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Accelerating Language Development Through Picture Book Reading

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We experimentally assessed a 1-month, home-based intervention, designed to optimize parental reading of picture books to young children. Parents in the experimental group received instructions to increase their rates of open-ended questions, function/attribute questions, and expansions; to respond appropriately to children's attempts to answer these questions; and to decrease their frequency of straight reading and questions that could be answered by pointing. Control-group parents were instructed to read in their customary fashion. All families audiotaped their reading sessions at home. Analysis of these tapes demonstrated that the experimental-group parents complied with the intervention instructions. Children in the experimental group scored significantly higher than children in the control group on standardized posttests of expressive language ability. On the basis of analysis of audiotapes, children in the experimental group also had a higher mean length of utterance (MLU), a higher frequency of phrases, and a lower frequency of single words. Follow-up 9 months after the completion of treatment disclosed continued, although statistically diminished, differences between the two groups.

Picture book story time offers a potentially rich opportunity for young children to learn language. Wells (1985a) found that approximately 5% of the daily speech of a sample of 24-month-olds occurred in story-time settings. In addition to being a setting in which children are prone to talk, story time also appears to evoke tutorial behavior from mothers that varies across dimensions such as social class. Ninio and Bruner (1978) studied a single middle-class mother–child pair over a 10-month period, with no special instructions given with regard to book reading. The mother labeled objects most frequently during picture book reading, with 75.6% of all instances of labeling occurring in that context. In addition, the mother provided consistent and informative feedback for the child's attempts at labeling (all incorrect labels were corrected, and 81% of the child's correct labels were reinforced). Similar effects have been found in case studies by Snow and Goldfield (1983) and Moerk and Moerk (1979). Ninio (1980) examined social class differences and 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 had smaller productive vocabularies than middle-class children.

As one might expect, the focus of the speech that parents direct to their children (child-directed speech) during picture book reading changes with the age and linguistic sophistication of the child. Wheeler (1983) demonstrated, for example, that mothers of 3- and 4-year-old children often ask questions that go beyond the information given in the book (e.g., "Do you think that kitty will get in trouble?", whereas mothers of 1-year-olds focus on the names of individual objects in the book (e.g., "What's the name of that?").

These descriptive studies suggest that picture book reading is an activity that parents approach with an intent to teach language to their young children and that in so doing they use techniques such as asking questions, giving feedback, and adjusting questions to the developmental level of the child that might have desirable instructional functions. The studies suggest, moreover, that there are potentially important individual differences in parent behavior during story time. There is a widespread assumption, based in part on this descriptive literature, that early picture book reading is causally related to language growth and later school achievement (e.g., Chomsky, 1972; Moerk, 1985; Snow, 1983). Plausible though the assumption may be, the empirical support for a causal connection between early picture book reading and growth in language skills is weak.

In the methodologically strongest example of correlational research on the effects of picture book reading, Wells (1985b) showed that the frequency of listening to stories between 1 and 3 years of age (as measured directly in the home) was significantly associated with literacy and teacher ratings of oral language skill at 5 years of age as well as to reading comprehension at 7 years of age for a sample of 32 normal children. These data are subject to the qualifications on interpretation that are appropriate to any correlational finding. In this particular case, the later measures of literacy were correlated as highly with parent education as with the early measures of picture book reading, plausibly suggesting the functioning of third variables. Two intervention studies (in which parents were encouraged to read more frequently to their children) suffer from such critical problems

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in design and analysis that they are uninterpretable (Donachy, 1976; Swinson, 1985). Thus, no extant research provides strong support for a causal link between picture book reading and language development.

Given the practical importance of language skills in industrialized societies and the considerable theoretical interest in mechanisms of transition between oral and written language (e.g., Olson, Torrance, & Hildyard, 1985), it would appear worthwhile to explore experimentally the relations between early reading and children's linguistic development. This could be accomplished by training selected parents to engage in potentially desirable patterns of interaction and comparing their children's progress with that of children in a nontreated control group. A reasonable question to address first is whether parental reading of stories to young children has direct and immediate effects on their language skills. A positive demonstration could set the stage for more fine-grained analyses of particular processes mediating such effects and their long-term consequences. A failure to find a positive effect would not be definitive, but it would suggest caution in concluding that early reading has direct and cumulative long-term effects on the child's language skills.

