DISSERTATION

PARENT-CHILD RELATIONSHIPS IN CONTEXT: AN APPLICATION OF THE PERSON-PROCESS-CONTEXT-TIME MODEL TO THE DEVELOPMENT OF LOW-INCOME TODDLERS' SOCIAL-EMOTIONAL ADJUSTMENT

Submitted by

Erin Christine Albrecht

Department of Human Development and Family Studies

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Doctoral Committee:

Advisor: David MacPhee
Co-advisor: Erika Lunkenheimer

Nathaniel Riggs
Mary Khetani

ABSTRACT

PARENT-CHILD RELATIONSHIPS IN CONTEXT: AN APPLICATION OF THE PERSON-PROCESS-CONTEXT-TIME MODEL TO THE DEVELOPMENT OF LOW-INCOME TODDLERS' SOCIAL-EMOTIONAL ADJUSTMENT

This dual manuscript dissertation addresses current empirical evidence and developmental theory that acknowledges the active role of the toddler in shaping ontogeny. As such, both studies utilized cross-lagged panel models to investigate the longitudinal, bidirectional associations among different features of the microsystem and the child, using repeated measures data from the Early Head Start and Evaluation Research Project (EHSREP; 1996-2010). In the first study, transactional relations between observed maternal supportiveness and child emotion regulation at age 14-, 24-, and 36-months were evaluated. Results supported extant research that establishes significant longitudinal associations between more supportive mother behavior and higher levels of child emotion regulation, net the stability in these constructs over time; there was no evidence to support child-driven pathways, or a developmental transaction. This model was then assessed with the addition of the total home environment measure across time points. Both child emotion regulation and the home environment significantly predicted each other from child age 2 to 3, while maternal supportiveness remained a significant predictor of emotion regulation, but only at age 2. These results suggest that different facets of the child's microsystem may become more salient at different times in development, and the child emerges as an influence on the microsystem in his or her own right. Findings also underscore the need for research that

compares the predictive utility of parent-child interaction measures and the home environment for diverse developmental outcomes.

The second study incorporated toddlers' negative emotionality into a cross-lagged panel model of maternal depressive symptoms, maternal supportiveness, and child externalizing behaviors. A central goal of this study was to incorporate process-oriented questions about the linkage between individual differences in child temperament, maternal risk, parenting, and child externalizing behaviors (mediation), while also addressing questions about for whom these pathways are most relevant (moderation). Maternal depressive symptoms predicted subsequent child behavior problems; in turn, child behavior problems predicted later depressive symptoms. Child negative emotionality at 14 months demonstrated an indirect effect on maternal depressive symptoms at 3 years by way of externalizing behavior at 2 years. Nonsignificant tests of moderation rendered the current study unable to generate support for diathesis-stress or differential susceptibility models in the current sample. Results imply the emergence of parent-driven transactions between maternal depressive symptoms and child externalizing behaviors within the first few years of life. Moreover, the temperamental characteristic of negative emotionality connotes further risk for maladjustment for both mother and child. Collectively, both studies highlight the need for continued research and interventions that consider the child's contributions to the dynamic process of development during toddlerhood.

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CHAPTER I - INTEGRATIVE LITERATURE REVIEW

The current longitudinal studies examine how, for Early Head Start eligible families, the Person-Process-Context-Time model (Bronfrenbrenner & Morris, 2006) and transactional perspectives (Sameroff, 2009) on development can be applied to toddler's social-emotional adjustment, a developmental antecedent of school readiness. In the literature review that follows, I provide the foundation for two interrelated studies by first explaining the brief history and context of the Early Head Start Research and Evaluation Project, the dataset that will be used to answer the primary research questions. Next, I summarize what is known about the effects of the EHS program on children and families, and highlight results of secondary analyses that demonstrate the development of children's social emotional adjustment and related child- and family-level variables in this dataset. I conclude by identifying the specific gaps that these studies will address, including an explanation of how I employed advanced analytic methods to propel current research that has examined longitudinal relations among key features of the microsystem and toddlers' social-emotional adjustment; thus, the completed studies are timely and relevant for informing developmental theory and EHS practice and policy.

Early Head Start: A Brief History

Early Head Start (EHS) was created as part of the 1994 Head Start reauthorization to provide intensive, two-generation support services to poverty-level pregnant women, children under the age of 3, and their families (Love, Chazan-Cohen, & Raikes, 2007; Raikes & Love, 2002). Since 1995, EHS has provided a wide range of services for children and families, including health and child development services, parenting and family support, case management, and child care (Raikes & Love, 2002). Families may receive these services in one

of three program models: center-based, home-based, or a mixture of the two program models, depending on the needs of the community where the program is situated. The program was instated just as research highlighting the primacy of early experiences for brain development and widespread concern over the lack of high-quality child care for infants and toddlers put the developmental period between ages 0 and 3 at the forefront of the policy arena (Administration for Children and Families, 2004; Kamerman & Kahn, 2004). Based on the consensus that relationships with caregivers provide a primary context for young children's development (Bronfrenbrenner & Morris, 2006; Mashburn & Pianta, 2006; Vernon-Feagans & Cox, 2013), a central goal of EHS is "to provide safe and developmentally enriching caregiving which promotes the physical, cognitive, social and emotional development of infants and toddlers, and prepares them for future growth and development" (Administration for Children and Families, "The Goals of Early Head Start", 2014a). As such, regardless of program model, an additional priority for EHS programs was to help parents find appropriate childcare that met their needs and was also of high quality, as operationalized by the Head Start Program and Performance Standards (Raikes & Love, 2002).

Extant research supports this goal, demonstrating that sensitive and responsive caregiving practices in early childhood provide a context that supports young children's burgeoning abilities to monitor their attention, behavior, and emotions (Calkins & Hill, 2007; Kopp, 1989; Sroufe, 1996); all are essential skills that contribute to social-emotional adjustment, a developmental precursor of school readiness (Blair, 2002; Denham, 2006; Mashburn & Pianta, 2006; Pianta, Cox, & Snow, 2007). However, a well-documented risk factor for increased parenting stress, poor caregiving practices, and children's maladaptive regulatory behaviors is poverty (Duncan & Brooks-Gunn, 1997; McLoyd, 1990; McLoyd, 1998; Raver, 2004; Ryan, Fauth, Brooks-Gunn,

2006; Shonkoff & Phillips, 2000; Vernon-Feagans & Cox, 2013). Children who experience poverty in early childhood are therefore at higher risk for experiencing poor achievement and behavior problems, issues that stem from social-emotional skill deficits that persist through late adolescence and early adulthood (Ryan et al., 2006). EHS was thus created to help support low-income children and families by providing *high-quality* community, family, and child-level supports to reduce the deleterious effects of poverty on child and family well-being.

The Early Head Start Research and Evaluation Project

At the time of Early Head Start's inception, the rigorous, large-scale Early Head Start Research and Evaluation Project (EHSREP) was also mandated, with the purpose of evaluating how the program was working, for whom, and under what conditions, creating a program that would inform future developmental and intervention research (Love et al., 2007). Evaluation studies have demonstrated that EHS has been effective in promoting both short- and long-term positive parenting and child outcomes, with effect sizes ranging from small to moderate, depending on the subgroup being evaluated (for review, see Love, Chazan-Cohen, Raikes, & Brooks-Gunn, 2013). For example, at age 2 (i.e., after EHS children and families had received approximately a year of EHS services), children showed higher levels of cognitive, language, and social-emotional functioning compared to the control group, and EHS parents were more likely to demonstrate more sensitive caregiving and provide a more stimulating home environment than control group parents (Administration for Children and Families, 2001). By age 3 (i.e., the end of EHS services), EHS program participation was associated with small to moderate effect sizes in child outcomes, including better cognitive and language development scores, lower levels of aggressive behavior, higher levels of engagement with parents, and persistence in attention to objects during play, compared to controls (Administration for Children

and Families, 2002; Love et al., 2005). The same study documented small effect sizes for parent outcomes, including higher levels of support for language and learning in the home setting, and higher levels of observed supportiveness during parent-child play, compared to the control group (Administration for Children and Families, 2002; Love et al., 2005).

EHS program theories of change focus on two central hypotheses; first, that children's development is enhanced directly, evidenced by the direct effects of program participation on children's cognitive, language, and social emotional outcomes. Second, child development is enriched indirectly, through the program's effects on enhanced parenting and family processes (Administration for Children and Families, 2002). Capitalizing on the longitudinal research design that involved collecting child and parent information at the 14-month, 24-month, and 36-month birth-related assessments, certain features of parenting at 24 months were tested as mediators of child outcomes at 36 months (Administration for Children and Families, 2002). With respect to the analyses that focused on positive social-emotional outcomes, results indicated that at age 2, mothers' observed sensitivity, emotional warmth, and cognitive stimulation in the home were the processes by which some of the impacts of EHS translated to children's observed engagement of the parent at age 3. Observed maternal supportiveness and supportive cognitive stimulation in the home at age 2 also emerged as mediators of the longitudinal effect of EHS services on children's higher levels of observed sustained attention with objects at age 3. Taken together, results lend support to the theory of change that emphasizes the indirect effects of the program on children's positive development. Thus, both features of the home environment and maternal sensitivity and supportiveness in parent-child interaction appear to be relevant to understanding the development of EHS children's positive

social emotional skills, including engagement of the mother during play and sustained attention with objects.

Vogel, Brooks-Gunn, Martin, and Klute (2013) documented long-term, sustained outcomes of EHS when children were approximately 5 years old, with EHS children demonstrating fewer behavior problems, higher levels of approaches to learning and observed attention, and better vocabulary. Long-term parent outcomes included a greater tendency to report reading daily to children and engaging in teaching activities with children, lower levels of maternal depression, and higher levels of parent involvement in the child's schooling at age 5. Researchers extended these findings by testing earlier effects on parenting and child outcomes as mediators of the link between program participation and child outcomes at age 5, demonstrating that age 3 observed engagement of the parent and performance on the Bayley MDI positively mediated, and child aggressive behavior negatively mediated, the longitudinal relation between program participation and age 5 observed attention, an indicator of school readiness. In addition, children's age 5 approaches to learning was positively mediated by support for cognitive stimulation in the home and negatively mediated by aggressive behavior at age 3 (Vogel et al., 2013). Collectively, children's socioemotional and cognitive skills, as well as the quality of the home environment, operated as essential mechanisms in the link between EHS program participation and children's school readiness at age 5.

With the goal of understanding the primacy of early (ages 0-3), preschool (ages 3-5), or collective (ages 0-5) supportive experiences in early childhood, researchers have also evaluated the significance of receipt of EHS by itself and in combination with additional early childhood services. Moreover, researchers also established an explicit link between receipt of EHS services and children's later developmental outcomes for children who received both EHS and later

formal program participation (i.e., center based care, universal prekindergarten, Head Start). This group demonstrated the most positive pattern of outcomes, whereby experience in EHS was specifically associated with higher levels of approaches to learning, more cognitively stimulating home environments, and more responsive and appropriate parenting practices (Chazan-Cohen & Kisker, 2013). Extant evaluation research therefore demonstrates that EHS was effective at producing small to modest short- and long-term benefits for parents and children from birth to age 5, most notably with respect to young children's emerging school readiness skills (Love et al., 2012).

Social Emotional Development and School Readiness in the Context of EHS

Current definitions of school readiness include more than just cognitive and language skills, with health and physical development, social emotional competence, and approaches to learning considered to be three critical dimensions of this construct (National Education Goals Panel, 1997). Although these skills are essential in facilitating successful adaptation to formal schooling, school readiness is considered as a process that unfolds from birth through age 5 (Pianta, Cox, & Snow, 2007; Snow, 2006); hence, a goal of EHS is to promote low-income infants' and toddlers' school readiness skills, with a particular emphasis on the "whole child." To that end, a more comprehensive understanding of EHS children's developing school readiness skills requires a closer look at young children's social emotional development. A focus on this dimension of school readiness dovetails with the 2015-16 Head Start Research Agenda, which emphasizes children's social emotional development as a key topic (National Head Start Research Association, 2015); namely, highlighting the particular variables that teachers, parents, and home visitors can target to enhance children's social and emotional functioning.

What behaviors and skills are involved in children's early social-emotional adjustment, particularly during infancy and toddlerhood? Broadly speaking, social emotional development includes both self-regulation and behavior problems (see Campbell et al., 2016, for review). From a self-regulation perspective (Blair, 2002; Blair & Raver, 2012), an essential task for children in this age range is to learn how to monitor their feelings, thinking, and behavior in socially appropriate ways, skills that evolve in the context of relationships with caregivers until children become increasingly able to regulate themselves independently (Kopp, 1989; Sroufe, 1996). These skills progress from basic physiological regulation, including motor and attention control in infancy, to increased awareness of social demands and of the self, the internalization of rules and social norms, and the enhanced ability to behave accordingly in toddlerhood and preschool (Brownell & Kopp, 2007; Eisenberg, Spinrad, & Eggum, 2010; Kochanska, Coy, & Murray, 2001; Kopp, 1989).

Indeed, the skills involved in self-regulation in early childhood provide a strong foundation for later adjustment, including positive social skills, harmonious relationships with teachers and peers, and higher levels of academic achievement in school (Eisenberg, Valiente, & Eggum, 2010; Liew, 2012; Ursache, Blair, & Raver, 2012). Yet, it is not uncommon during early childhood for parents, teachers, and caregivers to report high levels of child externalizing behaviors (Campbell, 1995), which includes high levels of activity, poor self-control, and relatively high levels of noncompliance, aggression, and tantrums, otherwise considered to be deficits in developing regulatory skills. Because of their significance in the forecasting of future adjustment, including success at the transition to school, the current dissertation focuses on children's emotion regulation and externalizing behaviors during toddlerhood in the first and second studies, respectively.

Researchers have lamented that our understanding of the development of school readiness skills between birth and age 3 lags behind the state of research documenting its development from preschool onward (Pianta, Barnett, Burchinal, & Thornburg, 2009; Pianta, Cox, & Snow, 2007; Snow, 2006). Others have explicitly called for work that hones in on self-regulation as an organizing construct during this developmental period (Blair, Berry, & Friedman, 2012). Several attempts to remedy these knowledge gaps have relied on data from the EHSREP (e.g., Ayoub, Valotton, & Mastergeorge, 2011; Bocknek, Brophy-Herb, Banerjee, 2009; Brady-Smith et al., 2013; Brophy-Herb, Zajicek-Farber, Bocknek, McKelvey, & Stansbury, 2013; Harden, Sandstrom, & Chazan-Cohen, 2012; Raikes, Robinson, Bradley, Raikes, & Ayoub, 2007), but these studies have limited their focus to unidirectional models from parenting and family-level variables to children's self-regulation and school readiness.

Historically, most research on bidirectional effects and/or transactional models in development focused on models that link different aspects of parenting to the development of children's psychopathology (e.g., Patterson, 1992; Pettit & Arsiwalla, 2008). More recently, researchers have begun to examine the significance of bidirectional parent-child relations with respect to positive adjustment (Dadidov, Knafo-Noam, Serbin, & Moss, 2015). Although empirical evaluation of transactional models continues to gain new ground, unidirectional model testing from parent → child adjustment prevails (Pardini, 2008; Dadidov et al., 2015). In particular, there appear to be very few studies using the current EHS dataset that have empirically evaluated transactional models of development, in terms of understanding both positive and maladaptive adjustment in toddlerhood. This is an important gap to address, given that significant child → parent and parent → child effects indicate interventions, especially those delivered by EHS, could use this information to modify parent-training components and

education around developmentally appropriate expectations and reframing attributions of young children's behavior. Moreover, these findings are informative for expanding current knowledge about how parent → child and child → parent pathways operate in a socioeconomically and racially diverse sample of families in toddlerhood, an important time of transition in ability, behavior, and cognition in early childhood (Brownell & Kopp, 2007).

The Current Dissertation

The current studies build upon prior research linking parenting and children's social-emotional adjustment in several significant ways. First, these studies use the EHSREP data to consider both the family-level and child-level variables *across multiple time points* within a longitudinal cross-lagged panel model. These results will therefore answer questions about the direction of influence between the home environment, parenting, and children's development (e.g., does child emotion regulation elicit more supportive parenting behavior, and vice versa) and the strength of the associations among these constructs. A related goal is to answer questions about how maternal depressive symptoms, parenting behavior, and child temperament interact to protect or hamper children's social-emotional adjustment, in the form of child externalizing behaviors. Collectively, these studies will provide evidence for transactional models of low-income children's social-emotional adjustment in an EHS sample.

In an effort to adequately assess the relevant proximal processes in their respective contexts, as specified by the Person-Process-Context-Time model (Bronfrenbrenner & Morris, 2006), sensitive mother behavior will be used to assess responsive caregiving in context; more global indices of the quality of the parent-child environment will include a measure of the home environment. Primary analyses followed a longitudinal cross-lagged panel model framework that capitalized on the repeated measures design of the EHSREP data. The use of a cross-lagged

panel design is advantageous because it allows tests of the predictive relations among constructs over time, accounting for the stability in each construct (Little, 2013; Little, Preacher, Selig, & Card, 2007); in this case, parenting and the home environment, and child emotion regulation as separate, continuous constructs at child age 14, 24, and 36 months. Moreover, this same analytic framework can be used to test for reciprocal effects, permitting the refinement of developmental models of low-income toddlers' social-emotional adjustment. Finally, this same framework is useful for testing longitudinal moderation, which allowed for a methodologically rigorous examination of diathesis stress and differential susceptibility frameworks in understanding individual differences in young children's adjustment to parenting and maternal depression. Such findings are further buttressed by the close alignment between theory, research questions, and the analytic framework employed to answer these questions.

The current dissertation also addresses the recent call for evaluating individual differences in children's responses to parenting, and includes a longitudinal examination of the developmental interplay of maternal depressive symptoms, maternal supportiveness, child externalizing behaviors, and child temperament (characteristics of the *person* in the Person-Process-Context-Time model; Bronfenbrenner & Morris, 2006). Highlighting the potential individual differences in adjustment to parenting risk and supportive parenting can provide developmental researchers and practitioners with important information about who may be the most sensitive to variations in the environment and thus require additional support in optimizing social-emotional development in toddlerhood. As a result, these models are useful for informing practitioners and policymakers about promoting parental sensitivity to children's unique temperaments, and leveraging the quality of home environments for parents in order to better promote low-income toddlers' social-emotional development.

