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Family Involvement in School and Low-Income Children's Literacy: Longitudinal Associations Between and Within Families

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Longitudinal data from kindergarten to 5th grade on both family involvement in school and children's literacy performance were examined for an ethnically diverse, low-income sample ($N = 281$). Within families, increased school involvement predicted improved child literacy. In addition, although there was an achievement gap in average literacy performance between children of more and less educated mothers if family involvement levels were low, this gap was nonexistent if family involvement levels were high. These results add to existing evidence on the value of family involvement in school by demonstrating that increased involvement between kindergarten and 5th grade is associated with increased literacy performance and that high levels of school involvement may have added reward for low-income children with the added risk of low parent education. As such, these results support arguments that family involvement in school should be a central aim of practice and policy solutions to the achievement gap between lower and higher income children.

Keywords: educational involvement, child literacy, longitudinal methods, low income, maternal education

Families' involvement in their children's schools is central to most public efforts aimed at reducing the achievement gap between children living in low-income families and their wealthier peers (e.g., U.S. Department of Health and Human Services, 2005). There is, in fact, increasing evidence that high levels of family involvement in school are associated with high levels of child achievement (for meta-analytic reviews, see Fan & Chen, 2001; Jeynes, 2003, 2005a). Nonetheless, the empirical knowledge base on this topic is limited in two regards. First, few studies have examined the relations between involvement in school and child achievement longitudinally. Second, few studies have moved beyond main effect associations between involvement and achievement to consider for whom involvement-achievement relations may be most meaningful.

Family Involvement in School and Child Literacy as Developmental Processes

Families may be involved in their children's education in a variety of ways, including involvement in the home (e.g., help with homework) and in the school (e.g., attending open houses) as well as through parent–teacher communication and parent-to-parent communication. With regard to involvement practices in the school context, meta-analytic reviews have repeatedly documented that children whose families are more involved in school (e.g., via attending parent–teacher conferences and parent meetings, visiting and volunteering in the classroom, and participating in social events in the school) display higher levels of achievement than children whose families are less involved in school (Fan & Chen, 2001; Jeynes, 2003, 2005a). Links between family involvement in school and children's literacy are particularly noteworthy given the developmental importance of literacy skills. Indeed, the academic, social, and economic sequelae of childhood literacy problems include an increase in school dropout rates, juvenile delinquency, and welfare costs (Autor, Levy, & Murnane, 2003; Hart & Risley, 1995; Snow, Burns, & Griffin, 1998).

Although family involvement in school may have some direct effects on children's literacy through achievement socialization processes such as reinforcement and modeling, its benefits may also be realized indirectly through children's feelings, attitudes, and self-efficacy (e.g., Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Dearing, McCartney, Weiss, Kreider, & Simpkins, 2004; Frome & Eccles, 1998; Hoover-Dempsey et al., 2001). Specifically, family involvement in the school may promote positive feelings and attitudes towards education as well as increased self-efficacy, which in turn may then promote literacy performance. Through such mechanisms, family involvement in school may have long-lasting effects on children's life chances via positive effects on the development of literacy. There is some evidence, in fact, that high levels of family involvement during the

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elementary school years are associated with a decreased probability of high school dropout and an increased probability of on-time high school completion (Barnard, 2004).

Empirical work on family involvement in school and children's achievement, however, has been limited primarily to cross-sectional studies. There are particularly few longitudinal studies on links between family involvement in school and literacy during the elementary school years, despite the developmental importance of this time when children build the literacy skills necessary for later life (Snow et al., 1998). There are also few longitudinal studies of involvement in school focused on low-income samples. This limitation to the knowledge base is particularly salient when considering recent work highlighting the need to disentangle the effects of family involvement from those of socioeconomic status (e.g., Jeynes, 2005b). Furthermore, low-income children are at exceptional risk to develop literacy problems (e.g., Hart & Risley, 1995; Snow et al., 1998), and these children are the focus of public policy aimed at increasing family educational involvement (e.g., U.S. Department of Health and Human Services, 2005).

It is worth noting, however, that parents' motivational practices and educational expectations have been addressed longitudinally, both during the elementary school years and among low-income families (e.g., Entwisle & Alexander, 1996; Gottfried, Fleming, & Gottfried, 1994). Recently, literacy-related practices in the home environment and communication with teachers have also been studied longitudinally and in the context of low family income (Serpell, Baker, & Sonnenschein, 2005). With regard to longitudinal studies of low-income families' involvement in the school environment, two studies are notable.

Englund and colleagues (Englund, Luckner, Whaley, & Egeland, 2004) used path analysis to examine parents' involvement in their children's schools (e.g., attending parent–teacher conferences) and overall levels of academic achievement at first and third grades. These authors found that both higher involvement and higher achievement at first grade predicted higher involvement at third grade and, in turn, higher achievement at third grade. Izzo and colleagues (Izzo, Weissberg, Kasprow, & Fendrich, 1999), also examining involvement in elementary school longitudinally for low-income families, used residual change analyses (i.e., predicting later levels of an outcome while controlling for earlier levels of that outcome) to examine involvement and achievement between kindergarten and third grade. These authors found that third grade achievement levels were related to earlier involvement levels, while controlling for kindergarten achievement.

These results extend cross-sectional work by demonstrating links over time between family involvement and child achievement. As Rogosas (1995) has detailed, however, between-waves path analyses do not address processes of stability and change, per se. Further, residual change analyses can result in estimates that are imprecise and unreliable (Rogosa, 1995). In short, although these methods have strengths (e.g., path analysis provides an elegant means of simultaneously estimating multiple relations and pathways of mediation), they are less than ideal if the goal of the study is to examine developmental patterns of stability and change over time. Growth modeling is preferable in this regard, primarily because individual patterns of stability and change, between-families differences in these patterns, and within-families associations among time-varying constructs may be simultaneously estimated (Raudenbush & Bryk, 2002; Rogosa, 1995; Singer & Willett, 2003).

