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## “My Baby & Me”: Effects of an Early, Comprehensive Parenting Intervention on At-Risk Mothers and Their Children

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## Abstract

This study examined the efficacy of a multimodule parenting intervention, “My Baby & Me,” that began prenatally and continued until children reached 2.5 years of age. The intervention targeted specific parenting skills designed to alter trajectories of maternal and child development. Of 361 high-risk mothers (193 adolescents, 168 adults) enrolled across 4 states, half were randomly assigned to the high-intensity (HI) home visitation coaching program (55 sessions), and half to a low-intensity (LI) condition that included monthly phone calls from a coach, printed informational materials, and community resource referrals. Videotaped observations of mother–child play were coded at 5 time points for multiple maternal and child behaviors and skills. Compared to mothers in the LI group, mothers in the HI group showed higher levels of contingent responsiveness, higher quality verbal stimulation, and more verbal scaffolding by 30 months, with higher levels of warmth and greater decreases in physical intrusiveness and negativity when their children were 24 months. By 30 months, children in the HI group showed more rapid increases and higher levels of engagement with the environment, expressive language skills, and social engagement, as well as more complex toy play and fewer problem behaviors than those in the LI group. Gains in maternal responsive behaviors mediated the effects of the intervention on child outcomes. Results were comparable for adolescent and adult mothers. A strong theoretical framework, consistent focus on maternal responsiveness, high dosage, and trusting relationships with coaches are thought to explain the positive outcomes.

## Keywords

parenting; prevention; intervention; infants; toddlers; responsiveness; neglect

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Young children living in poverty are at substantially increased risk for poor developmental and adverse behavioral outcomes (e.g., Shonkoff & Phillips, 2000) as well as increased risk for abuse and neglect (e.g., Slack et al., 2011). However, the quality of the parent–child relationship, including attentiveness to the infant’s needs and responsive support for the toddler’s emerging desire to explore and gain independence, can moderate this risk and improve children’s developmental outcomes (Landry, Smith, Swank, Assel, & Vellet, 2001). A number of home visiting interventions have been developed over the past 2 decades to try to improve outcomes for these vulnerable children. Examples of such programs include: Parents as Teachers (Wagner, Cameto, & Gerlach-Downie, 1996), Healthy Families America (Caldera et al., 2007), Nurse–Family Partnership (Olds, 2006), and the Infant Health and Development Program (Ramey et al., 1992). The content of these programs has typically included provision of information about parenting, assistance with accessing community services and a medical home for the child, providing emotional support for the family, and/or teaching parents educational activities to do with their children. Such broad-based programs have yielded mixed results (e.g., Howard & Brooks-Gunn, 2009; Silovsky et al.,

2011). Those that have included a focus on enhancing the parent–child relationship show more promising results than those that focus primarily on providing child health care, basic developmental information, or other community resource support (Kearney, York, & Deatrick, 2000). Results have included changes in parent attitudes and behaviors (Fergusson, Grant, Horwood, & Ridder, 2005) and, for some, improvement in children’s developmental outcomes (e.g., Olds, 2006). There is usually an assumption that changes in parent behaviors were the mechanism responsible for any child changes. However, there is often limited information reported about changes in specific aspects of responsive parenting in relation to specific changes in children’s skills.

There is also growing evidence of positive results from short-term interventions specifically targeting parents’ responsive interaction skills with their young children. Such studies with middle-class families have documented positive effects on parents’ responsiveness skills and young children’s social–emotional outcomes (e.g., Van Zeijl et al., 2006). Another group of experimental studies has found improvements in responsive parenting for parents and/or children with a variety of risk factors for poorer outcomes (e.g., maternal depression, poverty, child prematurity, risk for maltreatment, adoption). In these studies, when responsiveness was increased, children showed at least short-term increases in cognitive and social skills (e.g., Linares, Montalto, Li, & Oza, 2006; Toth, Rogosch, Manly, & Cicchetti, 2006). A meta-analysis (Dunst & Kassow, 2008) reported that best outcomes were achieved when programs included frequent visits and focused explicitly on teaching parents to attend to children’s signals and respond sensitively. Video modeling and parent self-reflection also produced positive behavioral changes (e.g., van den Boom, 1995).

Thus, evidence across both comprehensive and more targeted, short-term studies suggests that a focus on building responsive parent–child interactions should be a critical component of home-based interventions when attempting to alter the trajectory of at-risk children’s development. Responsive parenting has been described as an affective–emotional style of interaction between caregivers and their children that includes acceptance of a child as a unique individual with his or her own needs and interests of their own (Darling & Steinberg, 1993). Grounded in attachment theory, the caregiver’s responses are contingently linked to the child’s signals in a prompt and sensitive way. These contingent responses, if used consistently, provide the child with feedback that his or her needs are important and that the child is valued and loved. The child, in turn, develops trust and a secure bond with his or her caregiver that occurs through a process of internalization (Ainsworth, Blehar, Waters, & Wall, 1978; Bornstein & Tamis-Lemonda, 1989). As a result, the child learns to self-regulate, as responsive interactions facilitate the development of mechanisms for coping with stress and novelty. Studies examining parents’ contingent responsiveness to children’s behaviors often show relations with children’s emotional and social outcomes.