CHAPTER II - TESTING A TRANSACTIONAL MODEL OF LOW-INCOME TODDLERS' EMOTION REGULATION

One of the foremost themes in development during toddlerhood (ages 12 to 36 months) is the emergence of impulse control and emotion regulation (Edwards & Liu, 2002). Emotion regulation, formally defined, "…consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (Thompson, 1994, pg. 27-28). Toddlerhood is an especially salient time for understanding developing emotion regulation skills because it at this time when children are increasingly able to apply what they have learned about regulation, especially in the context of early parent-child relationships, to their own actions, thoughts, behaviors, and feelings (Fox & Calkins, 2003; Thompson & Goodvin, 2007; Thompson & Meyer, 2007). Children's higher levels of emotion regulation in toddlerhood have been linked to skilled social interactions with peers in preschool (Calkins, Smith, Gill & Johnson, 1998) and child cooperation, assertiveness, and less externalizing behavior at age 6 (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). Deficits in emotion regulation have a well-documented association with maladajustment, including more internalizing and externalizing behaviors (e.g., Eisenberg et al., 2001). With respect to the extrinsic component of this definition, the quality of parenting and parent-child relationships in this age range can either augment or undermine these developing capacities (for review, see Calkins & Hill, 2007).

Understanding of the development of emotion regulation in toddlerhood is thus a central task for researchers interested in elucidating developmental pathways to competence or dysfunction in psychopathology (Cicchetti, Ackerman, & Izard, 1995; Cole, Michel, & Teti, 1994; Denham, 1998; Eisenberg, 2001). Recent work has emphasized the incorporation of

transactional perspectives of development (Sameroff, 2009) for extending the current knowledge base of how children actively construct and contribute to their own development (Davidov, et al., 2015). As part of this critique, Feldman (2015) evaluated a cross-lagged panel model of young children's emotion regulation and parent-child dyadic reciprocity as a mediator of the link between pre-term infants' regulation and behavioral outcomes at 10 years. Physiological regulation in infancy predicted long-term outcomes both directly and indirectly, mediated by reciprocal relations between parent-child reciprocity and child emotion regulation in early childhood. These results suggest the import of bidirectional exchanges, driven by both the parent and the child, for understanding long-term developmental outcomes that stem from regulatory abilities early in life. Yet, less is known about the nature of such reciprocal exchanges for young children in low-income samples, and how parent and child-driven pathways operate in the context of other microsystemic variables, such as the home environment.

Due to the stressful, chronic weight of poverty, the home environment, parent-child relationships, parent behaviors, and child adjustment are all at-risk of being disrupted by pervasive socioeconomic disadvantage (e.g., McLoyd, 1998; Ryan et al., 2006). As such, the Early Head Start Research Evaluation dataset affords researchers an opportunity to examine how these microsystemic processes function in the high-risk context of poverty. In particular, researchers have begun to examine questions about the developmental trajectories of supportive parenting and the development of toddler's emotion regulation and related abilities. For example, Raikes and colleagues (2007) used Hierarchical Linear Modeling (HLM) methods in analyses of the EHSRE ($N = 2,441$) to explore growth in children's self-regulation between child ages 14 and 36 months, and to identify meaningful parent-child relationship and child-level predictors of individual differences in observed self-regulation. Results painted a picture of positive growth in

self-regulation from 14 to 36 months, but children demonstrating more negative engagement during mother-child interactions at each time point showed slower rates of growth and comparatively lower levels of self-regulation at 36 months. Boys at this age demonstrated lower self-regulation than girls. As expected, mother-child interactions characterized by shared positive affect and involvement at 14 and 24 months predicted greater self-regulation at 36 months (Raikes et al., 2007).

Observed maternal supportiveness at each of the 14-, 24-, and 36-month assessments emerged as a meaningful predictor of children's emotion regulation for a subsample of African-American families in the EHSRE (Bocknek et al., 2009). Latent growth curve modeling was used to identify longitudinal trajectories of maternal supportiveness and emotion regulation. Controlling for child temperament and baseline cumulative risk, maternal supportiveness predicted the average level of emotion regulation at each time point, and growth in maternal supportiveness corresponded to growth in children's regulatory behaviors across time (Bockneck et al., 2009). Extending these findings, latent growth curve analyses were used to examine the longitudinal relations among maternal supportiveness and children's emotion regulation at 14, 24, and 36 months as mediators of children's cognitive school readiness indicators at age 5 (Brophy-Herb et al., 2013). Results of analyses from $N = 1{,}258$ mother-child dyads across racial/ethnic subgroups demonstrated that the initial level and subsequent growth in maternal supportiveness and children's emotion regulation at each time point predicted children's cognitive skill performance at age 5. Further, children's emotion regulation partially mediated the relation between 14-month maternal supportiveness and school readiness at age 5, providing additional evidence that low-income children's emerging regulatory skills in the first few years

operate as a springboard for school readiness. Model comparisons by gender revealed larger effect sizes for girls (Brophy-Herb et al., 2013).

Brady-Smith and colleagues (2013) derived supportive, harsh, and detached dimensions of parenting during the child's first year to predict children's later cognitive and social-emotional development. The supportive parenting dimension at child age 1 significantly predicted higher levels of children's Bayley MDI scores, emotion regulation, and engagement of the mother at 2 and 3 years of age, across ethnic groups (i.e., African-American, Mexican American, and European American). Thus, early supportive parenting remained an important predictor of toddlers' positive social-emotional and cognitive skills, even when considering potentially meaningful cultural variations in parenting behaviors.

Despite a common theme across studies in finding supportive parenting particularly salient for young children's social-emotional development, parenting occurs in the context of the home environment, which has also been documented as a relevant component of the developing child's microsystem (Bradley & Caldwell, 1995; Bradley, Corwyn, Burchinal, McAdoo, & Garcia-Coll, 2001a; Bradley et al., 1989; Edwards & Liu, 2005; Ford & Lerner, 1992; Kagan, 1984; Parke, 1978). Indeed, evidence from EHSRE data supports extant research maintaining that parenting and the home environment during the first three years of life set the foundation for school readiness skills at the transition to kindergarten (Chazan-Cohen et al., 2009). Maternal depressive symptoms and stress, the quality of supports for learning at home, and maternal supportiveness at child age 14 months, as well as changes in these aspects of parenting and the home environment over time, significantly predicted children's school readiness skills at age 5. Maternal supportiveness at 14 months and growth in maternal supportiveness over time (at child age 2 and 3) significantly predicted the observed emotion regulation measure of school readiness

at age 5. A cognitively stimulating home environment, and growth in the level of cognitive stimulation, was predictive of higher levels of children's approaches to learning, letter-word knowledge, and vocabulary at age 5 (Chazan-Cohen et al., 2009). These findings are consonant with earlier research that indicates the home environment measure is a significant predictor of child social and cognitive adjustment (for review, see Bradley, 2015).

Taken together, findings from secondary analyses of the EHSRE highlight the significant longitudinal associations between maternal supportiveness and toddler's emotion regulation. Beyond specific maternal behaviors, a cognitively stimulating home environment also promotes children's school readiness (Chazan-Cohen et al., 2009). These findings align with a bioecological framework (Bronfrenbrenner & Morris, 2006) that draws attention to relationships with caregivers and the home environment as some of the key proximal processes that act as guiding forces in the development of social-emotional adjustment; namely, toddler's emotion regulation. However, unanswered questions remain about the direction of associations between child emotion regulation and maternal supportiveness in this sample during toddlerhood (Brophy-Herb et al., 2013), as well as the significance of these transactions when including a measure of context, the home environment.

A central goal of the current study is to integrate the empirical evidence linking the home environment, parenting, and children's social-emotional adjustment with a transactional perspective on development (Sameroff, 2009; Sameroff & Mackenzie, 2003), which notes that developmental studies should include a focus on how both the child and the parent influence each other in ways that may shape and constrain future parenting and child development, rather than unidirectional models from parenting to child outcomes. Testing the bidirectional, longitudinal relationships between supportive parenting and children's emotion regulation will

answer important questions about developmental transactions related to whether there is a stronger relationship between earlier supportive parenting and children's later emotion regulation, and vice versa. In particular, an important question to address is whether children who are better regulated elicit more supportive behaviors from parents. More in accord with a transactional perspective, it is also plausible that both the parent's supportiveness and the child's emotion regulation simultaneously influence each other, such that concurrent parental supportiveness predicts future child social emotional skills, while concurrent child regulation elicits future supportive parenting. The answers to these questions are especially relevant for advancing current understanding of bidirectional linkages between maternal supportiveness and child emotion regulation in this sample, and for informing appropriate intervention targets in the context of EHS. For example, significant associations between early emotion regulation and later maternal supportiveness suggest the importance of emphasizing mothers' sensitivity to variations in child regulatory skills as a point of entry for existing home-visiting and parent support components of EHS.

In addition, there may also be evidence of similar bidirectional patterns between child adjustment and the home environment. A historic study of the home environment and young children's cognitive developmental status revealed child-directed pathways between cognitive status and higher levels of maternal involvement and stimulation between ages 6 to 22 months and significant parent-directed pathways from maternal involvement and child cognitive development between the ages of 12 and 24 months (Bradley, Caldwell, & Elardo, 1979). Although these findings do not appear to have been replicated and reported elsewhere, they indicate the relevance of considering transactions between the broader home environment and child adjustment.

A growing body of research has examined positive parent-child transactions and children's developing social-emotional adjustment (Barnett, 2012; Eisenberg et al., 2010; Feldman, 2015; Lunkenheimer, Kemp, & Albrecht, 2013; Newton, Laible, Carlo, Steele, & McGinley, 2014; Perry, Mackler, Calkins, & Keane, 2014), in contrast with the extant literature that has emphasized coercive cycles of interaction in parent-child relationships and the coalescence of children's aggression and noncompliance (e.g., Keenan & Shaw, 1995; Patterson, 1982; Scaramella & Leve, 2004). Recent findings from a sample of children ages 3 and younger demonstrated that observed parental sensitivity at child age 1 predicted mother's ratings of children's social skills at 2 years; in turn, 2-year social skills predicted sensitive parenting at 3 years, thereby illustrating a parent-driven transaction between sensitive parenting and children's social skills in toddlerhood (Barnett, 2012). Feldman (2015) also documented a parent-driven transaction between parent-child reciprocity at child age 1, to child observed emotion regulation at age 2, and parent-child reciprocity at age 5. Perry and colleagues (2014) found evidence of parent-driven reciprocal effects, wherein high maternal sensitivity in toddlerhood predicted children's greater vagal regulation at age 4.5; in turn, greater vagal regulation at age 4.5 predicted higher maternal sensitivity at age 5.5. Collectively, it appears that in early childhood, the reciprocal pathways between positive parenting and children's developing social and regulatory abilities are bolstered by early sensitive and supportive parenting; in turn, the child's subsequent development of such skills predicts later sensitive and supportive parenting.

Research Questions and Hypotheses

The current study investigated developmental transactions between the home environment, maternal supportiveness, and toddlers' developing emotion regulation in a low-income sample of EHS-eligible families. Using a cross-lagged panel framework, the first

research question thus addressed the reciprocal nature of maternal supportiveness and child emotion regulation in the first three years of life (see Figure 1.1). I first hypothesized that higher levels of maternal supportiveness at T1 and T2 would predict higher levels of child emotion regulation at each of the cross-lagged time points. I evaluated potential evocative effects (Scarr & McCartney, 1983) of child emotion regulation on parenting. An exploratory hypothesis I addressed was that higher levels of child emotion regulation at T1 and T2 predict higher levels of maternal supportiveness at the next respective time point, accounting for the often-neglected developmental pathways from child adjustment to parent (Dadidov et al., 2015) and addressing the existing gap in the EHS literature regarding what is known about the longitudinal linkage between maternal supportiveness and child emotion regulation (Bockneck et al., 2013). I hypothesized that higher levels of T1 maternal supportiveness predict higher levels of T2 child emotion regulation, which then predict higher levels of T3 maternal supportiveness, demonstrating a parent-driven transaction between supportive parenting and emotion regulation. At the same time, I evaluated child-driven pathways, wherein higher levels of T1 child emotion regulation predicted higher levels of T2 maternal supportiveness, which then predicted higher levels of T3 child emotion regulation.

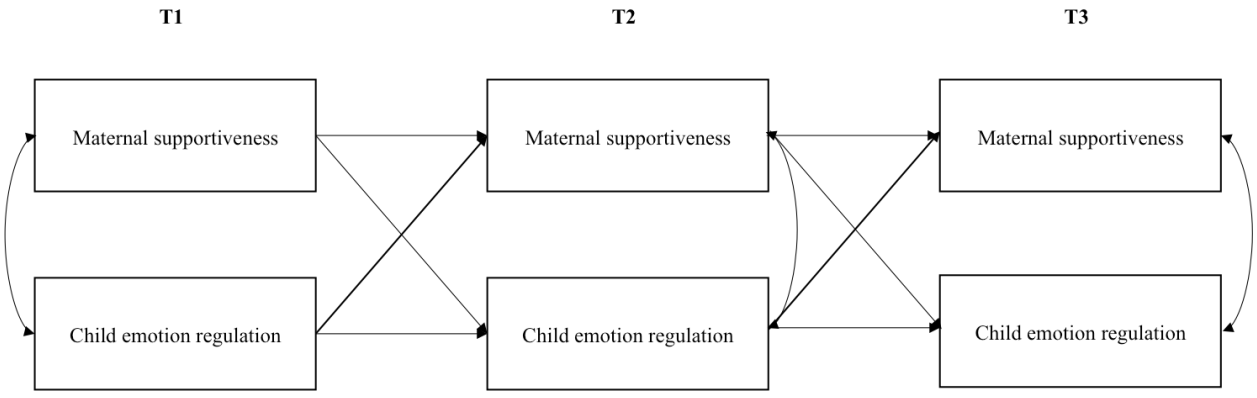

Figure 1.1 Saturated cross-lagged model of the hypothesized longitudinal relations among maternal supportiveness and child emotion regulation. *Note.* T1 = Time 1 (child age 14 months); T2 = Time 2 (child age 24 months); T3 = Time 3 (child age 36 months).

The second research question extended the first (and existing research) by considering parent-child relationship linkages *in context;* evaluating a transactional model of parenting and child emotion regulation, including a measure of the home environment (see Figure 1.2). I hypothesized that the aforementioned cross-lagged relations between maternal supportiveness and child emotion regulation should remain the same in this model, but expected to find significant cross-lagged associations between the home environment and parenting, and the home environment and child emotion regulation, whereby a more nurturing home environment predicts higher levels of maternal supportiveness, and higher levels of child emotion regulation. In particular, I expected the home environment at T1 and T2 to predict maternal supportiveness and child emotion regulation at each of the next respective time points. As parent-child interaction is one of several key components of the home environment measure (Bradley, 2015; Bradley, 2013; Bradley & Caldwell, 1984; Totsika & Silva, 2004), I anticipated observed maternal supportiveness during parent-child interaction to be related to the home environment, demonstrating concurrent and potentially reciprocal relations both within and across time. Accounting for potential evocative child effects, I explored child emotion regulation as a predictor of the home environment at each of the next respective time points, hypothesizing that children higher in emotion regulation elicit more stimulating and nurturing rearing practices and environments. An additional exploratory hypothesis was that a more nurturing T1 home environment predicts higher T2 child emotion regulation, which in turn predicts a more nurturing T3 home environment.

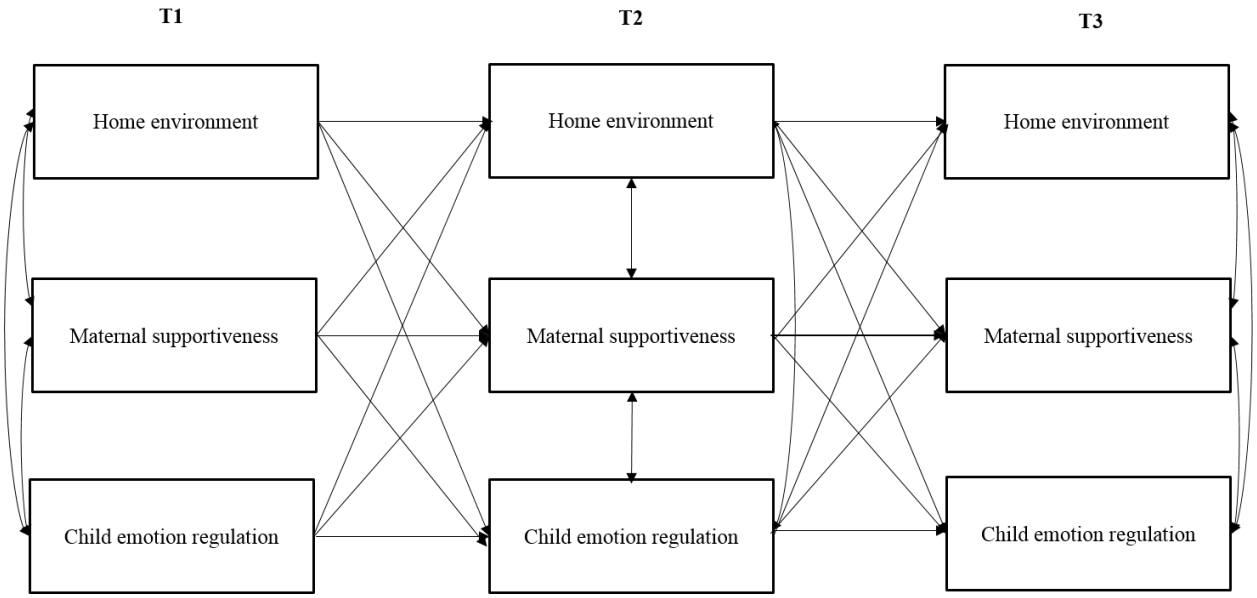

Figure 1.2 Saturated cross-lagged model of the hypothesized longitudinal relations among the home environment, maternal supportiveness, and child emotion regulation. *Note.* T1 = Time 1 (child age 14 months); T2 = Time 2 (child age 24 months); T3 = Time 3 (child age 36 months).

