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Maternal Depression and the Development of Executive Function and Behavior Problems in Head Start: Indirect Effects Through Parenting

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Abstract

The present study used a large, nationally representative sample of Head Start children (*N*=3349) from the Family and Child Experiences Survey of 2009 (FACES-2009) to examine associations among maternal depression (measured when children were approximately 36-months old) and children's executive function (EF) and behavior problems (measured when children were approximately 48-months old). Preliminary analyses revealed that 36% of mothers in the sample had clinically significant levels of depressive symptoms. Furthermore, a path analysis with demographic controls showed a mediation effect that was significant and quite specific; mother-reported warmth (and not mother-child reading) mediated the path between maternal depression, children's EF and behavior problems. Findings provide support for a family process model in which warm, sensitive parenting supports children's emerging self-regulation and reduces the likelihood of early onset behavior problems in families where children are exposed to maternal depression.

Keywords: maternal depression, executive function, behavior problems, Head Start

Maternal Depression and the Development of Executive Function and Behavior Problems in Head Start: Indirect Effects Through Parenting

Executive function (EF) is an aspect of self-regulation that allows children to exert control over their attention, cognition and behavior over time and across changing contexts (Blair, 2002; Blair & Razza, 2007; Zelazo, 2003). Emerging evidence suggests that children who have opportunities to development these skills during early childhood are more likely to experience short and long-term school success (Bierman, Nix, Greenberg, Blair, & Dimitrovich, 2008; Ursache, Blair & Raver, 2012). In fact, one recent classroom-based intervention showed that enhancing EF during early childhood reduced poverty-linked deficits in children's school readiness and produced gains in kindergarten academic skills that lasted well into first grade (Blair & Raver, 2014). Given the importance of EF for children's school readiness and later school success, it is important to understand how family processes contribute to the EF skills that children bring to school.

Emerging research on associations between parenting and EF is often based on suppositions from ecological theory, which posit that family processes critical to the emergence of EF play out across early childhood—a period of dramatic expansion in children's brain development, social relationships, and expectations for goal directed behavior (Blair, 2002; Bronfenbrenner & Morris, 2005; Sulik, Blair, Mills- Koonce, Berry, & Greenberg, 2015; Shonkoff & Levitt, 2010; Towe-Goodman, Willoughby, Blair, Gustafsson, Mills-Koonce, & Cox, 2014). That is, research has often assumed that associations between children's EF and parenting stem from proximal family processes in which caregivers (mostly mothers) model appropriate social behaviors and use language and scaffolding to teach children new EF skills (Fay- Stammbach, Hawes, & Meredith, 2014; Hoffman, Crnic, & Baker, 2006).

Reciprocally, deficits in mother-child relationships forecast short and long-term deficits in children's EF along with increases in behavior problems (Fay- Stammbach et al., 2014; Landry & Smith, 2008; Sulik et al., 2015). One limitation of the existing literature on children's EF is the lack of attention to the role that maternal depression plays in shaping mother-child relationships, particularly in low-income and ethnic minority families. Whereas ecological theory argues that positive mother-child relationships lead to increases in children's cognitive and behavioral capacities, family stress theory posits that adverse mother-child relationships resulting from economic hardship and/or depression may expose children to "toxic stress" which increases the likelihood of early onset behavior problems and disrupts EF development (Conger, McCarty, Yang, Lahey, & Kropp, 1984; Repetti, Taylor, & Seeman, 2002; McCubbin, & Sussman, 2014; Murry et al., 2001). This may be especially pronounced in low-income families where maternal depressive symptomology is more severe (McDaniel & Lowenstein, 2013) and mothers are less likely receive adequate treatment (Santiago, Kaltman, & Miranda, 2012).