The literature offers several suggestions about what a parent should do when reading to her young child. We opted for an intervention that was based on a package of stimulation rather than on changing one particular form of input because of our relative ignorance about the functions of the many things that parents do when reading to children. Without such knowledge, an intervention that was based on any single, arbitrarily selected change in parental behavior stood a good chance of failing. We selected three general principles as organizational devices for designing an intervention: (a) The use of *evocative* techniques by the parent that encourage the child to talk about pictured materials is preferable to techniques that place the child in a more passive role; for example, asking children "what" questions is preferable to reading to them without asking questions or to asking them "yes–no" questions. Wells' (1985b) transcripts of extremes of individual differences in parent reading appear to illustrate this principle, with the "ineffective" mother asking few questions, with those that she asks focusing on names (e.g., "What's that?") and the "effective" mother asking more questions and questions that require much more from the child (e.g., "There's Eeyore. What's happening to him?"). (b) The mother's use of *feedback* to the child should be maximally informative, for example, by incorporating expansions, corrective modeling, and other forms that highlight differences between what the child has said and what he might have said. The literature on expansions and related forms is large. For example, Scherer and Olswang (1984), in an experimental study of four 2-year-olds and their mothers, showed that an increase in mothers' expansions was systematically related to an increase in the children's spontaneous imitations and spontaneous productions. (c) The mother's mastery standards for the child should show *progressive* change that is sensitive to the child's developing abilities. For example, a child should indicate knowledge of the names of the objects in books before the mother attempts to evoke talk about object attributes and relations. Moerk (1985) has reviewed several studies demonstrating just such progressive changes in interactional patterns during story times as the child matures.

Fidelity: that is, the degree to which an intervention is implemented as described, is an important issue in any intervention effort. It is particularly critical when an intervention is to be implemented second hand. For example, in the case of this research, we intended to instruct parents on how to read to their children, but the parents might or might not have followed those instructions. In order to assess the fidelity of the intervention, parents were required to tape record their reading sessions at home with their children.

Furthermore, we reasoned that if positive effects were obtained from the planned intervention, the duration of those effects would be of considerable interest. For that reason, we studied the children longitudinally and tested them at the end of treatment and, again, 9 months later.

In summary, our research was designed to test experimentally the hypothesis that maternal picture book reading has direct immediate effects on the rate of children's language acquisition. A positive result would demonstrate a direct causal relation between early literacy-related activities in the home and the child's language development and would buttress correlational and descriptive research that has been consistent with such a relation. Depending on the magnitude of the effects, positive results might also have practical implications for accelerating children's language development.

Method

Subjects

Thirty children, with normal developmental and linguistic status, and their families served as subjects in this research. All children ranged between 21 and 35 months of age and were from intact middle-class families living on suburban Long Island, New York. Modal income for each group of families was $30,000 and over per year. All families volunteered as a result of newspaper reports of the project in local newspapers. We divided children randomly into an experimental group and a control group, with the restriction that there be an equal number of boys and girls in each group. One child in the experimental group dropped out before posttesting, resulting in a final sample size of 29.

All children had expressive, receptive, and performance skills within the normal range for their age as measured by the Denver Developmental Screening Test (Frankenburg, Dodds, & Fandal, 1973) and the Early Language Milestones Scale (Coplan, 1982). These are screening tests that serve to identify delayed children. They do not provide discriminations among normal or above normal children. The control and experimental group did not differ significantly on any of a number of pretest measures, including the following: (a) chronological age (M = 29.4, SD = 4.1, and M = 27.9., SD = 2.9, for the experimental and control group, respectively); (b) number of children in the family (M = 1.4, for both the control and experimental group); (c) number of years of education completed by the mother (M = 15.3, SD = 2.5, and M = 15.8, SD = 1.8, for experimental and control group, respectively); (d) frequency per week of story book reading with the child reported initially by the mother (M = 7.57, SD = 3.4, and M = 8.2, SD = 4.5, for experimental and control group, respectively); (e) frequency per week of reported reading sessions for the first 2 weeks of the study (M = 7.5, SD = 1.9, and M = 8.8, SD = 2.4, for experimental and control group, respectively); (f) frequency per week of reported reading sessions for the last 2 weeks of the study (M = 7.1, SD = 1.7, and M = 6.6, SD = 2.1,

for the experimental and control group, respectively), and (g) an upper-limit measure of initial child mean length of utterance (MLU; described below).