Method

Participants

The EHSREP is a publically available dataset through the Child Care and Early Education *Research Connections* project. In 1995 and 1996, 17 of the inaugural EHS programs (N = 3,001 families) located in various urban and rural sites across the United States were selected to be a part of this national evaluation study (i.e., EHSREP; Administration for Children and Families, 2001). Families were eligible to participate if they had a child less than 12 months of age or if the mother was pregnant, and the family income was at or below the federal poverty level. Eligible families were randomly assigned to an EHS program or community services control group (Program N = 1,513; Control N = 1,488). Families in the EHS program group could receive home-based, center-based, or a combination of the two service approaches (known as the mixed approach option).

This dataset contains longitudinal childcare, family, and child data that were collected from 1996 through 2001. The sample was ethnically and racially diverse, with 34% African American, 24% Latino, 37% White, and 5% of families identified as another race/ethnicity. Children were less than 12 months old at the time of their family's enrollment in the study. Data were collected at several points from the time families were randomly assigned to program or control groups until completion of the program (at child age 3), as well as at long-term follow-ups when children were in prekindergarten and fifth grade. Data were collected through parent services interviews around 6, 15, and 26 months after the family was randomly assigned to the program or control group. Parent interviews, child assessments, videotaped parent-child interactions, and observations of early child care settings were completed around the child's 14-, 24-, and 36-month birthdays.

Earlier evaluations of the program documented a decrease in response rates over time (Administration for Children and Families, 2002), which is typical with longitudinal research. At the parent interview completed in tandem with child ages 14, 24, and 36 months, the response rate was 78 percent, 72 percent, and 70 percent. For the observed Bayley and parent-child video assessment at child age 14 months, the response rate was 63 percent for the Bayley and 66 percent for the parent-child videotaped assessment. At 36 months, the response rate was approximately 55 percent for both assessments. Response rates were similar across the program and control groups, but did differ according to level of education, welfare receipt, and employment status at random assignment. There were also some differences in response rates to certain types of measures based on the family's identified race/ethnicity. The same families tended to consistently respond across time points (Administration for Children and Families, 2002). Table 1.1 presents descriptive information for the key study variables at each time point.

Table 1.1
Valid N, Means, Variance, and Skewness for Home, Parenting, and Child Emotion Regulation Variables at Time 1 (T1), Time 2 (T2), and Time 3 (T3)

Variable	*N*	*M*	*Variance*	*Skewness*
T1 HOME	2,114	25.98	13.05	-1.05
T2 HOME	1,949	26.36	12.28	-1.22
T3 HOME	1,807	27.23	22.94	-0.55
T1 Maternal supportiveness	1,956	3.94	1.12	-0.07
T2 Maternal supportiveness	1,793	3.98	1.05	-0.13
T3 Maternal supportiveness	1,658	3.92	0.86	-0.11
T1 Emotion regulation	2,040	3.69	0.48	-0.70
T2 Emotion regulation	1,910	3.64	0.64	-0.67
T3 Emotion regulation	1,760	3.93	0.58	-0.79

Measures

Quality of the home environment. The Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) was used to assess the level of cognitive stimulation and emotional support provided by parents in the home environment. An independent observer completed an interview with parents and observations of the parent and child in the home at 14 and 24 months. The total score out of 45 items, checked as present or absent, on the measure was used to represent the overall quality of the home environment, with higher scores indicating a higher-quality environment. Items for this version of the HOME measure correspond with subscales that assess the parent's emotional responsiveness towards the child, support for the child's cognitive, language, and literacy environment, maternal verbal-social skills, and non-punitive parenting practices (Administration for Children and Families, 2001). Example items include, "parent talks to child while doing housework," "child has cuddly or role-playing toys," and "parent tells child name of object or person during visit" (Bradley,

2015). At child age 36 months, the HOME-short form inventory, Preschool version was used to represent the overall quality of cognitive stimulation and emotional support provided by parents, with a total score out of 37 items. This version of the measure includes items that assessed the parent's warmth and harsh parenting, support for language and learning, and the internal and external physical environment (Administration for Children and Families, 2002). Example items include "child has toys which teach colors, sizes, and shapes," "child is encouraged to learn alphabet," and "parent converses with child at least twice during visit" (Bradley, 2015). The current study used the total score for the HOME at child age 14, 24, and 36 months as an indicator of the quality of the home childrearing environment at each time point. In the final EHS evaluation report for the whole sample at child-age 24 months, $\alpha = .76$, and $\alpha = .80$ at 36 months (Administration for Children and Families, 2001; Administration for Children and Families, 2002).

Maternal supportiveness. At child age 14, 24, and 36 months, mothers' supportiveness was observed in the context of a 10-minute videotaped parent-child interaction called the Three Bag Task (NICHD ECCRN 1997, 1999). A coding team at Columbia University observed the task and rated child and parent behaviors accordingly, meeting 85% inter-rater reliability requirements (see Ware, Brady, O'Brien, & Berlin, 1998). The task was structured so that the parent and child received three bags of toys and were asked to play together with the toys in the order that the bags were presented. In the EHSREP dataset, supportiveness is a composite score based on observers' ratings for three highly interrelated subscales ($r = .52$ to .67 at 24 months; $r = .50$ to .71 at 36 months); parent sensitivity (mother is attuned to and appropriately responsive to child's signals), cognitive stimulation (mother evinced appropriate teaching behaviors), and positive regard (expressions of love and positive affect towards the child). The ratings for this

measure are based on a seven-point scale, from 7 (*very high)* to 1 (*very low)* supportiveness. In accord with other published studies that have used this same dataset (e.g., Brophy-Herb et al., 2013; Chazan-Cohen et al, 2009), the current study used the parent supportiveness variable at child age 14, 24, and 36 months as an indicator of mothers' sensitive parenting at each time point.

Child emotion regulation. At child age 14, 24, and 36 months, the Bayley Behavior Rating Scale (BRS; BSID-II; Bayley, 1993) was completed by an interviewer performing the Bayley Mental Developmental Index assessment with the focus child. Interviewers were trained to achieve interrater reliability of 85% or greater (Raikes et al., 2007). The BRS is designed to assess children's behavioral regulation in the face of the demands posed by a test of cognitive and psychomotor skills. On a five-point scale, with 5 indicating the most positive behavior, the interviewer assessed the child's emotion regulation (ER) by scoring five items about his/her ability to adapt to the different assessment tasks and test materials, expressions of negative affect, and difficulty regulating emotions throughout the assessment. The composite score for emotion regulation was created by averaging these five items, with a higher score indicated higher levels of emotion regulation. The current study used the scores on BRS emotion regulation at child age 14, 24, and 36 months.

Planned covariates.

Maternal depressive symptoms. Prior theoretical and empirical work has established that low-income parents are more likely to experience depression (McLoyd, 1998), and depression is meaningfully associated with parenting behavior (for review, see Lovejoy et al., 2000); thus, the current study controlled for initial levels of maternal depressive symptoms. At child age 14 months, mothers self-reported their depressive symptoms based on the Center for

Epidemiologic Studies-Depression scale (CES-D; Radloff, 1977). The short form includes 12 items from the 20-item full measure that asks about the number of different depressive symptoms mom experienced in the past week, on a four-point scale from 0 (*rarely or none of the time; less than one day over the past week)* to 3 (*most or all of the time (5-7 days))*. Example items include ("During the past week,") "I felt sad," "I felt that people dislike me," and "I thought my life had been a failure." The composite score was created by summing responses across all items; higher scores indicated higher levels of depressive symptoms. Authors of the measure documented good reliability for the CES-D, $\alpha = .85$ (Radloff, 1977). In the full EHS evaluation sample, reliability was comparable with $\alpha = .77$ at 14 months (Berlin et al., 2009).

Child developmental status. Prior work has established meaningful links between children's regulation, social engagement, and cognitive processes, beginning in early childhood (e.g., Blair, 2002; Goodrich, Mudrick, & Robinson, 2015) and thus the current study used child scores on the Mental Development Index at 14 months to control for children's initial levels of cognitive functioning and potential developmental delays. This measure is an observational assessment completed with an interviewer as part of the Bayley Scales of Infant Development (BSID-II; Bayley, 1993). Interviewers were trained to achieve a minimum criterion of 85% interrater reliability. In previous work with this sample, a Bayley MDI score below 77 (1.5 *SDs* below the mean) was used as an index of developmental delay (Peterson et al., 2004). In the total sample, 64% of the children met this criterion ($N = 1{,}173$; Peterson et al., 2004).

Child temperament. (EAS Temperament Survey for Children; Buss & Plomin, 1984). Extant research has documented the importance of accounting for children's temperament in understanding the interplay between children and caregivers in their environment (Kiff, Lengua, & Zalewski, 2011). Thus, the current study controlled for children's negative

emotionality at child age 14 months, which has successfully been used in other studies of EHS as an index of child temperament (e.g., Bocknek, Brophy-Herb, & Banerjee, 2009). During the 14-month parenting interview, parents responded to five questions from the emotionality subscale on a scale of 1 to 5; a composite score was created from the average across five items. An example item is, "He/she cries easily." A higher score indicates higher levels of negative emotionality.

Child sex. I explored differences in the relations among the links between parenting and child emotion regulation according to child sex, as reported by parents at baseline.

Demographic categorical covariates. The family's program status (intervention or control group) and reported race/ethnicity were also included in multiple groups analysis on the basis of prior evaluation research with this sample to evaluate whether there were meaningful subgroup differences in the hypothesized relations among the home environment, maternal supportiveness, and child emotion regulation.

Plan of Analysis

Path analytic models were computed in M*plus* Version 7 (Muthén & Muthén, 1998-2015) using full information likelihood estimation (FIML) to account for missing data, which estimates parameters on the basis of all available data; cases with missing data on all variables at all time points were dropped (Enders & Bandalos, 2001). The current sample thus included participants who had data on at least one study variable at T1, T2, or T3. For the first set of models (maternal supportiveness and child emotion regulation across time), this resulted in a sample of $N = 2{,}490$ participants, and for the second set of models (the home environment, maternal supportiveness, and child emotion regulation across time), $N = 2{,}546$ participants.

Model fit was evaluated for each respective model using several fit indices, including χ^2, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). χ^2 values were reported for all models but are more likely to be significant with large sample sizes; thus, several different absolute and relative fit indices were reported (Kline, 2011; Little, 2013). Acceptable fit indices range from .90 to .99 for CFI, and lower than .08 for SRMR and RMSEA (Hu & Bentler, 1999; Little, 2013). Collectively, a total of four panel models were interpreted (see Figures 1.3 – 1.6).

A stability model was first estimated for maternal supportiveness and emotion regulation at T1, T2, and T3, and then a full reciprocal model, including cross-lagged paths, was estimated for these variables across time (following transactional model testing by Perry et al., 2014). The stability model included autoregressive paths between T1 and T2, and T2 and T3 maternal supportiveness, and T1 and T2, and T2 and T3 emotion regulation. In the stability and full reciprocal models, nondirectional covariance paths were specified between maternal supportiveness and child emotion regulation within each time point, accounting for their relations to each other within time. The cross-lagged model included paths between T1 maternal supportiveness and T2 child emotion regulation, and T2 child emotion regulation to T3 maternal supportiveness, as well as paths between T1 emotion regulation and T2 supportiveness, and from T2 supportiveness to T3 emotion regulation. The stability and cross-lagged panel models were nested; thus, a chi-square difference test was used to evaluate a significant improvement in model fit (Kelloway, 2015; Kline, 2011; Little, 2013).

In the second set of models, a stability model was estimated for the home environment, maternal supportiveness, and emotion regulation at T1, T2, and T3, followed by a full reciprocal model. The stability model included autoregressive paths between each construct with itself from

T1 to T2, and T2 to T3. In the stability and full reciprocal models, nondirectional covariance paths were specified between maternal supportiveness, child emotion regulation, and the home environment within each time point. The cross-lagged model included regressive paths between the different constructs from each point to the next. Again, a chi-square difference test was used to evaluate a significant improvement in model fit between the nested models.

Lastly, multiple group analysis was performed to assess differences in the hypothesized models according to child sex, race/ethnicity, or program status. Multiple group analyses in path analytic models involve using equality constraints to assess whether the unconstrained model fits the data better than the constrained model according to a chi-square difference test (Little et al., 2007). A significant chi-square difference indicates significant differences in the parameter estimates by group. In the current investigation, parameter estimates did not significantly differ by child sex, race/ethnicity or program group. Thus, all results reported represent findings that were applicable across these categorical variables.

Results

Preliminary analyses were conducted to examine correlations among key study variables and to assess relevant continuous covariates (see Table 1.2). The home environment and maternal supportiveness demonstrated moderate rank-order stability over time; child emotion regulation demonstrated modest rank-order stability. There were significant positive correlations among the home environment, maternal supportiveness, and child emotion regulation within and across time. As expected, the home environment and maternal supportiveness demonstrated larger correlations than child emotion regulation demonstrated with maternal supportiveness or the home environment.

In terms of continuous covariates, the Bayley MDI at T1 was significantly and positively associated with the home environment, maternal supportiveness, and child emotion regulation at all three time points (home environment, r = .18 - .23, p <.01; maternal supportiveness, r = .13 - .22, p <.01; and emotion regulation, r = .17 - .30, p < .01). Child temperament was also significantly negatively correlated with the home environment (r = -.14 – (-.16), p <.01), maternal supportiveness (r = -.09 – (-.13), p <.01), and T1 and T2 emotion regulation (r = .-.16 and (-.09), p <.01, respectively). Maternal depression showed small yet significant negative associations with each variable across time, (home environment, r = -.16 – (-.19), p <.01; maternal supportiveness, r = -.05 - (-.10), p <.05; and emotion regulation, r = -.07 - (-.10), p < .01). The child's MDI, maternal depression, child temperament at child age 14 months were therefore examined as covariates in both sets of models. Results were consistent regardless of whether these covariates were included; therefore, the results below summarize models excluding these variables.

Table 1.2
Correlations among Key Predictors
Note. T1 = Time 1, T2 = Time 2, T3 = Time 3, Mat = Maternal, SUPP = supportiveness, ER = emotion regulation.
** p < .01

	1	2	3	4	5	6	7	8	9
1. T1 HOME	-								
2. T2 HOME	.56**	-							
3. T3 HOME	.48**	.52**	-						
4. T1 Mat supp	.44**	.41**	.36**	-					
5. T2 Mat supp	.40**	.43**	.37**	.55**	-				
6. T3 Mat supp	.38**	.38**	.40**	.43**	.52**	-			
7. T1 Child ER	.16**	.13**	.13**	.16**	.10**	.08**	-		
8. T2 Child ER	.14**	.20**	.20**	.22**	.21**	.16**	.27**	-	
9. T3 Child ER	.14**	.16**	.20**	.16**	.13**	.16**	.12**	.37**	-

Model Comparisons

Stability model for maternal supportiveness and child emotion regulation. The stability model for maternal supportiveness and child emotion regulation at T1, T2, and T3 provided an acceptable fit to the data, $\chi^2(8) = 118.16$, $p < .01$, CFI = 0.93, RMSEA = 0.07, SRMR = 0.06 (see Table 1.3). Examination of modification indices suggested that an additional autoregressive path between T1 and T3 maternal supportiveness would significantly improve model fit. Substantively, adding this pathway to the model indicates that maternal supportiveness at T3 is related to the T1 maternal supportiveness above and beyond the change process of maternal supportiveness in early childhood (Little, 2013). Addition of this pathway to the model resulted in a model that provided fit indices that ranged from acceptable to good, $\chi^2(7) = 66.37$, $p < .01$, CFI = 0.96, RMSEA = 0.06, SRMR = 0.05 (see Table 1.3). Results of the chi-square difference test demonstrated that the stability model including the autoregressive pathway between T1 and T3 maternal supportiveness provided a better fit to the data, $\Delta \chi^2(1) = 51.79$, $p < .01$, which exceeds the critical chi-square difference value of $\Delta \chi^2(1) = 6.635$, $p < .01$. Based on the results of this chi-square difference test, the second stability model was retained. Figure 1.3 presents the model with standardized path coefficients.

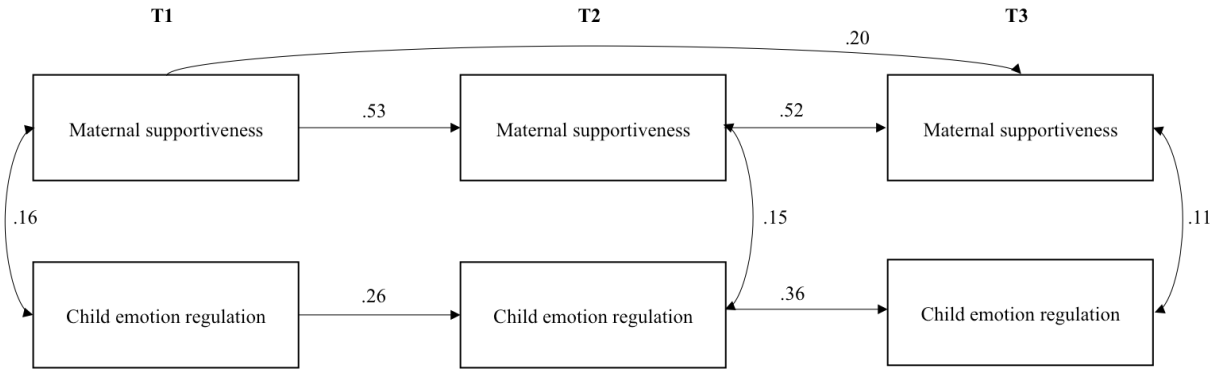

Figure 1.3 Stability model of maternal supportiveness and child emotion regulation.

Standardized path coefficients for maternal supportiveness demonstrated moderate stability from T1 to T3 (child age 14 months to 36 months) and were significant (T1 to T2: β = .53, p < .01; T2 to T3: β= .52, p < .01, and T1 to T3: β= .20, p < .01). For child emotion regulation, the autoregressive paths were significant and demonstrated low to moderate stability from T1 to T3 (T1 to T2: β = .26, p < .01; T2 to T3: β= .36, p < .01). Within-time nondirectional covariance paths demonstrated that maternal supportiveness was significantly associated with concurrent emotion regulation at T1 (β = .16, p <.01) , T2 (β = .15, p <.01) , and T3 (β = .11, p <.01). Collectively, maternal supportiveness demonstrated moderate stability between T1 and T3 (i.e., child ages 14 to 36 months) and child emotion regulation demonstrated low to moderate stability across early childhood.