Early Parenting and Child Development

Ecological theory supports the premise that the family plays a critical role in child development (Bronfenbrenner & Morris, 2005) and growing evidence suggests that parents can support children's EF by engaging in warm, cognitively stimulating parent-child interactions (Bernier, Carlson, Whipple, 2010; Center on the Developing Child at Harvard University, 2014; Landry, Miller-Loncar, Smith, & Swank, 2002; Razza, Martin, & Brooks-Gunn, 2010; Towe-Goodman et al., 2014). For example, Towe-Goodman et al. (2014) used a sample of low-income children from the Family Life Project (FLP) to show that parent warmth/sensitivity during a free-play task at 24-months predicted children's EF skills (defined in their study as inhibitory control, working memory and attention) at 3 years of age. In another study with younger children,

Bernier et al. (2010) found that parents who engaged in more warmth and sensitivity at 12-months had children with stronger EF skills at 26 months. Their analyses also showed that children performed better on working memory tasks at 18 months, but this trend did not hold above the demographic control variables.

There is some evidence that parenting practices mediate associations between family-level risk factors (e.g., poverty) and childhood EF. For instance, Hackman et al. (2015) found that parent-reported warmth and cognitive stimulation across infancy and early childhood predicted children's working memory in first grade. Their analyses also revealed that parents' provision of cognitive stimulation mediated the adverse effects of low-SES on children's EF skills. Other studies using parent-child free-play tasks as well as parent-report measures have yielded similar results and imply that both parent warmth and cognitive stimulation are salient to children's EF development across early childhood (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Blair et al., 2011; Rhoades et al., 2010). One limitation of the existing literature is the lack of statistical models that include measures of both EF and behavior problems in low-income and ethnic minority families. This is especially important because developmental scholars argue that a combined focus on strengthening EF and reducing behavior problems holds the most promise for supporting low-income children's school readiness (Blair & Raver, 2014).

In general, the research on parenting and early childhood behavior suggests that warm, cognitively stimulating parenting reduces aggressive and disruptive behaviors in preschool and kindergarten (Buschgens et al., 2010; Eisenberg et al., 2005; Querido, Warner, & Eyberg 2002). In a cross-sectional study of 108 low-income mothers and their young children, Querido et al. (2002) found that mother-reported warmth (e.g., warm hugs) predicted fewer externalizing behavior problems in preschool. More recently, Baker & Rimm-Kaufman (2014) used data from

the Early Childhood Longitudinal Study of Kindergartners (ECLS-K) to show that mothers who engaged in more frequent home learning stimulation (e.g., shared book reading) had children with more positive teacher ratings of self-control, interpersonal skills, and fewer externalizing behavior problems. Although these studies suggest that parenting is associated with declines in children's negative and disruptive behaviors, limited research has simultaneously examined EF and behavior problems in low-income families. In one recent exception, Suilk et al. (2015) used a sample of white and black families from low-income rural contexts to link maternal warmth to children's performance on a battery of EF tasks (including three inhibitory control tasks and two working memory tasks).

Data from their study also showed that maternal warmth reduced children's behavior problems primarily by supporting their EF skills. However, their study did not consider whether and how exposure to poverty and economic hardship increased the likelihood that mothers would experience declines in their mental health (i.e., increased depressive symptoms) and its subsequent influence parenting and children's emerging self-regulation. This is especially important because maternal depression constitutes a major mental health and parenting concern (Ammerman et al., 2015; Hoffman et al., 2006) and growing evidence suggests that low-income and ethnic minority mothers are more likely to experience depressive symptomology (McDaniel & Lowenstein, 2013; Silverstein et al. 2017; Tandon et al. 2014), which has implications for the long-term health and development of their children.

Maternal Depression, Parenting and Child Development

Maternal depression is usually reflected in mother reports of their levels of sadness, irritability and poor moods. Studies have shown that mothers who report higher levels of depressive symptoms often engage in less positive parenting practices , which in turn predicts

less optimal child development (Cummings & Davies, 1994; Lovejoy, Graczyk, O'Hare, & Neuman, 2000). For example, Paulson et al. (2009) used the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) to link mother-reported depression to children's language and reading-related skills. Specifically, white, black and Hispanic mothers who experienced more depressive symptoms when their children were 9-months old had children with lower expressive vocabulary skills at 24 months old and mother-child reading mediated the path between maternal depression and children's expressive vocabulary skills. More recently, Baker and Iruka (2013) used a nationally representative sample of African American families to examine links between mother-reported depressive symptoms and children's kindergarten achievement.

