EXTENSIVE READING INTERVENTIONS IN GRADES K– 3

From Research to Practice

CENTER ON INSTRUCTION

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EXECUTIVE SUMMARY

The report summarizes relevant high-quality research studies and synthesizes their findings to determine the relative effectiveness of interventions for struggling early readers. Additionally, we outline the implications of these findings for practice. Specific suggestions for implementing the findings are discussed in detail beginning on page 29; they are briefly listed below.

1. Extensive interventions can be effective even when provided by relatively low-cost implementers when appropriate training is provided and the interventions are fairly structured and delivered one-on-one or in groups of two or three students.
2. In studies that included a follow-up assessment, gains from early extensive interventions appear to be maintained over time, at least into second grade.
3. All of the effective early interventions examined in these studies shared four essential elements: training in phonological awareness, decoding, and word study; guided and independent reading of progressively more difficult texts; writing exercises; and engaging students in practicing comprehension strategies while reading text.
4. Other elements of these interventions that may be related to their success include group size (one-on-one, small group), the daily or near-daily frequency of the intervention sessions, and the early identification (in K or Grade 1) of students in need of intervention. These elements were evident though not directly tested in most relevant research studies.
5. We know considerably more about the effectiveness of early interventions than we do about interventions provided at later stages of development.
6. Considerably more research is needed on students whose response to treatment is relatively low.

Most of these implications apply best to students who are judged to be among the 20% to 25% most at risk for reading problems at the beginning of kindergarten, first, or second grade. As the research intervention literature extends to more severely disabled students, these conclusions may need to be modified.

INTRODUCTION

As school personnel implement response to intervention (RTI) models, many issues related to effective intervention practices arise. Because the law requires interventions to be based on the best scientific research currently available, it is important to synthesize and present current research findings on interventions to make the best research accessible to educational practioners responsible for implementing RTI models in the field.

Within the RTI model, many students who are at risk for reading problems or disabilities may require extensive interventions. In fact, questions about the required duration or intensity of preventive interventions for young students are among the important unresolved issues related to implementing the RTI model. At present, there is insufficient research to provide clear guidance about the duration or intensity of interventions that might be required for individual students. However, by acquiring information about the average effects of interventions of varying lengths, schools may begin to develop a deeper understanding of the characteristics of interventions they will need to provide to achieve their goals in preventing early reading difficulties. In the current analysis, we present information about a set of clearly described *extensive interventions,* defined for the purposes of this paper as interventions that provided for at least 100 instructional sessions.

Of course, the number of instructional sessions is only one dimension of extensiveness relevant to the description of interventions. Other important dimensions might include the breadth of instructional content, or the teacher's skill and training, or the size of the instructional group. However, we considered the number of sessions to be a measurable criterion that allows for synthesis and represents the way in which many schools will implement these types of interventions. We view this as a starting point in understanding the knowledge base about extensive interventions for students at risk for reading difficulties and disabilities.

The purpose of this report is to increase the knowledge of those working with or in state departments of education and local education agencies on reading-related issues for primary-grade students at risk for reading difficulties and learning disabilities. The report includes a narrative summary of research studies, a synthesis of their findings to determine the relative effectiveness of

interventions for struggling early readers, and an outline of the implications of these findings for practice. While we describe our methods and general findings, we present them in terms of their impact on practice and policy. Specific suggestions for implementing these and other research findings appear in the last section of this document.

This report is *not* intended as a comprehensive review of all aspects of the research on early literacy instruction for struggling readers or students with learning disabilities (LD). Rather, it presents and discusses a set of studies that met specific inclusion criteria (described in the next section of the report). The findings represent one data source for decision-making about instruction for struggling early readers.

METHODOLOGY AND CRITERIA FOR SELECTING AND ANALYZING STUDIES†

Studies for this synthesis were located by searching electronic databases, perusing reference lists of prior syntheses on related topics, and researching citations to assure a comprehensive pool of eligible studies. Interventions were included in this synthesis if they met the following criteria:

- Published between 1995 and 2005 in a peer-reviewed journal and printed in English;
- Conducted with students in grades K-3;
- Participants included students with learning disabilities or students identified as at risk for reading difficulties (or data are disaggregated for such groups);
- Interventions were provided for 100 sessions or more, and were not part of the general curriculum provided to all students;
- Interventions were provided as part of the school programming (not a home, clinic, or camp program);
- Results were reported on dependent measures addressing reading outcomes;
- A treatment/comparison group design was used (or multiple treatments were compared); and
- Report contained sufficient data to allow for computing an effect size.

A total of 12 studies reported in 13 publications were found that meet the above criteria. They were implemented in ways that shared many similar procedures:

- Most (8 of 12) were delivered one-on-one (one student with one teacher or tutor). Two studies provided intervention in small groups of 3 or fewer, and two studies used somewhat larger groupings (5 to 8 students).
- Most (9 of 12) identified students for intervention who were in kindergarten or first grade.
- All interventions were provided 4 or 5 times per week.

†The data used in this report are a subset of the data presented in Wanzek, J. & Vaughn, S. (in press). Research-based implications from extensive early reading interventions. *School Psychology Review.*

- The length of each instructional session was generally around 30 minutes, although one intervention (Foorman, Francis, Winikates, Mehta, Schatschneider, & Fletcher, 1997) provided 60 minutes of instruction each session and one (Schneider, Roth, & Ennemoser, 2000) provided 10-15 minutes.
- Interventions generally were conducted for one school year (approximately 35 weeks). One intervention (Torgesen, Wagner, & Rashotte, 1997; Torgesen, Wagner, Rashotte, Rose, Lindamood, & Conway, 1999) was provided over a three-year period; another was provided over three semesters (Gunn, Biglan, Smolkowski, & Ary, 2000; Gunn, Smolkowski, Biglan, & Black, 2002).
- The total number of sessions generally was around 100, although the intervention provided over three semesters delivered 300 sessions and the three-year intervention delivered 520 sessions.

Two main areas of variability between the interventions are noteworthy:

- Total hours of intervention varied from 25 to 173. Some interventions were relatively brief but occurred frequently (e.g., 15 minutes per day over more than 100 sessions); some did not specify precisely how long each session was, although the intervention met the criterion of occurring for at least 100 sessions; and some occurred for longer periods of time per session.
- About half of the interventions were provided by paraprofessional tutors (parents, teacher's aides, college students) and half by teachers.

See Table 2 (page 64) for a description of study characteristics.

For each study, we provide a brief synopsis of the research design, methodology, nature of the intervention, and results. Effect sizes, calculated as a measure of the effectiveness of the interventions, are reported in Table 3, page 66. For all studies, the Hedges (1981) procedure for calculating unbiased effect sizes for Cohen's *d* was used (this statistic is also known as Hedges *g*). Average effect sizes were calculated across all measures used in each study and are reported in the text below.

Several factors influence the interpretation of an effect size. Previous research has demonstrated that effect sizes tend to be higher on non-standardized, researcher-developed measures than on standardized, norm-referenced measures (Swanson, Hoskyn, & Lee, 1999). Therefore, a smaller

effect on a standardized measure may reflect a greater impact of the intervention than a larger effect on researcher-developed measures. Because effect sizes are calculated based on the difference in means between the experimental and control groups, the nature of the instruction received by the control group affects the magnitude of the resulting effect size. In all studies, control group students received at least typical classroom instruction and in a number of cases received some type of modified instruction or intervention as well. A smaller effect size from a study where control group students received some intervention may indicate a greater impact for the intervention than a larger effect size where the control group received only typical instruction. Further, in some cases students receiving intervention were compared to typically achieving students. Because we would expect typically achieving students to do at least as well on outcome measures as at-risk students receiving intervention, effect sizes would be presumed to be small or even zero even if the intervention were very effective. Additionally, stronger research designs with standardized measures typically yield more reliable estimates of a treatment's effect and may have greater value for informing practice than less rigorous designs.

BRIEF NARRATIVE SUMMARIES OF EXTENSIVE INTERVENTIONS

In the pages that follow, we present a very brief summary of each study that met our inclusion criteria. Studies that evaluated the effectiveness of the same or similar interventions are presented sequentially. The research design, intervention provider, participants, nature of the intervention and comparison groups, and results (with effect sizes) are listed. For a brief description of each intervention and the effect sizes by measure, see Table 3, page 66. For a more detailed description of each study, see Detailed Summaries of Research Studies, page 33. Readers also can access the detailed summary for each study via the hyperlink within each brief summary.

Santa, C. M., & Hoien, T. (1999). An assessment of early steps: A program for early intervention of reading problems. *Reading Research Quarterly, 34,* 54–79.

Research design

- Quasi-experimental (intact groups were assigned to treatment or comparison conditions)

Intervention provider

- General education teachers, other teachers, other educators

Participants

- The lowest 20% of first-grade students in each class at four schools on the Early Reading Screening Instrument were selected.
- Students were mostly Caucasian and from lower and middle class families. All schools were Title I.

Intervention group

- Early Steps, a program that was developed to provide a cost-effective, balanced, daily, one-to-one intervention for struggling readers, consisted of rereading familiar books, word study, sentence writing, and introduction of a new book.
- Intervention was provided for 30 minutes per day each school day for a total of 87.5 hours.

Comparison group

- Received daily intervention involving guided reading of a level-appropriate text followed by repeated reading of a level-appropriate text for 30 minutes in a small group of 2-4 students at a similar reading level

Results

- The intervention group scored significantly higher than the comparison group on all posttest measures, including measures of spelling, word recognition, and passage reading.
- High-risk students in the intervention group outperformed the high-risk students in the comparison group on every measure. No differences were found between the low-risk intervention and the low-risk comparison group students.
- 52% of the intervention group students were reading at or above grade level at posttest, compared with 24% of students in the comparison group.
- Effect sizes ranged from 0.59 to 0.91 at posttest (average=0.74, SE=0.17) and from 0.57 to 1.15 on standardized measures at follow-up (average=0.85, SE=0.19). All effects were significantly different from zero except for Word Identification at follow-up in the fall of second grade.

Morris, D., Tyner, B., & Perney, J. (2000). Early steps: Replicating the effect of a first–grade reading intervention program. *Journal of Educational Psychology, 92,* 681–693.

This study replicated Santa and Hoien (1999), with a slightly different population of students in a different region of the U.S. and a somewhat larger sample.
Research design

- Quasi-experimental (intact groups were assigned to treatment or comparison conditions and comparison group participants were matched to treatment group participants based on screener score)

Intervention provider

- General education teachers, other teachers, other educators

Participants

- First-grade students in the bottom half of their class were identified for

screening by their teachers and selected for intervention based on scores on the Early Reading Screening Instrument (ERSI). All were in the bottom 20% of their class.

- Both groups consisted predominantly of African-American students from lower and working class families.
- All but one school was Title I.

Intervention group

- Early Steps, a program that was developed to provide a cost-effective, balanced, daily, one-to-one intervention for struggling readers, consisted of rereading familiar books, word study, sentence writing, and introduction of a new book.
- Intervention was provided for 30 minutes per day each school day. The total hours of intervention ranged from 40 to 53.5.

Comparison group

- At three comparison schools, at-risk students received additional reading instruction in small groups (3-5 students).
- At the other two schools, at-risk students were taught using Direct Instruction in reading groups.

Results

- Students enrolled in Early Steps scored significantly higher than comparison students on every outcome measure.
- High-risk students within the intervention group significantly outscored the comparison students on every measure. Low-risk students who received the Early Steps intervention also scored significantly higher than the low-risk comparison group students on all measures except for word recognition.
- In the Early Steps group, 63% of students were reading at or above grade level at the end of the year, compared with 30% in the comparison group.
- Effect sizes ranged from 0.68 to 0.83 (average=0.76, SE=0.10). All were significantly different from zero.

Foorman, B. R., Francis, D. J., Winikates, D., Mehta, P., Schatschneider, C., & Fletcher, J. M. (1997). Early interventions for children with reading disabilities. *Scientific Studies of Reading, 1,* 255–276.

Research design

- Quasi-experimental (assignment to groups was based on teacher preference for each type of intervention)

Intervention provider

- Special education teachers

Participants

- All were second and third grade students who had been identified by their schools as learning disabled.
- Most were from middle-class families; ethnicity varied.

Intervention groups

- The sight-word intervention used was a commercially available reading program.
- The synthetic phonics intervention used a packaged program based on the Orton-Gillingham approach.
- The analytic phonics program was developed for this study and scripted to ensure that it was as directive as the comparison programs.
- Each intervention was provided for one hour each day as part of the daily two-hour language arts block. The total number of hours of intervention was not given.
- All intervention was provided in groups of about 8 students.

Comparison group

- None

Results

- The synthetic phonics group scored significantly higher on phonemic awareness than the sight-word group at year's end.
- The synthetic phonics group scored significantly higher than the analytic phonics group on orthographic processing and word reading at the end of the year, although this difference did not remain significant once demographic variables and Verbal IQ were added as covariates.

- Effect sizes for synthetic phonetics compared to sight-word ranged from 0.05 to 0.59 (average=0.26, SE=0.14). Only the effect for phonological analysis differed significantly from zero.
- Effect sizes for the analytic phonics compared to sight-word ranged from 0.19 to 0.27 (average=0.23, SE=0.13). None differed significantly from zero.
- No information was available on the percentage of students who achieved grade-level performance.

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.

Research design

- Randomized experiment

Intervention provider

- General education teachers

Participants

- Kindergarten children in the bottom quartile on a screening measure for deficits in phonological processing were selected.
- Conducted in Germany. No demographic information was available on any participants or their schools.

Intervention group

- In the phonological awareness (PA) intervention, children learned verbal and nonverbal sounds, rhyming, syllable segmentation, identification of initial and mid-word phonemes, and word reading.
- In the letter sound (LS) intervention, children learned to produce specific sounds, to identify the initial sound of a word and the corresponding letter, and to make sound-symbol connections.
- In the PA+LS intervention, children received 10 weeks of treatment that was identical to the first 10 weeks of the training provided to the PA group. Over the next 10 weeks, they were taught using both

metalinguistic games from the PA condition and letter-sound exercises from the LS condition.

- All instruction was conducted in groups of 5-8 children for 10-15 minutes each day, for a total of 25 hours of intervention.

Comparison group

- A group of *not-at-risk* students received the standard kindergarten curriculum and participated in pre- and posttest assessment.

Results

- At the end of kindergarten, the PA group significantly outscored all other groups on phonological awareness when pretest score on the measure was included in the analysis as a covariate. The PA+LS group scored significantly higher than the LS and comparison group that was not at risk for reading difficulties. Results were similar for the measure of rhyming skills, but with no differences between the PA and PA+LS groups.
- On the metalinguistic transfer test at the start of first grade, the scores of PA and PA+LS groups did not differ from the comparison group's score. The LS group scored lower than the comparison group, although the difference was not quite significant (p=0.07).
- The comparison group scored significantly higher than the PA and LS groups on decoding speed at the end of first and second grade. The difference with the PA+LS group neared significance (p=0.10 for first grade and p=0.06 for second grade).
- On reading comprehension at the end of second grade, the comparison group of students who had not been at risk in kindergarten scored significantly higher than the PA and LS groups, but not the PA+LS group.
- Effect sizes (compared with the not-at-risk comparison group) ranged from -0.65 to 0.54 for the LS group (average=0.13, SE=0.06), -0.61 to 1.08 for the PA group (average=0.14, SE=0.05), and -0.40 to 0.83 (average=0.12, SE=0.05) for the PA+LS group. In all cases, the average effect size differed significantly from zero but some effects on individual measures did not differ from zero. It is important to keep in mind that the comparison group was composed of essentially average students, which tends to result in lower effect sizes.