Procedure

The experimental group participated in a 4-week treatment program involving two assignments of 2-weeks duration that instructed parents to alter the frequency and timing of various aspects of their child-directed speech during story time. Control families also read to their children but were not told to change any behaviors.

All children and parents were seen in a university setting. The first visit involved a brief interview with parents (nearly always mothers), administration of the language and developmental screening devices described above, and instruction on the first assignment for the experimental group. The potential importance of picture book reading in children's language development was stressed to control- and experimental-group parents as the reason for the investigation. All families were instructed to audiotape their reading sessions with their child 3 or 4 times a week. Parents were contacted over the telephone on a weekly basis to remind them to complete taping and assignments. In addition, parents were given a calendar-like checklist to be used to keep track of when and how frequently they read with their child (including taped and nontaped sessions). Parents were instructed to bring books that they typically read with their child to their first visit. The experimenter picked out books with many vivid and easily described pictures as examples of the type of book that should be used for reading sessions.

At the end of the 4-week period, families returned for posttesting. All children were given the verbal expressive subscale of the Illinois Test of Psycholinguistic Abilities (ITPA; Kirk, McCarthy, & Kirk, 1968), the Peabody Picture Vocabulary Test-Revised (PPVT; Dunn & Dunn, 1981), and the Expressive One Word Picture Vocabulary Test (EOWPVT; Gardner, 1981). The verbal expressive subtest of the ITPA involves presenting children with objects and asking them to tell about them (e.g., a child is handed a button and asked to tell about it and, then, prompted to tell more about it). The PPVT is a test of receptive vocabulary that requires the child to point to a picture of an object named by the examiner (e.g., "Point to truck"). The EOWPVT, a test of expressive vocabulary, involves the child saying the name of pictures of common objects.

Nine months following posttesting, we retested 22 of the original subjects, 12 from the control group and 10 from the experimental group, on the same three tests, using a different examiner than had administered the posttests. One subject from the control group completed only the PPVT and EOWPVT portions of follow-up testing. The ITPA and the EOWPVT do not have alternate forms. An alternate form of the PPVT was used.

Parents in the experimental group participated in two 25- to 30-min training sessions (one for each assignment) at the university. These involved verbal explanation of the skills involved, watching the experimenter and an assistant (one playing the role of the child, one, the parent) demonstrate the technique, and finally the parent herself or himself participating in a short role-playing session, with the assistant acting as the child and the experimenter giving feedback about the parent's performance. The first training session occurred at the time of the initial assessment of the child. Experimental-group parents returned 2 weeks later to be trained in the second assignment. Parents were given a handout describing the techniques and reminding them to complete the assignment three to four times a week.

Comparisons

Several related within- and between-subject comparisons were made. Upper-limit MLU was compared across the two groups at the outset of treatment. This comparison was conducted to assess the possibility that the groups might have differed in expressive skill despite random assignment. Information on the effects of treatment on the "at home" behavior of parents and children was obtained by analyzing one story time from the end of the second and fourth week of home tape recording by each group. Comparisons were made of group differences in children's scores on the posttests and follow-up tests (i.e., ITPA, PPVT, EOWPVT). These comparisons allowed conclusions to be drawn about the effects of the treatment on child language skills.

