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FOCUS SECTION

Relative Efficacy of Parent and Teacher Involvement in a Shared-Reading Intervention for Preschool Children from Low-income Backgrounds

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The effects of an interactive shared-reading intervention were evaluated with 3- to 4-year-old children from low-income families who attended subsidized child care. The children entered the program with oral language skills that were significantly below age-level as measured by standardized tests. Children were pretested and randomly assigned to 1 of 4 conditions: (a) no treatment control, (b) a school condition in which children were read to by their teachers in small groups, (c) a home condition in which children were read to by their parents, and (d) a combined school plus home condition. Parents and teachers were trained in a specific form of interactive reading via an instructional videotape. The intervention was conducted for 6 weeks, after which children were posttested on standardized measures of oral language, and language samples were obtained during a shared-reading assessment. Significant effects of the reading intervention were obtained at posttest and were largest for children in conditions involving home reading.

A substantial number of children in the United States enter kindergarten with low levels of skills that are critical to school success. According to the Carnegie Foundation for the Advancement of Teaching Report, *Ready to learn: A mandate for the nation* (1991), 35% of these children lack skills in the area of vocabulary and sentence structure required to participate in the educational process. Although one could quarrel with aspects of these conclusions, for example, whether it is children who are unready for schools or schools who are unready for children, there is little doubt that there is a significant mismatch between what children bring to school and what schools expect of children. Children from low-income families appear to

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be particularly at risk for educational problems. Socioeconomic status (SES) is strongly related to school success. When schools are ranked by the median SES of their students, SES correlates .68 with academic achievement (White, 1982). SES has been reported as one of the strongest predictors of school performance at the beginning of first grade (Alexander & Entwisle, 1988). Moreover, individual differences in school performance appear to be very stable across the school years. For example, Stevenson and Newman (1986) found that the ability to name letters of the alphabet when children entered kindergarten correlated .52 with the children's 10th grade performance on a test of reading comprehension. These results indicate that: (a) school success is partially a function of variables that covary with social class, (b) social class differences in performance are present from the very beginning of school, and (c) these differences are likely to remain present from kindergarten to high school. Children from low-income families are likely to start school behind and stay behind.

Significant social class differences in oral language and preliteracy skills may be associated with differences in shared-reading in the home. Ninio (1980) found that mothers from lower SES groups engaged in fewer teaching behaviors during shared-reading than mothers from middle-class groups, and the children of mothers from lower SES groups had smaller productive vocabularies than the children of the middle-class mothers. Numerous studies have documented differences in the pattern of book ownership and frequency of shared-reading between families with lower SES and families with higher SES (Anderson & Stokes, 1984; Feitelson & Goldstein, 1986; Heath, 1982; Raz & Bryant, 1990; Teale, 1986). For instance, McCormick and Mason (1986) reported that 47% of their sample of public-aid parents reported no alphabet books in the home, whereas only 3% of their sample of professional parents reported the absence of such books. Adams (1990, p. 85) estimated that the typical middle-class child enters first grade with 1,000 to 1,700 hours of one-on-one picture book reading, whereas a child from a low-income family averages just 25 hours.

In addition to descriptive studies, several correlational studies suggest a link between early shared-reading and later reading and academic performance (e.g., Crain-Thoreson & Dale, 1992; Mason, 1992; Mason & Dunning, 1986; Moon & Wells, 1979). For example, Wells (1985) showed that the frequency of listening to stories between the ages of one and three was significantly associated with teacher ratings of oral language skills at five years of age and with reading comprehension at seven years of age. Stevenson and Fredman (1990) found an association between the frequency of preschool shared-reading and individual differences in the reading, spelling, and IQ scores of 550 13-year-olds.

Most studies investigating the effects of shared-reading during the preschool years have focused on shared-reading experiences in the home. A number of studies have investigated the effects of preschool environments on children's literacy development; however, most of these studies have not involved shared-reading manipulations (cf. Morrow, 1988). For instance, Dickinson and Smith (1994) examined the effects of preschool teachers' interaction styles during shared-reading on the vocabulary and story comprehension abilities of 25 4-year-old children

in 25 different preschool classrooms. They found that the proportion of teacher and child talk during reading that included analysis of characters or events, predictions of coming events, and discussion of vocabulary (e.g., definitions, comments about sounds or functions of words) was significantly associated with a higher level of children's vocabulary and story comprehension. Other research has found that characteristics of preschool settings such as opportunities to engage in shared-reading, writing activities, and teachers' child-directed speech are associated with higher levels of vocabulary, print concepts, and story comprehension (e.g., Dickinson & Tabors, 1991). Manipulations of children's preschool environments that provide more opportunity for interaction with literacy materials can also have an impact on children's emergent literacy skills (e.g., Morrow, 1990; Neuman, & Roskos, 1993).

Despite suggestive correlational evidence for a linkage between early experiences with shared-reading and later literacy and academic skills, recent reviews have noted that evidence for a strong causal connection between shared-reading during the preschool years and children's literacy development is weaker than typically thought (e.g., Bus, van IJzendoorn, & Pellegrini, 1995; Lonigan, 1994; Scarborough & Dobrich, 1994). Scarborough and Dobrich (1994) suggested that correlations between shared-reading and children's development may reflect other variables that covary with social class or may reflect the effects of a third variable such as the effects of children's interest in books on their parents' behavior.

In a series of studies, Whitehurst and colleagues have demonstrated that a program of shared-reading, called *dialogic reading*, can produce substantial changes in preschool children's language skills. Dialogic reading involves several changes in the way that adults typically read books to children. Central to these changes is a shift in roles. During typical shared-reading, the adult reads and the child listens, but in dialogic reading the child learns to become the storyteller. The adult assumes the role of an active listener, asking questions, adding information, and prompting the child to increase the sophistication of her or his descriptions of the material in the picture book. As the child becomes accustomed to her or his role as the storyteller, the adult shifts more of the responsibility for telling the story to the child. For example, early in the program the child is asked to name objects pictured in the book; later in the program the adult asks open-end questions (e.g., "What's happening on this page?") that allow the child to determine what to talk about. A child's responses to the book are encouraged through praise and repetition, and more sophisticated responses are modeled by expansions of the child's utterances.

In studies conducted with typically developing children from middle- to upper-income families, dialogic reading has produced superior effects on children's language skills compared to a similar frequency of typical picture book reading (e.g., Arnold, Lonigan, Whitehurst, & Epstein, 1994; Whitehurst et al., 1988). The effects of this reading program also have been evaluated with groups of children from low-income families. Valdez-Menchaca and Whitehurst (1992) examined dialogic reading with 20 children attending public child care centers in Mexico. The mean annual income of these families was less than $2,500. In comparison to a group of children who engaged in perceptual and motor tasks for an equivalent

period, children exposed to one-on-one dialogic reading for 6 weeks experienced significantly more growth in oral language skills as measured by standardized measures and spontaneous verbalizations.

Whitehurst, Arnold et al. (1994) conducted a more ecologically valid test of dialogic reading with low-income children. Seventy-three children attending publicly-subsidized child care in Long Island, NY were randomly assigned to either a control condition or one of two intervention conditions. In one intervention condition, children were read to in groups of no more than 5 children by their child care teachers. Children in the second intervention condition were read to by their parents at home and by their child care teachers in the small group format. Children in the control condition engaged in teacher-led small group play activities for an equivalent period. Teachers and parents were trained to read to children in a dialogic reading style using a videotape training method (Arnold et al., 1994; Whitehurst, Arnold, & Lonigan, 1990). Children were tested using standardized oral language measures prior to the intervention, at the end of the 6 weeks of intervention, and 6 months after the posttest. Prior to the intervention, the vocabulary and expressive scores of the children were significantly below average as measured by standardized tests. At posttest, both intervention groups experienced large and significant increases in oral language skills compared to the control group, and these gains were maintained at the 6-month follow-up test. Children who were read to by both teachers and parents experienced larger gains than the children read to by just teachers.

