The Effectiveness of Kindergarten Peer-Assisted Learning Strategies for Students With Disabilities

BROOKE H. RAFDAL

KRISTEN L. MCMASTER

SCOTT R. MCCONNELL
University of Minnesota

DOUGLAS FUCHS

LYNN S. FUCHS
Peabody College of Vanderbilt University

ABSTRACT: *This study determined the effectiveness of Kindergarten Peer-Assisted Learning Strategies (K-PALS) for students with disabilities. The researchers randomly assigned 89 kindergartners with individualized education programs (IEPs) from 47 classrooms to control (*n = 9*); K-PALS Level 1 (teachers received 1-day workshop;* n = 19*); or K-PALS Level 2 (teachers received workshop plus booster sessions;* n = 19*). Multivariate analysis of covariance on posttest measures of beginning reading skills indicated that K-PALS students outperformed controls on alphabetic and oral reading measures, but that no reliable between-group differences were attributable to level of support. The researchers also discuss directions for further research and implications for implementing classroom-based reading interventions for students with disabilities.*

Proficient reading relates strongly to academic success throughout primary and secondary schooling (Snow, 2002; Snow, Burns, & Griffin, 1998). However, reading difficulties are among the most common challenges that school-aged children, particularly those at risk for or identified as having disabilities, confront. In fact, 80% of students with learning disabilities have a reading deficit (Lyon et al., 2001). The prognosis for struggling readers is poor unless effective reading intervention is in place early (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Juel, 1988). Although this population is in great need of effective literacy intervention, few researchers have examined the effectiveness of early literacy interventions specifically for students with disabilities (cf. Fuchs et al., 2002). Because reading problems tend to permeate all areas of learning and become increasingly difficult to remediate, early identification and intervention are essential to student success (Morocco, 2001; Torgesen, 1998).

Current educational policies and reforms are also calling for research to examine the effectiveness of classwide general education curricula that

work for all students. The Individuals With Disabilities Education Act (IDEA, 1990, 1997) mandates that the best placement for students with disabilities is the one that is the least restrictive, which for many students is the general education classroom. The Individuals With Disabilities Education Improvement Act (IDEA, 2004) and the No Child Left Behind Act (NCLB, 2002) reinforce the belief that the general education classroom, curriculum, and accountability systems should be for all children, including those with disabilities.

Further, IDEA (2004) put into law the right of a school district to choose a response-to-intervention (RTI) model over the traditional discrepancy model to identify students with learning disabilities. RTI involves early identification of students at risk, progress monitoring, and increasingly intensive intervention for students who continue to struggle. The application of an RTI model requires that schools implement high-quality, evidence-based classroom instruction (Tier 1 instruction) that meets the needs of most students, including those with disabilities. One of the primary goals of RTI is to reduce the need for more intensive (and restrictive) intervention. Thus, robustly effective universal Tier 1 interventions are a central component of high-quality RTI implementation. In light of these reforms, researchers must test the effectiveness of Tier 1 general education instruction for *all* students. For young students at risk for severe reading difficulties, including those with disabilities, the following are two important questions:

- What types of instruction should they receive?

- Can the general education classroom provide this early reading instruction?

EFFECTIVE BEGINNING READING INSTRUCTION

Researchers who have identified early reading skills that predict later reading success agree that phonological awareness (PA) relates strongly to subsequent reading achievement (Adams, 1990; Juel, 1988; Snow et al., 1998). PA refers to awareness of the larger and smaller parts of spoken language (including syllables, rimes, and individual phonemes); and children can demonstrate PA by blending, segmenting, rhyming, and other types of sound manipulation (Adams, 1990). Decades of research indicate that kindergartners with strong PA skills read better than their peers with weak PA skills, even after taking into account other variables that affect reading skill—such as intelligence, social class, memory, and vocabulary (see Whitehurst & Lonigan, 1998, for a review of PA research).

RTI involves early identification of students at risk, progress monitoring, and increasingly intensive intervention for students who continue to struggle.

Although many children develop PA through common preschool activities (rhyming songs, stories and games, alliterative text, etc.), other children require more systematic instruction. Fortunately, researchers have demonstrated that educators can teach PA by using explicit instructional approaches. Results of the National Reading Panel's meta-analysis on PA instruction (National Institute of Child Health and Human Development, 2000) indicated an average effect size of 0.86 on PA outcomes for preschoolers through children in sixth grade. For kindergartners, the effect of PA instruction on PA outcomes was even larger (0.95). PA instruction also had a large effect on kindergartners' spelling outcomes (0.97) and a moderate effect on reading outcomes (0.48).

The National Reading Panel (National Institute of Child Health and Human Development, 2000) also indicated that PA instruction is most effective when (a) children learn to manipulate phonemes with letters, (b) instruction explicitly focuses on one or two types of phoneme manipulations rather than many types, and (c) educators teach PA in small groups. Further, the National Reading Panel reported that systematic phonics instruction provided to kindergartners resulted in an effect size of 0.56 on reading outcomes. The National Reading Panel therefore recommends that a balanced early reading program include systematic PA and phonics instruction. Finally, con-

sistent with research indicating that reading interventions are most successful when implemented early, the National Reading Panel concluded that PA and phonics instruction are most effective for students in preschool and kindergarten rather than in first grade and above.

Although researchers have studied the effectiveness of PA instruction (e.g., O'Connor, 2000; O'Connor, Fulmer, Harty, & Bell, 2005; O'Connor, Harty, & Fulmer, 2005), only a few have examined the effects of PA instruction implemented by teachers in their classrooms (Fuchs et al., 2002). For example, O'Connor, Notari-Syverson, and Vadasy (1996) tested whole-class, teacher-led PA and print awareness training and found that students with mild disabilities in the experimental group outperformed control students on blending, segmenting, word identification, and dictation. In a follow-up study, O'Connor, Notari-Syverson, and Vadasy (1998) found that students with mild disabilities in the experimental group continued to outperform controls 1 year after treatment.