## The Intervention

With this literature in mind, the core of the present intervention, known as “My Baby & Me,” focused on changing specific aspects of mothers’ responsive behaviors with their children across the infant and toddler developmental periods. To do so, we used the Play and Learning Strategies (PALS) curriculum, which in previous random assignment studies has

been shown to increase mothers' use of a range of responsive behaviors and in turn increase children's emotional, behavioral, and language skills (Landry, Smith, & Swank, 2006; Landry, Smith, Swank, & Guttentag, 2008). PALS has also been shown to help mothers generalize their use of the target skills in new contexts that were not explicitly practiced during intervention (Landry et al., 2012). This structured, developmentally sequenced curriculum comprised 22 of the 55 total intervention sessions. PALS was originally designed for parents of particularly vulnerable children (infants and toddlers from low-socioeconomic-status backgrounds) and includes both Infant and Toddler modules that taught mothers a set of interactional skills that collectively represent a responsive parenting style, informed by attachment and social learning theories (Ainsworth et al., 1978; Bornstein & Tamis-Lemonda, 1989). Four key constructs comprise this interactive style: (a) contingent responsiveness; (b) warm sensitivity, including positive behavior management skills; (c) maintaining children's focus of attention and interest; and (d) rich verbal input. The curriculum (available in both English and Spanish) includes educational videotapes featuring mothers with similar backgrounds to the study participants demonstrating specific target skills, guided discussion and questions to ensure parents' understanding of the concepts, direct coaching of parents' use of the key behaviors during videotaped interactions with their children, supporting mothers to critique their videotaped behaviors, and planning for integration of target behaviors into daily ongoing interactions with their children.

Similar to other comprehensive interventions, the My Baby & Me program included a number of other sessions that targeted goals such as establishing consistent daily routines, learning about infant health and safety, developmental milestones, and problem solving and decision making. However, this program was unique in several aspects. First, its core focus was on building responsive parenting in a structured, step-by-step approach via a combination of video modeling, interactive discussion, live coached practice, and video self-reflection. Many of the specific principles of intervention effectiveness proposed by Small, Cooney, and O'Connor (2009) were included, such as sufficient dosage and intensity, active engagement of parents in learning and practicing new skills, developmental appropriateness (i.e., tailored to the ages/stages of children), and delivery by well-qualified and trained staff.

## Mechanism of Expected Impact

The intervention explicitly targeted mothers' skills in attending to and responding warmly and contingently to their children's communicative signals and needs, with the expectation that this fundamental set of skills, once mastered, would result in more positive, enriching, and effective interactions between mother and child. Such successful interaction patterns were expected, in turn, to lead to positive outcomes in children's learning and social-emotional development, as children were assisted by the responsive parent to remain regulated and positively engaged in meaningful play and learning interactions to build their emerging skills. In addition, as mothers learned to tune in to their children's signals and needs, while simultaneously learning about relevant topics such as health, safety, developmental milestones, and age-appropriate play activities, they were expected to be better able to apply this information to their children in ways that were individualized and that could adapt to their children's changing capabilities and needs as they grew from infancy through toddlerhood.

## Hypotheses

The present study was designed to assess the impact of the My Baby & Me intervention on changes in parent responsiveness behaviors and in children's social-emotional, cognitive, and language skills, as well as examine whether changes in mothers' responsiveness behaviors explained the effects of the intervention on increases in children's cognitive and social skills over time. To control for the potential effects of having a supportive relationship over time with a family coach and individualized referrals to community resources, we created a low-intensity intervention as a control condition. Mothers in the low-intensity condition were matched with a coach who provided monthly check-in phone calls and individualized referrals to community resources as requested by the mothers. This condition is described in more detail later in this article. During pregnancy and prior to receiving any intervention, mothers were randomly assigned to either the high- or low-intensity intervention condition. Using this randomized control design, we hypothesized the following study outcomes:

1. We expected that mothers in high intensity intervention would show greater increases in all responsive parenting behaviors at each time point after 4 months than mothers in the low-intensity intervention.
2. We expected that children of mothers who received the high-intensity intervention would show higher levels and greater increases in social, cognitive, and language skills than children whose mothers received the low-intensity intervention.
3. We expected that increases in mothers' responsiveness would mediate the effects of the intervention on gains in children's skills, as the mechanism of impact of the intervention on children was expected to be primarily indirect, through changing mothers' parenting behaviors.

We did not have a specific hypothesis with regard to anticipated differences between teen mothers' and adult mothers' response to the intervention, given mixed findings in the literature, but examined these comparisons as well.

## Method

### Participants

Pregnant women and adolescents with less than a high school education were recruited from community health and education agencies serving low-income clients in four geographical regions: South Bend, Indiana; Kansas City, Kansas and Missouri; Washington, D.C.; and Houston, Texas. Through telephone or home visit prescreenings, women were deemed eligible for enrollment if they were pregnant, 15 years of age or older, did not have high school degree, and did not have any of the following exclusion criteria: preexisting diagnosis of major mental illness such as schizophrenia, currently receiving substance abuse treatment in a residential facility, or planning not to keep the baby after birth. From the 396 women judged eligible, 361 (91%) were enrolled during their third trimester of pregnancy. See Table 1 for maternal characteristics.

The initial sample consisted of 193 adolescents (age = 18 years) and 168 adults. The average age of teen mothers at enrollment was 17.18 years ( $SD = 1.14$ ), and 24.29 years ( $SD = 4.97$ ) for adult mothers. Self-identified race and ethnicity were 56.23% African American, 35.45% Hispanic, and 11.91% White non-Hispanic; the majority of mothers (88%) were unmarried. During pregnancy, 40% scored at least 1 standard deviation below the national mean on the Word Attack subscale of the Woodcock–Johnson III/Woodcock–Muñoz III tests, and 37% had elevated scores on the Child Abuse Potential Inventory (Milner, 1986). There were no significant group differences on any risk or demographic characteristics (see Table 1).

