

A Picture Book Reading Intervention in Day Care and Home for Children From Low-Income Families

Grover J. Whitehurst, David S. Arnold, Jeffery N. Epstein, Andrea L. Angell,
Meagan Smith, and Janet E. Fischel

The effects of an interactive book reading program were assessed with children from low-income families who attended subsidized day-care centers in New York. The children entered the program with language development in standard English vocabulary and expression that was about 10 months behind chronological age on standardized tests. Children were pretested and assigned randomly within classrooms to 1 of 3 conditions: (a) a school plus home condition in which the children were read to by their teachers and their parents, (b) a school condition in which children were read to only by teachers, and (c) a control condition in which children engaged in play activities under the supervision of their teachers. Training of adult readers was based on a self-instructional video. The intervention lasted for 6 weeks, at which point children were posttested on several standardized measures of language ability that had been used as pretests. These assessments were repeated at a 6-month follow-up. Educationally and statistically significant effects of the reading intervention were obtained at posttest and follow-up on measures of expressive vocabulary.

According to the 1991 Carnegie Foundation for the Advancement of Teaching report, *Ready to Learn: A Mandate for the Nation*, 35% of children in the United States enter kindergarten unprepared to learn, with most lacking the vocabulary and sentence structure crucial to school success. Although there are some problems with the methods of this report and inherent difficulties in dichotomizing school readiness, there is no doubt that there are very large individual differences in early educational achievement that have long-term consequences for children and society (Alexander & Entwisle, 1988; Stevenson & Newman, 1986).

Why are so many children, particularly those from low-income families, deficient in the skills that are critical to school readiness? Children's preschool experience with books may play an important role. Adams (1990, p. 85) estimated that a typical middle-class child enters first grade with 1,000 to 1,700 hr of one-on-one picture book reading, whereas the correspond-

ing child from a low-income family averages 25 such hours. Ninio (1980) found that lower-class mothers were less likely than middle-class mothers to engage in a number of potentially instructive behaviors during story time. Correspondingly, lower-class children in her sample had smaller productive vocabularies than middle-class children. McCormick and Mason (1986) demonstrated large social class differences in the availability of printed materials in the home. For example, 47% of public-aid parents of preschoolers reported no alphabet books in the home, compared with 3% of professional parents. Feitelson and Goldstein (1986) found that 60% of the kindergartners in neighborhoods in which children did poorly in school did not own a single book; in neighborhoods characterized by good school performance, kindergartners owned an average of 54 books each. Heath (1983) described a lower socioeconomic status (SES) community in the South in which adults read to children infrequently and in which reading by oneself was frowned upon; people who did so were thought to be antisocial. Teale (1986) found that book reading to children was very unevenly distributed across 22 low-income families he visited in San Diego. Book reading occurred four or five times a week in 3 of the homes, whereas in the remaining 19 homes it occurred only about five times per year. Teale's study is important because it makes the critical point that children's individual environments vary substantially within social class categories. It is the existence of such variation and potential for change within economically disadvantaged families that is the basis for intervention efforts, including those that are described in this study.

Supporting these descriptive studies of relations between social class and literacy activities are correlational studies that demonstrate associations between early book reading to children and later academic performance. Wells (1985) showed that the frequency of listening to stories between 1 and 3 years of age

Grover J. Whitehurst, David S. Arnold, Jeffery N. Epstein, Andrea L. Angell, and Meagan Smith, Department of Psychology, State University of New York (SUNY) at Stony Brook; Janet E. Fischel, Department of Pediatrics, SUNY at Stony Brook.

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Correspondence concerning this article should be addressed to Grover J. Whitehurst, Department of Psychology, State University of New York, Stony Brook, New York 11794-2500. Electronic mail may be sent to russ@psych1.psy.sunysb.edu.

(as measured directly in the home) was significantly associated with teacher ratings of oral language skill at 5 years of age and with reading comprehension at 7 years of age for a sample of 32 normal children. Raz and Bryant (1990) demonstrated significant differences between lower- and middle-class samples of preschool children in the frequency of picture book reading, the number of books owned by the children, and the frequency of visits to a library. These latter two measures were significantly correlated with a measure of the children's phonological awareness (a critical basis for learning to read), even after the effect of the children's IQ was statistically removed. Stevenson and Fredman (1990) showed statistically significant relations between the frequency of book reading to children during the preschool period and individual differences in the reading, spelling, and IQ scores of 550 thirteen-year-olds. As Stevenson and Fredman put it, "Those parents who reported having read to their children more regularly during the preschool years had children with higher reading scores than those parents who rarely read to their children. There seemed to be a cutoff point whereby children who were read to less than four times a week achieved less well than those read to more regularly" (p. 690).

Day care, Head Start, and other organized preschool programs would seem to offer an antidote to some of the literacy deficiencies in the homes of children. However, there are substantial differences in the quality of preschool programs on the dimension of verbal interaction (McCartney, 1984; Scarr & McCartney, 1988), with children from low-income families generally receiving less optimal stimulation (Schliecker, White, & Jacobs, 1991). Enhancing the quality of the environment for language development and preliteracy skills in child-care programs is a promising target for research and social policy that aim to improve the lives of children of low-income parents.

One promising vehicle for transmitting this knowledge to children is a method of reading picture books to children, called *dialogic reading*, that we have demonstrated to be effective in enhancing children's language skills (Arnold, Lonigan, Whitehurst, & Epstein, 1994; Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Falco, et al., 1988). Dialogic reading differs substantially from the manner that adults typically read picture books to children. A shift of roles is central: In typical book reading, the adult reads and the child listens, but in dialogic reading the child learns to become the storyteller. The adult then assumes the role of an active listener, asking questions, adding information, and prompting the child to increase the sophistication of his or her descriptions of the material in the picture book. As the child becomes more skillful in the role of storyteller, the adult is encouraged to ask open-ended questions and to avoid yes/no or pointing questions. For example, the adult might say, "What is Eeyore doing?" or "You tell me about this page" instead of "Is Eeyore lying down?"