- No information on achievement in terms of grade-level performance was reported.

Vadasy, P. F., Jenkins, J. R., Antil, L. R., Wayne, S. K., & O'Connor, R. E. (1997). Community–based early reading intervention for at–risk first graders. *Learning Disabilities Research & Practice, 12,* 29–39.

Research design

- Randomized experiment

Intervention provider

- Paraprofessional tutors

Participants

- Teachers ranked first-grade students they thought were at risk for reading problems after the first few weeks of school. The 65 students with the lowest scores were screened on multiple early reading measures and 40 of those with the lowest scores were randomly assigned to the intervention and control groups.
- About half of the students at the schools were eligible for free or reduced-price lunch.

Intervention group

- Components of the intervention included letter naming and letter-sound instruction, sound categorization as a means of applying letter-sound knowledge, rhyming games, onset-rime tasks, phonogram exercises, spelling, free writing, and reading of primary-level books.
- Intervention was provided one-on-one for 30 minutes 4 days per week for a total of 50 hours of intervention.

Comparison group

- Received only regular classroom instruction

Results

- The intervention group scored significantly higher than the control group on the Yopp-Singer Segmentation Test and the WRAT-R (Wide Range Achievement Test-Revised) Spelling subtest. Differences on other measures were not significant.

- On standardized measures (WRAT-R Reading and Spelling and WJ-R Word Attack), average posttest scores were at or near grade level for the treatment group. No other information on grade-level performance was reported.
- Effect sizes at posttest ranged from 0.31 to 0.78 (average=0.44, SE=0.11). The average effect size at posttest differed significantly from zero, although effects on some measures did not differ from zero.
- In the spring of second grade, four follow-up measures were administered. No significant differences were found. Average scores on standardized measures (WJ-R Word Attack and Word ID) were at grade level for the treatment group.
- At follow-up, effect sizes ranged from -0.10 to 0.56 (average=0.42, SE=0.20), and were not significantly different from zero.

Vadasy, P. F., Sanders, E. A., Peyton, J. A. & Jenkins, J. R. (2002). Timing and intensity of tutoring: A closer look at the conditions for effective early literacy tutoring. *Learning Disabilities Research & Practice, 17,* 227–241.

Research design

- Quasi-experimental (treatment and comparison students were matched)

Participants

- Classroom teachers identified students as at risk for reading problems in the fall of first and second grade. The WRAT-R Reading subtest was administered to these students, and those with standard scores of 90 or below were eligible for intervention.

Intervention provider

- Paraprofessional tutors

Intervention group

- The first-grade intervention, Sound Partners, emphasized letter sounds, segmenting, decoding, spelling, sight words, and fluency. Students also read decodable books at the close of each session that matched the skills already taught.
- In the second-grade intervention, Thinking Partners, lessons were matched to 48 grade-level books. Students were taught to use comprehension strategies as they read aloud.

- One group received only first-grade intervention (SP), one group received only second-grade intervention (TP), and one group received both first-grade and second-grade intervention (SP+TP).
- Interventions were provided one-on-one four days per week for 30 minutes per session. The average number of hours of intervention received was 36.4 (SD=6.29).

Comparison group

- Received only regular classroom instruction

Results

- At the end of first grade, the SP and SP+TP groups showed gains that averaged 17 standard-score points, which brought them up to or near grade-level performance.
- At the end of second grade, SP students scored significantly higher that SP+TP students on the Word Attack and Word Identification subtests. The SP students also appeared to maintain their first-grade gains through second grade, while the SP+TP students made small to no gains.
- For the SP group compared to the control group (all first graders), effects ranged from 0.05 to 2.06 (average=1.18, SE=0.14). All of these effects were significantly different from zero and were 0.99 or higher, except for comprehension.
- At the end of second grade, no differences were found between students who only received TP and the control group. Effect sizes at the end of second grade, when compared with the control group, ranged from 0.05 to 0.38 for the TP group (average=0.21, SE=0.11) and were not significantly different from zero.
- For the SP+TP group compared with the control group (all second graders), effects ranged from 0.07 to 0.92 (average=0.40, SE=0.09). The average effect size differed significantly from zero, although effects on some measures were not different from zero.
- The average scores for first and second graders in the SP, TP, and SP+TP group on Word Attack, Word ID, and Spelling all were at or near grade level at posttest. No information on the percentage of students with scores at grade level was reported.

Jenkins, J. R., Peyton, J. A., Sanders, E. A., & Vadasy, P. F. (2004). Effects of reading decodable texts in supplemental first–grade tutoring. *Scientific Studies of Reading, 8,* 53–85.

Research design

- Randomized experiment

Intervention provider

- Paraprofessional tutors

Participants

- First-grade students scoring at or below the 25th percentile on the WRAT-R Reading subtest were selected.

Intervention group

- The phonics and word-study content of the intervention was drawn from the Sound Partners intervention, described in Vadasy, Sanders, Peyton, and Jenkins (2002). This intervention focuses on learning letter sounds, decoding text, spelling, reading nondecodable words, and text reading.
- In the more decodable (MD) text condition, the students practiced with storybooks where the majority of the words could be read using the phonics concepts they had been taught.
- In the less decodable (LD) text condition, the books read had fewer words that could be read using phonics skills.
- The intervention was provided one-on-one to students in both groups for 30 minutes per day, four days per week, for a total of 50 hours of intervention.

Comparison group

- Received no instruction beyond the standard reading curriculum

Results

- The combined treatment groups scored higher than the control group on Bryant's Diagnostic Test of Basic Decoding Skills, WRMT-R Word Attack, WRAT-R Reading, WRMT-R Word Identification, TOWRE Sight Word, Text Word list, WRAT-R Spelling, WRMT-R Passage Comprehension, and reading fluency for highly decodable passages.
- When the two treatment groups were compared, no significant differences were found on any measure. In the more decodable group,

84.6% of students achieved grade-level performance on the WRMT-R Word Identification and 87.2% achieved this level of performance on the Word Attack tests. For the less decodable group, the percentage achieving grade-level performance was 77.5% for Word ID and 90.0% for Word Attack. Grade-level performance was defined as scoring within one standard error of measurement of the 50th percentile.

- Effect sizes for the less decodable group compared with the control group ranged from 0.41 to 1.11 (average=0.61, SE=0.07). For the more decodable group compared with the control group, effects sizes ranged from 0.35 to 0.99 (average=0.65, SE=0.07). For both treatment groups, the average effect size was significantly different from zero, although effects on some measures were not.

Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2005). Relative effectiveness of reading practice or word–level instruction in supplemental tutoring: How text matters. *Journal of Learning Disabilities, 38,* 364–380.

Research design

- Quasi-experimental (triads of students, one from each treatment group and one from the control group, were matched based on pretest scores)

Intervention provider

- Paraprofessional tutors

Participants

- First-grade students scoring at or below the 25th percentile on the WRAT-R Reading subtest were selected.

Intervention group

- Students received the Sound Partners intervention (described in Vadasy, Sanders, Peyton, and Jenkins, 2002), but with varying emphasis on decoding instruction and text reading.
- In the Reading Practice group, students received phonics instruction using Sound Partners and then spent 10-15 minutes in oral reading using decodable texts.
- In the Word Study group, students spent the full 30 minutes in Sound Partners instruction with no oral reading practice during the session.

- Both interventions were provided one-on-one four days per week for 30 minutes per session. Approximately 70 hours of intervention were provided.

Comparison group

- Received no instruction beyond the standard reading curriculum

Results

- The treatment groups scored significantly higher than the comparison group on all measures other than reading fluency rate. The average scores on these measures were at or near grade level for reading accuracy and reading comprehension for both treatment groups. The percentage of students at or near grade level was not reported.
- The two treatment groups did not differ significantly from each other on any measure other than reading fluency rate and accuracy. The average fluency rate was below the grade-level benchmark for all groups.
- Effect sizes for the Reading Practice group compared with the comparison group ranged from 0.17 to 0.99 (average=0.63, SE=0.11). For the Word Study group, effect sizes ranged from 0.13 to 1.33 (average=0.62, SE=0.11). For both treatment groups, the average effect size was significantly different from zero, although effects on some measures were not.

Mathes, P. G., Denton, C. A., Fletcher, J. M., Anthony, J. L., Francis, D. J., & Schatschneider, C. (2005). The effects of theoretically different instruction and student characteristics on the skills of struggling readers. *Reading Research Quarterly, 40,* 148–182.

Research design

- Randomized experiment

Intervention provider

- Teachers

Participants

- Two cohorts of first-grade students from urban schools diverse in ethnicity and SES were selected. All schools had been commended for their reading scores on the state proficiency examination.

- Students were identified for intervention through end-of-kindergarten or start of first-grade screening using the Texas Primary Reading Inventory and the Woodcock-Johnson (W-J) III Word Identification subtest. Students who read five or more words or who read with 90% accuracy at Level D were excluded from the intervention group.

Intervention groups

- Proactive Reading (PR) had a predetermined scope and sequence designed to prevent errors from occurring, provided daily lesson plans, and used decodable stories. Teachers were asked to follow the predetermined sequence of instruction closely.
- In the Responsive Reading (RR) condition, the teachers followed menus to guide them, but had no preset scope and sequence. The teachers designed lesson plans after observing students' errors. Text practice involved more authentic literature using leveled libraries.
- Both interventions taught phonemic awareness and alphabetic skills explicitly and emphasized using this knowledge in reading and comprehending text. Teachers in both interventions modeled concepts and strategies, guided students in practicing them, and provided scaffolding and support while students practiced.
- Both interventions were provided to groups of three students who met daily for 40 minutes, for a total of 117 hours of intervention.

Comparison group:

- The comparison group received an enhanced classroom instruction (EC) intervention. Teachers were provided with progress-monitoring data every three weeks and attended a one-day seminar on how to use the data to provide differentiated instruction.
- A group of typically achieving students was also selected at random and received only regular classroom instruction.

Results

- On assessments of growth in reading-related skills administered every two months during the intervention, the Proactive Reading and Responsive Reading groups grew more rapidly than the enhanced classroom and typically achieving groups.

- The Proactive Group also grew more rapidly than the Responsive Group in phonological awareness and more rapidly than the typically achieving and enhanced classroom group on word reading fluency and nonword reading fluency.
- At the last growth measurement point, the scores for the two intervention groups remained below the typically achieving group.
- In the analysis of end-of-year outcomes, both intervention groups scored significantly higher than the enhanced classroom group on WJ-III Word Identification and Spelling. The Proactive Group also outperformed the typically achieving, enhanced classroom, and Responsive Groups on WJ-III Word Attack.
- End-of-year scores on standardized measures were close to grade-level norms for all groups. No additional information on grade-level achievement was reported.
- Effect sizes for the Proactive Reading Group compared with the enhanced classroom group ranged from 0.00 to 0.63 (average=0.34; SE=0.06). Effect sizes for the Responsive Reading group compared with the enhanced classroom group ranged from 0.17 to 0.53 (average=0.30; SE=0.06). For both intervention groups, the average effect size was significantly different from zero, although effects on some measures were not.

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

Research design

- Randomized experiment

Intervention provider

- Teachers and instructional aides

Participants

- Students qualified based on screening at the beginning of kindergarten on letter-name knowledge, a measure of phonological awareness, and the Vocabulary subtest of the Stanford-Binet (students scoring below 75 were

excluded). The participants varied in ethnicity and SES. To minimize attrition, students were followed if they transferred to another local school.

Intervention groups

- In the regular classroom support condition (RCS), tutoring focused on providing additional support in skills and activities found in their classroom reading program.
- The phonological awareness and synthetic phonics intervention (PASP) was based on the Lindamood Auditory Discrimination in Depth Program. Students began learning phonemes through their associated mouth movements. Practice in decoding and spelling words was emphasized.
- The embedded phonics (EP) intervention also involved phonics training, but in the context of reading stories and writing text. Students took part in games that taught word reading, letter-sound training with a list of sight words, writing sentences using these words, and reading sentences.
- All interventions were provided through four 20-minute one-on-one sessions each week for 2 1/2 years, for a total of 173 hours of intervention.

Comparison group

- Received only regular classroom instruction

Results

- The PASP group scored significantly higher than all other groups on Word Attack and Nonword List (measures of phonemic decoding). The PASP group also significantly outperformed the control and RCS groups on Word Identification and Real Word List (measures of real word reading) and outperformed the control group on the measure of developmental spelling. Students in the PASP group had standard scores at the end of the intervention that were close to the grade-level average on word reading and reading comprehension, while the other groups did not.
- Effect sizes for the PASP group compared to the control group ranged from 0.14 to 1.21 (average=0.58, SE=0.07). Effect sizes for the EP group compared to the control group ranged from 0.00 to 0.91 (average=0.29, SE=0.07). Effect sizes for the RCS group compared to the control group ranged from 0.00 to 0.79 (average=0.22, SE=0.07). For all three interventions, the average effect sizes were significantly different from

zero, although effects on some outcome measures did not differ from zero.

- The 9 students in the EP group who had been retained were matched with students in the PASP group on measures at the end of kindergarten and the groups were compared again. PASP students scored significantly higher than EP students on measures of phonological awareness, untimed decoding, phonemic decoding efficiency, and untimed word reading. No differences were found for reading comprehension.
- Growth curve analyses indicated that the variables that explained most of the variability in response to instruction (as measured by growth in reading accuracy) were rapid naming ability, home background, and teacher ratings of classroom behavior.

Gunn, B., Biglan, A., Smolkowski, K., & Ary, D. (2000). The efficacy of supplemental instruction in decoding skills for Hispanic and Non–Hispanic students in early elementary school. *The Journal of Special Education, 34,* 90–103.

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. *The Journal of Special Education, 36,* 69–79.

Research design

- Quasi-experimental (students were matched on ethnicity, grade, and reading ability and then randomly assigned to the intervention or control condition)

Intervention provider

- Instructional aides, some of whom were teachers

Participants

- Kindergarten through third-grade students were screened at the beginning of the school year on a measure of aggressive behavior and on DIBELS Rapid Letter Naming, Phoneme Segmentation Fluency, Phoneme Onset Fluency, and Oral Reading Fluency measures as appropriate for their grade level. Those scoring below grade level qualified for intervention.

Intervention group

- The Reading Mastery (grades 1 and 2) and Corrective Reading (grades 3 and 4) programs emphasized phonological awareness, letter-sound correspondence, decoding, and fluency. Teachers provided direct instruction and modeling in reading skills. Students had many opportunities for practice with immediate feedback and cumulative reviews. Skills were taught until they were mastered.
- The intervention was conducted for 25-30 minutes each day, in groups of 2-3 students or one-on-one. Students received 4-5 months of intervention in year one and 9 months in year two. The total number of hours of intervention was not reported.