The potential contribution of research directly modeling within-families patterns of stability and change on involvement in school and literacy achievement is at least threefold. Consider first that theory highlights the dynamic nature of family involvement in school, emphasizing involvement as a process that varies over time within families (Epstein, 1995; Hill & Taylor, 2004; Hoover-Dempsey & Sandler, 1995, 1997). Families, for example, may increase involvement following decreases in life demands, improvements in relationships with teachers and other school personnel, and/or increases in invitations and opportunities to become involved (Henderson & Mapp, 2002; Hoover-Dempsey & Sandler, 1997). Thus, examining within-families patterns of stability and change in involvement may more fully capture children's educational experiences than analytic methods that ignore these dynamics.

The second contribution of analyzing within-families patterns of involvement is that such analyses can help determine whether increased involvement is associated with improved achievement. Although previous cross-sectional analyses have demonstrated that lower levels of involvement are associated with lower levels of achievement, scientists and policymakers must also know whether change matters. If, for example, involvement increases within a family, then does child achievement improve? Within-families analyses of longitudinal data on both family involvement and child achievement are necessary to answer such questions.

Third, within-families analyses of longitudinal data can help control for potential omitted variable bias associated with fixed characteristics of children and their families. Most studies of family involvement in school are between-families comparisons (i.e., comparing achievement levels across children with varying levels of family involvement) using nonexperimental data. Estimated associations between involvement and child achievement in these types of studies are potentially biased by time-varying or time-invariant omitted variables. That is, unmeasured characteristics of children, their families, and their environments may be causally related to both involvement and achievement, and as such, associations between these two may be spurious.

Within-families estimates, however, are not susceptible to omitted variable bias caused by between-families heterogeneity that is fixed over time (Angrist & Krueger, 1999; Duncan, Magnuson, & Ludwig, 2004; Hsaio, 2003). If, for example, changes over time in involvement are associated with changes over time in child achievement within families, characteristics of children, their families, and their environments that are stable over time (e.g., genetics) may be ruled out as potential sources of bias. Although within-families estimates are not a panacea for potential sources of bias in nonexperimental studies (e.g., like between-families estimates of nonexperimental data, within-families estimates may be biased by reciprocal causation or time-varying omitted variables), they are a useful and recommended means of dealing with bias associated with potentially omitted variables that are time invariant (Duncan et al., 2004).

Involvement in School Within Context

Despite advances in developmental science emphasizing the physical and psychosocial milieu in which children's growth is

embedded (e.g., Bronfenbrenner & Morris, 1998; Magnusson & Stattin, 1998), the role of developmental context has received little attention in studies of family educational involvement beyond main effect comparisons across social addresses. There is good evidence that levels of family educational involvement vary, on average, across social and economic contexts (Bandura et al., 1996; Fan & Chen, 2001; Hill & Taylor, 2004; Hoover-Dempsey et al., 2001; Kohl, Lengua, & McMahon, 2000; Lareau, 1989; Sanders, 1998). Yet, few researchers have considered how developmental context may also moderate the effects of involvement on children's lives.

Given that some children are at greater risk than others for academic underachievement, it stands to reason that some children may benefit more than others from family educational involvement. Consider, for example, families that are characterized by both low income and low parent education. There is overwhelming evidence that children living in low-income families display lower levels of academic self-efficacy and achievement relative to other children (e.g., Bandura et al., 1996; Taylor, Dearing, & McCartney, 2004). Further, within low-income families, low levels of parental education place children at exceptionally high risk for academic failure (e.g., Rauh, Parker, Garfinkel, Perry, & Andrews, 2003). Of importance, however, is recent evidence from the sample we analyze in the present study that educational involvement may be particularly meaningful for these children, even leading to achievement levels similar to those of children from more educated families (Dearing et al., 2004). A focus on interacting processes between involvement and parent education is central to the present study, primarily because answers to these types of questions can help guide intervention efforts by identifying children who are most likely to benefit from intervention.

Present Study

In the present study, longitudinal data on family involvement within children's school environments and literacy performance from kindergarten through fifth grade were examined for a sample of ethnically diverse low-income children and their families. Specifically, we used individual growth modeling and latent growth modeling to address three research questions: (a) Was average family involvement level associated with average literacy performance? (b) Was average family involvement associated with changes in literacy performance? and (c) Were changes in family involvement within families associated with changes in literacy performance? For each of these questions, we also examined the potential moderating effect of maternal education.

We expected both between-families and within-families associations between family involvement in school and literacy performance. For example, we expected that children living in families with higher average levels of family involvement in school would display higher average levels of literacy performance as well as larger gains in literacy performance between kindergarten and fifth grade compared with children living in families with lower average levels of involvement. Beyond these between-families associations, we also expected that changes in involvement within families would be associated with changes in literacy performance, such that increased family involvement would be associated with improved literacy performance. In addition, we expected that these positive associations between involvement and literacy, both the between-families and within-families relations, would be largest for children whose mothers were least educated. Finally, given theory on the potential direct and indirect effects of involvement on literacy as well as previous longitudinal work indicating that involvement in kindergarten predicts achievement in later grades (even when controlling for achievement at kindergarten; e.g., Dearing et al., 2004; Izzo et al., 1999), we expected that our results would be most consistent with a path of influence leading from involvement to literacy performance rather than from literacy performance to involvement.[1]

Method

Participants

Data for this study were drawn from the impact evaluation of the Comprehensive Child Development Program (CCDP) and the School Transition Study (STS). The CCDP was a federally funded early intervention program at 21 sites across the United States for low-income children and their families from birth to entry into kindergarten (for further description of the CCDP, see St. Pierre, Layzer, Goodson, & Bernstein, 1999). The intervention included services aimed at children (e.g., high-quality preschool) and their families (e.g., education and job training), with the dual goals of enhancing child development and family economic self-sufficiency. For the impact evaluation, approximately half of children were randomly assigned to receive these intervention services, and the other half were included in a control group.