Data from their study indicated that higher levels of mother-reported depressive symptoms at the start of kindergarten predicted lower reading and math scores at the end of kindergarten. However, maternal warmth mediated the relation between maternal depression and children's reading achievement. Other studies focusing on different aspects of maternal mental health (e.g., anxiety and stress) have also shown that links between maternal mental health and child outcomes are mediated by parenting (e.g., Harmeyer et al., 2016). For instance, Harmeyer et al. (2016) reported that the associations between mother-reported stress when their children were 15-months old and children's vocabulary skills just prior to kindergarten entry were mediated by mother-child relationships (i.e., closeness) at 25 months.

Although studies have provided consistent support for the idea that maternal mental health is directly associated with children's cognitive development and this link is often mediated by parenting, the research on maternal depression and childhood EF is less prevalent and less clear. For example, Hoffman et al. (2006) found that white, black and Hispanic mothers who experienced more depressive symptoms when their children were 3 years old had children

with poorer self-regulation skills at age 4. More recently, Hughes et al. (2013) used a small sample of white families to demonstrate that mother-reported depressive symptoms across toddlerhood were negatively associated with children's EF (defined in their study as inhibitory control and working memory) at age 6, but the mechanisms driving these associations were not investigated. In contrast, Rhoades et al. (2011) used a large sample of black and white families from the Family Life Project (FLP) to examine family-level predictors of children's EF (defined in their study as inhibitory control, working memory and attention). Their analyses showed no direct or mediated links between mother-reported depressive symptoms across infancy and children's EF development during toddlerhood.

Findings are more clear with regard to links between maternal depression and children's behavior problems, with results from small and large-scale studies indicating that maternal depressive symptoms are positively associated with childhood behavior problems and these associations are often mediated by parenting practices (Cummings & Davies, 1994; Davis & Windle, 1997; Elgar, Mills, McGrath, Waschbusch, & Brownridge, 2007; Goodman et al., 2011; Forehand, Lautenschlager, Faust, & Graziano, 1986; Foster, Garber, & Durlak, J. A. 2008; Lovejoy et al., 2000; Webster-Stratton et al., 1988). For example, in a small sample of Head Start children and their mothers, Jones-Harden et al. (2000) found a direct link between African American mothers' depressive symptoms and children's behavior problems.

In a more recent meta-analysis of 193 studies, Goodman et al. (2011) found that mother-reported depressive symptoms were related to higher levels of childhood conduct problems and parenting practices such as warmth and monitoring were mediators of these associations (e.g., Elgar et al., 2007). Taken together, the literature suggests that maternal depression matters for children's EF and behavioral skills and implies that parenting constitutes a potential mechanism

underlying the observed relationship between maternal depression, children's EF and behavioral outcomes.

The Present Study

Using nationally representative data from Head Start families and controlling for demographic factors, this study tested direct and indirect associations between mother-reported depressive symptoms, parenting (operationalized in this study as mother-reported warmth and mother-reported shared book reading), children's EF (operationalized in this study as inhibitory control, working memory, and attention), and behavior problems (operationalized in this study as mother reports of negative and disruptive behaviors). Based on prior research and theory, it was hypothesized that maternal depression would be negatively associated with children's EF but positively associated with children's behaviors problems. It was also hypothesized that mother-reported warmth and mother-reported shared book reading would mediate these associations.