Comparison group

- Received no instruction beyond the standard reading curriculum

Results

- At the end of the first year of intervention, the only significant difference by group occurred on Word Attack, with the treatment group scoring significantly higher. The only significant difference by ethnicity was found on Oral Reading Fluency, where Hispanic students scored significantly lower.
- At the end of the second year of intervention, significant differences were found on the Word Identification, Word Attack, Reading Vocabulary, and Passage Comprehension subtests, all favoring the treatment group, with effect sizes ranging from 0.27 to 0.73 (average=0.39, SE=0.07). The average effect size differed significantly from zero, although effects on some outcome measures did not.
- Hispanic students had a significantly smaller gain on the Reading Vocabulary subtest than non-Hispanic students. The oral reading fluency scores for those in the intervention group who spoke limited English were higher than their matched control group participants.
- Improvements in oral reading fluency were found to be the best predictor of reading comprehension.
- At follow-up one year after the end of the second year of intervention, differences were significant for Word Attack and Passage Comprehension

for Hispanic students (regardless of initial English proficiency) and for oral reading fluency for all students.

- Average scores on standardized measures remained below grade level at follow-up for students who received intervention.

Miller, S. D. (2003). Partners–in–reading: Using classroom assistants to provide tutorial assistance to struggling first–grade readers. *Journal of Education for Students Placed At Risk, 8,* 333–349.

Research design

- Quasi-experimental (comparison group students had pretest scores within one standard deviation of the mean of the intervention groups)

Intervention provider

- Paraprofessional tutors

Participants

- Two cohorts of first-grade students from a Title I elementary school
- Students were in the lowest third on an assessment of developmental spelling and word list reading and teacher rankings of reading ability.

Intervention group

- Partners in Reading (PIR) focused on increasing students' ability to read independently and at progressively more difficult reading levels. Students re-read previously mastered texts, were introduced to a new book at their reading level, and engaged in word-sort activities. Tutors provided feedback and encouragement, modeled reading strategies for students to practice, helped them to set reading goals, and monitored progress.
- Sessions were provided four times per week for 40 minutes per session. The exact total number of hours of intervention was not reported, but was approximately 67.

Comparison group

- Received only regular classroom instruction

Results

- At the end of first grade, both cohorts of students who received PIR or Reading Recovery (RR) scored significantly higher than students in the comparison group on word recognition and developmental spelling.

- On the end-of-second-grade achievement test, PIR and RR students scored significantly higher than comparison group students on the word recognition subtest. PIR students scored significantly higher than the comparison group on comprehension, although the RR group did not. Scores for PIR students remained below those of typically achieving students. No other information on grade-level performance was reported.
- Effect sizes ranged from 0.71 to 1.09 (average=0.85, SE=0.14) for the PIR group compared with the control group across cohorts and 0.88 to 1.10 (average=0.97, SE=0.14) for the RR group compared with the control group. Average effect sizes and effects for all outcome measures were significantly different from zero for both the PIR and RR groups.

IMPLICATIONS FOR PRACTICE

Several implications for practice can be derived from these studies. We note that these implications are based on a relatively small sample of extensive intervention studies, and a formal aggregation of effects from these studies through meta-analysis was not possible because of the small number of reports available. Therefore, the implications drawn from these studies must be viewed as *preliminary* and in need of further validation through additional research efforts. Additionally, caution must be used in making direct comparisons of effect sizes among different studies. Given the variance in types of comparison/control groups and factors other than the intervention (noted in the methodology section) that influence effect sizes, effects from each study must be evaluated in light of the specific features of that study.

Finally, relatively few of these studies were actually conducted with students who were identified through Response to Intervention as nonresponders or severely disabled. Thus, most of these implications relate best to students judged to be among the 20 to 25% most at risk for reading problems at the beginning of kindergarten, first, or second grade. As the research intervention literature extends to more severely disabled students, these conclusions may need to be modified.

- **Extensive interventions can be effective when provided by relatively low-cost implementers (paraprofessionals).** Although no studies directly compared the effectiveness of paraprofessionals with certified teachers, the 7 studies that used paraprofessionals demonstrated good effects. We think this finding is valuable since the cost of providing very extensive (long-term) interventions to students with reading difficulties may be considerable when implemented by certified teachers. Using paraprofessionals also frees up more qualified personnel (e.g., reading specialists, special education teachers) to provide interventions for those students whose response to these typically effective interventions is low. It should be noted, however, that all of the interventions implemented by paraprofessionals were fairly structured, in that they generally provided lesson plans and routines to guide instruction during the intervention and that the interventions were provided one-on-one or in groups of 2 or 3 students. It may be that interventions with these characteristics can be

implemented successfully by paraprofessionals, while those involving larger groups of students or less structured protocols require certified teachers. Further research is needed to determine when paraprofessionals can be most successful and when certified teachers must provide interventions if the interventions are to be effective.

- **A range of training was provided to interventionists** (see detailed summaries, beginning on page 33, for descriptions of training for each intervention). Some were paraprofessionals given only several hours of training, while others were certified teachers given extensive training (more than 40 hours). Although the type of intervention provider was not compared directly in any study, the effect sizes calculated in studies where paraprofessionals provided the intervention were similar to those in which certified teachers provided the intervention, as long as similar outcome measures were used. Mean effect sizes ranged from 0.12 to 0.74 for interventions provided by teachers and from 0.21 to 1.18 for interventions provided by paraprofessionals, although all but one mean effect size for interventions provided by paraprofessionals was in the range of 0.21 to 0.76.
- In the two studies that conducted follow-up analyses, **gains from early extensive interventions appear to be maintained over time, at least into second grade.**
- No single intervention program stood out as yielding effect sizes that were substantially larger than any of the others examined in these studies. **The findings from these interventions do not identify any particular method as the "one right way" to provide early extensive interventions to students at risk for reading problems in the early grades.** However, we note that all of the effective interventions examined in these studies shared a number of essential elements: training in phonological awareness, decoding, and word study; guided and independent reading of progressively more difficult texts; writing exercises; and engaging students in practicing comprehension strategies while reading text.
- Other elements of these interventions that may be related to their success are **group size** (one-on-one, small group), the **daily or near-daily**

frequency of the intervention sessions, and the **early identification of students in need of intervention (in K or Grade 1).**

- The number of studies addressing kindergarten and first grade students exceeded the number addressing students in second and third grades. Thus, **we know considerably more about the effectiveness of early interventions than we do about interventions provided at later stages of development.**
- Considerably **more research is needed on students whose response to treatment is relatively low.** Models and intervention practices for improving outcomes for the most difficult to teach students (e.g., students with reading and learning disabilities who do not respond to initial, well-designed interventions) are needed.

The effect sizes reported in this paper provide information about the effectiveness of the experimental interventions in comparison with the instruction, or lack of instruction, provided to students in the control groups. Since students in the experimental groups were often taught in smaller groups than those in the control groups, it is frequently not possible to determine whether the impacts were the result of more intensive instruction, or to a specific type of instruction.

Additionally, effect sizes do not help us know what proportion of the students in a given study actually responded weakly, or not at all, to the intervention. Not all studies reported the proportion of students who were able to meet grade-level standards on important outcomes measures at the conclusion of the interventions described in this report. In an earlier report that examined outcomes from similar types of interventions, Torgesen (2000) estimated that anywhere from two to six percent of students would remain poor readers if such interventions were available to everyone who needed them. In the study by Mathes et al. (2005) reported in this document, the authors estimated that fewer than one percent of students would remain poor readers at the end of first grade if the most effective intervention were made available to any student who needed it. We hope that in the future those who conduct prevention studies like those examined here will provide information about the extent to which significant numbers of students remained struggling readers following the intervention.

Estimating Costs for Extensive Interventions

Cost is often an impediment to providing extensive interventions for at-risk students or those who do not respond to regular classroom reading instruction. Vaughn, Wanzek, Linan-Thompson, and Murray (2007) estimated the personnel costs (typically the greatest of the expenses associated with extensive interventions) for the studies described in this report at $50/hour for certified teachers. We have estimated the cost for paraprofessionals as $25/hour.

As an indicator of cost, Vaughn et al. (2007) multiplied the per-hour cost by the number of hours of intervention provided and then divided the result by the number of students in each intervention group, yielding the intervention cost per student for the intervention. These costs will vary by location and other factors and are intended merely as estimates of the range of total costs for staffing extensive interventions. Other costs may be incurred for materials and facilities. See Table 1, below, for the cost of each intervention, based on the above method of calculation, with the average effect size for that intervention.

TABLE 1. ESTIMATED PERSONNEL COST PER STUDENT OF PROVIDING EACH INTERVENTION[a]

Study	Cost	Average ES
Foorman et al. (1997)	$1,125	0.23, 0.26
Gunn et al. (2000, 2002)	$2,000	0.39
Jenkins et al. (2004)	$1,250	0.61, 0.65
Mathes et al. (2005)	$1,944	0.30, 0.34
Miller (2003)	$2,400	0.76
Morris et al. (2000)	$4,000	0.74
Santa & Hoien (2000)	$4,000	0.12, 0.13, 0.14
Schneider et al. (2000)	$156	0.22, 0.29, 0.58
Torgesen et al. (1999)	$6,487[b]	0.44
Vadasy et al. (1997)	$270	G1=1.18, G1 & 2=0.40, G2=0.21
Vadasy et al. (2002)	$3,500	0.62, 0.63
Vadasy et al. (2005)	$1,750	.23, .26

[a] When multiple treatment groups were compared, average ESs are listed for each group.

[b] Cost per student is high in studies that were conducted for multiple years since the number of hours of intervention is greater.

DETAILED SUMMARIES OF RESEARCH STUDIES

Santa, C. M., & Hoien, T. (1999). An assessment of Early Steps: A program for early intervention of reading problems. *Reading Research Quarterly, 34,* 54–79.

The authors evaluated Early Steps, a program developed to provide a cost-effective, balanced, daily, one-to-one intervention for struggling readers. First grade classes from four Title I elementary schools in Montana were selected to participate in the study. The standard first-grade reading instruction at both schools involved a 2-hour block each morning for language arts activities and a 20-30 minute period for independent reading from books selected to match each student's reading level.

At the start of the school year, first-grade teachers at all schools evaluated their students' early reading and identified those in the lower half of the class in reading readiness. Using the Early Reading Screening Instrument, these students were tested on letter knowledge, spelling, word recognition, and concept-of-word in text (which involved pointing to words in a sentence while reading it and then having the child repeat the sentence while pointing to each word as he or she read it). The lowest 20% of students in each class were selected to participate in the study as either intervention (n=23) or comparison (n=26) subjects. Intervention was provided to students at two schools; students at the remaining two schools served as comparison group participants. At all four schools, students were mostly Caucasian and from lower and middle class families.

Students at the schools selected for intervention were removed from the classroom for 30 minutes each day for one-to-one Early Steps instruction. The components of Early Steps were 1) re-reading of books at progressive reading levels; 2) word study aimed at remediating deficits in phonological processing, developing sight-word reading skills, and teaching meta-cognitive strategies for reading and spelling new words; 3) instruction in meta-cognitive strategies and how to apply skills learned through word study; 4) sentence writing; and 5) guided reading of a new book at a slightly higher reading level that the student will re-read at the start of the session the following day.

At-risk students at the comparison schools received daily intervention for 30 minutes in a small group of 2-4 students of a similar reading level. This intervention involved guided reading of a level-appropriate text followed by repeated reading of the text in pairs and then independently.

Daily intervention was provided from September-May (35 weeks), for a total of 175 sessions. Instructors included first-grade teachers, Title I tutors, the language arts coordinator, and the school principal. All received training specific to Early Steps prior to and during implementation. The Language Arts Coordinator provided observation and feedback to teachers once per month during the year of implementation, and one of the Early Steps developers visited the schools several times, providing training and feedback.

Outcome measures included:

- Spelling test consisting of 12 words administered on the screening pretest and 3 new words.
- Word recognition test involving 40 common words from first- and second-grade materials.
- Passage reading test where six progressively more difficult 100-word passages were presented.
- Follow-up assessment in fall of second grade using the Woodcock Reading Mastery Test (WRMT) Word Identification, Word Attack, and Passage Comprehension subtests.

The intervention group scored significantly higher than the comparison group on all posttest measures. Following this overall analysis, each group also was divided into high- and low-risk categories based on their screening test scores and these sub-groups were compared. The high-risk intervention group outperformed the high-risk comparison group on every measure. No differences were found between the low-risk intervention group and the low-risk comparison group. In the intervention group, 52% of students were reading at or above grade level at posttest, compared with 24% of students in the comparison group. On the follow-up assessment, the intervention group again scored significantly higher than the comparison group on all measures. The high-risk intervention group outperformed the high-risk comparison group only on the Word Identification subtest.

Effect sizes ranged from 0.59 to 0.91 at posttest (average=0.74, SE=0.17) and from 0.57 to 1.15 on standardized measures at follow-up (average=0.85, SE=0.19). All effects were significantly different from zero except for Word Identification at follow-up. The magnitude of these effects is impressive given that the comparison group received a small-group reading intervention.

The authors conclude that for high-risk students, Early Steps was more effective than the instruction given to the comparison group students. Both groups spent additional time each day reading books at their reading level; this type of intervention may be sufficient for low-risk students. One key difference between the instruction each group received was the inclusion of word study in Early Steps. Santa and Hoein believe that added instruction in phonological processing skills and meta-cognitive strategies for applying them resulted in the gains seen in the high-risk intervention group.

Morris, D., Tyner, B., & Perney, J. (2000). Early Steps: Replicating the effect of a first–grade reading intervention program. *Journal of Educational Psychology, 92,* 681–693.

This study replicated Santa and Hoien (1999), with a slightly different population of students in a different region of the U.S. and with a somewhat larger sample. Authors in this study implemented Early Steps in an urban area of Tennessee with predominantly African-American students from lower and working class families. The intervention was implemented at six schools where the principals had shown interest in the program. Five comparison schools were selected based on similar demographics and levels of achievement. All but one comparison school was a Title I school; all the intervention schools were Title I schools.

Students were selected for intervention using the Early Reading Screening Instrument (ERSI). After testing students identified as at risk by their teachers, the authors selected as many students at each school as could be accommodated by the school staff, starting with those with the lowest scores, for a total of 43 students. These students were matched with comparison students based on their score on the ERSI.

Early Steps was implemented by first-grade teachers, Title I reading teachers, and tutors. One Early Steps author made nine visits to the schools during the year of implementation to observe and provide feedback and training. Intervention was provided daily from September-May (35 weeks); on

average students received 91 sessions of intervention (range was between 80 and 107 sessions).

The implementation of Early Steps was very similar to that of Santa and Hoien. No changes were made to the instructional components. At three of the comparison schools, the at-risk students received additional reading instruction in small groups (3-5 students). At the other two schools, at-risk students were taught using Direct Instruction in reading groups. The outcome measures were the same as those used by Santa and Hoien, except that the Word Identification subtest of the Woodcock Reading Mastery Test (WRMT) was not administered and the WRMT measures were given at posttest, not as a follow-up.