Table 1.3
Model Fit and Model Comparisons for Stability and Cross-lagged Models
Note. Model 1 includes maternal supportiveness and child emotion regulation at T1, T2, and T3. Model 2 includes the HOME, maternal supportiveness, and child emotion regulation at T1, T2, and T3.
+ p < .10. * p < .05. ** p < .01.

Model	χ^2	***df***	$\Delta\chi^2$**(Δ *df*)**	**CFI**	**RMSEA**	**SRMR**
Stability model 1	118.16**	8		0.93	0.07	0.06
Stability model 1 adjusted	66.37**	7	51.71(1)**	0.96	0.06	0.05
Cross-lagged model 1	7.05	3	59.42(4)+	0.98	0.02	0.01
Stability model 2	428.08**	20		0.87	0.09	0.10
Stability model 2 adjusted	325.71**	19	102.37(1)**	0.90	0.08	0.09
Cross-lagged model 2	32.48**	7	293.23(12)**	0.99	0.04	0.02

Cross-lagged model for maternal supportiveness and child emotion regulation.

Results of the chi-square difference test demonstrated that the cross-lagged model provided a better fit to the data, as compared to the stability model, $\Delta \chi^2(4) = 59.32$, which exceeds the critical chi-square difference value of $\Delta \chi^2(4) = 13.28$, $p < .01$. The cross-lagged model for maternal supportiveness and child emotion regulation at T1, T2, and T3 provided a close fit to the data, $\chi^2 (3) = 7.05$, $p = .07$, CFI = 0.98, RMSEA = 0.02, SRMR = 0.01 (see Table 1.3). The results for the cross-lagged model were thus interpreted. Figure 1.4 presents the cross-lagged autoregressive model with standardized path coefficients.

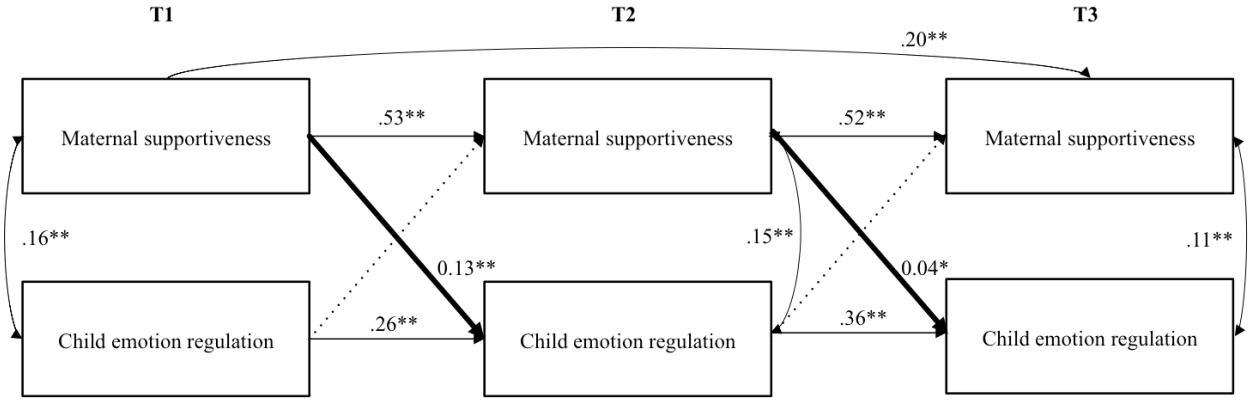

Figure 1.4 Cross-lagged model of maternal supportiveness and child emotion regulation. *Note:* Solid lines indicate significant non-directional covariance and autoregressive paths; bold lines indicate significant cross-lagged paths. T1 = Time 1 (child age 14 months), T2 = Time 2 (child age 24 months), T3 = Time 3 (child age 36 months).
* $p < .05$. ** $p < .01$.

All autoregressive paths for maternal supportiveness and child emotion regulation within the cross-lagged model were positive and significantly different from zero, demonstrating their stability over time. In addition, maternal supportiveness was significantly and positively associated with emotion regulation within each time point. The cross-lagged paths revealed that maternal supportiveness at T1 significantly predicted child emotion regulation at T2 ($\beta = 0.13$, $p < .01$), and maternal supportiveness at T2 significantly predicted child emotion regulation at T3

(β = 0.04, $p < .05$). However, child emotion regulation at T1 did not significantly predict maternal supportiveness at T2 (β = 0.02, p = .51), nor did child emotion regulation at T2 predict maternal supportiveness at T3 (β = 0.02, p = .45). In sum, the cross-lagged model supported the hypothesis that there is a significant longitudinal association between maternal supportiveness and child emotion regulation, net the stability in these constructs over time. However, the exploratory hypotheses regarding reciprocal effects between parent and child, and evidence of a developmental transaction between maternal supportiveness at T1, child emotion regulation at T2, and maternal supportiveness at T3, were not supported. This model accounted for 9.8% of the variance in T2 emotion regulation ($p < .01$), 13.6% of the variance in T3 emotion regulation ($p < .01$), 29.3% of the variance in T2 maternal supportiveness ($p < .01$), and 30.1% of the variance in T3 maternal supportiveness ($p < .01$).

Stability model for home environment, maternal supportiveness, and child emotion regulation. The stability model for the home environment, maternal supportiveness, and child emotion regulation (which included the aforementioned autoregressive path from T1 to T3 maternal supportiveness) at T1, T2, and T3 provided a poor to mediocre fit to the data, $\chi^2(20) = 428.08$, $p < .01$, CFI = 0.87, RMSEA = 0.09, SRMR = 0.10 (see Table 1.3). Examination of modification indices suggested that an additional autoregressive path between the T1 and T3 home environment would significantly improve model fit. Addition of this pathway to the model resulted in a model with mediocre fit, χ^2 (19) = 325.71, $p < .01$, CFI = 0.90, RMSEA = 0.08, SRMR = 0.09 (see Table 3). Results of the chi-square difference test demonstrated that the stability model including the autoregressive pathway between the T1 and T3 home environment provided a significantly better fit to the data, $\Delta \chi^2(1) = 102.37$, which exceeds the critical chi-

square difference value of $\Delta \chi^2(1) = 6.635$, $p < .01$. The second stability model was therefore retained. Figure 1.5 demonstrates this model with standardized path coefficients.

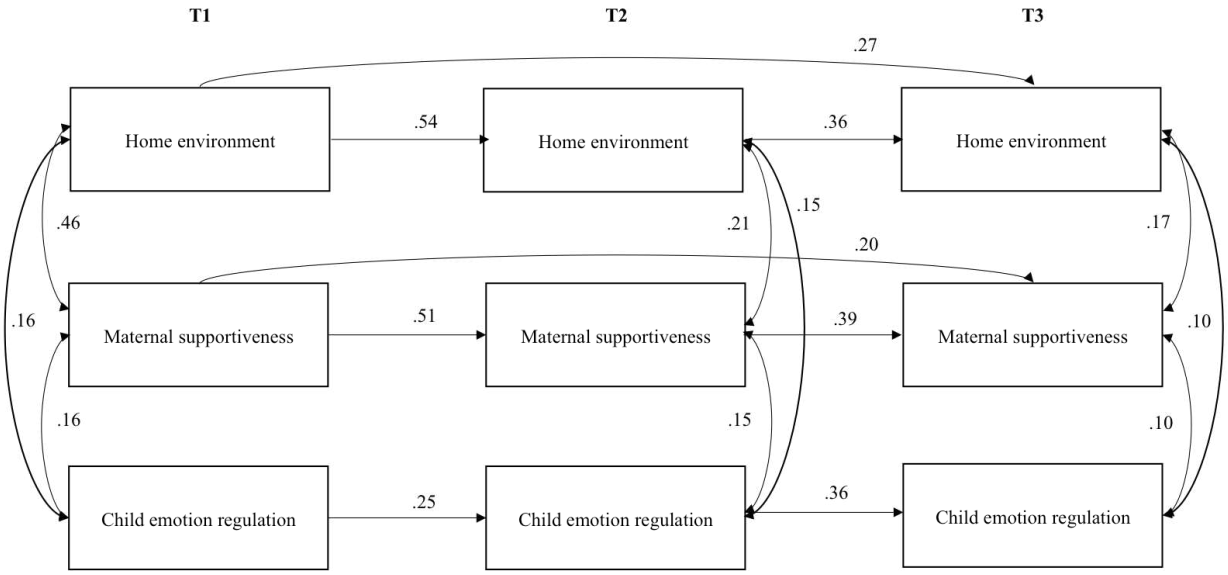

Figure 1.5 Stability model of the home environment, maternal supportiveness, and child emotion regulation. *Note.* T1 = Time 1 (child age 14 months), T2 = Time 2 (child age 24 months), T3 = Time 3 (child age 36 months).

Standardized path coefficients for the home environment demonstrated moderate stability from T1 to T3 (T1 to T2: $\beta = .54$, $p < .01$; T2 to T3: $\beta = .36$, $p < .01$; and T1 to T3: $\beta = .27$, $p < .01$). Similar to model 1, standardized parameter estimates demonstrated low to moderate stability for maternal supportiveness (T1 to T2: $\beta = .51$, $p < .01$; T2 to T3: $\beta = .39$, $p < .01$; and T1 to T3: $\beta = .20$, $p < .01$) and child emotion regulation (T1 to T2: $\beta = .25$, $p < .01$; T2 to T3: $\beta = .36$, $p < .01$). Within-time nondirectional covariance paths demonstrated that the home environment was significantly associated with maternal supportiveness (T1, $\beta = .46$, $p < .01$; T2 = $\beta = .21$, $p < .01$; and T3, $\beta = .17$, $p < .01$), and child emotion regulation (T1, $\beta = .16$, $p < .01$; T2, $\beta = .16$, $p < .01$; and T3, $\beta = .12$, $p < .01$). Similar to the first model, maternal supportiveness was associated with concurrent emotion regulation at T1 ($\beta = .16$, $p < .01$), T2 ($\beta = .15$, $p < .01$), and T3 ($\beta = .10$, $p < .01$). In sum, the home environment demonstrated moderate stability between T1

and T3, and was significantly associated with concurrent maternal supportiveness and child emotion regulation at each time point.

Cross-lagged model for home environment, maternal supportiveness, and child emotion regulation. The cross-lagged model for the home environment, maternal supportiveness and child emotion regulation at T1, T2, and T3 provided close fit to the data, χ^2 (7) = 32.48, $p < .01$, CFI = 0.99, RMSEA = 0.04, SRMR = 0.02 (see Table 1.3). Results of the chi-square difference test demonstrated that the cross-lagged model provided a significantly better fit to the data, $\Delta \chi^2(12) = 293.23$, $p < .01$, exceeding the critical chi-square difference value of $\Delta \chi^2(12) = 21.03$, $p < .01$. The results for the cross-lagged model were thus interpreted (see Figure 1.6). Table 1.4 depicts the standardized path coefficients with confidence intervals.

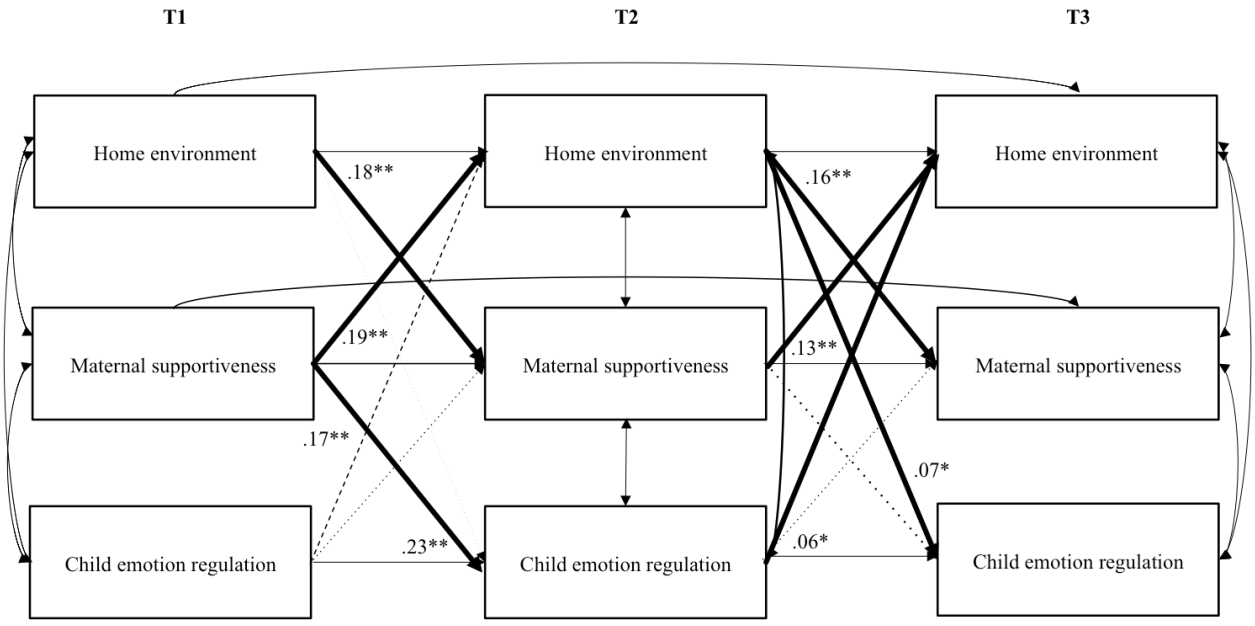

Figure 1.6 Cross-lagged model of the home environment, maternal supportiveness, and child emotion regulation. *Note.* Solid lines indicate significant non-directional covariance and autoregressive paths; bold lines indicate significant cross-lagged paths; dotted lines indicate non-significant paths; dashed lines indicate cross-lagged paths significant at the trend level. Only significant cross-lagged coefficients are displayed. T1 = Time 1 (child age 14 months), T2 = Time 2 (child age 24 months), T3 = Time 3 (child age 36 months).
* $p < .05$. ** $p < .01$.

Table 1.4
Parameter Estimates for Autoregressive and Cross-lagged Paths for the Home, Parenting, and Child Emotion Regulation Model
Note. B = standardized path coefficients; *CI* = confidence interval; *LL* = lower level; *UL* = upper level. Mat = maternal, Supp = supportiveness, ER = emotion regulation.
+ $p < .10$. * $p < .05$. ** $p < .01$.

Parameter	***B (SE)***	**95% *CI* [LL, UL]**
Construct Stability		
T1 Home -> T2 Home	.48 (.02)**	[.42, .53]
T2 Home -> T3 Home	.34 (.03)**	[.27, .40]
T1 Home -> T3 Home	.23 (.03)**	[.17, .30]
T1 Mat supp-> T2 Mat supp	.46 (.02)**	[.41, .52]
T2 Mat supp -> T3 Mat supp	.37 (.03)**	[.30, .44]
T1 Mat supp -> T3 Mat supp	.15 (.03)**	[.08, .22]
T1 Child ER -> T2 Child ER	.23 (.02)**	[.17, .29]
T2 Child ER -> T3 Child ER	.34 (.02)**	[.28, .41]
Crosslagged Paths		
T1 Home -> T2 Mat supp	.18 (.02)**	[.12, .24]
T1 Home -> T2 Child ER	.01 (.03)	[-.05, .08]
T1 Mat supp -> T2 Home	.19 (.02)**	[.13, .24]
T1 Mat supp -> T2 Child ER	.17 (.03)**	[.10, .23]
T1 Child ER -> T2 Home	.03 (.02)+	[-.02, .09]
T1 Child ER -> T2 Mat supp	.00 (.02)	[-.06, .05]
T2 Home -> T3 Mat supp	.16 (.03)**	[.10, .23]
T2 Home -> T3 Child ER	.07 (.03)*	[.003, .139]
T2 Mat supp -> T3 Home	.13 (.02)**	[.07, .19]
T2 Mat supp -> T3 Child ER	.02 (.03)	[-.05, .09]
T2 Child ER -> T3 Home	.06 (.02)*	[.01, .12]
T2 Child ER -> T3 Mat supp	.00 (.02)	[-.06, .06]

Consistent with the hypotheses, examination of the cross-lagged paths revealed a transactional pattern between maternal supportiveness and the home environment, such that a more nurturing home environment at T1 predicted higher levels of maternal supportiveness at T2, which in turn predicted a more nurturing rearing environment at T3. The opposite was also true, whereby more supportive parenting at T1 predicted a more nurturing environment at T2, which then predicted more supportive parenting at T3. Similar to the first cross-lagged model, T1 maternal supportiveness significantly predicted T2 emotion regulation. However, T2 maternal

supportiveness did not significantly predict T3 emotion regulation. Contrary to what was expected, the home environment at T1 did not significantly predict child emotion regulation at T2. Higher levels of child emotion regulation at T1 showed evidence of a trend in predicting a more nurturing home environment at T2, but the confidence interval for this parameter estimate contained zero; as a result, this pathway was not interpreted further (see Table 1.5). Bidirectional effects emerged between the home environment and child emotion regulation at T2 and T3, such that the T2 home environment significantly predicted T3 child emotion regulation, as predicted, and T2 child emotion regulation significantly predicted the T3 home environment, providing partial support for the evocative effects hypothesis. This model accounted for 9.7% of the variance in T2 emotion regulation ($p < .01$), 14% of the variance in T3 emotion regulation ($p < .01$), 32.1% of the variance in T2 maternal supportiveness ($p < .01$), 31.9% of the variance in T3 maternal supportiveness ($p < .01$), 34.7% of the variance in the T2 home environment ($p < .01$), and 35.1% of the variance in the T3 home environment ($p < .01$).

