

Family Poverty, Family Processes and Children's Preschool Achievement: Understanding the Unique Role of Fathers

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Abstract Developmental research has highlighted the importance of fathers for children's early academic success, and growing evidence suggests that children living in poverty may benefit the most from positive father involvement. Using a subsample of children from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), this study examined direct and mediated pathways from family poverty to children's preschool achievement. Analyses revealed that poverty had a more consistent negative association with fathers' parenting than mothers' parenting and fathers' parenting was a more consistent mediator of links between poverty and child achievement than mothers' parenting. Specifically, fathers' and mothers' warmth as well as fathers' home learning stimulation mediated the relation between poverty and children's reading scores. Furthermore, fathers' warmth and mothers' home learning stimulation mediated the relation between poverty and children's math scores. Results point to the unique contribution of fathers to children's preschool achievement and imply that poverty is differentially associated with fathers' and mothers' parenting practices during the early childhood period.

Keywords Poverty · Fathers · Mothers · Family processes · Preschool achievement

Introduction

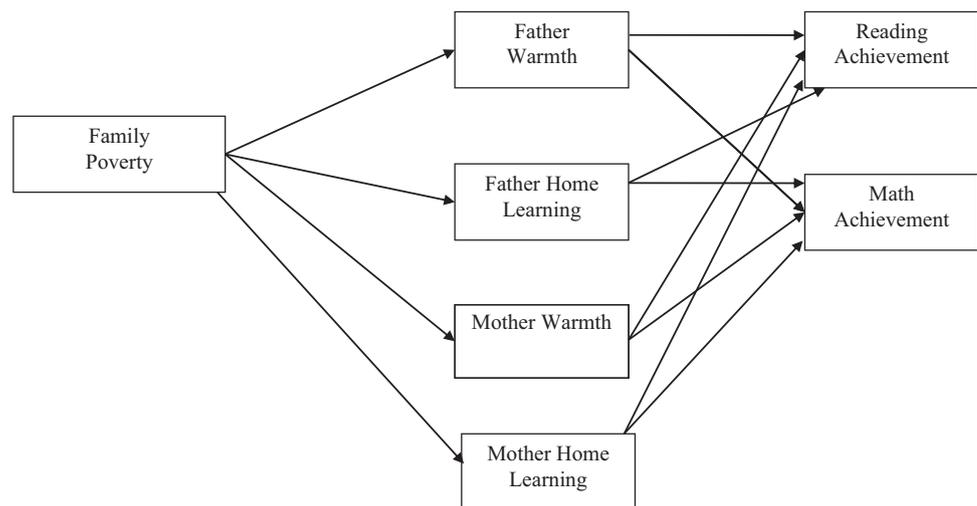
Academic disparities between children living in poverty and more affluent children are present at school entry (Reardon 2013). In fact, nationally representative studies indicate that poor children score significantly lower than both middle income and upper income children on measures of reading and math during the transition to preschool and kindergarten (Baker et al. 2012; Crosnoe and Cooper 2010; Gershoff et al. 2007). Given that 1 in 5 children in the United States lives in poverty and early reading and math scores are the most salient predictors of high school success (Duncan et al. 2007; Reardon 2013), a more nuanced understanding of how poverty places children at-risk for early school difficulty is needed. It is equally important that research seeks to identify malleable mechanisms underlying associations between poverty and child achievement, with the ultimate goal of contributing to interventions that hold promise for low-income children.

Research that has focused heavily on mothers suggests that family processes are a key mechanism through which poverty affects child achievement (Bradley and Corwyn 2002; Burchinal et al. 2008; Morris et al. 2004; Newland et al. 2013). Indeed, prior studies have delineated links between poverty and disruptions in family processes such as maternal warmth and home learning stimulation, which in turn predicts less optimal academic outcomes (Brooks-Gunn and Duncan 1997; Brooks-Gunn and Markman 2005). The associations among poverty, fathers' parenting and child achievement, however, have not been well established, particularly in ethnic minority families. This gap in the literature is surprising given the evidence, suggesting that fathers living in poverty have a stronger influence on certain aspects of child achievement (e.g., math skills) than mothers (Baker et al. 2015;

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Fig. 1 Conceptual model depicting hypothesized pathways from family poverty to preschool children's reading and math achievement through family processes (defined in this study as paternal and maternal warmth and home learning stimulation)



65 Pancsofar et al. 2010). As such, it is essential that research
 66 moves beyond studies that focus exclusively on mothers
 67 and investigates the contribution of both mothers and
 68 fathers to children's early education and development.

69 According to bioecological theory, children learn best in
 70 the context of warm, parent-child relationships (Bronfen-
 71 brenner and Morris 2006). Parental warmth reflects parents'
 72 general tendencies to be supportive, sensitive, and respon-
 73 sive to their children's needs as well as their general
 74 expressions of affection and approval (e.g., Baumrind 1991;
 75 Landry et al. 2008). Decades of ecological research indi-
 76 cates that mothers who combine warmth (e.g., hugs and
 77 kisses) with consistent cognitive stimulation (e.g., shared
 78 book reading) have children with stronger cognitive skills
 79 compared to mothers who are less warm and engage in less
 80 cognitive stimulation (e.g., Landry et al. 2008). Recipro-
 81 cally, family stress theory posits that family poverty
 82 increases the stress and strains of parents' daily lives and
 83 reduces parents' capacity for engaging in warm, cognitively
 84 stimulating parenting practices (Conger et al. 1995; Conger
 85 et al. 2002; McLoyd 1998). A key argument in both eco-
 86 logical and family stress theories is the idea that micro-
 87 system factors (e.g., family poverty) influence child
 88 achievement by shaping the quantity and quality of
 89 parent-child interactions (see Fig. 1).