Overall results for the analysis of scores from the intervention and comparison groups showed that the students enrolled in Early Steps scored significantly higher than comparison students on every outcome measure. Effect sizes ranged from 0.68 to 0.83 (average=0.76, SE=0.10). All effects were significantly different from zero. In the Early Steps group, 63% of students were reading at or above grade level at the end of the year, compared with 30% in the comparison group.

Intervention and comparison group students were identified as high-risk and low-risk based on pretest scores. As in Santa and Hoien, high-risk students in the intervention group significantly outscored the comparison students on every measure. Unlike Santa and Hoien, low-risk students who received the Early Steps intervention also scored significantly higher than low-risk comparison group students on all measures except for Word Recognition. The authors attribute the difference in findings to a slightly higher ability level in Santa and Hoien's low-risk students and the strength of the instruction provided to the comparison group in Santa and Hoien's study.

While this study successfully replicated Santa and Hoien's finding that Early Steps was effective, the authors point out that whether the reading gains made in Early Steps are maintained in later grades is unknown. Students may need further intervention to continue their growth as readers.

Foorman, B. R., Francis, D. J., Winikates, D., Mehta, P., Schatschneider, C., & Fletcher, J. M. (1997). Early interventions for children with reading disabilities. *Scientific Studies of Reading, 1,* 255–276.

The authors compared the effectiveness of three types of reading interventions for second and third grade students with reading disabilities. An analytic phonics reading program was compared with a sight-word program and a synthetic phonics program, with the expectation that the analytic phonics program would show superior results.

Students were selected from 13 elementary schools in an urban area in the Southwest. Most were from middle-class families, but varied in ethnicity. All students received one of the three interventions, conducted over the entire school year. Only those who received at least six months of intervention were included in the data analysis, resulting in a sample of 114 students (attrition was about 20%).

Each intervention was provided for one hour each day as part of the daily two-hour language arts block. The sight-word program used was a commercially available reading program. The synthetic phonics intervention used a packaged program based on the Orton-Gillingham approach. The analytic phonics program was developed for this study and scripted to ensure that it was as directive as the comparison program. Both phonics programs were provided in a whole-group format, while the sight-word program was implemented in centers. An average of 8 students were involved in the intervention in each classroom. All interventions were implemented by classroom teachers who were trained prior to the start of the school year. The project director and her assistant checked fidelity of implementation through bi-weekly classroom visits.

Outcome measures included:

- Experimenter-designed measures of phonemic awareness, word reading, and orthographic processing (administered four times during the intervention year); and
- Woodcock-Johnson-R (WJ-R) Word Identification and Word Attack subtests (administered at pre- and posttest).

The Wechsler Intelligence Scale for Children-Revised (WISC-R) was administered at posttest and scores were used as a covariate in the analyses. Data from the tests administered during the year were analyzed using growth-

curve analysis. Demographic variables included in the analysis were ethnicity, SES, gender, and age. Any pretest measures that differed significantly among groups were also included in the models.

Contrary to the authors' expectations, the analytic phonics program did not show superior results. The synthetic phonics group scored significantly higher on phonemic awareness than the sight word group at year's end. This difference remained significant even after variance from demographic variables and differences in Verbal IQ were accounted for. The synthetic phonics group scored significantly higher than the analytic phonics group on orthographic processing and word reading at the end of the year, although this difference did not remain significant once demographic variables and Verbal IQ were added as covariates.

Effect sizes for synthetic phonetics compared to the sight word intervention ranged from 0.19 to 0.27 (average=0.23, SE=0.13). Effect sizes for the analytic phonics compared to sight-word ranged from 0.19 to 0.27 (average=0.23, SE=0.13). None of these effects differed significantly from zero. However, effects often tend to be underestimated when all students in all groups receive an intervention.

Based on these results, the authors conclude that special educators should emphasize phonological skills with young readers with reading disabilities. They point to the age of the children, the size of the intervention group, and the integration of the intervention into the standard school program as reasons that their study produced results different from similar previous research.

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.

Building on previous research on the role of phonological awareness in developing reading skills, the authors compared the effects of three types of training on the reading ability of students identified as at risk for reading difficulties in kindergarten. The authors sought to determine if a phonics training curriculum would improve these students' reading and spelling skills and whether adding letter-sound training would enhance the effect.

The study was conducted in Germany, where the kindergarten curriculum is generally not structured around formal training in academic skills. Approximately

700 children from 25 kindergarten classes were screened for deficits in phonological processing. Children in the bottom quartile were determined to be at risk and were candidates for intervention (n=208). They were assigned to receive either phonological awareness training (PA), letter-sound training (LS), or a combination of both (PA+LS). A disproportionate number of children dropped out of the LS condition when their teachers decided not to participate in the study. Other children were dropped from the data analysis because they repeated kindergarten, were enrolled in special education outside of mainstream elementary schools, or moved away from the area. As a result, 138 at-risk students were retained across the three conditions (n=54 for PA, n=36 for LS, n=48 for PA+LS). A comparison group of 115 students not at risk received the standard kindergarten curriculum and participated in pre- and posttest assessment. No demographic information was available on any of the participants or their schools.

Kindergarten teachers, trained to deliver one of the three programs, provided daily interventions for 10-15 minutes per session over 10-20 weeks. Students in the PA condition received 20 weeks of training, which involved six units of metalinguistic games. Children learned verbal and nonverbal sounds, rhyming, syllable segmentation, identification of initial and mid-word phonemes, and word reading. Children in the LS condition received a 10-week program involving learning to produce specific sounds, identifying the initial sound of a word and the corresponding letter, and using alphabet cards to teach sound-symbol connections. In the PA+LS condition, children received 10 weeks of training identical to the first 10 weeks of the training provided to the PA group; over the next 10 weeks, they were taught using both metalinguistic games from the PA condition and letter-sound exercises from the LS condition. All instruction was conducted in groups of 5-8 children outside of their regular kindergarten classroom.

Outcomes were assessed at the program's conclusion (end of kindergarten) and at the beginning and end of first and the end of second grade for students in all three training conditions and the comparison group. Kindergarten measures included tests of phoneme awareness, rhyming skills, verbal memory, processing speed, and letter knowledge. At the start of first grade, students were given a series of metalinguistic tests, including initial sound analysis, word length analysis, identification of initial consonant sounds, and vowel substitution. At the end of first grade and the end of second grade,

reading skills were assessed using the Wurzburg Silent Reading Test, which assesses decoding speed. A reading comprehension test was administered at the end of second grade. Different cloze-type spelling tests were administered at the end of first and second grade. The Culture Fair Intelligence Test was also administered at the end of first grade to allow for the inclusion of IQ as a covariate in the analyses.

The authors expected that students in the PA+LS condition would outperform those in the other two training conditions. The not-at-risk comparison group was included to determine if the reading and spelling skills of students in the training conditions differed from those of a normal-achieving group of students at the end of the intervention. Results at the end of kindergarten indicated that the PA group significantly outscored all other groups on phonological awareness when the pretest score on the measure was included in the analysis as a covariate. Additionally, the PA+LS group scored significantly higher than the LS and comparison groups. Results were similar for the measure of rhyming skills, but with no differences between the PA and PA+LS groups. No other differences were significant at the end of kindergarten.

On the metalinguistic transfer test at the start of first grade, the scores of PA and PA+LS groups did not differ from the comparison group's score. The LS group scored lower than the comparison group, although the difference was not quite significant ($p=0.07$). Scores on the intelligence test administered in first grade indicated that comparison group students' scores were significantly higher than those of the training groups. No differences were found among training groups. IQ was included as a covariate in the analysis of decoding speed and reading comprehension at the end of first and second grade results. The comparison group scored significantly higher than the PA and LS groups on decoding speed at the end of first and second grade. The difference with the PA+LS group neared significance ($p=0.10$ for first grade and $p=0.06$ for second grade). On reading comprehension at the end of second grade, the comparison group scored significantly higher than the PA and LS groups, but not the PA+LS group.

IQ was not found to be a significant covariate in the analysis of spelling results and was not included. At the end of first grade, the LS group scored significantly lower than the PA+LS group and the comparison group. No other groups differed significantly. At the end of second grade, the comparison group scored significantly higher than the PA and LS groups, but did not differ from

the PA+LS group. The PA+LS group scored significantly higher than the LS group. Effect sizes (compared with the comparison group) ranged from 0.01 to 0.65 for the LS group (average=0.33, SE=0.06), 0.01 to 1.08 for the PA group (average=0.43, SE=0.05), and 0.04 to 0.83 (average=0.27, SE=0.05) for the PA+LS group. In all cases, the average effect size differed significantly from zero but some effects on individual measures did not differ from zero. In considering these effect sizes, it is important to recall that the comparison group was composed of not-at-risk students.

Based on the end-of-kindergarten results, the authors concluded that all three training programs were effective for at-risk students. These students generally scored at the same level or higher than the comparison group of not-at-risk students. The authors assert that the effectiveness of the training persisted at the start of first grade, given that no significant differences were observed in the metalinguistic transfer test between any of the training groups and the comparison group. The authors acknowledge the overall superior performance group at the end of first and second grades. However, the PA+LS group came close to equaling their performance in decoding speed and reading comprehension and did equal their performance in spelling.

Vadasy, P. F., Jenkins, J. R., Antil, L. R., Wayne, S. K., & O'Connor, R. E. (1997). Community–based early reading intervention for at–risk first graders. *Learning Disabilities Research & Practice, 12,* 29–39.

The authors set out to test an intervention for at-risk first-grade students that emphasized phonological processing skills. While the efficacy of such interventions is well-established, the cost of providing them has been a barrier to their implementation in schools. Therefore, the authors chose tutors from the community (parents and high school and college students) as the providers of the intervention to test a lower-cost model for providing one-on-one reading intervention.

First-grade students from four elementary schools in a diverse urban area participated in the intervention. About half of the students at the schools were eligible for free or reduced price lunch. The schools already had initiatives in place to encourage greater parental involvement and promote other links between the school and the community, making them ideal settings to test this type of intervention.

The intervention consisted of 100 lessons of 30 minutes each, provided one-on-one after school. Components of the intervention included letter-naming and letter-sound instruction, sound categorization as a means of applying letter-sound knowledge, rhyming games, onset-rime tasks, phonogram exercises, spelling, free writing, and reading of primary-level books. Tutors received three hours of training before the start of the intervention and two hours of training after it was underway. Two of the authors provided individual feedback during observations. Students in the control group received only regular classroom instruction.

To select students for intervention, all first-grade students at the schools were screened using a set of measures that included reading of real words and nonsense words, repeating single and multiple phonemes, rapid letter naming, and static and dynamic segmentation. Teachers also were asked to rank the children they thought to be at risk for reading problems after the first few weeks of school. The 65 students with the lowest scores were given the Wide Range Achievement Test-Revised (WRAT-R) Reading and Spelling subtests and the Peabody Picture Vocabulary Test-Revised (PPVT-R). Forty of these students were then randomly assigned to the intervention and control groups. As a result of attrition, outcome data were available for 17 students in the intervention group and 18 in the control group.

Outcome measures administered at the end of the intervention were:

- WRAT-R Reading and Spelling subtests;
- Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R) Word Attack and Word Identification;
- Yopp-Singer Segmentation Task (the student is asked to segment the sounds in a list of 22 words);
- Bryant Pseudoword Test (decoding test with 50 nonwords);
- Analytical Reading Inventory (test of oral reading fluency);
- Dolch Word Recognition Test (word reading test with 220 frequently used short words); and
- Writing sample (5 minutes of writing in response to a prompt).

No significant differences between groups were found on any of the reading measures or the writing measure. The intervention group scored significantly higher than the control group on the Yopp-Singer Segmentation Test and the

WRAT-R Spelling subtest. Follow-up testing was done in the spring of second grade. All but one student (from the intervention group) was available for testing at this point. Four measures were administered: WJ-R Word Attack and Word Identification, the Test of Written Spelling, and two one-minute readings of a second-grade level passage. No significant differences were found. Effect sizes at posttest ranged from 0.31 to 0.78 (average=0.44, SE=0.11). The average effect size at posttest differed significantly from zero, although effects on some measures did not differ from zero. At follow-up, effect sizes ranged from -0.10 to 0.56 (average=0.42, SE=0.20), and were not significantly different from zero.

The positive outcomes in segmentation and spelling are attributed to the intervention's focus on teaching and practicing these skills. The lack of differences in other outcomes may be due the presence of behavior problems in about one-third of the students in the intervention group. The tutors, who lacked training in behavior management, had difficulty managing these students. Other factors that may have limited the effectiveness of the intervention include turnover in tutors, the inconsistent commitment level of the schools to the program, and possible lack of fidelity in implementation (observations were too few to determine the degree of fidelity).

Vadasy, P. F., Sanders, E. A., Peyton, J. A. & Jenkins, J. R. (2002). Timing and intensity of tutoring: A closer look at the conditions for effective early literacy tutoring. *Learning Disabilities Research & Practice, 17,* 227–241.

The authors tested Sound Partners, a phonics-based intervention for first-grade students, and Thinking Partners, a reading and comprehension strategies intervention for second-grade students, both alone and in combination. They sought to determine if continuing intervention into second grade is beneficial for first graders who had received a year of intervention. They also tested the efficacy of Thinking Partners when provided to students who were not identified as struggling until the start of second grade. Thus, four groups of students were included in this study: 1) an SP group (n=13) that received only the first-grade intervention; 2) an SP+TP group (n=26) that received intervention in both first and second grade; 3) a TP group (n=10) that received only the second-grade intervention; and 4) a comparison group (n=16) who received regular classroom instruction in first and second grades.

Students were selected for participation from 12 urban elementary schools in the Pacific Northwest. Six schools provided comparison group students only, four provided intervention students only, and two provided both. Classroom teachers identified students as at risk for reading problems in the fall of first and second grade. The Wide Range Achievement Test-Revised (WRAT-R) Reading subtest was administered to these students, and those with standard scores of 90 or below were eligible for intervention. Students identified in second grade either did not qualify for intervention in first grade or enrolled in the school after the start of the first-grade intervention.

The first-grade intervention, Sound Partners, involved 100 scripted lessons with six to nine brief activities emphasizing letter sounds, segmenting, decoding, spelling, sight words, and fluency. Students also read decodable books at the close of each session that matched the skills already taught.

Thinking Partners, the second-grade intervention, also involved scripted lessons. The lessons were matched to 48 grade-level books that students read during each session. Students read one book every two sessions. Students were taught to use strategies, including summarizing each part of the story as they read, noting unfamiliar words and determining their meanings, making connections between parts of the story and between the story and their previous knowledge, predicting what would happen next in the story, and asking "why" questions as they read. At the start of the intervention, tutors modeled the strategies; later, they prompted students to use them. Two weeks were spent reviewing letter-sounds and decoding at the start of the intervention.

Both interventions were provided four days per week for 30 minutes per session for about 35 weeks. Tutoring sessions occurred one-on-one during the school day outside the classroom. In some cases the students received the intervention in addition to the full regular reading instruction provided to all students, and in others the intervention was conducted during part of the regular reading instruction time. Comparison group students received regular reading instruction. In some cases they also received special education services and/or Title I services.