Beginning in the fall of 1995, the STS was a follow-up investigation for children from three of the CCDP sites (for further description of the STS, see Harvard Family Research Project, 2006; Weiss et al., 2005). The primary aim of the STS was to examine the developmental implications of family and school contexts for low-income children, including the developmental role of family educational involvement. STS study sites were selected to provide a diverse sample with regard to geographic region and ethnicity, including a Northeastern city with a primarily African American population, a rural New England town with an almost entirely European American population, and a Western city with a primarily Latino population.

Of the 403 children attending these three CCDP sites, 329 were followed from kindergarten through the fifth grade in the STS; the remaining children at these three sites were already in first grade by the start of the STS. Of the 329 children, 281 had at least one observation for variables that were measured longitudinally in the STS as well as complete data for study covariates; as such, these 281 children could be included in this study. Although children who were missing data did not significantly differ from those with complete data on most demographic indicators (i.e., African American ethnicity, gender, birth weight, birth order, maternal education, maternal employment, maternal partner status, maternal age at childbirth, family income, or family Aid to Families with Dependent Children [AFDC] receipt), children who were Latino and children who were non-English speakers were more likely ($p < .05$) to have missing

[1] Although children may evoke family involvement in school, past empirical work has often indicated that parents display an increased likelihood of getting involved when they perceive their child as having achievement problems (for a review of this work, see Hoover-Dempsey et al., 2001). Thus, to the extent that we find positive associations between involvement in school and literacy performance, we expected these associations to be the result of the effects of involvement on literacy rather than the opposite.

observations than were other children.[2] Further details on patterns of missing data for variables of primary interest (i.e., family school involvement and children's literacy) are provided along with the descriptions of these measures.

Measures

Demographic data. Demographic data on child, maternal, and family characteristics that were collected during recruitment into the CCDP were used as covariates in analyses. Child characteristics included ethnicity, gender, birth weight (i.e., low birth weight vs. other), biological risk at birth (i.e., 7-point index assessing risk factors such as use of alcohol, cigarettes, or drugs during pregnancy; higher scores indicated more risk factors), and birth order (i.e., firstborn vs. later born). Maternal characteristics included age at childbirth (i.e., teenager vs. other), partner status, primary language (i.e., English vs. other), employment (i.e., employed vs. unemployed), and depressive symptoms (i.e., Center for Epidemiological Studies—Depression Scale; Radloff, 1977). Family characteristics included CCDP status (i.e., control group vs. experimental group), AFDC receipt (i.e., yes/no), per capita income, and study site (i.e., two dummy codes for which Study Site 1 was the rural New England site and Study Site 2 was the Northeastern city).

Maternal education, used as a covariate and as a potential moderator of family involvement in school, was collected during the STS at kindergarten, third grade, and fifth grade. Maternal education was assessed on an 8-point scale ranging from 1 (*no formal education*) to 8 (*graduate school*). In our analyses, we used the mean level of maternal education across these assessments. Descriptive statistics for these demographic indicators are presented in Table 1.

Families also reported on their total income and maternal hours of employment at kindergarten, third grade, and fifth grade. There was, however, considerable missing data (i.e., approximately 50% of families had incomplete data) for these time-varying demographic indicators, and as such, they were not included in our primary analyses. Nonetheless, it is noteworthy that although most mothers were likely to be employed between kindergarten and fifth grade (e.g., averaged across this time period, the 25th percentile was approximately 30 hr/ week, and the 75th percentile was 40 hr/week), family income remained low (e.g., averaged across this time period, the 50th percentile was less than $15,000/year, and the 75th percentile was less than $30,000/year).

Table 1
Sample Descriptive Statistics

Variable	*M* (*SD*)/%
African American ethnicity	36.4%
Latino American ethnicity	21.2%
Child is a boy	48.8%
Low birth weight	15.2%
Biological risk	1.07 (1.13)
Birth order was firstborn	35.7%
Teenage childbirth	29.3%
Mother had resident partner	44.4%
Primary language was English	82.2%
Mother was employed	13.8%
Maternal depressive symptoms	15.12 (9.98)
Maternal education[a]	4.23 (1.13)
CCDP experimental group	49.2%
Received AFDC	66.7%
Income (per person)	$2,003.37 ($1,095.23)
Study Site 1	42.8%
Study Site 2	23.1%

Note. CCDP = Comprehensive Child Development Program; AFDC = Aid to Families With Dependent Children.
[a] Maternal education was assessed on an 8-point scale ranging from 1 (*no formal education*) to 8 (*graduate school*). The average level of education (4.23) was slightly greater than high school completion, which was indicated by a value of 4.

Family involvement in school. Mothers reported on family involvement in children's school at kindergarten, at third grade, and at fifth grade. Specifically, eight dichotomous (yes/no) items were used to assess involvement at school during the year (i.e., "Did you attend parent–teacher conferences?", "Did you visit your child's classroom?", "Did you attend any school performances?", "Did you attend any social events at your child's school?", "Did you attend any field trips?", "Did you volunteer in your child's classroom?", "Did you attend meetings, like PTO or PTA?", "Did you attend classroom open houses?", and "Did you volunteer in the classroom?").

For our within-families estimates of associations between involvement and child literacy performance, the eight items were averaged within each year so that yearly involvement scores ranged from 0 to 1, with higher scores indicating higher levels of involvement within each year. Thus, scores indicated the proportion of school involvement activities in which families were involved at each year (e.g., a score of .50 indicated that families were involved in four of the eight activities). Across children in the study, the mean for yearly family involvement was 0.56 ($SD = 0.26$) at kindergarten, 0.61 ($SD = 0.25$) at third grade, and 0.54 ($SD = 0.26$) at fifth grade. On this indicator, 49.8% of sample children had no missing data, 26.1% were missing one observation, 15.2% were missing two observations, and 8.8% were missing all three observations.