90 Family poverty occurs when a family's income fails to
 91 meet a federally established threshold. Typically, it is
 92 measured with respect to families and not the individual,
 93 and is adjusted for the number of persons in a family
 94 (DeNavas-Walt et al. 2015). For example, a four-person
 95 family with two adults and two children living in the U.S. in
 96 2015 was considered poor with annual cash income below
 97 \$23,283 (DeNavas-Walt et al. 2015). Research suggests that
 98 family poverty increases negative life events, generates
 99 more stress in the mother-child relationship, and reduces
 100 positive parenting practices (Brooks-Gunn and Duncan

101 1997; Guo and Harris 2000; McLoyd 1998). Mothers
 102 rearing children in poverty are also less likely to engage in
 103 parent-child reading and direct instruction of shapes, letters
 104 or numbers compared to more affluent mothers
 105 (Brooks-Gunn and Markman 2005; Davis-Kean 2005;
 106 Votruba-Drzal 2003).

107 Interestingly, studies with fathers imply that exposure
 108 family poverty and economic hardship affects fathers dif-
 109 ferently than mothers (Cabrera et al. 2011; Karrass et al.
 110 2003; Harris et al. 1998; Silinskas et al. 2010). For instance,
 111 one small scale of predominantly white families found that
 112 declines in family income were not associated with the
 113 frequency of fathers' shared book reading with their infants
 114 but it was associated with declines in mother-child shared
 115 book reading (Karrass et al. 2003). In a nationally repre-
 116 sentative study of black and white families, increases in
 117 family income had a stronger positive association with
 118 mothers' provision of home learning stimulation with their
 119 preschoolers than fathers' provision of home learning sti-
 120 mulation (Baker 2013). Similar results have been found for
 121 kindergarten and first-grade children. Specifically, Silinskas
 122 et al. (2010) found that fathers who experienced poverty
 123 and income deprivation engaged in more frequent involv-
 124 ement in teaching reading and mathematics concepts to
 125 their children compared to fathers who were not poor,
 126 raising questions about whether fathers increase their
 127 learning related involvement with their children as a result
 128 of experiencing poverty or economic hardship.

129 The data from studies on parent warmth have unearthed a
 130 similar pattern of inconclusive results. For example,
 131 Klebanov et al. (1994) used a small sample of white, black,
 132 and Hispanic 3-year olds and their mothers to demonstrate
 133 that exposure to family poverty was not linked to declines in
 134 maternal warmth. In a more recent large-scale study that
 135 focused on white families, Harris et al. (1998) found that
 136 exposure to family poverty had a stronger negative impact

137 on fathers' provision of warmth and emotional support than
138 mothers' provision of warmth and emotional support.
139 Although the small body of work that exists points to
140 potential differences in links among family poverty, and
141 fathers' and mothers' parenting, much of the prior work has
142 excluded Hispanic families (the most rapidly growing
143 demographic group in the U.S.). Further, studies have not
144 typically used a federally guided measure of income pov-
145 erty, which is used to determine eligibility for a range of
146 federal assistance programs including Head Start (DeNavas-
147 Walt et al. 2015).

148 Findings are clearer with regard to direct links between
149 family poverty and children's academic outcomes, with data
150 from small- and large-scale studies, indicating that poverty
151 is negatively associated with children's reading and math
152 outcomes (Brooks-Gunn and Duncan 1997; Dahl and
153 Lochner 2005; McLoyd 1998; Morris et al. 2004; Reardon
154 2013). Moreover, seminal work in this area indicates that
155 exposure to poverty during early childhood has a stronger
156 association with child academic achievement than exposure
157 to poverty during later childhood (McLoyd 1998). For
158 example, in a meta-analysis of nearly 200 studies, White
159 (1982) found that family income was significantly asso-
160 ciated with children's reading and math scores and the
161 magnitude of these associations (i.e., effects sizes) were
162 stronger earlier in childhood compared to later childhood or
163 adolescence.

164 Evidence from experimental studies that draw causal
165 links between poverty and child achievement also suggest
166 that poverty negatively impacts child achievement. In a
167 large sample of single parent families, Morris et al. (2004)
168 found that increasing family income in an anti-poverty
169 program had a positive influence on the academic
170 achievement of preschoolers. In another experimental study,
171 Dahl and Lochner (2005) found that increases in family
172 income raised children's math test scores by 2.1% of a
173 standard deviation and reading test scores by 3.6% of a
174 standard deviation. These increases were even more pro-
175 nounced among disadvantaged African-American and
176 Hispanic children, with an increase of 3% (math) and 4.8%
177 (reading) of a standard deviation.

178 Although these studies and others like them (e.g.,
179 Burchinal et al. 2011; Cabrera et al. 2011; Reardon 2013)
180 provide evidence that family income and poverty are
181 directly related to child achievement, there is evidence that
182 family processes mediate these links. For instance, studies
183 that have not distinguished between the contribution of
184 fathers and mothers have found indirect links among pov-
185 erty, parenting and child achievement across multiple racial/
186 ethnic groups (Burchinal et al. 2008; Davis-Kean 2005;
187 Eamon 2002; Yeung et al. 2002). In a small-scale study of
188 African-American children and their mothers, Burchinal
189 et al. (2008) found that family poverty was negatively

190 related to children's reading and math achievement and
191 these associations were mediated by mother-child home
192 learning and communication. Yeung et al. (2002) used a
193 large sample of white, black, and Hispanic children from
194 the Panel Study of Income Dynamics (PSID) to demonstrate
195 that maternal home learning activities and the provision of
196 cognitively stimulating materials were the most important
197 mediators of links between family income and children's
198 emergent literacy skills.

199 There is mixed evidence for mediation by parent warmth
200 with some research indicating that parental warmth med-
201 iates links between poverty and child achievement (Davis-
202 Kean 2005; Pittman and Chase-Lansdale 2001) and other
203 studies finding no mediating affects for parent warmth
204 (Doyle and Markiewicz 2005; Wolfradt et al. 2003). For
205 example, Davis-Kean (2005) used a large sample of white
206 and black children to demonstrate that maternal warmth was
207 indirectly associated with child achievement for black
208 children but not white children. Although less work has
209 examined these links among fathers, one study using a
210 sample of black and white children from the PSID found
211 that father-school involvement (i.e., discussing school
212 related events with child) mediated the association between
213 family income and children's reading and math scores
214 (McBride et al. 2005). Similarly, Hango (2007) found that
215 father involvement, defined as "interest in education"
216 reduced the negative effects of financial disadvantage and
217 acted as a partial mediator between poverty and children's
218 educational outcomes.