Method

Participants

Data for the present study were drawn from Head Start Family and Child Experiences Survey of 2009 (FACES-2009). The FACES study used a multi-stage clustered sampling frame to recruit children and families from the (2007-2008) Head Start Program Information Report, which included 2,600 Head Start programs in the 50 states and the District of Columbia (Malone et al., 2013). Programs in Puerto Rico and other U.S. territories including American Indian-Alaska Native Head Start programs, Migrant/Seasonal Head Start programs, Early Head Start programs, defunded programs, and programs temporarily out of operation were excluded. The sampling procedure resulted in 3,349 children with parent consent to participant in the study. FACES collected data in the of fall 2009 when children entered Head Start (Time 1), the end of children's first year in Head Start or spring 2010 (Time 2), the end of the children's second year

in Head Start or spring 2011 (Time 3), and the end of children's first year of kindergarten or spring 2012 (Time 4).

The analytic sample for the present study consisted of 3,349 children with valid data from Time 1 and Time 2. This age group was chosen because early childhood is an important time for understanding the contribution of parenting to children's EF (see Blair & Raver, 2014) and the pencil-tapping task (i.e., a direct measure of childhood EF) was only administered to children who were 4 years old or older (i.e., Time 2). The average age of children during the Time 2 data collection was 53.31 months old (*SD* = 6.57) and the majority of children in the sample were male (51%). Further, 40% of the children were Hispanic, 32% were African American, 21% were European American, and 10% were other (i.e., Asian American, Native American and Biracial). All of the children in the study were from low-income families and 58% lived below the poverty line.

Furthermore, 57% of children in the sample lived in single parent families, 32% of mothers were immigrants (i.e., born outside of the U.S.). Finally, 37% of mothers had less than a high school education, 33% had a high school diploma or GED and only 5% had a college degree. More information on the FACES study and its design can be obtained from the 2009 users guide and psychometric report (see Malone et al., 2013). Descriptive statistics for the sample and the measures used in this study are presented in Table 1 and internal reliability for the measures are reported below.

Measures

Executive function. Children's executive function was directly measured (at Time 2) using the using Pencil Tapping task (Blair, 2002; Diamond & Taylor, 1996). The Pencil Tapping task is an objective measure of children's inhibitory control, working memory, and attention.

During the Pencil Tapping task, children are asked to do the opposite of what the trained assessor does. For example, children were told to tap one time when the assessor tapped two times and children were told to tap two times when the assessor tapped one time. The task has high internal reliability for preschool aged children ($\alpha = .85$).

Behavior problems. Children's behavior problems were assessed (at Time 2) using 21 items from the Behavior Problems Index (BPI; Peterson and Zill 1986). The BPI includes behaviors such as aggression, hyperactivity, destructiveness, social withdrawal, depression, and somatic problems. Parents indicated the extent to which their child engaged in any of the aforementioned negative behaviors (e.g., fights with other children, aggression, etc.) on a (3-point) scale ranging from 1 (never) to 3 (very often). The mean of these items was used in this study ($\alpha = .89$).

Maternal depression. Maternal depression was measured (at Time 1) using an abbreviated version of the original 20-item Center for Epidemiological Studies of Depression Scale (Radloff & Locke, 1986) developed by the National Institute of Mental Health. Thus, in the present study, depression was measured using a 12-item scale in which mothers reported how often 1 (never) to 4 (most of the time) during the past week they experienced specific depressive symptoms ($\alpha = .86$). An example of a maternal depression item is, "How often during the past week have you felt depressed?"

Maternal parenting. Maternal parenting practices were measured (at Time 1) using the Child Rearing Practices Report (CRPR; Block 1965). Specifically, maternal warmth was measured using five items that asked mothers to report the extent to which they agreed or disagreed with five statements 1 (not at all) to 5 (exactly). The mean of these five items was used in this study ($\alpha = .82$). An example of a specific maternal warmth item is "My child and I

have warm intimate moments together." Mother-child shared book reading was measured using a single item where mothers reported the number of times they had read to their children during the previous week. Responses ranged from 1 (not at all) to 4 (everyday).