Yearly involvement indicators were moderately reliable at each grade (i.e., alpha [α] ranged from .65 to .73) and were moderately intercorrelated across grades (i.e., $r = .33$, $p < .01$ for kindergarten and third grade; $r = .33$, $p < .01$ for kindergarten and fifth grade; and $r = .41$, $p < .01$ for third and fifth grade). Approximately 45% of families in the STS displayed decreases in yearly school involvement between kindergarten and fifth grade, and another 10% of families displayed stable involvement levels over time, results that are consistent with past research indicating that educational involvement decreases during the early school years for many low-income families (Serpell et al., 2005). Yet, the remaining 45% of families in the study displayed increases in yearly involvement, with an average increase of .29 points (i.e., 2.32 involvement activities) and a maximum increase of .75 points (i.e., 6 involvement activities).

To assess average involvement across the study period, which was used for our between-families estimates of associations between involvement and child literacy performance, we averaged the three yearly involvement indicators (i.e., the average of kindergarten, third grade, and fifth grade involvement; $\alpha = .79$). Thus, this variable provided an indicator of the average proportion of school involvement activities in which families were involved across kindergarten, third grade, and fifth grade.

Literacy performance. Children's literacy performance at kindergarten, at third grade, and at fifth grade was assessed using the Letter–Word Identification subscale from the Woodcock–Johnson Psycho-Educational Battery—Revised (WJ–R; Woodcock & Johnson, 1989). Specifically, when completing this subscale, children are asked to (a) identify isolated letters and words and (b) match pictographic representations of words with pictures of the corresponding objects. At kindergarten, however, children in the present study displayed a floor effect. To correct for this problem and ensure variability in children's scores, the subscale was adjusted at this assessment time to include more letters and more short words of two to four letters. This adjusted measure included 26 letters and 26 short words; these 52 items proved to be internally consistent ($\alpha = .85$).

[2] The Latino American ethnicity and primary language groupings were largely overlapping. Specifically, of all non-English-speaking children, 92.8% were Latino American.

At third and fifth grades, we administered the complete Letter–Word Identification subscale (57 items) using standardized administration procedures, including basal and ceiling levels to establish subtest scores. Because complete subtests were administered only at third and fifth grades, we calculated children's literacy performance using the percentage of items that children answered correctly, such that a higher proportion of items correct indicated better literacy performance. At kindergarten, this proportion was calculated by dividing the number of items answered correctly by 52 ($M = 0.39$, $SD = 0.23$). At third and fifth grades, this proportion was calculated by dividing children's raw scores by 57 ($M = 0.61$ and 0.71, respectively; $SD = 0.15$ and 0.14, respectively). The third and fifth grade raw scores were the total number of questions answered correctly, including items below the basal level (i.e., raw scores were derived by subtracting item failures from ceiling levels).

Although we did not examine internal consistency for the third and fifth grade assessments because children completed different item sets as a result of the use of basal and ceiling levels, this WJ–R subscale demonstrated excellent split-half reliability and validity in the standardization sample (Flanagan & Alfonso, 1995; McGrew & Knopik, 1993; Woodcock & Johnson, 1989). In addition, children's literacy scores in the present study were significantly correlated over time, helping validate the use of the adjusted measure at kindergarten; specifically, correlations for children's literacy performance across grades were .45 ($p < .001$) for kindergarten and third grade, .44 ($p < .001$) for kindergarten and fifth grade, and .63 ($p < .001$) for third and fifth grades. Of the 329 children in the sample, 46.2% had no missing data for literacy assessments, 31.6% had missing data for one of the three assessments, 14.6% had missing data for two of the three assessments, and 7.6% were missing all three assessments.

Results

Analysis Plan

Multilevel models (Raudenbush & Bryk, 2002; Singer & Willett, 2003) were used to estimate individual growth curves for children's literacy performance from kindergarten through fifth grade, as well as to examine patterns of association between family involvement in school and child literacy performance. Analyses were conducted in four steps. First, as is generally recommended for growth modeling (Raudenbush & Bryk, 2002; Singer & Willett, 2003), we estimated an unconditional growth model to help determine the appropriate parameter specifications for subsequent models. Second, we estimated two-level models in which average school involvement across the study was specified as a time-invariant (Level 2) predictor of literacy performance growth curves, and average school involvement at each year was specified as a time-varying (Level 1) predictor of literacy performance.[3] Third, we estimated two latent growth models predicting changes in literacy performance from school involvement and changes in school involvement from literacy performance.

The second analytic step was taken to address two questions, the first focused on between-families differences and the second focused on within-families associations. Specifically, we addressed (a) whether children living in families with higher average levels of involvement in school displayed higher average levels of achievement and greater gains in achievement levels over time and (b) whether changes in involvement were associated with changes in child literacy achievement such that increased involvement predicted increased achievement. In answering these questions, we also examined the moderating effect of maternal education to determine whether involvement in school was more strongly related to literacy performance for children whose mothers were relatively less educated compared with children whose mothers were relatively more educated.

It is important to note that in all models, child grade and the time-varying school involvement predictor were centered within families. Although other centering options for time-varying predictors in multilevel growth models (e.g., uncentered or grand-mean centered) result in estimates that contain a mix of within-families and between-families information, by using within-families centering (alternatively referred to as "group-mean" centering) we ensured that our estimated associations between the time-varying predictors and literacy performance were within-families estimates and were not biased by between-families heterogeneity (Raudenbush & Bryk, 2002; Singer & Willett, 2003). Yet, despite this advantage of within-families estimates compared with between-families estimates, both can be affected by reciprocal causation. Our third analytic step was taken to help address this issue. Specifically, for our third analytic step, we were interested in whether associations between family involvement and literacy performance would be most consistent with a pathway of influence leading from involvement to performance, from performance to involvement, or both.

After completing these three analytic steps, we examined the robustness of our results to respecification. First, we reestimated our models using only those items from the kindergarten literacy assessment that were taken directly from the WJ–R. We used this respecification to help examine whether the additional items, which were included to adjust for floor effects, biased our results. Next, we reestimated our models using multiple imputation for missing values to help ensure that our results were not biased by missing data. Of import, in the models using multiple imputation, we were also able to include two additional covariates to help control for contemporaneous family circumstances: average family income and maternal hours of employment between kindergarten and fifth grade.[4]

Multiple imputation replaces missing data with values computed from multivariate analyses of participants' nonmissing data on other variables plus random variation (Rubin, 1987; Schafer & Graham, 2002). For the present study, we used multiple imputation by chained equations (i.e., MICE, Royston, 2004) to generate five complete data sets that combined observed and imputed values. We then reestimated our multilevel and latent models from these five complete data sets and combined estimates according to "Rubin's rules" (Rubin, 1987).