Discussion

This study provides partial support for a transactional model of young children's emotion regulation, maternal supportiveness, and the home environment across the first three years of life in a low-income, EHS-eligible sample. In the first model that depicted longitudinal transactions between maternal supportiveness and child emotion regulation, the results aligned with prior work that has established supportive parenting is positively and significantly associated with children's concurrent and later emotion regulation (Brophy-Herb et al., 2013; Fabes, Leonard, Kupanoff, & Martin, 2001; Raikes et al., 2007). Importantly, there was no evidence of the hypothesized reciprocal effects between parenting and child emotion regulation, nor did the data suggest a parent-driven transaction such that T1 maternal supportiveness predicted T2 child

emotion regulation, in turn predicting T3 maternal supportiveness. This contrasts with a recent study of young children that demonstrated a parent-driven transaction between observed maternal sensitivity at age 1, maternal-rated social competence at age 2, and maternal sensitivity at age 3 (Barnett et al., 2013). Small effect sizes for child emotion regulation echo earlier findings that used latent growth curve modeling to assess how growth in maternal supportiveness between child age 14 and 36 months was associated with growth in child ER, and suggest that other aspects of the child, parent, and environment may contribute to a child's emerging regulation (Brophy-Herb et al., 2013). In the first model, results indicate that across time, maternal supportiveness exerts a small yet significant contribution to subsequent child emotion regulation, independent of the child's regulatory abilities. Furthermore, these results were consistent across child sex, race/ethnicity, and program group, and did not vary when accounting for the child's cognitive developmental status, maternal depression, or child temperament.

Examination of the nature of maternal supportiveness and child emotion regulation in context involved modeling the reciprocal relations among the home environment, parenting, and child emotion regulation. In this three-tiered model, more maternal supportiveness at child age 14 months was significantly predictive of higher levels of child emotion regulation at age 2, but not from child age 2 to 3. Moreover, reciprocal relations between the home environment measure and child emotion regulation between age 2 and 3 indicated higher levels of emotion regulation at age 2 contribute to a more nurturing childrearing environment at age 3, and vice versa. These results suggest that observed maternal supportiveness during mother-child interaction was a better predictor of child emotion regulation at age 2, but the home environment measure at age 2 was a better predictor of child emotion regulation at age 3.

One possible explanation for the difference in significant predictors between each time point might be their developmental significance. In other words, as child regulation evolves from dyadic to increasingly self-oriented across the first three years (Calkins & Hill, 2007; Kopp, 1989), a dyadic assessment of maternal behavior close to child age 1 may be more salient to child emotion regulation at age 2, but by age 3, characteristics of the home environment, beyond the dyad, may emerge as a more salient form of support for the child's nascent regulatory skills. For example, the Infant Toddler HOME (IT-HOME) includes assessment of how the child's physical environment is structured, the types of materials available for the child to play with, and experiences with people other than the mother, in addition to looking at parent responsiveness and child discipline (Totsika & Sylva, 2004). Bradley and colleagues (1989) documented that at age 2, the correlation between the home environment measure and child cognitive developmental status was stronger than at age 1, a finding that seems applicable to the current study, which focused on emotion regulation. Bradley et al. (1989) assessed how the subscales of the HOME were related to cognitive development; parental involvement, availability of stimulating materials, and available experiences were moderately associated with child cognitive developmental status, and parental responsiveness demonstrated stronger correlations with child cognitive development across time, suggesting that different features of caregiving, the context in which this process takes place, and children's adjustment become more closely aligned, representing a more stable attractor state (Bradley, 2015). Different components of the home environment measure have been documented as significant longitudinal predictors of young children's social development (Bradley et al., 2001b), including attachment status (NICHD ECCRN, 2001), self-regulation (Nievar, Moske, Johnson, & Chen, 2014), and effortful control (Merz et al., 2014), a related yet distinct measure of a child's constitutionally-based regulation.

An alternative explanation for the significant reciprocal relations between the home environment and child emotion regulation (versus maternal supportiveness and child emotion regulation) involves the measurement of the home and parenting. Maternal supportiveness involved an observation of mother's sensitivity, cognitive stimulation, and positive regard during a semi-structured interaction with the child, and the home environment included an independent observation of parental emotional support and involvement with the child, in addition to the aforementioned cognitive and social provisions. Thus, there was some shared variance between the two measures, which was reflected in their moderate within-time covariance and significant cross-lagged relations.

Yet, a previous cross-lagged panel analysis of different subscales of the home environment and children's cognitive development indicated that higher cognitive development scores, as measured by the Bayley Mental Development Index, were significantly predictive of more maternal involvement and cognitive stimulation in the home environment between child age 6 months to 2 years, and more maternal involvement was significantly associated with higher cognitive development scores between 12 and 24 months (Bradley et al., 1979). Although the current study does not include cognitive status as an outcome measure, emotion regulation was measured in the context of the same Bayley assessment used to evaluate the child's cognitive status (BSID-II; Bayley, 1993). The results of the current study indicate that the home environment beyond mother-child interaction at age 2 is more informative (compared to the measure of observed maternal supportiveness) in understanding the development of young children's emotion regulation at age 3. Furthermore, there was also a significant child-driven path between age 2 emotion regulation and the age 3 home environment, highlighting the child's contributions to a nurturing childrearing environment, converging with earlier results that

revealed significant pathways between child developmental status and the same home environment measure. Taken together, these results suggest the importance of considering the child's contributions to parent-child interactions and the larger context in which this unfolds, supporting recent work that has documented both parent and child-directed pathways between child regulatory abilities and parent-child reciprocity across early childhood (Feldman, 2015).

Barnett et al.'s (2012) findings of a parent-driven transaction between maternal sensitivity and toddler's social adjustment provide an important basis of comparison for the current study in a few notable ways. First, their study included an observed measure of maternal sensitivity, which was similar to the current study's measure of observed maternal supportiveness. This could account for the similar finding of a significant longitudinal association between early maternal supportiveness and child emotion regulation, which is well documented in the literature (e.g., Ayoub, Vallotton, & Mastergeorge, 2011; Brophy-Herb et al., 2013). In contrast, the current study did not find evidence of a cross-lagged association between child ER at age 2 and maternal supportiveness at age 3. Barnett and colleagues (2012) measured child social adjustment with maternal report, whereas the current study included an observed measure of child emotion regulation. It is possible that mothers who reported their children as more socially competent were more likely to interact with them in sensitive ways, thus promoting the significant parent-driven transaction. Although the discrepancies in measurement could account for the divergent findings, a parent-driven transaction has previously been detected using observational methods to assess both child emotion regulation and parent-child interaction (Feldman, 2015). Nevertheless, the addition of the home environment to the second set of models adds a layer of complexity to parent-child interactions and child emotion regulation that the previously mentioned studies did not examine. It should be noted that further exploration

of the components of the home environment in relation to different aspects of toddler's adjustment is prudent for enhancing interpretation of the current model. Nonetheless, the current study extends prior work by examining child, parenting, and home environment variables in the same model at multiple time points, providing an explicit test of the Person-Process-Context-Time model that has so rarely been explicitly evaluated in the literature (Bronfrenbrenner & Morris, 2006).

Taken together, the significant bidirectional pathways in the current study support a transactional perspective on development (Sameroff, 2009) and extend current empirical evidence by highlighting the simultaneous contributions of the home environment and the child to ontogeny. The emergence of these bidirectional associations beginning at child age 2 are consistent with prior work that emphasizes the weight of parent- and child-driven effects during times of developmental transition (e.g., Feldman, 2015; Gross, Shaw, & Moilanen, 2008). Although the effect sizes for emotion regulation were small, these results align with extant research that has documented small but significant relations between different components of the home environment and young children's social and cognitive skills (Bradley et al., 2001b; Bradley, 2013; Chazan-Cohen et al., 2009; Fuligni, Han, & Brooks-Gunn, 2004). In addition, the moderate effect sizes for parenting and the home environment are reflective of the relative stability in these microsystem variables over time (Bradley, 2013; Bradley et al., 2001; Dallaire & Weinraub, 2005). These effect sizes have important implications for interventions (such as Early Head Start) that seek to modify the relevant contextual factors and processes that wield a stable, enduring pressure on the developing organism. These results were also applicable across relevant subgroups, including child sex, race/ethnicity, and program group.

Limitations

Despite the methodological and theoretical strengths of the current investigation, there are several limitations. The measurement of child emotion regulation, a multidimensional construct (Cole et al., 2004), was limited to one specific laboratory context. Future research would do well to assess emotion regulation using multiple measures that permit modeling of child self-regulation as a latent factor, providing the advantage of enhanced reliability (Little, 2013). The measurement of both maternal supportiveness and the home environment included assessments of parent-child interaction, and thus may not have provided a clear picture of the variance unique to the home environment separate from parent-child interaction that relates to child emotion regulation (and vice versa) in the first few years of life. The HOME environment inventory (Bradley & Caldwell, 1984) assesses diverse aspects of the child's social and inanimate environment. However, there may be other aspects of the home environment that are more or less salient for children depending on their individual characteristics, such as disability status. For example, research in the occupational therapy literature highlights the significance of parents' perceived supports and barriers in the home environment for children's adjustment, especially when their child has a developmental delay or disability (Law et al., 2013). As previously mentioned, prior work with this dataset has documented that 64% of the sample met the criterion for developmental delay (a Bayley MDI score below 77, 1.5 *SDs* below the mean; Peterson et al., 2004). Thus, future work that investigates the relations between the home environment and child developmental outcomes with this sample would do well to include measures of the home environment that are sensitive to the unique needs' of families of children with developmental delay and/or disabilities.

The current study also focused on mothers' supportive parenting as a context for children's developing emotion regulation. Fathers, as well as mothers, are important agents of socialization for child development, and their supportiveness may potentially demonstrate different relations with child emotion regulation across time in early childhood (e.g., Cabrera, Shannon, & Tamis-Lemonda, 2007; Lamb, 2004). Furthermore, there are multiple dimensions of parenting that may be considered in relation to the development of child emotion regulation, and future research that examines this model with harsh parenting will contribute to the ample body of research that has looked at coercive cycles in early childhood (Combs-Ronto, Olson, Lunkenheimer, & Sameroff, 2009; Keenan & Shaw, 1995; Scaramella & Leve, 2004; Scaramella, Neppl, Ontai, & Conger, 2008). Finally, this model was evaluated in a large sample of low-income, EHS-eligible children. It is unclear whether this model would be replicated in a sample of young children from a broader range of socioeconomic backgrounds. However, the models presented here were grounded in theory and evidenced good model fit, suggesting meaningful relations among the home environment, maternal supportiveness, and low-income children's emotion regulation in the first few years of life.

Conclusion

The use of a longitudinal cross-lagged panel design to model the reciprocal relations among the home environment, maternal supportiveness, and child emotion regulation provided a methodologically rigorous evaluation of the Person-Process-Context-Time model as it applies to a large sample of low-income toddlers' emotion regulation. This is important for honing existing models of the development of young children's emotion regulation, a foundational piece of school readiness. Furthermore, the current study addresses existing gaps in the literature with this dataset that has explored the longitudinal relations between maternal supportiveness and child

ER by providing evidence of the direction of associations among the home environment, parenting, and child emotion regulation across time points, including predictive associations from child emotion regulation to parenting and the home environment (Bockneck et al., 2009; Brophy-Herb et al., 2013). Results suggest the need for continued dialogue and careful consideration of the measures used to assess different aspects of parenting and the home environment in understanding social-emotional development. In addition, toddlerhood is an important time in the development of social-emotional skills, with evidence from a few different studies now showcasing the emergence of child-directed pathways at age 2 in transactional models.

CHAPTER III - DIFFERENTIAL SENSITIVITY TO PARENTING AND DEPRESSION? MICROSYSTEMIC TRANSACTIONS AND TODDLER'S EXTERNALIZING BEHAVIORS

From a bioecological perspective (Bronfrenbrenner & Morris, 2006), and in particular, the Person-Process-Context-Time model, individual characteristics contribute to the nature of parent-child interactions, especially during infancy and toddlerhood. The relative contribution of these proximal processes to development likely varies as a function of individual characteristics (Bronfrenbrenner & Morris, 2006). An individual disposition variable that has received considerable attention in the developmental literature is child temperament (Bates, 2012; Bates, Schermerhorn, & Petersen, 2012; Rothbart & Bates, 2006; Sanson, Hemphill, & Smart, 2004), defined as "constitutionally based individual differences in emotional, motor, and attentional reactivity and self-regulation" (Rothbart & Bates, 2006, p. 109). These characteristics present themselves early in life and describe children's behavioral styles across contexts (Rothbart & Bates, 2006; Sanson et al., 2004; Thomas, Chess, Birch, Hertzig, & Korn, 1963), and demonstrate increasing stability across time in early childhood (Lemery, Goldsmith, Klinnert, & Mrazek, 1999).

Much of the research in this area has utilized Thomas and Chess's broad categorization of easy versus difficult temperament for conceptualizing how temperament relates to development (Sanson et al., 2004). Children with difficult temperaments are often described as demonstrating higher levels of negative emotionality, referring to a greater disposition towards more intense and dysregulated negative affective responses (Belsky, Bakermans-Kranenberg, & van IJzendoorn, 2007; Kim & Kochanska, 2012; Sanson et al., 2004). On the other hand, children with easy temperaments are often characterized as being more adaptable and well-regulated in

their moods and behaviors. Developmental theory and research proposes that these biologically based differences in reactivity and regulation manifest themselves in young children's behaviors, which in turn elicit certain parenting behaviors (Collins et al., 2000; Kiff, Lengua, & Zalewski, 2011; Putnam, Sanson, & Rothbart, 2002; Rothbart & Bates, 2006; Scarr & McCartney, 1983). In the same vein, caregiving behaviors shape how children's temperament is expressed behaviorally. Thus, it follows that if the developmental significance of child temperament is considered, not all proximal processes necessarily influence children's adjustment in the same way.

Recent work has focused on illuminating heterogeneity in developmental pathways with an eye towards child temperament as a moderator of the link between parenting and child adjustment. Across studies, a significant interaction between child negative emotionality and maternal sensitivity on child externalizing behaviors has been most consistent, with children manifesting higher levels of negative emotionality especially sensitive to variations in parental sensitivity (Belsky, Hsieh, & Crnic, 1998; Bradley & Corwyn, 2008; Gallitto, 2015; Mesman et al., 2009; Pluess & Belsky, 2010; Stright, Gallagher, & Kelley, 2008). In addition, these same children may also be more sensitive to early maternal depressive symptoms, which translates to poorer social-emotional adjustment at age 3 (Dix & Yan, 2014). The current study seeks to advance current understanding of the link between child negative emotionality, sensitive parenting, maternal depression, and child adjustment by evaluating temperament as a moderator, and parenting and toddler adjustment as a mediator, in one integrated, transactional model using a low-income sample.

Temperament, Parenting, and Social-Emotional Adjustment

Two theoretical frameworks that have guided research on temperament-by-environment interactions are diathesis stress (Monroe & Simons, 1991; Sameroff, 2000; Zuckerman, 1999) and differential susceptibility (Belsky, 1997; Belsky et al., 2007; Roisman et al., 2012). A diathesis stress model explicates the temperamental characteristics of negative emotionality as a vulnerability or risk factor for the development of future psychopathology, whereby children high in negative emotionality demonstrate a greater likelihood or diathesis for poor adjustment in the context of adverse caregiving environments, compared to children who demonstrate lower levels of negative emotionality. Belsky and colleagues (1997; 2007) extended this model to delineate differential plasticity (versus vulnerability) for conceptualizing how individual differences in temperament may operate. According to this differential susceptibility framework, temperamentally difficult children show not only worse outcomes in harsh caregiving contexts, but social-emotional adjustment at a level that exceeds the adjustment of children with easy temperaments in supportive caregiving contexts. The underlying mechanism may be an inherent child vulnerability, such that children with higher levels of negative emotionality are more sensitive to contextual variations because they possess more reactive stress response systems (Belsky & Pluess, 2009; Boyce & Ellis, 2005; Ellis & Boyce, 2008). In essence, diathesis stress describes negative emotionality as a *risk factor* while differential susceptibility models characterize negative emotionality as a *plasticity factor*, whereby children's adjustment to environmental conditions unfolds in a "for better or for worse" fashion (Belsky et al., 2007; Belsky & Pluess, 2009).

The interaction between difficult child temperament and maternal sensitivity has emerged as especially relevant in the prediction of later externalizing behavior problems. For example,

structural equation models used to assess the interaction between early sensitive and harsh parenting and young children's internalizing and externalizing behaviors revealed that only difficult child temperament and sensitive parenting demonstrated a significant interaction in the prediction of child internalizing and externalizing behaviors at age 6 (Gallitto, 2015). Fitting with a diathesis stress framework, children with higher levels of difficult temperament demonstrated more behavior problems in the context of insensitive parenting, and less behavior problems (yet still at a level comparable to children with easy temperaments) in the context of responsive parenting. Using the NICHD SECCYD data, Bradley and Corwyn (2008) found evidence of differential susceptibility. For children higher in maternal-rated negative emotionality during infancy, higher maternal sensitivity (but not harsh parenting) was significantly predictive of lower levels of teacher-reported behavior problems in first grade. Less maternal sensitivity was significantly predictive of higher levels of first grade externalizing behaviors. Moreover, results suggested differential susceptibility; children with difficult temperaments had the lowest levels of externalizing behaviors in first grade when they experienced high maternal sensitivity, even compared to children with average or easy temperaments. Results from latent growth curve analyses revealed that maternal sensitivity only emerged as a significant predictor of decreases in young children's externalizing behaviors between ages 2 and 5 for children with difficult temperaments, but not easy temperaments (Mesman et al., 2009).

Kochanska and Kim (2013) investigated the relations among temperament, parenting, and social-emotional adjustment in a low-income sample of young children from 30-40 months of age. For children with difficult temperaments, maternal responsiveness at 30 months was significantly predictive of higher levels of compliance and fewer externalizing behaviors at 40

months, whereas insensitive maternal behavior was predictive of poor adjustment at 40 months. Although there was not a significant relation between maternal responsiveness and adjustment for children with easy temperaments, it is noteworthy that children considered to be temperamentally difficult did not outperform children with easy temperaments when they had experienced highly responsive maternal behavior, thus reflecting diathesis-stress. Kochanska and Kim (2013) speculated that, for low-income families and children, positive caregiving may be protective for children with difficult temperaments to some extent, but may not be enough to offset the risks for poorer social emotional adjustment - compared to children possessing easy temperaments - associated with living in poverty.

