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Kindergarten Reading Interventions for At-Risk Students: Twenty Years of Research

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Findings from a synthesis of 27 intervention studies that examined the effects of school-based reading interventions for kindergarten students at-risk for reading difficulties are reported. Results indicated that reading interventions were effective for improving reading outcomes for kindergarten students with disabilities and those at-risk for reading difficulties (i.e., low socioeconomic status, low phonological awareness, or low letter naming ability). Although there is variation among intervention types and delivery, certain features (e.g., phonemic awareness component, small group size, intensity of 15–30 minutes) produced the largest effects. The findings were consistent with converging evidence that early intervention for the prevention of reading difficulties is effective for kindergarten students.

For the past two decades, awareness of the importance of reading has been growing, and consequent demands for effective reading instruction have increased (National Reading Panel [NRP], 2000; Snow, Burns, & Griffin, 1998). The most recent legislation to support effective reading instruction is the *No Child Left Behind Act of 2001 (NCLB)*, which addresses the literacy crisis in the United States wherein two thirds of fourth graders fail to read at a proficient level (U.S. Department of Education, 2002). As solutions to the crisis, the *NCLB Act* emphasizes (a) the early identification of children who are at-risk for reading difficulties and (b) the provision of scientifically research-based reading instruction to achieve and maintain these children's reading growth at adequate levels.

Preventing reading difficulties as early as possible is critical because children who are poor readers early in their schooling are likely to continue to struggle with reading throughout their lives (Good, Simmons, & Smith, 1998; Juel, 1988). In fact, the gap between good readers' and poor readers' abilities continues to grow as these students get older, thus, making it more difficult to help the poor readers catch up by the end of first grade or beginning of second grade (Good et al., 1998). Once children fall behind in reading, very intensive reading interventions are often required to help them achieve adequate levels of reading proficiency (Allington & McGill-Franzen, 1994). For example, in a notable study by Torgesen and colleagues (2001), significant positive effects on word-reading accuracy and comprehension (but not reading rate) were found from an *intensive* remedial program in which elementary school students with severe reading difficulties received *50 minutes of one-to-one instruction twice a day everyday* for 8 weeks. However, typical reading remediation services (i.e., special education reading classes), which usually incorporate much less intense instruction, have not been effective in elementary schools (Hanushek, Kain, & Riukin, 1998; Moody, Vaughn, Hughes, & Fisher, 2000).

Such research findings support the *NCLB Act*'s focus on the identification of students who are at-risk for reading difficulties *before* they fall behind and the earlier provision of effective, research-based reading instruction to these students. Most states in the United States have formal education in kindergarten. Forty-one states require school districts to offer kindergarten programs, but attendance is mandatory in 14 states (Education Commission of the States, August 2001). Therefore, the earliest most children can be identified as having difficulties that may inhibit their success in reading is kindergarten. Also, kindergarten is often the first opportunity schools have to provide school-based preventive reading instruction for children to achieve and maintain adequate reading growth. Many states provide pre-kindergarten programs; however, publicly funded pre-kindergarten programs maintain specific criteria for eligibility such as disability or low socioeconomic status. Because of these specific criteria for inclusion in public pre-kindergarten programs, kindergarten remains the most frequent formal opportunity for students to benefit from preventive reading programs.

An on-going body of research and the *NCLB Act* have converged on findings about what effective, research-based reading instruction should look like and what critical elements should compose research-based reading instruction (Adams, 1990; Chard, Simmons, & Kame'enui, 1998; Grossen, 1997; NRP, 2000; Smith, Simmons, & Kame'enui, 1998b; Snow et al., 1998; Torgesen & Hecht, 1996). Based on the accumulated body of research and the *NCLB Act*, an effective, research-based reading instruction should provide systematic and explicit instruction in phonological awareness, phonics, vocabulary, reading comprehension, and fluency. Among these five critical elements, the first four, as well as oral language development, should be addressed in kindergarten (NRP, 2000).

Students at-risk for reading difficulties demonstrate deficits in phonological processing skills, including phonological awareness and rapid naming (Foorman, Francis, Fletcher, & Lynn, 1996; Smith, Simmons, & Kame'enui, 1998a; Stanovich & Siegel, 1994; Torgesen, 1996; Wagner, Torgesen, & Rashotte, 1994). Similarly, many correlation studies revealed

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that poor readers have poor phonemic awareness (Bradley & Bryant, 1983; Bruck, 1992; Fawcett & Nicholson, 1995). High- or average-achieving students outperform students at-risk for reading difficulties on a range of phonological tasks independent from general intelligence and socio-economic status (SES; Blachman & James, 1985; Calfee, Lindamood, & Lindamood, 1973; Fox & Routh, 1980; Stanovich et al., 1984). However, SES has been examined as a risk factor related to reading difficulties as well. For example, children from lower SES backgrounds are more likely to become at-risk for reading difficulties when compared with children from middle or higher SES backgrounds (Bowey, 1995; Hecht, Burgess, Torgesen, Wagner, & Rashotte, 2000). More specifically, children with lower SES backgrounds generally demonstrate lower levels of phonemic awareness than those with middle or higher SES backgrounds (Hecht & Greenfield, 2001; Nicholson, 1997; Raz & Bryant, 1990), and may also demonstrate delays in oral language skills (Hart & Risley, 1995).

Such deficits in phonological awareness processing have been found to influence significantly early word-level reading skills (Torgesen et al., 2001; Wagner et al., 1997). For instance, students with limited phonological awareness and rapid naming skills usually have difficulty understanding the alphabetic principle (i.e., recognition of print as the representation of speech sounds)—a problem that can lead to further difficulty with decoding and word recognition (i.e., connecting letters and letter patterns to speech sounds). To illustrate such negative effects, Wagner and colleagues (1997) revealed that over a five-year period, students with low phonological processing skills made significantly fewer gains in word-level ability than students with average phonological processing skills. Because of the correlation between phonological awareness processing and word-level reading skills, many students at-risk for reading difficulties experience limited growth in both of these areas (Share & Stanovich, 1995).

Given this relationship, beginning in kindergarten, students at-risk for reading difficulties need to acquire the necessary phonological processing and early word-level skills in order to prevent them from falling further behind in reading as they progress through school. Instruction that effectively addresses phonological processing and word-level reading skills has been well documented. According to the NRP (2000), phonemic awareness instruction was associated with significant improvements both in phonemic awareness and more general reading outcomes (d = .86, .59 respectively). More specifically, the effects for phonemic awareness were significantly larger for kindergarten students (d = .95) than for older students (d = .48 for first graders; d = .70 for second through sixth graders). Additionally, larger effects for the more general reading outcomes were obtained in studies of students at-risk for reading difficulties (d = 1.33) than those of average-achieving students (d = .30). In these studies, the most effective instruction included explicit and systematic teaching, focused on one or two skills rather than multiple skills, utilized small groups rather than a whole class format, and integrated letters into phonemic awareness instruction rather than not using letters.

Similar to phonemic awareness instruction, phonics instruction focusing on word-level reading skills yielded significant overall effects (d = .41; NRP, 2000), and a larger effect size was obtained for kindergarten students (d = .54) than for older students (i.e., second through sixth graders; d = .27). Again, as with phonemic awareness instruction, explicit and systematic phonics instruction resulted in greater reading improvement than informal, nonsystematic instruction.

Both the phonemic awareness and phonics instruction resulted in such strong effects on reading growth that the NRP recommended educators implement these practices along with other literacy activities in their classrooms. Although a complete research-based reading program for kindergarten may address other critical elements of effective reading instruction (i.e., vocabulary, comprehension, oral language development), preventive reading instruction in kindergarten should provide support for developing phonological processing and early word-level reading skills through systematic and explicit instruction.

To provide a better understanding of the critical elements of preventive reading instruction in kindergarten and their effects on reading growth, this synthesis reviews reading intervention studies conducted with kindergarten students at-risk for reading difficulties. Specifically, we will answer two questions:

(a) What are the features of reading intervention conducted with kindergarten students at-risk for reading difficulties?
(b) How effective are those reading interventions on reading growth of students at-risk for reading difficulties?

Method

Selection of Studies

Studies were identified through a three-step process. First, computer searches of PsycInfo and ERIC were conducted to locate studies that met the criteria described below and were published between the years 1982 and 2002. Key words were used (*kindergarten*, *reading, reading difficulties, learning disabilities, reading disabilities, delays, disorders, at-risk, high risk, disabilities, intervention, instruction, reading intervention, reading strategies, supplemental instruction, phonological awareness training, phonemic awareness, phon*, reading readiness, instructional support*) in appropriate combinations. The initial electronic searches yielded approximately 2300 studies. Second, a hand-search was conducted of 12 major journals related to the topic (i.e., *Annals of Dyslexia*, *Elementary School Journal, Exceptional Children, Journal of Early Intervention, Journal of Educational Psychology, Journal of Learning Disabilities, Journal of Literacy Research, Journal of Special Education, Learning Disabilities Research & Practice, Reading and Writing Quarterly, Reading Research Quarterly, Remedial and Special Education*) for the years 2001 through 2002. The hand-search yielded approximately 10 articles for further review. Third, reference sections from three relevant literature reviews were examined to identify additional studies that were not captured through computer searches (i.e., Al-Otaiba & Fuchs, 2002; Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001; Troia, 1999). The reviews of the abstracts yielded 27 studies for inclusion in this synthesis, which represents 1% of the abstracts reviewed.