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[3] The following equation corresponds to the two-level model that included family involvement as a time-varying predictor of literacy performance:

$$y_{it} = [\beta_{00} + \beta_{01}\text{AvgInvolvement}_i + \beta_{10}(\text{ChildGrade}_{it} - \text{ChildGrade}_i) + \beta_{11}\text{AvgInvolvement}_i \times (\text{ChildGrade}_{it} - \text{ChildGrade}_i) + \beta_{20}(\text{AvgInvolvement}_{it} - \text{AvgInvolvement}_i)] + [\zeta_{00} + \zeta_{10}(\text{ChildGrade}_{it} - \text{ChildGrade}_i)] + \mu_{it}.$$

Level 2 time-invariant covariates have been excluded from the equation for brevity. In addition, only the fixed effect for child grade was estimated in models presented here, although all statistically significant effects were also present when fixed and random effects were estimated for this parameter.

[4] These covariates were not included in the first set of analyses because they would have reduced the analysis sample size by 30% as a result of missing observations.

Unconditional Growth Model for Children's Literacy Performance

To help determine appropriate parameter specifications for subsequent growth models, we first estimated an unconditional growth model for which child grade was the only predictor specified for children's literacy performance. Results from this unconditional growth model are summarized in Table 2. The fixed-effect coefficients noted in Table 2 provide estimates for the average child literacy performance across the study period and the average association between child grade and literacy performance (i.e., the average rate of change in literacy performance from kindergarten to fifth grade). The random effect estimates provide information regarding individual variations around the sample averages.

When we averaged results across the 3 years of assessment, we found that children responded correctly to 56% of the literacy items, and this percentage of correct answers increased by approximately 7% each year, as indicated by the fixed-effect coefficients of .56 and .07, respectively. Thus, the average proportion of items correct at kindergarten was 39%, and the average proportion correct at fifth grade was 74%. As indicated by the significant random effects (i.e., standard deviations), there were statistically distinguishable variations around these averages as well. Although estimates for average performance were more reliable than those for child grade (i.e., .85 vs. .36), both were well above the minimum computational criterion of .05, as recommended by Raudenbush and Bryk (2002).

Average performance and rate of change in performance, however, were very strongly and negatively associated with one another (−.83), such that children with lower levels of average performance experienced greater increases in performance over time than did children with higher levels of average performance. This is justification for constraining the residual variance of one or more parameter estimates to be zero (i.e., only estimating model fixed effects). Considering this, we estimated two sets of models for our questions of interest: (a) models with fixed and random effects for child grade and (b) models with only fixed effects for child grade (i.e., constraining the residual parameter variance for child grade to zero). Given the strong association between parameters, we present models that included only the fixed effect for this parameter; however, all significant results we report hereafter were also significant when both fixed and random effects were estimated for child grade.

Table 2
Unconditional Growth Model for Children's Literacy Performance

	Fixed effect	Random effect		
Parameter	Coefficient (*SE*)	τ^a	Reliability	SD^b
Average performance (intercept)	.56*** (.01)	−.83	.85	.16***
Child grade (slope)	.07*** (.003)		.36	.03***

[a] Tau is an estimate of the correlation between the random effects for the model intercept and slope. [b] The statistical significance of random-effect variance was estimated with a chi-square test statistic.
*** $p < .001$.

Average Family Involvement and Average Literacy Performance: Between-Families Associations

As a second analytic step, we estimated a two-level individual growth model. In the first level of this model, yearly measures of family involvement in school were specified as a time-varying predictor of literacy performance to determine whether changes in involvement were associated with changes in child literacy performance such that increased involvement predicted increased performance. In the second level of this model, average family involvement between kindergarten and fifth grade was specified as a predictor of average literacy performance and change in literacy performance (i.e., child grade) to determine whether children living in families with higher average levels of involvement in school displayed higher average levels of achievement and greater gains in achievement levels over time.

To control for potential omitted variable bias when examining between-families differences at Level 2, we also included the following child and family covariates as predictors of average performance and change in performance: child gender, ethnicity, biological risk at birth, birth order, and birth weight; maternal education, age at childbirth, partner status, employment status, primary language, and depression; family income, AFDC receipt status, and CCDP group; and study site. Results for the family involvement predictors in this model specification are displayed in Table 3. Results for maternal education are also displayed because of its inclusion in later models as a potential moderator.

Although the model coefficient for average family involvement in school was positive for children's average literacy performance (i.e., .09) and for change in literacy performance (i.e., .01), these trends were not statistically significant (i.e., $p = .09$ and .46, respectively). Similarly, maternal education was positively associated with average literacy performance, but not significantly so ($p = .09$). Within-families changes in yearly involvement in school, however, were significantly associated with changes in literacy performance (coefficient = .07) such that increased involvement predicted increased performance. The effect size for this association, as gauged by the partial correlation (i.e., $pr = .13$), was small in absolute terms. Relatively, however, it was similar to the partial correlation for income (i.e., $pr = .11$), the largest effect size among the covariates.

When considering both the statistical and practical significance of family involvement in this model, it is also important to note that by estimating only the main effect, we have constrained associations between involvement and literacy performance to be equal across children. To move beyond the main effect results, we added the interaction of average family involvement and maternal education as a Level 2 predictor of both average literacy performance and change in literacy performance. In addition, maternal education was added as a Level 2 predictor of the within-families association between yearly family involvement and literacy performance. By so doing, we examined whether the between-families and within-families associations between involvement and literacy varied as a function of maternal education.

