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Intergenerational Effects of Maternal Childhood Experiences on Maternal Parenting and Infant Developmental Progress

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Abstract

Objective: This study evaluated the intergenerational indirect effects of maternal childhood experiences on infant progress in reaching developmental milestones through maternal scaffolding behaviors. We hypothesized that mothers who perceived their own mothers as highly supportive in childhood, even in the context of adverse childhood experiences (ACEs), would be more likely to engage in scaffolding with their infants, which in turn would predict greater infant developmental progress (e.g., less risk for developmental delay).

Method: Participants included 295 low-income mothers and their infants who were assessed prenatally and at 6 and 12 months postpartum. Mothers retrospectively reported on their childhood experiences, maternal parenting behaviors were observationally rated at 6 months postpartum, and infant developmental progress (communication, problem-solving, gross motor, fine motor, personal-social) was assessed at 6 and 12 months postpartum using the Ages and Stages Questionnaire.

Results: Results of autoregressive structural equation models indicated that mothers who perceived their own mothers as highly supportive in childhood were more likely to engage in scaffolding behaviors with their infants, who in turn made greater progress (e.g., showed less risk for developmental delay) in reaching developmental milestones from 6 to 12 months postpartum. Follow-up analyses revealed that indirect effects were specific to infant problem-solving and communication skills. Maternal ACEs were not associated with parenting or infant developmental progress.

Conclusion: Parenting behaviors in one generation influence parenting behaviors in the next, which has implications for infant developmental progress. Results may inform evidence-based preventive interventions for mothers and infants living in contexts of risk.

Keywords

adverse childhood experiences; infant development; scaffolding; parenting; intergenerational transmission

Introduction

Adverse childhood experiences (ACEs), including maltreatment and household dysfunction, have enduring effects on individuals across the lifespan (1). Exposure to ACEs early in life may instigate an abnormal developmental trajectory that leads to a myriad of mental and physical health problems in childhood and adulthood (2). The buffering effect of social support on early life stress has long been demonstrated in the literature, but it has traditionally been examined as a moderator rather than a stand-alone predictor of health outcomes (3). However, a recent study suggests that the level of social and emotional support experienced in childhood has a unique effect on health outcomes in the context of ACEs (4). After controlling for ACEs, the odds of having depression or poor mental health were 72% lower for adults who reported six to seven vs. zero to two positive childhood supports. These results suggest the importance of examining relational experiences in early childhood in addition to ACEs, as relational experiences co-occur and operate independently from ACEs in predicting outcomes.

A burgeoning body of research indicates that early life experiences have far-reaching consequences and can be transmitted from one generation to the next (5–6). Infants of mothers with ACEs have shown delays in achieving developmental milestones, with higher maternal ACEs having indirect effects on lower development scores on the Ages and Stages Questionnaire (ASQ-3) (7–8). Similarly, Folger and colleagues (2018) found that for each additional maternal ACE, there was an 18% increase in the risk for a developmental delay, and three or more maternal ACEs was associated with increased risk for developmental delay across multiple domains on the ASQ-3 (5). Mothers with one or more ACEs were also more likely to report one or more developmental concerns on the PEDS (Parents' Evaluations of Developmental Status) compared to mothers with no ACEs (9). Despite these associations, little is known about the intermediary mechanisms between maternal early childhood experiences, including both ACEs and social and emotional support in childhood, and infant developmental outcomes.

Although studies have examined potential prenatal intermediary mechanisms, such as stress, depression, and anxiety (10), the bioecological model of child development posits that proximal processes in the postpartum environment may be equally important for understanding mechanisms of transmission from maternal childhood experiences to infant developmental outcomes (8). Bronfenbrenner (1994) argues that the reciprocal interactions between a child and his or her caregivers is the most proximal process contributing to the child's development. Therefore, parenting may be a particularly salient mechanism through which intergenerational transmission of early experiences occurs (11).

An aspect of parenting that may be relevant is scaffolding. Maternal scaffolding, conceptualized as structured assistance around developing new skills, is associated with

children's advances in problem-solving, cognitive functioning, language development, and later academic success (12–13). A growing body of research guided by parenting process models (14) suggests that important continuities exist in parenting practices across generations (15). Therefore, it is possible that mothers' own experiences with their mothers in childhood may influence the degree to which they scaffold their own children, which has implications for emerging stage-salient abilities. The primary aim of this study was to test whether mothers' perceptions of their childhood experiences (i.e., ACEs versus supportive maternal parenting) predicted their engagement in scaffolding with their infants, which in turn predicted infant progress in achieving developmental milestones.