In sum, these results establish empirical evidence for differential sensitivity to parenting, whereby temperamentally difficult children may be more susceptible to variations in maternal sensitivity and responsiveness, with the positive end of this spectrum in maternal behavior conferring benefits for children with difficult temperaments and the negative end of the spectrum hampering these children's adjustment. Still, it is unclear whether or not low-income children considered to be temperamentally difficult demonstrate social-emotional adjustment that comparatively exceeds their peers when they receive more sensitive parenting. To wit, it may be that low-income, temperamentally difficult children show more positive adjustment in the context of responsive parenting, but not enough to offset the risks associated with poverty or cumulative risk (Kochanska & Kim, 2013), an intriguing proposition that is addressed by the current study.

Maternal Depressive Symptoms, Parenting, and Behavioral Adjustment

Higher levels of maternal depression in early childhood connote risk for young children's behavioral adjustment (Cummings & Davies, 1994; Goodman & Gottlib, Goodman et al., 2011;

Luoma et al., 2011). One theoretically and empirically supported mechanism of the linkage between depression and young children's behavior problems is parenting (for review, see Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Goodman & Gottlib, 1999), whereby depressed parents demonstrate lower levels of sensitivity and contingent responsiveness, and higher levels of intrusiveness, negative affect, and coercive behavior, which in turn predicts child behavior problems. In addition, some have proposed that behavior problems, parenting, and maternal depressive symptoms act as mutually sustaining processes in development (Elgar, McGrath, Waschbusch, Stewart, & Curtis, 2004). Researchers have begun to successfully employ transactional modeling frameworks, revealing evidence that higher levels of child externalizing behaviors at age 3 predict subsequent maternal depressive symptoms at age 4 (Ciciolla, Gerstein, & Crnic, 2014; Garstein & Sheeber, 2004). In a sample of toddlers, there were significant cross-lagged associations from child behavior problems at earlier time points to subsequent parenting support, control, and disciplinary strategies, but not the opposite (Verhoeven, Junger, van Aken, Dekovic, & van Aken, 2010). Above the age of 4, research shows reciprocal relations between maternal depressive symptoms and child behavior problems over time, whereby maternal depression predicts child behavior problems at the next time point, and vice versa (Bagner, Pettit, Lewinsohn, Seeley, & Jaccard, 2013; Elgar, Curtis, McGrath, Waschbusch, & Stewart, 2003; Gross, Shaw, & Moilanen, 2008). This growing body of evidence supports a transactional model of the relations between maternal and child adjustment across time. Despite these advances in our understanding of parent-child relationships, depression, and behavior problems, less is known about how child temperament plays a role in these transactions.

Differential Sensitivity to Depression and Parenting

Researchers have started to utilize differential sensitivity frameworks for conceptualizing individual differences in how maternal depressive symptoms are linked to social-emotional adjustment in early childhood (Dix & Yan, 2014; Owens & Shaw, 2003). Using data from the NICHD Study of Early Child Care, Dix and Yan (2014) found support for differential susceptibility to maternal depressive symptoms; children high in negative emotionality were more likely to demonstrate behavior problems and less social competence at age 3 in the context of higher levels of maternal depressive symptoms. When maternal depressive symptoms were low, these children were less likely than children low in negative emotionality to demonstrate behavior problems, showing a "for better or for worse" pattern of adjustment in association with maternal depression (Dix & Yan, 2014). Owen and Shaw (2003) found a meaningful interaction between young children's negative emotionality and maternal depressive symptoms. High negative emotionality in the context of lower levels of depressive symptoms predicted significant decreases in children's externalizing behavior over time, whereas low negative emotionality in the context of high maternal depressive symptoms was associated with decreases in externalizing over time. They interpreted their findings to suggest that negative emotionality may be less salient for children's externalizing behaviors under conditions of typical parenting across time in childhood (Owen & Shaw, 2003). These results imply that when parenting is compromised by maladjustment, such as depression, child negative emotionality may be a key individual difference variable in understanding young children's externalizing behaviors. More research is needed to corroborate this idea.

Research Questions and Hypotheses

A central goal of the current study was to evaluate a transactional model of maternal depressive symptoms, parenting, and young children's externalizing behaviors, considering how young children's negative emotionality plays a role in these processes (see Figures 2.1 – 2.3). Moreover, tests of longitudinal moderation between children's negative emotionality, supportive parenting, and maternal depressive symptoms were conducted to evaluate differential susceptibility versus diathesis-stress models of adjustment in a large, low-income sample of EHS-eligible families. An important context for understanding maternal depressive symptoms is poverty (Lanzi, Pascoe, Keltner, & Ramey, 1999; Loeb, Fuller, Kagan, & Carroll, 2004), and future research using such samples is crucial for improving understanding of how maternal depression and child adjustment are reciprocally related across time (Malik et al., 2007). This is a notable contribution to the extant literature, given that the majority of studies have used summative early experience scores in the context of linear regression analyses (Bradley & Corwyn, 2008; Dix & Yan, 2014; Kim & Kochanska, 2012; Kochanska & Kim, 2013; Pluess & Belsky, 2009), or in one case, a structural equation model limited to two time points, to evaluate differential susceptibility versus diathesis stress and young children's adjustment (Gallitto, 2015). Latent growth curve methods have permitted evaluating questions of differential sensitivity to variations in externalizing behavior trajectories in early childhood (Mesman et al., 2009; Owen & Shaw, 2003), but a paucity of research exists that has addressed the *direction* of relations among these variables across multiple time points. Thus, the current cross-lagged panel analytic framework reflects a more dynamic view of the interplay among child temperament, maternal depressive symptoms, parenting, and children's externalizing behaviors in early childhood. Empirically evaluating the Person-Process-Context-Time model with these variables

permits the fine-tuning of existing models for the intergenerational transmission of risk between maternal psychopathology and child maladjustment (Goodman & Gottlib, 1999).

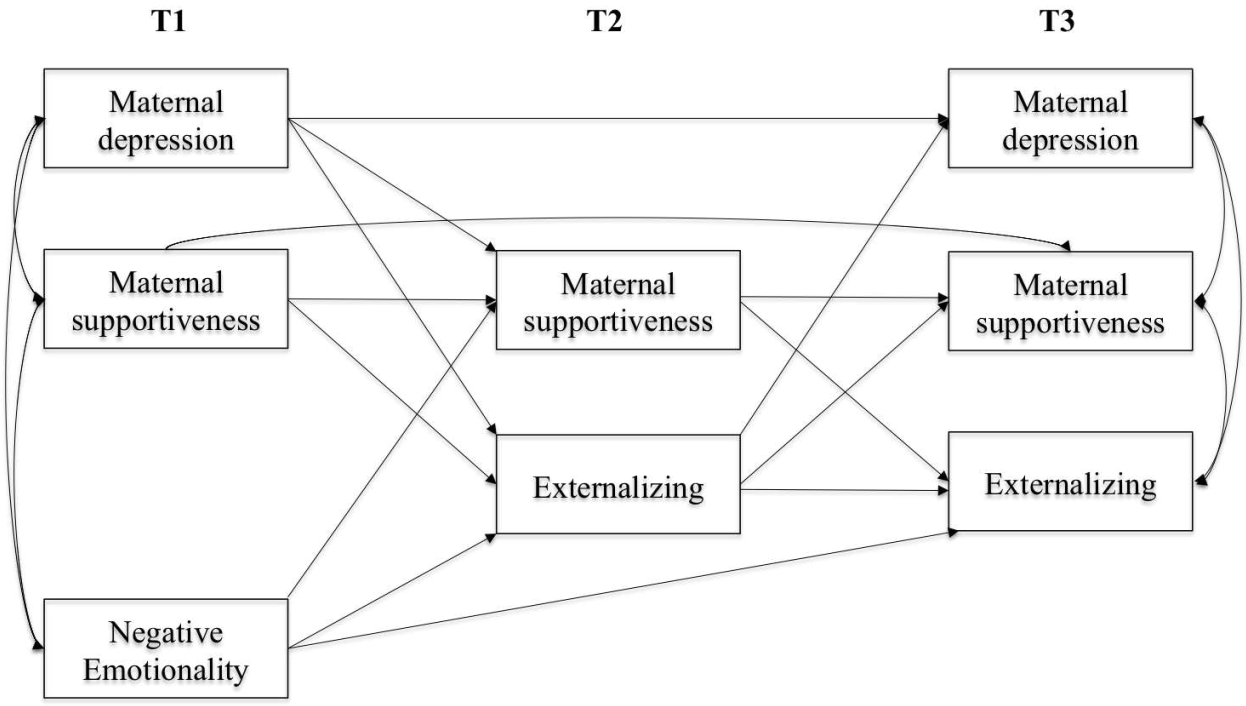

Figure 2.1 Saturated model of the hypothesized relations among maternal depressive symptoms, maternal supportiveness and child negative emotionality. *Note.* T1 = Time 1, T2 = Time 2, T3 = Time 3.

First, the stability of maternal depressive symptoms, maternal supportiveness, and child behavior problems was examined between child ages 14 to 36 months. I hypothesized significant associations for each variable with itself across each time point, and between 14-month and 36-month maternal supportiveness over time, demonstrating relative stability across time. Next, cross-lagged associations between maternal depressive symptoms at 14 and 36 months and child externalizing behaviors at 24 and 36 months were examined. I hypothesized that maternal depressive symptoms at 14 months predicts child externalizing behaviors at 24 and 36 months, and that child behavior problems at 24 months predicts maternal depressive symptoms at 36 months. I also hypothesized a significant parent-driven transaction between higher levels of 14-

month maternal depressive symptoms and 24-month child externalizing behaviors, which in turn predicts higher levels of maternal depressive symptoms at 36 months.

Cross-lagged paths between maternal supportiveness at 14 and 24-months and child externalizing behaviors at 24 and 36-months were examined, as I expected that lower levels of maternal supportiveness at an earlier time point is associated with more externalizing behavior at the next time point. I also specified a path between T2 child externalizing and T3 maternal supportiveness, hypothesizing that more externalizing behaviors would significantly predict less supportive parenting in the next time point. Cross-lagged associations between 14-month child negative emotionality and child behavior problems were also estimated to test the hypothesis that 14-month child negative emotionality predicts both 24 and 36-month externalizing behaviors. I also hypothesized that child negative emotionality predicts 24-month maternal supportiveness.

Mediation hypotheses involved evaluating maternal supportiveness at 24 months as a mediator of the hypothesized relation between 14-month maternal depressive symptoms and 36-month child externalizing behavior. I expected that higher levels of maternal depressive symptoms at T1 would be associated with lower levels of maternal supportiveness at T2, which in turn would be associated with higher levels of child externalizing behavior at T3. Child externalizing at 24 months was evaluated as a mediator of the relation between 14-month child negative emotionality and maternal depressive symptoms at 36 months. In keeping with an evocative effects model of development (Scarr & McCartney, 1983), I hypothesized that higher levels of child negative emotionality at T1 would be associated with higher levels of externalizing behavior at T2, which in turn would predict higher levels of maternal depressive symptoms at T3.

To evaluate individual differences in the associations between maternal psychopathology and parenting and child behavior problems, child negative emotionality was examined as a moderator of maternal supportiveness on child externalizing behavior, and as a moderator of maternal depressive symptoms on child externalizing behavior (see Figure 2.2 & 2.3). I hypothesized maternal supportiveness at 14 and 24 months is associated with less externalizing behaviors at 24 and 36 months, especially for children with higher levels of negative emotionality. In accord with previous research on difficult temperament as a moderator in low-income samples (e.g., Kochanska & Kim, 2013), I anticipated children with higher levels of negative emotionality would evidence less behavior problems in the context of more maternal supportiveness, but behavior problems at levels comparable to children with less negative emotionality in the context of less maternal support, supporting a diathesis-stress framework. Similarly, I evaluated whether higher levels of maternal depressive symptoms at 14 months were associated with more externalizing behaviors at 24 and 36 months, and whether this relation is stronger for children with a more difficult temperament (see Figure 2.3). I hypothesized that children with higher levels of negative emotionality demonstrate higher levels of behavior problems in the context of higher levels of maternal depressive symptoms, and included an exploratory hypothesis that these children demonstrate significantly less behavior problems in the context of lower levels of maternal depressive symptoms, compared to children with easier temperaments, thus supporting a differential susceptibility framework.

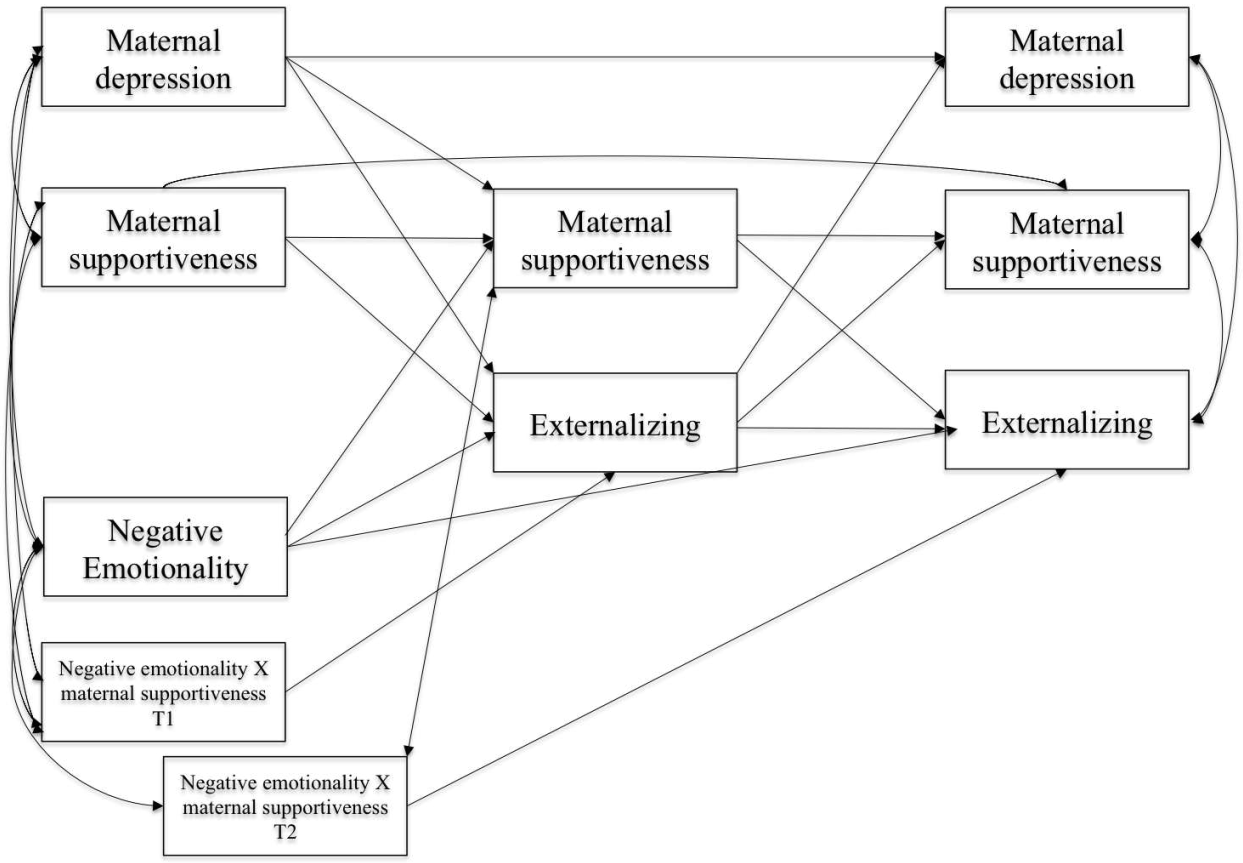

Figure 2.2 Saturated model of the hypothesized relations among maternal depressive symptoms, maternal supportiveness, child externalizing behaviors, and child negative emotionality, including the interaction term between child negative emotionality and maternal supportiveness at T1 and T2. *Note.* T1 = Time 1, T2 = Time 2, T3 = Time 3.

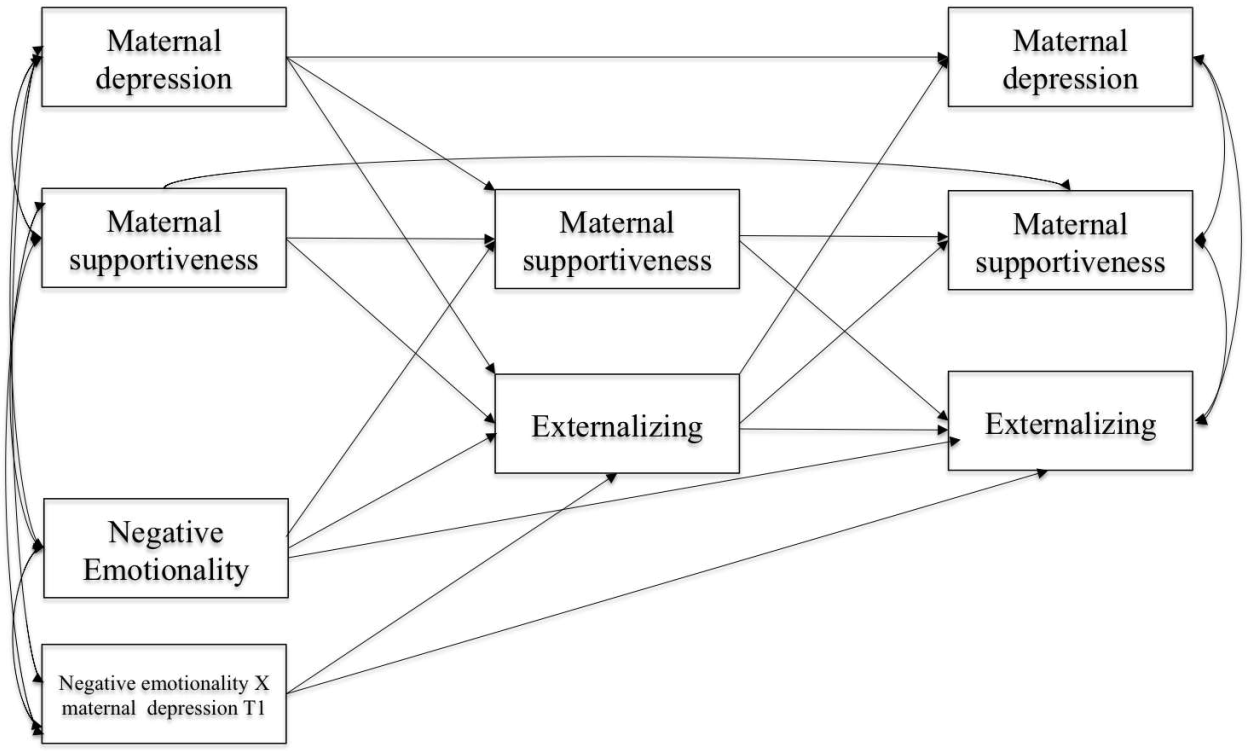

Figure 2.3 Saturated model of the hypothesized relations among maternal depressive symptoms, maternal supportiveness, child externalizing behaviors, and child negative emotionality, including the interaction term between child negative emotionality and maternal depression at T1. *Note.* T1 = Time 1, T2 = Time 2, T3 = Time 3.

