

The Role of Home Literacy Environment in the Development of Language Ability in Preschool Children from Low-income Families

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The relations between home literacy environment and child language ability were examined for 323 4-year-olds attending Head Start and their mothers or primary caregivers. Overall frequency of shared picture book reading, age of onset of picture book reading, duration of shared picture book reading during one recent day, number of picture books in the home, frequency of child's requests to engage in shared picture book reading, frequency of child's private play with books, frequency of shared trips to the library, frequency of caregiver's private reading, and caregiver's enjoyment of private reading constituted the literacy environment, and were measured using a questionnaire completed by each child's primary caregiver. Using a primary subsample of 236 children, a composite literacy environment score was derived from the literacy environment measures and was correlated with a composite child language measure, derived from two standardized tests of language skills. Depending on the form of regression analysis employed and depending on whether primary caregiver IQ and education were entered into the prediction equations, from 12% to 18.5% of the variance in child language scores was accounted for by home literacy environment. These analyses were cross-validated on a secondary subsample of 87 children with similar results. The strength of the relations between home literacy environment and child language are stronger in this study than in previous research,

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due to the use of statistically derived aggregate measures of literacy environment. The presence of substantial variability in home literacy environments in low-income families, and the substantial relations between these environments and child language outcomes has important implications for intervention.

Individual differences in early reading achievement appear to be related to children's oral language skills (Bowey & Patel, 1988; Butler, Marsh, Sheppard, & Sheppard, 1985; Edmaston, 1984; Scarborough, 1990). Children from low-income backgrounds are particularly likely to have low levels of skill in the forms of language that are important in formal schooling, and such children are at risk for later reading difficulties (Alexander & Entwisle, 1988; Raz and Bryant, 1990).

Though family income or socioeconomic status have frequently been used as variables in studies of children's achievement, they are marker rather than process variables. Psychological studies of the effects of environments on children's development have attempted to identify specific characteristics of families that are subsumed by socioeconomic status or family income. In that tradition, several studies have demonstrated that children from low-income families are read to less frequently than children from higher socioeconomic groups (e.g., Feitelson & Goldstein, 1986; Harris & Smith, 1987). Large social-class differences have also been found in the availability and use of printed materials in the home (Feitelson & Goldstein, 1986; McCormick & Mason, 1986). A growing literature finds significant correlations between the frequency of shared picture book reading in the home and preschool children's language abilities (e.g., Crane-Thoreson & Dale, 1992; Mason, 1980; Mason & Dunning, 1986; Rowe, 1991; Wells, Barnes & Wells, 1984; Wells, 1985). This suggests that limited opportunities for literacy-related activities in the home may have significant effects on the language development and later reading achievement of children from low-income families. The problems that may be associated with children's infrequent exposure to shared picture book reading in low-income homes are compounded because book reading interactions are known to attenuate social class differences in the forms of mothers' speech to children (Hoff-Ginsberg, 1991). Thus, children from low-income families as a group have infrequent exposure to the one opportunity for interaction during which maternal speech that is particularly likely to stimulate language growth is most probable.

Most studies of the relation between social class and shared reading activity in the home have focused on how low-income or working-class families are different from families of higher socioeconomic status (SES), or have simply incorporated a measure of SES into a model of differences in literacy-related activities in the home (e.g., Hoff-Ginsberg, 1991; Ninio,

1980; Raz & Bryant, 1990; Wells, 1985). In addition, a nascent literature suggests that there are substantial individual differences in literacy practices within low-income families that may affect children's language and achievement outcomes. For instance, Teale (1986) found that book reading to children was very unevenly distributed across 22 low-income families in San Diego. Book reading occurred four or five times a week in three of the homes, whereas in the remaining 19 homes, it occurred only about five times per year. Relatedly, Ricciuti, White, and Fraser (1993) found a significant correlation between the home literacy environment and first-grade children's language and reading skills in a low-income sample. However, in a study of children enrolled in Head Start and low-income day care, DeBaryshe, Rodarmel, Daly, and Huntley (1992) found no significant relation between the amount of exposure to reading in the home and preschoolers language abilities.