Present Study

To our knowledge, this study is the first to evaluate if there are intergenerational indirect effects of maternal childhood experiences on infant progress in reaching developmental milestones through maternal scaffolding behaviors. As a more rigorous test of this novel aim, we specifically examine (a) the unique predictive value of different types of maternal childhood experiences (i.e., ACEs versus supportive maternal parenting) and (b) whether these indirect pathways are specific to scaffolding or generalizable to other parenting behaviors more broadly (i.e., sensitivity). We specifically hypothesized that mothers who perceived their own mothers as being highly supportive in childhood, even in the context of ACEs, would be more likely to engage in scaffolding behaviors with their infants. In turn, scaffolding would predict greater infant developmental progress (e.g., less risk for developmental delay in problem-solving, communication, gross motor, fine motor, and personal-social abilities) from ages 6 to 12 months as measured by the ASQ-3 (7). Although maternal childhood experiences may be related to both scaffolding and sensitivity (15), we hypothesized that indirect effects on infant developmental progress would be specific to maternal scaffolding as opposed to sensitivity given prior evidence of the unique role of scaffolding in developing new skills and bolstering advances in emerging stage-salient abilities (13). Hypotheses were examined in a large, high-risk sample of low-income mothers and their infants assessed prenatally and at 6 and 12 months postpartum. To reduce the operation of common method and informant variance in the analyses, we utilized a multi-method (i.e., observation, survey), multi-informant (i.e., observer, mother) approach to assessing key constructs. Furthermore, to increase the specificity and practical utility of our findings, we also conducted follow-up analyses to examine whether there were domain-specific indirect effects on infant developmental outcomes (i.e., effects on individual ASQ-3 subscales).

Methods

Participants

Participants were drawn from a larger longitudinal project designed to examine the impact of ACEs in the parent generation on family engagement in home visiting as well as the efficacy of home visiting for enhancing parenting and infant health and developmental outcomes (The PEDI Study; R40MC28318). Participants were recruited from Women, Infants, and Children (WIC) clinics and included 295 mothers and their infants who were assessed at three time-points (prenatal, 6 and 12 months postpartum). Retention from the prenatal to 12

months postpartum assessments was 84%. Mothers and infants were racially and ethnically diverse. Of mothers, 40% were Hispanic, 42% White, 19% Black, 7% Biracial, and 32% Other Races. Of infants, 49% were Hispanic, 35% White, 17% Black, 26% Biracial, and 22% Other Races. Mothers ranged in age from 18 to 44 years ($M = 25.61$ years; $SD = 5.33$ years), 23% had less than a high school degree, 37% completed high school, 36% had some post-secondary education, and 4% had a bachelor's degree; 65% were unemployed in pregnancy, 44% were single parents, and 38% were first time mothers. Of infants, 53% were female, and 10% were born premature. All families received public assistance, and 39% enrolled in evidence-based home visiting services over the course of their participation in the study.

Procedure

Expectant mothers completed baseline assessments at a prenatal study enrollment visit, and mothers and their infants participated in follow-up assessments at 6 and 12 months postpartum. At each time-point, participants completed assessments in their homes. Mothers provided written consent for themselves and their infant to participate. Ethical permission for the study was granted by the Institutional Review Board.

Measures

Demographics.—At the prenatal assessment, mothers reported their educational level, race and ethnicity, marital status (single vs. two-parent household), and employment status (unemployed vs. employed). At 6 months postpartum, mothers reported whether their infant was born premature, and infant race, ethnicity, and sex.