A summary of results from the model that included involvement by education interactions is displayed in Table 4. Neither the between-families association for average involvement and change in literacy performance nor the within-families association for change in yearly involvement and change in literacy performance

Table 3
Two-Level Growth Models for Child Literacy Performance

Model parameter	Literacy performance	
	Coefficient (*SE*)	*t*(262)
Average literacy performance (i.e., Level 1 intercept)		
Average family involvement in school	.09 (.06)	1.66†
Maternal education	.02 (.01)	1.68†
Change in literacy performance (i.e., child grade)		
Average family involvement in school	.01 (.02)	.72
Maternal education	.00 (.00)	.26
Yearly family involvement in school	.07 (.03)	2.27*

Note. For brevity, coefficients are displayed only for predictors of primary interest; however, the following covariates were estimated for both average performance and child grade (i.e., change in performance): child gender, ethnicity, biological risk at birth, birth order, and birth weight; maternal age at childbirth, partner status, employment status, primary language, and depression; family income, Aid to Families With Dependent Children receipt status, and Comprehensive Child Development Program group; and study site.
† $p < .10$. * $p < .05$.

varied by level of maternal education. However, the association between average level of family involvement and average literacy performance between kindergarten and fifth grade was significantly different for children with less educated versus more educated mothers. The direction of this interaction is illustrated in Figure 1 (i.e., for graphing purposes, the percentage of literacy items answered correctly are displayed at levels of family involvement that were either one standard deviation above or below the mean and maternal education levels that were either one standard deviation above or below the mean).

Table 4
Summary of Family Involvement by Maternal Education Interactions

Model parameter	Literacy performance	
	Coefficient (*SE*)	*t*(261)
Average literacy performance (i.e., Level 1 intercept)		
Average family involvement in school	.61 (.18)	3.39***
Maternal education	.11 (.03)	3.34***
Family Involvement × Maternal Education	−.13 (.04)	−3.01**
Change in literacy performance (i.e., child grade)		
Average family involvement in school	.01 (.07)	.16
Maternal education	−.00 (.01)	−.31
Family Involvement × Maternal Education	.00 (.02)	.01
Yearly family involvement in school		
Maternal education	.02 (.03)	.87

Note. For brevity, coefficients are displayed only for predictors of primary interest; however, the following covariates were estimated for both average performance and child grade (i.e., change in performance): child gender, ethnicity, biological risk at birth, birth order, and birth weight; maternal age at child birth, partner status, employment status, primary language, and depression; family income, Aid to Families With Dependent Children receipt status, and Comprehensive Child Development Program group; and study site.
** $p < .01$. *** $p < .001$.

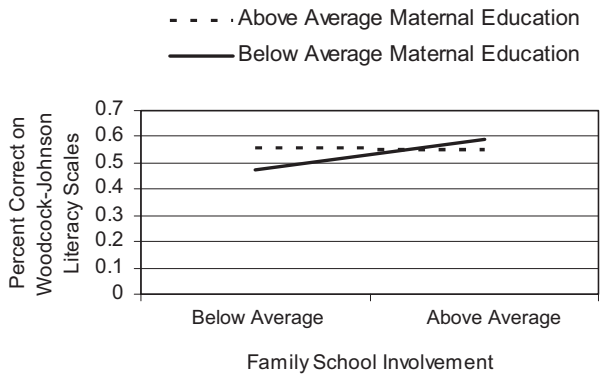

Figure 1. The association between family school involvement and literacy performance for children whose mothers had above- and below-average levels of maternal education. For both family involvement and maternal education, above- and below-average predicted scores were calculated with values one standard deviation above and below the mean, respectively.

For children whose mothers had above-average levels of education, there was no association between average level of family involvement in school and average literacy performance. On the other hand, for children whose mothers had below-average levels of education, higher levels of family involvement were associated with better literacy performance. In fact, although children with less educated mothers had, on average, approximately 10% fewer items correct on the literacy scales than children with more educated mothers if family involvement in school was low, this achievement gap was nonexistent if family involvement in school was high.[5]

Latent Growth Models

As a third analytic step, we estimated two latent growth models examining associations between family involvement in school and children's literacy performance. In the first model, four latent constructs were estimated from the observed data: kindergarten status for literacy performance, change in literacy performance between kindergarten and fifth grade, average school involvement between kindergarten and fifth grade, and change in school involvement between kindergarten and fifth grade. In this model, change in literacy performance was then regressed on the other three latent variables as well as the Level 2 control variables specified in the multilevel growth models. In other words, we estimated the association between change in literacy and the involvement indicators while controlling for initial literacy performance levels as well as child and family covariates.

[5] For this interaction, we estimated the range of values on maternal education for which the association between involvement and literacy was significant (i.e., the region of significance). At maternal education levels of 3.65 and lower, family involvement in school was positively and significantly associated with child literacy performance. In other words, the positive effects of family involvement in school were significant for children whose mothers had less than a high school level of education.

We also estimated four latent constructs for the second model: average literacy performance between kindergarten and fifth grade, change in literacy performance between kindergarten and fifth grade, kindergarten status for school involvement, and change in school involvement between kindergarten and fifth grade. In this model, change in school involvement was regressed on the other three latent variables as well as the Level 2 control variables from the multilevel growth models. In other words, we estimated the association between change in school involvement and the performance indicators while controlling for initial school involvement levels as well as child and family covariates.

These two latent growth models were estimated to help determine whether associations between family involvement and literacy performance were most consistent with a pathway of influence leading from involvement to performance, from performance to involvement, or both. If involvement influences performance, then high average levels of involvement between kindergarten and fifth grade and increasing involvement across this time period should be associated with increased performance after kindergarten (i.e., when controlling for children's performance levels at kindergarten) in the first latent growth model. Alternatively, if performance influences involvement, then high average levels of performance and increasing performance should be associated with increased involvement after kindergarten in the second growth model. Note, however, that although the results of the latent models could prove to be consistent or inconsistent with one or both of these pathways of influence, causality could not be entirely disentangled on the basis of any of our analyses, because the present study relies on nonexperimental data.