The study presented here adds to the small and conflicting literature on the importance of variations in literacy-related behaviors in the home on the language and literacy development of preschoolers from low-income families. It examines the relations between low-income caregivers' responses to questions concerning their literacy-related behavior and their Head Start children's receptive and expressive language abilities. To obtain a comprehensive measure of the home literacy environment, nine home literacy environment variables were studied, including the frequency of caregiver-preschooler reading, the number of picture books in the home, the frequency of caregiver-preschooler library visits, and caregiver enjoyment of reading. Maternal intelligence and education level were also assessed, as they have been found to be predictive of children's language skills and are usually viewed as capturing some of the genetically mediated effects of mothers on their children's achievement (e.g., Hess, Holloway, Dickson, & Price, 1984; Scarr, 1985).

We believe there are two important reasons to examine the effects of the home literacy environment on the language development of preschoolers in low-income families. The first is practical: Interventions that attempt to enhance the home literacy environments of children from low-income families are unlikely to succeed unless the forms of behavior that are targeted by the interventions are feasible within an environment of poverty. In this regard, Snow, Dubber, and de Blauw (1982) have argued that the stresses of poverty leave mothers with little time or energy for language interactions with children that are not directed towards immediate goals. If this hypothesis is correct, one would expect to find relatively little variation in the literacy environment across low-income homes, and weak to nonexistent correlations between literacy environment and language development in children from those homes. On the other hand, significant correlations would suggest that an environment of poverty with its attendant stresses still allows many parents to engage in behavior that fosters long-term goals for children such as language growth and literacy.

The second reason the results from this study might be important is theoretical. Scarborough and Dobrich (1994) conducted a thorough review of the literature on parent-child shared reading in the preschool period and concluded that it made a weaker contribution to children's development of language and literacy skills than generally believed. They suggested that many studies purporting to demonstrate large effects of shared reading were capitalizing on other influences that correlate with families' socioeconomic status. Because this study includes only low-income families, any significant effects of shared reading on children's language development that emerge cannot be attributed to confounds with socioeconomic status.

METHOD

Subjects

The primary subjects for this study were 236 children enrolled in Head Start and their primary caregivers. The secondary subjects for this study were 87 children from the same centers whose primary caregiver did not complete an IQ test, as described subsequently. All subjects were obtained from five Head Start centers on Long Island, NY. The sample included 90% of the total enrollment of 4-year-olds at these centers, that is, all children whose primary caregivers completed the Stony Brook Family Reading Survey (Whitehurst, 1992), as described subsequently. All families met economic criteria for participation in Head Start and were drawn from a population of Head Start families in which the median family income was \$10,500, as determined through Head Start records. Additional demographic information on the two samples is presented in Table 1.

Procedure

We surveyed the primary caregiver of each family regarding the literacy environment in the home, using the Stony Brook Family Reading Survey (Whitehurst, 1992). The Survey consists of 52 multiple-choice questions that measure a variety of family variables on a four or five point scale. Nine of those questions focused on literacy environment in the home and constituted the measure of home literacy environment employed in this study (Table 2).

Children's language abilities were measured within one month of the completion of the Survey. Children were assessed using the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) and the Expressive One Word Picture Vocabulary Test (One Word; Gardner, 1981). These language tests assess receptive vocabulary and expressive vocabulary respectively. Raw scores on both these tests are converted to standard scores with a population mean of 100 and a standard deviation of 15. Means and standard deviations for the primary and secondary samples are presented in