219 Although there is evidence supporting associations
220 among family poverty, family processes and child
221 achievement, there are limitations in the current literature
222 that preclude conclusions about potential mechanisms and
223 processes underlying the observed relationships. Further,
224 much of the research has been conducted with small sam-
225 ples, and prior work has often excluded fathers and ethnic
226 minority families. Additionally, poverty work has too often
227 focused black families from urban contexts, with less
228 emphasis on families from ethnically, economically, and
229 geographically diverse contexts.

230 Three specific research questions were examined: (1)
231 what is the relation between family poverty and family
232 processes (defined in this study as fathers' and mothers'
233 warmth and home learning stimulation), (2) what is the
234 relation between family poverty and children's preschool
235 achievement (defined in this study as children's reading and
236 math scores), and (3) are the associations among family
237 poverty and children's preschool achievement mediated by
238 family processes? We hypothesized that family poverty
239 would be differentially associated with fathers' and mothers'
240 parenting practices. We also hypothesized that family
241 poverty would be negatively associated with children's
242 preschool achievement with pathways from poverty to

Table 1 Family poverty, family processes and children's preschool achievement: correlations and descriptive statistics ($N = 7700$)

Variables	1	2	3	4	5	6	7
1. Reading achievement	1.00						
2. Math achievement	0.76*	1.00					
3. Father warmth	0.06**	0.65*	1.00				
4. Father home learning	0.15*	0.12*	0.15*	1.00			
5. Mother warmth	0.02**	-0.02	0.03	-0.05**	1.00		
6. Mother home learning	0.19*	0.17*	0.01	0.20*	-0.04**	1.00	
7. Family poverty	-0.28*	-0.29*	-0.07**	-0.07**	-0.01	-0.21*	1.00
Mean	24.20	28.20	1.83	2.34	1.51	3.11	0.27
Standard deviation	9.83	9.47	0.52	0.68	0.51	0.67	0.44
Range	11.65–80.29	9.87–65.74	2.33–10.67	2.33–9.33	2.00–9.22	2.33–9.33	0.00–1.00

* $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$

243 achievement being partially mediated by fathers' and
244 mothers' parenting practices.

245 Method

246 Participants

247 The data for the present study are from the Early Childhood
248 Longitudinal Study-Birth Cohort (ECLS-B), a restricted-use
249 longitudinal study that tracked a nationally representative
250 sample of 10,700 children born in the U.S. in 2001 from
251 birth to kindergarten (Nord et al. 2004). The data for the
252 ECLS-B were collected when children were approximately
253 9 months, 24 months, 48 months (preschool), and
254 58 months (kindergarten). Response rates for the data used
255 in this study were 74% at 9 months, 69% at 24 months, and
256 63% at 48 months. The ECLS-B collected data from each
257 child's mother and father through both a computer-assisted
258 questionnaire and a self-administered questionnaire. Anal-
259 yses for the present study were conducted using the pro-
260 vided sampling weights to adjust for the differential
261 probabilities of sample selection resulting from the complex
262 stratified random sampling design. More detailed informa-
263 tion on the ECLS-B study, including sampling frame, and
264 data structure can be obtained from the ECLS-B psycho-
265 metric report published by the National Center for Educa-
266 tion Statistics (Najarian et al. 2010).

267 The sample for our analyses was ($N = 7700$) white, black
268 and Hispanic children and the sample size was rounded to
269 the nearest 10 due to restricted license requirements. Over a
270 quarter of the families in the study were living below the
271 poverty line (27%). The average age of the children (at the
272 time of assessment) was 50.84 months old ($SD = 4.04$), the
273 average age of fathers was 32.32 years old ($SD = 4.39$) and
274 the average age of mothers was 26.65 years old ($SD =$
275 3.22). On average, fathers and mothers had approximately

two children living in their homes ($M = 2.22$), had at least a
high school diploma or GED with nearly 30% having a
bachelors or graduate degree. Finally, most of the fathers in
this study were biological, resident fathers (76%). Table 1
presents descriptive information for all the key variables in
the study.

282 Measures

283 Reading and math achievement

284 Reading and math scores (i.e., collected when children were
285 48-months old) were measured using individually admin-
286 istered tests that lasted approximately 35 min for each
287 child. The final content of the early reading and math
288 assessments were guided by a framework provided by
289 Brush et al. (2003). The preschool reading test assessed
290 children's emergent literacy skills in six specific areas as
291 follows: (1) English language skills/oral language, (2) pho-
292 nological awareness, (3) letter /word sound knowledge, (4)
293 print conventions, (5) word recognition, and (6) vocabulary.
294 The reliability estimates for the reading test scores were
295 $\alpha = 0.95$. The math test assessed children's math skills in
296 four specific areas, as follows: (1) number sense, properties,
297 and operations, (2) measurement which involved under-
298 standing the attributes of objects and the ability to compare
299 objects by their attributes, (3) geometry and spatial sense,
300 and (4) patterns, algebra, and functions. The reliability
301 estimates for the math test scores were $\alpha = 0.94$.

302 Family processes

303 During the 24-month data collection wave, fathers and
304 mothers were asked to report the frequency (1 = never to
305 5 = always, $\alpha = 0.62$; $\alpha = 0.73$, respectively) of their par-
306 ticipation in "warm" interactions with their children. In the
307 present study, parent warmth was the mean of four specific

items. An example of a specific item is “How often do you express love and affection with hugs and kisses?” Higher scores indicate more frequent warmth. Fathers and mothers were also asked to report the frequency (1 = never to 4 = everyday, $\alpha = 0.70$; $\alpha = 0.79$, respectively) of their participation in home learning stimulation. In the present study, home learning stimulation was the mean of three specific items. An example of a specific item is “In the past week, how often have you read to your child?” Higher scores indicate more frequent home learning stimulation.