Another classwide teacher-implemented instructional approach that has benefited many beginning readers is Kindergarten Peer-Assisted Learning Strategies (K-PALS; Fuchs et al., 2001), a supplemental, classwide peer-tutoring program that involves pairing higher and lower performing readers to practice beginning reading skills. Results of large-scale experimental research has shown that K-PALS can have a substantial positive impact on the beginning reading skills of many children and that K-PALS decoding activities add value to PA training alone. Fuchs et al. (2001) reported a study in which researchers assigned 33 classrooms randomly to three groups: control, PA training, and PA training plus K-PALS decoding activities. After approximately twenty weeks, the PA group and the PA plus K-PALS group statistically significantly outperformed controls on measures of PA. Further, the PA plus K-PALS group reliably outperformed the other two groups on reading and spelling tasks.

Fuchs et al. (2001) also showed K-PALS to be effective in schools with large percentages of minority children and children living in poverty, as well as in schools with predominantly White, middle-class student populations.

Although K-PALS has been effective for many students, results for students with disabilities have been less robust. Fuchs et al. (2002) investigated the effectiveness of K-PALS for students with disabilities who had been included in the larger K-PALS study (Fuchs et al., 2001). PA instruction on its own had no significant effect on the beginning reading skills of students with disabilities compared with their control counterparts. On average, students with disabilities who participated in PA plus K-PALS outperformed their counterparts in the PA group on a measure of letter-sound recognition, and outperformed both the PA group and control group on word attack. However, examination of individual students' data clearly indicated that although some children made impressive gains, others showed limited to no gains on important beginning reading skills, suggesting that K-PALS may be effective for some, but not all, students with disabilities. Research that replicates and extends this work is necessary to shed further light on the effectiveness of K-PALS for students with disabilities.

CONTEXT AND PURPOSE OF THE PRESENT STUDY

Researchers recently conducted a large-scale, multisite study to bring K-PALS to scale (Fuchs et al., 2008; see also Stein et al., 2008). The purpose of the large-scale study was to examine the effectiveness of K-PALS when it was implemented beyond the original research setting (K-PALS validation originally occurred in Nashville, Tennessee) and to determine the types of professional development and support necessary to ensure fidelity of implementation and improved student reading outcomes. During a 2-year period, educators randomly assigned 224 kindergarten teachers from 71 schools in three states (Tennessee, Minnesota, and Texas) to a control condition (in which they implemented their regular reading and language arts instruction); K-PALS Level 1

(in which they attended a 1-day-long K-PALS workshop and then implemented PALS for 20 weeks); or K-PALS Level 2 (in which they attended the workshop and attended three "booster" sessions during the school year). In the first year of the study, an additional group of teachers received K-PALS Level 3 (in which they received booster sessions plus a PALS "mentor," who provided on-site technical assistance); the study dropped this level of support in the second year because it did not appear to add value to the less-resource-intensive Level 2 support. All K-PALS teachers received manuals expressly written for teachers.

Results indicated that, as a group, students in K-PALS classrooms outperformed controls on PA tasks. Further, K-PALS students in Tennessee and Minnesota outperformed controls on word-reading tasks, and K-PALS students in Tennessee outperformed controls on an oral reading measure. In addition, Fuchs et al. (2008) found that K-PALS Level 2 teachers implemented K-PALS with greater fidelity than K-PALS Level 1 teachers and that students in K-PALS Level 2 classrooms outperformed students in K-PALS Level 1 classrooms on some measures of beginning reading. These findings suggest that providing K-PALS teachers with support beyond initial training may improve student outcomes.

Whereas the primary purpose of the preceding study was to examine the effectiveness of K-PALS when brought to scale, it also provides an opportunity to look at the effects of K-PALS for subsamples within the larger data set. Thus, in this study, we further examined effects of K-PALS for students with disabilities, in part to replicate the study by Fuchs et al. (2002) at a site distal from the original research site and at a different point in time. Replicating the Fuchs et al. (2002) study at a distal site would lend further support to the efficacy of K-PALS for students with disabilities and illustrate the generalizability of Fuchs et al.'s (2002) findings to a different population outside the area where K-PALS was originally developed. Replicating the findings at the present time would be significant, given that the Fuchs et al. (2002) study occurred around the time that the National Reading Panel's report (National Institute of Child Health and Human Development, 2000) was released and the authors conducted the

present study after its publication. Educators have subsequently made significant changes to kindergarten reading instruction in general, including a shift from emphasizing letter recognition to increased emphasis on phonemic awareness, letter-sound recognition, and word- and text-level reading.

We also sought to extend this work by examining the effect of added support to teachers (in the form of booster sessions, as in Fuchs et al., 2008). The boosters represent a relatively low-resource-intensive (i.e., feasible for schools) approach to providing teachers with opportunities to solve problems that arise during K-PALS implementation with the help of researchers and other K-PALS teachers. Such support may be particularly useful for teachers who have students with disabilities in their classrooms because it furnishes opportunities to discuss ways to address academic and behavioral challenges that students with difficulties often experience.

We conducted the current study by using data from only one of the three sites, because we were primarily interested in the efficacy of K-PALS for students with disabilities, given that the efficacy for this group is not as well-established as efficacy for students without disabilities. The nature of the larger effectiveness study resulted in variation in K-PALS implementation across states (e.g., in one site, classrooms implemented fewer K-PALS sessions than the other sites because of other testing and professional development initiatives that occurred in that site; this lower dosage may have compromised the integrity of PALS implementation, limiting conclusions regarding its efficacy at that site). Further, classification and service-delivery systems varied across the three states, adding yet another source of variance to this data set. We began by examining data from one state (Minnesota), which helped control for some of the previously described complexities.

This study addressed two research questions:

- Does participating in K-PALS result in improved critical beginning reading skills for students with IEPs?

- Does the level of support given to the teacher affect outcomes for students with IEPs?