At the final assessment, 247 mother–child dyads remained (68.42% of the original sample, 32% attrition rate), which compares favorably to attrition in other home visiting studies (e.g., 57% in McGuigan, Katzev, & Pratt, 2003; 36% in Fernandez & Eyberg, 2009; 57% in Wagner et al., 1996). Primary reasons for attrition in our sample, from most to least frequent, were inability to locate family, family moved out of area, mother’s increased commitment to work or school interfered with ability to continue in the program, child removed from mother’s care by Child Protection Services or permanently placed in the care of another family member, maternal incarceration, and maternal inpatient substance abuse treatment.

When looking at attrition rates, an additional concern is that dropout is often not random (e.g., McGuigan et al., 2003). This is a significant problem if participants who have more risk factors and are thus most in need of services are more likely to drop out. However, our analyses detected no significant differences in the demographic and maternal characteristics of those who completed the intervention compared with those who did not. Furthermore, at three of the four sites, rates of attrition were comparable across high-versus low-intensity intervention groups. At only one site was there differential attrition, and at that site, although there were more high-intensity group families lost to attrition, observed parent and child behaviors at the 4-month time point were very similar between those who later dropped out of the program and those who remained enrolled. Only two variables at 4 months showed any difference: Mothers who dropped out showed lower levels of demonstrating/physical teaching,  $t(304) = -2.06, p = .041$ , and higher levels of negativity,  $t(304) = 2.03, p = .043$ , compared to mothers who remained in the study at 30 months. No other maternal variables and none of the child variables indicated any difference between those attrited and those who did not,  $t(304) = 0.00–1.69, ns$ .

## Design and Procedures

Participants agreed to be randomly assigned to one of two groups through a matched blocking procedure for teen and adult mothers: a low-intensity intervention condition in which mothers received monthly check-in phone calls from a family coach, informational print materials, and needs-based referrals to existing community resources or a high-intensity intervention condition in which participants received referrals to community resources as well as the comprehensive My Baby & Me intervention designed to enhance parenting skills.

**High-intensity treatment**—The high-intensity intervention began during the third trimester of pregnancy and continued until each child reached 30 months of age. Coaches

worked individually with each mother–child dyad at home or in a location of their choice (e.g., relative’s home, local library). The intervention was designed to provide a cohesive, developmentally sequenced curriculum across 55 sessions. As noted above, the core of the My Baby & Me curriculum (comprising 22 of the 55 sessions) was the PALS program developed by Landry et al. (2006). Parents begin with basic skills of observing their child’s communicative signals and progress to using a variety of responsiveness behaviors (e.g., smiling, using a warm tone of voice, encouraging children’s efforts, avoiding intrusiveness and unnecessary restrictions, attending to and following the child’s interests) in a contingent manner related to what the child signaled, along with using rich language input and scaffolding to support the child’s language and cognitive development. This program has been shown to be one of the more effective intervention programs targeting at-risk parents and is currently listed in the U.S. Department of Health and Human Services Home Visitation Evidence of Effectiveness programs, the Promise Neighborhoods Research Consortium What Works programs, and the Sociometrics Corporation Effective Programs Archive. In a randomized controlled trial, mothers who had received the 10- to 12-week PALS intervention showed significantly more warmth and sensitivity toward their children, increased contingent responsiveness, greater skills in maintaining the duration of their children’s attention and interest, richer vocabulary use and verbal explanations when interacting with their children, and more praise than mothers in the control condition (Landry et al., 2006; Landry et al., 2008); these significant effects occurred irrespective of maternal anger or depressive symptoms (Smith, Landry, & Swank, 2005). In turn, children of mothers who received the PALS intervention showed more positive affect during interaction with their mothers, initiated conversation with their mothers more often, used more words during interactions with their mothers, and developed larger receptive vocabularies than children of mothers in the control condition (Landry et al., 2006).

Additional modules in eight major topic areas covered other important areas of early parenting knowledge and skills, including establishing early routines; infant and toddler health and safety (using materials from Lutzker & Bigelow, 2002); personal problem solving and decision making (adapted from the Infant Health and Development Program by Gross, Spiker, & Hayes, 1997); infant touch and massage using material from McClure, 2000; developmental milestones and age-appropriate play activities (using the “Healthy Start, Grow Smart” series of booklets (U.S. Department of Education, 2002); reading with babies and promoting early literacy (following the Reading Is Fundamental parent guidelines); promoting positive behavior; and enhancing community connections. For a complete list of the modules and numbers of sessions, see supplemental materials (Appendix A). We designed the home-based format to maximize parental engagement by beginning each session with a review of homework and material from the previous session, then introducing new material using video modeling whenever possible, coaching and videotaping the parent as she actively practiced the new target skills with her child, engaging the mother in self-reflection while reviewing the video footage of her interaction with her child, and planning for the coming week’s homework. Sessions followed a schedule of weekly or biweekly visits, with some breaks built in to allow for rescheduled visits, holidays, etc. Each visit lasted approximately 1.5 hr. When children were 24–30 months of age, the last six sessions occurred at monthly intervals as part of the program completion and graduation process.

The following guidelines framed our approach: (a) target improving specific maternal interaction skills that predict positive child outcomes; (b) use a variety of formats (video and in-person demonstration and feedback, discussion, pictures, print materials) to engage each mother actively in the learning process; (c) build in recurring opportunities for parents to master and integrate new skills over time; (d) foster a trusting, caring relationship between coach and mother to promote active and sustained engagement; (e) make session sequence and contents developmentally appropriate for children and interesting for mothers; (f) provide explicit coaching, practice, and guided self-reflection activities for each target skill within the context of naturalistic mother–child interactions; (g) provide mothers with resource and referral information to address broader, individualized needs such as housing, adult education, health care, and insurance, while maintaining the primary focus on the explicit teaching of parenting skills.