Demographic characteristics

Several demographic characteristics (collected when children were 24-months old) were included as covariates in our study. Family poverty (0 = above poverty threshold or 1 = below poverty threshold) was a binary variable that was created by the ECLS-B. In the ECLS-B, poverty status was based on preliminary U.S. Census thresholds for 2010, which identify incomes determined to meet household needs given the household size (Najarian et al. 2010). For example, in 2010, a family of two was below the poverty threshold if its income was lower than \$14,220. Mothers’ and fathers’ education were ordinal variable with values ranging from 1 = 8th grade or below to 9 = doctorate degree. Mothers’ and fathers’ age as well as number of children living in the home were continuous variables. Finally, child race was a series of dummy coded variables, with the largest racial group in the sample (i.e., whites) representing the reference group.

Data Analyses

In the first step of our analyses, we examined raw means, standard deviations and correlations among key variables in the study. Second, Little’s MAR test was used to examine missing data patterns (Little 1988). On the basis of these findings (i.e., the missing data ranged from 0% to 18%, data appeared to be missing at random), we used multiple imputation (MI). MI has been shown to be superior to ad hoc missing data techniques such as mean imputation, listwise deletion and pairwise deletion (Enders 2010). Third, as discussed by Preacher and Hayes (2008) and Enders (2010) we used a set of auxiliary variables to increase the likelihood that missing at random was achieved. The reasoning this strategy is as follows: if many variables are included it becomes less likely that variables that are both causes of the missingness and the analytic variables with the missing data are omitted. Such omission would be harmful as it would destroy the conditional independence posited in MAR and induce bias. Fourth, we used guidelines from Preacher and Hayes (2008) to test linearity, data structure, error terms, disturbance terms, multicollinearity, identification and made

sure we had an adequate sample size to conduct our analyses.

Finally, a path analysis with bootstrapped estimation of the standard errors for indirect effects was conducted in Mplus version 7.3. The path analysis allowed for estimation of direct effects between poverty and child achievement, conditioned on family demographic variables, as well as indirect effects accounted for by mothers’ and fathers’ parenting. Before conducting the path analysis, we used multiple imputation in Mplus to create 10 complete data sets. The imputation model included all variables in the final analysis, plus a set of auxiliary variables, including indicators of fathers’ stress, depression, and disciplinary practices and three indicators of children’s social development to increase the likelihood that missing at random was achieved. All path analyses were conducted on the 10 imputed data sets, and parameters were aggregated in Mplus for reporting.

Results

Means, standard deviations, ranges, and correlations for key study variables are presented Table 1. Some correlations merit mention. First, family poverty was negatively correlated with children’s preschool achievement such that children living below the poverty line had lower reading and math scores than children living above the poverty line. Second, family poverty was negatively correlated with fathers’ warmth and home learning stimulation such that fathers living below the poverty line engaged in less frequent warmth and home learning stimulation than fathers living above the poverty line. In contrast, family poverty was not associated with mothers’ warmth but was negatively associated with mothers’ home learning stimulation such that mothers living below the poverty line engaged in less frequent home learning stimulation than mothers living above the poverty line.

To address our final research question investigating whether family poverty was associated with children’s preschool achievement through family processes, a path analysis was conducted using MPlus[®] 7.3 (Muthén and Muthén 2010). Model fit was assessed by the obtained chi-square, Confirmatory Fit Index (CFI), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). Good fit is indicated by a value >0.95 for CFI, values below .05 for RMSEA, and values below 0.08 for SRMR (Bentler and Bonett 1980; Browne and Cudeck 1992; Hu and Bentler 1998). Our hypothesized model fit the observed data very well. The fit indices for the final model were $F 2(10) = 24.834$, $p < 0.01$; CFI = 0.996; RMSEA = 0.025; SRMR = 0.012; TLI = 0.91.

Table 2 Mediation model parameters for children’s preschool reading and math achievement (standardized estimates shown; $N = 7700$)

	Mediators				Outcomes	
	Father Warmth	Father HLS	Mother Warmth	Mother HLS	Reading	Math
	B (S.E.)	B (S.E.)				
Poverty	-0.10 (0.03)*	-0.12 (0.02)*	-0.01 (0.02)	-0.31 (0.02)*	-1.29 (0.27)*	-1.78 (0.30)*
Father warmth	—	—	—	—	0.63 (0.27)**	0.64 (0.27)**
Father HLS	—	—	—	—	0.65 (0.19)***	0.23 (0.22)
Mother warmth	—	—	—	—	0.31 (0.21)	0.17 (0.23)
Mother HLS	—	—	—	—	1.42 (0.19)*	1.10 (0.20)*
Mother ed.	—	—	—	—	0.85 (0.09)*	0.79 (0.09)*
Mother age	—	—	—	—	0.09 (0.03)***	0.12 (0.03)*
Number of kids	—	—	—	—	-1.07 (0.09)*	-0.84 (0.10)*
Father age	—	—	—	—	-0.01 (0.03)	0.05 (0.03)
Father ed.	—	—	—	—	0.83 (0.08)*	0.77 (0.08)*
Black	—	—	—	—	0.25 (0.59)	-0.68 (0.58)
White	—	—	—	—	0.26 (0.58)	0.20 (0.54)
Hispanic	—	—	—	—	-1.44 (0.58)**	-0.50 (0.57)
Birth father	—	—	—	—	0.75 (0.30)**	0.99 (0.31)***

TLI = 0.91, CFI = 0.996; RMSEA = 0.025; SRMR = 0.012; R^2 Math = 0.21, Reading = 0.19