Table 1. Demographic Information

Demographic Categories	Primary Sample	Secondary Sample
Race		
Caucasian	50.0%	26.5%
African American	42.4%	59.0%
Latino	5.5%	13.3%
Asian American	2.1%	1.2%
Gender		
Male	55.0%	45.0%
Female	45.0%	55.0%
Child Age in months		
Mean	53.5	55.25
Range	45–65	47–66
Number of Siblings		
Mean	3.55	4.27
Number of Adults in Home		
Mean	2.01	2.17
Primary Caregiver		
Mother	89.9%	88.2%
Father	4.2%	3.5%
Grandparent	3.4%	5.9%
Other	3.4%	2.4%
Primary Caregiver Education		
Less than 9th grade	2.5%	8.0%
Some high school	19.1%	29.9%
High school degree	27.1%	25.3%
High school + some college	46.2%	33.3%
4 year college degree	1.7%	0.0%
College +	3.4%	3.5%
Language Spoken at Home		
English	97.8%	91.6%
Spanish	0.9%	6.0%
French	0.0%	1.2%
Other	1.3%	1.2%
Children's Test Means (SDs)		
One Word	90.1 (15.1)	81.4 (13.4)
PPVT-R	87.6 (14.2)	80.2 (16.1)

Table 1. For the standardization samples of children aged four, the split-half reliability of the One Word is 0.93 and the test-retest reliability of the PPVT is 0.76. A subsample of the children from this study were retested at the end of the Head Start year, and test-retest reliabilities for this subsample were 0.67 for the One Word and 0.65 for the PPVT.

Table 2. Simple Correlations of Predictor Variables With Child Language Scores ($N = 236$)

Predictor Variables	Canonical Test Score	PPVT-R	One Word
Canonical literacy environment score	0.43***	0.42***	0.35***
Frequency of reading with child	0.26***	0.23***	0.27***
Age when reading with child began	-0.25***	-0.23***	-0.22**
Number of minutes reading to child yesterday	0.13*	0.08	0.21**
Number of picture books in home	0.31***	0.30***	0.25***
Frequency with which child asks to be read to	0.22**	0.21**	0.18**
Frequency child looks at books by self	0.04	0.04	0.02
Frequency of trips to library with child	0.24***	0.25***	0.16*
Duration per day of caregiver reading by self	0.08	0.09	0.05
Amount caregiver enjoys reading by self	0.00	0.00	0.02
Primary caregiver IQ	0.33***	0.34***	0.23***
Caregiver Education	0.21**	0.23***	0.09

* $p < .05$. ** $p < .01$. *** $p < .001$.

To better clarify the relations between literacy environment and child language, we determined the educational level of the primary caregiver, through self-report, and the IQ of the primary caregiver using an adaptation of the Quick Test (Ammons & Ammons, 1962). Socioeconomic status was not introduced as a variable due to the homogeneity of the sample. In the standard administration of the Quick Test the examinee selects a picture from a plate of four pictures that matches words that are presented both in printed form and orally by the examiner. In our adaptation, the examinee received the words on a printed list, but did not hear them pronounced by the examiner. Although this may have had some effect on the scores of the primary caregivers ($M = 37.2$, $SD = 6.86$, corresponding to a mean IQ of 89), our concern was not with any examinee's absolute score, but only with relative differences among the examinees that could be used in regression analyses to estimate the effects of intelligence. The psychometric properties of our adaptation of the Quick Test appeared to support this purpose in that the split-half reliability for the primary sample in this study was .903, while Cronbach's coefficient alpha was .895.

RESULTS

There are a variety of statistical methods for estimating the strength of correlative relationships between variables (e.g., simple regression, hierarchical multiple regression, simultaneous multiple regression, path analysis, structural equation modeling) (Budescu, 1993). Each of these methods has a different procedure for dealing with variance that is shared between the independent