Studies were included in the synthesis if each of the following criteria were met:

1. *At-risk for reading difficulties*: A study must include students at-risk for reading difficulties. Students were

considered to be at-risk for reading difficulties if they had low phonemic awareness, low letter identification ability, few pre-school or home literacy experiences, low socioeconomic status, or were attending a school with historically low reading achievement. When a study included average achieving students as well as those at-risk for reading difficulties at least 50% of the sample was at-risk for reading difficulties or the reading outcome findings were disaggregated for at-risk kindergarten students.

2. *Grade K (or Ages 5-6):* At least two thirds of participants in each study must be in kindergarten (or ages 5.0 to 6.11).
3. *Design:* Treatment/comparison designs, single group designs, and single subject design studies were included.
4. *Independent variables:* A study was included if it provided any type of a school-based reading or pre-reading intervention primarily for improving reading outcomes for kindergarten students. The intervention was identified for the purpose of improving reading outcomes for at-risk students. Studies in which all students were randomly selected for intervention without a priori identification of at-risk status were not included.
5. *Dependent variables*: A study was included if outcome measures to assess pre-reading, reading, or language arts skills (e.g., phonological awareness, word recognition, comprehension, etc.) were utilized.

Coding Procedures

An extensive coding sheet was used to organize pertinent information from each intervention study. The pertinent information included information about the participants, research design, treatment descriptions, measures, and findings. Three coders recorded information on each of 27 categories for the same study. Inter-rater agreement was checked across categories and reached 91%. Inter-rater agreement was calculated as the number of agreements divided by the number of agreements plus the number of disagreements on the pertinent information coded by each of three coders. All other studies were then coded independently by two of the coders. Any discrepancies were discussed until the coders reached agreement.

Calculation of Effect Sizes

For dependent variables in which sufficient statistical information was provided (i.e., means and standard deviations), effect size, *d*, was calculated. For studies utilizing a treatment/comparison design, effect sizes were calculated as the difference between the mean posttest score of the intervention group minus the mean posttest score of the comparison group divided by the pooled standard deviation. For those studies reporting statistically significant differences between groups at pretest, a procedure by Bryant and Wortman (1984) was used. The procedure involved the following calculations: The quantity of the pretest experimental mean minus the pretest comparison mean was divided by the quantity of the pretest comparison standard deviation. This quantity was subtracted from the quantity of the posttest experimental mean minus the posttest comparison mean divided by posttest comparison standard deviation. When only a test statistic t or F was available, effect sizes were estimated by applying the following formulas:

$$d = \frac{2t}{\sqrt{df}} \qquad d = \frac{2\sqrt{F}}{\sqrt{df(error)}}$$

(Rosenthal, 1991; Rosenthal & Rosnow, 1984). Effect sizes were calculated for non-significant results, when sufficient data (i.e., means and standard deviations) were reported in published manuscripts. According to Cohen (1988), effect sizes can be interpreted as $d = 0.2$ as small, $d = 0.5$ as medium, and $d = 0.8$ as a large effect.

Results

This synthesis contains a corpus of 27 studies that examined the effects of school-based reading interventions for kindergarten students at-risk for reading difficulties. Twenty-five studies employed a treatment and comparison design and two employed a single subject design; however, two of the treatment/comparison studies compared two treatments without the use of a control group (Hoffman & Norris, 1994; Qi & O'Connor, 2000). One study compared three treatments, but used a control group that was not comparable to the treatment groups (i.e., high achieving students, not at-risk; Schneider, Roth, & Ennemoser, 2000). For studies in which multiple comparison groups were used, effect sizes were only calculated based on comparisons with the comparable group and not a high achieving or average comparison group that did not receive treatment (Lennon & Slesinski, 1999; O'Connor, Jenkins, & Slocum, 1995; O'Connor, Notari-Syverson, & Vadasy, 1996; Warrick, Rubin, & Rowe-Walsh, 1993).

Information for each study included in the synthesis is provided in Table 1 with descriptions of: (a) criteria for determining students' risk, (b) intervention type, (c) delivery of intervention, (d) outcome measures, and (e) mean effect sizes. Effect sizes were calculated for each reading related outcome measure including phonological measures, reading words (real and non-words), spelling, literacy concepts, and measures of phonological processes (e.g., memory, perception). The individual effect sizes within each study, for which sufficient data were provided for calculation, were then averaged across all measures to report a mean effect size. The results are summarized according to effects by: (a) criteria for determining risk, (b) type of intervention, (c) grouping for intervention (i.e., individual vs. small group vs. whole group instruction), (d) person implementing intervention (i.e., researcher vs. teacher), and (e) duration and intensity of intervention. In addition, a brief summary of fidelity of implementation reported in studies is presented.

Criteria for Determining Risk

Researchers reported several criteria for selecting kindergarten students as "at-risk" for reading difficulties. These criteria included: low socioeconomic status (SES), low phonological awareness, a combination of low SES and low phonological awareness, disabilities, and other (i.e., poor letter naming skill, "non-reader" accompanied by one or more of the previously listed characteristics). Studies and their findings based on criteria for determining risk for reading difficulties are discussed.

Low SES

Researchers in five studies determined that low SES alone was the criteria for classification of students as at-risk for

reading difficulties and likely to benefit from reading intervention during kindergarten (Blachman, Ball, Black, & Tangel, 1994; Brady, Fowler, Stone, & Winbury, 1994; Hecht & Close, 2002; Saint-Laurent & Giasson, 2001; Tangel & Blachman, 1992). However, two of these studies used a "non-reader" criterion, determined by 0-3 words read on a standardized word reading measure, to exclude students with beginning reading skills (Blachman et al., 1994; Tangel & Blachman, 1992). The effects of interventions for students considered at-risk based on low SES status alone were mixed ranging from small to large (.16 to .78); however, the types of interventions also varied (phonemic awareness with and without print, multi-component literacy program, and computer assisted instruction).

Low Phonological Awareness

The determination of low phonological awareness skills was used as the only criteria for at-risk status in seven studies. A variety of measures were used to assess the level of phonological awareness skill among students, including standardized measures and researcher-developed instruments. The effects of interventions implemented for students at-risk based only on low phonological awareness revealed consistently large mean effect sizes in five of seven studies with a mean effect size range of 1.28 to 4.39 (Bentin & Leshem, 1993; Castle, Riach, & Nicholson, 1994, Experiment 1; Davidson & Jenkins, 1994; Fox & Routh, 1984; O'Connor et al., 1995). All of these studies employed a treatment/comparison design, implemented phonemic awareness (PA)-based interventions, and used phonological awareness measures combined with other literacy related measures to determine outcomes of interventions. The remaining two studies that used a phonological awareness only criteria also implemented PA interventions; however, sufficient data were unavailable for calculating effect sizes—one because the design employed three PA treatments in the absence of a comparable control group (Schneider et al., 2000) and the other because data were unavailable to compare treatment groups with the comparison groups (Hohn & Ehri, 1983). Authors of both studies reported significant gains for students in treatment groups ($p<.01$; Hohn & Ehri, 1983; Schneider et al., 2000).

Low SES and Low Phonological Awareness

Five studies included both low SES and phonological awareness skills as the selection criteria (Castle et al., 1994, Experiment 2; Gross & Garnett, 1994; Hoffman & Norris, 1994; Morrow, O'Connor, & Smith, 1990; Torgesen & Davis, 1996). All of these studies employed a treatment/comparison design. One of these studies resulted in negative (-.75) and small (.33) effect sizes for two treatments (Castle et al., 1994, Experiment 2); and two resulted in moderate (.52) to large (1.14) effect sizes (Morrow et al., 1990; Torgesen & Davis, 1996). The data for the remaining two studies were insufficient for calculating effects (Gross & Garnett, 1994; Hoffman & Norris, 1994); however, the authors reported positive outcomes for the treatment groups (nonsignificant, [NS]).

Students with Disabilities

The effects of interventions for kindergarten students with disabilities were the focus in six studies (Falk & Wehby, 2001; Fuchs et al., 2002; O'Connor & Jenkins, 1995; O'Connor et al., 1995; O'Connor et al., 1996; Warrick et al., 1993). The disabilities of students included language delays, mild mental retardation, developmental delays, emotional and behavior disorders, and attention deficit/hyperactivity disorders. The effects for interventions implemented for students with disabilities ranged from small (.26 for one of two interventions; Fuchs et al., 2002) to high (.84 to 1.62; O'Connor & Jenkins, 1995; O'Connor et al., 1995; O'Connor et al., 1996; Warrick et al., 1993) with one very large estimated effect size of 6.34 for a pre/post comparison (O'Connor et al., 1996).

In one study, 19 teachers, who taught at least one student with disabilities, were randomly assigned to one of two treatments (PA-based interventions) or a no-treatment control group. Twenty-five students with "special needs" were identified among the teacher participants' mainstream kindergarten classrooms (Fuchs et al., 2002). The resulting mean effect sizes were .26 for a PA program combined with *PALS* (*Peer Assisted Learning Strategies*, a peer tutoring model) and -.42 for implementation of PA activities without the peer tutor feature when compared with students in the control classrooms.