Maternal ACEs.—At the prenatal assessment, mothers completed the Adverse Childhood Experiences Questionnaire (1). This 10-item measure assessed mothers' exposure to adversity before age 18, including abuse (emotional, physical, sexual), neglect (physical, emotional), and household dysfunction (household mental illness, substance abuse, physical violence, separation/divorce, incarceration). Responses to each item were scored as 0 (not experienced) or 1 (yes experienced), and possible scores ranged from 0 to 10 ACEs. In this sample, the percentage of mothers who reported exposure to each ACE was as follows: 26% verbal abuse, 16% physical abuse, 17% sexual abuse, 32% emotional abuse, 13% neglect, 61% separation/divorce, 11% domestic violence, 28% substance abuse, 25% mental illness, and 14% incarceration. Of mothers, 22% reported zero ACEs, 26% reported one ACE, 14% reported two ACEs, 11% reported three ACEs, 11% reported four ACEs, and 15% reported five or more ACEs.

Supportive maternal parenting in mothers' childhood.—At the prenatal assessment, mothers completed the Parental Bonding Instrument (PBI) (16–17) with additional items developed by Leerkes and Siepak (2006) to assess the quality of care mothers received from their own mothers in childhood (i.e., during first 18 years of life). Subscales included Care (mean of 15 items; “made me feel loved”; $\alpha = .93$), Control (mean of 11 items; “tried to control everything I did”; $\alpha = .68$), Emotional Responsiveness (mean of 8 items; “comforted me when I was sad”; $\alpha = .93$), and Emotional Minimization (mean of 9 items; “told me to get over it when I was disappointed”; $\alpha = .78$). Items were rated on

four-point scales ranging from 1 (*very unlike my mother*) to 4 (*very like my mother*). After reverse-scoring the Control and Emotional Minimization scales, the four measures were standardized and aggregated together to form a single, parsimonious composite of supportive maternal parenting in mothers' childhood ($\alpha = .77$), with higher scores indicating greater supportive parenting.

Maternal parenting behaviors.—Maternal parenting behaviors were assessed from videotaped observations of mother-infant free play tasks completed at 6 months postpartum. Mothers were asked to play with their infant for 7 minutes using toys provided by our research team. Using the Emotional Availability Scales (EAS) (18), two trained raters coded maternal parenting along dimensions of Scaffolding and Sensitivity (rater reliability .80 or above). The Scaffolding scale is a 5-point scale that ranges from 1 (*non-optimal*) to 5 (*optimal*) and assesses the amount and quality of positive control and structuring the mother uses in the interaction with her infant (e.g., letting infant lead while providing a supportive frame, physically positioning infant or toys in such a way that infant can engage in activities, helping infant appropriately modulate interest, attention, mastery, and affect). The Sensitivity scale is a 9-point scale that ranges from 1 (*highly insensitive*) to 9 (*highly sensitive*) and assesses the degree to which mothers display a behavioral style that is responsive to infant cues, affectively positive, flexible, interactive, and emotionally connected (e.g., showing genuine interest and positive affect toward infant, reading infant's signals accurately and responding appropriately, clear emotional connection between infant and mother).

Infant developmental progress.—At 6 and 12 months postpartum, mothers completed the Ages and Stages Questionnaire, Third Edition (ASQ-3) (7). The ASQ-3 is a parent-report screening questionnaire designed to screen infants for developmental delays in five critical domains of child development: problem-solving, communication, gross motor, fine motor, and personal-social. Consistent with administration and scoring guidelines, age versions of the ASQ-3 were corrected for gestational age for the preterm infants. Mothers answered six questions in each domain, and response alternatives for each item included “yes” (scored as 10 points), “sometimes” (scored as 5 points), or “not yet” (scored as 0 points). Scores on each scale ranged from 0 to 60, with higher scores indicating greater (e.g., “on schedule”) developmental progress, and lower scores indicating greater risk for developmental delay. Consistent with previous research (8), we specified infants' scores on each of the five domains as indicators of a latent construct of infant developmental progress at 6 and 12 months postpartum. The ASQ-3 has been shown to have good psychometric properties, and continuous scores have been associated with indices of adversity (8, 29) and developmental progress later in childhood (19).