**Low-intensity treatment**—To control for some of the attentive and supportive aspects of the intervention and to provide important basic child development information, we assigned a family coach to each participant in the low-intensity condition, providing printed informational materials and appropriate referrals to community agencies. These supports to mothers were provided at the same developmentally appropriate time points as families in the high-intensity condition received materials on these same topics. Families were offered additional community resource information based on the mother’s responses to the Eco-Map assessment (see measures below), administered during each assessment time point. In addition, the coaches contacted their assigned low-intensity mothers by phone once a month. To maximize fidelity, coaches followed a systematic format for each call, asking a standard set of questions about the parent’s current status and her child’s developmental progress. Coaches were trained to provide supportive, nondirective responses during these calls and to refrain from giving specific parenting advice. They were instructed in how to handle questions from parents within the guidelines of the intervention. For example, coaches would send mothers preapproved, printed handouts on a specific topic if the mother requested help in that area (e.g., toilet training, child nutrition) and were otherwise referred to contact their child’s pediatrician about any child-related concerns. In this way, we enabled mothers in the low-intensity group to establish a supportive relationship with their coaches, provided regular opportunities for mothers to talk about and reflect on their children’s health and development, and provided individualized resource and referral information upon request, but without providing instruction or coaching on specific parenting skills.

**Family coaches**—Family coaches had a minimum of a bachelor’s degree in psychology, education, or a related field. Several had master’s degrees and/or were graduate students at the time of their involvement in the project. To the extent possible, we recruited coaches whose ethnicities were reflective of the diverse population of families with whom they worked. This varied somewhat by site, but out of 30 coaches, 16 were Caucasian, seven were Hispanic/Latina, and seven were African American. Due to logistical constraints, coaches were not systematically matched with families by ethnicity, but families completing the intervention in Spanish were matched with a fluent Spanish-speaking coach. Families completed satisfaction surveys at regular intervals (results were not seen by their coach), and these included questions about their satisfaction with their relationship with their coach. The



co-investigator at each site reviewed these surveys and addressed any concerns with the coach if needed. However, this was an exceedingly rare occurrence, as the vast majority of satisfaction surveys indicated a high level of satisfaction with the program and with the coaches.

**Fidelity**—To promote consistency and fidelity across the four intervention sites, the following strategies were incorporated: (a) cross-site trainings; (b) formal certification processes for administering each module; (c) detailed, scripted program manuals; (d) weekly group supervision meetings; (e) monthly field supervision; and (f) regular principal and coprincipal investigator conference calls to ensure consistency across sites. For more information, see supplemental materials (Appendix B).

**Assessment approach and measures**—All mothers completed an assessment during pregnancy prior to randomization to the two conditions. Subsequent assessments of mothers and children occurred when the child was 1, 4, 10, 16, 24, and 30 months of age. Research assistants who were blind to conditions conducted assessments in the families' homes, including maternal interviews; self-report and parent report measures of maternal and child functioning; standardized measures of children's language, cognitive, and socioemotional development; and direct observations of mother–infant interaction that were videotaped and later coded (see below). Mothers in both conditions received \$425 for participation in assessments throughout the project, beginning with \$35 for the pregnancy assessment, with amounts increasing incrementally at each subsequent assessment. All measures were administered in English or Spanish, depending upon the mother's preference.

**Demographic and risk characteristics:** Maternal demographic and risk characteristics were assessed at the prenatal and 1-month assessments to describe the sample characteristics and analyze equivalence of the two groups at the time of enrollment. Measures included the Child Abuse Potential Inventory (Milner, 1986), which assessed child abuse risk; the Symptom Checklist–90 (Derogatis, 1994), which assessed maternal depression and psychiatric symptoms; the Adult–Adolescent Parenting Inventory–2 (Bavolek & Keene, 2001), which examined parenting beliefs and attitudes; the Postpartum Depression Screening Scale (Beck & Gable, 2001), which identified women at risk for postpartum depression; the Knowledge of Infant Development Inventory (MacPhee, 1981), which obtained information on parents' factual knowledge of parental practices and typical infant behavior; a background history interview, which obtained demographic information and self-report of substance use; and the Letter–Word Identification and Word Attack subtests of the Woodcock–Johnson, Third Edition (Woodcock, McGrew, & Mather, 2003), and parallel subtests of the Bateria III Woodcock–Muñoz (Woodcock, Muñoz-Sandoval, McGrew, & Mather, 2005), which assessed literacy related skills. See supplemental materials (Appendix C) for more information on these measures.

**Parenting outcome measures:** Parenting outcomes were based on direct observations of parenting practices by means of the Landry Parent–Child Interaction Scales (Landry et al., 2006) to code observed behaviors during mother–infant interactions at home at the 4-month assessment time point and each time point thereafter. See supplemental materials (Appendix

D) for mother and child coded variables. Each mother and her child were videotaped at home during a 20-min free-play period.

**Coding procedures and interrater reliability:** The coding staff was trained by an expert senior coder under the direction of Susan H. Landry. Coders were blind to intervention group participant status. Initial training involved each member achieving interrater agreements equal to or greater than 80% per variable. To guard against observer drift, monthly meetings were conducted where videotapes were coded as a team and interrater agreements were checked to ensure that they continued to meet the criterion of equal to or greater than 80% per variable. A second rater coded 15% of the videotapes, and generalizability coefficients were calculated with repeated-measures analyses of variance. This method is recommended for studies using continuous, observational data and has the advantage of evaluating both consistency across participants for each rater and rater variance within participants for those variables used in subsequent analyses (Frick & Semmel, 1978). Generalizability coefficients for the maternal and child behaviors ranged from .63 to .75.