HLS home learning stimulation

* $p < 0.01$, ** $p < 0.001$; *** $p < 0.05$

406 As shown in Table 2, children living in poverty had
 407 lower reading ($\beta = -0.06, p < 0.01$) and math scores ($\beta =$
 408 $-0.08, p < 0.01$) than children who were not living in
 409 poverty. This relationship remained statistically significant
 410 even in the presence of mediators. Table 2 and Table 3 also
 411 indicate that fathers living in poverty engaged in less fre-
 412 quent warmth ($\beta = -0.09, p < 0.01$) and less frequent home
 413 learning stimulation ($\beta = -0.08, p < .01$) than fathers who
 414 were not living in poverty. Mothers living in poverty
 415 engaged in less frequent home learning stimulation ($\beta =$
 416 $-0.21, p < .01$) than mothers who were not living in pov-
 417 erty. Fathers’ warmth ($\beta = 0.03, p < 0.05$), mothers’ home
 418 learning stimulation ($\beta = 0.10, p < 0.01$) and fathers’ home
 419 learning stimulation ($\beta = 0.05, p < 0.05$) positively pre-
 420 dicted children’s reading performance. Further, fathers’
 421 warmth ($\beta = 0.04, p < 0.05$) and mothers’ home learning
 422 stimulation ($\beta = 0.08, p < 0.01$) positively predicted chil-
 423 dren’s math performance.

424 As shown in Table 3, mediation analyses showed that
 425 fathers’ warmth ($\beta = -0.004, p < 0.05$) and mothers’ home
 426 learning stimulation ($\beta = -0.003, p < 0.05$) and fathers’
 427 ($\beta = -0.020, p < 0.01$) home learning stimulation mediated
 428 the relation between poverty and children’s reading per-
 429 formance (sum of the unstandardized indirect effect =
 430 -0.60 , standard error = $.06, p < 0.001$). Fathers’ warmth
 431 ($\beta = -0.004, p < 0.01$) and mothers’ home learning stimu-
 432 lation ($\beta = -0.016, p < 0.01$) mediated the relation between
 433 poverty and children’s math performance (sum of the

Table 3 Indirect effects for children’s preschool reading and math achievement (standardized estimates shown; $N = 7700$)

	Reading B (S.E.)	Math B (S.E.)
Total Indirect Effects	-0.60 (.06)*	-0.44 (.06)*
<i>Specific indirect effects</i>		
Poverty—Father warmth	-0.08 (0.03)**	-0.09 (0.02)*
Poverty—Father HLS	-0.07 (0.02)**	-0.01 (0.02)
Poverty—Mother warmth	-0.002 (0.005)	-0.001 (0.003)
Poverty—Mother HLS	-0.44 (0.06)*	-0.34 (0.05)*

HLS home learning stimulation

* $p < 0.05$; ** $p < 0.01$

indirect effect = $-.44$, standard error = $0.06, p < 0.001$. 434
 The full path model with mediation by mothers’ and fathers’ 435
 parenting and covariates accounted for 21% of variation in 436
 children’s reading scores and 19% of variation in children’s 437
 math scores. 438

Discussion 439

The present study offers new insight into the role that 440
 family poverty and family processes stemming from fathers’ 441
 and mothers’ provision of warmth and home learning sti- 442
 mulation may play in shaping children’s preschool 443
 achievement. Three major findings with implications for 444

445 future research, practice and policy emerged. First, family
446 poverty was negatively associated with some family pro-
447 cesses and had a more consistent negative association with
448 fathers' parenting than mothers parenting. Second, family
449 poverty was negatively associated with children's preschool
450 achievement such that children living in poverty had lower
451 reading and math scores than children who were not living
452 in poverty. Third, family processes mediated some of the
453 associations between family poverty and child achievement
454 and fathers' parenting served as a more consistent mediator
455 of these links than mothers' parenting. These findings were
456 evident even after controlling for demographic factors that
457 have been linked to child achievement in prior research.

458 The first key finding in this study was that family poverty
459 was differentially associated with fathers' and mothers'
460 parenting practices. Specifically, poverty was negatively
461 related to fathers' provision of warmth but it had no asso-
462 ciation with mothers' provision of warmth. It is also worth
463 noting that, although poverty was negatively associated
464 with both fathers' and mothers' provision on home learning
465 stimulation, the link was stronger for mothers (i.e., larger
466 effect size). This contrast in results is intriguing and implies
467 that exposure to family-level poverty may have different
468 consequences for fathers' and mothers' parenting behavior
469 during the early childhood period. Our overall pattern of
470 results are in line with prior early childhood research that
471 has focused exclusively on mothers (e.g., Klebanov et al.
472 1994) as well as studies that have focused on fathers of
473 older children (e.g., Harris et al. 1998; McBride et al. 2005).
474 In fact, Harris et al. (1998) used a sample of mostly white
475 families to demonstrate that fathers' warmth and emotional
476 involvement with their adolescent children was more
477 negatively influenced by poverty than mothers' warmth and
478 emotional involvement. Data from the present study imply
479 that the same is true for white, black and Hispanic fathers of
480 preschoolers.

481 One possible explanation for the present finding is that
482 fathers often serve as the primary breadwinners in American
483 families. As such, fathers living below the poverty line may
484 experience more stressors related to unemployment, job loss
485 and economic instability than mothers. Consistent with
486 family stress theory, exposure to these kinds of economic
487 stressors might decrease fathers' capacity for engaging in
488 warm, sensitive interactions with their young children.
489 Future research with fathers should explore this possibility
490 by examining links among fathers' work conditions (e.g.,
491 number of hours per week, earnings and job satisfaction),
492 father involvement (e.g., time spent with children, discipline
493 practices and home learning) and children's preschool
494 achievement. It is possible that this kind of research will
495 uncover new information about the contribution of fathers
496 to overall family functioning and children's preschool
497 achievement.

498 The second key finding in this study was that family
499 poverty was negatively associated with children's preschool
500 achievement and some of these links were mediated by
501 family processes. These findings corroborate findings from
502 prior work that linked poverty to lags in children's reading
503 and math skills (Brooks-Gunn and Duncan 1997; Dahl and
504 Lochner 2005; Mcloyd 1998) as well as work that has
505 identified mediators of these associations (Burchinal et al.
506 2008; Davis-Kean 2005; Eamon 2002). For instance, in a
507 small-scale study of African-American children and their
508 mothers, Burchinal et al. (2008) demonstrated that family
509 poverty was negatively related to children's reading and
510 math scores and these associations were mediated by
511 mother-child home learning and communication. The pre-
512 sent study extends their research in a large sample of white,
513 black and Hispanic families and provides evidence that both
514 fathers' and mothers' parenting mediates links between
515 family poverty and children's reading and math scores.