variable and other predictors. For this analysis, we chose two methods that are most likely to mark the boundaries of the degree of statistical relationship between literacy environment and children's language development. In the first, simple regression, other predictors such as maternal IQ or education are ignored and the estimate of importance would be the squared correlation between literacy environment and child language. In the second, hierarchical multiple regression, multiple predictors such as literacy environment and maternal IQ are considered sequentially so that the importance of a predictor is affected not only by its covariation with other predictors, but also by the order in which the predictors are considered. For example, if literacy environment were entered at the second step in a hierarchical procedure, the strength of its relationship with child language would be estimated based only on what it added to the prediction that emerged after the first step in the procedure. Any overlap or redundancy in prediction between literacy environment and variables entered at the first step (e.g., maternal IQ or education) would be taken away from literacy environment and assigned to the variables entered at the first step. The estimate of effect in the hierarchical procedure is the squared increment to the multiple correlation. Our aim in using these two methods was to bracket the range of correlations of literacy environment with children's language ability in low-income families.

In the absence of the possibility of suppressor variables, the largest correlation between a predictor and a dependent variable will be obtained in a simple regression that does not take other predictors into account. Because this study involved multiple measures of family literacy environment and child language, we needed to form a composite of the literacy environment measures and the language measures in order to determine the simple correlation between them. We utilized canonical correlation to do this. Canonical correlation is related to multiple regression and principal-components analysis. Given two sets of variables, it produces weights for the variables in each set so as to maximize the correlation between the weighted sums of each set. Because there is no reason to assume that all aspects of the literacy environment as measured by the Stony Brook Family Reading Survey contribute equally to language development, a canonical procedure of weighting individual variables is much preferred to a correlation between unweighted sums. The canonical correlation between the literacy environment questions and the language test scores was 0.43 ($p < .001$), which when squared produces an estimate that the literacy environment accounted for 18.5% of the variance in child language scores.

To cross-validate the canonical correlation, we performed a second canonical analysis on the 87 cases from the secondary sample (those on which we were unable to obtain measures of primary caregiver IQ). It is important to demonstrate cross-validation of the canonical correlation since canonical weights can capitalize on chance relationships within a data set and therefore

may overestimate those relationships in the population. Our cross-validation procedure involved taking the canonical weights that had been derived from the primary sample and applying them to the home literacy environment questions and the two language posttests for the secondary sample. The canonical correlation for the cross-validation sample was 0.42 ($p < .001$), which was virtually identical to the canonical correlation of 0.43 for the primary sample. Since the original canonical correlation and the cross-validation canonical correlation are consistent, we can be confident that the strength of the relation between literacy environment and child-language ability demonstrated in this study has not been inflated by chance.

The similarity of the canonical correlations for the primary and secondary samples is of interest beyond the issue of cross-validation because the two samples were different. Compared to the secondary sample, the primary sample included children with more highly developed language abilities ($t = 4.65, p < .001$ for the One Word; $t = 3.96, p < .001$ for PPVT), families with fewer children ($t = 3.94, p < .001$), and families with more highly educated primary caregivers ($t = 2.89, p < .001$). Obtaining the same correlation in the two samples suggests that the relation between home literacy environment and children's language development is not limited to the upper range of low-income families.

A second estimate of the relationship between literacy environment and child language was determined using forced-entry hierarchical regression. Using the canonical test score as the dependent variable, primary caregiver IQ and education were entered together in the first step of a stepwise regression, followed by the canonical literacy environment score. Since the three predictor variables were correlated with the dependent measure of child language (see Table 2), and each other (IQ-Education $r = .408, p < .001$; IQ-Literacy Environment $r = .292, p < .001$; Education-Literacy Environment $r = .156, p = .016$), and since the hierarchical procedure allows the literacy environment variable to account only for what is left over in the test scores, after the effects of caregiver IQ and education are removed, the estimate of the effects of the literacy environment on language scores will be lower than in the previous analysis: After entering primary caregiver IQ and education in the first step of a stepwise regression (which together accounted for 11.6% of the variance in child language ability, $p < .001$), the canonical literacy-environment score still added significantly to the multiple correlation. The squared increment to the multiple correlation indicated that the literacy environment accounted for 12.0% ($p < .001$) of the variance in canonical test scores after all of the influence of caregiver IQ and education were removed.