Data Coding and Reliability

Data coders were blind to families' group assignment. The observational scheme coded 14 categories of parental behavior and 3 categories of child behavior (see Table 1). Two measures of child MLU were also used. An upper-limit estimate of MLU was obtained from the first 10 min of the audiotape of the first home story time on the basis of the average number of words per utterance in the longest 10% of each child's utterances. Because the intervention was designed to require more speech from the experimental-group children, we used the upper-limit MLU at the outset of the study because it would be relatively immune to early treatment-induced differences in the amount of speech in the two groups and, thus, would serve as a measure of possible preexisting differences in expressive capacity. Regular MLU, as a measure of treatment effects, was determined from a tape from the second and fourth week of treatment by computing the average number of words per utterance for all of the child's utterances. Both MLU measures were based on words per utterance (per Nelson, 1977), rather than morphemes per utterance (per Brown, 1973), because rule-based plurals and tense endings occur infrequently in children of this age group and are difficult to discriminate reliably on inherently noisy, low-fidelity cassette tapes of natural language interactions in the home.

Audiotapes were coded using continuous 10-s intervals of observation. Coders listened to a 10-s interval then stopped and recorded as many instances of each behavior category as occurred. They could relisten to intervals as necessary. Data coders worked at a desk computer that drove two cassette recorders: a primary recorder that contained the original tape and a secondary recorder that copied the primary tape and marked it with time signals at the end of each 10-s interval. A second coder could then score this tape for reliability.

Reliability was determined by having an additional observer score 12 tapes selected at random. Reliability for each category was determined using the intraclass correlation based on a one-way analysis of variance (ANOVA) model (Bartko, 1976). The between-subjects factor in this analysis represents the sessions of observation. Differences between two coders in the number of instances of a category recorded in a particular session of observation are the basis for the error term.

Table 1 presents the intraclass correlations for 15 of the 17 behavior categories. Because of extremely low frequencies of occurrence for "other" (occurring once in all reliability sessions) and "pointing request" (occurring three times), correlations for these 2 categories were not computed. The average intraclass correlation across the 15 categories was .86, and was quite high for all categories of observation except expansions (.58). Expansions was a low-frequency category, thus making estimates of reliability less stable, and observers had occasional difficulty in discriminating contingent expansions from noncontingent instances of labeling or reading.

Results

Upper-Limit MLU

The measure of upper-limit MLU from the first session of reading did not differ significantly between the two groups, $t(27) = .811$, $p = .425$.

Table 1

Categories, Brief Definitions, and Intraclass Correlations

Category	Definition	Intraclass correlation
	Parent codes	
Directives	Request for nonverbal action ("Turn the page.")	.72
Labeling	Labeling of objects or events ("It's a monkey.")	.82
Reading/conversation	Reading not requiring a response ("Once upon a time. . . .")	.97
Yes/no questions	Expected answer is yes/no or nod of head ("Do you know that one?")	.87
Simple *what* questions	Can be answered with name or label ("Who is that?")	.84
Imitative directives	Labeling with request to imitate ("Giraffe. You say that.")	.90
Other	Not directed to child (Talk to spouse or other child)	—[a]
Praise/confirmation	Praise or compliance with request ("Yes, that's the name of it.")	.88
Open-ended questions	Nonspecific request for description ("Tell me more.")	.99
Repetition	Copy or reduced copy of child's utterance (Child: "Want milk." Mother: "Milk.")	.94
Pointing request	Expected response is pointing. ("Where is the monkey?")	—[a]
Expansion	Repetition with added elements (Child: "Dog." Mother: "Big dog.")	.58
Criticism/correction	Disapproval or correction ("No, that isn't a kitty.")	.84
Function/attribute questions	Expected answer is function, attribute, or action. ("What is it doing?")	97
	Child codes	
Child vocalization	Nonword utterance ("Eeeee")	.69
Child word	Single word utterance ("Dog")	.95
Child phrase	Multiword utterance ("I want more.")	.95

[a] Insufficient frequency to calculate.

Frequency of Occurrence of Individual Behavior Codes

We tested main effects for group (experimental vs. control), time (Week 2 vs. Week 4), and the Group × Time interaction using a separate multivariate profile analysis (Morrison, 1976) for each of the 17 behavior categories and regular MLU derived from the at-home audiotapes. Effects from this analysis are presented in Table 2. There were six significant main effects for group, with the experimental group showing higher levels than the control group of repetition, child phrases, and child MLU, and the control group showing higher levels of yes/no questions, reading/conversation, and directives. The three Group × Time interactions are also interpretable as main effects in that t tests showed that the experimental group scored at higher levels than the control group at both Time 1 and Time 2 on each of three measures: praise, expansion, and open-ended questions. The significant interactions were the result of praise going down over time in the control group while going up in the experimental group and to expansions and open-ended questions remaining constant over time in the control group while going up in the experimental group. The three significant main effects for time were the result of function/attribute questions and directives decreasing from Time 1 to Time 2 while child MLU increased.