Whitehurst, Falco, et al. (1988) studied middle- to high-SES mothers and their 2-year-olds. The intervention group of mothers received two training sessions, each about half an hour in duration, and read to their children at home for 2 weeks after each training session. The control group of mothers received no training but read to their children as frequently as the intervention mothers. The program produced significant increases in

the grammatical complexity of children's speech and a 6- to 8.5-month gain in expressive language ability. These are very large effects in children who were already functioning at an advanced level before the intervention. Arnold et al. (1994) also found significant effects for middle- to upper-class children when parent training was based entirely on exposure to a videotape.

Valdez-Menchaca and Whitehurst (1992) evaluated dialogic reading techniques with children attending a public day-care center in Mexico, whose families had a mean income of less than \$2,500 per year. The linguistic ability of these children had developed very slowly as measured by standardized assessments, even though the children were developmentally normal in terms of physical and motor development. Children were matched by language test scores and were then assigned randomly to an intervention or control condition. Children in the intervention condition engaged in a one-on-one reading session with an adult each weekday for 6 weeks. The same adult also engaged children in the control condition in daily one-on-one activities, such as building with blocks and doing puzzles. There were large effects of the intervention on measures of children's spontaneous verbalizations while looking at a book and on three standardized tests of language.

Although the Mexican intervention in Valdez-Menchaca and Whitehurst (1992) demonstrated powerful effects on the language development of children from low-income backgrounds, there are limits to its external validity. Principal among these is that the adult reader was an advanced doctoral student in psychology. In a practical application of dialogic reading, adult readers would have to be day-care teachers or parents of low-income children. The Mexican project leaves unanswered the question of whether less well-educated adults can be trained to use dialogic reading techniques. A second constraint on the external validity of the Mexican procedures is that dialogic reading occurred with one child at a time. A practical dialogic reading intervention in day care would necessarily involve reading to children in groups because there is not enough staff time for an intensive program of one-on-one reading. Although there is evidence that reading to children in small groups can be effective (Morrow & Smith, 1990), dialogic reading is particularly interactive and therefore might not be easily applied in a group setting.

We conducted the present study in response to these two limitations of the Mexican study, and with the goal of developing a practical interactive book reading intervention for day-care, preschool, and Head Start settings. Children were read to in groups, rather than one at a time. Training of readers in the principles of dialogic reading was based primarily on a videotape package (Arnold et al., 1994) rather than the direct training provided to parents in Whitehurst, Falco, et al. (1988) to make training less expensive and more portable. Parents as well as teachers were involved as readers to expand the frequency of dialogic reading from that which could occur in day care alone. Day-care centers and parents were provided with books to use in dialogic reading to ensure that the reading materials would be appropriate to dialogic reading techniques. We hypothesized that children who were read to by teachers in day care would

show increments in language ability compared with a control group and that children who were read to by teachers and parents would show even stronger effects, because of a greater frequency of shared reading and a synergistic interaction between shared reading experiences at home and at day care. On the basis of previous research (Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Falco, et al., 1988), we hypothesized that effects would be stronger on measures of expressive language than on measures of receptive language and that some effects would endure following the end of the intervention.

Method

Subjects

Seventy-three 3-year-olds from low-income families participated in this research. The children attended five day-care centers in Suffolk County, New York. Suffolk County, the easternmost of the two counties that constitute Long Island, has a population of 1.3 million. Whereas sections of the north shore of the county are among the most affluent in the nation, the center of the county and some areas of the south shore include large populations living in conditions of poverty. The enrollees of the day-care centers used in this study consisted predominantly of children whose parents qualified for public subsidy of day-care costs under Title XX of the Federal Social Security Act. In Suffolk County the maximum allowable family income for a Title XX subsidy was approximately \$24,000 at the time of this study, with the limit varying somewhat depending on family size. Because living costs, and particularly housing costs, are high in Suffolk County, families at that income level could be described as the working poor. The mother was the primary or sole wage earner for most of the families in this study; virtually all of the mothers required child care to hold a job outside the home. The incomes of the families who participated in this study fell above the limits for entry of their children into Head Start and related programs for the poorest families. Few would have been able to afford day-care services without public subsidy.

Table 1 presents detailed information on the families and children who participated in this study. About half the children were Black, a quarter Hispanic, and a quarter White. The frequency with which they experienced book reading in the home as reported by their parents was less than half that reported for children from middle-class families in the same county who have previously participated in our research (Whitehurst, Falco, et al., 1988). Only about a third of the children had ever visited a library with their parents. Virtually all of the mothers worked outside the home, about half were married, and about half reported the level of stress in their lives as high. Most were high school graduates and reported reading for pleasure several times each week. Ninety percent were native speakers of English, and all whose children were included in the analyses conducted on the intervention portion of the study were fluent in English. The vocabulary and expressive skills in standard English of children at entry into the study were significantly below average as measured by standardized tests. Note that scores on these tests for children whose parents are bilingual or whose parents use nonstandard English may not have the same meaning as they do for children whose parents use standard English. Our use of standardized tests in this study is for the purposes of measuring gains in standard English, not for diagnosing disabilities.