Whereas the results of the Whitehurst, Arnold et al. (1994) study demonstrate that a relatively brief shared-reading intervention can have powerful effects on the oral language skills of children from low-income backgrounds, the results raise additional questions. Primary among these is the role of child care teachers and parents in implementing effective interventions. Whitehurst, Arnold et al. (1994) found that the combination of teachers and parents resulted in the largest effects on children's skills. However, the design of the study did not allow a determination of the relative contribution of teachers versus parents to the effects of the combined intervention because there was no condition in which parents alone read to their children. It is possible that the effectiveness of the combined intervention was due entirely to parents, perhaps because they were reading in a one-on-one situation and were better able to adjust the level of interaction than were teachers. Alternatively, it is possible that the effectiveness of the combined intervention depended on the contributions of both teachers and parents, perhaps because of the greater frequency of shared-reading to which children would be exposed when engaged at school and at home or because of an interactive effect of parents and teachers.

The present study was designed to replicate the findings of Whitehurst, Arnold et al. (1994) with a more disadvantaged group and to address the question of the relative effectiveness of parents versus teachers in implementing the dialogic reading program with low-income children. Such a question is important because many children from lower income families do not attend preschool or child care. Moreover, Whitehurst, Arnold et al. found that the child care centers in their study were unlikely to maintain the small group shared-reading format beyond the 6-week

intervention period. Such conditions make it difficult to achieve the goal of developing practical and effective shared-reading interventions for low-income children that rely solely on child care personnel. In addition, the present study attempted to extend these findings to more naturalistic measures of language. Although Valdez-Menchaca and Whitehurst (1992) demonstrated effects of dialogic reading on both standardized tests and spontaneous verbalizations, the assessment of spontaneous verbalization occurred during an interaction with a book familiar to children in the intervention condition and unfamiliar to children in the control condition.

The present study followed the design employed by Whitehurst, Arnold et al. (1994); however, a third intervention group that involved just parent reading was included. The effectiveness of teacher-only, combined teacher and parent, and parent-only reading was compared to a no-treatment control condition. Child care centers and parents were provided with books to ensure that the reading materials available would be appropriate for the dialogic reading techniques and the children. We hypothesized that children's oral language skills would be impacted positively in all three intervention groups compared to the control group. We hypothesized that the combined teacher and parent group would show the strongest effects, both because of the higher frequency of shared-reading and because of the potential positive interaction between the effects of shared-reading experiences at home and at school. We expected that the parent-only group would produce effects between the teacher-only group and the combined teacher and parent group because although these children would be exposed to less shared-reading than the combined group, all of their shared-reading experiences would be one-on-one rather than in a group. Based upon past findings and the skills targeted by dialogic reading, we hypothesized that the effects of the intervention would be more pronounced on measures of expressive language (Arnold et al., 1994; Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold et al., 1994; Whitehurst et al., 1988) and would extend to more spontaneous measures of language production (e.g., Valdez-Menchaca & Whitehurst, 1992; Whitehurst et al., 1988).

METHOD

Participants

One hundred fourteen 3- and 4-year-old children from low-income families were recruited for this research. The children attended one of four child care centers in metropolitan Nashville, Tennessee. Children attending these four child care centers were primarily from families that qualified for public subsidy of child care costs under Title XX of the Federal Social Security Act. Parents or guardians of these children were typically involved in some form of employment or school activity as a requirement for their children's attendance at the centers. The children were from English-speaking homes, and although their living situations varied (e.g., living with parent, grandparent, or guardian; number of other children in the home; number of adults in the home), all children were from families with permanent residences. Of the 114 children, 23 left the center they were attending prior to

completing the posttest. The 91 children who completed the posttest comprised the sample for the study. A comparison between the 91 children who completed the posttest and the 23 who could not be posttested indicated that they did not differ on any of the pretest variables.

At pretest, the 91 children ranged in age from 33 to 60 months (M = 44.68 months, SD = 5.83). Forty-nine of the children were girls (53.8%), and 83 (91.2%) were African American. Scores on tests of receptive and expressive vocabulary skills administered at pretest were significantly below average as measured by standardized tests. The mean receptive vocabulary standard score was 74.9 (SD = 13.31) and the mean expressive vocabulary standard score was 83.6 (SD = 8.22).

Child Care Centers

The four child care facilities that participated in this research mainly served children of families eligible for subsidized child care. Each center was organized as a private, nonprofit entity, and each met the Tennessee state licensing requirements for child care centers. Two of the centers were located within the boundaries of two large public housing projects near the downtown area of Nashville, Tennessee. The other two centers were located closer to the outskirts of the metropolitan urban area in older neighborhoods consisting of smaller public housing facilities and multifamily dwellings. Although formal evaluation of the centers was not conducted, informal observations revealed considerable variation in terms of facility and staff quality. The center directors were above the national average in terms of educational background (i.e., all held at least a master's degree in education, social work, or related field). The educational background of staff was more variable than that of the directors, ranging from bachelor's degrees in education-related fields to those who had not completed high school. 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 children's parents or guardians, the children were pretested on three standardized tests of oral language ability. Children were then randomly assigned within classroom to one of four experimental conditions. At the end of 6 weeks of these experimental conditions, children again were administered standardized tests of oral language and a subset participated in a book reading interaction. The four experimental conditions were *school* reading, *home* reading, *school plus home* reading, and a no treatment *control* condition. Random assignment was weighted more heavily toward the control and school reading conditions (in approximately a 2:1 ratio favoring control and school conditions) because of the costs in materials associated with the two conditions involving home reading. Twins or siblings within the same classroom were randomly assigned unless this resulted in one child being assigned to a condition involving home reading and one child not. In that case, a coin was flipped to deter-

mine whether the pair would be assigned to the home reading condition of the first or second member.

Initial randomized group assignments were checked for balance on pretest scores in each center and children were reassigned if necessary to achieve balance in pretest scores. This was needed for only one of the centers. It was done before the start of the intervention conditions and exclusively on the basis of pretest scores. This procedure was used at the outset rather than relying on statistical control of preexisting group differences because the same personnel within the centers were responsible for carrying out the design with respect to each group of children in their classroom. It was important to avoid the possibility that teachers' behavior would be biased toward one group or another solely on the basis of the average ability level of a group. Randomized group assignments across centers were not checked for balance on pretest scores prior to the start of the intervention.

Parent participation in the home reading condition was voluntary. Parents or caretakers of children assigned to a home reading condition were contacted by the centers and asked to attend one of several prescheduled training sessions. All parents of children who were assigned to a home reading condition attended the first training session. Two of these parents did not make themselves available for the second training session. Although it could not be determined if these children were receiving home reading, the original group assignment of these children was maintained for purposes of analyses because this provided the most conservative test of the outcome.

For the conditions involving school reading, the teacher or aide engaged in dialogic book reading with children in groups of no more than 5 children at a time. The number of children in school reading groups in each center required that multiple groups be read to each day. Membership in a specific reading group varied among children assigned to a school reading condition on a day-to-day basis.[1] Shared-reading sessions were scheduled to occur daily for approximately 10 minutes per reading group. The teacher or aide conducting the dialogic reading group often took the children to a location outside the classroom for these sessions. At other times, the reading groups were held in an isolated area of the classroom or when the other children were in a different location (e.g., playground). A second teacher or aide supervised the rest of the class during reading sessions. The six books listed in Table 1 were provided to each classroom for use over the 6-week intervention. These books were chosen because of their potential to support vocabulary growth. Each had numerous colorful illustrations that could serve as a basis for introducing new vocabulary to children, and each book could support a story narrative through the illustrations alone. Picture books that relied heavily on the written text to convey the story narrative or pleasure of the book were not used because such books generate more straight reading by adults and decrease children's opportunities to participate actively in storytime. With the exception of one of the books in one classroom, none of these books was present in the classrooms prior to the start of the intervention.