Because variables such as maternal IQ and education have sometimes been offered as explanations of the observed correlations between home-

literacy variables and child language development (e.g., Scarborough & Dobrich, 1994), it is instructive to reverse the hierarchical procedure described previously: Using canonical test score as the dependent variable, the canonical literacy environment score was entered in the first step of a stepwise regression, followed by primary caregiver IQ and education in the second step. After removing the effect of the canonical literacy environment score, primary caregiver IQ and education produced a squared increment to the multiple correlation of 5.0% ($p < .001$). Thus, in equivalent hierarchical tests, literacy environment accounted for substantially more variance in child-language scores than primary caregiver IQ and education combined.

In summary, literacy environment accounts for 18.5% of child language in a simple correlation, and 12.0% after the effects of caregiver IQ and education are removed in a hierarchical regression. Note that caregiver IQ and education are associated with biological factors and environmental factors that are unrelated to literacy environment. These factors influence children's language skills and should be removed from an estimate of the effects of literacy environment. However, caregiver IQ and education also are likely to be related to the nature of the interactions in which the caregiver engages the child during literacy-related events such as shared book reading. For example, since the measure of caregiver IQ used in this study is based on vocabulary and since caregivers with more advanced vocabularies are likely to expose their children to more words during shared book reading, caregiver IQ should have a path of influence to child language that runs directly through literacy environment. Thus, removing all of the influence of caregiver IQ when estimating the effect of literacy environment probably leads to an underestimation of that effect.

To evaluate the relative strengths of the relations between each literacy environment Survey question and the child language measure, we computed simple correlations between primary caregivers' responses to each of the nine literacy environment questions and the canonical test score. These and other simple correlations based on the primary sample are listed in Table 2.

In Table 2, relatively robust correlations between child language and individual literacy environment questions include frequency of reading with child, child's age when shared reading began, number of picture books in the home, frequency with which child asks to be read to, and frequency of trips to the library with child. Weaker to nonsignificant correlations involve number of minutes reading to child yesterday, frequency with which child looks at books by self, duration per day of caregiver reading by self, and caregiver enjoyment of reading by self. Note from Table 2 that, consistent with the previously reported correlations involving the primary sample, the aggregated canonical scores for literacy environment and child language consistently produce stronger correlations than any of their individual constituents.

DISCUSSION

This study is part of a large body of literature in which correlations have been demonstrated between characteristics of the home environment and language or literacy skills in children (cf. Adams, 1990; Scarborough & Dobrich, 1994). This study differs from the existing literature and thus adds to it in the following respects. First, it focused exclusively on children from low-income families, specifically, children attending Head Start classrooms. In doing so, it allows conclusions about the effects of literacy environment on child language that are not confounded by social class and all the things that covary with it. Second, this study was specific to the effects of the literacy environment in the home, rather than subsuming measures of the literacy environment within larger composites of home variables. Third, this study involved a large enough sample to obtain reliable estimates of effects. As Lonigan (1994) has argued, much of the existing research on the effects of home literacy practices has had such low power due to small sample sizes that firm conclusions are difficult. Fourth, by using composite measures derived from canonical correlation, this study employed measurement operations that are likely to result in more reliable estimates of effects than would have been the case if we had based our conclusions on bivariate relations between individual measures. The latter practice is typical of the existing literature. Finally, this study was unusual in including a measure of caregiver IQ. Whereas the existing correlation literature has been uniformly interpreted as demonstrating effects of family environment on child development, the absence of a measure of caregiver IQ has left these interpretations vulnerable to a genetic interpretation.