Data Analysis

Primary hypotheses were tested using autoregressive structural equation modeling (SEM) in Mplus 7.4 (20). Full-information maximum likelihood estimation was used to accommodate missing data (19.32% of values). Model fit was assessed using standard criteria (21), including the root mean square error of approximation (RMSEA; values $< .08$ indicate acceptable fit), comparative fit index (CFI; values $> .90$ indicate acceptable fit), and the

standardized root mean square residual (SRMR; values < .08 indicate acceptable fit). Two SEM models (one for each parenting behavior) were tested to examine if maternal childhood experiences (supportive maternal parenting, ACEs) had an indirect effect on infant developmental progress through parenting (scaffolding, sensitivity). In each model, both forms of maternal childhood experiences and identified covariates were specified as predictors of parenting at 6 months postpartum and a latent construct of infant developmental progress at 6 and 12 months postpartum. A path was also specified between parenting and infant developmental progress at 12 months. To maximize measurement equivalence of the latent construct of infant developmental progress across time, parameter estimates of corresponding indicators were constrained to be equal across time-points. The autoregressive path between infant developmental progress at 6 and 12 months was also included. Correlations were specified among exogenous predictors and among residual errors on variables assessed at 6 months postpartum (parenting, infant developmental progress). Because our primary aim was to test longitudinal indirect effects on infant developmental progress at 12 months postpartum, predictive paths were specified between parenting and developmental outcomes at 12 months, but a covariance was specified between parenting and developmental outcomes at 6 months to account for concurrent associations between parenting and infant development. To test for hypothesized indirect effects, we utilized Mplus capabilities to assess models using 1,000 bootstrap replicates to obtain bias-corrected bootstrap confidence intervals for the indirect effects (22). The bias-corrected bootstrap method was used because it: (a) reflects that the average bootstrap indirect effect in generated samples is not the same as the value of the indirect effect in the original sample (e.g., corrects for this bias) and (b) has been shown to provide more accurate confidence intervals for indirect effects (23).

Results

Descriptive Analyses

SPSS Version 25 was used to examine descriptive statistics, correlations between the substantive variables of interest, and potential covariates (infant born premature, maternal education level, maternal race and ethnicity, infant race and ethnicity, infant sex, single parent household, maternal unemployment, enrollment in home visiting intervention). Values on primary variables that were greater than 3.29 standard deviations from the mean were winsorized (24). Only two potential covariates (infant born premature and maternal education level) were consistently related to parenting behaviors and/or infant developmental progress. Furthermore, the pattern of results remained identical with and without inclusion of the other variables in analytic models. Therefore, to maximize parsimony, the only covariates included in final models were whether the infant was born premature (specified as predictor of infant developmental progress at 6 and 12 months) and maternal educational level (specified as a predictor of all endogenous variables). When examining whether rates of missingness in the dataset were associated with any of the 16 primary study variables and covariates, only one analysis was significant: higher rates of missingness were associated with lower scores at 12 months postpartum on the ASQ-3 fine motor subscale ($r = -.15$, $p = .03$). Table 1 provides the means, standard deviations, and correlations for the variables used in the primary analyses.

Using ASQ-3 recommended cutoff ranges for monitoring and referral for further screening for developmental delay (7), at 6 months postpartum, 88.9% of infants in our sample were on schedule in communication development (8.8% monitor, 2.3% refer), 83.3% were on schedule in gross motor development (9.7% monitor, 6.9% refer), 76.4% were on schedule in fine motor development (13.0% monitor, 10.6% refer), 81.9% were on schedule in problem-solving development (8.3% monitor, 9.7% refer), 81.0% were on schedule in personal-social development (12.5% monitor, 6.5% refer). At 12 months postpartum, 89.1% of infants were on schedule in communication development (7.8% monitor, 3.0% refer), 80.9% were on schedule in gross motor development (11.7% monitor, 7.4% refer), 80.0% were on schedule in fine motor development (11.7% monitor, 7.8% refer), 74.3% were on schedule in problem-solving development (10.9% monitor, 14.3% refer), and 80.4% were on schedule in personal-social development (11.7% monitor, 7.8% refer). These distributions of scores are consistent with other samples of infants (5).