Teachers were trained to read to children in a dialogic reading style by using a videotape training method (Arnold et al., 1994; Whitehurst et al., 1990) that was

Table 1. Books Used in Dialogic Reading at School and Home

Author	Title and Publisher
Kate Duke (1988)	*What Would a Guinea Pig Do?* New York: E. P. Dutton.
Jack Gantos (1989)	*Rotten Ralph's Show and Tell.* Boston: Houghton Miffin.
Marie-Louise Gay (1987)	*Rainy Day Magic.* Niles, IL: Albert Whitman.
Thomas Hood (1990)	*Before I go to Sleep.* New York: Putnam
Angela Johnson (1990)	*Do Like Kyla.* New York: Orchard, Division of Franklyn Watts
Eric Kimmel (1990)[1]	*I Took My Frog to the Library.* New York: E. P. Dutton.
Dave Saunders & Julie Saunders (1990)	*Dibble and Dabble.* New York: Viking Penguin.

Note: [1]Book used for shared-reading assessment only.

modeled closely on the direct training procedures used previously (e.g., Valdez-Menchaca & Whitehurst, 1992; Whitehurst et al., 1988). The videotape contained two assignments, described in Table 2. These procedures were presented as a set of guidelines and were followed by taped vignettes of adult-child book reading that exemplified these guidelines. The version of the videotape used with teachers contained a second section with guidelines specific to using dialogic reading in groups (see Table 2). The final section of the videotape consisted of vignettes of adult-child reading that did not conform to the guidelines. Teachers were asked by the trainer to criticize the reading presented in these vignettes according to the dialogic reading guidelines and to indicate what the adult reader should have done differently. Following the videotape, the trainer engaged teachers in a one-on-one role-play, which involved presenting the teacher with various examples of child behavior, and providing the teacher with feedback on her use of the dialogic reading guidelines. The whole training session took about 30 minutes per trainee for Part 1 and 20 minutes for Part 2. Part 1 and Part 2 training sessions were separated by 3 weeks. All teachers were trained during the school day.[2]

The parents or caretakers of children in the conditions involving home reading were trained to use dialogic reading at home with a videotape similar to the one used with teachers; however, this videotape did not include the section with guidelines for dialogic reading in groups. Parents were trained at their child's child care center. Training sessions were usually conducted in the late afternoon, just before closing time. Children were cared for by child care staff while a number of parents watched the training video simultaneously and then engaged in one-on-one role plays with the trainer. Parent training was delivered as two assignments separated by 3 weeks. Parents were given three of the books listed in Table 1 at each assignment. Books were given to families to keep. Parents of children in the two conditions involving home reading were encouraged to read to their children daily using the methods outlined in training.

No specific instructions or activities were provided for children in the control group. This strategy was selected for three reasons. First, we wanted to reduce the possibility of differential teacher treatment of children in the home conditions. Teachers were not informed of the home reading status of the children; however, they were informed that some children were in a home reading condition. Teachers

Table 2. Dialogic Reading Training Assignmens

Goals for the Child	Procedures for Adult
ASSIGNMENT 1	
Noun Labels	Ask who, what, and when questions, not yes-no or where questions
Attrubute and Function Labels	
Turn Taking	Follow answers by child with questions
	Repeat what child says
	Help the child with answers as needed
	Praise and encourage
	Follow child's interest
ASSIGNMENT 2	
Multiword Expression	Ask open ended questions
Story and Picture Structure	Expand what the child says
SPECIFIC TEACHER INSTRUCTIONS	
	Read to small groups of no more than 5 children
	Group should sit next to teacher
	Have entire group repeat
	- Don't let one child dominate
	- Don't let children interrupt each other
	- Children should take turns

obviously knew which children were in the school reading conditions, and some believed they knew which children were in the home reading conditions (e.g., because of children's knowledge of the books used 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). Such factors would serve to reduce treatment effects, however, and are therefore not threats to the interpretation of obtained differences. An alternative design that randomly assigned classrooms to conditions would have required a far larger sample size than was available. Second, previous studies (Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold et al., 1994) have already shown that dialogic reading produces effects superior to an activity and attention control group. Finally, we wanted to reduce the demand on teachers' time to facilitate their compliance with the suggested reading group frequency. Because of the large number of children in the combined control and home group, teachers would have had to conduct more control activity groups than reading groups. Parents of children in the control and school conditions were not given any instructions or asked to complete any forms after they returned consent forms.

Teachers and the parents of children in the two conditions involving home reading were asked to fill out a daily log sheet of when dialogic reading occurred and the particular books that were used. The teachers' reading logs also included information about which teacher or aide conducted the reading session and which children were included in the reading group. Each center was visited weekly to collect teacher logs, check compliance with the intervention, and provide guidance to

resolve any difficulties with conducting the intervention. Parent logs were collected at the second training session and following the last week of intervention.

Assessments. At both pretest and posttest, the children were administered three standardized tests of oral language. Receptive vocabulary skills were assessed using the *Peabody Picture Vocabulary Tests - Revised* (PPVT-R; Dunn & Dunn, 1981). On the PPVT-R, the child is required to point to one of four pictures that represent an object or action named by the examiner (e.g., "Point to bus."). Alternate forms of the PPVT-R were used for the pretest and posttest assessments. Form L of the PPVT-R was used at pretest and Form M of the PPVT-R was used at posttest. Expressive vocabulary skills were assessed using the *Expressive One-Word Picture Vocabulary Test* (EOWPVT; Gardner, 1979) at pretest and the *Expressive One-Word Picture Vocabulary Test - Revised* (EOWPVT-R; Gardner, 1990) at posttest. Both versions of the EOWPVT require the child to provide names for pictures of common objects. The Verbal Expression subtest of the *Illinois Test of Psycholinguistic Abilities* (ITPA-VE; Kirk, McCarthy, & Kirk, 1968) was administered at both pretest and posttest. The ITPA-VE is a test of verbal fluency in describing common objects.

These three tests were used to provide continuity with previous research and because they assess the domain of vocabulary and expressive skills that the dialogic reading program is intended to affect. Both the PPVT-R and EOWPVT were standardized and normed on a nationally representative sample; the standardization sample for the ITPA-VE was less representative. Indices of internal consistency for each test are high (e.g., split-half reliabilities: PPVT-R = .80, EOWPVT = .94, ITPA-VE = .86). Correlations between pretest and posttest scores for the control group, which ranged from .73 to .57, indicate that these tests have moderately high reliability across time and form (for the PPVT-R and the EOWPVT) within this population. At pretest, scores on each of the three tests were only moderately correlated (ranging from $r = .27$ to $r = .66$), suggesting that these tests assessed somewhat different dimensions of oral language.

In addition to the assessment of children's oral language skills using standardized tests, the verbal productions of a subset of the children ($n = 66$) were assessed during a semi-structured reading interaction. These 66 children were those who were available to complete the assessment. These assessments occurred near the end of the school year, and it is likely that many of the children who were not given this assessment had left the centers because their parents were no longer attending school or they had older siblings who could care for them at home. The children who were administered this assessment looked at two books with a familiar adult male who asked open-ended questions (e.g., "Tell me about this page.") during the book interactions. One of the books was unfamiliar to all the children (*I Took My Frog to the Library*, Kimmel, 1990). For the other book, children in the intervention groups were asked to select one of the six books that had been used in the reading intervention. Children in the control condition were assigned an intervention book for the semi-structured reading assessment in a manner that equated the number of times a particular intervention book was read in the control and inter-

vention groups. The order of intervention and unfamiliar books was counterbalanced across children.