Demographic covariates. A number of child and family characteristics collected at Time 1 and 2 were included in the analyses as covariates including: child age, child gender (0 = male, 1 = female), child race/ethnicity (dummy coded as White, Black, Hispanic and Other), number hours in Head Start or other child care per week, mothers' immigration status (0=not born in the U.S. and 1=born in the U.S.). The FACES 2009 study also created a *family economic risk* index, which consisted of three factors that have been linked to school difficulty in prior Head Start research including: having a mother with less than a high school education, living in a single parent family and living below the poverty line. The family economic risk index ranged from 0 to 3 and was used a covariate in this study.

Analytic Approach and Missing Data

The primary aim of this study was to examine direct and indirect effects of maternal depression on Head Start children's development. Thus, hypothesized path models (see Figure 1) were specified and fitted in Mplus® (version 7; Muthen & Muthen, 1998-2012). To assess how well the models fit the data, the chi-square statistic, the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the standardized root-mean-square residual (SRMR) were evaluated. In general, values greater than .90 on the CFI and less than .05 on the RMSEA and SRMR have been considered indicators of good model fit (Hu & Bentler, 1999). Evidence of mediation was determined by evaluating the significance of the indirect effect (Bollen, 1987) and by using bias-corrected confidence intervals.

This approach was chosen over the commonly used causal steps approach (Baron & Kenny, 1986) due to the low statistical power of the causal-step approach, which may result in the failure to detect real effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Further, the causal steps approach does not allow for the test of multiple mediators and it does not provide a formal test of the significance of the intervening variable. Missing data, which ranged from 0 to 15 percent were addressed with full information maximum likelihood estimation (FIML) for composite measures, missing data were handled at the scale rather than item level. Finally, a child-level weight that adjusted for sampling stratification and nonresponse bias was used to ensure that the present sample was representative of the larger population of Head Start children (discussed further below).

Results

Descriptive Statistics and Correlations

Table 1 presents correlations, means, standard deviations, and ranges for the key variables in the study (descriptive information for the covariates are presented above). Some correlations and demographics merit mention. First, 20% (*N*=602) of Head Start mothers met the clinical criteria for mildly depressed, 9% (*N*=301) met the clinical criteria for moderately depressed and 7% (*N*=234) met the clinical criteria for severely depressed. In line with a priori hypotheses, as maternal depressive symptoms increased children's EF scores decreased and as maternal depressive increased children's behavior problems increased. Finally, mothers who reported that they experienced more frequent depressive symptoms also reported engaging in less frequent warmth and shared reading with their young children..

Path Analysis

The primary hypothesis in this study was that the associations among maternal depression and children's EF and behavior problems would be mediated by parenting. Therefore, direct and indirect effects were examined after adjusting for set of demographic control variables (see Figure 1). Maternal warmth and mother-child reading were also simultaneously modeled to predict child outcomes. All paths were simultaneously tested, which allowed for the simultaneous testing of mediators. In all the models, the covariance errors for the independent variable (depressive symptoms), the mediators (warmth and shared book reading) and child outcomes (EF and behavior problems) were controlled. The fit indices indicated that the hypothesized model fit the data well $\chi 2$ (df=45) = 1387.74, p < .01; root mean square error of approximation (RMSEA) = .04, 90% CI [.012, .036], comparative fit index (CFI) = .990, standardized root mean square residual (SRMR) = .002.

Table 2 and Table 3 present the standardized and unstandardized coefficients for all paths among children's EF, behavior problems and parenting practices in the model (with standard errors). The statistically significant directional paths in the model are also depicted in Figure 2. As hypothesized, the analysis provided evidence for direct and mediated associations between maternal depression, parenting and child outcomes after controlling for a set of covariates. Specifically, maternal depression predicted higher behavior problems scores (β= .13, p <. 01) while maternal warmth (β= -.15, p <. 01) and mother-child reading (β= -.08, p <. 01) predicted lower behavior problems scores. Maternal warmth also predicted higher EF scores (β= .07, p <. 05) but mother-child reading did not.