Primary Analyses

Indirect effect of maternal childhood experiences on infant development through scaffolding.—We first tested a model that included scaffolding as the intermediary mechanism between maternal childhood experiences and infant developmental progress (see Figure 1). The model provided adequate fit to the data, $\chi^2(79) = 143.63$, $p < .001$, RMSEA = .05, CFI = .94, SRMR = .07. Standardized parameter estimates of all manifest indicators of latent constructs were significant ($p < .002$), in the expected direction, and moderate to strong in magnitude (range = .59 to .84). The autoregressive path was significant for infant developmental progress from 6 to 12 months postpartum ($\beta = .73$, $p < .001$). As expected, higher maternal education level was associated with greater scaffolding at 6 months postpartum ($\beta = .19$, $p = .005$), and infants who were born premature had greater risk for developmental delay on the ASQ-3 at 6 months postpartum ($\beta = -.28$, $p = .001$). Of relevance to our aims, maternal report of highly supportive maternal parenting in childhood was associated with greater scaffolding at 6 months postpartum ($\beta = .23$, $p = .004$), but ACEs were not ($\beta = .10$, $p = .20$). Scaffolding, in turn, predicted greater infant progress (e.g., less risk for delay) on the ASQ-3 from 6 to 12 months postpartum ($\beta = .14$, $p = .046$). Bias-corrected bootstrapping tests indicated that the indirect path involving mothers' supportive maternal parenting in childhood, scaffolding, and infant developmental progress was significantly different from zero (95% CI [.016, .347]).

Follow-up analyses: indirect effects on specific domains of infant development.—We then conducted follow-up analyses to test if these indirect effects were evident for specific ASQ-3 subscales. Therefore, we tested five additional path models (one for each ASQ-3 subscale) following the same model specifications described previously, but with each ASQ-3 subscale specified as a manifest variable at 6 and 12 months postpartum, rather than the latent constructs that had all ASQ-3 subscales as indicators (see Supplemental Document for figures). Table 2 summarizes the β s and significance for associations between study variables and each ASQ-3 subscale at 12 months postpartum in each model. All five models provided an adequate representation of the data (fit for all models: RMSEA = .00, CFI = 1.00, SRMR = .01). Notably, higher scaffolding at 6 months postpartum predicted greater infant progress (e.g., less risk for delay) on communication (β

= .19, $p = .01$) and problem-solving ($\beta = .15$, $p = .03$) subscales of the ASQ-3 from 6 to 12 months postpartum. However, scaffolding was unrelated to progress on gross motor ($\beta = .11$, $p = .13$), fine motor ($\beta = .09$, $p = .18$), or personal-social ($\beta = .08$, $p = .23$) subscales. Results of bias-corrected bootstrapping tests indicated significant indirect effects of mothers' supportive maternal parenting in childhood on infant communication (95% CI [.031, .422]) and problem-solving (95% CI [.024, .383]) through scaffolding.

We also examined whether infants in different ASQ risk categories differed in the levels of scaffolding they experienced at 6 months. Supporting the clinical relevance of indirect effects on problem-solving at 12 months, results of t -tests revealed that infants who scored in the "monitor" or "refer for screening" ranges on this scale had significantly lower ratings of maternal scaffolding at 6 months than those scoring in the "on schedule" range, $t(189) = 2.73$, $p = .007$. These differences were not present for communication at 12 months, $t(189) = .76$, $p = .45$. Although there were not significant indirect effects on these outcomes in larger SEM models, infants who scored in the "monitor" or "refer for screening" ranges on gross motor, $t(189) = 2.93$, $p = .004$, and fine motor, $t(189) = 3.25$, $p = .001$, scales at 12 months had significantly lower ratings of maternal scaffolding at 6 months than those scoring in the "on schedule" range. There was not a significant difference for the personal-social scale at 12 months, $t(189) = .23$, $p = .82$.

Indirect effect of maternal childhood experiences on infant development through sensitivity.

—To test whether results replicated across another dimension of parenting, we tested an additional model that included sensitivity, rather than scaffolding, as the intermediary mechanism between maternal childhood experiences and developmental progress (see Figure 2). The model provided adequate fit to the data, $\chi^2(79) = 141.85$, $p < .001$, RMSEA = .05, CFI = .94, SRMR = .07. Consistent with the model for scaffolding, higher maternal education level was associated with greater sensitivity at 6 months postpartum ($\beta = .17$, $p = .02$). Of relevance to our aims, neither supportive maternal parenting in childhood ($\beta = .09$, $p = .24$) nor ACEs ($\beta = .06$, $p = .46$) were associated with sensitivity at 6 months postpartum, and sensitivity was not associated with infant developmental progress on the ASQ-3 from 6 to 12 months postpartum ($\beta = .07$, $p = .26$). Therefore, results did not support sensitivity as an intermediary mechanism between maternal childhood experiences and infant developmental progress. Because there was not a significant link between either maternal childhood experience variable and sensitivity, we did not conduct follow-up analyses to test if there were indirect effects on any of the individual ASQ-3 subscales.