**Child outcome measures:** The following measures assessed children's outcomes related to the intervention: The Landry Parent–Child Interaction Scales were used to code children's behavior during videotaped mother–child play and mother–child book-reading sessions. The Brief Infant–Toddler Social and Emotional Assessment (BITSEA) assessed children's social–emotional functioning (Briggs-Gowan, Carter, Irwin, Wachtel, & Cicchetti, 2004) at 16, 24, and 30 months. The Preschool Language Scale, Fourth Edition (PLS–4; English and Spanish versions; Zimmerman, Steiner, & Pond, 2002) assessed children's expressive and receptive language at ages 10, 16, 24 (Expressive scale only), and 30 months. The Cognitive Scale of the Bayley Scales of Infant and Toddler Development, Third Edition, assessed children's cognitive functioning at 24 months (Bayley, 2006). See supplemental materials (Appendix E) for more information on these measures.

## Results

We first focus on group differences over time in observed parenting practices and child development. We then examine maternal reports of children's behaviors, followed by mediational analyses in which observed parenting behaviors are treated as mediators between treatment groups and children's outcomes. Finally, group differences in children's standardized cognitive and language test scores are reported. Because analyses indicated that the high- and low-intensity intervention groups did not reliably differ by site, maternal age, or race/ethnicity, we did not include these variables as moderators or covariates in further analyses.

To model repeated outcome measures over time, we adopted a mixed model analysis. There are two major advantages to this approach: A mixed model uses all available cases rather than making listwise deletions; in addition, a mixed model provides greater flexibility in specification of the variance–covariance matrix among repeated observations. Missing data were handled with full information maximum likelihood, which is robust when missing data are ignorable (Little & Rubin, 1987).

To examine parenting behaviors, the model included intervention condition, time of assessment, and the condition by time interaction. Examination of these variables revealed that the changes over time were not linear. Therefore, time was entered as a categorical variable and a repeated-measures analysis was conducted. The test of time allowed us to examine differences in means across the groups because the groups did not start off the same. When group effects were significant, we compared group means and standard deviations (simple main effects). Effect size (ES) was estimated in terms of least square mean differences between groups at each time point divided by the model-estimated standard deviation from the model, which is approximately equivalent to the pooled standard deviation of the raw variable. Table 2 provides the means and standard deviations for the observed and parent-rated variables, and Figures 1 and 2 present means for conditions across time.

### Intervention Effects on Parenting Outcomes: Maternal Behaviors

**Warmth**—For maternal warmth, there were significant differences by group,  $F(1, 334) = 16.41, p < .0001$ , and time,  $F(4, 921) = 6.44, p < .0001$ , with a significant interaction of group by time,  $F(4, 921) = 4.20, p = .0022$ . Analysis of the simple main effects indicated that mothers in the high-intensity group were significantly higher on warmth at 16 months,  $F(1, 921) = 17.76, p < .0001, ES = .53$ , and 24 months,  $F(1, 921) = 23.19, p < .0001, ES = .61$ . Differences in favor of the high-intensity mothers at 4 months ( $p = .078, ES = .20$ ) and 10 months ( $p = .055, ES = .23$ ) approached significance.

**Contingent responsiveness**—Results for contingent responsiveness also demonstrated significant differences between groups,  $F(1, 334) = 23.93, p < .0001$ , and time,  $F(4, 921) = 17.90, p < .0001$ , as well as a significant Group  $\times$  Time interaction,  $F(4, 921) = 2.72, p = .03$ . Analyses of simple main effects revealed that mothers in the high-intensity group showed more contingent responsiveness at 10 months,  $F(1, 921) = 9.88, p = .002, ES = .38$ ; 16 months,  $F(1, 921) = 12.17, p = .0005, ES = .45$ ; 24 months,  $F(1, 921) = 26.09, p < .0001, ES = .66$ ; and 30 months,  $F(1, 921) = 8.10, p = .005, ES = .37$ . The difference at 4 months approached significance,  $F(1, 921) = 2.96, p = .0854, ES = .20$ .

**Physical intrusiveness**—There were significant group differences on maternal physical intrusiveness,  $F(1, 334) = 7.02, p = .008$ , as well as significant differences over time,  $F(4, 921) = 31.25, p < .0001$ . The Group  $\times$  Time interaction was also significant,  $F(4, 921) = 3.07, p = .016$ , indicating that group differences were not the same at all time points. Simple main effects revealed that mothers in the high-intensity condition were significantly less intrusive at 16 months,  $F(1, 921) = 6.09, p = .014, ES = .15$ , and 24 months,  $F(1, 921) = 11.04, p = .0009, ES = .22$ , but not at the other time points.

**Quality of verbal stimulation**—There were significant group differences on quality of verbal stimulation,  $F(1, 334) = 16.25, p < .0001$ , as well as significant differences over time,  $F(4, 921) = 74.16, p < .0001$ ; in addition, the group differences varied significantly by time,  $F(4, 921) = 2.45, p = .045$ . Analyses of simple main effects indicated that mothers in the high-intensity condition engaged in higher quality of verbal stimulation (e.g., rich vocabulary words) at 10 months,  $F(1, 921) = 12.04, p = .0005, ES = .42$ ; 16 months,  $F(1,$

921) = 13.36,  $p = .0003$ ,  $ES = .47$ ; 24 months,  $F(1, 921) = 9.86$ ,  $p = .002$ ,  $ES = .40$ ; and 30 months,  $F(1, 921) = 5.16$ ,  $p = .0233$ ,  $ES = .30$ ; but not at 4 months ( $p = .45$ ,  $ES = .085$ ).