As shown in Figure 2, the path analysis also revealed that maternal depressive symptoms predicted less maternal warmth and less frequent mother-child book reading. As shown in Table

3, two indirect pathways were significant in this study. Specifically, maternal depressive symptoms were associated with children's EF through maternal warmth. Further, maternal depressive symptoms were associated with children's behavior problems through maternal warmth. None of the indirect paths for mother-child reading were significant. The full model explained 15% of the variance in children's behavior problems and 8% of the variance in children's EF.

Discussion

The present study used nationally representative data from the Head Start Family and Child Experiences Survey of 2009 to examine direct and mediated associations among maternal depression, parenting and childhood EF and behavior problems. Results from this study extend prior work in two distinct ways. First, the present study showed direct and indirect associations between maternal depression and childhood EF. This is an important extension of prior work that has linked maternal depression to childhood EF without examining possible mechanisms for the association. For example, Hughes et al. (2013) used a small sample of white families from the United Kingdom to demonstrate that maternal depression had a negative influence on children's EF (defined in their study as working memory and inhibitory control) at school entry, but the mechanisms driving these associations were not clearly delineated. Findings from this study extend their work in a nationally representative sample of ethnically diverse American families and imply that one possible mechanism for links between maternal depression and childhood EF (defined in this study as inhibitory control, working memory and attention) is maternal warmth.

One plausible explanation for the present finding is that the maternal warmth and sensitivity required for children's emerging self-regulation is often compromised when mothers

are depressed. Indeed, prior research has shown that heightened depressive symptoms compromise a mothers' ability to be sensitive and responsive to their children's developmental needs (Cummings & Davies, 1994; Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Prior research has also shown that maternal warmth is a mediator of links between maternal depression and socioeconomically diverse African American children's reading skills (Baker & Iruka, 2013). The present study extends the aforementioned work by providing some empirical evidence that maternal warmth is a significant mediator between maternal depressive symptomology and ethnically diverse children's ability to exert control over their attention, cognition and behavior in Head Start.

Second, this study added to the literature by demonstrating that maternal warmth mediated the link between maternal depression and children's behavior problems. These findings are in line with ecological theory, which argues that children's initial capacity for controlling negative behaviors develops within the context of parent-child interactions and is a function of a child's own ability to control oneself and the ability of parents to appropriately respond to and correct poor behavior (Bronfenbrenner & Morris, 2005). For example, Goodman and Gotlib (1999) argued that during the preschool years, children require parental support that helps them progress from one developmental level to the next, and without this guidance, children are likely to have difficulty with independent control of their behavior. Data from this study provide some support for their suppositions and imply that increasing maternal warmth in families where children are exposed to maternal sadness, poor moods or crying spells may reduce the likelihood of early onset conduct problems.

Contrary to a priori hypotheses, mother-child reading was not a significant mediator of links between maternal depression and children's EF or behavior problems. This is in direct

contrast to prior research that has found direct and mediated links between maternal depression and children's vocabulary skills. For instance, Paulson et al. (2009) found that mother-child reading mediated the path between maternal depression and children's vocabulary skills. One possible explanation for the lack of findings in the present study is the fact that this study focused on children's emerging self-regulation and behavior problems rather than vocabulary skills. It is likely that mother-child reading does not influence children's behavioral skills in the same way that it influences their vocabulary or emergent literacy skills.

Although not central to the current investigation, family economic risk predicted more maternal depressive symptoms in this study and Hispanic mothers were significantly less depressed than white mothers (see Figure 2). African American mothers and mothers of other races (e.g., Native American) did not show any significant differences in depressive symptoms when compared to white mothers who served as the reference group in the analyses. Finally, immigrant mothers reported significantly less depressive symptoms compared to American born mothers. These findings underscore the importance of culturally sensitive models of child development and point to the role of ethnicity and nativity in shaping family processes in diverse contexts. Overall, data from this study provide some evidence that maternal mental health matters for both EF and behavior problems during the developmentally important preschool years. Furthermore, these associations are mediated by maternal warmth, which provide tentative support for both ecological and family stress models of development.