Age, Sex, Race, and Education of Teachers

Variables	Control (n = 9) n (%)	K-PALS Level 1 (n = 19) n (%)	K-PALS Level 2 (n = 19) n (%)	χ^2 (df)
Age				12.35 (8)
21–29	2 (22)	1 (5)	0 (0)	
30–39	2 (22)	8 (42)	9 (47)	
40–49	2 (22)	5 (26)	8 (42)	
50–59	2 (22)	5 (26)	2 (11)	
60+	1 (11)	0 (0)	0 (0)	
Sex				.00 (2)
Male	1 (11)	2 (11)	2 (11)	
Female	8 (89)	17 (90)	17 (90)	
Race				3.90 (6)
African American	0 (0)	1 (5)	1 (5)	
Caucasian	8 (89)	16 (84)	15 (79)	
Hispanic	0 (0)	0 (0)	2 (11)	
Other	1 (11)	2 (11)	1 (5)	
Highest degree				1.14 (2)
B.S./B.A.	4 (44)	5 (26)	5 (26)	
M.Ed/M.S.	5 (56)	14 (74)	14 (74)	
Ed.S./Ed.D./Ph.D.	0 (0)	0 (0)	0 (0)	
Title I school	9 (100)	14 (74)	12 (63)	4.37 (2)
	M (SD)	M (SD)	M (SD)	F (df)
Total years teaching	13.56 (8.80)	13.06 (5.43)	15.89 (6.23)	.96 (2,43)
Years in current position	7.00 (5.00)	6.72 (4.42)	8.95 (6.92)	.79 (2,43)
Number of special ed. students in class	1.78 (1.39)	1.61 (1.46)	2.06 (2.26)	.27 (2,42)

Note. K-PALS = Kindergarten Peer-Assisted Learning Strategies

As in Fuchs et al. (2002), we conducted classroom-level statistical analyses but also used student-level descriptive data to illustrate the range in individual responsiveness to PALS.

METHOD

SETTINGS AND PARTICIPANTS

The researchers drew data for this study from the larger, 2-year study examining the effects of varying levels of teacher support on students' beginning reading achievement (Fuchs et al., 2008; Stein et al., 2008). As previously mentioned, the current study included only data from students attending Minnesota schools. The researchers selected classrooms from the larger study that had one or more students with IEPs. This selection process resulted in a total of 47 classrooms: 9 control, 19 K-PALS Level 1, and 19 K-PALS Level 2. Table 1 compares teacher demographic information by group. Chi-square analyses revealed no reliable differences across groups based on teachers' age, sex, race, or highest degree earned. Chi-square analyses also revealed no significant differences between groups on the basis of the Title I status of the school. One-way analyses of variance (ANOVAs) conducted for total years teaching, years in current position, and number of special

education students in the classroom revealed no reliable differences between groups.

Participants in the current study were students enrolled in the larger investigation who had an IEP at some time during their kindergarten year and who scored within three standard deviations (*SD*) of the mean on the reading measures at pretest (thereby excluding students with severe cognitive disabilities or with highly advanced reading skills). A total of 89 participants met this criterion; 21 were controls, 34 were in K-PALS Level 1, and 34 were in K-PALS Level 2. Table 2 compares participant demographic information by group. Chi-square analyses indicated no statistically significant differences between groups in race, sex, number of English learners (ELs), free/reduced lunch, IEP type, or number of absences. Table 2 shows that students in this study had high-incidence disabilities, with most having speech/language disorders and the remainder identified with learning disabilities (LD), emotional and behavioral disorders (EBD), developmental cognitive delay (DCD), or attention deficit hyperactivity disorders (ADHD). Because of the very small number of students in each category, we did not separate students into subcategories.

Treatments

K-PALS Instruction. Researchers at Vanderbilt University (Fuchs et al., 2001) developed K-PALS to supplement core reading curricula in general education classrooms. Teachers who participated in the larger study implemented K-PALS four times each week for 18 weeks. Each K-PALS session lasted approximately twenty to thirty minutes. Teachers in each K-PALS classroom placed their students into pairs of higher- and lower-performing readers. The teacher ranked the students according to reading skill, split the list in half, and paired the top high-performing reader with the top low performer, and so on down the list. During each K-PALS activity, each student took a turn being coach and reader. The higher-performing reader always began as the coach, whereas the lower-performing reader started out as the reader. Teachers created new pairs approximately every four weeks.

The teacher trained students to conduct K-PALS by using eight teacher-directed lessons taught in a whole-class format. During training, the teacher modeled the roles of coach and reader and gave students many opportunities to practice the K-PALS roles, activities, and procedures. The teacher monitored students while they worked in pairs, providing corrective feedback and assistance when necessary.

K-PALS includes two activities: *sound play* and *decoding PALS*. Sound play addresses PA skills through five activities: rhyming, isolating first sounds, isolating ending sounds, blending, and segmenting. Each of the five types of activities follows a standard routine. For example, students play the rhyming game in several lessons with alternative forms of the activity. All rhyming lesson sheets consist of rows of four pictures. The items depicted in the first two pictures in each row rhyme. The teacher points to the first two pictures and says, for example, "cat, mat" and then points to the other two pictures and says, "Which one rhymes with cat and mat; bat or carrot?" The students reply, "bat." Sound play games become increasingly difficult throughout the year.

Decoding PALS consists of four activities: "what sound?" "what word?" "sound boxes," and "reading sentences." Lesson sheets for "What sound?" consists of rows of letters that students read from left to right. The coach points to each letter and asks, "What sound?" The reader says the corresponding sound. When the reader makes an error, the coach says, "Stop. That sound is _____. What sound?" The reader says the sound; and the coach says, "Good. Read the line again." The teacher places stars among the letters to remind the coach to praise the reader (e.g., "Great job!"). At the completion of the activity, the coach marks one of four happy faces printed at the end of the "What sound?" section. Students then switch roles and repeat the activity.

"What word?" involves reading common sight words printed in rows on the lesson sheet. The coach points to each word and asks, "What word?" The reader reads the words, and the coach corrects errors by using the same procedure as in the "what sound?" activity. After the reader finishes the activity, the coach marks a happy face and the students switch roles and repeat the activity.