Tutors were parents and others from the community. Sixty percent had provided tutoring in a previous intervention study for one year or more. Tutors were trained for four hours at the start of the school year. All tutors were provided with instructional scripts and were trained in modeling, scaffolding,

and providing appropriate correction. Tutors were observed at least weekly by members of the research team, who provided coaching and modeling for the tutors. A checklist was used to monitor fidelity of implementation during observations. Fidelity was 92% for SP-only tutors and 91% for SP+TP tutors across both years.

Measures for first grade included:

- PPVT-R (pretest only);
- WRAT-R Reading and Spelling (pre- and posttest); and
- Woodcock Reading Mastery Test-Revised (WRMT-R) Word Identification and Word Attack (pre- and posttest).

Pretest measures administered to second graders who did not receive intervention in first grade included:

- WRAT-R Reading and Spelling;
- WRMT-R Word Identification and Word Attack; and
- Fluency measure with two grade-level passages taken from the Informal Reading Inventory.

Posttest measures administered at the end of second grade included:

- WRAT-R Reading and Spelling;
- WRMT-R Word Identification and Word Attack;
- Fluency measure with two grade-level passages taken from the Informal Reading Inventory;
- Test of Word Reading Efficiency (TOWRE) Sight Word and Phonemic Decoding subtests; and
- Reading comprehension measure involving two decodable passages and two less decodable passages with more high-frequency words with five to seven comprehension questions (inferential and literal) and retell of main ideas for two passages (one decodable and one nondecodable).

No differences existed on first-grade pretest measures for the SP and SP+TP groups. At the end of first grade, the SP and SP+TP groups showed gains that averaged 17 standard score points. These gains brought them up to or near grade-level performance. At the end of second grade, SP students scored significantly higher that SP+TP students on the Word Attack and Word

Identification subtests. The SP students also appeared to maintain their first-grade gains through second grade, while the SP+TP students made little to no gain. At the end of second grade, students who only received TP were compared to the control group. Results at the end of second grade showed no significant differences on any measure. When compared with the control group, effect sizes at the end of second grade ranged from 0.05 to 0.38 for the TP group (average=0.21, SE=0.11) and were not significantly different from zero. For the SP+TP group compared with the control group, effects ranged from 0.07 to 0.92 (average=0.40, SE=0.09). The average effect size differed significantly from zero, although effects on some measures were not different from zero. For the SP group compared with the control group, effects ranged from 0.05 to 2.06 for the SP group (average=1.18, SE=0.14). All of these effects were significantly different from zero and were 0.99 or higher except for comprehension.

These results affirm the value of phonics-based intervention for first-grade students at risk for reading problems. However, the efficacy of continued intervention in second grade and of intervention beginning in second grade is questionable, particularly when non-teachers are used as tutors.

Jenkins, J. R., Peyton, J. A., Sanders, E. A., & Vadasy, P. F. (2004). Effects of reading decodable texts in supplemental first–grade tutoring. *Scientific Studies of Reading, 8,* 53–85.

In response to the lack of research on the effects of decodable texts on learning to read, the authors designed a phonics intervention for at-risk first-grade students that varied in its use of decodable texts for practice. The phonics lessons were the same for both treatment groups. A control group received no instruction beyond the standard reading curriculum.

At-risk first-grade students at 11 urban schools were identified by their teachers and then screened with the WRAT-R Reading subtest. Those scoring at or below the 25th percentile were randomly assigned to one of the treatment groups (n=95). Students were assigned to the control group (n=26) by the school. Due to attrition, the final sample sizes were 39 in the more decodable text groups, 40 in the less decodable text group, and 20 in the control group.

The phonics and word-study content of the intervention was drawn from the Sound Partners intervention, described in Vadasy et al. (2002). This

intervention focuses on learning letter-sounds, decoding text, spelling, reading nondecodable words, and text reading. The time spent in text reading from storybooks increased as the intervention progressed. In the more decodable (MD) text condition, students practiced with storybooks where the majority of the words could be read using the phonics concepts they had been taught. In the less decodable (LD) text condition, the books had fewer words that could be read using phonics skills, teaching new words through picture clues and repetition. The intervention was provided one-on-one to students in both groups for 30 minutes per day, four days per week, for 25 weeks.

Intervention was provided by paraprofessional tutors who received three hours of training on the scripted phonics lessons they were given and directions for text reading. A monthly meeting also was held for follow-up with all tutors. Observations of lessons were made weekly and coaching was provided to the tutors. Treatment fidelity was assessed during observations with a checklist, and found to exceed 90% for most elements of instruction. No differences in fidelity were found between groups.

Measures included:

- Peabody Picture Vocabulary Test-Revised (PPVT-R; pretest only);
- Two measures of letter knowledge (letter naming and letter sounds; pretest only);
- Comprehensive Test of Phonological Processing (CTOPP) Rapid Letter Naming and Nonword Repetition subtests;
- Yopp-Singer Segmentation Task (the student is asked to segment the sounds of a list of 22 words; pretest only);
- Modified Rosner Deletion Test (requires deletion of one syllable in a multi-syllabic word pretest only);
- Woodcock Reading Mastery Test-Revised (WRMT-R) Word Attack and Word Identification subtests;
- Bryant Diagnostic Test of Basic Decoding Skills (decoding up to 50 nonwords);
- WRAT-R Reading and Spelling subtests;
- Test of Word Reading Efficiency (TOWRE) Sight Word and Phonemic Decoding subtests (posttest only);

- Text Word List (10 words from each treatment, drawn from books near the highest lesson taught; posttest only);
- Fluency measure constructed from two grade-level highly decodable passages and one grade-level passage with high-frequency words that was less decodable (posttest only);
- WRMT-R Passage Comprehension subtest (posttest only); and
- 20-item measure of growth in word reading, with words drawn from the first 200 words of the Fry Instant Word List (administered in November, February, and May).

No significant pretest differences were found between any groups. In analyzing posttest results, the Word Attack pretest score was used as a covariate for decoding measures, the Word Identification pretest score was used as a covariate for word reading measures, the PPVT-R was used as a covariate for reading comprehension, and WRAT-R Spelling was used as a covariate for spelling measures. Results were analyzed first for all students who received treatment versus the control group and then for the more decodable text group versus the less decodable text group.

Results on the decoding measures indicated that the combined treatment groups scored higher than the control group on Bryant's Diagnostic Test of Basic Decoding Skills and Word Attack; no differences were observed on the TOWRE Phonemic Decoding test. The treatment group also scored significantly higher than the control group on the WRAT-R Reading, WRMT-R Word Identification, TOWRE Sight Word, Text Word list, WRAT-R Spelling, and WRMT-R Passage Comprehension. The treatment group outperformed the control group on reading fluency for the highly decodable passages. Effect sizes for the less decodable group compared with the control group ranged from 0.41 to 1.11 (average=0.61, SE=0.07). Effect sizes for the more decodable group compared with the control group ranged from 0.35 to 0.99 (average=0.65, SE=0.07). For both treatment groups, the average effect size was significantly different from zero, although effects on some measures were not.

When the two treatment groups were compared, no significant differences were found on any measure. Most students in both groups achieved grade-level or near grade-level performance on the WRMT-R Word Identification and Word Attack tests. Growth in word reading as measured on the words from the Fry Instant Word List was examined using growth curve analysis. All students

showed significant growth, but there were no significant between-group differences.

Based on these results, the authors conclude that the intervention was effective overall, but the degree to which the practice texts were decodable had no effect on student outcomes. Additional phonics instruction and practice in text reading, at least when provided one-on-one, is associated with improving word reading and decoding for most at-risk first graders. No added benefit was gained through the purposeful use of highly decodable practice texts. The extent to which these findings would generalize to first-grade classroom instruction is unknown.

Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2005). Relative effectiveness of reading practice or word–level instruction in supplemental tutoring: How text matters. *Journal of Learning Disabilities, 38,* 364–380.

The authors again tested the efficacy of the Sound Partners intervention (described in Vadasy et al., 2002), this time varying the emphasis on decoding instruction and text reading within the intervention. The purpose of the study was to determine how to allocate instructional time in order to maximize the efficacy of the intervention. The authors sought to investigate the relative effects of giving additional time to oral reading practice (Reading Practice condition) or to intensive word study (Word Study condition) on decoding, word identification, fluency, and comprehension.

Students were first graders from 12 urban elementary schools in the Northwest. Six schools served as intervention sites, five as control sites, and one included students in both treatment and control groups. At the start of first grade, classroom teachers referred students whom they believed were at risk for reading problems. These students were screened using the Wide Range Achievement Test-Revised (WRAT-R) Reading subtest. Those whose scores fell at or below the 25th percentile were eligible for the intervention. Assignment to groups was based on scheduling of available tutors. Of the 99 students originally identified for intervention, 78 completed the intervention. Triads of students (one from each treatment condition and one from the control condition) were matched based on pretest scores. As a result of this matching procedure and the size of the Word Study group (n=19), just 57 of the 78 students were included in the analysis. There were no significant group differences on any pretest measure.

The intervention was provided by paraprofessional tutors, more than half of whom had one or more years of experience in implementing Sound Partners. Tutors with prior experience received two hours of training; new tutors were trained for four hours. Ongoing coaching was provided through weekly visits and observation by research team members. Treatment fidelity was also assessed during these observations using a checklist. Average fidelity ratings were around 95% for both interventions.

Students received one-on-one tutoring four days per week for 30 minutes per session over a 35-week period. Sessions took place during the classroom reading instruction block. The two treatment groups differed in their use of tutoring time. In the Reading Practice group, students spent 15-20 minutes on phonics instruction using Sound Partners and then spent 10-15 minutes in oral reading using decodable texts. In the Word Study group, students spent the full 30 minutes in Sound Partners instruction with no oral reading practice during the session. The additional word study time was spent working with additional letter sounds, two-letter pairs, decoding with silent-e, and repeated reading of word lists.

Measures included:

- Peabody Picture Vocabulary Test-Revised (PPVT-R; pretest only);
- Two measures of letter knowledge (letter naming and letter sounds);
- Comprehensive Test of Phonological Processing (CTOPP) Nonword Repetition subtest;
- Modified Rosner Deletion Test (requires deletion of one syllable in a multi-syllabic word);
- Woodcock Reading Mastery Test-Revised (WRMT-R) Word Attack and Word Identification subtests;
- WRAT-R Reading and Spelling subtests;
- Test of Word Reading Efficiency (TOWRE) Sight Word and Phonemic Decoding subtests (posttest only);
- WRMT-R Passage Comprehension subtest (posttest only); and
- Fluency measure constructed from three grade-level passages (posttest only).

Researchers also collected observational data on student attention during tutoring sessions. Attention was rated on a 5-point scale.

No significant differences existed between any groups at pretest. At posttest, analyses were conducted with WRAT-R Reading pretest scores as a covariate for measures of reading accuracy and efficiency. The treatment groups scored significantly higher than the control group on all measures other than reading fluency rate. The two treatment groups did not differ significantly from each other on any measure other than reading fluency rate and accuracy. Effect sizes for the Reading Practice group compared with the control group ranged from 0.17 to 0.99 (average=0.63, SE=0.11). For the Word Study group, effect sizes ranged from 0.13 to 1.33 (average=0.62, SE=0.11). For both treatment groups, the average effect size was significantly different from zero, although effects on some measures were not.

Researchers concluded that both variations of the intervention were effective for at-risk first-grade students. Gains compared with control group students were greater than one standard deviation for all measures of reading accuracy. Findings indicate that reading practice has a beneficial effect similar to that of word study. However, reading fluency rates remained below the benchmark of 40 words per minute correct for the intervention groups (35 words per minute correct for the Reading Practice group and 27 words per minute correct for the Word Study group). More students in the Reading Practice group were above the benchmark compared with the Word Study group (7 students vs. 1 student). The additional supported practice may have raised the fluency rate for this group.

Mathes, P. G., Denton, C. A., Fletcher, J. M., Anthony, J. L., Francis, D. J., & Schatschneider, C. (2005). The effects of theoretically different instruction and student characteristics on the skills of struggling readers. *Reading Research Quarterly, 40,* 148–182.

The authors set out to determine if enhanced classroom reading instruction in combination with a small-group intervention would be more effective for at-risk first graders than enhanced classroom instruction alone. They also compared two intervention programs—one based on behaviorist theory (Proactive Reading) and one based on cognitive theory (Responsive Reading)—to determine if they would differ in effectiveness based on characteristics of the students receiving the intervention. A group of typically achieving first-grade

students was included to compare how effectively the interventions "closed the gap" between at-risk students and those not at risk.

First-grade students from six urban schools in Texas participated in the study. None were Title I schools, but all were diverse in the ethnicity and SES of students enrolled. All schools had been commended for their reading scores on the state proficiency examination. As a result, researchers had confidence that the core reading program was being implemented effectively.

Students were identified for intervention through end-of-kindergarten screening using the Texas Primary Reading Inventory. Students who entered the school in first grade were screened with the first-grade version of the same instrument. Those identified through either screening as potentially at risk were given the Woodcock-Johnson III (W-J III) Word Identification subtest, the Observation Survey of Early Literacy Achievement text reading subtest, and a one-minute oral reading fluency measure using a passage leveled for end-of-first grade. Students who read five or more words correctly or who read with 90% accuracy at Level D were excluded from the intervention group.

Students determined to be at risk were randomly assigned within their schools to receive enhanced classroom instruction only or enhanced instruction plus one of the two interventions. A group of typically achieving students was also selected at random from the same classrooms. A cohort of students was selected to participate from two successive school years to provide a sufficient sample size for analysis. Sample sizes after attrition were 78 for the Proactive Reading intervention, 83 for Responsive Reading, 91 for enhanced classroom instruction only, and 101 for the typical achieving group.

The interventions were provided by six certified teachers who were hired by the researchers. All had experience with teaching primary-grade students. They received 42 hours of training at the start of the program and 12 hours in the second year of the study. Monthly half-day meetings were held throughout the course of the study. Teachers in each intervention met separately to review videotaped lessons, discuss implementation issues, and problem-solve issues related to the growth of particular students. The developers of each intervention provided onsite coaching throughout the intervention years. They also monitored fidelity of implementation, which was found to be uniformly high across both small-group interventions.

Over the two years of the study, 30 first-grade teachers at the participating schools took part in the enhanced classroom instruction aspect. All were

implementing one of two basal reading programs, although in a varied manner involving the integration of other resources and methods. Researchers enhanced classroom instruction by providing teachers and principals with progress-monitoring data (passage reading fluency) every three weeks. Teachers took part in a one-day seminar on how to use these data to provide differentiated instruction. Peer tutoring was introduced to teachers in the second year of the study. The researchers were also available to the teachers as consultants to assist them with instructional issues and questions related to reading instruction. The teachers were observed three times during each school year to gather data on the instruction that students in the enhanced classroom instruction-only condition were receiving.

The Proactive Reading and Responsive Reading interventions were provided in groups of three students. They met daily for 40 minutes for approximately 7 months. The groups met at a time when classroom reading instruction was not occurring, so that the intervention would be in addition to the enhanced classroom instruction.