Day-Care Centers

The five day-care centers participating in this research occupied the second through sixth positions in Suffolk County in terms of their num-

Table 1
Characteristics of Children and Families at Entry Into Study

| Characteristic | % | <i>M</i> | <i>SD</i> |
|--|----|----------|-----------|
| Child | | | |
| Male | 55 | | |
| White | 22 | | |
| Black | 55 | | |
| Hispanic | 23 | | |
| Age (years) | | 3.46 | 0.39 |
| PPVT-R standard score ^a | | 84.5 | 8.7 |
| One Word standard score ^a | | 81.9 | 14.2 |
| Age at first word (years) | | 0.94 | 0.35 |
| Speech hard to understand | 16 | | |
| TV per day (hr) | | 2.6 | 1.3 |
| Ever visits library | 36 | | |
| Picture books in home | | 27.0 | 29.0 |
| Adult-child reading sessions per week | | 3.7 | 2.0 |
| Family's annual income | | \$23,000 | 17.5 |
| No. of children living at home | | 2.2 | 0.16 |
| Mother | | | |
| Married | 46 | | |
| Living with husband or partner | 58 | | |
| Relationship with live-in partner is secure ^a | 66 | | |
| English native language | 90 | | |
| English native language of partner ^a | 82 | | |
| Works outside home | 91 | | |
| Partner works outside home ^a | 70 | | |
| Years of school | | 12.59 | 1.8 |
| Partner's years of school | | 12.32 | 3.1 |
| Stress high | 47 | | |
| Frequency of reading for pleasure per week | | 5.2 | 3.6 |

Note. All data except standard scores are based on the Family Reading Survey, a questionnaire filled out by the mother or principal caretaker of the children who participated in the study. PPVT-R = Peabody Picture Vocabulary Test—Revised; One Word = Expressive One-Word Picture Vocabulary Test—Revised.

^a Based on a denominator of the number of mothers who reported living with husbands or partners.

ber of publicly subsidized day-care slots. Each center was organized as a private, nonprofit entity, and each met the New York State licensing requirements for day-care providers. Each classroom in each center that had children participating in this study was rated by one of the coauthors of this study using the Early Childhood Environment Rating Scale (ECERS; Harms & Clifford, 1980). This scale consists of 37 items divided into seven subscales. Each item is scored from 1 (*inadequate*) to 7 (*excellent*) by the rater. The average score across subscales for each center ranged from 3.76 to 5.12. For all of the subscales except adult needs, the centers collectively averaged at or above the midpoint of 4 on the 7-point rating scales. Our impressions were that these day-care centers were above the national average in terms of the educational backgrounds of the directors and staff. However, there was considerable variability in staff quality within and across centers. All of the centers were financially marginal, depending as they did on relatively low tuition payments from the county department of social services for most of their income.

Procedure

Design. After informed consent was obtained from parents, subjects were pretested on several standardized tests of language ability,

Table 2
Books Used in Dialogic Reading

| Author | Title and publisher |
|---------------------------------------|--|
| Kate Duke (1984) | <i>Guinea Pigs Far and Near</i> . New York: E. P. Dutton. |
| Kate Duke (1988) | <i>What Would a Guinea Pig Do?</i> New York: E. P. Dutton. |
| Hazel Edwards (1988) | <i>Stickybeak</i> . Milwaukee: Gareth Stevens. |
| Don Freeman (1972) | <i>A Pocket For Corduroy</i> . New York: Viking. |
| Jack Gantos (1989) | <i>Rotten Ralph's Show and Tell</i> . Boston: Houghton Mifflin. |
| Marie-Louise Gay (1987) | <i>Rainy Day Magic</i> . Niles, IL: Albert Whitman. |
| Eric Hill (1989) | <i>Spot's Baby Sister</i> . New York: Putnam. |
| Thomas Hood (1990) | <i>Before I Go To Sleep</i> . New York: Putnam. |
| Angela Johnson (1990) | <i>Do Like Kyla</i> . New York: Orchard, Division of Franklin Watts. |
| Eric Kimmel (1990) | <i>I Took My Frog to the Library</i> . New York: Viking Penguin. |
| Dave Saunders & Julie Saunders (1990) | <i>Dibble and Dabble</i> . New York: Bradbury Press. |
| Ashley Wolff (1990) | <i>Come With Me</i> . New York: E. P. Dutton. |

were assigned randomly within classrooms to one of three conditions, underwent their assigned condition for 6 weeks, were posttested, and received a follow-up assessment 6 months after the posttest. The three experimental conditions were *school* reading, *school plus home* reading, and an activity and attention *control*. When the number of children in a classroom was not evenly divisible by three, the school plus home condition was designated to have the smallest sample size to save on the extra costs in materials and time of the home reading program. Twins or siblings in the same classroom were randomly assigned unless this resulted in one child being assigned to the school plus home reading condition and one not. In that case, which occurred only once, we flipped a coin to determine whether the pair would be assigned to the condition of the first or second member.

We checked initial randomized group assignments for balance on pretest scores in each classroom and reassigned subjects if necessary to achieve parity in pretest scores across the three groups. Reassignment proved necessary in only one classroom. It was done before the onset of the intervention and exclusively on the basis of pretest scores. We used this procedure rather than relying on statistical control of imbalances because the same teacher and aide were responsible for carrying out the design with respect to each group of subjects in their classroom. It was important to avoid the possibility that their behavior might be biased toward one group or another solely on the basis of the average ability level of that group.

Parents of 2 children who had been assigned to the school plus home condition did not make themselves available for training, and parents of a 3rd child assigned to that condition could not participate because their level of English proficiency was too low. These 3 children were assigned to one of the other two conditions of the study but were removed from the sample for all statistical tests of the effects of the reading intervention. We did this because they were exceptions to random assignment and thus were threats to the internal validity of the experiment. These 3 subjects were retained for correlational analyses not involving the treatment effect.

For the school reading condition, the teacher or aide engaged in dialogic book reading with children in groups of no more than 5 children at a time. Shared reading sessions were scheduled to occur daily for about 10 min per reading group. Six to eight of the books listed in Table 2 were used in any particular classroom over the 6-week intervention. The books in Table 2 were chosen primarily because of their potential to support vocabulary growth. Each had illustrations that could serve as a basis for introducing new vocabulary to the child, and each could support a story narrative through the illustrations alone. We avoided

picture books that relied heavily on the written text for the sense or pleasure of the book because such books generate more straight reading by adults and decrease a young child's opportunities to participate actively in story time. The selection of books for a particular classroom from those in Table 2 depended primarily on availability from the supplier. We excluded from use in any classroom any book that children had previously encountered in their day-care center.