Four studies, all of which employed a treatment/comparison group design and implemented PA-based interventions, demonstrated large effect sizes, ranging from .84 to 1.62, for students with disabilities (O'Connor & Jenkins, 1995; O'Connor et al., 1995; O'Connor et al., 1996; Warrick et al., 1993). One of these studies reported on effects for students with disabilities in three different classroom types: (a) small effects (.11) for students with disabilities who were integrated into general kindergarten classes, (b) large effects (1.55) for students in transition kindergarten classes, and (c) significant pre/post gains for students with disabilities in a self-contained classroom (estimated effect size = 6.34; O'Connor et al., 1996).

One of the studies for students with disabilities used a single subject design (multiple baseline across tutoring pairs) that resulted in positive reading outcomes as a result of a peer tutoring, PA-based intervention (Falk & Wehby, 2001). All of the students exhibited gains in letter and sound identification (range increases from baseline to intervention were: 5–9 to 9–17, 1–3 to 4–18, 1–5 to 7–11, 0–3 to 2–9, 1–11 to 11–12, and 0–7 to 7–14) following intervention. Blending scores also increased for most participants; however, segmenting increased for only one participant.

Other

A combination of low phonological awareness skills and low letter naming ability was used as the criteria for determining risk in one study (Torgesen et al., 1999). The effects of three PA-based interventions when compared to a no-treatment control group resulted in a mean range of .13 to .32. In two studies, low phonological awareness skills were used in combination with a "non-reader" description of at-risk status (Qi & O'Connor, 2000; Torgesen, Morgan, & Davis, 1992). One of these studies reported large effect sizes (1.88 and 2.07) for two interventions (Torgesen et al., 1992); however, the other study using the "phonological awareness + 'non-reader" criteria for which effect sizes could not be calculated reported significant pre/post gains ($p<.05$) in phonological awareness skills and letter knowledge as a result of two similar PA interventions. There were no significant differences between treatments (Qi & O'Connor, 2000).

Intervention Type

The majority of studies (n = 22) examined the effects of phonological or PA-based interventions. Within this genre of interventions, there was some variation related to the inclusion of letter name and sound instruction, the combination of analysis and synthesis (segmenting and blending), and the incorporation of other phonological awareness elements (e.g., rhyming, alliteration, deletion). Remaining studies implemented interventions that were characterized as whole language, storybook reading, a multi-component program that included both literacy and phonological awareness activities, and computer assisted instruction, which incorporated elements of PA and language skills. The majority of PA-based interventions resulted in high effect sizes, while the remaining few other intervention types resulted in small to moderate effects. The following sections provide descriptions and results of each intervention type.

Phonological Awareness

PA instruction without print. Eight studies examined the effects of PA-based instruction without print. Three resulted in large mean effect sizes (.84 to 4.27; Davidson & Jenkins, 1994; Torgesen et al., 1992; Warrick et al., 1993), two had a small mean effect size (.33 to .35; Brady et al., 1994; Castle et al., 1994, Experiment 2), and three studies did not provide sufficient data to calculate or report effect sizes (Gross & Garnett, 1994; Hohn & Ehri, 1983; Qi & O'Connor, 2000).

Of the studies for which effect sizes could not be calculated, one study reported greater reading and spelling outcomes for students who received additional alliteration and rhyme activity training in addition to instruction provided in the classroom (NS, Gross & Garnett, 1994). Another study compared effects of two related training programs on letter names, phoneme segmentation/deletion, and decoding. Students who participated in both treatment groups, letter and ear group (i.e., phonemes were marked with tokens displaying alphabet letters or phonemes marked with a picture of an ear) significantly outperformed the control group ($p<.01$; Hohn & Ehri, 1983). Qi and O'Connor (2000) compared two treatments: blending and segmenting using pictures and markers, and sound categorization in which students were taught to identify initial sounds and rhyme. While this study did not employ a control group comparison, the authors described significant pre/post improvements on phonological measures, but no significant differences between the treatment groups (Qi & O'Connor, 2000).

PA plus print. Fifteen studies described interventions integrating PA and print resulting in moderate to high effect sizes for the majority of these studies (.64 to 4.39; Bentin & Leshem, 1993; Blachman et al., 1994; Castle et al., 1994, Experiment 1; Fox & Routh, 1984; Lennon & Slesinski, 1999; O'Connor & Jenkins, 1995; O'Connor et al., 1995; O'Connor et al., 1996; Tangel & Blachman, 1992; Torgesen & Davis, 1996). One study reported small effects (.26) for an intervention that combined a PA program with *PALS* (*Peer Assisted Learning Strategies,* a peer tutoring model), while implementation of PA activities only (without the peer tutoring model) resulted in negative effects (-.42; Fuchs et al., 2002).

Effect sizes could not be calculated for the additional two studies; however, favorable findings were reported for students in the treatment groups (Hohn & Ehri, 1983; Schneider et al., 2000). In one study, students in the letter group (letter tiles) and the ear group (tiles marked with an ear) performed comparably to each other, but significantly outperformed the no training control group on trained items for segmentation (Hohn & Ehri, 1983). In another study, students, who received PA training with and without letter sound training, achieved comparable phonological awareness levels to normal achieving students (Schneider et al., 2000). In addition, all training programs were effective for at-risk students.

Two studies used a single subject design, both of which resulted in positive reading outcomes. In a study of the effectiveness of mnemonic letter flashcards, the researchers reported increases in both number of consonant sounds produced correctly (41 to 52% increase following intervention) and consonant names (27 to 36% increase) identified for all participants (Agramonte & Belfiore, 2002). In addition, Falk and Wehby (2001) reported consistent increases in letter-sound and blending scores for most participants, and an increase in segmenting scores for one participant as a result of the implementation of *Kindergarten Peer Assisted Literacy Strategies (K-PALS),* a peer tutoring program for kindergarten students that emphasizes early literacy skill instruction.

Whole Language/Literacy Experiences

Whole language. The implementation of a program based on a whole language approach was compared to a curriculum that was alphabet-based (Hoffman & Norris, 1994). Twenty students, all African-American, were assigned to either the whole language or alphabet-based group (no control group provided). Effect sizes could not be calculated; however, the researchers reported that there were no significant differences in students' gains on the alphabet and conventions subtests between the alphabet-based group and the whole language group. All teachers who implemented both curricula had previously taught for at least 15 years in a traditional, alphabet-based program. The lack of fidelity of implementation checks is of concern because all teachers had previous experience using one of the treatment curricula and thus, the likelihood of contamination is high.

Storybook reading. A storybook reading program was implemented for 60 minutes a day for students in the treatment group who qualified for an extended day kindergarten program based on low scores on a district-wide screening test and low SES (Morrow et al., 1990). Both treatment and control groups attended the regular half-day program that implemented a traditional reading readiness program. The storybook program (added in the extended day program) incorporated several components including strategy instruction for teachers to maximize the benefits of storybook reading, but did not include explicit instruction on phonological awareness or letter naming skills. When compared to the control group that received some alphabet instruction and storybook reading (without strategy instruction) the mean effect size on literacy outcomes was .52 with the strongest effects on a retelling test (1.42) and a recall comprehension test (1.03).

Multi-component program. A multi-component literacy program that included eight separate elements of literacy instruction, including phonological awareness, was implemented in four classes from low SES schools (Saint-Laurent &

Giasson, 2001). In two of the classes, an additional phonological awareness component was delivered twice a week. The multi-component literacy program with the additional phonological awareness instruction resulted in a mean effect size of .27, whereas the basic literacy program resulted in a mean effect size of .16.

Computer Assisted Instruction

Only one study described a computer assisted instruction (CAI) intervention for kindergarten at-risk students (Hecht & Close, 2002). The CAI program was implemented for students from low SES backgrounds. The mean effect size was .61 with effects on phonological awareness, literacy concepts, letter names, sounds, word reading, and spelling ranging from -.10 to 1.19. The program emphasized phonological awareness skills, letter knowledge, print concepts, and oral language skills and was implemented daily as part of the typical classroom practices.

Other

One study that compared two interventions with a control group implemented a semantic categorization strategy (focus on word meanings and semantic cues) without phonological awareness instruction (Castle et al., 1994, Experiment 2). The mean effect size for the semantic categorization strategy calculated across four measures of phonological awareness, letter recognition, and word reading was -.75. The treatment for the other group (described in the phonological awareness section) resulted in a small mean effect size of .33 and did include explicit PA-based instruction.

Grouping for Intervention

Authors of all studies in this synthesis provided descriptions of the grouping format utilized for interventions. Three formats were used: (a) individually, (b) small groups, and (c) whole class.