All book interactions were audio recorded and lasted until the child had looked through the whole book; however, only the first five minutes of the interaction was used for analysis. The audiotapes were transcribed and analyzed using the CHILDES language coding and analysis procedures (MacWhinney, 1991). All transcripts were reviewed by a second coder for accuracy and any discrepancies were resolved by discussion. Children's verbalizations were scored for overall complexity (i.e., MLU), total speech production and diversity (i.e., token, type), and specific categories of semantic diversity (i.e., different nouns, verbs, adjectives/modifiers). Correlations within scored categories between books indicated moderate reliability (average $r = .61$, range = .33 to .75)

Each child was tested individually at his or her child care center on each of the three standardized measures in one session lasting about 25 minutes. Posttesting occurred immediately following the end of the 6-week intervention in a single session. Each child's assessment sessions were conducted either by a Ph.D. level clinical psychologist or one of three doctoral students in clinical psychology. All had undergone general training in developmental assessment and particular training on the measures used in this study. The assessors were familiar with the design and hypotheses of the study but were, in most cases, not familiar with a child's assignment to condition at the time an assessment was conducted. Analyses of assessor by group assignment did not reveal any significant group by assessor interactions at pretest (all $ps > .21$) or posttest (all $ps > .21$). Each test record was scored twice, once by the person conducting the assessment and once by another assessor. Discrepancies were resolved by a third assessor. The reading interaction assessment was completed within two weeks of a child's standardized posttesting.

RESULTS

Preliminary Analyses

The reading logs completed by the teachers revealed substantial variability in the frequency that teachers followed the reading group schedule that was conveyed to them as part of the training. Mean number of reading sessions per child in the intervention conditions per center ranged from 2.8 to 20.5 ($M = 11.7$, $SD = 7.84$). The difference in reading frequency between centers was statistically significant, $F(3, 43) = 102.98$, $p < .001$, and post hoc analyses showed that all centers differed from each other ($p < .05$). Reading per child was relatively frequent at two of the centers ($M = 17.4$, $SD = 5.63$) and infrequent at the other two centers ($M = 6.8$, $SD = 5.94$), $F(1, 45) = 39.17$, $p < .0001$. The correlation between the posttest EOWPVT and the frequency with which children in the school and the school plus home condition were reported to have participated in the school reading sessions was significant (simple $r = .30$, $p < .05$, partial $r = .49$, $p < .001$ controlling for pretest EOWPVT). The frequency that parents reported reading to their children in the school plus home and home conditions was also variable ($M = 28.2$, $SD = 9.63$,

range = 12 to 52); however, only 60% of parents returned their reading logs. There was no evidence of systematic differences in frequency of parent reading across centers or the two groups involving home reading (*p*s > .47), and whether or not parents returned their reading logs was not associated with center compliance with the intervention ($p > .25$). There was no significant relation between parents' reports of reading frequency and children's scores on the outcome measures.

Because of the significant differences between centers in the frequency that the center-based intervention sessions were conducted and the relation between the frequency of school reading sessions and outcome, subsequent analyses were conducted at the level of center compliance with the intervention reading frequency instructions (i.e., high versus low). Because of the small number of children in each of the two home reading groups at each center, analyses were conducted at the level of center compliance rather than at the level of centers to maximize the number of children in each cell of the design.[3]

Standard scores on each of the pretest measures, children's ages, and number of children in each group for the 91 children who completed the posttest assessments are shown in Table 3 for the high and low compliance centers separately. Visual inspection of histograms as well as examination of the distributional properties (e.g., skew) of the pretest and posttest measures did not reveal any significant departures from normality or restriction of range. Children's age was correlated with pretest scores on the PPVT-R ($r = -.51, p < .001$) and the EOWPVT ($r = -.53$, $p < .001$). Older children scored significantly lower on these tests than the younger children. Analyses of variance on the pretest variables revealed that children in the high compliance centers were older ($M = 46.0$ months, $SD = 4.24$) than children in the low compliance centers ($M = 43.4$ months, $SD = 6.69$), $F(1, 83) = 5.31, p = .03$. There were no significant effects of group (all *p*s > .26) or the group by center compliance interaction (all *p*s > .31) on the pretest variables.

Treatment Effects

Standardized Tests. A 4 (group) × 2 (center compliance) analysis of covariance (ANCOVA) was conducted on each of the three posttest measures. Children's scores on the three pretests (PPVT-R, EOWPVT, and ITPA-VE) and children's ages at pretest were used as covariates. Preliminary omnibus multivariate tests of effects were not used prior to conducting the separate ANCOVAs because we hypothesized on the basis of past research and the nature of the intervention that the dependent measures would respond differently to the intervention. Under such circumstances, omnibus multivariate analyses of covariance are not appropriate (Rosenthal & Rosnow, 1991). To examine the effects of the intervention, significant treatment effects within the ANCOVAs were followed with a set of nonorthogonal planned comparisons. The three intervention groups combined were compared to the control group, and three two-group comparisons were used to examine differences between the intervention groups because a primary question was whether different intervention components were more effective than each other. Finally, to further understand significant effects, the separate intervention groups were compared to the control group.

Preliminary analyses revealed that there were no interactions between the covariates and either group, center compliance, or the group by center compliance interaction (all *ps* >.19). Consequently, the covariates met the homogeneity of regression assumption of ANCOVA. There were no main effects for child ethnicity or gender (all *ps* > .38), and neither gender nor ethnicity entered a significant interaction with group (all *ps* > .16). Descriptive statistics for raw and adjusted scores for each of the posttests for each group in high and low compliance centers are shown in Table 3.

The ANCOVA on the EOWPVT at posttest revealed a significant effect of intervention group, $F(3, 79) = 3.13$, $p = .03$, center compliance, $F(1, 79) = 8.35$, $p = .005$, and the group by center compliance interaction, $F(3, 79) = 2.84$, $p = .04$. Because of the significant interaction, planned comparisons were conducted separately for the high and low compliance centers. In the high compliance centers, the combined intervention groups scored significantly higher than the control group, $F(1, 79) = 4.57$, $p = .04$, and none of the intervention groups differed from each other (all *ps* > .31). The school plus home group scored higher than the control group, $F(1, 79) = 4.72$, $p = .03$ and there was a trend for the school group to score higher than the control group, $F(1, 79) = 2.96$, $p = .09$. In the low compliance centers, the combined intervention groups did not score higher than the control group, $F(1, 79) < 1.0$, $p = .81$. However, the school group scored lower than both the school plus home group, $F(1, 79) = 7.62$, $p = .01$, and the home group, $F(1, 79) = 8.64$, $p = .005$. The school group also scored lower than the control group, $F(1, 79) = 4.80$, $p = .03$. The effect of center compliance was due to scores for the school group being higher in high compliance centers than in low compliance centers, $F(1, 79) = 20.70$, $p = .001$.

The ANCOVA on the ITPA-VE at posttest revealed a significant effect of intervention group, $F(3, 79) = 4.94$, $p = .003$. There was no effect for center compliance, $F(1, 79) = 0.10$, $p = .75$, or the group by center compliance interaction, $F(3, 79) = 1.19$, $p = .32$. The combination of all three intervention groups scored higher than the control group, $F(1, 79) = 4.40$, $p = .04$. Scores in the home group were higher than scores in either the school group, $F(1, 79) = 11.22$, $p = .001$, or the school plus home group, $F(1, 79) = 6.44$, $p = .02$. Scores for the home group were higher than scores in the control group, $F(1, 79) = 12.87$, $p = .0005$. The ANCOVA on the PPVT-R at posttest revealed no significant effects (all *ps* > .30).