Teachers were trained to read to children in a *dialogic reading* style by using a videotape training method (Arnold et al., 1994; Whitehurst, Arnold, & Lonigan, 1990) modeled closely on our previously used direct training procedures (Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Falco, et al., 1988). The videotape contained two assignments, described in Table 3. The procedures for the adult in Table 3 were presented as a set of rules and were followed by taped vignettes of adult-child book reading that exemplified those rules. A final section of the videotape consisted of vignettes of inappropriate adult-child book reading. Teachers were asked by the trainer to criticize the readers in the vignettes in terms of the rules of dialogic reading and to indicate what the adult reader should have done differently in response to the child. Following the videotape, the trainer engaged in role play with the teachers being trained, which involved presenting various examples of child behavior and giving the teacher feedback on her use of the dialogic reading rules. The whole training sequence took about 30 min per trainee for Part 1 and 20 min for Part 2. Part 1 and Part 2 training were separated by 3 weeks. Teachers were trained during the school day.

Children in the school plus home reading condition experienced small-group dialogic reading in school under the same conditions as children in the school reading condition. In addition, a parent or primary caretaker of each child was trained to use dialogic reading at home with the same videotape that was used for teachers and similar training procedures. Parents were trained at their child's day-care center. Training sessions were held in late afternoon, just before closing time. Children were cared for by the day-care staff while a number of parents watched the training video simultaneously and then engaged in one-on-one or two-on-one role play with a trainer. As was the case for the teachers, parent training was delivered in two assignments, separated by 3 weeks. Parents were given three books at each assignment to be used at home during dialogic reading. The books were given to the families to keep. The books were those also used by a child's teacher during dialogic reading. Parents were encouraged to read to their child daily.

Children in the control condition engaged in play activities in small groups of no more than 5 children under the supervision of a teacher or aide. Play sessions were scheduled to occur daily for about 10 min per

Table 3
Training Assignments

| Goals for the child | Procedures for adult |
|-------------------------------|--|
| Assignment 1 | |
| Noun labels | Ask who, what, and when questions, not yes-no or where questions |
| Attribute and function labels | Follow answers by the child with questions |
| Turn taking | Repeat what the child says |
| | Help the child with answers as needed |
| | Praise and encourage |
| | Follow the child's interests |
| | Have fun |
| Assignment 2 | |
| Multiword expression | Ask open-ended questions |
| Story and picture structure | Expand what the child says |
| | Have fun |

play group. Play centered around commercially available construction toys (Mobilo, Krinkles, Stackers, Tinkertoys, Tub Blocks, and Lincoln Logs) that were not present in the classrooms before the study. The teachers were instructed to make one of the six toys available to a play group at the beginning of each week of the 6-week intervention and to encourage the children to engage in cooperative, creative play. The rationale for the play sessions given to teachers was vaguely Piagetian, stressing the importance for the child's cognitive development of discovery through independent interactions with the environment and peers.

Teachers scheduled the intervention activities within their classroom at their convenience. Typically the teacher or aide would read to one small group while the other adult engaged the remaining children in another activity in the classroom. Then the teacher and aide would switch roles while the second group engaged in dialogic reading. Roles would be switched again as the teacher or aide supervised the play session for the control group. However, some teachers chose to conduct most of the small-group reading sessions themselves, leaving the aide in the role of supervising activities for the remaining children in the class. Patterns also changed from day to day, or as a result of teachers or aides being absent. Books used in the intervention condition were not available to children in the control condition during the 6-week intervention period, nor were the control condition toys available to children in the intervention conditions.

Teachers and aides obviously knew which children were in the reading and the control conditions, because they were carrying out those interventions. They were not told which children of those to whom they were reading were also being read to at home by parents. However, many teachers believed that they had discovered this on the basis of children's knowledge of the books being read in the classroom. Having the same teachers responsible for all children in the design raises the possibility of diffusion of treatment or compensatory equalization (Cook & Campbell, 1979). However, such factors are not threats to the interpretation of obtained differences because they serve only to reduce treatment effects. We believe that the likelihood of diffusion of treatment was slight because teachers viewed dialogic reading as effortful. In any case, an alternative design in which classrooms would have been assigned randomly to conditions would have required a far larger sample size than was available.

Parents and teachers were asked to fill out a daily log sheet of when reading occurred and the particular books that were used. The teachers' reading log also included information on which teacher or aide con-

ducted the reading session and which children were included in the reading group. A similar log for construction activities was kept by teachers for children in the control condition.

Assessments. At pretest, children were administered (a) the Peabody Picture Vocabulary Test—Revised, Form L (PPVT-R; Dunn & Dunn, 1981), which is a test of receptive vocabulary; (b) the Expressive One-Word Picture Vocabulary Test—Revised (One Word; Gardner, 1990), which is a test of expressive vocabulary; (c) the expressive subscale of the Illinois Test of Psycholinguistic Abilities (ITPA; Kirk, McCarthy, & Kirk, 1968), which is a test of verbal fluency in describing common objects; and (d) the *Our Word*, which is an expressive vocabulary test of our devising. The *Our Word* was in the same format as the One Word. It consisted of black-and-white photocopies of 37 pictures from the books used in this study that were judged to call for novel vocabulary (e.g., a picture of an oar). For each picture, the child was asked "What is this?" or "What is this part of the picture?"

These four tests were chosen to provide continuity with our previous research and because their domain is the vocabulary and expressive abilities that the dialogic reading intervention is designed to foster. For this population, each test has moderately high reliability across time and also across forms (for the PPVT-R and the One Word) as measured by correlations between pretest and posttest scores for the control group, which ranged from $r = .62$ to $r = .80$. Correlations among the four tests at pretest were only moderate (ranging from $r = .37$ to $r = .52$; $M = .46$), suggesting that they assessed somewhat different dimensions of language.