Individual

Five studies reported using an individually administered intervention (Agramonte & Belfiore, 2002; Hecht & Close, 2002; Hohn & Ehri, 1983; O'Connor & Jenkins, 1995; Torgesen et al., 1999). One of these interventions used a computer program in which students worked individually with the program, monitored by the teacher (Hecht & Close, 2002), whereas students in the remaining studies were taught in a 1:1 session. The mean effect size of the CAI intervention was moderate, .61. The mean effect sizes for two of the studies in which interventions were individually administered were small (.13, .31, .32; Torgesen et al., 1999) and high (1.07; O'Connor & Jenkins, 1995). Effect sizes could not be calculated for the remaining individual intervention (Hohn & Ehri, 1983); however, the results indicated that students in both intervention groups significantly outperformed the control group and the use of letters or ear symbols on tiles facilitated phoneme segmentation for students. One of the individual interventions was implemented in a single subject design and resulted in positive outcomes as students increased knowledge of letter names and sounds (Agramonte & Belfiore, 2002).

Small Group

Interventions were implemented in small group sessions in 16 studies. Studies, for which the number of student participants was specified, reported a range of two to seven students, with most reporting a group size of three to five. Among the studies that utilized small group sessions, 11 resulted in mean effect sizes in the moderate to high range (.64 to 4.39; Bentin & Leshem, 1993; Blachman et al., 1994; Castle et al., 1994, Experiment 1; Davidson & Jenkins, 1994; Fox & Routh, 1984; Lennon & Slesinski, 1999; O'Connor et al., 1995; Tangel & Blachman, 1992; Torgesen & Davis, 1996; Torgesen et al., 1992; Warrick et al., 1993). Two studies, both of which examined the effects of two treatments, resulted in effect sizes that were negative (-.75; Castle et al., 1994, Experiment 2) and small (.16 and .27; Saint-Laurent & Giasson, 2001; .33; Castle et al., 1994, Experiment 2). The remaining studies did not provide sufficient information to calculate effect sizes, but reported gains on reading outcomes for students in treatment groups (Gross & Garnett, 1994; Qi & O'Connor, 2000; Schneider et al., 2000).

Whole Class

Reading interventions were implemented with the whole class in six studies (Brady et al., 1994; Falk & Wehby, 2001; Fuchs et al., 2002; Hoffman & Norris, 1994; Morrow et al., 1990; O'Connor et al., 1996). Effect sizes could not be calculated for one of the whole-class intervention studies, but the results indicated favorable outcomes for students in the alphabet-based curriculum program that were similar to gains of the whole language group on two of three measures (Hoffman & Norris, 1994). Three studies with whole-class implemented interventions, PA without print, storybook reading, and PA plus print, resulted in small (.35; Brady et al., 1994), moderate (.52; Morrow et al., 1990), and large (1.55 and 6.34 for 2 out of 3 groups) effect sizes (O'Connor et al., 1996), respectively. The remaining two studies implemented a peer-tutoring model as part of whole group instruction (Falk & Wehby, 2001; Fuchs et al., 2002). The resulting mean effect sizes for one study were small (.26; Fuchs et al., 2002) and negative (-.42). While effect sizes were not available for a single subject design study (Falk & Wehby, 2001), all students showed an increase in letter/sound identification, most increased in blending scores, and one improved in segmentation.

Person Implementing Intervention

Researcher

In 17 of the studies, researchers were responsible for implementing the intervention. In most of these studies, the researchers actually implemented the intervention (Agramonte & Belfiore, 2002; Bentin & Leshem, 1993; Castle et al., 1994, Experiment 1, Experiment 2; Davidson & Jenkins, 1994; Falk & Wehby, 2001; Fox & Routh, 1984, Hohn & Ehri, 1983; Lennon & Slesinski, 1999; O'Connor & Jenkins, 1995; Qi & O'Connor, 2000; Saint-Laurent & Giasson, 2001; Torgesen & Davis, 1996; Torgesen et al., 1999; Warrick et al., 1993), but for two, they provided training to paid tutors or teachers (O'Connor et al., 1995; Torgesen et al., 1992). Twelve of these studies resulted in mean effect sizes ranging from moderate to large (.64 to 4.39), including those in which tutors or teachers were trained by researchers. Three studies (all with multiple treatments) reported outcomes that resulted in small (.13,.16, .27, .31, .32, .33) mean effect sizes (Castle et al., 1994, Experiment 2, phonemic training group; Saint-Laurent & Giasson, 2001; Torgesen et al., 1999) and negative effect sizes (-.75, Castle et al., 1994, Experiment 2, semantic categorization group). Additional researcher-implemented studies did not provide sufficient data to calculate effect sizes (Hohn & Ehri,

1983; Qi & O'Connor, 2000); however, students made significant gains in treatment groups. The remaining studies utilized a single subject design (Agramonte & Belfiore, 2002; Falk & Wehby, 2001), in which all students improved on letter names and letter/sound identification.

Teachers and Teaching Assistants

Teachers or teaching assistants delivered interventions in ten studies; and all but one study reported that the intervention was delivered in the classroom. Of the seven studies that provided data sufficient to calculate effect sizes, five resulted in moderate to large effects ranging from .52 to 1.55 ([6.34 reported as an estimated effect size for a pre/post comparison group]; Blachman et al., 1994; Hecht & Close, 2002; Morrow et al., 1990; O'Connor et al., 1996; Tangel & Blachman, 1992). The remaining two reported small (.35) mean effect sizes (Brady et al., 1994) and negative (-.42; Fuchs et al., 2002). In addition, one of the treatment groups receiving supplemental PA-based activities (students with disabilities integrated in a typical kindergarten class) in a study by O'Connor et al. (1996) resulted in a small mean effect size (.11) when compared with students in the comparison kindergarten class. Three studies reported positive reading outcomes, but inadequate data were available to estimate effect sizes (Gross & Garnett, 1994; Hoffman & Norris, 1994; Schneider et al., 2000).

Duration/Frequency/Intensity

There is much variation among intervention studies related to variables of duration, frequency, and intensity of the intervention. Duration refers to the length of intervention, usually measured by weeks. We define frequency as the number of sessions held per week and intensity as the amount of time per session, reported in minutes. Findings related to each variable are provided.

Duration

Five studies reported duration ranging from four to eight weeks; and subsequently, four resulted in large mean effect sizes (.84 to 2.07; Fox & Routh, 1984; O'Connor & Jenkins, 1995; Torgesen et al., 1992; Warrick et al., 1993). A single subject study reported implementation of the intervention in 7-18 daily sessions, which resulted in duration less than 6 weeks (Agramonte & Belfiore, 2002). The outcomes for this study were favorable in that all students increased their knowledge of letter names and sounds from baseline to the end of the intervention phase.

Among the five studies that reported a 10-week intervention, four resulted in high mean effect sizes ranging from .93 to 4.39 (Bentin & Leshem, 1993; Castle et al., 1994, Experiment 1; Lennon & Slesinski, 1999; O'Connor et al., 1995) with one treatment effect in the moderate range, .68 (Lennon & Slesinski, 1999). For a reported duration of 11 to 15 weeks, four of six resulted in mean effect sizes in the moderate to high range (.76 to 4.27; Blachman et al., 1994; Davidson & Jenkins, 1994; Tangel & Blachman, 1992; Torgesen & Davis, 1996). One other study resulted in a small and negative mean effect size for two interventions (Castle et al., 1994, Experiment 2). The final one in this range was a single subject design study reporting a duration period of 11 weeks, in which all students increased their ability to identify letters and sounds and most in their ability to blend phonemes.

The remaining studies reported a duration exceeding 17 weeks. The results indicated mean effect sizes within the negative or small ranges for five out of nine of the studies (Brady et al., 1994; Fuchs et al., 2002; O'Connor et al., 1996; Saint-Laurent & Giasson, 2001; Torgesen et al., 1999). Two studies provided insufficient data to estimate mean effect sizes (Hoffman & Norris, 1994; Schneider et al., 2000). Nevertheless, gains were reported for students in all intervention groups. The remaining two studies, CAI intervention, and storybook reading, resulted in moderate mean effect sizes, .61 (Hecht & Close, 2002) and .52 (Morrow et al., 1990), respectively.

Frequency

Only one study reported an intervention frequency of one time per week that resulted in small and negative mean effect sizes (.33, -.75; Castle et al., 1994, Experiment 2). Eleven studies indicated that the intervention was delivered two or three times per week, five of which resulted in large mean effect sizes ranging from .84 to 4.39 (Bentin & Leshem, 1993; Castle et al., 1994, Experiment 1; O'Connor et al., 1995; Torgesen et al., 1992; Warrick et al., 1993). Three studies in the 2-3 times per week range resulted in small (.16, .27, .26, .35) mean effect sizes (Brady et al., 1994; Fuchs et al., 2002; Saint-Laurent & Giasson, 2001) to negative (-.42; Fuchs et al., 2002). The residual studies used a single subject design (Falk & Wehby, 2001) or did not provide sufficient data for calculating effect sizes (Gross & Garnett, 1994; Qi & O'Connor, 2000). However, all of these studies reported gains for students in interventions.

Four of five studies that specified a frequency of four times per week resulted in mean effect sizes ranging from the moderate (Blachman et al., 1994; Fox & Routh, 1984; Tangel & Blachman, 1992) to large (Fox & Routh, 1984; Torgesen & Davis, 1996) range. The additional study resulted in small mean effect sizes for all three treatment groups (.13, .31, .32; Torgesen et al., 1999).