Verbal Productions. As noted previously, only 66 of the 91 children who completed the standardized posttests were available for the semi-structured reading interaction assessment. More reading interaction assessments were conducted with children from high compliance centers (59% were from high compliance centers), $\chi^2 = 8.93$, $df = 1$, $p = .003$, and this difference was due to fewer children in the control and school group being available for this assessment in the low compliance centers. There were no differences on any of the pretest or posttest measures between the 66 children who were administered the reading interaction assessment and the 25 children who were not (all *ps* > .30), and there were no effects of inter-

Table 3. Descriptive Statistics by Intervention Group and Center Intervention Compliance for Raw Pretest and Posttest Scores and Adjusted Mean Posttest Scores

		Low Compliance Centers				High Compliance Centers			
		Control	School	Home	School plus Home	Control	School	Home	School plus Home
n per Group		11	16	9	10	16	15	7	7
Age in Months	*M*	43.5	44.0	41.9	43.4	46.3	45.4	46.9	46.0
	SD	(7.65)	(8.31)	(5.37)	(3.86)	(4.90)	(3.64)	(4.79)	(4.04)
PPVT									
Pretest	*M*	73.7	73.5	79.2	67.1	76.8	79.3	74.7	71.9
	SD	(16.41)	(12.43)	(11.94)	(14.35)	(17.04)	(6.85)	(9.69)	(13.75)
Posttest	*M*	83.9	78.4	88.1	80.0	83.0	83.3	80.1	77.9
	SD	(7.47)	(12.62)	(17.22)	(11.33)	(17.78)	(8.88)	(9.41)	(8.63)
Adjusted Posttest		83.4	80.1	84.7	83.9	80.7	80.8	82.1	79.0
EOWPVT									
Pretest	*M*	84.5	82.3	86.3	82.4	84.8	84.7	80.1	82.1
	SD	(9.63)	(8.43)	(8.08)	(4.48)	(11.14)	(7.41)	(5.11)	(7.58)
Posttest	*M*	87.3	79.6	90.7	85.5	89.5	93.5	93.7	90.6
	SD	(8.97)	(11.59)	(9.77)	(4.88)	(14.02)	(8.25)	(6.87)	(7.00)
Adjusted Posttest		87.1	81.3	88.8	88.6	86.8	91.2	95.4	91.3
ITPA-VE[1]									
Pretest	*M*	96.4	90.0	96.9	89.0	100.9	97.2	92.9	97.5
	SD	(10.57)	(7.36)	(14.94)	(8.60)	(13.00)	(9.49)	(8.47)	(10.99)
Posttest	*M*	106.8	99.1	108.3	110.5	104.1	108.3	104.0	123.2
	SD	(14.28)	(15.91)	(17.23)	(15.13)	(12.21)	(12.74)	(8.02)	(16.69)
Adjusted Posttest		106.1	102.3	107.3	114.5	100.2	106.8	105.4	121.8

Notes: Adjusted posttest scores are corrected for pretest covariates. Unadjusted posttest scores are not corrected and, as such, are different from the ANCOVA results reported in the text. PPVT-R = Peabody Picture Vocabulary Test - Revised; EOWPVT = Expressive One-Word Picture Vocabulary Test; ITPA-VE = Verbal Expression subscale, Illinois Test of Psycholinguistic Abilities.

[1]Standard scores on the ITPA-VE have been converted from the published norms (i.e., $M = 36$, $SD = 3$) to the more common standard score format (i.e., $M = 100$, $SD = 15$) to aid comparisons to other tests.

vention group (all *ps* > .26) or group by compliance interactions (all *ps* > .37) on any of the pretest variables for these 66 children.

Children's verbal productions during the semi-structured book-reading assessment were analyzed by a 4 (group) × 2 (center compliance) multivariate analysis of covariance (MANCOVA). Preliminary analyses indicated that three of the pretest variables (i.e., age, PPVT-R, EOWPVT) did not meet the homogeneity of regression assumption of MANCOVA/ANCOVA. Consequently, only children's pretest ITPA-VE scores were used as covariates in these analyses. The overall MANCOVA revealed a significant effect for group, approximate $F(36, 141) = 1.79$, $p = .009$, center compliance, $F(12, 45) = 2.18$, $p = .03$, and a marginally significant group by compliance interaction, approximate $F(36, 131) = 1.40$, $p < .09$. Inspection of the data as well as the univariate simple effects indicated that there were several group by compliance interactions, which paralleled the interaction found in the standardized test data, for the individual dependent measures. Consequently, group effects on the individual dependent measures from the reading interactions were analyzed for the high and low compliance centers separately. Significant effects of group were examined using the same nonorthogonal contrasts described for the standardized tests.

Means and standard deviations for children's verbal productions while reading the unfamiliar book are shown in Table 4. In the high compliance centers, significant effects of group were found for children's MLU, $F(3, 57) = 3.67$, $p = .02$, the total number of words produced, $F(3, 57) = 3.53$, $p = .02$, the number of different words produced, $F(3, 57) = 3.66$, $p = .02$, the number of different nouns produced, $F(3, 57) = 3.28$, $p = .03$, and the number of different adjective/modifiers produced, $F(3, 57) = 2.81$, $p = .05$. Planned comparisons revealed that the combined intervention groups produced longer utterances ($p = .018$), produced more words overall ($p = .005$), produced a higher diversity of words ($p = .015$), and produced more adjectives/modifiers ($p = .04$) than the control group. Overall, there were minimal differences between the three intervention groups, and most of the separate intervention groups differed from the control group on a majority of these variables (see Table 4). In the low compliance centers, there was a significant effect of group for the number of different words produced, $F(3, 56) = 3.13$, $p = .04$; however, neither the combined intervention groups nor any individual intervention group differed from the control group (see Table 4). Children in high compliance centers scored higher on MLU, number of words, and number of different words, and the effects were due to differences between centers in the school plus home and home groups.

Means and standard deviations for children's verbal productions while reading the intervention book are shown in Table 5. In the high compliance centers, significant effects of group were found for the total number of words produced, $F(3, 58) = 2.84$, $p = .05$, the number of different words produced, $F(3, 58) = 3.42$, $p = .02$, and the number of different verbs produced, $F(3, 58) = 3.67$, $p = .02$. Planned comparisons indicated that the combined intervention groups produced more words overall ($p = .007$), produced a higher diversity of words ($p = .003$), and produced more verbs ($p = .003$) than the control group. There were no differences between the three intervention groups on any of the measures of verbal interaction with the

Table 4. Descriptive Statistics by Intervention Group and Center Intervention Compliance for Children's Verbal Productions While Reading Unfamiliar Book with Examiner