**Frequency of verbal scaffolding**—There were significant group differences in mothers' frequency of verbal scaffolding,  $F(1, 333) = 9.00$ ,  $p = .003$ , as well as significant differences over time,  $F(4, 906) = 77.56$ ,  $p < .0001$ . Analyses of simple main effects indicated that mothers in the high-intensity condition engaged in more frequent use of verbal scaffolding at 16 months,  $F(1, 906) = 4.40$ ,  $p = .036$ ,  $ES = .28$ ; 24 months,  $F(1, 906) = 8.29$ ,  $p = .004$ ,  $ES = .38$ ; and 30 months,  $F(1, 906) = 4.58$ ,  $p = .033$ ,  $ES = .28$ ; though not at 4 months ( $p = .94$ ,  $ES = .009$ ) or at 10 months ( $p = .13$ ,  $ES = .19$ ).

**Demonstrating/physical teaching**—There was a significant group difference,  $F(1, 334) = 7.86$ ,  $p = .0053$ , and significant changes over time,  $F(4, 921) = 39.25$ ,  $p < .0001$ , with group differences being consistently maintained over time (average  $ES = .19$ ). Specifically, mothers in the high-intensity group were significantly higher on demonstrating/physical teaching by the time their infants were 4 months old and continued to improve thereafter by about the same amount as the low-intensity group over time. This suggests that the high-intensity intervention was related to early and sustained increases due to the intervention sessions mothers had received during their children's first few months of life.

**Positive affect**—Although there were significant differences over time in maternal positive affect during observed mother-child interactions,  $F(4, 921) = 39.51$ ,  $p < .0001$ , there were no overall group differences nor a significant Group  $\times$  Time interaction. Main effects analyses indicated a significant difference between groups at 16 months in favor of the high-intensity condition,  $F(1, 921) = 4.42$ ,  $p = .04$ ,  $ES = .27$ .

**Negativity**—There was a significant change over time in maternal negativity,  $F(4, 921) = 4.05$ ,  $p = .0003$ , but no overall group difference nor a significant Group  $\times$  Time interaction. Analyses of simple main effects indicated that mothers in the high-intensity group were significantly less negative at 24 months,  $F(1, 921) = 4.63$ ,  $p = .03$ ,  $ES = .16$ .

### Intervention Effects on Adolescent Versus Adult Mothers

Although we did not have an a priori hypothesis with regard to potential differences in response to the intervention by teenage (defined as equal to or less than 18 years of age) versus adult mothers, we examined the three-way interaction between time, intervention group, and maternal age. There was little evidence of differences between teenage and adult mothers, with only one significant difference between the maternal age groups at the 4-month time point, when adolescent mothers in the low-intensity intervention group showed more verbal scaffolding than adult mothers.

### Intervention Effects on Developmental Outcomes: Observed Children's Behaviors

Children's developmental outcomes were analyzed with growth curve models. In this type of model, the outcome is modeled as a function of age. The function can be linear with a random intercept and slope and may include a curvilinear term (quadratic). If the quadratic term was not significant, it was dropped and the model assuming linearity was reported

(Maxwell & Delaney, 1990; Raudenbush & Bryk, 2002). Time was centered at 16 months to reduce the chances of multicollinearity. Effect sizes for the growth curve models were calculated as the difference between groups in the change from the first to the last time point, divided by the model-estimated standard deviation.

**Engagement with environment**—The model assuming curvilinearity indicated a significant quadratic trend,  $F(1, 289) = 268.00, p < .0001$ ; since the quadratic term did not depend on group membership, the Group  $\times$  Quadratic Term interaction was dropped. In other words, there was no evidence that the curvature of the model differed for the high- and low-intensity conditions. The resulting model revealed a significant Group  $\times$  Slope interaction,  $F(1, 637) = 4.11, p = .04$ . Both groups showed positive changes, but the slope for the high-intensity group was significantly steeper. Thus, children in the high-intensity condition displayed more engagement with their environment at a more rapid rate than children in the low-intensity condition. Changes from 4 to 30 months compared across conditions had an effect size of .33.

**Expressive language**—Children's expressive language showed a similar quadratic trend,  $F(1, 289) = 32.86, p < .0001$ , but no differences in the quadratic term by group. Dropping this interaction, the resulting model revealed a significant group by slope interaction,  $F(1, 637) = 4.61, p = .032$ . In other words, children in the high-intensity condition showed improvements in their expressive language at a faster rate than children in the low-intensity group. Comparison of the change in group means from 4 to 30 months resulted in an effect size of .34.

**Receptive language**—There were no significant group effect or Group  $\times$  Slope interactions for receptive language. Thus, children in the high- and low-intensity conditions both improved by equivalent amounts.

**Social engagement**—There was no indication of curvilinearity for the social engagement data. The resulting model assuming linearity indicated a significant Group  $\times$  Slope interaction,  $F(1, 408) = 5.02, p = .03$ . Children in the high-intensity group increased their level of social engagement over time at a more rapid rate than children in the low-intensity group. The interaction between 4 months and 30 months and group had an effect size of .38. Examination of the least squares estimates at each time point indicated that the children in the high-intensity condition were higher on social engagement at 30 months than children in the low-intensity condition,  $t(408) = 2.46, p = .01, ES = .31$ .

**Negative affect**—There was no curvilinearity evident in ratings of children's negative affect. The model assuming linearity showed that although children displayed less negative affect over time during observed mother-child interactions,  $F(1, 408) = 97.68, p < .0001$ , there was no significant group or Group  $\times$  Time effects. Main effects analyses indicated that group differences approached significance at 10 months,  $F(1, 921) = 3.72, p = .054, ES = .25$ , and at 30 months,  $F(1, 921) = 3.07, p = .08, ES = .25$ , such that children in the high-intensity condition showed less negative affect than those in the low-intensity condition at these time points.

**Cooperation**—Since cooperation was assessed only at 16, 24, and 30 months, and individual growth curves indicated no linearity over time, we used a repeated-measures analysis rather than growth curve modeling. However, no group or Group  $\times$  Time effects were observed.