This study produced a bounded estimate of the variance in child language accounted for by a literacy environment of 12.0% to 18.5%. This range of effects may be lower than the true relationship between environment and language development to the degree that measurement error attenuates correlations and to the degree that some of the effects of caregiver IQ and education are reflected directly in literacy environment. On the other hand, this range may be higher than the true relationship to the degree that the present model is incomplete (i.e., to the degree that there are other covariates of literacy environment that would have had significant effects on language scores had they been measured and entered into the regression equations). Nevertheless, we believe that in the context of existing research literature, the currently derived bracket of effects (12%–18.5% of variance accounted for) provides as good an estimate as is available of the effects of literacy environment on language development of preschoolers from low-income homes.

Interestingly, the estimates of the strength of the relationship between literacy environment and child language ability found in this study are higher

than those found in many previous studies (Scarborough & Dobrich, 1994), where the amount of variance in child outcome measures accounted for by literacy environment is generally less than 10%. This difference may be explained largely by most previous work having examined single aspects of the literacy environment (e.g., frequency of reading) in relation to single measures of child language ability, while this study used composite measures of literacy environment and child language.

If we look at single aspects of the literacy environment and single language tests, separating them from the composite, the relations with child language ability found in the present study are similar to those found previously. For example, the simple correlation of 0.27 in the present study between One Word score and the frequency of reading picture books with the child (Table 2) is very similar to the $r = .33$ found by Wells et al. (1984), and the $r = 0.26$ found by Dunn (1981) between frequency of reading and a language measure. Likewise, the correlation of 0.25 between number of picture books in the home and children's One Word score in this study is similar to the median correlation of 0.27 for the same variable as determined by Scarborough and Dobrich (1994) for the Mason & Dunning (1986), Share, Jorm, Maclean, and Matthews (1984), and Wells (1985) studies. Similarly, the number of library visits produced a correlation of 0.16 with One Word score in this study compared to Scarborough and Dobrich's median correlation of 0.17 for these same variables for the DeBaryshe (1993), Mason (1980), and Share et al. (1984) studies. We should not be surprised to find that appropriately aggregated measures are more sensitive than the individual measures from which they are constituted: This is a basic principle of psychological measurement that has shown its worth repeatedly in other areas (e.g., Epstein, 1979).

Consistent with other researchers (DeBaryshe et al., 1991; Scarborough, Dobrich, and Hager, 1991; Share et al., 1984; and Thomas, 1984), we found very low correlations between adult reading practices and child language ability. This latter finding has interesting implications for family literacy programs such as Even Start that are based on the assumption that increases in adult literacy will lead to increases in children's school readiness and achievement. It appears that the amount of time that caregivers spend reading to themselves and their enjoyment of that reading has much less direct influence on their children's language development than interactions in which the child is a direct participant.

Previous research suggests that differences in the quality of the literacy environment exist between different socioeconomic groups (Anderson & Stokes, 1984; Feitelson & Goldstein, 1986; Mason & McCormick, 1981; Miller, 1969; Ninio, 1980; Raz & Bryant, 1990; and Wells, 1985) and that these differences are related to child language ability (Mason & McCormick, 1981; Wells et al., 1984). The present research demonstrates there are also

differences in the quality of literacy environment within lower socioeconomic groups that are related to child language ability. These results suggest that despite the economic difficulties and other stresses faced by the low-income families, many still manage to engage in interactions such as shared picture book reading that are motivated by long-term goals such as school readiness. Further, our results demonstrate that these interactions affect children's skills, no less in low-income families than in the middle-class families that have been the subjects of previous research.

These results present a more hopeful picture for family intervention than studies that focus on differences between socioeconomic groups. Much of that research implies that parents living in poverty lack either the forms of child-directed interaction that are necessary for their children to acquire skills that are critical for success in school, or the motivation to engage in those interactions. This research demonstrates that there are substantial differences among low-income families in literacy environment and that these differences have strong effects on children's language development. Consistent with results from several ongoing intervention projects (Lonigan, 1993; Morisset, 1993; Needlman et al., 1991; Whitehurst et al., 1994; Whitehurst et al., in press), these findings suggest that the home literacy environments of children from low-income families can be enhanced, to good effect.

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