Race, Sex, EL Status, and IEP Status for Students With Disabilities

Variables	Control (n = 21) n (%)	K-PALS Level 1 (n = 34) n (%)	K-PALS Level 2 (n = 34) n (%)	χ^2 (df)
Race				12.84 (8)
African American	9 (43)	14 (41)	9 (27)	
Caucasian	6 (29)	13 (38)	14 (41)	
Hispanic	0 (0)	2 (6)	5 (15)	
Asian/Indian	2 (10)	4 (12)	4 (12)	
Other	4 (19)	0 (0)	2 (6)	
Sex				
Male	14 (67)	22 (65)	22 (65)	.027 (2)
Female	7 (33)	12 (35)	12 (35)	
EL	3 (14)	7 (21)	6 (18)	.35 (2)
Received free or reduced lunch	11 (52)	10 (29)	14 (41)	3.24 (2)
Type of IEP in fall				8.37 (8)
No IEP in fall	8 (38)	4 (12)	8 (24)	
Speech/language	7 (33)	13 (38)	15 (44)	
LD, EBD, DCD, ADHD	5 (24)	10 (29)	5 (15)	
Other/not specified	1 (5)	6 (18)	5 (15)	
In process, referred	0 (0)	1 (3)	1 (3)	
Type of IEP in spring				15.22 (8)
No IEP in spring	3 (14)	5 (15)	3 (9)	
Speech/language	6 (29)	16 (47)	19 (56)	
LD, EBD, DCD, ADHD	4 (19)	6 (18)	5 (15)	
Other/not specified	3 (14)	6 (18)	7 (20)	
In process, referred	5 (24)	1 (3)	0 (0)	
	M (SD)	M (SD)	M (SD)	F (df)
Absences	3.77 (3.75)	2.81 (2.56)	4.06 (4.94)	.56 (2,46)

Note. EL = English learner; IEP = Individualized education program; K-PALS = Kindergarten Peer-Assisted Learning Strategies; LD = Learning disabled; EBD = Emotional and behavioral disorders; DCD = Developmental cognitive delay; ADHD = Attention deficit hyperactivity disorder.

"Sound boxes" consists of reading decodable words containing the sounds practiced in the lesson. Words appear in word families, such as "sat," "bat," and "mat." Each letter of a word is in a "sound box." The coach says, "Read it slowly"; and the reader sounds out the word, pointing to the letter in each box. Then the coach says, "Sing it and read it," thereby prompting the reader to blend the sounds together and then read the word. Correction procedures are the same as in previous activities. When the activity is complete, the coach marks a happy face. Students then switch roles and repeat the activity.

Finally, the students read sentences consisting of sight and decodable words that they have practiced in the lesson. The coach says, "Read the sentence" and corrects any errors while the reader reads. After both students have read the sentence, they repeat the decoding PALS activities for a total of 15 min. At the end of the session, each pair counts the happy faces that they have marked and records the number on point sheets.

Control Instruction. The researcher asked teachers in the control group to continue with their regular reading instruction. They did not receive training in K-PALS in the fall but did have the opportunity to obtain training the following year. The researchers observed control teachers once during a 30-to-60-min reading lesson that the teacher identified as typical daily instruction. In all control classrooms, the teacher furnished reading instruction in either a whole-class or small-group format. Observations indicated that all teachers implemented explicit instruction focusing on PA skills, letter sounds, and word identification. Several teachers also incorporated storybook reading and journal writing.

MEASURES

All participants received a battery of beginning reading measures pretreatment and posttreatment. Project staff administered measures in October through November before K-PALS implementation and again immediately following treatment in April through May. Measures used for the current study included Rapid Letter Naming (RLN), Rapid Letter Sound (RLS), Blending, Segmenting, Word Identification (Word ID), Word Attack, Oral Reading, and Spelling. The measures test children's beginning reading skills in three broad categories: phonemic awareness, alphabetic principle, and oral reading. Project staff administered all measures both as pretest and posttest measures except for Spelling and Oral Reading, which were given at posttest only.

Phonemic Awareness. Tests used to measure phonemic awareness included segmentation and blending. The segmentation test measured the number of correct phonemes expressed in 1 min. The basis for this measure was the Yopp-Singer test (Yopp, 1988), which has high internal consistency (.95) and predictive validity ($r = .67$). Fuchs et al. (2001) developed the segmentation test used in this study for previous PALS research to measure the students' ability to segment words into individual sounds. The measure consists of 3 three-phoneme practice words to help the student understand the task and 22 two- or three-phoneme words (e.g., "ice," "dog"). The examiner states the word and prompts the student to say the sounds in the word. If the student is unable to

produce a single correct sound in at least one practice word, the examiner terminates testing and the student receives a score of zero; otherwise, the examiner administers the test for 1 min. The score is the number of correct phonemes expressed in 1 min. If the student completes the test in less than 1 min, the examiner prorates the score. For this sample, criterion-related validity correlations between the segmentation task and other measures administered were as follows: Spelling ($r = .63$), Word ID ($r = .58$), and Word Attack ($r = .64$).

The blending task, also used by Fuchs et al. (2001), consists of three practice words and 22 test words, all with three phonemes, such as "cat," or "mom." The examiner says the sounds (e.g., "/m//o//m/") and then says, "What word is that?" The score is the number of correctly blended words in 1 min. For this sample, criterion-related validity correlations between the blending task and other reading-related measures were as follows: Spelling ($r = .68$), Word ID ($r = .52$), and Word Attack ($r = .74$).

Alphabetic Principle. Tests used to measure the alphabetic principle included RLN, RLS, Word ID, Word Attack, and Spelling. RLN assessed the number of letters that a student could identify correctly in 1 min. This measure, developed for use in a previous PALS study (Fuchs et al., 2001), consisted of all letters in uppercase and lowercase presented randomly in black type on a single sheet of paper. The examiner provided all directions and prompted the student to begin the test and to stop after 1 min. If the child paused for 3 s during testing, the examiner told him or her the letter name and instructed the child to move on to the next letter. The number of letters named correctly in 1 min was the student's score. If the student completed the test in less than 1 min, the examiner prorated the score. For this sample, criterion-related validity correlations between RLN and other reading-related measures were as follows: Spelling ($r = .58$), Word ID ($r = .62$), and Word Attack ($r = .49$).

The examiners administered RLS to assess the number of sounds that a student could identify correctly in 1 min. Researchers developed this test, based on a measure by Levy and Lysunchuk (1997), for use in previous PALS research (Fuchs et al., 2001). Stimulus materials consisted of a

practice sheet containing four letters (b, c, h, a) and a test sheet with all 26 lowercase letters presented randomly in black print. The examiner instructed students to say the sounds as quickly as they could and recorded the score as the number of sounds produced correctly in 1 min. If the student completed the test in less than 1 min, the examiner prorated the score. For this sample, criterion-related validity correlations between RLS and other reading-related measures were as follows: Wechsler Individual Achievement Test (WIAT; Psychological Corporation, 1992; r = .74); Woodcock Reading Mastery Tests-Revised (WRMT-R; Woodcock, 1987; r = .71); and Word Attack subtest (r = .58).