Posttest Measures

Because the experimental hypotheses were directional, simultaneous one-tailed t tests were performed on the three dependent measures, with a Bonferroni correction for lack of independence. (An overall ANOVA is neither necessary nor recommended when comparisons are planned rather than post hoc, and the overall protection level is maintained using the Bonferroni procedure; Myers, 1979). For three t tests and an overall protection level of .05, a level of .016 is required for significance for individual tests. Significant group differences were found for the ITPA, $t(27) = 3.941$, $p = .0005$ (one-tailed), and the EOWPVT, $t(27) = 2.513$, $p = .009$ (one-tailed). Differences on the PPVT favored the experimental group but were not statistically significant, $t(27) = 1.555$, $p = .0655$ (one-tailed). Age-corrected language-age scores (i.e., language age in months minus chronological age in months) were used for each comparison and are reported in Table 3 and depicted in Figure 1.

Follow-up Measures

The same statistical procedure applied to the posttest measures was also applied to the follow-up measures collected 9 months after posttesting. Although the mean differences between the two groups were as large or larger on the follow-up measures of expressive ability as on the posttest measures, the differences were no longer statistically significant because of the reduced sample size: for ITPA, $t(19) = 1.564$, $p = .067$ (one-tailed); and for EOWPVT, $t(20) = 1.603$, $p = .0625$ (one-tailed). Posttest differences on the PPVT had disappeared at follow-up, $t(20) = .014$, $p = .495$ (one-tailed). (See Figure 1 and Table 3.)

Discussion

These results lead us to conclude that variations in reading to young children can have appreciable effects on language de-

Table 2
Comparison of Groups on Frequency of Categories of Interaction

Category	Experiminental group		Control group	
	Week 2	Week 4	Week 2	Week 4
Labeling	.43	.34	.35	.32
Directives	.06	.04	.11	.09 (G)*, (T)*
Imitative directives	.07	.08	.02	.01 (G)*
Yes/no questions	.15	.14	.26	.22 (G)*
Simple *what* questions	.17	.10	.11	.07
Reading/conversation	.75	.67	1.35	1.52 (G)**
Other	.00	.00	.03	.04
Praise/confirmation	.36	.41	.26	.20 (G × T)*
Criticism/correction	.09	.07	.05	.05
Expansion	.11	.16	.05	.05 (G × T)**
Complex *what* questions	.58	.38	.34	.29 (T)**
Repetition	.25	.29	.16	.12 (G)**
Pointing requests	.00	.00	.00	.01
Open-ended questions	.10	.32	.01	.01 (G × T)**
Child vocalization	.25	.28	.27	.28
Child word	.57	.43	.49	.39
Child phrase	.80	.90	.48	.45 (G)**
Child MLU	2.12	2.55	1.92	2.04 (G)*, (T)*

G = group effects. T = time effects. * $p < .05$. ** $p < .01$.

velopment. The posttest scores of the experimental group were approximately 8.5 months ahead of those of the control group on the ITPA and 6 months ahead of those of the control group on the EOWPVT. In addition, the experimental group had an average MLU of 2.55 versus a control-group average MLU of 2.04 at the end of treatment. Nine months later at follow-up there was still a 6-months advantage on the two expressive tests for the experimental group. These differences were the result of instituting a brief experimental reading program that required less than an hour of direct training for parents; they are based on comparison with a control group of motivated, middle-class parents who read as frequently to their children as parents in the experimental group.