Proactive Reading is based on the Direct Instruction approach. It relies on the behaviorist model, using positive reinforcement to encourage growth in reading skills. The teacher's role is to provide instruction in progressively more difficult skills as the student shows mastery of simpler skills. Students have many opportunities to practice their skills as they are learning them. The program follows a set scope and sequence, which starts with very basic skills and builds on them progressively toward the goal of reading with fluency and comprehension. Teachers followed this set plan, which provided scripted lessons and planned reinforcements for correct student responses. When students made errors, teachers provided additional instruction, scaffolding, and more opportunities for practice.

Responsive Reading draws from cognitive theory, using cognitive strategy instruction as its main approach to teaching reading skills. The teacher models a particular concept or strategy, guides students in practicing it, and then provides coaching and scaffolding support while the student practices. The goal is for students to learn to apply the strategies on their own. Instruction is explicit for early essential skills. Teachers modify each day's instruction to reflect the needs of the students, focusing on one particular student's needs each day. Responsive Reading doesn't have a set scope and sequence.

Both Responsive Reading and Proactive Reading included the essential components of research-based reading instruction. Both interventions taught phonemic awareness and alphabetic skills and emphasized using this knowledge in reading text and comprehending it. Proactive Reading emphasized the practice of skills and word reading in isolation, while Responsive Reading emphasized the application of strategies and skills while reading passages or books. Text read in the Proactive Reading intervention was fully decodable, while in the Responsive Reading intervention the texts were at progressively more difficult levels but were not decodable. Limited time was spent on writing in the Proactive Reading intervention and mostly involved spelling individual words. In Responsive Reading, students used nine minutes of their lesson to write complete sentences as they received instruction in spelling.

Assessment was conducted four times during the school year to model students' reading growth. These measures included:

- Comprehensive Test of Phonological Processing (CTOPP) First Sound Comparison, Blending Onset-Rime, Blending Words, Blending Nonwords, and Phoneme Elision subtests; scores on these subtests were combined into a single scaled score for phonological awareness using item response theory procedures;
- CTOPP Rapid Automatized Naming subtest;
- Untimed reading of words from a list of increasingly difficult words;
- Test of Word Reading Efficiency (TOWRE) Sight Word Efficiency and Phonemic Decoding Efficiency subtests; and
- Passage reading fluency words correct per minute using a one-minute oral reading from a passage at the end-of-first-grade level.

Outcome measures were administered at the end of the year. These measures included:

- WJ-III Word Attack, Word Identification, Passage Comprehension, Reading Fluency, Spelling, and Calculations subtests;
- Comprehensive Assessment of Reading Battery Revised for First Grade (CRAB-R; administered only to students with a raw score of 5 or greater on the WJ-III Passage Comprehension subtest); and

- Wechsler Abbreviated Scale of Intelligence (WASI) Vocabulary subtest.

At the start of the intervention, the scores for the three at-risk groups were generally comparable. The Responsive Reading group had higher Rapid Automatized Naming scores than the enhanced classroom instruction-only group. The typically achieving students had scores that were significantly higher than the other groups and exceeded the normed average by one standard deviation. No other differences were significant at the start of the intervention.

Growth over time in phonological awareness, untimed word reading, word reading fluency, and nonword reading fluency differed between groups. The Proactive Reading and Responsive Reading groups grew more rapidly than the enhanced classroom and typically achieving groups in phonological awareness and untimed word reading. The Proactive group grew more rapidly than the Responsive group in phonological awareness and more rapidly than the typically achieving and enhanced classroom group on word reading fluency and nonword reading fluency. For passage reading fluency, data were analyzed separately for the two years of cohorts because of a change to the number of passages read. For Cohort 1, the typically achieving group had more rapid growth than the other groups. No difference between the at-risk groups was found for April scores. In Cohort 2, both intervention groups had more rapid growth than the typically achieving group and the enhanced instruction only. No other significant differences were found in growth over time.

At the last growth measurement point in April, the two intervention groups had significantly higher scores on phonological awareness, untimed word reading, and word reading fluency than the enhanced classroom group, but remained below the typically achieving group. No differences were found in April between the intervention groups. No other significant differences were found in April scores.

The analysis of end-of-year outcomes controlled for effects of classroom, ethnicity, and gender. Both intervention groups scored significantly higher than the enhanced classroom group on WJ-III Word Identification and Spelling. The Proactive group also outperformed the typically achieving, enhanced classroom, and Responsive groups on WJ-III Word Attack. No other group differences were significant. Effect sizes for the Proactive Reading group compared to the enhanced classroom group ranged from 0.00 to 0.63 (average=0.34; SE=0.06). Effect sizes for the Responsive Reading group compared to the enhanced

classroom group ranged from 0.17 to 0.53 (average=0.30; SE=0.06). For both intervention groups, the average effect size was significantly different from zero, although effects on some measures were not. These effect sizes may somewhat underestimate the efficacy of the interventions, given that the comparison group did receive a type of intervention through the enhanced classroom instruction.

These results indicate that both types of interventions were effective for at-risk first graders, over and above the effect of enhancing an already strong core reading curriculum. Students in the intervention group showed gains both in their rate of learning and end-of-year outcomes that were greater than those of the at-risk students who received only the enhanced classroom instruction. Student characteristics did not result in any differences in the effectiveness of either intervention. Although neither intervention fully closed the achievement gap between at-risk students and typically achieving peers, students in the invention groups did reach a level of achievement on standardized measures that reflects performance in the average range. Neither intervention proved superior, indicating that the philosophy of a particular intervention may be less important than its inclusion of research-based aspects of effective reading intervention.

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

The authors targeted this intervention at kindergarten students who are struggling with phonological language skills. It is thought that students with delays in this area are most at risk for reading disabilities. The study sought to prevent reading problems by providing an extensive early intervention.

Three types of interventions were compared with a control condition where students received only typical classroom instruction. In the regular classroom support condition (RCS), tutoring focused on providing additional support in skills and activities found in their classroom reading program. This intervention varied by school to some extent, due to differences in the way reading instruction was provided. The other two interventions varied in their emphasis on explicit instruction in phonological awareness and phonetic reading skills and the amount of practice students were given in these skills. The phonological

awareness and synthetic phonics intervention (PASP) was based on the Lindamood Auditory Discrimination in Depth Program. Students began learning phonemes through their associated mouth movements. Practice in decoding and spelling words was emphasized. Students at first read books with text restricted to phonemes that they had learned. As they progressed to multisyllabic text, they read classroom books and appropriate trade books. The embedded phonics (EP) intervention also involved phonics training, but in the context of reading stories and writing text. Students took part in games that taught word reading, letter-sound training with a list of sight words, writing sentences using these words, and reading sentences. As students progressed, they spent more time reading and less time writing. They read from basal series and trade books.

All interventions were provided through four 20-minute one-on-one sessions each week for 2 1/2 years. Of the four weekly sessions, two were conducted by certified teachers and two by instructional aides who reinforced what the students had learned in the previous session. A total of 88 hours of instruction was provided. Before beginning the intervention, teachers received 20 hours of training specific to the method they were implementing. Three-hour biweekly meetings were held during the intervention period. Aides received 6 hours of training and then met once per month for additional training throughout the intervention. Both teachers and aides were randomly assigned to an intervention type.

Students from 13 elementary schools were screened at the beginning of kindergarten on letter name knowledge, Phoneme Elision (to measure phonological awareness), and the Vocabulary subtest of the Stanford-Binet (students scoring below 75 were excluded). After screening, the 180 qualifying children were randomly assigned to one of the four interventions. The participants varied in ethnicity and SES. To minimize attrition, students were followed if they transferred to another local school.

Outcome measures included:

- Woodcock Reading Mastery Test-Revised (WRMT-R) Word Identification and Word Attack subtests (administered at five assessment points);
- Phoneme elision and phoneme blending (administered at five assessment points);
- List of real words and a list of nonwords that increased in difficulty very gradually (administered at five assessment points);

- Test of Word Reading Efficiency (TOWRE) Sight Word Efficiency and Phonemic Decoding Efficiency subtests (end of second grade only);
- WRMT-R Passage Comprehension subtest (end of second grade only);
- Gray Oral Reading Test-III (GORT-III) (end of second grade only);
- Wide-Range Achievement Test-Revised (WRAT-R) Spelling subtest (end of second grade only);
- A measure of developmental spelling (accuracy of representation of phonemes in spelling; end of second grade only); and
- Woodcock-Johnson Psycho-Educational Battery-Revised Calculation subtest (end of second grade only).

At the end of second grade, 138 students who attended 23 different schools remained in the study. However, 26% of participants had been retained in kindergarten or first grade. The retention rate differed significantly across groups; far fewer students in the PASP group were retained (9%) compared with the other three groups (41%, 30%, and 25% for the control, RCS, and EP groups). In analyzing the outcome data, researchers chose to report results including all 138 students on key measures and then conducted further analyses using just those students in the PASP and EP condition who could be matched on educational experience.

In the overall analysis with all students, the PASP group scored significantly higher than all other groups on Word Attack and Nonword List (measures of phonemic decoding). The PASP group also significantly outperformed the control and RCS groups on Word Identification and Real Word List (measures of real word reading) and outperformed the control group on the measure of developmental spelling. Students in the PASP group had standard scores at the end of the intervention that were in the low-average to average range on word reading and reading comprehension. Effect sizes for the PASP group compared with the control group ranged from 0.14 to 1.21 (average=0.58, SE=0.07). Effect sizes for the EP group compared with the control group ranged from 0.00 to 0.91 (average=0.29, SE=0.07). Effect sizes for the RCS group compared with the control group ranged from 0.00 to 0.79 (average=0.22, SE=0.07). For all three interventions, the average effect sizes were significantly different from zero, although effects on some outcome measures did not differ from zero.

In further analyses, the 9 students in the EP group who had been retained were matched with students in the PASP group on measures at the end of kindergarten. These students were dropped from further analyses. No significant differences were found between these groups on any pretest measures or demographic variables. PASP students scored significantly higher than EP students on measures of phonological awareness, untimed decoding, phonemic decoding efficiency, and untimed word reading. No differences were found for reading comprehension. Growth curve analyses were conducted to determine which factors significantly contributed to variation in reading growth on the untimed measures of decoding and real word reading. The variables that contributed most to the differences between the PASP and EP groups were rapid naming ability, home background, and teacher ratings of classroom behavior.

Results suggest that the most effective one-on-one intervention includes direct and focused instruction in phonemic awareness and decoding. However, given that no between-group differences were found for reading comprehension, the ultimate effectiveness of even this type of intervention remains somewhat questionable. A more effective intervention might incorporate instruction in comprehension strategies and skills in addition to phonemic awareness and decoding. Despite the added cost, having teachers (rather than aides) provide all instruction might increase the effectiveness of the intervention.

Gunn, B., Biglan, A., Smolkowski, K., & Ary, D. (2000). The efficacy of supplemental instruction in decoding skills for Hispanic and Non–Hispanic students in early elementary school. *The Journal of Special Education, 34,* 90–103.

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. *The Journal of Special Education, 36,* 69–79.

Both of these reports present findings from a two-year reading intervention. The 2002 publication reports data for a one-year follow-up after the end of the intervention. The authors set out to determine the effectiveness of an intervention that emphasized phonological awareness and decoding for both

Hispanic and White, non-Hispanic students. Spanish-speaking Hispanic students were included in the study and taught decoding skills in English.

Students were selected from nine elementary schools in three small towns in Oregon with substantial Hispanic populations. Kindergarten through third-grade students were screened at the beginning of the school year on a measure of aggressive behavior and on DIBELS Rapid Letter Naming, Phoneme Segmentation Fluency, Phoneme Onset Fluency, and Oral Reading Fluency measures as appropriate for their grade level. Scores on these measures were averaged for each student. Those scoring below grade level qualified for intervention. These students were then matched on ethnicity, grade, and reading ability. One student from each pair was randomly assigned to the intervention and the other student to the control condition.

The intervention was conducted for 25-30 minutes each day, in groups of 2-3 students or one-on-one. The intervention was provided at a time that did not interfere with regular classroom instruction. The Reading Mastery (grades 1 and 2) and Corrective Reading (grades 3 and 4) programs formed the basis for the intervention. These programs emphasize phonological awareness, letter-sound correspondence, decoding, and fluency. Teachers provide direct instruction and modeling in reading skills. Students have many opportunities for practice with immediate feedback and cumulative reviews. Skills are taught until they are mastered.

Intervention was provided by 10 instructional assistants, three of whom were certified teachers. The remaining seven had some experience in tutoring elementary school students. Ten hours of training were provided before the start of the intervention. The instructors were observed weekly for the first month of intervention, and bi-weekly thereafter. Observations were conducted with a checklist to monitor fidelity of implementation; observers provided corrective feedback as necessary. Instructors also met twice a month with the trainers as a group for additional practice and to discuss the needs of particular students.

Outcomes were assessed at the end of the first year of intervention (students had received 6-7 months of treatment), at the end of the second year of intervention (students had received the year one treatment and a full school year of treatment in year two), and one year after the end of the second year of intervention (no treatment was received during this year).

Outcome measures included:

- Oral reading fluency; and
- Woodcock-Johnson Tests of Achievement (WJ-R) Letter-Word Identification, Word Attack, Passage Comprehension, and Reading Vocabulary subtests (Passage Comprehension and Reading Vocabulary were administered at the end of year two and at follow-up only).

At pretest, the only significant difference found was between non-Hispanic and Hispanic students, with non-Hispanic students scoring significantly higher. There were no differences between the treatment and control groups. At the end of the first year of intervention, only those students who had received at least 5 months of instruction (and their matched controls) were included in the analysis (n=256 across all grades and conditions). The only significant difference by group occurred on Word Attack, with the treatment group scoring significantly higher. The only significant difference by ethnicity was found on Oral Reading Fluency, where Hispanic students scored significantly lower.

At the end of the second year of intervention, 198 students had complete data. Significant differences were found on the Word Identification, Word Attack, Reading Vocabulary, and Passage Comprehension subtests, all favoring the treatment group, with effect sizes ranging from 0.27 to 0.73 (average=0.39, SE=0.07). The average effect size differed significantly from zero, although effects on some outcome measures did not. Hispanic students had a significantly smaller gain on the Reading Vocabulary subtest than non-Hispanic students. No other differences were significant. Improvements in oral reading fluency were found to be the best predictor of reading comprehension.

Further analysis of the Hispanic students indicated that those who spoke limited English at the start of the intervention made gains similar to those who were proficient English speakers. The Oral Reading Fluency scores for those in the intervention group who spoke limited English were higher than their matched control group participants.

At one-year follow-up, data were available for 195 students. Differences were significant for Word Attack and Passage Comprehension for Hispanic students (regardless of initial English proficiency) and on Oral Reading Fluency for all students. However, students who received intervention continued to have below-average scores on the WJ-R measures at follow-up. Sufficient data to compute accurate effect sizes were not available for the follow-up analyses.

The authors note that this intervention's long duration may account for the effects found, given that more differences were apparent at the end of the second year of intervention than at the end of the first year. Struggling students may need long-term help to make significant gains in reading skills.