**Complexity of toy play**—Children in the high-intensity group demonstrated significantly higher levels of toy play at 30 months, after controlling for their level of toy play at 24 months. Across a hierarchical play scale with functional and pretend play as the highest levels, children in the high-intensity group showed significantly more complex play than did children in the low-intensity group,  $F(1, 193) = 4.73, p < .05, d = .31$ .

### Intervention Effects on Developmental Outcomes: Maternal Ratings of Child Behavior

A growth curve modeling approach was used to analyze maternal reports of children's behaviors on the two scales of the BIT-SEA at three time points: 16, 24, and 30 months. The model results were compared to a repeated-measures model and had very similar results. Effect sizes for the growth curve models were calculated as the difference between groups in the change from the first to the last time point, divided by the model-estimated standard deviation.

**Competence**—There was no indication of curvature for the child Competence scale. The model assuming linearity had no significant results for group or group by time. It should be noted that the means for children in the high-intensity group were higher than for those in the low-intensity group, but the results were not statistically significant ( $.05 < p < .20, ES = .15$ ).

**Problems**—On the Problems scale, there was evidence of curvature,  $F(1, 248) = 7.85, p = .006$ , but it did not depend on group membership. There was a trend for a group effect on the intercepts,  $F(1, 210) = 3.79, p = .05, ES = .21$ . To explore the group effect on the intercepts, we calculated simple main effects at each time point. Groups did not differ at 16 months ( $p = .213, ES = .16$ ), but did at 24 months,  $t(210) = 1.95, p = .05, ES = .21$ , and at 30 months,  $t(210) = 2.10, p = .04, ES = .25$ . At both these time points, children in the high-intensity condition were reported to have fewer problems overall than children in the low-intensity condition.

### Intervention Effects on Developmental Outcomes: Children's Cognitive and Language Test Scores

Analysis of variance was used to test for group differences on the Bayley-III Cognitive scaled score that was obtained at 24 months. There were no significant differences between groups,  $F(1, 242) = .57, ns$ . A mixed model analysis of the PLS-4 Expressive Communication Scale, which was administered at the 10-, 16-, 24-, and 30-month time points, revealed no group differences in standardized scores at any time point,  $F(1, 588) = 0.00-2.24, ns$ . Likewise, there were no group differences on the PLS-4 Auditory Comprehension standard scores, which were obtained at the 10-, 16-, and 30-month time points,  $F(1, 384) = 0.03-2.26, ns$ .

## Parenting as a Mediator of Children's Development

To test our third hypothesis, that increases in mothers' responsiveness would mediate the effects of the intervention on gains in children's skills, we had to define our mediator and outcome variables from the repeated-measures and growth curve analyses. Given that increases in parenting levels due to the intervention were most notable at 16 and 24 months, an average of the means at these time points was created for each variable to use as a mediator. Similarly, the same procedure was used to create averages of the significant child variables at the 24- and 30-month time points. See supplemental materials (Appendix D) for correlations between these maternal and child variables. The effect of grouping on the maternal variables was the "a" parameter for the mediation effect. All of the group effects on the originally significant maternal variables (warmth, contingent responsiveness, physical intrusiveness, negativity, demonstrating/physical teaching, quality of verbal stimulation, and frequency of verbal scaffolding) were statistically significant as expected.

The second model included all of the original variables in the same model and added the mediators simultaneously in a multiple mediation model. The relation of the mediators to the outcome represented the "b" parameters. The product of these parameters ( $a*b$ ) was the estimate of the indirect effect. In addition to the individual indirect effects, in a multiple mediator model, a total indirect effect is estimated that represents the average of all the individual indirect effects. We tested the significance of the indirect effects using a bias-corrected bootstrapping procedure as described and evaluated by MacKinnon, Lockwood, and Williams (2004) and implemented by the SAS macro PROCESS (Preacher & Hayes, 2008). Random draws from the "a" and "b" distributions are simulated and the product  $a*b$  computed. On the basis of 20,000 bootstrapping samples, a 95% confidence interval for the product was determined. If this confidence interval did not contain 0, evidence for mediation would be documented.

Results indicated that the indirect effect of all of the maternal behaviors together, as well as the individual indirect effect of physical intrusiveness, showed evidence of mediation for the children's engagement with the environment. The indirect effect of all of the maternal behaviors together, as well as quality of verbal stimulation, mediated children's complexity of toy play. For children's negative affect, maternal physical intrusiveness, quality of verbal stimulation, and the indirect effect of all the maternal behaviors together showed evidence of mediation. For children's social engagement, the total maternal indirect effect showed evidence of mediation. Finally, for children's expressive language the indirect effect of maternal negativity showed evidence of mediation, and for BITSEA Problems the indirect effect of all the maternal behaviors together and the individual indirect effect of physical intrusiveness showed evidence of mediation. Table 3 shows the confidence intervals for these mediation effects.

## Discussion

As hypothesized, mothers receiving the high-intensity My Baby & Me intervention showed greater increases in a range of parenting behaviors, such as contingent responsiveness and quality of verbal stimulation, when compared to mothers in the low-intensity condition (primarily an information and referral treatment). At enrollment, mothers in these two

groups were comparable in terms of major risk factors (e.g., depression, psychological distress, substance abuse, age, and education), as well as most of their responsive behaviors at 4 months (i.e., before the full responsive parenting curriculum was delivered and could reasonably have a strong effect on maternal behaviors). Thus, the sizable gains seen over time for mothers in the high-intensity treatment were likely due to the intervention itself.