Method

Participants

In 1995 and 1996, 17 of the first funded EHS programs were selected to be a part of the national evaluation study (i.e., EHSREP; Administration for Children and Families, 2002a). Pregnant women or families with a child aged 12 months or younger were eligible to participate if they had an income at or below the poverty level. Eligible families (N = 3,001) were randomly assigned to a program or control group (Program N = 1,513; Control N = 1,488). Program participants could choose one of three options for receiving EHS services: home, center, or a combination of home and center-based services, based on their needs. Control group families did not receive EHS services but had access to other available community resources.

The EHSREP is a publically available dataset through the Child Care and Early Education *Research Connections* project. This dataset contains longitudinal childcare, family, and child data that were collected from 1996 through 2001. The sample was ethnically and racially diverse, with 34% African American, 24% Latino, 37% White, and 5% of families identified as another race/ethnicity. Children were less than 12 months old at the time of their family's enrollment in the study. Data were collected at several points from the time families were randomly assigned to program or control groups until completion of the program (i.e., at child age 3), as well as at long-term follow-ups when children were in prekindergarten and fifth grade. Data were collected through parent services interviews around 6, 15, and 26 months after the family was randomly assigned to the program or control group. Parent interviews, child assessments, videotaped parent-child interactions, and observations of early child care settings were completed around the child's 14-, 24-, and 36-month birthdays.

Earlier evaluations of the program documented a decrease in response rates over time (Administration for Children & Families, 2002a), which is typical with longitudinal research. At the parent interview completed at approximately child ages 14, 24, and 36 months, the response rate was 78%, 72% and 70%. For the parent-child video assessment at child age 14 months, the response rate was 66%. At 36 months, the response rate was approximately 55%. Response rates were similar across the program and control groups, but did differ according to level of education, welfare receipt, and employment status at random assignment. There were also some differences in response rates to certain types of measures based on the family's identified race/ethnicity. The same families tended to consistently respond across time points (Administration for Children & Families, 2002a). Table 2.1 presents descriptive information for the key study variables at each time point.

Table 2.1
Valid N, Means, Variance, and Skewness of Maternal Depressive Symptoms, Parenting, Child Behavior Problems, and Child Temperament Variables

Variable	***N***	***M***	***Variance***	***Skewness***
T1 Maternal depressive symptoms	2299	8.78	46.32	1.15
T3 Maternal depressive symptoms	2095	7.72	48.92	1.32
T1 Maternal supportiveness	1956	3.94	1.12	-0.07
T2 Maternal supportiveness	1793	3.98	1.05	-0.13
T3 Maternal supportiveness	1658	3.92	0.86	-0.11
T2 Child externalizing behavior	2102	12.62	45.71	0.53
T3 Child externalizing behavior	2031	11.08	41.87	0.69
T1 Child negative emotionality	2334	2.96	0.90	0.18

Measures

Maternal depressive symptoms. At child age 14 and 36 months (T1 and T3), mothers self-reported their depressive symptoms based on the CES-D short form (CESD-SF; Ross, Mirowsky, & Huber, 1983). The short form includes 12 items from the 20-item full measure that asks about the number of different depressive symptoms the mother experienced in the past week, on a four-point scale from 0 (*rarely or none of the time; less than one day over the past week)* to 3 (*most or all of the time (5-7 days)*. Example items include ("During the past week,") "I felt sad," "I felt that people dislike me," and "I thought my life had been a failure." A summed composite was created; higher scores indicated higher levels of depressed symptoms. Authors of the measure documented good reliability for the CES-D, $\alpha = .85$ (Radloff, 1977). Reliability in the EHSRE sample was more or less comparable with $\alpha = .77$ for the full CES-D scale at 14

months (Berlin et al., 2009) and α = .88 at 36 months (Administration for Children and Families, 2002).

Maternal supportiveness. At child age 14, 24, and 36 months, mothers' supportiveness was observed in the context of a 10-minute videotaped parent-child interaction called the Three Bag Task (NICHD ECCRN 1997, 1999). A coding team at Columbia University observed the task and rated child and parent behaviors accordingly, meeting 85% interrater reliability requirements (see Ware, Brady, O'Brien, & Berlin, 1998). The task was structured so that the parent and child received three bags of toys and were asked to play together with the toys in the order that the bags were presented. In the EHSREP dataset, supportiveness is a composite score based on observers' ratings for three highly interrelated subscales (r = .52 - .67 at 24 months; r = .50 - .71 at 36 months); parent sensitivity (mother is attuned to and appropriately responsive to child's signals), cognitive stimulation (mother evinced appropriate teaching behaviors), and positive regard (expressions of love and positive affect towards the child). The ratings for this measure are based on a seven-point scale, from 7 (*very high)* to 1 (*very low)* supportiveness. As other studies exploring the links between parenting and child outcomes in EHSRE have done (e.g., Brophy-Herb, Zajicek-Farber, Bockneck, McKelvey, & Stansbury, 2013; Chazan-Cohen et al, 2009), the current study will use the parent supportiveness variable at child age 14, 24, and 36 months as an indicator of mothers' sensitive caregiving at each time point.

Child temperament. At child age 14 months, mothers completed the emotionality subscale of the Emotionality, Activity, Sociability, and Impulsivity Temperament Survey for Children (EASI; Buss & Plomin, 1984). Mothers responded to five questions from the emotionality subscale on a scale of 1 to 5; a composite score was created from the average across five items. An example item is, "He/she cries easily." A higher score indicates higher levels of

negative emotionality. This measure has successfully been used in other studies of EHS as an index of a child's fussy, difficult temperament (e.g., Berlin, 2009; Bocknek, Brophy-Herb, & Banerjee, 2009). Berlin and colleagues (2009) documented adequate reliability for the EHSRE sample (α = .72).

Child externalizing behavior problems. At child age 24 and 36 months, mothers completed the 19-item Aggressive subscale of the Child Behavior Checklist (ASEBA CBCL Ages 1 ½ - 5; Achenback & Rescorla, 2000). Mothers were asked to report on the frequency of different types of aggressive behavior problems on a scale of 0 *(never)*, 1 (*sometimes*), or 2 *(often)*. Total scores were summed, and a higher score indicated higher levels of aggressive behavior problems. Example items include, "Child is easily frustrated" and "Child hits others" (Administration for Children and Families, 2002). Internal consistency reliability was reported to be α = .91 at 24 months and α = .88 at 36 months for the full EHSRE sample (Administration for Children and Families, 2002).

Plan of Analysis

Analyses examined the transactional relations among maternal depressive symptoms, maternal supportiveness, child externalizing behaviors, and child temperament to evaluate cross-lagged associations and examine child negative emotionality in interaction with maternal depressive symptoms and maternal supportiveness. Path analytic models were computed in M*plus* (Version 7, Muthen & Muthen, 1998-2012) using full information likelihood estimation (FIML) to account for missing data, which estimates parameters on the basis of all available data; cases with missing data on all variables at all time points were dropped (Enders & Bandalos, 2001). The current sample thus included participants who had data on at least one study variable at T1, T2, or T3 (N = 2,639).

Main effects of the predictors were evaluated in a three-tiered cross-lagged panel model. Autoregressive paths were specified for each variable on itself at one point to the next instance in which it was measured, to model stability. Maternal depression was only assessed at T1 and T3, and child externalizing behavior was assessed at T2 and T3 only (see Figure 2.1). Cross-lagged paths were estimated from T1 maternal depressive symptoms to T2 child externalizing, and from T2 externalizing to T3 depressive symptoms. Paths were also estimated from T1 maternal depressive symptoms to T2 maternal supportiveness. Cross-lagged paths were estimated between T1 and T2 maternal supportiveness and T2 and T3 child externalizing behavior. Likewise, paths were estimated between T2 child externalizing behavior and T3 maternal depression, and T3 maternal supportiveness. Cross-lagged paths were also specified between T1 child negative emotionality and T2 child externalizing and maternal supportiveness. Significant estimates demonstrate a significant cross-time association among the variables, accounting for the stability in that variable over time.

Tests of the mediation hypotheses used the MODEL INDIRECT command in Mplus with bias corrected bootstrap resampling (5,000 samples) to maximize the accuracy of the standard errors (MacKinnon, 2008). Mediation analysis involved estimating the indirect effect of T1 maternal depressive symptoms on T3 child behavior problems via T2 maternal supportiveness, and estimating the indirect effect of T1 child temperament on T3 maternal depressive symptoms via T2 child externalizing behavior.

In order to test the moderation hypotheses (see Figures 2.2 & 2.3), an interaction term was first created by mean centering the child negative emotionality and parenting variables (depressive symptoms or maternal supportiveness) and then creating a multiplicative interaction term in M*plus*. Per Little's (2013) guidelines for evaluating moderation in the context of a

longitudinal panel model, there were four different steps to assessing T1 child temperament as a moderator of the relation between maternal depression and maternal supportiveness on children's later (i.e., T2 and T3) externalizing behaviors. The first two steps were completed with the purpose of assessing the time-specific moderated relationships between maternal supportiveness and child temperament on child's externalizing behaviors at T2, and then at T3. First, a model was estimated that included regressive paths between each individual predictor, (T1 maternal supportiveness, T1 child negative emotionality), the interaction term, and T2 child behavior problems, while specifying all other relations to be nondirectional covariances. Second, a model was estimated that included the regressive paths between each individual predictor (T1 maternal depression, T1 maternal supportiveness, and T1 negative emotionality), the interaction term, and T3 child behavior problems, while specifying all other relations to be nondirectional covariances. The third step involved estimating a model wherein all regressive relationships were estimated between T1 and T2, and T2 and T3; thereby assessing the strength of the moderation relationship accounting for other predictive relationships in the model. To evaluate the fit of the final model compared to the baseline main-effects model, a CFI change greater than .002 indicates model fit is compromised (Little, 2013).

Model fit was evaluated using several fit indices, including χ^2, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The evaluation of χ^2 as a fit index is problematic with large samples and complex models; thus, several fit indices were reported (Kline, 2011; Little, 2013). CFI values greater than .90, SRMR values less than .08, and RMSEA values less than .08 are considered acceptable (Hu & Bentler, 1999; Little, 2013). Collectively, one transactional model and two moderation models were interpreted (see Figures 2.4-2.6).

Results

Preliminary analyses were conducted to examine correlations among study variables (see Table 2.2). Maternal supportiveness demonstrated moderate rank-order stability over time. Child externalizing behavior demonstrated a moderate correlation between T2 and T3, as did maternal depression at T1 and T3. Child negative emotionality showed a small but significant positive association with maternal depression at T1 and T3, and child externalizing behaviors at T2 and T3. In addition, child negative emotionality evidenced a small but significant negative association with maternal supportiveness at all time points. Maternal depression at T1 and T3 demonstrated a small yet significant negative correlation with maternal supportiveness at T1 and T2 only, and a small to medium positive correlation with child externalizing behaviors. Finally, there was a small yet significant association between maternal supportiveness at all time points and child externalizing behaviors at T2 and T3.

Table 2.2
Correlations Among Key Predictors
Note. T1 = Time 1, T2 = Time 2, T3= Time 3; M = Maternal, C= Child; DEP = depressive symptoms, SUPP = supportiveness, EXT = externalizing, NEG EMO = negative emotionality.
***p <.01, **p <.05

	1	2	3	4	5	6	7	8
1. T1 M DEP	-							
2. T3 M DEP	.40***	-						
3. T1 M SUPP	-.05**	-.08**	-					
4. T2 M SUPP	-.06**	-.06**	.55***	-				
5. T3 M SUPP	-.01	-.04	.43***	.52***	-			
6. T2 C EXT	.20***	.20***	-.09***	-.14***	-.10***	-		
7. T3 C EXT	.23***	.30***	-.06**	-.10***	-.07**	.53***	-	
8. T1 C NEG EMO	.17***	.17***	-.13***	-.10***	-.09***	.27***	.22***	-

Transactional Model

This model provided a close fit to the data, χ^2 (6) = 12.99 $p < .05$, CFI = 1.00, RMSEA = 0.02, SRMR = 0.01. Inspection of model fit indices in the first model (see hypothesized model, Figure 2.1) suggested the addition of regressive pathways between T1 child negative emotionality and T1 maternal depressive symptoms to T3 child externalizing. Upon including the suggested parameter estimates, model fit demonstrated significant improvement, $\Delta \chi^2(2) = 47.62$, $p < .01$, exceeding the critical chi-square difference value of $\Delta \chi^2(2) = 9.21$, $p < .01$. Therefore, the additional pathways and their parameter estimates are reflected in the final transactional model presented in Table 2.3 and Figure 2.4.

Table 2.3
Parameter Estimates for Autoregressive and Cross-lagged Paths for the Transactional Model
Note. B = standardized path coefficients; *CI* = confidence interval; *LL* = lower level; *UL* = upper level. T1 = Time 1, T2 = Time 2, T3= Time 3; M = Maternal, C= Child; DEP = depressive symptoms, SUPP = supportiveness, EXT = externalizing, NEG EMO = negative emotionality. + $p < .10$. * $p < .05$. ** $p < .01$.

Parameter	***B (SE)***	**95% *CI* [*LL, UL*]**
Construct Stability		
T1 Mat dep -> T3 Mat dep	.38 (.03)**	[.32, .45]
T1 Mat supp-> T2 Mat supp	.54 (.02)**	[.49, .58]
T2 Mat supp -> T3 Mat supp	.41 (.03)**	[.34, .47]
T1 Mat supp -> T3 Mat supp	.21 (.03)**	[.14, .28]
T2 Child EXT -> T3 Child EXT	.49 (.02)**	[.44, .55]
Cross-lagged Paths		
T1 Mat dep -> T2 Mat supp	-.04(.06) +	[-.10, .02]
T1 Mat dep -> T2 Child EXT	.16(.02)**	[.10, .22]
T1 Mat supp -> T2 Child EXT	-.04(.07) +	[-.10, .02]
T1 Neg Emo -> T2 Child EXT	.25(.02)**	[.19, .31]
T1 Neg Emo -> T2 Mat Supp	-.02(.02)	[-.07, .04]
T1 Neg Emo -> T3 Child EXT	.05(.02)*	[-.01, .11]
T2 Mat supp -> T3 Child EXT	-.02(.02)	[-.07, .03]
T2 Child EXT -> T3 Mat dep	.13(.02)**	[.07, .18]
T2 Child EXT -> T3 Mat supp	-.02(.02)	[-.08, .03]

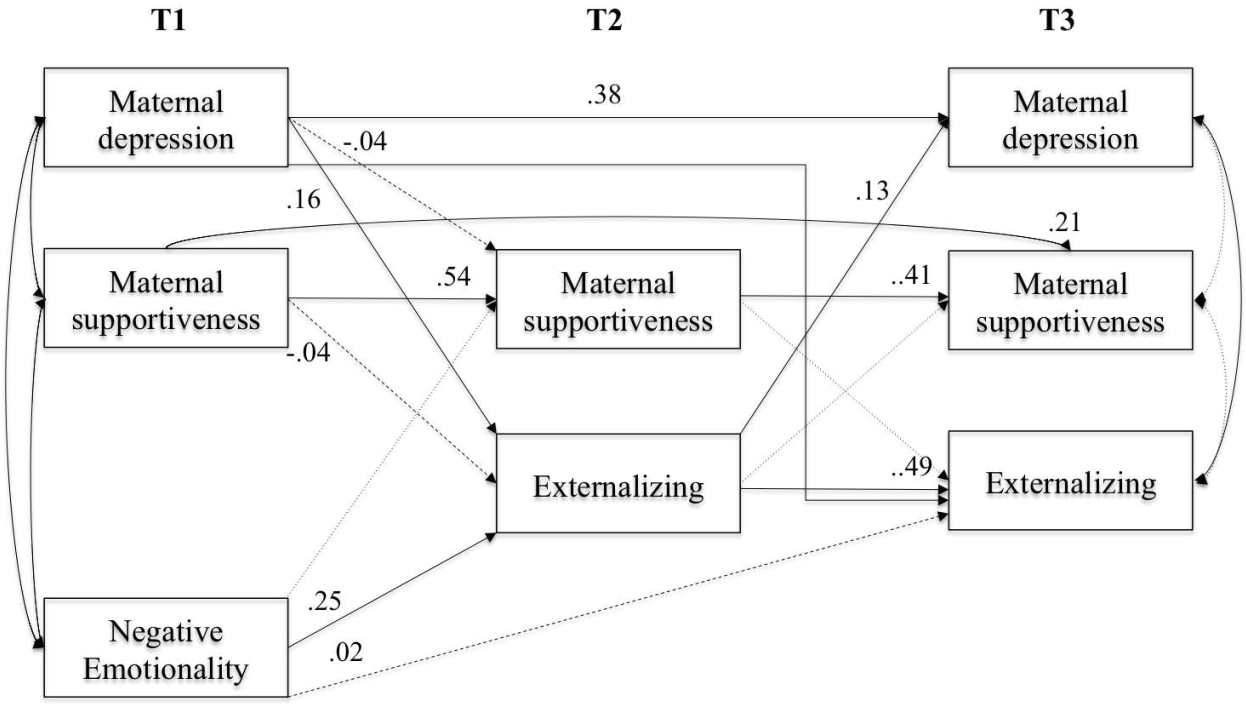

Figure 2.4 Transactional model of the relations among maternal depressive symptoms, maternal supportiveness, child externalizing behaviors and negative emotionality. T1 = Time 1, Time 2 = Time 2, Time 3= Time 3. *Note.* Solid lines indicate significant paths, dotted lines indicate paths that indicated marginal significance but the confidence intervals contained zero. Faded lines indicate nonsignificant pathways.