		Low Compliance Centers				High Compliance Centers			
		Control	School	Home	School plus Home	Control	School	Home	School plus Home
n per Group		4	6	9	8	12	13	7	7
Language Production									
MLU	*M*	2.93	3.25	3.22	3.21	3.27^{*1}	3.41_{a}	$3.81_{a, b}$	$4.48^{5}{}_{b}$
	SD	(1.20)	(0.69)	(0.81)	(0.95)	(0.78)	(0.60)	(0.81)	(0.78)
# of Words	*M*	59.75	114.00	70.22	89.38	78.75^{*1}	$129.33^{5}{}_{a}$	113.14_{a}	$144.29^{5}{}_{a}$
	SD	(46.52)	(57.91)	(39.17)	(42.80)	(38.73)	(54.59)	(54.23)	(20.45)
Semantic Complexity									
# of Different Words	*M*	36.25^{*}	59.67_{a}	37.67_{b}	$50.88_{a, b}$	49.58^{*1}	$64.08^{4}{}_{a, b}$	54.71_{a}	$78.00^{5}{}_{b}$
	SD	(24.51)	(18.45)	(19.29)	(20.22)	(14.94)	(20.86)	(16.85)	(7.79)
# of Nouns	*M*	12.25	11.83	10.56	11.88	11.33^{*}	$16.17^{5}{}_{a}$	11.29_{b}	$15.86^{3}{}_{a, b}$
	SD	(4.35)	(4.84)	(5.46)	(5.11)	(3.50)	(6.01)	(3.60)	(2.91)
# of Verbs	*M*	6.50	10.50	6.89	8.75	10.92	11.50	11.43	17.57
	SD	(5.51)	(6.02)	(5.16)	(5.60)	(4.58)	(4.64)	(2.64)	(3.60)
# of Modifiers	*M*	2.00	2.33	2.00	2.88	1.67^{*2}	$3.50^{5}{}_{a}$	2.00_{a}	2.86_{a}
	SD	(1.83)	(1.21)	(1.23)	(2.36)	(0.99)	(1.24)	(1.63)	(3.34)

Notes: MLU = Mean Length of Utterance. All other terms defined in the text. *Group effect at $p < .05$. [1,2]Combined intervention groups differ from control at $^{1}p < .02$, $^{2}p < .05$. [3,4,5]Group differs from control group at $^{3}p < .06$, $^{4}p < .05$, $^{5}p < .01$. Intervention groups not sharing a common subscript differ from each other at $p < .05$ following significant group effect.

intervention book, and differences between the control group and the separate intervention groups tended to follow the pattern for the combined intervention groups (see Table 5). There were no effects of group for the interaction with the intervention book in the low compliance centers. Children in high compliance centers scored higher on all of these variables, and the effects were due to differences between centers in the school plus home and home groups.

DISCUSSION

These results demonstrate that both child care teachers and parents can produce significant positive changes in the development of oral language of low-income children using a relatively brief dialogic reading intervention. The effects were apparent on two standardized measures of expressive language (i.e., EOWPVT and ITPA-VE), and the results measured by these tests were both statistically significant and relatively large in absolute terms. The overall effect size[4] for the intervention on the EOWPVT in the high compliance centers was .41. Effect sizes for individual intervention groups on the EOWPVT in the high compliance centers ranged from .30 for the school group to .74 for the school plus home group. On the ITPA-VE, the overall effect size was .44 and ranged from .18 in the school group to 1.19 in the home group. Most of these effect sizes are in the medium range defined by Cohen (1977). Effects of the intervention also were found on more naturalistic measures of children's expressive language during shared-reading. In the high compliance centers, effect sizes for the intervention groups on the unfamiliar book ranged from .63 for MLU to 1.03 for total words produced. Similar effect sizes were obtained with the intervention book (i.e., effect sizes of 1.30 and 1.03 for word diversity and total words produced, respectively).

These results add important data to the theoretical and empirical controversy concerning the role of shared-reading activities in the development of oral language and other emergent literacy skills. Despite the widespread acceptance that shared-reading influences language and literacy skills, available evidence indicates that the effect is unlikely to be as strong or as unambiguously demonstrated as it is often believed to be (Bus et al., 1995; Dunning, Mason, & Stewart, 1994; Lonigan, 1994; Scarborough & Dobrich, 1994). These data as well as other studies (e.g., Arnold et al., 1994; Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold et al., 1994; Whitehurst et al., 1988) indicate that at least some forms of shared-reading can increase children's oral language skills. In this study, effects were present both on standardized measures of oral language and on spontaneous speech samples. Moreover, the effects on structural aspects of spontaneous speech were relatively large, and they were present during interactions with materials that were novel to children in both control and intervention groups. To our knowledge, this is the one of the few studies that has demonstrated large environmental effects on core linguistic categories of children's spontaneous speech with materials not part of a manipulation (cf. Valdez-Menchaca & Whitehurst, 1992). These effects on standardized and naturalistic assessments were obtained despite the fact that the average child in the center with the highest frequency of reading in this study

Table 5. Descriptive Statistics by Intervention Group and Center Intervention Compliance for Children's Verbal Productions While Reading Intervention Book with Examiner

		Low Compliance Centers				High Compliance Centers			
		Control	School	Home	School plus Home	Control	School	Home	School plus Home
n per Group		4	6	9	8	12	13	7	7
Language Production									
MLU	*M*	3.13	3.17	3.38	2.78	3.47	3.64	4.09	4.42
	SD	(1.34)	(0.93)	(1.13)	(0.67)	(0.67)	(0.80)	(0.93)	(0.61)
# of Words	*M*	147.25	144.33	113.33	125.63	134.08^{*1}	$179.54^{3}{}_{a}$	$196.57^{4}{}_{a}$	$222.43^{5}{}_{a}$
	SD	(101.41)	(98.96)	(60.31)	(63.59)	(60.40)	(55.16)	(50.50)	(44.40)
Semantic Complexity									
# of Different Words	*M*	63.75	69.67	61.33	67.00	68.00^{*1}	$89.54^{4}{}_{a}$	$97.14^{4}{}_{a}$	$107.14^{5}{}_{a}$
	SD	(44.94)	(35.79)	(24.60)	(23.34)	(21.10)	(24.30)	(21.63)	(16.53)
# of Nouns	*M*	21.50	22.00	17.56	18.00	20.75	24.62	25.29	28.29
	SD	(12.87)	(6.13)	(6.27)	(4.87)	(7.94)	(7.18)	(5.85)	(7.70)
# of Verbs	*M*	11.75	14.17	10.78	12.50	12.25^{*1}	$17.00^{4}{}_{a}$	$20.71^{5}{}_{a}$	$17.86^{3}{}_{a}$
	SD	(9.98)	(6.11)	(5.74)	(5.13)	(5.01)	(6.37)	(4.68)	(8.21)
# of Modifiers	*M*	1.50	1.33	1.78	3.13	2.42	4.46	4.43	4.57
	SD	(1.29)	(1.63)	(1.30)	(2.42)	(1.98)	(3.50)	(2.82)	(3.69)

Notes: MLU = Mean Length of Utterance. All other terms defined in the text. *Group effect at $p < .05$.
[1]Combined intervention groups differ from control at $p < .01$. [3,4,5]Group differs from control group at $^{3}p < .06$, $^{4}p < .05$, $^{5}p < .01$. Intervention groups not sharing a common subscript differ from each other at $p < .05$ following significant group effect.

would have only been exposed to between 3.5 and 5 hours of center-based dialogic reading (i.e., 20.5 sessions at 10 to 15 minutes each).

The results indicated that the intervention worked better in some centers than in others. Children in groups involving center-based intervention improved in the more compliant centers, which conducted the intervention with a high frequency, whereas they did not in the less compliant centers, which conducted the intervention with a low frequency. It is possible that higher and lower compliance centers differed on educationally important factors other than the frequency with which the dialogic reading groups were conducted;[5] however, there is no reason to believe that different educational practices other than dialogic reading were differentially applied to children in the different intervention groups. Moreover, intervention effects were found within the center compliance factor; consequently, conclusions about the intervention effects are not threatened. Although frequency of reading is the most straightforward interpretation of the compliance interaction, it is possible that something that was not measured in this study interacted with the intervention. Unfortunately, extensive data on the characteristics of the centers in this study were not collected. However, both the director of the center with the highest compliance with the intervention and the director of the center with the lowest compliance with the intervention had doctoral degrees. Assistant directors at both of these centers held masters degrees, and the staff at both centers appeared to be similar in education and years of experience. No center had extensive involvement of parents in the center's activities, and all centers were equivalent in terms of teacher to child ratios and number of support staff. Consequently, factors other than center management (see below) did not seem to covary with compliance with the intervention.