Results from the first latent model are summarized in Table 5, and results from the second are summarized in Table 6. Changes in family involvement in school between kindergarten and fifth grade predicted changes in children's literacy performance during this time, controlling for children's literacy performance at kindergarten. Specifically, children whose families increased their involvement over time had greater gains in literacy performance after kindergarten than children whose families were stable or decreased their involvement over time.[6] Although not large in absolute terms, the effect size for this association ($pr = .23$) was the second largest in the model; only the effect size for kindergarten literacy performance ($pr = .38$) was larger. On the other hand, controlling for family involvement at kindergarten, neither average literacy performance nor increased literacy performance was significantly associated with changes in literacy performance.

Table 5
Latent Growth Curve Analysis Predicting Changes in Literacy Performance

Predictor	Coefficient (*SE*)	*t*(226)
Kindergarten literacy performance	−.13 (.02)	−6.81***
Change in literacy performance		
Average family involvement in school	.01 (.01)	0.75
Change in family involvement in school	.24 (.06)	3.95***

Note. For brevity, coefficients are displayed only for predictors of primary interest; however, the following covariates were estimated for both average performance and child grade (i.e., change in performance): child gender, ethnicity, biological risk at birth, birth order, and birth weight; maternal age at childbirth, partner status, employment status, primary language, and depression; family income, Aid to Families With Dependent Children receipt status, and Comprehensive Child Development Program group; and study site.
*** $p < .001$.

Table 6
Latent Growth Curve Analysis Predicting Changes in Family Involvement

Predictor	Coefficient (SE)	*t*(226)
Kindergarten family involvement in school	−.16 (.06)	−2.65**
Change in family involvement in school		
Average literacy performance	.29 (.77)	0.37
Change in literacy performance	2.27 (5.26)	0.43

Note. For brevity, coefficients are displayed only for predictors of primary interest; however, the following covariates were estimated for both average performance and child grade (i.e., change in performance): child gender, ethnicity, biological risk at birth, birth order, and birth weight; maternal age at childbirth, partner status, employment status, primary language, and depression; family income, Aid to Families With Dependent Children receipt status, and Comprehensive Child Development Program group; and study site.
** $p < .01$.

Replication Models

To help ensure that the adjusted kindergarten assessment and missing data were not biasing our results, we reestimated all of our statistical models. First, we reestimated our models using only those items from the kindergarten assessment that were taken directly from the WJ–R Letter–Word Recognition subscale. Second, we reestimated our models using multiple imputation for missing values. In the latter, we also added two additional control variables: families' average income and mothers' average hours of employment between kindergarten and fifth grade. The inclusion of these additional covariates allowed us to control for contemporaneous economic and employment circumstances, in addition to the baseline controls used in our original analyses.

All of our significant results for family involvement in school were replicated in these additional analyses. In fact, when using the smaller set of literacy items for the kindergarten assessment, we also found a significant association between average level of school involvement and changes in literacy performance, such that higher average levels of involvement were predictive of more rapid increases in literacy between kindergarten and fifth grade. This additional result, however, was not evident when we replaced missing data using multiple imputation.

Summary of Results

Our results indicated that both between-families differences in school involvement and within-families changes in school involvement were associated with child literacy. Although the main effect

[6] In latent growth models, we also examined the possibility that kindergarten achievement was indirectly associated with later achievement via family involvement. That is, high levels of kindergarten achievement may lead to high levels of family involvement and, thereby, positively influence later achievement. However, we found no evidence that this was the case.

of average involvement in school across the study was not a statistically significant predictor, its effect did vary by maternal education. Specifically, despite having little association with the literacy performance of children whose mothers were relatively more educated, average involvement was positively associated with average literacy performance for children whose mothers were relatively less educated, such that these children displayed higher levels of performance when their families were more involved. In addition, increased involvement in school within families was associated with improved child literacy performance, in both our multilevel and latent growth models.

Discussion

Family educational involvement is often touted by policymakers and educators alike as one way of improving the achievement of low-income children (U.S. Department of Education, 2005). The present study helps address these claims and extends previous empirical work on family involvement in school and low-income children's literacy by examining longitudinally both between-families and within-families associations for involvement and literacy achievement. Higher average levels of involvement were, for example, positively associated with higher average levels of literacy performance across the study for children from less educated families. In addition, regardless of maternal education level, when families increased their involvement in school between kindergarten and fifth grade, children's literacy performance improved.

Average Family Involvement in School and Literacy Performance

In this study, the main effect of average family involvement in school was not significantly associated with average literacy performance or change in literacy performance; the former association, however, did vary by maternal education. Specifically, although there was no association between average involvement and average literacy for children whose mothers were relatively more educated, average involvement levels between kindergarten and fifth grade were positively associated with average literacy performance levels for children whose mothers were relatively less educated. Indeed, although there was an achievement gap in average literacy performance across the study between children of more and less educated mothers if family involvement levels were low, this gap was nonexistent if family involvement levels were high.

On the basis of our past analyses of this same data set (Dearing et al., 2004), we reported similar moderating effects of maternal education for associations between family educational involvement at kindergarten and the development of low-income children's feelings about literacy and literacy achievement. We found, for example, that although children of relatively less educated mothers have more negative feelings about their literacy performance at kindergarten than do children of relatively more educated mothers, this difference diminishes over time if families are highly involved. Thus, the present study adds to increasing evidence that family involvement in school among low-income families may be most likely to improve the achievement of children who are at exceptional risk for academic failure because of both low income and low parent education.

Within-Families Changes in Involvement and Changes in Literacy Performance

Regardless of whether families had high or low average levels of involvement between kindergarten and fifth grade, we also found evidence that changes in involvement were associated with changes in child literacy performance. Specifically, increases in family involvement in school were associated with increases in literacy performance. This result adds to existing studies in at least two important ways. First, because most empirical work has focused solely on between-families differences using nonexperimental data (e.g., do children with higher levels of involvement have higher levels of achievement?), it has remained unclear whether changes in involvement within families have developmental repercussions; our results suggest that they do.