Discussion

The primary aim of this study was to test if there are intergenerational indirect effects of maternal childhood experiences on infant developmental progress through maternal scaffolding behaviors. Consistent with our hypotheses, we found that mothers who perceived their own mothers as highly supportive in childhood were more likely to engage in scaffolding behaviors with their infants, which in turn predicted greater infant progress (e.g., less risk for developmental delay) in reaching developmental milestones from 6 to 12 months postpartum as assessed by the ASQ-3. Interestingly, we found that this cascade of

processes was specific to: (a) maternal experiences of supportive parenting in childhood and not evident for maternal ACEs and (b) maternal scaffolding behaviors and not generalized to maternal sensitivity. Our findings are consistent with prior research demonstrating that maternal childhood experiences have intergenerational consequences for infant development (6, 8). However, we build on this prior work by showing that ACEs alone do not account for all the risk in the next generation. Rather, how mothers are parented in their own childhoods has specific downstream consequences for healthy infant development. Our findings make a novel contribution to the burgeoning literature that shows relational experiences co-occur and operate independently from ACEs in predicting health outcomes (4).

Findings revealed that mothers' perceptions of supportive maternal parenting in childhood were predictive of their later scaffolding behavior, but ACEs were not. Consistent with a growing body of research that suggests there are important continuities in parenting practices across generations (15), it is possible that mothers' own experiences with their mothers as children may be especially salient in guiding the degree to which they scaffold their own children, which ultimately has implications for emerging stage-salient abilities. Attachment and emotional security theories share the assertion that early family experiences are reflected in internal scripts individuals develop regarding their beliefs about the nature and quality of family relationships, particularly under times of stress (25). In turn, these scripts are used as guides for navigating new and challenging contexts. When mothers perceive their own mothers as being supportive, caring, and responsive, even under times of stress (e.g., in the context of ACEs), they may draw on these scripts as a way of navigating the novel task of parenting an infant, which in turn has implications for infant development. Furthermore, because these effects were apparent in a high-risk sample of low-income mothers, these supportive early relationships appear to be a potentially salient point of resilience. Conversely, intergenerational effects of ACEs on infant development may operate through different intermediary mechanisms (e.g., maternal depressive symptoms, prenatal health problems, postpartum psychosocial risk) (8).

Results also indicated that maternal scaffolding was a unique intermediary mechanism between maternal childhood experiences and infant developmental progress, but findings did not replicate when examining maternal sensitivity, rather than scaffolding, as an intermediary mechanism. This speaks to the crucial role of providing infants with structured assistance in developing new skills to bolster advances in emerging stage-salient abilities and reduce risks for developmental delays. Although previously included in many studies as a predictive parenting behavior, sensitivity may be more prominent as a predictor of other commonly studied outcomes (e.g., attachment, childhood psychosocial functioning) (27), rather than infant progress in reaching developmental milestones. It is also possible that links between maternal childhood experiences and later sensitive parenting may be moderated by other factors (e.g., socioemotional supports in adulthood, maternal psychopathology, concurrent experiences of adversity) that may limit our ability to detect direct effects. Furthermore, the current study examined sensitivity during a free-play task, and it is possible that findings may be different when sensitivity is assessed during tasks that are stressful or challenging. Future research is needed to further explore the potential role of maternal sensitivity in indirect pathways involving maternal childhood experiences and offspring developmental outcomes.

Follow-up analyses revealed that indirect effects of maternal supportive parenting in childhood on infant developmental progress were specific to infant problem-solving and communication skills. Furthermore, infants in the “monitor” or “refer for screening” risk groups for problem-solving had significantly less scaffolding at 6 months than those in the “on schedule” group. Original conceptualizations of parental scaffolding define scaffolding behaviors as those designed to promote independent problem-solving (28), and it is therefore unsurprising that problem-solving abilities would be a particularly salient outcome in these cascades of processes. Additionally, findings related to communication are consistent with prior work demonstrating consistent links between early scaffolding and emerging language skills (29). Conversely, maternal scaffolding was not associated with infant fine and gross motor function or personal-social skills. Traditionally more studied in relation to cognitive and academic outcomes in children (e.g., executive function, cognitive abilities, classroom competence, reading comprehension, language abilities; see 13 for review), scaffolding has not been widely examined as a predictor of socioemotional outcomes or infant motor development. Our findings provide preliminary support for the assertion that it may be beneficial to explore other intermediary processes that may be more predictive of these forms of infant developmental outcomes.