Results also differed depending on the outcome measure, and the obtained pattern of significance differed from that obtained by Whitehurst, Arnold et al. (1994). There are at least three explanations of these findings. First, the standardized tests used sample a relatively small pool of items at each age level, and there is no attempt to have dialogic reading target these specific items. Consequently, children may acquire specific vocabulary or language skills that are not measured by the tests. These tests may be less able to detect intervention effects for older children and children with more delayed language because the number of items is roughly equal at each age level and, therefore, the tests sample a smaller percentage of age-appropriate language skills. Second, despite a relatively large sample, the power to detect effects of even moderate magnitude was not high, making it less likely that smaller but true differences would be detected between the groups. Although this fact does not cause a problem in cases where significant differences were found, it does limit the conclusions that can be made where differences were not found. For example, whereas Whitehurst, Arnold et al. (1994) found significantly higher EOWPVT scores in the school plus home group than in the school group, in this study, the difference between the school plus home group and school group was not significant; however, estimates of the magnitude of effects were roughly equivalent in the two studies (i.e., effect size of school plus home group approximately double that of school group in both studies). The third explanation,

discussed below, concerns the domain of language skills assessed by the different outcome measures.

Answers to questions concerning the relative efficacy of teacher and parent involvement in dialogic reading interventions for low-income children seem to depend on the outcome measure. The most straightforward interpretation of the results on the EOWPVT involves the frequency of shared-reading. Stronger effects of the intervention were obtained in centers with more frequent dialogic reading. Children in the low compliance centers did not benefit from center-based dialogic reading perhaps because they were not exposed to it with sufficient frequency to make a difference. Within high compliance centers, children who were exposed to dialogic reading at both home and school appeared to benefit more than those exposed just at home or just at school. Although differences between these groups of children were not statistically significant, the effect size for the combined group was almost double that of the other two groups. These findings are in keeping with a growing body of research that indicates that shared-reading is an activity that fosters vocabulary development in children (e.g., Cornell, Sénéchal, & Broda, 1988; Elley, 1989: Jenkins, Stein, & Wysocki, 1984; Sénéchal, LeFevre, Hudson, & Lawson, 1996; Sénéchal, LeFevre, Thomas, & Daley, 1998; Sénéchal, Thomas, & Monker, 1995). The fact that the two school groups resulted in the largest gains in expressive vocabulary suggests that teachers may focus on teaching specific age-appropriate vocabulary.

In contrast to the results for vocabulary development, parents appear to be more influential in increasing their children's descriptive use of language. Results for the ITPA-VE were stronger in the home group than in either the school or the school plus home group, and the pattern of results on the naturalistic reading assessment in high compliance centers more closely followed the results for the ITPA-VE than for the EOWPVT. Part of this result may be accounted for by reading frequency. On average, home reading was more frequent than school reading was even at the two high compliance centers. The fact that only 60% of home reading logs were returned, however, suggests caution in interpreting this finding. Another possible explanation for this result concerns the nature of school versus home reading. Group reading interactions may not be sufficient to produce broad improvements in children's oral language skills, even if the groups are small and the type of interaction is optimized. Dialogic reading targets expressive language skills through the use of probing, practice, teaching, feedback, and repetition. Home reading for this study involved one-on-one reading interactions; in this context, parents might be better able to tailor their use of questions and feedback (e.g., expansions) to their children's interests and abilities. The group context may handicap teachers because they are less able to tailor questions and feedback to individual children; rather, they may adjust to the group's average or lowest common denominator. In some cases, children with more advanced abilities may not be challenged because children with less advanced abilities require teachers to limit the type of questions and feedback to a level consistent with their abilities. In other cases, the interaction may be at a higher than optimal level for children with less advanced abilities.

A progressive change in adult standards is thought to be an important aspect of dialogic reading that is based on the notion of a zone of proximal development (Vygotsky, 1978). Children are thought to develop skills most rapidly when interaction occurs at a level slightly more advanced than current skills. That is, when adults scaffold their interactions to the appropriate level for children's skills, children advance more rapidly. A number of studies have found such a naturally occurring progression in adult-child language interactions (e.g., DeLoache & DeMendoza, 1987; Ninio & Bruner, 1978; Wheeler, 1983). The group format of dialogic reading may derail this scaffolding process and cause interactions (e.g., level of questions, type of feedback) to occur outside a child's zone of proximal development. Additionally, individual children in the group format receive less opportunity for active participation than children in a one-on-one format. In part, dialogic reading is based on the premise that oral language is a complex skill that requires practice and feedback (Moerk, 1986; Scherer & Olswang, 1984; Whitehurst et al., 1988). Within the language acquisition literature, a positive relation between the frequency of maternal speech to children and the rate of children's language acquisition has been established (e.g., Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Factors that reduce children's opportunities to respond and receive feedback might reduce the effects of the intervention (e.g., Becker, 1977; Bohannon & Stanowicz, 1988; Whitehurst & Valdez-Menchaca, 1988).

The possibility that group-based interventions may not be the optimal format for oral language interventions in the late preschool years is supported by other studies. Whitehurst, Arnold, et al. (1994) found that the oral language skills of children from low-income families were more strongly affected when they were read to by both parents and teachers than when they were read to by just teachers. Whitehurst, Epstein et al. (1994) examined the effects of an emergent literacy intervention program for children attending Head Start. As a part of this intervention, children received the dialogic reading intervention at home and as part of their Head Start curriculum for 30 weeks. There was a strong positive relation between children's post-intervention oral language skills and measures of parents' compliance with the reading program. Bryant, Burchinal, Lau, and Sparling (1994) examined the effects of the quality of Head Start classrooms and the quality of home environments on children's cognitive, achievement, and language skills. Bryant et al. concluded that the home environment was more strongly related to children's language skills, whereas the classroom environment was more strongly related to children's achievement and overall cognitive abilities. Together these findings suggest that center-based interventions during the late preschool period may not be sufficient to completely close the gap between the oral language skills of children from low-income backgrounds and the typical skill levels demonstrated by economically more advantaged children of the same age. This may be particularly true for older preschool-age children. The negative correlations between children's ages and standardized test scores in this study suggest that the effects of disadvantaged environments are cumulative, a pattern typical of other educational outcomes (e.g., Stanovich, 1986).

Whereas parents may be more effective in increasing some of their children's language skills, it may be difficult to get all parents involved in a dialogic reading intervention. Although the frequency of parent reading in the groups not involving home reading was not assessed in this study, evidence from other studies indicates that the frequency of shared-reading in the home is relatively low in low-income homes (e.g., Adams, 1990; Heath, 1982; Teale, 1986). Whether or not parents in the control and school group engaged in shared-reading does not pose a threat to the conclusions because it would be expected to diminish differences between groups, and other studies have shown that dialogic reading produces effects larger than an equivalent frequency of typical shared-reading (Arnold et al., 1994; Whitehurst et al., 1988). Whether or not parents engaged in dialogic reading during the months following this study was not assessed formally. However, the fact that several parents reported that because of the study they discovered that both they and their children enjoyed shared-reading and many asked where they could obtain more books, suggests that at least some parents were likely to continue shared-reading.