The examiners administered the Word ID and Word Attack subtests of the WRMT-R (Woodcock, 1987) to measure word recognition and decoding skills. Scores on the Word ID and Word Attack subtests correlate highly with other tests of reading, including the Iowa Test of Basic Skills Total Reading (Hoover, Dubar, & Frisbie, 2001), the Woodcock-Johnson Tests of Reading Achievement (Woodcock, McGrew, & Mather, 2001), and the reading subtest of the Wide Range Achievement Test (Wilkinson, 1993), with correlations of .83 to .92. Internal consistency exceeds .90. The scores for these measures were the number of words read correctly.

The WIAT Spelling subtest (Psychological Corporation, 1992) consists of 50 letters, sounds, and words that the examiner asks the student to write. The examiner administered a minimum of 12 test items to each student to obtain a sufficient sample of spelling ability. For each item, the examiner says the letter or word and gives the student 10 s to write it on a sheet of paper. The score is the total number of correct items. Examiners administered the WIAT at posttest only. According to the technical manual, the WIAT correlates well with other achievement tests (rs = .70s to .80s), and has a test-retest reliability coefficient of .94 (Psychological Corporation, 1992).

Oral Reading. Examiners administered oral reading passages to determine the number of words that a student could read correctly in 1 min. They administered as 1-min oral reading probes two forms incorporating sight words and decodable words introduced in K-PALS lessons. Both stories had a Flesch-Kincaid readability

grade level of 0.0. Before reading each story, the examiner told the student to read aloud and to try his or her best. While the student read, the examiner marked errors, including insertions, omissions, substitutions, and mispronunciations not caused by speech-related problems or dialects. The examiners considered omissions and additions of endings to be errors but did not count self-corrections as errors and did not give any corrective feedback or assistance. The score was the number of words read correctly in 1 min. The researchers calculated students' mean scores from the two passages for analysis and administered oral reading at posttest only. For this sample, criterion-related validity correlations between oral reading scores and other reading-related measures were as follows: Spelling (r = .72), Word ID (r = .87), and Word Attack (r = .69).

PROCEDURES

Test Administration Training. In October of each year, the second author trained eight to 10 examiners to administer all pretest measures in two 1.5-hr-long sessions. The examiners were graduate students in educational psychology who had experience working with young children in schools. Before posttesting in the spring, a training session reviewed measures and trained the examiners in posttest-only measures. Following trainings, individual mock testing sessions established interrater agreement. The examiners administered each test to the second author, who provided feedback on accuracy of administration. Examiners scored each test and compared these scores with the second author's scoring. The researchers calculated interrater agreement by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. The trainer required examiners to practice and readminister any test on which interrater agreement was less than 90%. Across the 2 years, interrater agreement across examiners and measures ranged from 90% to 100%.

Pretesting and Posttesting. Examiners conducted testing individually in English with each student for whom the researchers had obtained parental consent. The first testing session consisted of building rapport and administering the RLN test. In the second session, the examiner

administered the remaining measures in random order to avoid an order effect. An unfamiliar examiner (i.e., one who had never had contact with the student or the student's classroom) conducted posttesting to avoid experimenter effect. Each posttesting session began with rapport-building followed by administration of the RLN test. Examiners then administered the remaining tests in random order.

K-PALS Training and Support. The second author trained all Level 1 and Level 2 K-PALS teachers as part of the larger study in a 1-day K-PALS workshop. The workshop included an overview of the purpose and background of K-PALS, as well as detailed descriptions and demonstrations of the K-PALS activities. The workshop provided opportunities for teachers to practice K-PALS in the role of both the teacher and the student. Teachers received a K-PALS manual expressly written for teachers and reviewed it in detail during the workshop. The workshop also included planning time for teachers to pair their students and think how they would organize their classrooms for K-PALS.

Following the workshop, teachers began K-PALS implementation in their classrooms. Teachers assigned to K-PALS Level 1 had minimal contact with the researchers, interacting only during the two subsequently described fidelity observations. K-PALS Level 1 teachers received no specific feedback or assistance during the study. Teachers assigned to the K-PALS Level 2 condition attended three 1-hr-long booster sessions that occurred approximately 3, 10, and 15 weeks after K-PALS implementation. Boosters occurred either during teacher preparation time or before or after school. Booster participants included the K-PALS trainer and teachers within a school or several schools that were close to one another. Booster-group sizes ranged from one to five teachers and one or two research staff. The sessions consisted of teacher-directed discussion and questions, as well as review of activities and lesson formats.

The first booster session focused primarily on procedural questions because it was early in the treatment. The second booster session focused on classroom management, student motivation, and discussion of what to do with specific students who were having difficulties during K-PALS. For example, the researchers encouraged teachers to move students who were struggling with K-PALS sounds and words to earlier lessons in the K-PALS sequence. Teachers brainstormed alternative pairing strategies for students who had difficulty working with a partner. Teachers' questions generally drove discussion, and it involved suggestions from the K-PALS trainer and the other teachers. The K-PALS trainer also shared suggestions that teachers had provided in other booster sessions and problems, strategies, and techniques that she had seen during observations. The second booster session also included a goal-setting activity in which teachers identified specific areas that they wished to improve, set goals, and identified two or three strategies to address each goal. Some teachers identified such instructional goals as increasing their modeling of K-PALS correction procedures. Others identified such behavioral goals as increasing their use of bonus points to improve individual student or whole-class behaviors or changing pairing formats to increase cooperation among students. The third booster session included discussion about whether teachers had met their goals and additional problem solving as needed.