The remainder of the investigations implemented the interventions on a daily basis (n = 10). The results of six of these indicated mean effect sizes in the moderate (Hecht & Close, 2002; Lennon & Slesinski, 1999; Morrow et al., 1990) to large (Davidson & Jenkins, 1994; O'Connor & Jenkins, 1995; O'Connor et al., 1996) ranges. Lennon and Slesinski (1999) implemented an intervention that resulted in a moderate mean effect of .68 for students with low letter naming scores and a large mean effect size of .93 for students with mid letter naming scores (same intervention program). Data were unavailable to calculate effect sizes for three remaining studies that delivered a daily intervention; however, gains were realized for students in treatment groups (Hoffman & Norris, 1994; Hohn & Ehri, 1983; Schneider et al., 2000). One single subject study that implemented intervention daily resulted in student increases on letter names and sounds (Agramonte & Belfiore, 2002).

Intensity

Three out of five interventions that were implemented for less than 15 minutes per session resulted in large effect sizes ranging from 1.07 to 1.55 ([6.34 for estimated effect size of a pre/post comparison]; Davidson & Jenkins, 1994; O'Connor & Jenkins, 1995; O'Connor et al., 1996). All three implemented interventions daily. The majority of studies implemented interventions lasting from 15 to 29 minutes (n = 17). Nine of

these resulted in mean effect sizes in the moderate to large range (.61 to 2.39; Blachman et al., 1994; Castle et al., 1994, Experiment 1; Fox & Routh, 1984; Hecht & Close, 2002; O'Connor et al., 1995; Tangel & Blachman, 1992; Torgesen & Davis, 1996; Torgesen et al., 1992; Warrick et al., 1993). Four of these studies resulted in effect sizes in the small range (.26, Fuchs et al., 2002; .16, .27, Saint-Laurent & Giasson, 2001; .33, Castle et al., 1994, Experiment 2; .35, Brady et al., 1994). Two studies in this range resulted in mean negative effects in the negative (-.75; Castle et al., 1994, Experiment 2; -.42; Fuchs et al., 2002). Two studies reported intensity within this range, but effect sizes could not be calculated (Hohn & Ehri, 1983; Qi & O'Connor, 2000; 20 minutes and 20-30 minutes, respectively).

Only three studies reported intervention intensity of 30 minutes or more. Two studies resulted in mean effect sizes in the moderate range, .68 and .52 (Lennon & Slesinski, 1999, [students in the low-letter naming score group]; Morrow et al., 1990, respectively). The other study resulted in a large mean effect size (4.39) for students in the phoneme segmentation group compared to a no training control group (Bentin & Leshem, 1993). Another large mean effect size resulted from an intervention for students in the mid-letter naming score group (.93; Lennon & Slesinski, 1999).

Fidelity of Implementation

Eleven of the 27 studies included in this synthesis addressed fidelity of implementation (40%) and even fewer provided sufficient detail to determine the extent to which the interventions were implemented with fidelity. Most of the studies that supplied information on fidelity of implementation reported the frequency and type of intervention monitoring conducted by researchers (e.g., weekly observations, biweekly videotaping and subsequent discussions), but lacked information on the accuracy of implementation (Hoffman & Norris, 1994; Lennon & Slesinski, 1999; Morrow et al., 1990; O'Connor et al., 1996; Qi & O'Connor, 2000; Saint-Laurent & Giasson, 2001; Torgesen et al., 1999). Four studies presented accuracy of implementation procedures within the descriptions of treatment integrity (Agramonte & Belfiore, 2002; Falk & Wehby, 2001; Fuchs et al., 2002; O'Connor et al., 1995).

Discussion

The purpose of this article was to synthesize findings from intervention studies that examined the effects of school-based reading interventions for kindergarten students at-risk for reading failure. The evidence to support the implementation of reading interventions for these students, based almost exclusively on treatment/comparison design studies, is strong. The consistent findings from this synthesis suggest that interventions have a positive impact on reading outcomes for at-risk kindergarteners regardless of how students were identified as at-risk for reading problems. The majority of the studies resulted in positive outcomes with most effect sizes in the moderate to high range. Only a few studies resulted in negligible outcomes. The potential for realizing student gains appears to be worth the effort of implementing school-based reading interventions during the kindergarten year to support students, who exhibit at-risk characteristics such as low SES, low phonological awareness, low SES *and* low phonological awareness, or disabilities.

In response to our first research question, we would describe interventions for kindergarten students at-risk for reading difficulties by summarizing features, which resulted in the greatest effect sizes. The features, which were present in studies that resulted in the most consistent moderate to high effect sizes, included: (a) PA instruction with or without print, (b) small group instructional format, (c) frequency of two to three times per week or daily intervention, (d) intensity between 15 and 30 minutes, (e) duration of eight to ten weeks, and (f) researcher-implemented or researcher-trained instructors. While the features vary among studies, a review of features reveals an emerging pattern of effective interventions, consistent with earlier recommendations for effective reading instruction (Adams, 1990; Chard et al., 1998; NRP, 2000). The results of this synthesis suggest emphatically that reading interventions are effective for impacting the reading growth of students at-risk for reading difficulties—the answer to our second research question.

The converging evidence illustrates a sharp contrast to the "wait and see what happens" approach to determining when to provide instructional support for young children at-risk for reading problems. During an era when education is crippled by swinging pendulums regarding the philosophies related to reading instruction, curriculum, identification of students at-risk for reading failure, and supplemental instruction during kindergarten, this is an important finding. The accumulation of an empirical body of literature that supports the effectiveness of reading interventions, coupled with the predictions for students who experience reading difficulties or failure by the end of first grade (Juel et al., 1988), suggests a prevention approach as early as kindergarten may be a valuable practice for reducing reading failure. Of importance is determining the linkages between these early reading intervention programs and later reduction in risk for reading problems. Continued investigation of both short and long-term effects of early reading interventions is necessary to determine these linkages.

We are particularly interested in the findings from kindergarten interventions for youngsters with disabilities. The significant gains made by many of the students with disabilities in the kindergarten intervention programs illustrate the value of providing support for these students early—particularly related to the academic skills for which they are most interested in accessing. If students with disabilities are truly going to be included in classrooms and instruction, providing them with the supports that they need early to ensure academic success is necessary. Without data documenting the benefits of early interventions for kindergarten students with disabilities, it would be possible to argue that these students should be either not included in early academic programs or not included in supplemental programs. All of the interventions for students with disabilities were implemented daily or two to three times per week for a duration of 30 minutes or less with a mixed variation of grouping formats and persons implementing intervention. Even with this range of variation in intensity and instructional personnel, positive outcomes or high effect sizes resulted in five of six studies (Falk & Wehby, 2001; O'Connor & Jenkins, 1995; O'Connor et al., 1995; O'Connor et al., 1996; Warrick et al., 1993). Again, the value of providing early support for young students with disabilities, who are at-risk for academic difficulty, is paramount and justified.

Methodological Issues

There are a few limitations of this synthesis. First, the amount of detail provided in many of these studies prevented us from paying attention to additional variables of interest. The ability to determine the extent to which interventions were provided as supplements to core instruction was not possible. Very few studies explicitly described interventions as supplemental (i.e., added as additional instruction or replaced part of the core instruction time). Second, most of the studies in our synthesis provided very little, if any, description of core instruction that students received in their classrooms. Without this knowledge, we need to take caution when interpreting results because we are unaware of the quality and depth of instruction students may have received; and therefore may not be able to determine the extent to which students are at-risk based on factors other than our assessments. Further, without details on fidelity of program implementation, we are also unable to draw conclusions about how intervention effects may be affected by variations in implementation.

Implications for Future Research

Although the research base to support the implementation of reading interventions for kindergarten students is strong, the need to further investigate the variables that produce the strongest outcomes remains. The studies in this synthesis represent a mixture of variables related to program type, group size, intensity, duration, frequency, instructor, and measures; nevertheless, the majority of studies resulted in positive outcomes. The obvious "next steps" for the research agenda are to determine which variables are the most critical and how schools can achieve similar outcomes with fewer resources than were previously available, particularly for teacher or classroom implementation. Although the number of studies in which the teacher or assistant implemented the intervention was fewer than researcher-implemented studies, the results were promising. The majority of these studies yielded moderate to high effect sizes. Among the studies that specified location of intervention, only a few reported that the researcher implemented the intervention in the classroom. Perhaps, this is an area in need of further investigation to assist with teacher and material preparation to assist in classroom implementations. To move our knowledge base into the classroom, consideration must be given to research that will continue to validate implementation of interventions under "classroom" conditions.

In addition, our efforts need to continue to focus on strengthening the quality of core reading instruction and maximizing teaching opportunities for effective instruction within the classroom in order to further prevent the need for more intense or supplemental interventions. For example, increasing instructional time devoted to the critical components of effective reading instruction for kindergarten students such as phonemic awareness and letter/sound correspondence and investigating the outcomes would be worthwhile research and practical endeavors. Further, research efforts aimed at describing the implementation of the critical components using core curricula would assist in establishing a common instructional base for all students prior to determining the need for supplemental interventions. Through the process of examining and strengthening core reading instruction, resources needed for supplemental reading interventions may decrease as a result of fewer students requiring additional instruction.