Autoregressive paths demonstrated moderate construct stability across time, highlighting the relative stability of maternal depressive symptoms, maternal supportiveness, and child externalizing behaviors across the first few years of life. Cross-lagged paths were consistent with hypotheses regarding the expected longitudinal relations between maternal depression and child behavior problems. In particular, T1 maternal depression significantly predicted higher levels of child externalizing at T2, which in turn significantly predicted higher levels of maternal depressive symptoms at T3. T1 maternal depression also significantly predicted higher levels of child externalizing at T3. Results were also congruent with the hypothesized link between child negative emotionality and child behavior problems; higher negative emotionality at T1 significantly predicted higher levels of T2 and T3 child externalizing. Moreover, the hypothesized longitudinal mediation path from T1 child negative emotionality to T3 maternal

depressive symptoms was significant; there was a significant indirect effect of child temperament on later maternal depressive symptoms by way of T2 child behavior problems (standardized indirect effect b = .03, p <.01, bias-corrected bootstrapped 95 percent CI: *LL* = .02, *UL* =.05).

In contrast with hypotheses about maternal supportiveness and child behavior problems, no significant cross-lagged paths emerged between earlier maternal supportiveness and children's later behavior problems, and vice versa. There was also no evidence that T1 child negative emotionality was associated with T2 maternal supportiveness. In terms of evaluating whether maternal depression predicted later maternal supportiveness, there was evidence of a marginal association between T1 maternal depressive symptoms and T2 maternal supportiveness, but the confidence interval contained zero. This model accounted for 18% of the variance in T3 maternal depressive symptoms (p < .01), 29.5% of the variance in T2 maternal supportiveness (p < .01), 30.2% of the variance in T3 maternal supportiveness (p < .01), 10.6% of the variance in T2 child externalizing behaviors (p < .01), and 31% of the variance in T3 child externalizing behaviors (p < .01).

Moderation Analyses – Child Negative Emotionality X Maternal Supportiveness

Turning to tests of longitudinal moderation, in step one, a path analytic model was analyzed that examined T1 maternal supportiveness X child negative emotionality as a moderator of child T2 behavior problems, in the context of the larger path analytic model that included autoregressive paths from each variable to itself at later time points. At T1, maternal depressive symptoms, maternal supportiveness, child negative emotionality, and the interaction term were included as predictors of T2 child externalizing behaviors. Nondirectional covariance relationships were specified between the interaction term and all T1 predictors, and the variables at T2 and T3 within each time point. This first model provided acceptable fit to the data, χ^2 (17)

= 116.06, $p < .001$, CFI = 0.96, RMSEA = 0.05, SRMR = 0.04. Standardized path estimates indicated a significant main effect of T1 maternal depressive symptoms on T2 child externalizing behavior ($\beta = 0.17$, $p < .01$) and T1 child negative emotionality on T2 child externalizing behavior ($\beta = 0.25$, $p < .01$). There was as marginal main effect of T1 maternal supportiveness on T2 child externalizing behaviors ($\beta = -0.04$, $p = .09$). However, standardized path estimates yielded a nonsignificant pathway between the interaction term and T2 child behavior problems, ($\beta = -0.03$, $p = .16$), indicating that child negative emotionality did not moderate the association between T1 maternal supportiveness and T2 child externalizing behavior.

Shifting focus to T3 child externalizing behaviors, the second step of moderation testing involved autoregressive paths from T1 to T3 maternal depressive symptoms, T1 to T2 as well as T2 to T3 maternal supportiveness, T2 to T3 child behavior problems, and nondirectional covariance paths between the variables at each time point. At T1, maternal depressive symptoms and child negative emotionality, T2 maternal supportiveness, and the interaction term (T2 maternal supportiveness X T1 child negative emotionality) were included as predictors of T3 child externalizing behaviors. Nondirectional covariance relationships were specified between all other variables within each time point. This second test of the moderation from T1 to T3 provided an acceptable fit to the data, χ^2 (12) = 57.66, $p < .01$, CFI = 0.98, RMSEA = 0.04, SRMR = 0.03. Standardized path estimates indicated a significant main effect of T1 maternal depressive symptoms on T3 child externalizing behavior, ($\beta = 0.14$, $p < .01$) and T1 child negative emotionality on T3 child externalizing behavior, ($\beta = 0.05$, $p < .05$). There was no significant main effect of T2 maternal supportiveness on T3 child externalizing, ($\beta = -0.02$, $p = .29$). Furthermore, standardized path estimates demonstrated a nonsignificant pathway between the interaction term and T3 child behavior problems, ($\beta = -0.02$, $p = .32$). Due to the

nonsignificant pathways between the interaction terms and child behavior problems at both time points, no further moderation analyses were performed.

Moderation Analyses – Maternal Depression X Child Externalizing Behavior

Following the same series of steps listed above, moderation was evaluated by mean-centering T1 maternal depression and T1 child negative emotionality to create a multiplicative interaction term, and a cross-lagged path was then estimated between the interaction term and T2 child behavior problems, including cross-lagged paths between the other T1 predictors and T2 child externalizing behavior. This first model provided acceptable fit to the data, χ^2 (17) = 116.06, $p < .001$, CFI = 0.96, RMSEA = 0.04, SRMR = 0.04. Standardized path estimates indicated a significant main effect of T1 maternal depressive symptoms on T2 child externalizing behavior ($\beta = 0.17$, $p < .01$) and T1 child negative emotionality on T2 child externalizing behavior ($\beta = 0.37$, $p < .01$). There was a nonsignificant main effect of T1 maternal supportiveness on T2 child externalizing behaviors ($\beta = 0.06$, $p = .40$). In terms of moderation between T1 and T2, standardized path estimates showed a nonsignificant pathway between the interaction term and T2 child behavior problems, ($\beta = -0.15$, $p = .16$), indicating that child negative emotionality did not operate as a moderator between T1 maternal depression and T2 child externalizing behavior.

Moderation was next assessed with T3 child externalizing as the outcome variable. A cross-lagged path was estimated from the T1 interaction term and T3 child behavior problems, including other significant predictors of T3 child externalizing behavior. This model demonstrated good fit, χ^2 (13) = 62.81, $p < .001$, CFI = 0.98, RMSEA = 0.04, SRMR = 0.03. Standardized path estimates indicated a significant main effect of T1 maternal depressive symptoms ($\beta = 0.14$, $p < .01$) and a marginal main effect of T1 child negative emotionality ($\beta =$

0.06, p = .06) on T3 child externalizing behavior. There was no significant main effect of T2 maternal supportiveness on T3 child externalizing, (β = -0.01, p = .57). Again, standardized path estimates demonstrated a nonsignificant pathway between the interaction term and T3 child behavior problems (β = -0.02, p = 63). Thus, no further moderation analyses were performed.

Discussion

The current study provides partial support for a transactional model of maternal depressive symptoms, maternal supportiveness, child externalizing behaviors, and child negative emotionality in a low-income, EHS-eligible sample. These findings are informative for current thinking about the processes that not only link parental psychopathology to child adjustment, but also child characteristics that predict later parental maladjustment. The current study also addressed important questions about for whom the links between parenting and child behavior problems, and psychopathology symptoms and child adjustment, are most pertinent. These findings address Goodman and colleagues' (2011) call for transactional studies of maternal depression and child adjustment that highlight key mediators and moderators, especially in samples comprised of families living in poverty. Taken together, these findings reveal important information for tailoring existing models of developmental psychopathology in context.

First, more maternal depressive symptoms at child age 14 months were predictive of more child externalizing behavior at ages 2 and 3, lending additional evidence to the well-documented longitudinal association between maternal depressive symptoms and child externalizing behavior problems (Beardslee, Versage, & Gladstone, 1998; Cummings & Davies, 1994; Gelfand & Teti, 1990; Goodman & Gottlib, 1999; Goodman et al., 2011). There was also evidence of a developmental transaction wherein more maternal depressive symptoms at child age 14 months predicted more externalizing behaviors at age 2, which then predicted more

maternal depressive symptoms at child age 3. This finding dovetails with recent work that has established the importance of considering developmental transactions between maternal psychopathology and child adjustment with a sample of children aged 4 to 7, wherein significant associations between both maternal depression and child behavior problems across time were detected (Bagner et al., 2013). Other studies have also documented child behavior problems as a significant predictor of later maternal depressive symptoms, but with samples of children aged 3 and older (Ciciolla et al., 2014; Garstein & Sheeber, 2004; Gross et al., 2008; Gross, Shaw, Moilanen, Dishion et al., 2008; Gross et al., 2009). Although limited measurement occasions precluded testing a child-driven transaction, this study addresses existing gaps in the literature about the nature of reciprocal relations between maternal depressive symptoms and child externalizing behaviors in a low-income sample of children younger than age 3.

The current investigation further augments past research by including a measure of child negative emotionality in a transactional model of maternal depressive symptoms, parenting, and child externalizing behaviors. Higher levels of child negative emotionality at 14 months predicted higher levels of externalizing behaviors at ages 2 and 3, congruent with past research that documents child negative emotionality as a risk factor for adjustment difficulties (Bates & Pettit, 2007; Cicchetti, Ackerman, & Izard, 1995; Collins et al., 2000; Rothbart & Bates, 2006). Moreover, child negative emotionality demonstrated a significant indirect association with maternal depressive symptoms at child age 3, by way of its significant positive association with child behavior problems at age 2. These results suggest that one mechanism that connects higher levels of child negative emotionality and maternal depressive symptoms across time in early childhood is externalizing behaviors. This is an important finding that contributes to our

understanding of how child characteristics, specifically negative emotionality, play a key role in early transactional processes (Cicchetti & Cohen, 1995; Sameroff & Mackenzie, 2003).

Nonetheless, this finding must be interpreted with caution due to shared method variance between the measures of maternal depressive symptoms, child externalizing behaviors, and negative emotionality, which were all completed by the mother. An alternative explanation is that mothers who report higher levels of depression are more likely to make negative attributions and evaluations of their children (Dix & Meunier, 2009; Goodman et al., 2011; Goodman & Gotlib, 1999). However, some researchers have suggested that this only makes a small yet significant contribution to these results (Boyle & Pickles, 1997). Further research would do well to attempt to replicate these findings using multiple methods of assessment and/or multiple reporters of child temperament and behavior problems.

The nonsignificant findings for the cross-lagged associations between maternal supportiveness and child behavior problems, and between maternal supportiveness and child negative emotionality, suggest that maternal supportiveness, as was measured in this study, may not be as germane in illuminating maladaptive transactions in toddlerhood, especially compared to negative parenting behaviors. This prevented the assessment of maternal supportiveness as a mediator between maternal depressive symptoms and later child externalizing behaviors. A recent study that evaluated a similar transactional model in a sample of 3 to 5 year olds did not find evidence of significant cross-lagged associations between maternal sensitivity and child externalizing behaviors, nor did they find support for maternal sensitivity as a mediator between depressive symptoms and externalizing (Ciciolla et al., 2014). In contrast with maternal supportiveness and sensitivity, harsh, negative parenting is an especially robust correlate of maternal depression (Lovejoy et al., 2000) and child externalizing behaviors (e.g., Patterson,

Dishion, & Reid, 1992). Coercive processes should be incorporated into future transactional modeling endeavors that strive to link maternal psychopathology symptoms and child behavior problems to clarify these findings.

Despite the lack of direct associations between maternal supportiveness and child behavior problems, extant research depicts maternal sensitivity as more salient for children who display high (but not low) negative emotionality (Bradley & Corwyn, 2008; Gallitto, 2015; Mesman et al., 2009), particularly with regards to the prediction of externalizing behaviors. Yet, the current moderation analyses did not support this link. Specifically, there was no evidence that the relation between maternal supportiveness and child behavior problems was significant, particularly for children with higher levels of negative emotionality. There was also no support for the hypothesis that children with higher levels of negative emotionality manifest higher levels of externalizing behaviors in the context of higher levels of maternal depressive symptoms. Consequently, the current investigation was unable to verify whether a diathesis stress or differential susceptibility framework provided a better explanation of the hypothesized relations.

Limitations

One limitation of the current study is that child temperament was measured at only one time point. Evaluating this model with a measure of child temperament across time would reveal important information about potential changes in child temperament across time, including its reciprocal relations with parenting and child adjustment (see Kiff et al., 2011). Current findings were also limited because both maternal depressive symptoms and child externalizing behavior were only measured at two time points that corresponded with the toddlerhood timeframe. This prevented the ability to detect child-direct cross-lagged pathways from T1 child externalizing behaviors → T2 maternal depressive symptoms → T3 child behavior problems, further

buttressing the limited evidence for these bidirectional effects across time in early childhood. As previously discussed, shared method variance was a central limitation in the current study, and future studies that incorporate multiple methods of assessment and/or reports from multiple informants will lend further credibility to the model. Finally, differential sensitivity to the pathways between maternal depressive symptoms, maternal supportiveness, and child behavior problems may be evident based on individual differences in developmental risk status, such as young children with developmental delays (Ciciolla et al., 2014). Future studies that address developmental risk as a moderator of these relations will provide additional insight of how characteristics of the person play out in evaluation of the Person-Process-Context-Time model.

Conclusions

The current study extends current transactional perspectives on development during toddlerhood by utilizing a longitudinal cross-lagged panel model to assess questions of differential susceptibility in the context of maternal depression and sensitivity to child behavior problems; as such, incorporating characteristics of the *person* in the Person-Process-Context-Time model (Bronfrenbrenner & Morris, 2006). Although the evidence implies additive models of maternal depressive symptoms, parenting, and child negative emotionality, it is important to address such questions in the context of longitudinal models that address both mediation and moderation of proximal processes across development. As Bronfrenbrenner and Morris (2006) aptly noted, "In ecological research, the principal main effects are likely to be interactions" (pg. 1001). Goodman and her colleagues (2011) highlighted the merits of such a transactional approach, emphasizing their utility for research and intervention. Thus, these results suggest that, in the context of a low-income sample, a developmental transaction between maternal depressive symptoms and child externalizing behaviors emerges between child age 14 and 36 months.

Hence, prevention programs would do well to target both maternal depression and child behavior management for change in the prevention of psychopathology (Dishion & Stormshak, 2006; Gross, Shaw, & Molianen, 2008; Shaw, Connell, Dishion, Wilson, & Gardner, 2009).

The meditational path between child negative emotionality and maternal depression by way of child externalizing behaviors across early childhood also suggests the importance of incorporating temperament information into existing parenting interventions (Putnam et al., 2002), especially interventions tailored to parents with depression in early childhood. Dix and Meuiner's (2009) action-control model of maternal depression and Azar's (1997) cognitive-behaviorally focused discussion of parenting in abusive families emphasizes the significance of negative appraisals of children's behavior in promoting and reinforcing maladaptive parent-child interactions. Beyond efforts to intervene solely on the parents' depressive symptoms, teaching parents to understand temperament in terms of inherent differences in child needs (rather than a consequence of personal shortcomings as a parent; Putnam et al., 2002) may help mothers with depressive symptoms view their child's behaviors in less aversive ways, and in combination with coaching around positive childrearing strategies, may promote positive exchanges with children and predict a lower incidence of toddler's externalizing behaviors.

CHAPTER IV – INTEGRATIVE DISCUSSION

The current studies applied the Person-Process-Context-Time model (Bronfrenbrenner & Morris, 2006) and transactional perspectives (Sameroff, 2009; Sameroff & MacKenzie, 2003) to the development of low-income toddlers' social-emotional development. The first study focused on the *process* of transactions between maternal supportiveness and child emotion regulation across *time*, and then extended the model to include a measure of the larger home *context*. The second study addressed child negative emotionality as a moderator of the relations between maternal depressive symptoms, parenting, and child externalizing behaviors, thus including characteristics of the *person* in understanding the *process* of transactions between maternal supportiveness, depressive symptoms, and child externalizing behaviors. The cross-lagged panel models employed to address these theoretically guided questions were especially fitting because of the way that time is handled in analyses. Time is both a control variable, in that significant relations between the different variables across time indicate their relation beyond the stability in each construct over time, and it is also informative in understanding when (i.e., developmentally) certain pathways between variables are detected. Using the PPCT model in tandem with a transactional perspective on development yielded a series of models that explicitly addressed both parent and child contributions to development. Notably, the use of the Early Head Start Research and Evaluation Project data in answering the current research questions sheds light on these models in the context of poverty. These results thus broaden current perspectives on low-income toddlers' contributions to their own social-emotional adjustment.

In both studies, partial support for the hypothesized transactional models was found. In particular, both studies revealed meaningful child-directed associations beginning at age 2. In the

first study, child emotion regulation at age 2 significantly predicted a more nurturing home environment at age 3, while a more nurturing home environment at age 2 also significantly predicted child age 3 emotion regulation. In the second study, child behavior problems at age 2 significantly predicted maternal depressive symptoms at age 3 (and age 2 behavior problems were significantly predicted by age 1 maternal depressive symptoms). Furthermore, child negative emotionality was indirectly related to age 3 depressive symptoms, with child externalizing behaviors acting at age 2 the mechanism. Regardless of positive or negative social-emotional adjustment, both models suggested that these skills at age 2 stimulate future proximal processes that serve to shape and constrain adjustment. Replications of similar cross-lagged panel models are necessary with additional samples to evaluate the generalizability of the significant relations documented here. However, the preliminary evidence suggests the relevance of toddlerhood, and in particular, age 2, as a key time for providing support to low-income parents in their efforts to support burgeoning social-emotional skills in their toddlers. Future work that expands these models to include follow-up assessments at later ages, such as Pre-K, will be informative for understanding the coalescence of these dynamic processes across childhood.

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