K-PALS Fidelity. The researchers assessed fidelity of implementation by using a checklist of teacher and student behaviors considered essential to K-PALS. The researchers had developed this checklist as part of the larger study. Each correct behavior observed earned one point. Percent fidelity was calculated by summing total correct behaviors, dividing by the total points possible, and then multiplying by 100. A small group of research team members completed fidelity checks. Each observer conducted 10% of her observations with the second author to establish interrater agreement. The researchers administered two fidelity checks in each K-PALS class for the entire 20-to-30-min K-PALS session (one in January and one in March of each study year). The observer first watched the teacher-directed lesson and then circulated among pairs during the peer-mediated lesson, watching at least one different pair conduct each K-PALS activity. The average fidelity of implementation for K-PALS Level 1 classrooms included in the present study was 79.7%. The average fidelity of implementation for K-PALS Level 2 included in the present study

was 86.2%. These fidelity levels are consistent with the larger study, in which K-PALS Level 2 classrooms had higher fidelity than K-PALS Level 1 classrooms (Fuchs et al., 2008; Stein et al., 2008).

Design and Data Analysis. The larger study used a pretest/posttest control group design with random assignment of teachers to groups. The present study used a quasi-experimental design that included only those classrooms with at least one student who met the inclusion criteria. The researchers obtained student-level data from each student with an IEP and aggregated the data at the classroom level because the larger study randomly assigned classrooms to conditions. The researchers analyzed classroom-level posttest data by using a multivariate analysis of covariance (MANCOVA) with pretest data as covariates. Posttest measures included RLN, RLS, segmentation, blending, Word ID, Word Attack, Spelling, and Oral Reading. Intercorrelations among these measures were statistically significant (rs = .40 to .87, all ps < .01); therefore, all eight posttest measures were analyzed in a single MANCOVA. The researchers also administered six of the eight measures (RLN, RLS, segmentation, blending, Word ID, and Word Attack) at pretest and included them as covariates. They also examined individual student data descriptively to gain further insight into the effects of PALS for individual students.

RESULTS

This study addressed two primary research questions:

- Does participating in K-PALS result in improved critical beginning reading skills for students with IEPs?

- Does the level of support given to the teacher affect outcomes for students with IEPs?

Table 3 provides raw means and standard deviations by group for pretests and posttests.

GROUP-LEVEL ANALYSES

The researchers conducted a MANCOVA on posttest outcomes with pretest scores as covariates. The homogeneity of regression assumption was tested by using Levene's Test of Equality of Error Variances. According to this conservative test, all measures met the homogeneity assumption (p = .032) except for Word ID.

The results of the initial multivariate test using Wilks's λ indicated that the differences between the three groups were statistically significant, Wilks's λ = .421, $F(16,62)$ = 2.100, p = .020. This omnibus test indicated that significant differences existed between groups and allowed follow-up contrasts to determine between-group differences. Researchers used a Helmert contrast, an orthogonal contrast that allows for the comparison of the control group with K-PALS Levels 1 and 2 combined as well as K-PALS Level 1 with Level 2, to address the specific research questions.

Contrast 1 compared the control group with the aggregated K-PALS groups to determine whether students with IEPs who participated in K-PALS outperformed control students with IEPs on critical beginning reading skills. The results, summarized in Table 4, indicated statistically significant differences favoring the combined K-PALS groups on three of eight posttest measures: Word Attack (p = .03), Spelling (p = .002), and Oral Reading (p = .04). The researchers calculated effect sizes (Cohen's *d*) by dividing the mean difference by the pooled *SD*. The effect of treatment ranged from 0.30 to 0.50, reflecting a moderate effect of K-PALS (see Table 4). Contrast 2 compared K-PALS Level 1 to K-PALS Level 2 to answer the question: Does the level of support given to the teacher affect the outcomes for students with IEPs? The researchers detected no statistically significant differences between these groups (see Table 4).

INDIVIDUAL RESPONSIVENESS TO INSTRUCTION

Although as a group, students with disabilities who participated in K-PALS reliably outperformed controls on measures of Word Attack, Spelling, and Oral Reading, an examination of individual students' performance shows that K-PALS was not beneficial for all students. Table 5 shows the mean of the full Minnesota sample (N = 824) from the larger study, the number of low responders to instruction in each group (indicated by no growth on Word Attack or posttest scores

TABLE 3

Classroom-Level Means and SDs *for Pretest and Posttest Measures by Instructional Group*

Measures	Control Classrooms (n = 9) M (SD)	K-PALS Level 1 Classrooms (n = 19) M (SD)	K-PALS Level 2 Classrooms (n = 19) M (SD)
Pretest and Posttest			
RLN			
Pretest	18.03 (7.35)	13.32 (9.90)	17.81 (13.09)
Posttest	37.42 (10.60)	28.79 (16.97)	34.63 (16.78)
RLS			
Pretest	8.62 (5.31)	4.11 (5.73)	10.45 (9.86)
Posttest	29.41 (14.24)	29.32 (16.60)	34.04 (18.58)
Segmentation			
Pretest	2.23 (2.21)	1.90 (2.65)	2.17 (2.77)
Posttest	15.35 (14.64)	12.96 (8.94)	16.81 (8.34)
Blending			
Pretest	0.64 (0.87)	0.95 (1.68)	0.35 (0.56)
Posttest	5.62 (5.78)	4.60 (4.95)	5.74 (4.87)
Word ID			
Pretest	0.58 (0.97)	.16 (.34)	1.00 (1.84)
Posttest	5.97 (4.15)	5.30 (4.25)	9.02 (8.77)
Word Attack			
Pretest	0.06 (0.17)	0.08 (0.25)	0.11 (0.27)
Posttest	1.18 (1.47)	1.64 (2.67)	2.81 (3.18)
Posttest only			
Fluency	8.69 (7.33)	12.46 (14.59)	19.73 (16.71)
Spelling	6.95 (2.26)	7.34 (2.49)	8.24 (3.01)

Note. K-PALS = Kindergarten Peer-Assisted Learning Strategies; RLN = Rapid Letter Naming; RLS = Rapid Letter Sound.

of zero on Spelling and Oral Reading), the percentage of low responders (in parentheses following the *n*), the number of high responders in each group (indicated by growth or posttest scores above the mean of the full sample mean), and the percentage of high responders (in parentheses following the *n*). These data demonstrate that whereas greater proportions of K-PALS students with disabilities outperformed controls with disabilities on these measures, the reading of some K-PALS students with disabilities did not substantially improve.