We have already determined that the dialogic reading intervention affects structural measures of language growth such as mean length of utterance and proportion of complex sentences (Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Falco, et al., 1988). We did not include structural measures in the present study because of the expense of doing so and because of the redundancy with prior research.

Each child was tested individually at the day-care center on each of the four pretest instruments, usually in one session of about 25 min. The mother or principal caretaker of each child was asked to complete the Family Reading Survey (Whitehurst, 1990), a multiple-choice and fill-in-the-blank questionnaire of our devising. This instrument sought information about family demographics, reading practices, and reading attitudes. Some of those data are presented in Table 1.

Posttesting occurred immediately after the end of the 6-week intervention. The posttest instruments were the same as the pretest instru-

ments, except that Form M of the PPVT-R and the original version of the One Word (Gardner, 1981) were substituted for the forms that were used at pretest.

Follow-up testing occurred 6 months after posttesting. The follow-up instruments were the same as the posttest instruments, except that Form L of the PPVT-R was used and the Our Word was not administered.

Each child's assessment session was conducted by one of six doctoral students in clinical psychology. All had undergone general training in developmental assessment and particular training on the instruments used in this study. Each test record was scored twice, once by the person who conducted the assessment and later by another assessor. Discrepancies of judgment were resolved by a third assessor. The assessors knew the design and hypotheses of the study but were not familiar with a child's assignment to condition at the time an assessment was conducted.

Results

Fidelity of the Intervention

There was substantial variability in the fidelity with which teachers followed the reading or activities schedule that was conveyed to them as part of training, as determined by the reading and activity logs that the teachers completed. Mean number of reading sessions per child in the intervention conditions per center ranged from 4.57 to 22.75 ($M = 16.63$, $SD = 8.24$). The difference in reported reading frequency across centers is statistically significant, $F(4, 43) = 86.87$, $p < .001$. This appears to be an important variable in that correlations between the outcome measures and the frequency with which individual children in the intervention conditions were reported to have participated in dialogic reading sessions at school were significant at $p \leq .05$ for the One Word posttest and follow-up, the Our Word, and the PPVT-R follow-up.

The frequency with which children in the school plus home condition were read to at home by parents also showed substantial variability ($M = 34.58$, $SD = 13.46$, range = 8–53). Correlations between this measure for children in the school plus home condition and the seven outcome measures showed $p < .05$ effects for the Our Word, One Word follow-up, and the ITPA follow-up.

Teachers were interviewed at the time of the follow-up assessment to determine the manner in which reading in classrooms was carried out after the initial 6-week intervention was completed. Each teacher indicated that all of the children were treated equally during the interval between the posttest and the follow-up assessment (i.e., the three experimental conditions were no longer maintained), that they continued to use the books that had been part of the intervention once or twice a week, and that they no longer maintained the limitation of 5 children per reading group that had been part of the intervention. Instead reading group size was reported to range from half to all of the children in a classroom (7–25 children). Shared book reading was reported to occur at least daily in all the centers except one, in which the reported frequency was 2–3 times per week. Thus during the follow-up interval, all of the children, including those assigned to the control condition, experienced frequent shared book reading in the classroom (occasionally in-

volving the books used in the intervention). However, the one-on-one interactions between an adult and child that defined the dialogic reading intervention (see Table 2) could have occurred only rarely during the follow-up interval because small-group reading ceased to occur.

Treatment Effects

A 5 (day-care centers) \times 3 (treatment conditions) analysis of covariance (ANCOVA) was conducted for each of the four posttests and each of the three follow-up tests that were administered. Children's scores on the four pretests (PPVT-R, One Word, Our Word, and ITPA) served as potential covariates for each ANCOVA. The procedure for selection of covariates was to conduct a separate multiple regression analysis for each dependent variable involving the simultaneous entry of the four pretest variables as predictors. Pretest variables that generated beta weights in the resulting prediction equation that were significant at $p \leq .05$ were then used as covariates in the corresponding ANCOVA for that dependent variable. This empirical procedure of covariate selection had the effect of producing the maximal reduction in error variance for each dependent variable (which is the purpose of covariates in a random assignment design) while eliminating problems of collinearity, redundancy, and irrelevance that might have emerged had an arbitrary set of covariates been used.

We did not use omnibus multivariate tests of effects as preliminaries to separate ANCOVAs because we hypothesized on the basis of past research that the dependent measures would respond differently to the intervention. Omnibus multivariate analyses of covariance are inappropriate under such circumstances (Rosenthal & Rosnow, 1991). We did not use a repeated measures procedure in a combined analysis of posttest and follow-up scores because we hypothesized neither main effects for the passage of time nor interactions between testing time and treatment condition, which are the two hypotheses to which a repeated measures procedure is relevant. In addition, nearly 25% of the subjects who were available at posttest had left their centers before follow-up testing. Use of a repeated measures procedure under these circumstances would have seriously compromised the power of the analysis to detect posttest effects.

The ANCOVA on One Word scores at posttest (with three covariates) produced significant effects for center, $F(4, 49) = 3.77$, $p = .009$, and condition, $F(2, 49) = 6.84$, $p = .002$, but not the interaction, $F(8, 49) = 1.55$, $p = .164$. The center effect was due to no gains having occurred at one center (which had the lowest frequency of classroom reading sessions), whereas appreciable gains occurred at the other centers (Newman-Keuls $p \leq .007$ for differences between the least compliant center and all other centers; no other center difference was significant). The effect for treatment condition was decomposed into two orthogonal contrasts: The combination of the two reading conditions versus the control condition was significant, $F(1, 49) = 10.72$, $p = .002$. The school plus home reading condition was also different from the school reading condition, $F(1, 49) = 4.39$, $p = .041$.