Second, by using within-families analyses, our estimates were not susceptible to bias caused by time-invariant omitted variables (Duncan et al., 2004). Causal inferences are not appropriate when associations between involvement and child achievement have been estimated using nonexperimental data, primarily because we cannot assume that different families provide different levels of involvement randomly. Of importance, however, because the association between increased involvement and improved achievement in the present study was estimated within families, characteristics of children, their families, and/or their environments that were fixed over time (i.e., did not vary) could be ruled out as potential sources of bias.

Nonetheless, as is true for between-families analyses of nonexperimental data, within-families analyses of nonexperimental data can be biased by reciprocal causation. For example, although literacy performance was specified as the outcome in most of our analyses, it may influence family involvement, or the two may simultaneously influence one another. Our results, however, were most consistent with a path of influence leading from involvement to achievement. Specifically, although changes in achievement were not predictive of changes in involvement when controlling for initial levels of involvement, changes in involvement were predictive of changes in achievement when controlling for initial levels of achievement.

When considering these results, it is important to recognize evidence that family involvement in school often decreases across the middle and high school years for middle-income families (e.g., Adams & Christenson, 2000; Simon, 2004), and it begins decreasing across the early school years for many low-income families (e.g., Serpell et al., 2005). In fact, nearly half of families in the present study displayed declines over time in their school involvement between kindergarten and fifth grade. On the other hand, most other families in the sample displayed increases in involvement, and these increases predicted improved literacy above and beyond average level of involvement. Thus, although low-income families may experience many barriers to increasing, or even sustaining, involvement in their children's early schooling, our results indicated that doing so has benefits for children's literacy.

Relative Effect Sizes

The effect sizes for family school involvement were not large in absolute terms. Yet, as McCartney and Rosenthal (2000) have pointed out, the practical significance of effect sizes is often best

evaluated within context. Compared with the effect sizes for our analysis covariates, those for school involvement were among the largest in the models we estimated. Given the socioeconomics of the sample, however, the range of values was restricted for covariates such as family income. Nonetheless, within the empirical context of the present study, family involvement in school was of both statistical and practical significance for children's literacy achievement, particularly for low-income children whose parents had relatively low levels of education.

Study Limitations

Our within-families analysis provided control for time-invariant heterogeneity across families. Between-families differences, whether observed or unobserved, could not have biased the within-families association between increased involvement and improved literacy. Our between-families results, on the other hand, were susceptible to omitted variable bias associated with either time-invariant or time-varying variables that were not observed. Further, our within-families results were susceptible to omitted variable bias associated with time-varying variables that were not observed.

During the course of the present study, for example, families may have experienced life changes (e.g., decreases in maternal depressive symptoms or increases in income) that influenced both their propensity to become involved in their children's education as well as their children's literacy performance. Indeed, five of the baseline covariates (i.e., maternal partner status, employment, and depression; and family income and AFDC receipt), which were assessed when children were born, likely varied over time. Although our results were, in general, replicated in models when we controlled for average income and maternal employment between kindergarten and fifth grade (using multiple imputation for missing data), time-varying data on all of these constructs would have strengthened statistical control in the present study.

The present study was also limited to examining family involvement in school. Beyond in-school activities, families can be involved in their children's education through involvement in the home (e.g., help with homework), home–school communications (e.g., phone conversations with teachers), and social networks (e.g., parent-to-parent networks) as well as parental attitudes (e.g., educational expectations). Although parents' educational expectations and involvement behaviors in the home have been of greatest importance for children's achievement compared with other areas of involvement when examined using between-families analyses (e.g., Fan, 2001; Izzo et al., 1999), future longitudinal studies that examine multiple areas of educational involvement within families could help further disentangle the unique and interactive effects of these family investments in their children's educations. This type of future research is of particular importance for understanding the involvement of low-income families who are working; these families experience unique barriers to involvement during the work day (e.g., inflexible work schedules limit classroom volunteering), but they may also develop unique strategies to stay involved (e.g., Weiss et al., 2005).

Higher rates of missing data for Latino and non-English-speaking families compared with other families limited the present study, particularly in light of these families' potential cultural and language barriers to family involvement in school. Although approximately 20% of the families in the present study were Latino and/or non-English speaking, and although our results were, in general, replicated when all families were included via multiple imputation of missing data, our findings should be replicated in samples with lower attrition rates before generalizing to these children and families.

In addition, there are two measurement issues of note. First, given that our estimates of family involvement in school were based on parent report, social desirability is a concern (i.e., parents may overreport their involvement in school). Because measurement error in predictor variables downwardly biases estimated associations, the results of the present study may underestimate effect sizes for school involvement as a function of social desirability. Second, the measure of child literacy performance at kindergarten differed from the measures administered at later grades. Although kindergarten scores were correlated with scores at later grades, standardized administration across waves would have strengthened the study.

Conclusion

Our results support the usefulness of family involvement in schools as a means of improving the achievement of children living in low-income families and underscore the value of empirically modeling both family involvement and child achievement as developmental phenomena. Given that higher average levels of involvement and increases in involvement were both associated with literacy performance, implications for practice include the need for schools to view family involvement over the long term, ideally creating an educational environment that increases the involvement of families that are less involved, and then helps sustain that involvement across elementary school. This need is underscored by the fact that, on average, lower income families display relatively low levels of involvement that may decrease across the early schooling years (Jeynes, 2005a, 2005b; Serpell et al., 2005).

Past research indicates that increases in family involvement are most likely to occur among lower income families when schools not only reach out to families and invite them to become involved but also help these families overcome barriers to involvement, such as child care and transportation needs (for a review, see Henderson & Mapp, 2002). Beyond practice, the policy implications of the present study include the potential benefit of targeting family involvement intervention toward children at exceptional risk for educational failure, those living in families with low income and little education. Considering that average level of family involvement in school was most strongly associated with literacy achievement for these children, both the child-level and societal-level benefits of intervention may be maximized when efforts are focused on these children and their families.

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