Limitations and Future Directions

Some limitations merit mention. First, maternal depression and parenting were assessed via maternal reports. Self-report measures are often limited by social desirability and reporter bias may be particularly problematic for mothers who experience depression. Future studies

should include clinically administered measures of depression as well as qualitative observations of mother-child interactions. It is also important that future research include more diverse indicators of mental health (e.g., anxiety and stress). It is possible that other aspects of maternal mental health matter for children's development. Another limitation of the present study was the lack of information provided in the data set about fathers. Growing research points to the importance of fathers for children's cognitive and behavioral competence (e.g., Baker, Vernon-Feagans & The Family Life Project, 2015; Baker, 2013); thus, future data collection efforts with Head Start families should include both mothers and fathers.

It is also important to note that the present study yielded small but significant direct and mediated effects. Although the effect sizes are similar to effect sizes from other large-scale studies (e.g., Paulson et al., 2009), the present findings should be considered with this in mind. Finally, children's EF involves multiple cognitive and behavioral capacities; however, this study used a single objective measure of EF that could not tap every single dimension of childhood EF. It is possible that using more comprehensive measures of childhood EF would have yielded different or more robust findings. Future research with Head Start children should utilize a full battery of EF assessments to examine pathways from maternal mental health to children's EF and behavioral skills.

Implications

According to the American Academy of Pediatrics, too many low-income children enter school with limitations in their behavioral skills that would have been reduced or eliminated through attention to family needs (High, 2008). Findings from this study provide support for this argument and suggest that focusing on maternal mental health and parenting during early childhood might enhance Head Start children's EF and decrease early onset behavior problems.

For example, some home-visiting programs indicate that cognitive behavioral interventions with low-income mothers reduce depressive symptoms and prevent the onset of perinatal depression (Ammerman et al. 2015; Tandon et al. 2014; Silverstein et al. 2017). Data from this study point to the positive potential of these interventions and suggest that home-visiting programs that lead to depressive symptom reduction may lead to improvements in the quality of mother-child relationships. Evidence from this study also suggest that Head Start mothers might benefit from the provision of home-visiting programs that promote mental health while also providing mothers with strategies for increasing warm, sensitive interactions with their children. Particularly important will be future efforts by Head Start to provide access to licensed psychologists who can provide diagnostic screenings, cognitive behavioral therapy and medication for low-income mothers who are at increased risk for mental health problems. It is possible that increasing Head Start mothers' access to quality mental health services could strengthen overall family functioning as well as school readiness among children enrolled in Head Start programs across the U.S.

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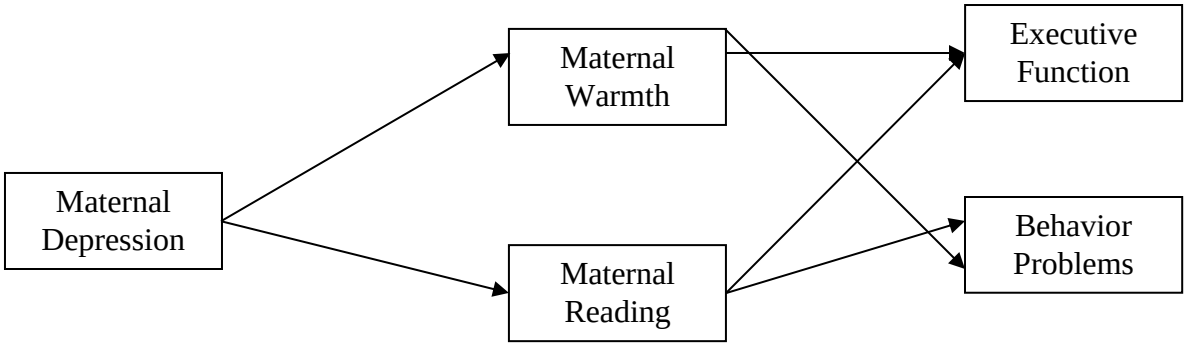

Figure 1. Conceptual model (the direct link between depressive symptomatology and children's EF and behavior problems is not depicted).