516 One plausible explanation for these results is that prior
517 research suggests that parents who combine warmth with
518 consistent cognitive stimulation have children with stronger
519 academic skills compared to parents who are less warm and
520 cognitively stimulating (e.g., Landry et al. 2008) and studies
521 have consistently linked home learning stimulation to
522 higher reading and math scores (Brooks-Gunn and Mark-
523 man 2005). In fact, the present study showed that maternal
524 home learning stimulation had the strongest association
525 (i.e., effect size) with child achievement. It is possible that
526 this kind of parenting (i.e., warmth and home learning)
527 instills confidence and persistence in young children who
528 are trying to acquire new skills, which in turn supports more
529 optimal reading and math achievement. It is equally plau-
530 sible that warm, cognitively stimulating activities not only
531 teach children how learn (i.e., through consistent support
532 and reassurance that builds self-confidence) but also what
533 to learn (i.e., through exposure to new language, words and
534 numbers) that ultimately bolster children's reading and math
535 performance.

536 The third key finding in this study was that fathers'
537 parenting served as a more consistent mediator of associa-
538 tions among poverty and child achievement than mothers
539 parenting and patterns were different for children's reading
540 and math scores. In relation to reading, fathers' warmth and
541 home learning stimulation mediated links between family
542 poverty and children's reading scores. In contrast, mothers'
543 warmth did not mediate the link between family poverty
544 and children's reading scores but mothers' home learning
545 stimulation did. In relation to math, fathers' warmth but not
546 home learning stimulation mediated the link between family
547 poverty and children's math scores. Mothers' home learning
548 stimulation but not warmth mediated the link between
549 family poverty and children's math scores. These results
550 provide new information about the kinds of family

551 processes that underlie associations among family poverty
552 and children's preschool achievement in a national sample
553 of ethnically diverse fathers, mothers and their preschool
554 aged children.

555 Findings also point to the unique role that fathers' pro-
556 vision of warmth and home learning stimulation may play
557 in shaping children's preschool achievement and adds to the
558 small body of literature on father involvement as a media-
559 tion of links between family income and child achievement.
560 For example, McBride et al. (2005) used a sample of black
561 and white families to demonstrate that father-school invol-
562 vement (i.e., discussing school related events with child)
563 mediated the association between family income and chil-
564 dren's reading and math scores. However, their study did
565 not include Hispanic families or measures of fathers'
566 warmth and home learning stimulation. This study extends
567 their work by using a more ethnically diverse sample (i.e.,
568 white, black and Hispanic) to demonstrate that paternal
569 warmth and home learning stimulation mediated links
570 between family poverty and children's preschool achieve-
571 ment. This is an important finding because developmental
572 theory and research suggests that child development is most
573 vulnerable to family influences during the preschool period
574 (Bronfenbrenner and Morris 2006), making this a critical
575 time for identifying malleable mechanisms that underlie
576 associations between poverty and child achievement.

577 One possible explanation for contrasting patterns of
578 mediation for mothers and fathers is that fathers often
579 interact differently than mothers with their young children
580 (Cabrera et al. 2011) and fathers may socialize their children
581 in unique and distinctive ways above and beyond the con-
582 tribution of mothers (Baker et al. 2015), which in turn leads
583 to unique developmental pathways from fathering to chil-
584 dren's preschool achievement. In addition, differences in
585 early parent-child attachment relationships may explain the
586 present results (Landry et al. 2008). In fact, children who
587 form stronger attachment relationships with their fathers
588 than their mothers may benefit more from fathers' parenting
589 than mothers' parenting. For example, children who con-
590 sistentlly ask that their fathers read to them rather than their
591 mothers may experience greater enjoyment during learning
592 activities, pay special attention during learning activities,
593 and retain more information during learning activities.
594 These opportunities to learn from their fathers above and
595 beyond their mothers have implications for children's ability
596 to read and understand written text as well as their ability to
597 solve basic math problems.

598 Limitations and Future Directions

599 Overall, our findings point to the positive potential of both
600 fathers and mothers during the early childhood years.
601 However, some limitations merit mention. First, the ECLS-

B focused on mostly residential fathers. More specifically,
602 of the 10,688 completed parent respondent interviews in the
603 larger ECLS-B, a total of 569 completed non-resident father
604 questionnaires were available for analysis. Further, in the
605 present study, nearly 80% of children had data from both
606 mothers and fathers, 2% had data from fathers only (i.e.,
607 single fathers) and only 17% had data from mothers only.
608 Future research should be more deliberate in its efforts to
609 have more complete data for analyses as well as include
610 non-resident, social fathers and stepfathers. Another lim-
611 itation was our focus on two dimensions of parenting and
612 the reliability estimate for paternal warmth was relatively
613 low. It is important that future work extends our con-
614 ceptualization of parenting and creates a culturally sensitive
615 measure of warmth that is reliable in ethnically diverse
616 families where expressions of love may not map onto Euro-
617 centric norms. Finally, the study did not measure bidirec-
618 tional, longitudinal or causal effects, which could explain
619 changes in child achievement over time as well as provide
620 causal explanations for links between parenting and child
621 development. Future research should utilize randomized
622 control trials to examine whether children with stronger
623 academic skills elicit different types of parenting across
624 multiple stages of childhood and adolescence. 625

626 Compliance with Ethical Standards

Ethical Approval We used secondary data analysis so there was no
627 direct contact with actual human participants in this study. 628

Informed Consent This was a secondary data analysis of data from
629 the ECLS-B. Informed consent was obtained by the U.S. Department
630 of Education from teachers and parents prior their inclusion in the
631 study. For more information on informed consent procedures see Nord
632 et al. 2004 listed below. 633

Conflict of Interests There authors declare that they have no com-
634 peting interests. 635