Summary

During a time when school budgets are often compromised and decreased, the need to examine the use of school resources for providing accelerated interventions is warranted. The feasibility of implementing reading interventions for young students at-risk for reading difficulties is always challenging, but this synthesis suggests that it is quite worthwhile. The evidence presented in this synthesis validates empirically the effectiveness of interventions for improving reading outcomes for at-risk students during kindergarten.

Through the combined efforts of teachers, administrators, and support personnel, students at-risk for reading difficulties and those with identified disabilities will likely benefit from intervention; and therefore, fewer students may need to "catch up" to the reading levels of their peers. This synthesis reveals that there is an empirical base to support the role of reading interventions for kindergarten students with disabilities and at-risk for reading difficulties. Our challenge is to increase implementation of research-based reading instruction in kindergarten to circumvent an increasing number of students with reading difficulties and demonstrate the commitment to benefit all students at-risk for reading difficulties, including those with disabilities.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge, MA: MIT Press.

Agramonte, V., & Belfiore, P. J. (2002). Using mnemonics to increase early literacy skills in urban kindergarten students. *Journal of Behavioral Education, 11,* 181–190.

Allington, R. L., & McGill-Frazen, A. (1994). *Reading and the mildly handicapped.* International Encyclopedia of Education, Oxford, UK: Pergamon.

Al Otaiba, S., & Fuchs, D. (2002). Characteristics of children who are unresponsive to early literacy intervention: A review of the literature. *Remedial and Special Education, 32,* 300–316.

Bentin, S., & Leshem, H. (1993). On the interaction between phonological awareness and reading acquisition: It's a two-way street. *Annals of Dyslexia, 43,* 125–148.

Blachman, B. A., Ball, E. W., Black, R. S., & Tangel, D. M. (1994). Kindergarten teachers develop phoneme awareness in low-income, inner-city classrooms: Does it make a difference? *Reading and Writing: An Interdisciplinary Journal, 6,* 1–18.

Blachman, B., & James, S. (1985). Metalinguistic abilities and reading achievement in first-grade children. In J. Niles & R. Lalik (Eds.), *Issues in literacy: A research perspective. Thirty-fourth yearbook of the national reading conference* (pp. 280–286). Rochester, NY: National Reading Conference.

Bowey, J. A. (1995). Socioeconomic status differences in preschool phonological sensitivity and first-grade reading achievement. *Journal of Educational Psychology, 87,* 476–487.

Bradley, L., & Bryant, P. E. (1983). Categorizing sounds and learning to read: A causal connection. *Nature, 301*(5899), 419–421.

Brady, S., Fowler, A., Stone, B., & Winbury, N. (1994). Training phonological awareness: A study with inner-city kindergarten children. *Annals of Dyslexia, 44,* 26–59.

Bruck, M. (1992). Persistence of dyslexics' phonological deficits. *Developmental Psychology. 28,* 874–886.

Bryant, F. B., & Wortman, P. M. (1984). Methodological issues in the meta-analysis of quasi-experiments. *New directions for program evaluation,* 24, 5–24.

Calfee, R. C., Lindamood, P., & Lindamood, C. (1973). Acoustic-phonetic skill and reading: Kindergarten through twelfth grade. *Journal of Educational Psychology, 64*, 293–298.

Castle, J. M., Riach, J., & Nicholson, T. (1994). Getting off to a better start in reading and spelling: The effects of phonemic awareness instruction within a whole language program. *Journal of Educational Psychology, 86,* 350–359.

Chard, D. J., Simmons, D. C., & Kame'enui, E. J. (1998). Word Recognition: Research Bases. In D. C. Simmons & E. J. Kame'enui (eds.), *What reading research tells us about children with diverse learning needs: Bases and basics* (pp. 141–168). Mahwah, NJ: Erlbaum.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ: Erlbaum.

Davidson, M., & Jenkins, J. R. (1994). Effects of phonemic processes on word reading and spelling. *Journal of Educational Research, 87,*148–157.

Education Commission of the States. State statutes regarding kindergarten. (August 2001). Retrieved November 18, 2003, from http://www.edc.org/clearinghouse/29/21/2921.htm.

Ehri, L. C., Nunes, S. R., Willows, D. M., Schuster, B. V., Yaghoub-Zadeh, Z., & Shanahan, T. (2001). Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's meta-analysis. *Reading Research Quarterly, 36*, 250–287.

Falk, K. B., & Wehby, J. H. (2001). The effects of peer-assisted learning strategies on the beginning reading skills of young children with emotional or behavioral disorders. *Behavioral Disorders, 26,* 344–359.

Fawcett, A., & Nicolson, R. (1995). Persistence of phonological awareness deficits in older children with dyslexia. *Reading and Writing: An Interdisciplinary Journal, 7*, 361–376.

Foorman, B. R., Francis, D. J., Fletcher, J. M., & Lynn, A. (1996). Relation of phonological and orthographic processing to early reading: Comparing two approaches to regression-based, reading-level-match designs. *Journal of Educational Psychology, 88*, 639–652.

Fox, B., & Routh, D. K. (1980). Phonemic analysis and severe reading disability in children. *Journal of Psycholinguistic Research, 9*, 115–119.

Fox, B., & Routh, D. K. (1984). Phonemic analysis and synthesis as word attack skills: Revisited. *Journal of Educational Psychology, 76,* 1059–1064.

Fuchs, D., Fuchs, L. S., Thompson, A., Al Otaiba, S., Yen, L., Yang, N. J., Braun, M., & O'Connor, R. E. (2002). Exploring the importance of reading programs for kindergartners with disabilities in mainstream classrooms. *Exceptional Children, 68,* 295–311.

Good, R. H., Simmons, D. C., & Smith, S. B. (1998). Effective academic interventions in the United States: evaluating and enhancing the acquisition of early reading skills. *Educational and Child Psychology, 15*, 56–70

Gross, J., & Garnett, J. (1994). Preventing reading difficulties: Rhyme and alliteration in the real world. *Educational Psychology in Practice, 9,* 235–240.

Grossen, B. (1997). 3*0 years of research: What we now know about how children learn to read*? Santa Cruz, CA: Center for the Future of Teaching and Learning.

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (1998). *Does special education raise academic achievement for students with disabilities?* National Bureau of Economic Research, Working Paper No. 6690, Cambridge, MA.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore: Paul H. Brookes.

Hecht, S. A., Burgess, S. R., Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (2000). Explaining social class differences in growth of reading skills from beginning kindergarten through fourth grade: The role of phonological awareness, rate of access, and print knowledge. *Reading and Writing: An interdisciplinary Journal, 12*(1–2), 99–128.

Hecht, S. A., & Close, L. (2002). Emergent literacy skills and training time uniquely predict variability in responses to phonemic awareness training in disadvantaged kindergartners. *Journal of Experimental Child Psychology, 82,* 93–115.

Hecht S. A., & Greenfield, D. B. (2001). Comparing the predictive validity of first grade teacher ratings and reading-related tests on third grade levels of reading skills in young children exposed to poverty, *School Psychology Review, 30*, 50–59.

Hoffman, P. R., & Norris, J. A. (1994). Whole language and collaboration work: Evidence from at-risk kindergartners. *Journal of Childhood Communication Disorders, 16,* 41–48.

Hohn, W. E., & Ehri, L. C. (1983). Do alphabet letters help prereaders acquire phonemic segmentation skill? *Journal of Education Psychology, 75,* 752-762.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grade, *Journal of Educational Psychology, 80,* 437–447.

Lennon, J. E., & Slesinski, C. (1999). Early intervention in reading: Results of a screening and intervention program for kindergarten students. *School Psychology Review, 28,* 353–364.

Moody, S. W., Vaughn, S., Hughes, M. T., & Fischer, M. (2000). Reading instruction in the resource room: Set up for failure. *Exceptional Children, 66*, 305–316.

Morrow, L. M., O'Connor, E. M., & Smith, J. K. (1990). Effects of a story reading program on the literacy development of at-risk kindergarten children. *Journal of Reading Behavior, XXII,* 255–275.

National Reading Panel (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups.* Bethesda, MD: National Institute of Child Health and Human Development.

Nicholson, T. (1997). Closing the gap on reading failure: social background, phonemic awareness, and learning to read. In B. A. Blachman (Ed.), *Foundations of reading acquisition and dyslexia: Implications for early intervention* (pp. 381–407). Mahwah, NJ: Erlbaum.

O'Connor, R. (2000). Increasing the intensity of intervention in kindergarten and first grade. *Learning Disabilities Research & Practice, 15,* 43–54.

O'Connor, R. E., & Jenkins, J. R. (1995). Improving the generalization of sound/symbol knowledge: Teaching spelling to kindergarten children with disabilities. *Journal of Special Education, 29,* 255–275.

O'Connor, R. E., Jenkins, J. R., & Slocum, T. A. (1995). Transfer among phonological tasks in kindergarten: Essential instructional content. *Journal of Educational Psychology, 87,* 202–217.

O'Connor, R. E., Notari-Syverson, A., & Vadasy, P. F. (1996). Ladders to Literacy: The effects of teacher-led phonological activities for kindergarten children with and without disabilities. *Exceptional Children, 63,* 117–130.