What threats to the validity of these conclusions should be considered? One potential concern is that results were caused by a Hawthorne effect of experimental-group parents knowing that they were in a special program, rather than by the specific intervention. Ordinarily one would guard against this possibility by running a placebo control in which subjects would receive a special treatment too, but a treatment presumed to be inert. We did not think this necessary here because it was presumably parents who might be subject to a Hawthorne effect, whereas it was children whose behavior constituted the dependent variable of interest. Clearly the Hawthorne effect, if any, would need to be indirect (from experimenter to parent to child), and we had measures of the parent to child link. If heightened expectations by parents in the experimental group were translated into behaviors toward their children that were unrelated to the specifics of the assignments, then and only then might one speak of a Hawthorne effect. Suppose, for example, that parents in the experimental group read more frequently to their children than parents in the control group. One could still say that variations in parental reading affect children's language development, but the variations would not be those specified in the intervention. Frequency of reported and recorded reading

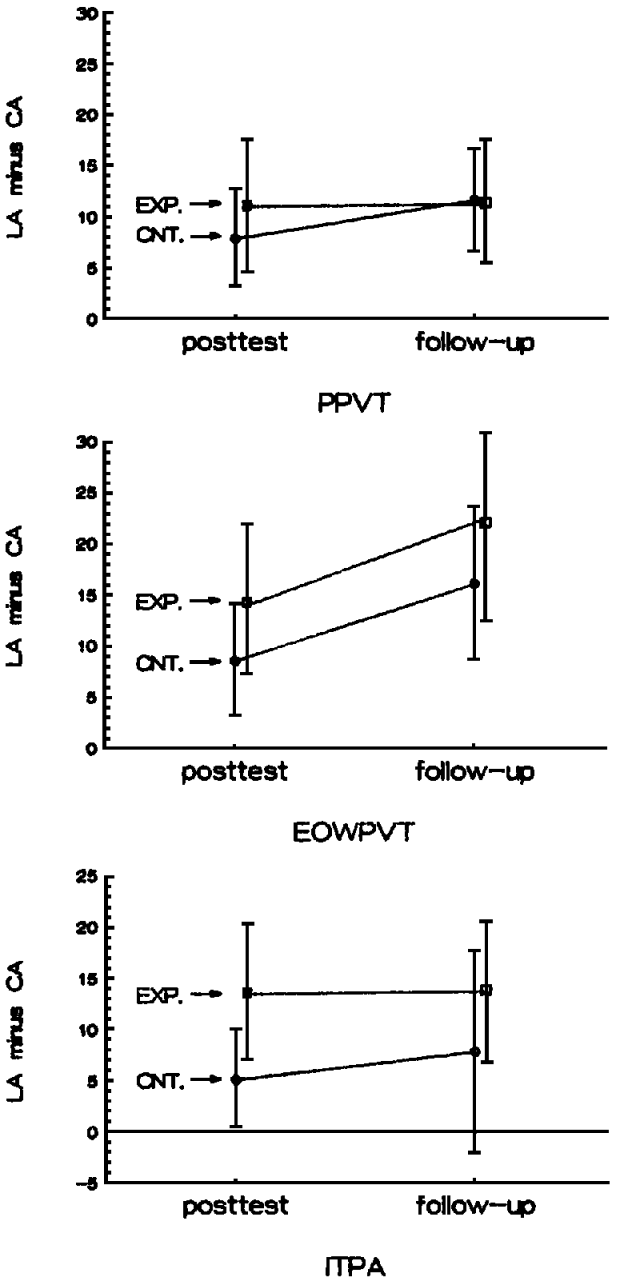

Figure 1. Means and standard deviations for three tests of language at posttest and follow-up for the experimental (EXP) and control (CNT) groups. (Error bars extend +1 *SD* and −1 *SD* from each mean. The plotted variable is corrected language age, that is, language age [LA] minus chronological age [CA]. PPVT = Peabody Picture Vocabulary Test; EOWPVT = Expressive One Word Picture Vocabulary Test; ITPA = Illinois Test of Psycholinguistic Abilities.)