Miller, S. D. (2003). Partners–in–reading: Using classroom assistants to provide tutorial assistance to struggling first-grade readers. *Journal of Education for Students Placed At Risk, 8,* 333–349.

The author implemented this intervention in a Title I elementary school in the Carolinas that lacked sufficient resources to provide Reading Recovery tutors for all first-grade students who needed assistance. To reduce the cost of intervention, a tutoring program was implemented by classroom assistants who were already employed by the school. The goal of the study was to determine if this intervention could provide comparable results to Reading Recovery and superior results compared with a comparison group that received only classroom instruction.

The Partners in Reading (PIR) intervention was implemented with two successive cohorts of first-grade students. Students were selected to receive intervention based on scores on an assessment of developmental spelling and word list reading. Teachers were also asked to rank their students in terms of reading ability. Students in the lowest third on all three criteria were candidates for intervention. Comparison group students were those with pretest scores within one standard deviation of the mean of the PIR and Reading Recovery (RR) groups. In the first cohort, 19 students received the PIR intervention, 30 received RR, and 29 were in the comparison group. In the second cohort, 35 received PIR, 32 received RR, and 29 were in the comparison group.

The PIR intervention was implemented by classroom assistants, most of whom had only high school degrees. They were trained at two half-day workshops before the beginning of the intervention. The author visited the school weekly during the first 6 weeks of the intervention to observe the tutors and answer their questions. For the remainder of the intervention, observations were made every three weeks.

PIR focused on increasing students' ability to read independently and at progressively more difficult reading levels. During each session, students re-read a book previously mastered, were introduced to a new book at their reading level, and engaged in word-sort activities. Tutors gave students

feedback and encouragement and modeled reading strategies for students to practice. They also helped students to set reading goals and monitored student progress.

Tutoring sessions were provided 4 times per week for 40 minutes per session. Students who participated in the first year of implementation were tutored for a full year. In the second year, students who had reached the reading level criterion used by Reading Recovery as a graduation point in January exited the PIR program.

Outcome measures included word recognition and developmental spelling assessments from the Howard Street Training Manual. Additionally, scores from the school-administered Metropolitan Achievement Test for reading and language arts at the end of second grade were analyzed. The test includes word recognition, vocabulary, language, and reading comprehension subtests.

Results were analyzed separately by cohort for the word recognition and developmental spelling assessments. For the first cohort, there were no differences among groups at the beginning of the intervention. At the end of first grade, students who received PIR or RR scored significantly higher than students in the comparison group on word recognition and developmental spelling. Scores did not differ between the two intervention groups. Identical results were found with the second cohort. Effect sizes ranged from 0.71 to 1.09 (average=0.85, SE=0.14) for the PIR group compared with the control group across cohorts and 0.88 to 1.10 (average=0.97, SE=0.14) for the RR group compared with the control group. Average effect sizes and effects for all outcome measures were significantly different from zero for both the PIR and RR groups.

When analyzing data from the end-of-second-grade achievement test, cohorts were combined due to the high rate of attrition across all groups. PIR and RR students scored significantly higher than comparison group students on the word recognition subtest. PIR students scored significantly higher than the comparison group on comprehension, although the RR group did not. No differences were found on the vocabulary and language subtests. Despite these encouraging findings, scores for PIR students remained below those of typically achieving students.

These results indicate that it is possible for struggling students to make substantial progress with an intensive reading intervention. Such interventions need not be extremely costly in order to be effective.

TABLE 2. STUDY CHARACTERISTICS

Study	Number of participants at end of intervention	Grade	Student characteristics	Person implementing	Group size	Length of sessions (minutes)	Length of intervention	Total number of sessions	Frequency of sessions	Total hours of intervention
Foorman et al. (1997)	112	Grades 2 & 3	Identified as LD and scored in lowest 25% on WJ-R Basic Reading Cluster	Special education teacher	Mean of 8	60	1 school year	NR[c]	5 days/ week	NR
Gunn et al. (2000, 2002)	195	K-Grade 3	Rated high in aggression by teachers (n=156) or scored below grade level on screener (n=100)	Instructional aides, some teachers	1:1 to 1:3	25-30	15-16 months	300	5 days/ week	NR
Jenkins et al. (2004)	99	Grade 1	At-risk readers who scored in lowest 25% on WRAT-R Reading subtest	Para-professionals	1:1	30	25 weeks	100	4 days/ week	50
Mathes et al. (2005)	252	Grade 1	At-risk readers who met risk criteria on multiple screeners	Teachers	1:3	40	35 weeks	175	5 days/ week	117
Miller (2003)	76 for Cohort 1; 95 for Cohort 2	Grade 1	At-risk readers who scored in lowest third on screener and teacher rankings	Para-professionals	1:1	40	1 school year	NR	4 days/ week	NR (approx. 67)
Morris et al. (2000)	86	Grade 1	At-risk readers who scored in lowest 20% on screener	General education teacher, other teachers and educators	1:1	30	Approx. 32 weeks	Average of 91; range 80-107	5 days/ week	40-53.5

[c]NR=Not reported

Study	Number of participants at end of intervention	Grade	Student characteristics	Person implementing	Group size	Length of sessions (minutes)	Length of intervention	Total number of sessions	Frequency of sessions	Total hours of intervention
Santa & Hoien (2000)	98	Grade 1	At-risk readers who scored in lowest 20% on screener	General education teacher, Title I tutors, other educators	1:1	30	35 weeks	175	5 days/ week	87.5
Schneider et al. (2000)	253	K	At-risk readers who scored in lowest 25% on screener	General education teacher	1:5 to 1:8	10-15	20 weeks	100	5 days/ week	25
Torgesen et al. (1999)	138	K-Grade 2	At-risk readers with the lowest combined scores on letter naming and phonological awareness measures	Teachers and instructional aides	1:1	20	130 weeks	520	4 days/ week	173
Vadasy et al. (1997)	35	Grade 1	At-risk readers who met risk criteria on multiple screeners	Para-professionals	1:1	30	27 weeks	100	4 days/ week	50
Vadasy et al. (2002)	65	Grades 1 & 2	At-risk readers who scored below 90 on WRAT-R Reading subtest	Para-professionals	1:1	30	35 weeks	140	4 days/ week	Mean=36.4 (SD=6.29)
Vadasy et al. (2005)	57	Grade 1	At-risk readers who scored in lowest 25% on WRAT-R Reading subtest	Para-professionals	1:1	30	35 weeks	140	4 days/ week	Approx. 70

TABLE 3. EFFECT SIZES BY MEASURE AND GROUP COMPARISON

Intervention	Measure[d]	Effect size[e]
Foorman et al. (1997) • T1 *(Analytic phonics—AP)*: Using scripted researcher-developed lessons, students learned onsets and rimes, wrote words, discussed word meanings, wrote sentences using rimes, and did independent, shared, or directed reading (n=38). • T2 *(Synthetic phonics—SP)*: Using a program based on the Orton-Gillingham approach, students learned phonics by learning letter names, letter sounds, and blending through a multi-sensory technique (n=46). • T3 *(Sight-word—SW)*: Using a commercially available reading program, students learned about 150 words plus endings. Researchers added a spelling component and used storybook lessons to introduce words in increasingly complex sentences (n=28).	AP vs. SW orthographic processing AP vs. SW phonological analysis AP vs. SW word reading SP vs. AP orthographic processing SP vs. AP phonological analysis SP vs. AP word reading SP vs. SW orthographic processing SP vs. SW phonological analysis SP vs. SW word reading	0.23 0.27 0.19 0.29 0.39 0.38 0.05 0.59* 0.17
Gunn et al. (2000) • T *(Reading Mastery/Corrective Reading)*: Intervention was provided over a two-year period and involved programs that emphasized phonological awareness, letter-sound correspondence, decoding, and fluency (n=95). • C *(typical classroom instruction)*: Administered measures only (n=94) *Outcomes were measured after one semester (Time 1) and three semesters (Time 2) of intervention.*	T vs. C Time 1 WJ-R Word Attack (standardized) T vs. C Time 1 Oral reading fluency T vs. C Time 1 WJ-R Letter-Word Identification (standardized) T vs. C Time 2 WJ-R Word Attack (standardized) T vs. C Time 2 Oral reading fluency T vs. C Time 2 WJ-R Letter-Word Identification (standardized) T vs. C Time 2 WJ-R Passage Comprehension *(standardized)* T vs. C Time 2 WJ-R Reading Vocabulary *(standardized)*	0.54* 0.09 0.20 0.73* 0.27 0.34* 0.28 0.31*
Jenkins et al. (2004) • T1 (More decodable texts—MD): Scripted lessons (Sound Partners program) that included practicing letter-sound relations, reading decodable words, spelling, reading non-decodable words, and text reading using story books that could be read from letter-sound	LD vs. C Bryant Diagnostic Test of Basic Decoding Skills LD vs. C nonphonetically controlled accuracy LD vs. C nonphonetically controlled fluency LD vs. C WRMT-R Passage Comprehension *(standardized)* LD vs. C phonetically controlled accuracy LD vs. C phonetically controlled fluency LD vs. C text word list	1.11* 0.41 0.51 0.76* 0.51 0.48 0.49

Intervention	Measure[d]	Effect size[e]
relations and word features taught previously (n=39). • T2 (Less decodable texts—LD): Same intervention as T1, but used books in story reading that contained fewer words that were decodable based on phonics instruction (n=40). • C (typical classroom instruction): Administered measures only (n=20)	LD vs. C TOWRE decoding *(standardized)* LD vs. C TOWRE sight word (standardized) LD vs. C WRMT-R Word Attack (standardized) LD vs. C WRMT-R Word Identification (standardized) LD vs. C WRAT-R reading *(standardized)* LD vs. C WRAT-R spelling *(standardized)* LD vs. C WRAT-R spelling words correct *(standardized)* MD vs. C Bryant Diagnostic Test of Basic Decoding Skills MD vs. C nonphonetically controlled accuracy MD vs. C nonphonetically controlled fluency MD vs. C WRMT-R Passage Comprehension *(standardized)* MD vs. C phonetically controlled accuracy MD vs. C phonetically controlled fluency MD vs. C text word list MD vs. C TOWRE decoding *(standardized)* MD vs. C TOWRE sight word *(standardized)* MD vs. C WRMT-R Word Attack (standardized) MD vs. C WRMT-R Word Identification (standardized) MD vs. C WRAT-R reading *(standardized)* MD vs. C WRAT-R spelling *(standardized)* MD vs. C WRAT-R spelling words correct *(standardized)* MD vs. LD Bryant Diagnostic Test of Basic Decoding Skills MD vs. LD nonphonetically controlled accuracy MD vs. LD nonphonetically controlled fluency MD vs. LD WRMT-R Passage Comprehension *(standardized)* MD vs. LD phonetically controlled accuracy MD vs. LD phonetically controlled fluency MD vs. LD text word list MD vs. LD total word read Feb MD vs. LD total word read May MD vs. LD total word read Nov MD vs. LD TOWRE decoding *(standardized)* MD vs. LD TOWRE sight word *(standardized)* MD vs. LD WRMT-R Word Attack (standardized) MD vs. LD WRMT-R Word Identification (standardized) MD vs. LD WRAT-R reading decoding *(standardized)* MD vs. LD WRAT-R spelling *(standardized)* MD vs. LD WRAT-R spelling words correct *(standardized)*	0.79* 0.48 0.65* 0.48 0.69* 0.58* 0.69* 0.99* 0.44 0.46 0.86* 0.81* 0.56* 0.93* 0.35 0.55 0.83* 0.50 0.74* 0.51 0.68* 0.12 0.06 0.07 0.10 0.12 0.03 0.14 0.17 0.15 0.25 0.00 0.08 0.18 0.02 0.05 0.07 0.01
Mathes et al. (2005) • T1 (Proactive Reading—PR): Direct Instruction approach that used positive reinforcement to encourage growth in reading skills.	PR vs. EC WJ-III Calculation *(standardized)* PR vs. EC CRAB comprehension *(standardized)* PR vs. EC CRAB fluency *(standardized)* PR vs. EC WJ-III Passage Comprehension *(standardized)*	0.09 0.13 0.26 0.21

Intervention	Measure[d]	Effect size[e]
Program follows a set scope and sequence starting with basic skills and builds toward fluency and comprehension (n=80). • T2 (Responsive Reading—RR): Cognitive strategy instruction approach where teacher models concepts and strategies, guides students in practicing them, and provides scaffolding support while student practices. Program has no set scope and sequence (n=83). • EC (enhanced classroom instruction): Teachers received progress-monitoring data every three weeks and a one-day seminar on how to use the data to provide differentiated instruction (n=82).	PR vs. EC WJ-III Spelling *(standardized)* PR vs. EC WJ-III Fluency *(standardized)* PR vs. EC WJ-III Word Attack *(standardized)* PR vs. EC WJ-III Word Identification *(standardized)* RR vs. EC WJ-III Calculation *(standardized)* RR vs. EC CRAB comprehension *(standardized)* RR vs. EC CRAB fluency *(standardized)* RR vs. EC WJ-III Passage Comprehension *(standardized)* RR vs. EC WJ-III Spelling *(standardized)* RR vs. EC WJ-III Fluency *(standardized)* RR vs. EC WJ-III Word Attack *(standardized)* RR vs. EC WJ-III Word Identification *(standardized)* PR vs. RR WJ-III Calculation *(standardized)* PR vs. RR CRAB comprehension *(standardized)* PR vs. RR CRAB fluency *(standardized)* PR vs. RR WJ-III Passage Comprehension *(standardized)* PR vs. RR WJ-III Spelling *(standardized)* PR vs. RR WJ-III Fluency *(standardized)* PR vs. RR WJ-III Word Attack *(standardized)* PR vs. RR WJ-III Word Identification *(standardized)*	0.53* 0.00 0.63* 0.52* 0.17 0.26 0.28 0.30 0.53* 0.22 0.24 0.37* 0.08 0.12 0.01 0.08 0.01 0.22 0.38* 0.15
Miller (2003) • T1 (Partners in Reading—PIR): Students read familiar books and then new books slightly above their reading level with support from tutors and did word-sort activities (Cohort 1 n=19; Cohort 2 n=35). • T2 (Reading Recovery—RR): Traditional Reading Recovery program (Cohort 1 n=30; Cohort 2 n=32). • C (typical classroom instruction): Administered measures only (Cohort 1 n=28; Cohort 2 n=29).	PIR vs. C Spelling Y1 PIR vs. C Spelling Y2 PIR vs. C Word recognition Y1 PIR vs. C Word recognition Y2 RR vs. C Spelling Y1 RR vs. C Spelling Y2 RR vs. C Word recognition Y1 RR vs. C Word recognition Y2 PIR vs. RR Spelling Y1 PIR vs. RR Spelling Y2 PIR vs. RR Word recognition Y1 PIR vs. RR Word recognition Y2	0.74* 1.09* 0.71* 0.81* 0.92* 1.10* 0.88* 0.96* 0.18 0.03 0.18 0.14
Morris et al. (2000) • T (Early Steps): Implemented the Early Steps intervention program, consisting of rereading familiar books, word study, sentence writing, and introduction of a new book (n=43). • C (small group reading instruction): Comparison group students at two schools were provided with additional reading instruction in small groups and at the other two comparison school students were taught in reading groups using Direct Instruction (n=43).	Passage reading Spelling Word recognition WRMT Passage comprehension *(standardized)* WRMT Word Attack *(standardized)*	0.79* 0.83* 0.68* 0.74* 0.76*

