized community resource. Indeed, for young at-risk children coming from impoverished communities (i.e., receiving Head Start services), a PA and alphabetic knowledge intervention may indeed help prevent future reading failure.

REFERENCES

Anthony, J. L., Williams, J. M., McDonald, R., & Francis, D. J. (2007). Phonological processing and emergent literacy in younger and older preschool children. *Annals of Dyslexia*, *57*, 113–137.

Ball, E. W., & Blachman, B. A. (1988). Phoneme segmentation training: Effect on reading readiness. *Annals of Dyslexia*, *38*, 208–225.

Bernhardt, B., & Major, E. (2005). Speech, language and literacy skills 3 years later: A follow-up study of early phonological and metaphonological intervention. *International Journal of Language and Communication Disorders*, *40*, 1–27.

Burgess, S. R. (2006). The development of phonological sensitivity. In D. K. Dickinson & S. B Neuman (Eds.), *Handbook of early literacy research* (Vol. 2, pp. 90–100). New York: Guilford.

Burgess, S. R., Hecht, S. A., & Lonigan, C. J. (2002). Relations of the home literacy environment (HLE) to the development of reading-related abilities: A one-year longitudinal study. *Reading Research Quarterly*, *37*, 408–426.

Byrne, B., & Fielding-Barnsley, R. (1991). Evaluation of a program to teach phonemic awareness to young children. *Journal of Educational Psychology*, *83*, 451–455.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.

Craig, S. A. (2006). The effects of an adapted interactive writing intervention on kindergarten children's phonological awareness, spelling, and early reading development: A contextualized approach to instruction. *Journal of Educational Psychology*, *98*, 714–731.

Dickinson, D. K., & Smith, M. W. (1994). Long-term effects of preschool teachers' book readings on low-income children's vocabulary and story comprehension. *Reading Research Quarterly*, *29*, 105–122.

Dunn, L. M., & Dunn, L. M. (2006). *The Peabody Picture Vocabulary Test: IIIA edition*. Circle Pines, MN: AGS.

Ehri, L. C. (1989). The development of spelling knowledge and its role in reading acquisition and reading disability. *Journal of Learning Disabilities*, *22*, 356–365.

Ehri, L. C., & Wilce, L. S. (1987). Cipher versus cue reading: An experiment in decoding acquisition. *Journal of Educational Psychology*, *79*, 3–13.

Farver, J. M., Xu, Y., Eppe, S., & Lonigan, C. J. (2006). Home environments and young Latino children's school readiness. *Early Childhood Research Quarterly*, *21*, 196–212.

Foorman, B. R., Francis, D. J., Fletcher, J. M., Schatschneider, C., & Mehta, P. (1998). The role of instruction in learning to read: Preventing reading failure in at-risk children. *Journal of Educational Psychology*, *90*, 37–55.

Foy, J. G., & Mann, V. (2003). Home literacy environment and phonological awareness in preschool children: Differential effects for rhyme and phoneme awareness. *Applied Psycholinguistics*, *24*, 59–88.

Gillam, R. B., & van Kleeck, A. (1996). Phonological awareness training and short-term working memory: Clinical implications. *Topics in Language Disorders*, *17*, 72–81.

Gillon, G. T. (2005). Facilitating phoneme awareness development in 3- and 4-year-old children with speech impairment. *Language, Speech, and Hearing Services in the Schools*, *36*, 308–324.

Griffin, E. A., & Morrison, F. J. (1997). The unique contribution of home literacy environments to differences in early literacy skills. *Early Child Development and Care*, *127–128*, 233–243.

Gunn, B., Smolkowski, K., Biglan, A., & Black, C. (2002). Supplemental instruction in decoding skills for Hispanic and non-Hispanic students in early elementary school: A follow-up. *Journal of Special Education*, *36*, 69–79.

Hox, J. J. (2002). *Multilevel analysis: Techniques and applications*. Mahwah, NJ: Erlbaum.

Justice, L. M., Meier, J., & Walpole, S. (2005). Learning new words from storybooks: An efficacy study with at-risk kindergartners. *Language, Speech, and Hearing Services in Schools*, *36*, 17–32.

Laing, S. P., & Espeland, W. (2005). Low intensity phonological awareness training in a preschool classroom for children with communication impairments. *Journal of Communication Disorders*, *38*, 65–82.

Liu, X., Congdon, R. T., & Raudenbush, S. W. (2001). *Optimal Design for Multi-level and Longitudinal Research 0.30*. Ann Arbor: University of Michigan Institute of Social Research, Survey Research Center.

Leafstedt, J. M., Richards, C. R., & Gerber, M. M. (2004). Effectiveness of explicit phonological-awareness instruction for at-risk English learners. *Learning Disabilities Research & Practice*, *19*, 252–261.

Lonigan, C. J. (2006). Conceptualizing phonological processing skills in preschoolers. In D. K. Dickinson & S. B Newuman (Eds.), *Handbook of early literacy research* (Vol. 2, pp. 77–89). New York: Guilford.