The group effects of parental involvement in the intervention need to be considered in light of the failure to find a significant relation between parent reports of reading frequency and children's language. The fact that only 60% of reading logs were returned suggests caution in interpreting this discrepancy; however, there are several possible explanations for this finding. The first involves a threshold model; dialogic reading may be equally effective above some minimum frequency. Second, it is possible that parents who did not return reading logs read the least or the most, resulting in a restricted range of reported reading frequency. Finally, parent reports of reading may have been unreliable or invalid, reflecting actual reading frequency, social desirability, or both. Although Whitehurst, Epstein et al. (1994) successfully used a title recognition test to assess reading frequency in a way that corrected for social desirability, the limited number of books used in this study made the use of such methodology impractical. Sénéchal et al. (1996) reported a significant positive correlation between parent-reported shared-reading frequency and scores on title and author recognition tests, indicating that parent-reported reading frequency has some validity. Although the question of the validity of parent-reported reading frequency in this study raises questions about the exact relation between children's language skills and increased reading frequency at home, it does not threaten conclusions about the intervention effects. There does not seem to be a strong alternative hypothesis concerning what training parents in dialogic reading would change other than parents' shared-reading practices; however, examination of the effects of training on parents' reading style and frequency would be useful in future studies.

Although center-based interventions may not be optimal for oral language skills, the results of the present study and others (e.g., Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold et al., 1994) indicate nevertheless that significant improvements in children's skills can be obtained in center-based interventions. An important issue that needs to be addressed concerns the practical aspects of maintaining an effective shared-reading intervention in child care settings. In both

this study and Whitehurst, Arnold et al. (1994), there was significant variability in the frequency that the small group reading was conducted, and in both studies, frequency of small group reading had a significant influence on outcome. Given the difficulties encountered maintaining reading despite the short 6-week duration of the program, provision of materials, center support for the program, and experimenter support, it is not surprising that the small group format was not maintained in any center after the initial 6 weeks of this study or during the follow-up period in Whitehurst, Arnold et al. (1994).

There appear to be a number of impediments to long-term maintenance of small group center-based intervention. The first concerns teacher time. Although this intervention was designed with the idea that the typical child care class consists of two adults and about 20 children, both adults are not usually available for teaching at the same time. One adult is often in charge of all children while the other adult is preparing materials, doing administrative activities, or dealing with individual children's problems. The low compliance centers in this study were chaotic places with a high rate of staff absenteeism and turnover; both adults in a classroom were rarely available at the same time. In contrast, the most compliant center was well-organized and the administrative staff often provided teachers with support to conduct the small group reading by helping out in the classroom. The second impediment involves the philosophy dominant in most preschool or child care settings. Most centers follow a "developmental" philosophy in which the center's role is to provide children with a supportive environment for their skills to emerge naturally. In such a context it may be difficult to motivate staff to engage in activities designed to facilitate children's learning of specific skills—a role that is seen as the function of the school system, not of child care. A final impediment concerns the fact that small group dialogic reading requires significant effort on the part of child care teachers. Teachers must carefully attend to individual children, provide instructive feedback, and manage the group dynamics. Whereas shared-reading is a common activity in most child care facilities, these reading episodes typically involve one teacher reading to the entire classroom, which makes frequent interaction between teacher and individual children unattainable. It is possible that additional work on structuring teacher time and commitment would make the small group format more practical. Another possibility would involve the use of adult community volunteers as readers. Evaluation of this approach, using university undergraduates, has indicated that it can be effective (Anthony, Lonigan, Dyer, Hooe, & Bloomfield, 1996; Lonigan, Anthony, Dyer, & Collins, 1995).

Although this study provided important information concerning the efficacy of shared-reading interventions for children from low-income backgrounds and about the role of shared-reading in the development of oral language skills, it also highlighted some of the problems of conducting applied research. Unlike laboratory-based research or intervention research in which all intervention is provided by a research team, there are many variables that are not under the control of the experimenter in applied research settings. The design of this study was complicated by unexpected and significant variability in the degree of center compliance with the intervention. Despite a fairly large initial sample size (i.e., 114), the transient

nature of some families with children attending the centers resulted in a smaller final sample, and the center compliance problem further reduced the power of the design to detect differences between the groups.[6] The problems with implementation of the intervention encountered in this study are likely similar to the problems that would be encountered if this intervention were adopted as educational policy. Consequently, the results of this study are instructive concerning the *likely* effects of the intervention when implemented under typical conditions, using existing personnel, in community settings compared to the *optimal* effects of an intervention conducted in a tightly controlled research setting—a distinction that has been referred to as *effectiveness* studies versus *efficacy* studies (e.g., Lonigan, Elbert, & Johnson, 1998).

Issues concerning the longer term effects of shared-reading programs for children from low-income backgrounds still need to be addressed. Although the results of several studies indicate that effects of dialogic reading with children from middle-class (Whitehurst et al., 1988) and low-income groups (Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold et al., 1994) last for at least several months, questions concerning the impact of these gains on children's later academic success remain (e.g., see Whitehurst & Lonigan, 1998). Whitehurst, Epstein et al. (1994) demonstrated that an emergent literacy intervention, which included dialogic reading, had a substantial effect on the emergent literacy skills of children from low-income backgrounds; however, their study did not allow the effects of dialogic reading to be evaluated separately from the rest of the intervention. The model that underlies this research is that dialogic reading and related activities enhance children's oral language and emergent literacy skills, which in turn influence children's abilities in learning to read and other academic tasks once they begin school (Lonigan, 1994; Whitehurst, Epstein et al., 1994). There is substantial evidence that oral language and other emergent literacy skills are significantly related to individual differences among children in learning to read (e.g., Adams, 1990; Whitehurst & Lonigan, 1998). Because the majority of this evidence comes from correlational studies, there is little unambiguous evidence that improving the language and other emergent literacy skills of children through shared-reading activities will result in improvements in later reading acquisition (Lonigan, 1994; Scarborough & Dobrich, 1994). Until such a causal link is established, large scale investment in shared-reading programs may not be justified; however, the results of this and other research (e.g., Karweit, 1989; Lonigan et al., 1996; McCormick & Mason, 1986; Needlman, Fried, Morley, Taylor, & Zuckerman, 1991; Whitehurst, Arnold et al., 1994; Whitehurst, Epstein et al., 1994) appear to be promising enough to warrant long-term outcome studies.

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NOTES

1. Because membership in the individual center-based reading groups was not held constant (i.e., children were included in a particular group on a particular day based on which children assigned to the school reading conditions were available at the time a reading session was to occur) and because random assignment was done on the basis of the individual, the appropriate units of analysis are individual children, rather than groups.
2. All training of teachers and parents was conducted by the first author.
3. ANCOVAs conducted using center instead of center compliance as the second between subjects factor produced results similar to those reported below; however, the limited *n* per cell precluded analyses of specific effects.
4. Effect sizes were calculated by subtracting the mean or adjusted mean of the control group from the mean or adjusted mean for the comparison condition and dividing the result by the standard deviation of the control group.
5. Although no formal evaluation of the validity of the teacher reading logs was undertaken in this study, informal observation and discussions with teachers during center visits corresponded to the information contained in the logs. Small group reading was observed frequently at the high compliance centers, and the teachers at these centers reported information consistent with a higher frequency of reading sessions (e.g., their desire to use more than the six books provided for the intervention). In contrast, small group reading was observed infrequently or not at all at the low compliance centers, and during a number of visits, teachers at these centers reported that they had not yet conducted any reading sessions that week.
6. As noted by one of the reviewers, this complication, which doubled the number of cells in the design and reduced the number of children in each cell, also increased the likelihood that the distribution of some child or family factor, unmeasured in the present study, was not equivalent across groups despite random assignment, and this unmeasured factor may have interacted with the intervention.

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