Qi, S., & O'Connor, R. (2000). Comparison of phonological training procedures in kindergarten classrooms. *Journal of Educational Research, 93,* 226–233.

Raz, I. S., & Bryant P. (1990). Social background, phonological awareness and children's reading. *British Journal of Developmental Psychology, 8,* 209–225.

Rosenthal, R. (1991). *Meta-analytic procedures for social research.* Thousand Oaks, CA: Sage.

Rosenthal, T., & Rosnow, R.L. (1984). *Essentials of behavioral research: Methods and data analysis.* New York: McGraw-Hill.

Saint-Laurent, L., & Giasson, J. (2001). Effects of a multicomponent literacy program and of supplemental phonological sessions on at-risk kindergartners. *Educational Research and Evaluation, 7,* 1–33.

Schneider, W., Roth, E., Ennemoser, M. (2000). Training phonological skills and letter knowledge in children at-risk for dyslexia: A comparison of three kindergarten intervention programs. *Journal of Educational Psychology, 92,* 284–295.

Share, D. L., & Stanovich, K. E. (1995). Cognitive process in early reading development: A model of acquisition and individual differences. *Issues in Education: Contributions from Educational Psychology, 1*, 1–57.

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

Smith, S. B., Simmons, D. C., & Kame'enui, E. J. (1998b). Phonological awareness: Instructional and curricular basics and implications. In D. C. Simmons and E. J. Kame'enui (Eds.), *What reading research tells us about children with diverse learning needs* (pp. 129–140). Mahwah, NJ: Erlbaum.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academic Press.

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.

Stanovich, K. E. & Siegel, L. S. (1994). The phenotypic performance profile of reading disabled children: A regression-based test of the phonological core variable-difference model. *Journal of Educational Psychology, 86*, 24–53.

Tangel, D. M., & Blachman, B. A. (1992). Effect of phoneme awareness instruction on kindergarten children's invented spelling. *Journal of Reading Behavior, XXIV,* 233–261.

Torgesen, J. K. (1996). A model of memory from an information processing perspective: The special case of phonological memory. In G. Reid Lyon (Ed.), *Attention, memory, and executive functions: Issues in conceptualization and measurement* (pp. 157–184). Baltimore: Brookes.

Torgesen, J. K. (1997). The prevention and remediation of reading disabilities: Evaluating what we know from research. *Journal of Academic Language Therapy, 1*, 11–47.

Torgesen, J. K., Alexander, A. W., Wagner, R. K., Rashotte, C. A., Voeller, K. S., & Conway, T. (2001). Intensive remedial instruction for children with severe reading disabilities: Immediate and Long-term outcomes from two instructional approaches. *Journal of Learning Disabilities, 34,* 33–58, 78.

Torgesen, J. K., & Davis, C. (1996). Individual difference variables that predict response to training in phonological awareness. *Journal of Experimental Child Psychology, 63,* 1–21.

Torgesen, J. K., & Hecht, S. A. (1996). Preventing and remediating reading disabilities: Instructional variables that make a difference for special students. In M. F. Graves, P. van den Broek, & B. M. Taylor (Eds.), *The first R: Every child's right to read* (pp. 133–159). New York: Teachers College Press.

Torgesen, J. K., Morgan, S. T., & Davis, C. (1992). Effects of two types of phonological awareness training on word learning in kindergarten children. *Journal of Educational Psychology, 84,* 364–370.

Torgesen, J. K., Wagner, R. K., Rashotte, C. A., Rose, E., Lindamood, P., Conway, T., & Garvan, C. (1999). Preventing reading failure in young children with phonological processing disabilities: Group and individual responses to instruction. *Journal of Educational Psychology, 91,* 579–593.

Troia, G. A. (1999). Phonological awareness intervention research: A critical review of the experimental methodology. *Reading Research Quarterly, 34,* 28–52.

U.S. Department of Education, Office of Elementary and Secondary Education (2002). *No Child Left Behind.* Washington, D.C.

Vaughn, S., Moody, S., & Schumm, J. S. (1998). Broken promises: Reading instruction in the resource room. *Exceptional Children, 64,* 211–226.

Wagner, R., 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.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., Hecht, S. A., Barker, T. A., Burgess, S. R., Donahue, J., & Garon, T. (1997). Changing causal relations between phonological processing abilities and word-level reading as children develop from beginning to fluent readers: A five-year longitudinal study. *Developmental Psychology, 33*, 468–479.

Warrick, N., Rubin, H., & Rowe-Walsh, S. (1993). Phoneme awareness in language-delayed children: Comparative studies and intervention. *Annals of Dyslexia, 43,* 153–173.

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TABLE 1. DESCRIPTION OF STUDIES

Study/Participants/Criteria	Intervention	Delivery	Measures	Results
1. *Agramonte & Belfiore (2002)* SS, MB 3 students Low LN's, LS's	Mnemonic consonant flashcards (T)	7–18 daily sessions, 1:1 with researcher in area of classroom	Upper case letters presented on flashcards one at a time	All students improved LN's LS's
2. *Bentin & Leshem (1993)* T/C 91 students Low PA	Phoneme Segmentation (T1) Phon. Seg. + Letter Shapes (T2) General Language, no PA (C1) No specific training, equal time in small groups, normal K curriculum (C2)	30 min, 2x/week, 10 weeks, groups of 2–4 with researcher.	1 & 2 syllable words and non-words, researcher developed	Mean ES * T1>C1 = 4.22 T1>C2= 4.39 T2>C1 = 2.1 T2>C2 = 2.2
3. *Blachman, Ball, Black, & Tangel (1994)* T/C 159 students Low SES, non-readers	PA training program with print (T) Traditional K curriculum with whole class letter and sound instruction (C)	15–20 min., 4x/wk, 11 weeks, 4–5:1 Teacher, assistant, classroom	Phoneme segm. Letter name, sounds WRMT-R, WID PR real and non words, DST	Mean ES =.76
4. *Brady, Fowler, Stone, & Winbury (1994)* T/C 42 students Low SES	***3*** Intervention, PA without print (T) Regular K curriculum with whole language philosophy (C)	20 min., 3x/week, 18 weeks, whole class, teacher, classroom	WRMT-LID, WRMT-WID, AT WRAT-R, Spelling, Rhyme generation Phoneme Seg/Del. Phon.Processing	Mean ES =.35
5. *Castle, Riach, & Nicholson (1994), Experiment 1* T/C 30 students Low PA	PA Training with print (T) Process writing (C)	20 min., 2x/wk,10 weeks, 5:1, researcher	*Roper's, PA,* EST WRAT, Spelling Dictation Test Word Writing Letter ID Test	Mean ES = 2.39
6. *Castle, Riach, & Nicholson (1994), Experiment 2* T/C 51 students (47 in analysis) Low SES and Low PA	Phonemic Training, no print (T1) Semantic categorization, no PA, L names not sounds (T2) No training (C)	20 min., 1x/wk, 15 weeks, 3–4, researcher	*Roper's PA Test* Letter recognition *Burt Word Reading* *Clay Word Reading* Dictation, CAP,	Mean ES * T1>C = .33 T2>C = -.75 * calculation based on 1st 4