Table 1. Correlations matrix displaying relations between maternal depression, parenting and child outcomes (*N*=3349)

Variables	1	2	3	4	5	Mean	SD	Range
1. Executive function	1.00					11.63	5.04	0.00-16.00
2. Behavior problems	-.10**	1.00				5.35	3.55	0.00-24.00
3. Maternal warmth	.07**	-.17**	1.00			4.30	.50	2.20-5.00
4. Maternal reading	.03	-.13**	. 14**	.1.00		3.09	.77	1.00-4.00
5. Maternal depression	-.06**	.20**	-.10**	-.03	1.00	4.60	5.72	0.00-36.00

Note. **p <.01; *p<.05

Table 2. Standardized and Unstandardized Direct Pathway Estimates for Children's Executive Function and Behavior Problems

	Executive Function			Behavior Problems		
	B	*(SE)*	*β*	*b*	*(SE)*	*β*
Depressive Symptoms	-.04	.02	-.07	.21***	.03	.13
Maternal Warmth	.58*	.24	.07	-.97***	.14	-.15
Maternal Reading	.10	.13	.04	-.31**	.08	-.08

Note. *p < .05. **p < .01. ***p < .001.

Table 3. Standardized and Unstandardized Indirect Pathway Estimates for Executive Function and Behavior Problems

	Executive Function			Behavior Problems		
	b	*(SE)*	*β*	*b*	*(SE)*	*β*
Maternal Depression ➔Maternal Warmth	-.004*	.02	.005	.012**	.01	.007
Maternal Depression ➔Maternal Reading	ns	ns	ns	ns	ns	ns

Note. *p < .05. **p < .01. ***p < .001.

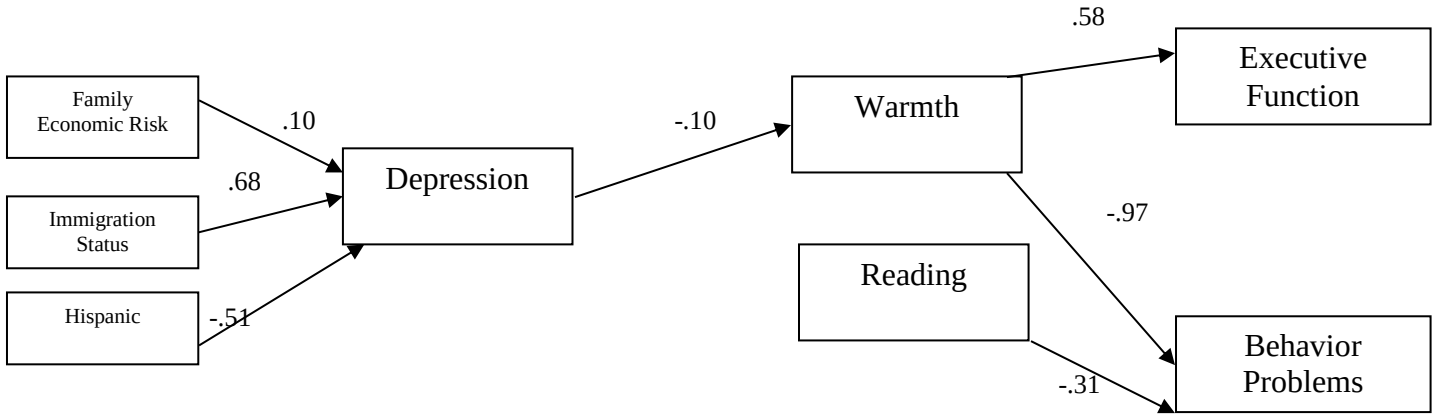

Figure 2. Final path model depicting significant pathways (controlling for child age, gender, race/ethnicity, time spent in childcare, maternal education, single parent status and poverty status). Significant covariates are also depicted. Direct paths from depressive symptomatology to children's EF and behavior problems are not depicted. All estimates depicted above are significant at the $p<.05$ level.