Lonigan, C. J. (2007). Vocabulary development and the development of phonological awareness skills in preschool children. In R. Wagner, A. Muse, & K. R. Tennenbaum (Eds.), *Vocabulary acquisition: Implications for reading comprehension* (pp. 15–31). New York: Guilford.

Lonigan, C. J., Anthony, J. L., Phillips, B. M., Purpura, D. J., Wilson, S. B., & McQueen, J. D. (2009). The nature of preschool phonological processing abilities and their relations to vocabulary, general cognitive abilities, and print knowledge. *Journal of Educational Psychology*, *101*, 345–358.

Lonigan, C. J., Wagner, R. K., & Torgesen, J. K. (2007). *Test of Preschool Early Literacy*. Austin, TX: Pro-Ed.

National Institute for Literacy. (2008). *Developing early literacy: Report of the National Early Literacy Panel*. Jessup, MD: Author.

Nelson, J. R., Benner, G. J., & Gonzalez, J. (2005). An investigation of the effects of a prereading intervention on the early literacy skills of children at risk of emotional disturbance and reading problems. *Journal of Emotional and Behavioral Disorders*, *13*, 3–12.

Nelson, J. R., Cooper, C., & Gonzalez, J. (2004). *Stepping stones to literacy*. Longmont, CO: Spring West.

Nelson, J. R., Stage, S. A., Epstein, M. H., & Pierce, C. D. (2005). Effects of a prereading intervention on the literacy and social skills of children. *Council for Exceptional Children*, *72*, 29–45.

Penno, J. F., Wilkinson, I. A. G., & Moore, D. W. (2002). Vocabulary acquisition from teacher explanation and repeated listening to stories: Do they overcome the Matthew effect? *Journal of Educational Psychology*, *94*, 23–33.

Phillips, B. M., Clancy-Menchetti, J., & Lonigan, C. J. (2008). Successful phonological awareness instruction with preschool children: Lessons from the classroom. *Topics in Early Childhood Special Education*, *28*, 3–17.

Raudenbush, S. W., Bryk, A. S., & Congdon, R. T. (2004). *HLM for Windows 6.0*. Lincolnwood, IL: Scientific Software International.

Raudenbush, S. W., & Xiao-Feng, L.. (2001). Effects of study duration, frequency of observation, and sample size on power in studies of group differences in polynomial change. *Psychological Methods*, *6*, 387–401.

Robbins, C., & Ehri, L. C. (1994). Reading storybooks to kindergartners helps them learn new vocabulary words. *Journal of Educational Psychology*, *86*, 54–64.

Share, D. L., Jorm, A. F., Maclean, R., & Matthews, R. (1984). Sources of individual differences in reading acquisition. *Journal of Educational Psychology*, *76*, 1309–1324.

Shaywitz, B. A., Lyon, G. R., & Shaywitz, S. E. (2006). The role of functional magnetic resonance imaging in understanding reading and dyslexia. *Developmental Neuropsychology*, *30*, 613–632.

Smith, S. B., Simmons, D. C., & Kame'enui, E. J. (1998). Phonological awareness: Research Bases. In D. C. Simmons & E. J. Kame'enui (Eds.), *What reading research tells us about children with diverse learning needs* (pp. 61–128). Mahwah, NJ: Erlbaum.

Speer, O. B., & Lamb, G. S. (1976). First grade reading ability and fluency in naming verbal symbols. *The Reading Teacher*, *29*, 572–576.

Stahl, S. A., & Murray, B. A. (2006). Defining phonological awareness and its relationship to early reading. In K. A. Dougherty Stahl & M. C. McKenna (Eds.), *Reading research at work: Foundations of effective practice* (pp. 92–125). New York: Guilford.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, *21*, 360–407.

Stanovich, K. E., Cunningham, A. E., & Cramer, B. B. (1984). Assessing phonological awareness in kindergarten children: Issues of task comparability. *Journal of Experimental Child Psychology*, *38*, 175–190.

Tunmer, W. E., Herriman, M. L., & Nesdale, A. R. (1988). Metalinguistic abilities and beginning reading. *Reading Research Quarterly*, *23*, 134–158.

Umek, L. M., Podlesek, A., & Fekonja, U. (2005). Assessing the home literacy environment: Relationships to child language comprehension and expression. *European Journal of Psychological Assessment*, *21*, 271–281.

Vadasy, P. F., & Sanders, E. A. (2008a). Code-oriented instruction for kindergarten students at risk for reading difficulties: A replication and comparison of instructional groupings. *Reading and Writing*, *21*, 929–963.

Vadasy, P. F., & Sanders, E. A. (2008b). Individual tutoring for struggling readers: Moving research to scale with interventions implemented by paraeducators. In G. A. Reid, A. Fawcett, F. Manis, & L. Seigel (Eds.), *The SAGE handbook of dyslexia* (pp. 337–355). Thousand Oaks, CA: Sage.

Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2006). Code-oriented instruction for kindergarten students at risk for reading difficulties: A randomized field trial with paraeducator implementers. *Journal of Educational Psychology*, *98*, 508–528.