Table 1. Description of Studies continued

			Book Level, Word Writing, Bryant.	measures only
7. *Davidson & Jenkins (1994)* T/C 18 students Low PA	Segmentation (S) (T1) Blending (B) (T2) B & S (T3) Small group storytime, no PA training (C)	10 min., daily, 8–12 weeks, 4:1, researchers	Blending, Segmentation Word Reading 1, 2 Spelling	Mean ES T1>C = 4.27 T2>C = 1.6 T3>C = 2.31
8. *Falk & Wehby (2001)* Single subject 6 student pairs Disabilities (S/LI, ED, ADHD)	K-Pals: teacher-directed then sound play & decoding in pairs.	10–25 min., 3x/wk, 11 weeks, whole class, researcher, classroom	Letter naming Letter sounds Segmentation Blending	All increased in LS id, most in blending, 1 increased in segmentation
9. *Fox & Routh (1984)* T/C 31 students Low PA	Segmenting & Blending (T1) Segmenting only (T2) No training control (C)	15 min., 4–5x/wk, 5 weeks, 5–6:1, researcher	*Fox-Routh Phoneme Segmentation Test* *Roswell Chall Blending Test*	Mean ES T1>C = 1.28 T2>C = .64
10. *Fuchs, Fuchs, Thompson, Al Otaiba, Yen, Yang, & Braun (2002)* T/C 25 students, 19 teachers	PA + PALS, Double PA (T1) PA Program, Ladders-to-Literacy (T2) Reading/language arts without PA (C) Disabilities	5–15 or 20 min., 3x/wk, 16 or20 weeks, pairs/whole class, teachers, classroom	Rapid L Names Rapid L Sounds Segmentation WRMT-WA, ID Blending, timed, untimed WIAT, DST, WIAT, Spelling	Mean ES T1>C = .26 T2<C = -.42
11. *Gross & Garnett (1994)* T/C 12 students Low SES, Low PA	PA Training, Rhyme and alliteration (T) Classroom rhyme and alliteration (C)	3–5x/wk, 1:1 or small group, assistants	*Vernon Spelling* Invented Spelling *Carver Word Recognition*	T>C on all measures, ns
12. *Hecht & Close (2002)* T/C 42 students Low SES, no prior exposure to program	*Waterford Early Reading Program* (WERP, a CAI program for PA, oral language, letters, and print concepts) (T) Teacher-led literacy instruction, no special intervention (C)	15 min, daily, 24 weeks, individually, teacher, classroom	Segm. & Blending Word Reading Invented Spelling Letter names/sounds Letter Writing Vocab. Knowledge CAP *	Mean ES = .61
13. *Hoffman & Norris (1994)* T/C 20 students Low SES, Low oral and written language scores	Whole language curriculum (T1) Alphabet-Based curriculum (T2)	Daily, 28 weeks, whole class, teacher, classroom	TERA Meaning Alphabet Conventions	 T1>T2, p<.025 T1=T2, ns T1=T2, ns
14. *Hohn & Ehri (1983)* T/C 24 students Low PA, non-reading of real or nonsense words	Letter Group (phoneme segmentation using letter tiles) (T1) Ear Group (tiles marked with an ear) (T2) No phonemic segmentation training (C)	20 min, daily, 1:1, researcher	Phoneme seg, training and transfer, Deletion, Decoding test, Decoding training on CV/VC & CVC	Mean ES T2 > C, *p*<.01 T1 = T2, ns
15. *Lennon & Slesinski (1999)* T/C 133 students Low to mid letter naming scores	Interactive strategies approach, including PA Training Program (T1, low; T2 , mid) Wait group controls (C1, low; C2, mid)	30 min, daily, 10 weeks, 2:1, researcher, part of classroom	Letter names, sounds Decoding, Phoneme Seg. Sight Words CAP	Mean ES T1 >C1 = .68 T2 >C2 = .93
16. *Morrow, O'Connor, & Smith (1990)* T/C 62 students Low SES, low screening scores, extended day program entry.	Storybook reading program (T) Reading readiness program (C)	60 min., daily, 7 months, whole class, teacher, classroom	*Retelling Test* CSCRFS, CAT, PRCT, CAP *Early Reading Test* *Child Interview* *Search Test*	Mean ES = .52
17. *O'Connor & Jenkins (1995)* T/C 10 students in integrated K Disabilities	PA-based spelling instruction (T) Matched number of reading trials (C)	10 min, daily, 4 weeks, 1:1, researcher, hall	Blending Segmenting Spelling RM words/nonwords WRMT, WID, WAT	Mean ES = 1.07
18. *O'Connor, Jenkins, & Slocum (1995)* T/C 67 students, Sp. Ed. students and referrals included.	Blend-segment + Letter sounds (T1) Global + Letter Sounds (T2) Letter sound only control (C)	15 min, 2x/wk, 10 T/C weeks, 3–5:1, 2 hired teachers, outside classroom	Blend, Segment Rhyme Production Syllable Deletion RLN, First sound LACT, Reading	Mean ES T1>C = 1.62 T2 >C = 1.32

Table 1. Description of Studies continued

Low PA			Analog	
19. *O'Connor, Notari-Syverson, & Vadasy (1996)* T/C 31 students Disabilities	25 activities PA activities, *Ladders to Literacy*, (Supplements to normal prereading instruction), (T) No PA training control (C)	5–15 min, daily, 24 weeks, whole class, teachers and assistants, classroom	Sound repetition Syllable deletion Letter naming Blend, Segment, First sound, Rhymes WJ Dictation WJ Letter-word ID	Mean ES DIT>DIC = .11 TT> TC = 1.55 DSC (no C) (pre/post)- estimated ES = 6.34
20. *Qi & O'Connor (2000)* T/C 61 students Low PA and "non-reader"	3-phoneme group (PA without print) (T1) Sound Categorization (initial sounds and rhyme) (T2) Both supplemental	20–30 min, 2x/wk, 10 weeks, 3–4:1, researcher, outside of classroom	Blend, Segment Rhyme, 1st Sound Id Syllable detection WJ-Letter/Word WJ-Dictation Reading analogue Spelling	T1 & T2 pre-post gains on PA skills and letter knowledge. T1 vs. T2, ns
21. *Saint-Laurent & Giasson (2001)* T/C 89 students Low SES, includes some special needs students	Multi-component literacy program including some PA (T1) Literacy + PA, added semi-weekly PA sessions for 25 min. (T2) Typical K curriculum (free play philosophy, story reading) plus same PA training lessons as T (C)	25–30 min., daily, (PA 2x/wk), 8 mos., 45 sessions 4–6:1, researcher, classroom	*Emergent Literacy Scales:* PA, Rdg Orientation, Word Concept, Pret rdg, Print functions, 1st name, word/sent-sp	Mean ES T1>C = .16 T2>C = .27
22. *Schneider, Roth, & Ennemoser (2000)* T/C 138 T, 115 C Low PA	PA (metalinguistic exercises, games) (T1) PA + Letter Sounds (T2) Letter Sounds only (T3) High achieving control group, regular K program, no formal cognitive training (C)	10–15 min, daily, 20 weeks, groups, teacher & assistant classroom	Phon. synthesis, analysis, Initial phoneme, rime, Rhyme (Initial, end) Verbal memory Rapid naming- Letter knowledge No. words read	T1>T2, $p < .01$ T1>T3, $p < .01$ T1> C, $p < .01$ T2> T3, $p < .01$ T2> C, $p < .01$ T3=C, ns
23. *Tangel & Blachman (1992)* T/C 149 students Low SES, "non-reader"	PA training program with print (T) Traditional K curriculum, no PA training (C)	15–20 min, 4x/wk, 11 weeks, 4–5:1, teacher & assistant classroom	Segmentation Letter names, sounds WRM word Id PR words, non-words, DST	Mean ES = .78
24. *Torgesen & Davis (1996)* T/C 100 students Low SES, Low performing schools, Low PA	Analytic and synthetic phonemic awareness training (print added last 3 weeks) (T) Whole language classroom instruction, no special instruction (C)	20 min, 4x/wk, 12 weeks, 3–4:1, researchers, quiet rooms close to classrooms	Segmenting Blending	Mean ES = 1.14
25. *Torgesen, Morgan, & Davis (1992)* T/C 48 students Low PA, "non-reader"	Analysis & Blending without print (T1) Blending without print (T2) Literacy activities for similar amount of time as T1 and T2 (C)	20 min, 3x/wk, 8 weeks, 3–5:1, tutors, outside classrooms	Segmentation Blending Letter-sound Word-learning	Mean ES T1>C = 2.07 T2>C = 1.88 (Seg/Blend only)
26. *Torgesen, Wagner, Rashotte, Rose, Lindamood, & Conway (1999)* T/C 180 students Low letter naming, Low PA	Regular classroom support (T1) PA + synthetic phonics (T2) Embedded phonics (T3) No-treatment control (C) Intervention supplemental, most of time.	20 min, 4x/wk, 5 mos. for k, 1:1, researcher, aides, quiet rooms, research trailers	WRMT, (WAT) Nonword list WRMT, Word Id Real Word list	Mean ES T1>C = .13 T2>C = .31 T3>C = .32
27. *Warrick, Rubin, & Rowe-Walsh (1993)* T/C 28 students Disabilities-Language delays, "non-readers"	Structured PA program without print (T) Language delayed control group, no training (C)	20 min, 2x/wk, 8 weeks, 7:1, researcher	Repair Manipulation Rhyme Initial, final, & word Segmentation	Mean ES = .84

Notes: *Mean effect sizes were achieved by averaging individual effect sizes for all reading related outcome measures.
ADHD-Attention Deficit/Hyperactivity Disorder, C-Control, CAI-computer assisted instruction, CVC-consonant, vowel, consonant, CV/VC-consonant vowel/vowel consonant, DIC-Disabilities Integrated Control, DIT-Disabilities Integrated Treatment, DSC-Disabilities Self-Contained, ED-Emotional disturbances, ES-Effect size, ID-Identification, K-Kindergarten, L-Letters, LNs-Letter names, LSs-Letter sounds, MB-Multiple baseline, PA-Phonological awareness, PALS-Peer Assisted Learning Strategies, Phon.-Phoneme, Seg. or segm.-Segmentation, SES-socioeconomic status, S/LI-Speech and Language Impaired, SS-Single subject, T-Treatment, TC-Transition Control, T/C-Treatment/Comparison, TT-Transition Treatment.
Measures Abbreviations: CAP-*Concepts about Print Test,* CAT-*California Achievement Test,* CSCRFS-*Classification Scheme for Children's Reenactment of Favorite Storybooks,* DST-*Developmental Spelling Test,* EST-*Experimental Spelling Test, LACT-Lindamood Auditory Conceptualization Test, PR-Phonetically regular, PRCT-Probed Recall Comprehension Test,* RLN-*Rapid Letter Naming,* RM-*Reading Mastery,* TERA-*Test of Early Reading Ability,* WIAT-*Wechsler Individual Achievement Test,* WJ-*Woodcock Johnson,* WRAT-*Wide Range Achievement Test,* WRMT-*Woodcock Reading Mastery Test (*LID-*Letter Identification,* WID-*Word Id.,* WAT-*Word Attack)*