At the same time, it appears that K-PALS did yield higher response rates than control instruction. Chi-square analyses indicated significant differences in the numbers of students scoring zero on Oral Reading, with fewer K-PALS Level 1 and

Level 2 students scoring zero than control students. Chi-square analyses also indicated significant differences in the numbers of students scoring above the sample mean on Word Attack growth and Oral Reading, with more K-PALS Level 1 and Level 2 students scoring above the mean than controls and more K-PALS Level 2 students than Level 1 students scoring above the mean (see Table 5).

DISCUSSION

The purpose of this study was to investigate whether K-PALS, an intervention with known efficacy for general education students (e.g., Fuchs et al., 2001; Fuchs et al., 2008), is beneficial for students with disabilities. The results indicate that

TABLE 4

Post-hoc Between-Group Contrasts[a]

Measure	K-PALS (Level 1 and Level 2 Combined) vs. Control		K-PALS Level 1 vs. K-PALS Level 2	
	F(1,38)	d[b]	F(1,38)	d[b]
Phonemic awareness				
Segmentation	0.08	−0.05	0.83	0.45
Blending	0.00	−0.09	1.46	0.23
Alphabetic				
RLN	0.49	−0.36	0.00	0.35
RLS	2.55	0.13	1.13	0.27
Word Identification	1.80	0.19	0.28	0.54
Word Attack	5.11*	0.38	2.91	0.40
Spelling	4.41*	0.31	0.16	0.34
Oral reading	11.21*	0.51	0.60	0.46

Note. K-PALS = Kindergarten Peer-Assisted Learning Strategies; RLN = Rapid letter naming; RLS = Rapid letter sound.
[a]Pretest segmentation, blending, RLN, RLS, Word ID, Word Attack were used as covariates. [b]Effect sizes were calculated by dividing the mean difference by the pooled SD.
*$p < .05$.

K-PALS was effective for increasing initial alphabetic principle and decoding skills (i.e., Word Attack, Spelling, and Oral Reading) for students with disabilities who were included in general education classrooms. This study replicates and extends the results of Fuchs et al. (2002), the only other study conducted to examine the effectiveness of K-PALS for students with disabilities. The results of the current study illustrate the generalizability of Fuchs et al.'s (2002) findings to a different population outside the area where K-PALS was originally developed and extends Fuchs et al. (2002) by examining the effect of added support to teachers (in the form of booster sessions, as in Fuchs et al., 2008). Analysis of individual responsiveness to K-PALS suggests that boosters may increase rates of responsiveness of students with disabilities, at least in Word Attack and Oral Reading.

DOES K-PALS IMPROVE CRITICAL BEGINNING READING SKILLS FOR STUDENTS WITH IEPS?

Our findings are consistent with previous research, which has demonstrated K-PALS effectiveness for students in the general education

population (Fuchs et al., 2001; Fuchs et al., 2008), as well as for ELs (McMaster, Kung, Han, & Cao, 2008). Findings also corroborate those of Fuchs et al. (2002), who found significant effects of K-PALS for students with disabilities on RLS (PA plus K-PALS students outperformed PA students) and Word Attack (PA plus K-PALS students outperformed controls). Thus, it appears that the effects of K-PALS for students with disabilities found by Fuchs et al. (2002) generalized to students in a different place and time.

In the present study, K-PALS students did not significantly outperform controls on measures of phonological awareness and RLN. We expected no difference on RLN because K-PALS does not emphasize letter naming. The nonsignificant results for phonemic awareness measures (segmentation and blending) might be attributable to features of the measures themselves. Many students in both K-PALS and control classrooms may have received sufficient PA instruction and thus became proficient on the PA tasks, so that the tasks no longer discriminated among students with stronger and weaker beginning reading skills. The relatively strong performance of K-PALS students on measures of Word

T A B L E 5

Individual Response to Instruction on Word Attack, Oral Reading, and Spelling

	Full MN Sample N = 824 Mean (SD)	Low Responders (Student With Disabilities Making No Growth or Scoring Zero at Posttest)				High Responders (Students With Disabilities Who Exceeded the Full Sample Mean)			
		Control n = 21 n (%)	K-PALS Level 1 n = 34 n (%)	K-PALS Level 2 n = 34 n (%)	χ^2	Control n = 21 n (%)	K-PALS Level 1 n = 34 n (%)	K-PALS Level 2 n = 34 n (%)	χ^2
Word Attack (growth)	4.90 (5.45)	14 (67)	24 (71)	18 (52)	2.43	1 (5)	5 (14)	12 (35)	8.54*
Spelling (posttest)	10.00 (4.18)	0 0	0 0	0 0	—	4 (19)	7 (21)	12 (35)	2.58
Oral Reading (posttest)	24.68 (22.46)	6 (29)	3 (9)	2 (6)	6.81*	2 (1)	3 (8)	12 (35)	9.34**

Note: K-PALS = Kindergarten Peer-Assisted Learning Strategies; MN = Minnesota.
*$p < .05$. **$p < .01$.

Attack, Spelling, and Oral Reading suggest that they had a good understanding of phonemes and phoneme manipulation. An alternative explanation is that both the control and K-PALS groups had adequate phoneme and phoneme-manipulation training but that the K-PALS program added value by exposing students to print and word reading, which enhanced their overall reading ability. At posttest, K-PALS students with disabilities were reading more than twice as many words per minute than controls, which is also indicative of much stronger reading skills.

In addition to conducting classroom-level statistical analyses, we examined individual responsiveness to K-PALS. This analysis supports findings of a similar analysis by Fuchs et al. (2002): Specifically, whereas K-PALS was beneficial for many students with disabilities, it was not beneficial for all. Our estimates of low and high responders are rather conservative (no growth or zero scores for low responders and exceeding the sample mean for high responders). Further, we had posttest-only scores, rather than growth scores, for Spelling and Oral Reading. Although different criteria or different measures would probably result in different estimates of students responsive to K-PALS, the data are useful for comparing rates of responders across the different

groups. Specifically, greater proportions of students were responsive to PALS than to control instruction, but there were students in all conditions who did not benefit from instruction. This finding is important because it reminds educators that even well-established interventions that work for most students are not going to meet the needs of *all* students. K-PALS appears to meet the requirements of a solid Tier 1 intervention, effectively increasing the reading outcomes of most students, including a portion of students with disabilities; but a group of students still remains who will likely require more intensive, individualized service to achieve desired outcomes. It is vital that educators track students' progress to identify those students for whom intervention is not effective.