Table 3
Means and Standard Deviations for Posttest and Follow-up Measures Expressed as Language Age Minus Chronological Age

Measure	Experimental group		Control group	
	M	*SD*	*M*	*SD*
Posttest PPVT	11.14	6.54	7.87	4.72
Follow-up PPVT	11.70	6.09	11.67	5.07
Posttest EOWPVT[a]	14.50	7.36	8.47	5.50
Follow-up EOWPVT	22.00	9.80	16.08	7.53
Posttest ITPA[b]	13.57	6.70	5.07	4.83
Follow-up ITPA	13.70	6.85	7.82	9.93

PPVT = Peabody Picture Vocabulary Test. EOWPVT = Expressive One Word Picture Vocabulary Test. ITPA = Illinois Test of Psycholinguistic Abilities.
[a] $p = .009$. [b] $p = .0005$.

sessions, however, did not differ between the two groups. On the other side of the equation, the differences between the behavior of parents in the experimental group and those in the control group were quite specific to the intervention. For example, the frequency of open-ended questions (e.g., "What's happening in this picture?") was higher for the experimental group at Time 1 (consistent with the assignment instructions) and went up still more in the second assignment for the experimental group (as instructed), whereas it was very low and did not change over time in the control group. Another of many possible illustrations of the fidelity with which parents conducted the intervention is in the lower frequency of straight reading and yes/no questions in the experimental group compared with the control group, which was consistent with instructions. The possibility remains, of course, that some aspect of the parental behavior that was not assessed and was not specific to the intervention was responsible for the results, either in whole or in part. That possibility appears remote in this case and could not, in any case, have been eliminated by the addition of more control groups.

Another potential threat to the internal validity of the experiment is the possibility of preexisting differences in the experimental- and control-group children that occurred despite random assignment. Children in the two groups were equivalent on all the measures obtained prior to the intervention as well as on one measure, upper-limit MLU, obtained during the first session of the intervention. They were not, however, pretested on the same tests on which they were posttested and received follow-ups. The possibility of pretest sensitization was a particular concern in this experiment because the same tests had to be given twice after the intervention and because there was a real probability that parents would coach their children on items that were missed on a pretest. Because measuring the effects of pretesting would have required two additional groups of children (Kazdin, 1980), we used a posttest-only design. Posttest-only designs depend on the logic of randomization. The chance that random differences between the two groups were responsible for the obtained effects was .05, in other words, the alpha level used to assess the posttest differences.

What are the practical implications of our research? The applied significance is substantial and derives from the magnitude of the obtained effects. The intervention to which the experimental group was exposed was adopted verbatim from an intervention that has been applied to children with specific expressive language delay (Whitehurst, Fischel, Caulfield, DeBaryshe, & Valdez-Menchaca, in press). Although the intervention seemed to work with delayed children, it was part of a larger package and could not be evaluated specifically. The success of the intervention with normal children suggests its usefulness as part of a clinical effort to accelerate the language development of delayed children. The applied significance of this research is not limited, however, to children who are delayed. Many parents of normal young children spend hours per week reading to them and purchase hundreds of picture books to facilitate that activity (Moerk, 1985; Wells, 1985a). Our research demonstrates that the reading behavior of parents is not optimal, even within a highly select, motivated, affluent sample. The implication is that changes in parental behavior that are not particularly difficult to obtain could have substantial positive effects on children's language development.

What are the theoretical implications of this research? By design, our investigation addressed the broad issue of whether variations in parental reading affect children's language development rather than more narrow issues concerning the effects of particular reading strategies. Only additional research can determine, for example, whether open-ended questions contributed to the intervention package. There are, however, at least three theoretical issues to which this research can contribute.

First is the question of whether joint reading activity in the preschool years actually contributes to children's language development. As discussed earlier, there is a strong presumption in the literature that it does, but only weak empirical support in terms of correlational, descriptive, and case studies. The current findings provide a much needed experimental anchor to conclusions such as "the single largest factor in later achievement was a child's being read to in the home" (Wolf & Dickinson, 1985, p. 230, describing the results of a descriptive study by Chomsky, 1972), or "these results can be taken as providing substantial support for the particularly beneficial effect of reading stories to preschool children" (Wells, 1985b, p. 248, describing his own correlational findings).