The ANCOVA on One Word scores at follow-up (with three

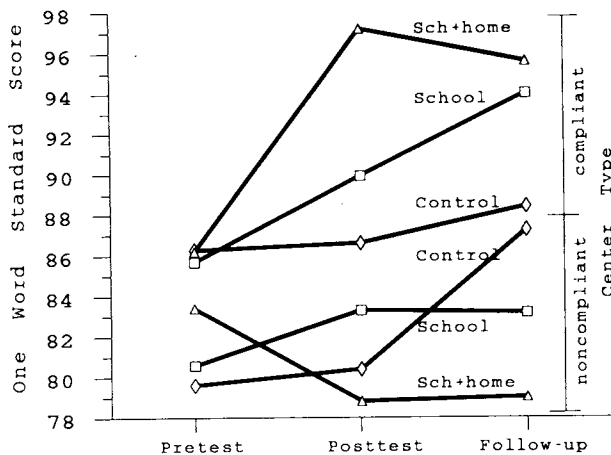


Figure 1. Pretest, posttest, and follow-up scores on the Expressive One-Word Picture Vocabulary Test—Revised in each experimental condition, illustrating statistically significant main effects of experimental condition at posttest and at follow-up and effects for center at posttest. The two reading conditions are significantly different from the control condition and different from each other at posttest. The two reading conditions are significantly different from the control at follow-up but are not significantly different from each other. The noncompliant center was significantly different from the other centers at posttest. It also had the lowest frequency of classroom reading sessions. Sch+home = school plus home.

covariates) produced a significant effect for condition, $F(2, 34) = 3.62, p = .037$. The effect for center was not significant, $F(4, 34) = 0.47, p = .753$, nor was the interaction, $F(8, 34) = 1.41, p = .224$. The contrast between the two reading conditions versus the control condition was significant, $F(1, 34) = 6.30, p = .017$, whereas the contrast between the two reading conditions was not, $F(1, 34) = 2.12, p = .156$. The effects for condition at posttest and follow-up can be seen in Figure 1, where the data from the least compliant center are plotted separately, and in Table 4.

An ANCOVA on PPVT-R posttest scores (with two covariates) produced a marginal effect for the interaction of center and condition, $F(8, 50) = 1.95, p = .073$, and no effects for center, $F(4, 50) = 0.18, p = .948$, or condition, $F(2, 50) = 1.22, p = .303$. An ANCOVA on the PPVT-R follow-up scores (with one covariate) produced a significant interaction effect, $F(8, 37) = 2.22, p = .048$, but no effects for center, $F(4, 37) = 0.77, p = .549$, or condition, $F(2, 37) = 0.80, p = .459$. The interaction at both posttest and follow-up is attributable to two centers (which had the lowest frequency of classroom reading), in which children in the control condition did marginally better than children in the reading conditions, whereas positive effects of the reading intervention were found in the other three centers.

An ANCOVA on the Our Word at posttest (with two covariates) produced significant effects for both center, $F(4, 50) = 2.89, p = .031$, and condition, $F(2, 50) = 3.46, p = .039$, but not for the interaction, $F(8, 50) = 1.25, p = .292$. The center effect was due to children at the least compliant center performing much below the level of the children at the other centers (New-

man-Keuls $p \leq .004$ for differences between the least compliant center and all other centers; no other center difference was significant), consistent with findings from the One Word. The treatment condition effect was decomposed into two orthogonal contrasts: The combination of the two reading conditions versus the control condition was significant, $F(1, 50) = 4.91, p = .031$, whereas the contrast between the two reading conditions was not, $F(1, 50) = 2.74, p = .104$. Children in the reading conditions gained approximately double the number of words between pretest and posttest as children in the control condition.

An examination of particular items on the Our Word posttest disclosed several items that were sometimes labeled correctly by children in the reading conditions (*seahorse*, *telescope*, *oar*, and *calendar*) but were never labeled correctly by any child in the control condition. Other items were labeled correctly at over twice the rate in the reading conditions as in the control condition (e.g., *violin*, *chalk*, and *washing*).

An ANCOVA on ITPA at posttest (with one covariate) and an analysis of variance on ITPA at follow-up revealed no significant differences or interactions ($p > .30$ for all tests).

Correlational Findings

In the Family Reading Survey, 65 questions were asked about family demographics and literacy-related attitudes and behaviors. We explored relations between responses to these questions and children's performance on the language assessments. With 11 individual pretest, posttest, and follow-up assessments and 64 Family Reading Survey questions, 715 correlations resulted. With an alpha level of .05, 59 significant correlations were obtained (36 would have been expected by chance). With this many correlations, it is difficult to know which of the statistically significant relations are real and which are spurious. To reduce the probability of Type I error and to increase the interpretability the results, we chose to focus on correlations between Family Reading Survey questions and posttests or follow-up tests that occurred at $p \leq .05$ and that replicated across at least three of the language assessments. Thirty-nine of the 59 significant correlations survived this screen, clustered within just 7 of the 63 questions from the Family Reading Survey (see Table 5). The positive correlations involving number of books in the home and the child's enjoyment of shared reading are consistent with theory and other findings in the literature (Crain-Thoreson & Dale, 1992; Raz & Bryant, 1990). Similarly, the negative correlations involving ear infections find support in the literature (Lonigan, Fischel, Whitehurst, Arnold, & Valdez-Menchaca, 1992). However, the relations involving the educational attainment or enjoyment of reading of the husband or partner are more clouded. Perhaps families in which the father is better educated and enjoys reading provide mothers and children with a support system that is more conducive to shared reading. Or perhaps measures of fathers' characteristics are simply markers of individual differences in a range of families' genetic or environmental advantages.