636 References

- Baker, C. E., Cameron, C. E., Rimm-Kaufman, S. E., & Grissmer, D. 637
(2012). Family and sociodemographic predictors of school 638
readiness among African American boys in kindergarten. *Early* 639
Education & Development, 23, 833–854. 640
- Baker, C. E. (2013). Fathers' and mothers' home literacy involvement 641
and children's cognitive and social emotional development: 642
Implications for family literacy programs. *Applied Developmental* 643
Science, 17(4), 184–197. 644
- Baker, C. E., & Vernon-Feagans, L., Family Life Project Investigators. 645
(2015). Fathers' language input during shared book activities: 646
Links to children's kindergarten achievement. *Journal of Applied* 647
Developmental Psychology, 36, 53–59. 648
- Baumrind, D. (1991). Parenting styles and adolescent development. 649
The Encyclopedia of Adolescence, 2, 746–758. 650

- 651 Bentler, P. M., & Bonett, D. G. (1980). Significance tests and good-
652 ness of fit in the analysis of covariance structures. *Psychological*
653 *Bulletin*, 88, 588–606.
- 654 Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and
655 child development. *Annual Review of Psychology*, 53, 371–399.
- 656 Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model
657 of human development. In R. M. Lerner (Ed.), *Handbook of child*
658 *development: Vol. 1. Theoretical models of human development*.
659 6th ed (pp. 793–828). Hoboken, NJ: Wiley.
- 660 Brooks-Gunn, J., & Duncan, G. J. (1997). The effects of poverty on
661 children. *The Future of Children*, 7(2), 55–71.
- 662 Brooks-Gunn, J., & Markman, L. B. (2005). The contribution of
663 parenting to ethnic and racial gaps in school readiness. *The*
664 *Future of Children*, 15(1), 139–168.
- 665 Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing
666 model fit. *Sociological Methods and Research*, 21, 230–258.
- 667 Brush, L., Salinger, T., Sussman, A., & Kirshstein, R. (2003).
668 *Cognitive assessment plan for the ECLS-B preschool battery*.
669 *Prepared for the National Center for Education Statistics*,
670 *U.S. Department of Education*. Washington, DC: American
671 Institutes for Research.
- 672 Burchinal, M., Vernon-Feagans, L., Cox, M., & Investigators,
673 K. F. L. P. (2008). Cumulative social risk, parenting and
674 infant development in low-income rural communities. *Parenting*
675 *Science and Practice*, 8, 41–69. [https://doi.org/10.1080/](https://doi.org/10.1080/15295190701830672)
676 [15295190701830672](https://doi.org/10.1080/15295190701830672).
- 677 Burchinal, M., McCartney, K., Steinberg, L., Crosnoe, R., Friedman,
678 S. L., McLoyd, V., & Pianta, R. (2011). Examining the
679 Black–White achievement gap among low-income children using
680 the NICHD study of early child care and youth development.
681 *Child Development*, 82(5), 1404–1420.
- 682 Cabrera, N. J., Fagan, J., Wight, V., & Schadler, C. (2011). Influence
683 of mother, father, and child risk on parenting and children's
684 cognitive and social behaviors. *Child Development*, 82,
685 1985–2005.
- 686 Conger, R. D., Patterson, G. R., & Ge, X. (1995). It takes two to
687 replication: A mediational model for the impact of parents' stress
688 on adolescent adjustment. *Child Development*, 66(1), 80–97.
- 689 Conger, R. D., Wallace, L. E., Sun, Y., Simons, R. L., McLoyd, V. C.,
690 & Brody, G. H. (2002). Economic pressure in African American
691 families: A replication and extension of the family stress model.
692 *Developmental Psychology*, 38(2), 179–193.
- 693 Crosnoe, R., & Cooper, C. E. (2010). Economically disadvantaged
694 children's transitions into elementary school: linking family
695 processes, school contexts, and educational policy. *American*
696 *Education Research Journal*, 47, 258–291.
- 697 Dahl, G. B., & Lochner, L. (2005). *The impact of family income on*
698 *child achievement* (No. w11279). National Bureau of Economic
699 Research.
- 700 DeNavas-Walt, C., Proctor, B. D., & Smith, J. C. (2015). *Income and*
701 *poverty in the United States: 2014* (p. 22). United States Census
702 Bureau.
- 703 Davis-Kean, P. E. (2005). The influence of parent education and
704 family income on child achievement: the indirect role of parental
705 expectations and the home environment. *Journal of Family*
706 *Psychology*, 19(2), 294–304. [https://doi.org/10.1037/0893-3200.](https://doi.org/10.1037/0893-3200.19.2.294)
707 [19.2.294](https://doi.org/10.1037/0893-3200.19.2.294).
- 708 Doyle, A. B., & Markiewicz, D. (2005). Parenting, marital conflict and
709 adjustment from early-to mid-adolescence: Mediated by adoles-
710 cent attachment style? *Journal of Youth and Adolescence*, 34(2),
711 97–110.
- 712 Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston,
713 A. C., Klebanov, P., & Japel, C. (2007). Supplemental material
714 for school readiness and later achievement. *Developmental Psy-*
715 *chology*, 43(6), 1428–1446. [https://doi.org/10.1037/0012-1649.](https://doi.org/10.1037/0012-1649.43.6.1428.supp)
716 [43.6.1428.supp](https://doi.org/10.1037/0012-1649.43.6.1428.supp).
- Eamon, M. K. (2002). Effects of poverty on mathematics and reading
717 achievement of young adolescents. *Journal of Early Adolescence*,
718 22(1), 49–74. 719
- Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press. 720
- Gershoff, E. T., Aber, J. L., Raver, C. C., & Lennon, M. C. (2007).
721 Income is not enough: Incorporating material hardship into
722 models of income associations with parenting and child devel-
723 opment. *Child Development*, 78(1), 70–95. 724
- Guo, G., & Harris, K. M. (2000). The mechanisms mediating the
725 effects of poverty on children's intellectual development. *Demog-*
726 *raphy*, 37(4), 431–447. 727
- Harris, K. M., Furstenberg, F. F., & Marmar, J. K. (1998). Paternal
728 involvement with adolescents in intact families: The influence of
729 fathers over the life course. *Demography*, 35(2), 201–216. 730
- Hango, D. (2007). Parental investment in childhood and educational
731 qualifications: Can greater parental involvement mediate the effects
732 of socioeconomic disadvantage? *Social Science Research*, 36(4),
733 1371–1390. <https://doi.org/10.1016/j.ssresearch.2007.01.005>. 734
- Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure
735 modeling: Sensitivity to under parameterized model mis-
736 specification. *Psychological Methods*, 3, 424–453. 737
- Karrass, J., VanDeventer, M. C., & Braungart-Rieker, J. M. (2003).
738 Predicting shared parent-child book reading in infancy. *Journal*
739 *of Family Psychology*, 17(1), 134–146. 740
- Klebanov, P. K., Brooks-Gunn, J., & Duncan, G. J. (1994). Does
741 neighborhood and family poverty affect mothers' parenting,
742 mental health, and social support? *Journal of Marriage and the*
743 *Family*, 56, 441–455. 744
- Landry, S. H., Smith, K. E., Swank, P. R., & Guttentag, C. (2008). A
745 responsive parenting intervention: the optimal timing across early
746 childhood for impacting maternal behaviors and child outcomes.
747 *Developmental Psychology*, 44(5), 1335–1353. [https://doi.org/10.](https://doi.org/10.1037/a0013030)
748 [1037/a0013030](https://doi.org/10.1037/a0013030). 749
- Little, R. J. (1988). A test of missing completely at random for mul-
750 tivariate data with missing values. *Journal of the American Sta-*
751 *tistical Association*, 83, 1198–1202. 752
- McBride, B. A., Schoppe-Sullivan, S. J., & Ho, M.-H. (2005). The
753 mediating role of fathers' school involvement on student
754 achievement. *Journal of Applied Developmental Psychology*, 26
755 (2), 201–216. <https://doi.org/10.1016/j.appdev.2004.12.007>. 756
- McLoyd, V. C. (1998). Socioeconomic disadvantage and child
757 development. *American Psychologist*, 53(2), 185–204. 758
- Morris, P., Duncan, G. J., & Rodrigues, C. (2004). Does money really
759 matter? Estimating impacts of family income on children's
760 achievement with data from random-assignment experiments.
761 Unpublished manuscript. Northwestern University. Retrieved
762 March 4, 2007, Available at: [http://www.cerforum.org/](http://www.cerforum.org/conferences/200406/papers/MorrisDuncanRodrigues.pdf)
763 [conferences/200406/papers/MorrisDuncanRodrigues.pdf](http://www.cerforum.org/conferences/200406/papers/MorrisDuncanRodrigues.pdf). 764
- Muthén, L. K., & Muthén, B. O. (2010). *Mplus user's guide*. Los
765 Angeles, CA: Author. 766
- Newland, R. P., Crnic, K. A., Cox, M. J., Mills-Koonce, W. R., &
767 Investigators, F. L. P. K. (2013). The family model stress and
768 maternal psychological symptoms: mediated pathways from
769 economic hardship to parenting. *Journal of Family Psychology*,
770 27(1), 96–105. 771
- Najarian, M., Snow, K., Lennon, J., & Kinsey, S. (2010). *Early*
772 *Childhood Longitudinal Study, Birth Cohort (ECLS-B),*
773 *preschool-kindergarten 2007 psychometric report (NCES 2010-*
774 *2009)*. Washington, DC: National Center for Education Statistics,
775 Institute of Education Sciences, U.S. Department of Education. 776
- Nord, C., Edwards, B., Hilpert, R., Branden, L., Andreassen, C., &
777 Elmore, A. (2004). *Early Childhood Longitudinal Study, Birth*
778 *Cohort (ECLS-B): User's manual for the ECLS-B nine-month*
779 *restricted-use data file and electronic codebook (NCES 2004-*
780 *092)*. Washington, DC: National Center for Education Statistics,
781 U.S. Department of Education. 782