Vellutino, F. R., & Scanlon, D. M. (1987). Phonological coding, phonological awareness, and reading ability: Evidence from a longitudinal and experimental study. *Merrill-Palmer Quarterly*, *33*, 321–363.

Wagner, R. K. (1988). Causal relations between the development of phonological processing abilities and the acquisition of reading skills: A meta-analysis. *Merrill-Palmer Quarterly*, *34*, 261–279.

Wagner, R. K., & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, *101*, 192–212.

Wagner, R. K., Torgesen, J. K., Laughon, P., Simmons, K., & Rashotte, C. A. (1993). Development of young readers' phonological processing abilities. *Journal of Educational Psychology*, *85*, 83–103.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1994). Development of reading-related phonological processing abilities: New evidence of bidirectional causality from a latent variable longitudinal study. *Developmental Psychology*, *30*, 73–87.

Wasik, B. A., & Bond, M. A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of Educational Psychology*, *93*, 243–250.

Wasik, B. A., Bond, M. A., & Hindman, A. (2006). The effects of a language and literacy intervention on Head Start children and teachers. *Journal of Educational Psychology*, *98*, 63–74.

Weigel, D. J., Martin, S. S., & Bennett, K. K. (2006). Contributions of the home literacy environment to preschool-aged children's emerging literacy and language skills. *Early Child Development and Care*, *176*, 357–378.

Whitehurst, G. J. (2002). *Research on teacher preparation and professional development White House Conference on Preparing Tomorrow's Teachers*. Retrieved March 5, 2009, from www.whitehouse.gov/admins/tchrqual/learn/preparingteachersconferenc/whitehurst.html

Whitehurst, G. J., Epstein, J. N., Angell, A. L., Payne, A. C., Crone, D. A., & Fischel, J. E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology*, *86*, 542–555

Wolf, M. (1984). Naming, reading, and the dyslexias: A longitudinal overview. *Annals of Dyslexia*, *34*, 87–115.

Wolf, M., Bally, H., & Morris, R. (1986). Automaticity, retrieval processes, and reading: A longitudinal study in average and impaired readers. *Child Development*, *57*, 988–1000.

Ziolkowski, R. A., & Goldstein, H. (2008). Effects of an embedded phonological awareness intervention during repeated book reading on preschool children with language delays. *Journal of Early Intervention*, *31*, 67–90.

APPENDIX

Table A1. Zero-order correlations

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Home Lit	—	.01	–.11	**.44**	.12	.27	.21	**.37**	.06	.15	.03	.30
2. Class Lit	–.04	—	.12	.13	.03	.17	–.09	–.12	.09	**.42**	.19	.22
3. Fidelity	.06	**.47**	—	–.07	–.13	–.02	.00	**–.31**	–.11	–.03	–.29	–.20
4. Recept Lang	**.63**	.11	.09	—	**.63**	**.65**	**.57**	**.74**	**.43**	**.52**	**.54**	**.72**
5. Print Aware	.06	–.11	.24	**.41**	—	**.60**	**.46**	**.53**	**.66**	**.48**	**.48**	**.45**
6. Alphabetics	.18	.17	.26	**.51**	**.57**	—	**.50**	**.52**	**.62**	**.75**	**.55**	**.49**
7. Phono Aware	**.45**	.15	.20	**.69**	**.47**	**.42**	—	**.53**	**.54**	.28	**.78**	**.51**
8. Vocabulary	**.58**	.00	.06	**.88**	**.43**	**.51**	**.62**	—	**.37**	**.46**	**.59**	**.63**
9. Print Aware	.19	–.07	.16	**.37**	**.41**	**.35**	**.30**	**.43**	—	**.52**	**.53**	**.43**
10. Alphabetics	.11	.23	**.33**	**.45**	**.42**	**.74**	**.33**	**.42**	**.55**	—	**.42**	**.44**
11. Phono Aware	**.50**	.04	.14	**.73**	**.41**	**.35**	**.61**	**.70**	**.55**	**.57**	—	**.66**
12. Vocabulary	**.54**	.02	.16	**.81**	**.37**	**.44**	**.59**	**.87**	**.50**	**.57**	**.79**	—

Note. Treatment condition correlations shown in upper diagonal ($n = 41$) and control condition correlations shown in lower diagonal ($n = 47$). Raw scores used for all measures. Home Lit = composite rating scale value of home literacy practices (self report rating scales grand-mean centered and averaged); Class Lit = total daily minutes spent on literacy activities (self report, grand-mean centered); Fidelity = composite 5-point rating scale value of intervention fidelity (mean of three observations, grand-mean centered); Recept Lang = receptive language measured using the raw score from the Peabody Picture Vocabulary Test IIIA; Print Aware = print awareness items from Section A of the Test of Preschool Early Literacy (TOPEL) Print Awareness subtest; Alphabetics = alphabetic knowledge items from Sections B and C of the TOPEL Print Awareness subtest; Phono Aware = TOPEL Phonological Awareness subtest; Vocabulary = TOPEL Definitional Vocabulary subtest; Correlations in bold face are significant at the .05 level.