A second theoretical issue is the role of child responding in acquiring new skills, including language. The current intervention was designed to increase child responding at the expense of simply listening to parents read. That it did so is evidenced by the higher child MLU, the higher frequency of child phrases, and the lower frequency of parent reading in the experimental group compared with the control group. Chomsky (1972, p. 23) stated that "it may matter little whether the child has the book read to him . . . or reads it himself. . . . It is possible, perhaps even likely, that in both situations the contents, style, and language usage of the book are made available to the child with little difference in effectiveness." We believe that the present results cast doubt on Chomsky's position and suggest an extremely important role for active responding on the part of the

child. This hypothesis is in line with research demonstrating that the opportunity to make responses may be critical for children in remedial intervention efforts (Becker, 1977).

A third theoretical issue to which the present research contributes concerns the role of child-directed speech in language development. After over a decade of intense scrutiny of this issue, there is still fundamental disagreement concerning whether parameters of the language that adults direct toward children are either necessary or sufficient for child language development. There is no question that child-directed speech, sometimes called "motherese," has unique characteristics that could serve important functions in child language acquisition (e.g., Moerk, 1986; Rondal, 1985; Snow & Ferguson, 1977). Those functions, however, have remained putative. For example, Bates, Bretherton, Beeghly-Smith, and McNew (1982, p. 64) concluded an extensive review of the language development literature by saying, "social-causal theories have not yet obtained adequate empirical support." In the same vein, Shatz (1982) argued that, although parental input has been described, its effects on language acquisition have not yet been proven. In a more recent review, Moerk (1986, p. 225) concluded that Shatz' (1982) argument "still remains largely unmet."

The empirical limitations of the literature on child-directed speech are perhaps responsible for the extremely conservative assumptions about the functions of parental speech that have been made by those building formal models of the language acquisition process. Pinker (1984), for example, predicated his version of language learnability theory on a single assumption with regard to parental speech to children: that it emphasizes basic sentences (e.g., actions should be expressed as verbs). Feedback functions were explicitly rejected, as were the practice effects that should be necessary if language acquisition is similar to the acquisition of other complex skills (cf., Moerk, 1986).

It is in this context that the present research makes an important theoretical contribution: We have shown experimentally that how parents talk to their children makes a difference in language development and have demonstrated this in the home by changing the frequencies of naturally occurring categories of stimulation. We know of no other study in which naturally occurring child-directed speech from parents has been shown experimentally to be sufficient to induce language development in normal children.

The particular patterns of stimulation that were induced in the experimental group parents were (a) to encourage the child to speak more often through use of wh—questions and open-ended questions, (b) to repeat, expand, and recast the child's speech more often, and (c) to provide praise and corrective feedback contingent on the child's speech. What were the mechanisms underlying the effects produced by these changes in parent stimulation? Although our analysis is necessarily speculative, we believe that practice increases fluency (Moerk, 1986), that contingent parental speech in the form of expansions and recasts provides ideal opportunities for children to contrast their own syntactic strings with their parents' (Nelson, 1981), and that corrective feedback provides important motivational and informational functions to the child (Bohannon and Stanowicz, in press; Penner, 1987; Whitehurst & Valdez-Menchaca, 1988).

This research cannot, of course, demonstrate that the forms of stimulation that were used are necessary to language acquisition. The possibility remains, as Pinker (1984, p. 29) maintained, that language acquisition is such a robust process that "there is virtually no way to prevent it from happening short of raising a child in a barrel." There are two answers to the point of view that one must demonstrate "necessity" before one has demonstrated anything important about the role of social variables in language acquisition. First, because the only research that could once and for all answer the "necessity" issue would be the ethical equivalent of raising a child in a barrel, there is simply no choice for the empiricist other than research that addresses "sufficiency" (cf. Whitehurst & Valdez-Menchaca, 1988). Second, the field of developmental psycholinguistics is virtually unique in defining its subject matter as the lowest common denominator of acquisition, thereby ignoring cultural, social, and individual differences in what is acquired. If one is willing to define the dramatic individual differences in semantic, syntactic, and pragmatic skills that can be observed in any socioeconomically heterogeneous group of 3-year-olds as differences in language acquisition, then language acquisition is a much more variable, much less robust phenomenon than the one described by Pinker (1984) and others. In this context, variables that are shown to be sufficient to produce appreciable individual differences in language acquisition are also variables that can be conceptualized as necessary to explain the full range of language acquisition. How parents read to children is one of those sets of variables.

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