Discussion

Our results demonstrate that day-care teachers and parents can produce significant increments in the language develop-

Table 4

Means, Standard Deviations, and Sample Sizes of Treatment Conditions at Pretest, Posttest, and Follow-Up

| Condition | Pretest | | | | Posttest | | | | Follow-up | | |
|------------------|----------|--------|----------|--------|----------|--------|----------|--------|-----------|--------|--------|
| | One Word | PPVT-R | Our Word | ITPA | One Word | PPVT-R | Our Word | ITPA | One Word | PPVT-R | ITPA |
| Control | | | | | | | | | | | |
| <i>M</i> | 84.88 | 83.54 | 6.58 | 97.08 | 85.18 | 83.68 | 8.91 | 100.11 | 88.07 | 83.21 | 104.23 |
| <i>SD</i> | 10.44 | 17.14 | 5.49 | 15.03 | 16.73 | 15.83 | 7.00 | 16.98 | 17.49 | 17.63 | 24.95 |
| <i>n</i> | 24 | 24 | 24 | 24 | 22 | 22 | 22 | 22 | 14 | 14 | 13 |
| School | | | | | | | | | | | |
| <i>M</i> | 84.31 | 83.12 | 5.31 | 97.79 | 88.12 | 85.73 | 9.35 | 99.62 | 91.17 | 79.52 | 102.28 |
| <i>SD</i> | 7.10 | 10.81 | 4.64 | 19.74 | 10.43 | 11.54 | 5.00 | 14.50 | 10.36 | 14.99 | 15.67 |
| <i>n</i> | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 23 | 23 | 23 |
| School plus home | | | | | | | | | | | |
| <i>M</i> | 85.50 | 80.65 | 5.40 | 103.63 | 92.32 | 87.53 | 11.32 | 100.66 | 91.14 | 83.31 | 109.22 |
| <i>SD</i> | 6.63 | 13.08 | 4.36 | 16.59 | 16.65 | 16.72 | 6.05 | 17.38 | 13.74 | 14.59 | 17.12 |
| <i>n</i> | 20 | 20 | 20 | 20 | 19 | 19 | 19 | 19 | 15 | 16 | 16 |

Note. Posttest and follow-up means and standard deviations are uncorrected for covariates. One Word = Expressive One-Word Picture Vocabulary Test; PPVT-R = Peabody Picture Vocabulary Test—Revised; Our Word = an expressive test devised for this study; ITPA = Illinois Test of Psycholinguistic Abilities.

ment of low-income preschoolers through a few weeks of dialogic reading. These effects were obtained on two different measures of expressive vocabulary (One Word and Our Word) and were still present on the One Word 6 months after the intervention ended. These results cannot reasonably be attributed to children simply learning the pragmatics of the testing situation, because children in the intervention condition used many words such as *oar* on the Our Word that are very low-frequency words for 3-year-olds in general and that were never produced once by any child in the control condition. This is in keeping with a significant body of research showing that children acquire specific new vocabulary in the context of shared book

reading (e.g., Cornell, Senechal, & Broda, 1988; Elley, 1989; Jenkins, Stein, & Wysocki, 1984; Leung & Pikulski, 1990).

The present investigation does not address the interactional or cognitive processes that underlie language learning in shared book reading, and in that sense we cannot answer the question of why the training was effective. However, the components of dialogic reading such as increasing the frequency of adult language input, using expansions, providing feedback, and following the interests of the child have all been the subject of considerable research by us and others (e.g., Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Pemberton & Watkins, 1987; Valdez-Menchaca & Whitehurst, 1988; Whitehurst, Fischel, et al.,

Table 5

Variables From the Family Reading Survey That Correlated With at Least Three Language Assessment Instruments

| Survey question | Pretest | | | | Posttest | | | | Follow-up | | |
|--|----------|--------|----------|-------|----------|--------|----------|-------|-----------|--------|------|
| | One Word | PPVT-R | Our Word | ITPA | One Word | PPVT-R | Our Word | ITPA | One Word | PPVT-R | ITPA |
| No. of books in home | .35* | .11 | .25 | .26 | 0.32* | .37* | .31* | .32* | .41* | .18 | .22 |
| Child enjoys being read to | .05 | .28* | .27* | .12 | 0.33* | .22 | .25 | .11 | .33* | .16 | -.01 |
| English not mother's native language | -.14 | -.22 | -.05 | -.14 | -0.28* | -.35* | -.27* | -.22 | -.30* | -.23 | -.25 |
| Spouse or partner's years of school | .37* | .31* | .18 | .35* | 0.35* | .30* | .36* | .19 | .40* | .30 | .19 |
| Child troubled by ear infections | -.49* | -.17 | -.46* | .01 | -0.32 | -.47* | -.22 | -.42* | -.53* | -.53* | -.43 |
| Spouse or partner doesn't read for fun | -.32* | -.03 | -.22 | 0 | -0.32* | -.43* | .11 | -.16 | -.26 | -.19 | -.23 |
| Race ^a | -.28* | -.27* | -.38* | -.28* | -0.37* | -.34* | -.32* | -.07 | -.35* | -.35* | 0 |

Note. All correlations are Pearson *rs*. One Word = Expressive One-Word Picture Vocabulary Test; PPVT-R = Peabody Picture Vocabulary Test—Revised; Our Word = an expressive test devised for this study; ITPA = Illinois Test of Psycholinguistic Abilities.

^a Black and Hispanic versus White.

* $p \leq .05$.

1988; Whitehurst & Valdez-Menchaca, 1988). In our view, an applied intervention is not the place to decompose and analyze the function of these components. The critical questions for applied research programs are usually those that relate to issues of external validity rather than those that relate to underlying processes. Our previous work demonstrated positive effects of dialogic reading involving mothers and children in upper-income families and involving low-income Mexican children being read to by a highly educated adult. The present work extended the external validity of those findings by demonstrating that effects on low-income children can be obtained when dialogic reading occurs in small groups rather than one-on-one, and when reading partners are day-care teachers and low-income parents rather than highly educated adults. These extensions are vitally important because they show that shared book reading can be a practical intervention for preschoolers from low-income backgrounds.