These findings must also be interpreted in the context of the study’s limitations. First, all mothers in this study were living in low-income or impoverished households (e.g., all received public assistance), and 78% experienced at least one ACE ($M = 2.34$ ACEs). Although the high-risk nature of our sample is a strength, results may not necessarily generalize to families with less risk or high affluence. Building off of this point, maternal ACEs were not directly related to infant outcomes in our study. Additionally, though there was not a significant association between ACEs and greater gross motor performance at 12 months when controlling for effects of other highly relevant variables, there was a very small but statistically significant positive correlation among these factors. Although other studies finding significant indirect effects of maternal ACEs on infant developmental progress also report non-significant direct links between these variables (8), it is possible that the demographic characteristics of our sample may explain this non-intuitive finding. Second, modest effect sizes of predictive pathways point to considerable variability in these associations. Therefore, it will be critically important for future studies to examine whether other characteristics of mothers (e.g., psychopathology, utilization of mental health services, personality), infants (e.g., temperament), and families (e.g., concurrent adversity, socioemotional supports, other adults in the home) may modify these indirect effects. Third, our decision to focus on maternal scaffolding and sensitivity was guided by prior research and theory, but our examination of potential intermediary mechanisms is not exhaustive. It will be important for future research to test whether other factors explain indirect effects of maternal childhood experiences on infant outcomes. Fourth, maternal supportive parenting in childhood and maternal ACEs were highly correlated with one another ($r = -.53$), which could affect the interpretation that maternal supportive parenting in childhood was a contributor to scaffolding while ACEs were not. Therefore, future research is necessary to replicate our findings and further disentangle the unique effects of different types of childhood experiences. Fifth, although our use of a longitudinal design with repeated measures is an important strength of our study, it will be important for future research to

examine whether these intergenerational effects persist as infants transition into the toddler, preschool, and early childhood years and beyond.

Finally, although our use of a developmental screening tool (ASQ-3) to assess infant developmental progress is consistent with prior research (8, 29), there are inherent limitations to how our findings can be interpreted. Because the *clinical* purpose of the measure is to identify infants who are below screening cutoffs to be referred for further assessment of developmental delay, high scores on this measure reflect that children are “typically developing” as opposed to necessarily showing above-average or advanced progress in development. Therefore, while our findings indicate that scaffolding is associated with higher scores on this measure (i.e., lower risk for developmental delay; more likely to be developing on schedule), it will be critical for future research to extend our findings to examine additional continuous measures of developmental progress and emerging abilities.

In summary, our study was designed to examine whether maternal scaffolding mediated indirect effects of maternal childhood experiences on infant progress in reaching developmental milestones. Findings revealed that mothers’ perceptions of the level of support they received from their own mothers in childhood increased their likelihood of engaging in scaffolding behavior with their own infants at 6 months postpartum, which in turn predicted greater infant developmental progress (e.g., less risk for developmental delay) from 6 to 12 months postpartum. Our finding that scaffolding is a salient mechanism through which mothers strengthen infants’ developmental trajectories may have important clinical implications for promoting healthy psychosocial, academic, and physical functioning across the lifespan. Facilitating mothers’ use of scaffolding can be done within existing programs that provide support to high-risk mothers of infants, such as home visiting programs, which may be key to promoting positive infant development (30). Although existing home visiting programs concentrate on teaching parenting behaviors, our findings suggest that further emphasizing maternal scaffolding may be important, particularly within families whose infants are more at risk for developmental delays. These findings may also inform the development and refinement of evidence-based preventive interventions for infants living in contexts of risk. This has implications not only for the infants themselves, but potentially future generations who are impacted by their parents’ own childhood experiences of parenting.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Figure 1.