The success of K-PALS for students with disabilities—and particularly its robustness across different places and points in time—is probably attributable to the many research-based elements incorporated into the program. Specifically, K-PALS incorporates National Reading Panel (National Institute of Child Health and Human Development, 2000) recommendations, such as providing students with systematic and direct instruction in PA and decoding. Further, embedded within K-PALS are opportunities for students

to practice words that they have learned to decode in connected text, thereby linking PA and phonics training to reading (National Institute of Child Health and Human Development, 2000). K-PALS also incorporates research-based instructional practices, such as providing explicit instruction, increased opportunities to respond, and immediate feedback—all practices shown to increase the effectiveness of interventions (Burns, VanDerHeyden, & Boice, 2007).

> *This finding is important because it reminds educators that even well-established interventions that work for most students are not going to meet the needs of all students.*

Does the Level of Support Given to the Teacher Affect Outcomes for Students With IEPs?

The researchers did not detect any statistically significant differences between K-PALS Level 1 and K-PALS Level 2 (which included three additional booster sessions). This outcome may have occurred because booster sessions tended to focus on a few specific students, usually those with behavioral problems; strategies discussed in the booster sessions may have had an impact for those students but not for the students with disabilities whom this study targeted. An alternative explanation could be the low intensity of the booster sessions. Teachers only attended three 1-hr-long booster sessions throughout the year, which may not have been sufficient time to affect students' beginning reading outcomes, especially those students who might have been experiencing significant reading difficulties.

Although the MANCOVA did not reveal statistically significant differences between K-PALS Level 1 and Level 2, the analysis of individual responsiveness to K-PALS demonstrated that more students responded (scored above the sample mean on Word Attack growth and Oral Reading) to K-PALS Level 2 than to K-PALS Level 1, indicating that providing teachers with booster ses-

sions may have improved outcomes for some students with disabilities.

Implications for Research

The results of this study suggest that K-PALS can be an effective instructional program for students with disabilities in general education classrooms and adds to the research base that supports K-PALS efficacy in the general education population (Fuchs et al., 2001). However, the current study included students with many different types of disabilities. Because the impact that different disability classifications have on early reading acquisition is likely to vary, further research examining the effectiveness of K-PALS for students with different types of disabilities may be useful. Such research is likely to be difficult because of the small numbers of kindergartners who have IEPs, and individual responses may vary considerably from the mean (as in Fuchs et al., 2002 and the current study). Larger samples, which may be possible as efforts to scale up K-PALS continue, may be necessary to produce larger, more homogeneous samples of students receiving special education. Single-case designs might also shed further light on students' individual responses to K-PALS. For example, Petursdottir et al. (2009) employed single-case designs to demonstrate that brief experimental analysis could be used to identify appropriate individualized modifications that increased the responsiveness to K-PALS of at-risk kindergartners.

Further research on the impact of booster sessions (or other types of ongoing teacher support) on outcomes for students with disabilities could also be useful. Although the conclusion of the group analysis conducted in the present study is that booster sessions did not add significantly to the impact of K-PALS, analysis of individual responsiveness revealed that boosters may have successfully increased the individual responsiveness of students with disabilities to K-PALS. Further, we are unable to comment on whether more extensive booster sessions would have a significant effect. A study examining various types and content of booster sessions may shed light on how much additional help is necessary to increase the impact of K-PALS. Furthermore, the present study did not specifically gear booster sessions

toward students with disabilities. The booster sessions only discussed students with disabilities if the teacher raised concerns about a specific student. If booster sessions had specifically focused on strategies and modifications for students with disabilities, we may have drawn a different conclusion.

IMPLICATIONS FOR PRACTICE

The results of this study have several implications for practice. First, K-PALS appears to be effective not only for general education students but also for many students with disabilities who are included in general education classrooms. The results of this study and others suggest that K-PALS, when implemented in the general education classroom, can be effective for a broad segment of children with and without disabilities. Also, many schools are beginning to employ RTI models, which require that they establish general education curricula and instructional practices that have been empirically validated and meet the needs of most students. This study demonstrates that K-PALS, when used as a supplement to the existing reading curriculum, can significantly increase the acquisition of early reading outcomes for a diverse group of students. In practice, however, continued monitoring of individual achievement is necessary to ensure that individual students are indeed making sufficient progress and to adapt instruction when progress is not sufficient. No single intervention, including K-PALS, will work for all students, so progress monitoring is essential to determining early whether an intervention is appropriate for a specific student.

Second, the findings of this study suggest that minimal training is necessary for teachers to implement K-PALS with adequate fidelity to obtain positive outcomes for students with disabilities. We base this conclusion on the lack of statistically significant differences in student outcomes between the group of teachers who only received a 1-day workshop at the beginning of the year and those who received booster sessions in addition to the workshop. This conclusion is somewhat tempered, however, by the results of the analysis of individual responsiveness, which demonstrated that more students in K-PALS

Level 2, whose teachers participated in booster sessions, fell into the high-responder group. Whereas future research may shed further light on the best ways to support K-PALS teachers who have students with disabilities in their classrooms, the fact that no statistically significant differences were detected between K-PALS Level 1 and Level 2 suggests that the K-PALS program is explicit and simple enough that a 1-day workshop may be sufficient for effective implementation. With the limited resources available to most schools, cost-effective programs that result in positive outcomes are vital to the success of the educational system.

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ABOUT THE AUTHORS

BROOKE H. RAFDAL, Doctoral Candidate; **KRISTEN L. MCMASTER** (CEC Minnesota), Professor; and **SCOTT R. MCCONNELL** (CEC Minnesota), Professor, Department of Educational Psychology, University of Minnesota, Minneapolis. **DOUGLAS FUCHS** (CEC Tennessee), Professor; and **LYNN S. FUCHS** (CEC Tennessee), Professor, Department of Special Education, Peabody College of Vanderbilt University, Nashville, Tennessee.

Correspondence concerning this article should be addressed to Brooke H. Rafdal, Urban Research and Outreach/Engagement Center, University of Minnesota, 2001 Plymouth Ave. North, Minneapolis, MN 55411 (e-mail: rafda001@umn.edu).