Intervention	Measure[d]	Effect size[e]
Santa & Hoien (1999) • T (Early Steps): Implemented the Early Steps intervention program, consisting of rereading familiar books, word study, sentence writing, and introduction of a new book (n=23). • C (additional reading instruction): Comparison group students participated in guided reading lessons and reread familiar books alone or in pairs, but received no word study intervention (n=26).	Passage reading Word recognition Spelling WRMT Word Identification (standardized) (follow-up) WRMT Word Attack (standardized) (follow up) WRMT Passage Comprehension (standardized) (follow up)	0.73* 0.91* 0.59* 0.57 1.15* 0.87*
Schneider et al. (2000) • T1 (Phonological awareness—PA): Intervention included identifying rhymes, listening to sentences and words, syllable segmentation and analysis, phoneme identification and manipulation, and word reading (n=54). • T2 (Letter-sound—LS): Twelve letters and their sounds were introduced; students were taught letter-sound correspondence and to identify initial sounds and letters in words and pictures (n=48). • T3 (Phonological awareness plus Letter-sound—PA+LS): Students received the first 10 weeks of the PA training followed by 10 weeks of metalinguistic games and letter-sound exercises (n=36). • C (typical classroom instruction): Received standard German kindergarten curriculum (n=115).	LS vs. C alliteration LS vs. C end sound LS vs. C initial phoneme LS vs. C letter knowledge LS vs. C memory span LS vs. C phoneme analysis LS vs. C phoneme synthesis LS vs. C rapid naming colored LS vs. C rapid naming uncolored LS vs. C remaining word LS vs. C words read PA vs. C phoneme synthesis PA vs. C alliteration PA vs. C end sound PA vs. C initial phoneme PA vs. C letter knowledge PA vs. C memory span PA vs. C phoneme analysis PA vs. C rapid naming colored PA vs. C rapid naming uncolored PA vs. C remaining word PA vs. C words read PA+LS vs. C alliteration PA+LS vs. C end sound PA+LS vs. C initial phoneme PA+LS vs. C letter knowledge PA+LS vs. C memory span PA+LS vs. C phoneme analysis PA+LS vs. C phoneme synthesis PA+LS vs. C rapid naming colored PA+LS vs. C rapid naming uncolored PA+LS vs. C remaining word PA+LS vs. C words read PA vs. LS alliteration PA vs. LS end sound PA vs. LS initial phoneme PA vs. LS letter knowledge PA vs. LS memory span PA vs. LS phoneme analysis PA vs. LS phoneme synthesis PA vs. LS rapid naming colored	-0.01 -0.20 0.54* 0.31 -0.65* -0.26 -0.46* 0.13 0.14 -0.49* -0.50* 0.53* -0.08 0.15 1.08* -0.50* -0.32 0.94* -0.10 -0.01 0.56* -0.61* 0.05 0.04 0.83* -0.12 -0.40 0.61* 0.33 0.18 -0.01 0.14 -0.31 -0.08 0.36 0.66* -1.27* 0.36 1.47* 1.16* 0.24

Intervention	Measure[d]	Effect size[e]
	PA vs. LS rapid naming uncolored	0.14
	PA vs. LS remaining word	1.12*
	PA vs. LS words read	-0.36
	PA vs. PA+LS alliteration	-0.13
	PA vs. PA+LS end sound	0.12
	PA vs. PA+LS initial phoneme	0.29
	PA vs. PA+LS letter knowledge	0.48*
	PA vs. PA+LS memory span	0.09
	PA vs. PA+LS phoneme analysis	0.31
	PA vs. PA+LS phoneme synthesis	0.22
	PA vs. PA+LS rapid naming colored	-0.27
	PA vs. PA+LS rapid naming uncolored	0.00
	PA vs. PA+LS remaining word	0.44*
	PA vs. PA+LS words read	-0.52*
	LS vs. PA+LS alliteration	-0.06
	LS vs. PA+LS end sound	-0.24
	LS vs. PA+LS initial phoneme	-0.35
	LS vs. PA+LS letter knowledge	0.62*
	LS vs. PA+LS memory span	-0.27
	LS vs. PA+LS phoneme analysis	-1.02*
	LS vs. PA+LS phoneme synthesis	-0.90*
	LS vs. PA+LS rapid naming colored	-0.06
	LS vs. PA+LS rapid naming uncolored	0.15
	LS vs. PA+LS remaining word	-0.84*
	LS vs. PA+LS words read	-0.34
Torgesen et al. (1999) • T1 (Regular classroom support—RCS): Tutoring focused on providing additional support in learning skills and practicing activities found in the regular classroom instruction reading program (n=37). • T2 (Phonological awareness and synthetic phonics—PASP): Intervention was based on the Lindamood Auditory Discrimination in Depth Program. Students learned phonemes initially through mouth movements and then practiced decoding and spelling (n=33). • T3 (Embedded Phonics—EP): Students received phonics instruction in the context of reading stories and writing text (n=36). • C (typical classroom instruction): Administered pretest and posttest measures only (n=32).	EP vs. C Blend phonemes	0.24
	EP vs. C Developmental spelling	0.00
	EP vs. C GORT comprehension *(standardized)*	0.30
	EP vs. C TOWRE Phonemic Decoding Efficiency *(standardized)*	0.18
	EP vs. C Nonword list	0.14
	EP vs. C WRMT-R Passage Comprehension *(standardized)*	0.08
	EP vs. C Phoneme Elision	0.23
	EP vs. C Phoneme Segmentation	0.07
	EP vs. C Real word list	0.26
	EP vs. C WRAT-R Spelling *(standardized)*	0.20
	EP vs. C WRMT-R Word Attack *(standardized)*	0.33
	EP vs. C TOWRE Sight Word Efficiency (standardized	0.91*
	EP vs. C WRMT-R Word Identification *(standardized)*	0.35
	PASP vs. C Blend Phonemes	0.33
	PASP vs. C Developmental spelling	0.72*
	PASP vs. C GORT comprehension *(standardized)*	0.30
	PASP vs. C TOWRE Phonemic Decoding Efficiency *(standardized)*	0.89*
	PASP vs. C Nonword list	0.93*
	PASP vs. C WRMT-R Passage Comprehension *(standardized)*	0.14
	PASP vs. C Phoneme Elision	0.52*
	PASP vs. C Phoneme Segmentation	0.59*
	PASP vs. C Real word list	0.71*
	PASP vs. C WRAT-R Spelling *(standardized)*	0.53*

Intervention	Measure[d]	Effect size[e]
	PASP vs. C WRMT-R Word Attack *(standardized)*	1.04*
	PASP vs. C TOWRE Sight Word Efficiency (standardized	1.21*
	PASP vs. C WRMT-R Word Identification *(standardized)*	0.36
	RCS vs. C Blend Phonemes	0.09
	RCS vs. C Developmental spelling	0.02
	RCS vs. C GORT comprehension *(standardized)*	0.12
	RCS vs. C TOWRE Phonemic Decoding Efficiency *(standardized)*	0.11
	RCS vs. C WRMT-R Passage Comprehension *(standardized)*	0.43
	RCS vs. C Phoneme Elision	0.20
	RCS vs. C Phoneme Segmentation	0.06
	RCS vs. C WRAT-R Spelling *(standardized)*	0.07
	RCS vs. C WRMT-R Word Attack *(standardized)*	0.27
	RCS vs. C TOWRE Sight Word Efficiency *(standardized)*	0.79*
	RCS vs. C WRMT-R Word Identification *(standardized)*	0.66*
	PASP vs. EP Blend Phonemes	0.14
	PASP vs. EP Developmental spelling	0.60*
	PASP vs. EP GORT comprehension *(standardized)*	3.45*
	PASP vs. EP TOWRE Phonemic Decoding Efficiency *(standardized)*	0.74*
	PASP vs. EP WRMT-R Passage Comprehension *(standardized)*	0.28
	PASP vs. EP Phoneme Elision	0.75*
	PASP vs. EP Phoneme Segmentation	0.57*
	PASP vs. EP WRAT-R spelling *(standardized)*	0.39
	PASP vs. EP WRMT-R Word Attack *(standardized)*	0.84*
	PASP vs. EP TOWRE Sight Word Efficiency *(standardized)*	0.34
	PASP vs. EP WRMT-R Word Identification *(standardized)*	0.37
Vadasy et al. (1997) • T1 (Phonological skills): Components of the intervention included letter naming, letter-sound instruction, sound categorization, rhyming games, onset-rime tasks, phonogram exercises, spelling, free writing, and story book reading (n=17). • C (typical classroom instruction): Administered pretest and posttest measures only (n=18).	Analytical Reading Inventory *(standardized)*	0.42
	Yopp-Singer Segmentation *(standardized)*	0.74*
	WJ-R Word Attack (standardized)	0.35
	Dolch Word Recognition Test	0.31
	Words correctly spelled	0.37
	Number of words written	0.42
	WRAT-R reading *(standardized)*	0.59
	WRAT-R spelling standard scoring *(standardized)*	0.78*
	WJ-R Word Attack (standardized) (follow up)	0.56
	WJ-R Word Identification (standardized) (follow-up)	0.45
	Words per minute read correctly (follow-up)	-0.10
	Test of Written Spelling (follow-up)	0.25
Vadasy et al. (2002) • T1 (Sound Partners): Scripted lessons with activities emphasizing	End of First Grade	
	SP vs. SP+TP WRAT-R reading *(standardized)*	0.31
	SP vs. SP+TP WRAT-R spelling *(standardized)*	0.50

Intervention	Measure[d]	Effect size[e]
letter sounds, segmenting, decoding, spelling, sight words, fluency, and reading decodable story books were provided to first graders (n=13). • T2 (Thinking Partners): Scripted lessons matched to 48 grade-level books that students were taught to read using comprehension strategies provided to second graders. (n=10). • T3 (Sound Partners plus Thinking Partners): Students received the Sound Partners intervention in first grade and the Thinking Partners intervention in second grade (n=26). • C (typical classroom instruction): Most were administered pretest and posttest measures only; some received special education and/or Title I services (n=16).	SP vs. SP+TP WRMT-R Word Attack (standardized) SP vs. SP+TP WRMT-R Word Identification (standardized) End of Second Grade TP vs. C 1 minute fluency TP vs. C comprehension total TP vs. C TOWRE Phonemic Decoding Efficiency *(standardized)* TP vs. C WRAT-R reading *(standardized)* TP vs. C WRAT-R spelling *(standardized)* TP vs. C WRMT-R Word Attack (standardized) TP vs. C TOWRE Sight Word Efficiency *(standardized)* TP vs. C WRMT-R Word Identification (standardized) SP+TP vs. C 1 minute fluency SP+TP vs. C comprehension total SP+TP vs. C TOWRE Phonemic Decoding Efficiency *(standardized)* SP+TP vs. C WRAT-R reading *(standardized)* SP+TP vs. C WRAT-R spelling *(standardized)* SP+TP vs. C WJ-R Word Attack (standardized) SP+TP vs. C TOWRE Sight Word Efficiency *(standardized)* SP+TP vs. C WRMT-R Word Identification *(standardized)* SP vs. C 1 minute fluency SP vs. C comprehension total SP vs. C TOWRE Phonemic Decoding Efficiency *(standardized)* SP vs. C WRAT-R reading *(standardized)* SP vs. C WRAT-R spelling *(standardized)* SP vs. C WRMT -R Word Attack *(standardized)* SP vs. C TOWRE Sight Word Efficiency *(standardized)* SP vs. C WRMT -R Word Identification SP vs. SP+TP 1 minute fluency SP vs. SP+TP comprehension total SP vs. SP+TP TOWRE Phonemic Decoding Efficiency *(standardized)* SP vs. SP+TP WRAT-R reading *(standardized)* SP vs. SP+TP WRAT-R spelling *(standardized)* SP vs. SP+TP WRMT-R Word Attack (standardized) SP vs. SP+TP TOWRE Sight Word Efficiency *(standardized)* SP vs. SP+TP WRMT-R Word Identification *(standardized)*	0.22 0.18 0.05 0.10 0.09 0.38 0.37 0.29 0.20 0.36 0.56 0.05 0.73* 0.92* 0.88* 0.63 0.71* 0.76* 0.99* 0.05 1.50* 1.45* 1.11* 2.06* 1.16* 1.69* 0.30 0.10 0.44 0.40 0.15 1.14* 0.42 0.79*
Vadasy et al. (2005) • T1 (Reading Practice): Students received the phonics instruction component of the Sound Partners program and then practiced oral reading of decodable texts (n=19).	RP vs. C accuracy rate RP vs. C fluency rate RP vs. C WRMT-R Passage comprehension *(standardized)* TOWRE Phonemic Decoding Efficiency *(standardized)*	0.41 0.50 0.81* 0.51

Intervention	Measure[d]	Effect size[e]
• T2 (Word Study): Students received the complete Sound Partners intervention (phonics instruction and word study components) with no practice in oral reading (n=19). • C (typical classroom instruction): Administered pretest and posttest measures only (n=19).	RP vs. C TOWRE Sight Word Efficiency (standardized)	0.61
	RP vs. C WRMT-R Word Attack (standardized)	0.99*
	RP vs. C WRMT-R Word Identification *(standardized)*	0.84*
	RP vs. C WRAT-R reading *(standardized)*	0.93*
	RP vs. C WRAT-R spelling *(standardized)*	0.17
	WS vs. C accuracy rate	0.28
	WS vs. C fluency rate	0.15
	WS vs. C WRMT-R Passage Comprehension *(standardized)*	0.63
	WS vs. C TOWRE Phonemic Decoding Efficiency *(standardized)*	0.61
	WS vs. C TOWRE Sight Word Efficiency *(standardized)*	0.56
	WS vs. C WRMT-R Word Attack (standardized)	1.33*
	WS vs. C WRMT-R Word Identification *(standardized)*	1.04*
	WS vs. C WRAT reading *(standardized)*	1.12*
	WS vs. C WRAT spelling *(standardized)*	0.13
	RP vs. WS accuracy rate	0.45
	RP vs. WS fluency rate	0.49
	RP vs. WS WRMT-R Passage Comprehension *(standardized)*	0.28
	RP vs. WS TOWRE Phonemic Decoding Efficiency *(standardized)*	0.09
	RP vs. WS TOWRE Sight Word Efficiency *(standardized)*	0.08
	RP vs. WS WRMT-R Word Attack (standardized)	0.20
	RP vs. WS WRMT-R Word Identification *(standardized)*	0.11
	RP vs. WS WRAT-R reading *(standardized)*	0.07
	RP vs. WS WRAT-R spelling *(standardized)*	0.22

[d] All measures are researcher-developed unless indicated by a parenthetical note (e.g., standardized)

[e] * indicates $p<.05$

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