Autoregressive structural equation model testing indirect effect of maternal childhood experiences on infant developmental progress through scaffolding. Note. Parameter estimates for structural paths are standardized path coefficients. Dashed lines indicate non-significant pathways. For clarity, only significant correlations depicted. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2.

Autoregressive structural equation model testing indirect effect of maternal childhood experiences on infant developmental progress through sensitivity. Note. Parameter estimates for structural paths are standardized path coefficients. Dashed lines indicate non-significant pathways. For clarity, only significant correlations depicted. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1.

Descriptive Statistics and Correlations among Substantive Variables of Interest

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Prenatal Predictors: Maternal Childhood Experiences																
1. Supportive Maternal Parenting	--															
2. ACEs	-.53*	--														
Observed Parenting: 6 Months Postpartum																
3. Maternal Scaffolding	.20*	.00	--													
4. Maternal Sensitivity	.09	.02	.67*	--												
Infant Developmental Progress: 6 Months Postpartum																
5. ASQ-3 Problem-Solving	.12	.06	.11	.07	--											
6. ASQ-3 Communication	.00	.09	-.04	-.03	.42*	--										
7. ASQ-3 Gross Motor	.01	.08	.13	.01	.47*	.36*	--									
8. ASQ-3 Fine Motor	.02	.04	.12	.09	.60*	.37*	.56*	--								
9. ASQ-3 Personal-Social	.10	.02	.01	-.02	.62*	.41*	.56*	.60*	--							
Infant Developmental Progress: 12 Months Postpartum																
10. ASQ-3 Problem-Solving	.08	.01	.23*	.11	.56*	.35*	.43*	.42*	.47*	--						
11. ASQ-3 Communication	-.01	-.01	.16*	.15*	.41*	.30*	.32*	.39*	.26*	.56*	--					
12. ASQ-3 Gross Motor	-.03	.15*	.19*	.05	.41*	.20*	.41*	.44*	.37*	.45*	.47*	--				
13. ASQ-3 Fine Motor	.09	.04	.20*	.12	.48*	.31*	.40*	.41*	.44*	.68*	.50*	.36*	--			
14. ASQ-3 Personal-Social	.01	-.03	.06	-.02	.55*	.40*	.38*	.48*	.50*	.62*	.56*	.41*	.57*	--		
Covariates Included in Models																
15. Maternal Education	.13*	.07	.23*	.18*	.12	.02	.08	.04	.08	.21*	.08	.15*	.21*	.01	--	
16. Infant Born Premature (% yes)	-.05	-.05	.02	.02	-.26*	-.11	-.13	-.17*	-.26*	-.18*	-.15*	-.24*	-.13	-.22*	-.02	--
Mean/n	.00	2.34	3.27	5.42	48.01	49.66	45.13	46.36	47.73	43.68	46.22	49.70	48.58	44.35	4.21	27
SD/%	3.06	2.22	1.13	1.25	12.21	8.82	11.96	13.35	11.14	14.68	12.22	13.70	12.50	13.98	.84	10.3%
Minimum	-9.77	0	1	2	10	25	10	10	15	0	10	10	10	0	3	0
Maximum	5.11	9	5	8	60	60	60	60	60	60	60	60	60	60	6	1

Note: ACEs = adverse childhood experiences; ASQ-3 = Ages and Stages Questionnaire. Values reported are based on winsorized data used in primary analyses.

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Table 2. Results of path models predicting infants' progress on individual subscales of the ASQ-3 at 12 months postpartum

	Problem Solving	Communication	Gross Motor	Fine Motor	Personal-Social
Scaffolding	.15*	.19*	.11	.09	.08
Supportive Maternal Parenting	-.02	-.11	-.01	.08	-.07
ACEs	-.03	-.10	.10	.04	-.10
Autoregressive Path	.52***	.30***	.35***	.38***	.48***
Maternal Education	.10	.04	.08	.15*	-.04
Infant Born Premature	-.05	-.12	-.18**	-.07	-.11

Note. Coefficients are standardized path coefficients; autoregressive path refers to each ASQ-3 subscale's 6-month counterpart; paths from predictors to 9 month postpartum variables were also estimated but are not depicted for clarity.

* $p < .05$.

** $p < .01$.

*** $p < .001$.