- 783 Pancsofar, N., & Vernon-Feagans, L., Family Life Project Investiga- 798
784 tors. (2010). Fathers' early contributions to children's language 799
785 development in families from low-income rural communities. 800
786 *Early Childhood Research Quarterly*, 25(4), 450–463. 801
787 Pittman, L. D., & Chase-Lansdale, P. L. (2001). African American 802
788 adolescent girls in impoverished communities: Parenting style 803
789 and adolescent outcomes. *Journal of Research on Adolescence*, 804
790 11(2), 199–224. 805
791 Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling 806
792 strategies for assessing and comparing indirect effects in multiple 807
793 mediator models. *Behavior Research Methods*, 40(3), 879–891. 808
794 Reardon, S. F. (2013). The widening income achievement gap. *Edu- 809
795 cational Leadership*, 70(8), 10–16. 810
796 Silinskas, G., Leppänen, U., Aunola, K., Parrila, R., & Nurmi, J.-E. 811
797 (2010). Predictors of mothers' and fathers' teaching of reading 812
and mathematics during kindergarten and Grade 1. *Learning and 798
Instruction*, 20(1), 61–71. <https://doi.org/10.1016/j.learninstruc.2009.01.002>. 799
800
Votruba-Drzal, E. (2003). Income changes and cognitive stimulation 801
in young children's home learning environment. *Journal of 802
Marriage and Family*, 65(2), 341–35. 803
White, K. R. (1982). The relation between socioeconomic status and 804
academic achievement. *Psychological Bulletin*, 91(3), 461–481. 805
Wolfradt, U., Hempel, S., & Miles, J. N. (2003). Perceived parenting 806
styles, depersonalisation, anxiety and coping behaviour in 807
adolescents. *Personality and Individual Differences*, 34(3), 808
521–532. 809
Yeung, W. J., Linver, M. R., & Brooks-Gunn, J. (2002). How money 810
matters for young children's development: Parental investment 811
and family processes. *Child Development*, 73(6), 1861–1879. 812

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