Without detracting from potential importance of the present study, there are three aspects of the results that suggest the need for additional work. These are discussed in turn.

Reading Group Size

In the present study, the intervention called for classroom shared reading in groups of no more than 5 children. Teachers followed this design during the 6 weeks of the intervention, but the interview of teachers conducted at the time of the follow-up testing indicated that no teacher had continued to read to children in groups of that size during the follow-up period of 6 months.

The principles underlying dialogic reading suggest that children benefit from active responding to picture books in a setting in which an adult gently pushes the child, through questions, expansions, and sensitivity to the child's interests and abilities. These interactions must diminish for any single child as the ratio of children to adults gets larger. The problem seems to be one of control: With twenty 3-year-olds as the audience for a story, attention is tenuous and easily lost if the teacher interrupts the story to engage in a dialogic interaction with a single child. Thus, "sit still and be quiet" becomes the operative rule for children who are being read to in large groups. This, of course, is the opposite of dialogic reading. It was for these theoretical reasons that we wanted reading groups as small as possible.

The present data support the theoretical arguments against large-group reading. All of the children, including those who had originally been assigned to the control condition, were read to three to five times per week during the follow-up interval. All of the readers were teachers who had been trained in the principles of dialogic reading and who had applied those principles during the intervention phase of the study. However, at the end of the follow-up period, children in the control condition were still behind children in the reading conditions on the One Word. Thus 6 months of large-group reading for all children did not erase the advantage bestowed by 6 weeks of small-group reading for children in the intervention groups.

In this context, it is important that teachers did not continue

small-group reading after the requirement to do so lapsed. In explaining this, teachers most frequently said that although they would have liked to continue with the small-group format, they simply did not have the time to do so. In some sense, this was not true. Each classroom had a teacher and at least one aide, with a resulting ratio of no less than one adult to 10 children. Assuming four reading groups per classroom, daily dialogic reading would take about 40 min. Splitting this between the two adults in a typical classroom would mean that each adult would hold two 10-min reading sessions per day. Such an arrangement seems feasible, which is why we designed the intervention as we did. However, the present results show that within the current organization of day-care classrooms, the small-group reading program we designed will not work. Why not? One reason is that the adult-to-child ratio is not what it appears to be on paper. Although there are two or more adults in each classroom, it is rare for both of them to be engaged in teaching at the same time. Instead, one adult is often preparing or putting away materials, or taking care of problems with individual children, or dealing with various administrative chores, while the other adult is responsible for the group. A second reason is that dialogic reading in small groups is hard work, requiring as it does careful attention to individual children for extended periods. Any parent who has had his or her 2-year-old ask to be read "the dinosaur book" (or any other favorite fare) for the umpteenth time can empathize with the labor component of dialogic reading. A third reason is that the philosophy of most day-care centers is developmental rather than instructional. The function of a center's program in a developmental philosophy is to provide a supportive environment for a child's naturally unfolding interests and needs. Under such a philosophy, it is sometimes difficult to motivate staff to use a technique that is justified on the basis of its effects on children's learning of specific skills. The teaching of specific skills is often seen as the province of the school system, not of day care.

Something must change if dialogic reading procedures are to be widely disseminated and used. One promising direction is the use of adult volunteers as reading partners in lieu of teachers. The success of programs such as Literacy Volunteers of America suggests there is a large reservoir of public interest in literacy that can be channeled into volunteering. Parents and relatives of children in a day-care center are another source of readers. School-age children (Grade 5 through college) are another source of readers when a school is geographically close to a day-care center. It is interesting to note that one of the centers that participated in this project later organized a successful dialogic reading program using community volunteers, recognizing that they were unable to sustain a dialogic reading program with their own staff as reading partners.

Reading at School and at Home

A second issue involves the function of school and parents in the school plus home condition. Children in the school plus home condition performed better than children in the school condition on the One Word posttest. However, interpretation of the effects of the school plus home condition in relation to the

school condition is difficult because the design of the present study did not include a condition in which parents alone engaged in dialogic reading with their children. It is possible that a program involving only parents as readers could have produced effects as large or larger than the effects of the combined school plus home condition in the present study. On the other hand, a program for low-income parents might not be successful without the collateral efforts of day-care center teachers or adult readers other than the parents.

It is important to determine the relative effectiveness of dialogic reading programs that involve only parents as readers given the difficulties we described of sustaining small-group shared reading in day care, and given that many low-income families do not use day care (Phillips, 1991). Efforts are already underway to teach dialogic reading to low-income parents in pediatric outpatient settings (Needlman & Fitzgerald, 1993) and library outreach programs (Morisset, 1993) in which the parent has the sole responsibility as a reading partner for the child. The added value of the school plus home condition offers some support for those efforts.

Long-Term Effects

The final issue concerns the long-term effects of dialogic reading. The model that underlies our research is that dialogic reading and related activities during the preschool period enhance language and preliteracy skills, which in turn help children in learning to read and other academic tasks when they begin school. There is substantial evidence that language and preliteracy skills account for individual differences in learning to read (Adams, 1990). Our research demonstrates that dialogic reading enhances some language skills during the preschool period. However, we have not demonstrated a direct link between early dialogic reading interventions and later academic success. In fact, there is little unambiguous evidence for a causal relation between preschool experience with books and academic performance, despite the wide acceptance of such a link (Scarborough & Dobrich, in press). Significant broad-scale investment in preschool shared reading programs will not be empirically justifiable until long-term effects are unambiguously demonstrated. The results from this and related research programs (e.g., Karweit, 1989; Mason, Sinha, Kerr, & McCormick, 1992; Needlman, Fried, Morley, Taylor, & Zuckerman, 1991) are sufficiently promising to warrant long-term outcome studies, as well as research on the cognitive and social processes that underlie emergent literacy.

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