Mothers in our high-intensity condition showed significantly greater contingent responsiveness by 10 months and sustained this increased responsiveness through 30 months (the endpoint of the study). Typically, mothers from high-risk backgrounds experience difficulty in interacting contingently with their children during toddlerhood (Landry et al., 2008). The results demonstrate that the mothers in our high-intensity group were adjusting to their toddlers' changing needs and signals by displaying behaviors associated with acceptance of the children as having unique individual needs and interests (Landry et al., 2001).

Verbal scaffolding, mothers' support for children's immature communication skills, and their use of rich vocabulary showed significantly greater gains for the high-versus low-intensity mothers between 10 and 30 months of age. High-intensity group mothers used richer language beginning during the infancy period, helping their children to learn the names of objects and actions and/or links between objects and experiences. They used gestures and language in ways that provided support to help their children understand and engage in cognitive and social interactions. Higher frequencies of verbal scaffolding and rich verbal input combined with contingent responsiveness likely enhanced the mother-child relationship over time and facilitated positive cognitive and social developmental outcomes.

Although many of the maternal behaviors in the high-intensity group sustained higher levels through 30 months, the end of the intervention, several other behaviors showed significant effects in the expected direction only through 24 months for high-compared to low-intensity mothers, including warmth, intrusiveness, and negativity. Although for all of these behaviors the high-intensity mothers continued to have more optimal scores through 30 months, the absence of significance at 30 months may have negative implications for the intervention to have long-term sustained effects. The absence of significant differences though 30 months may reflect changes in intervention intensity and focus that began at 24 months, when the intervention sessions tapered off dramatically from almost-weekly to monthly visits, and sessions focused on topics such as preschool readiness and strengthening family support through community connections. Our sample of high-risk mothers may have benefited from additional and more intensive intervention sessions between 24 and 30 months to support their acquisition of skills to respond appropriately to toddler behaviors (e.g., poor frustration tolerance, tantrums, and negativity), as this is a vulnerable time for mothers with limited parenting skills and knowledge.

In their review of a number of major home visiting interventions, Howard and Brooks-Gunn (2009) reported mixed results for the effectiveness of these interventions for adult versus teen mothers. Additionally, only a few studies have specifically compared differential benefits for teen and adult high-risk mothers living in poverty (e.g., DuMont et al., 2008; Olds, 2006). Teen and adult mothers in our study, who both had high and very similar levels



of risk, showed comparable benefits, which is important, as teen mothers have been shown to be at exceptionally high risk for child neglect, given their low levels of education, social and cognitive immaturity, and less stable social supports (e.g., Whitman, Borkowski, Keogh, & Weed, 2001).

Children's cognitive and social behaviors also showed positive benefits from the intervention, including faster rates of development in their engagement with the environment and with others (social engagement), better regulation of negative emotions, greater gains in expressive language in interactions with their mothers, and increases in complexity of play. Rates of growth over time demonstrated group differences through the 30-month assessment, with meaningful effect sizes ranging from .25 to .34, although in some cases simple mean differences were small between the groups because the groups began the study at different levels. More complex levels of play for children can be attributed, in part, to higher cognitive and executive skills. Complex play, an early indicator of cognitive development, is described as the child demonstrating age-appropriate concept development rather than just increased fine motor skills (Nicolopoulou, 1999), as they use objects in functionally and symbolically appropriate ways (Welsh & Pennington, 1988). Relatedly, gains in expressive language skills for children in the high-intensity group demonstrate increased knowledge about words and using language to express interests and needs in more complex ways. These early language skills are highly predictive of children's later academic success (e.g., Duncan et al., 2007). Just as importantly, children whose mothers received the high-intensity intervention showed better abilities than those in the low-intensity group to modulate their social and emotional behaviors, as reflected in fewer general behavior problems.

Although direct observational measures of children's language and cognitive skills (e.g., complexity of play) showed positive intervention effects, similar results were not found on standardized assessments of cognitive (Bayley-III Cognitive scale) and language (PLS-4) skills. Children across the two groups also did not differ on the BITSEA Competence subscale or the observation measure of cooperation, where both groups scored high. The absence of differences on these latter two measures may be due, in part, to the criteria of the measure. For example, the criteria of the cooperation measure placed an emphasis on simple compliance with mothers' requests and did not take into account children's ability to be involved more actively in a give-and-take process with their mothers. As children in the high-intensity group showed higher levels of language use and social engagement on other measures compared to those in the low-intensity group, a broader definition of cooperation may have better captured differences across the two groups of children related to an active rather than a passive form of cooperation. The lack of group differences on the Bayley-III Cognitive scale and the PLS-4 was disappointing. In the recent report describing findings from the Early Head Start national evaluation (Love, Chazan-Cohen, Raikes, & Brooks-Gunn, 2013), an intervention with families and very young children of similar high-risk status to those in our intervention and who received the program for a similar length of time, differences between the program and control children on the Bayley-III Cognitive scale reflected very small effect sizes ( $ES = .11$ ), although described as showing a modest impact. Effect sizes seen for children in the present study on the Bayley ( $ES = .09$ ) were also very small, and differences were not significant, given a much smaller sample compared with the sample in the Early Head Start study ( $n = 1,781$ ). It has been noted that previous evaluations

of home visiting programs found either small or no effects on standardized measures of cognitive and language development (e.g., Howard & Brooks-Gunn, 2009; Sweet & Appelbaum, 2004). Thus, it is possible that the sensitivity of these types of cognitive measures for very young children is such that significant and meaningful effect sizes are difficult to find, especially when the sample size is not very large. Another explanation for the absence of differences on the Bayley–III and PLS–4 may be related to the emphasis in our intervention on maternal responsiveness. Given this emphasis, the intervention may not have targeted, with enough specificity and intensity, mothers incorporating the types of cognitive activities into their interactions with their infants and toddlers that are measured on the Bayley–III or the PLS–4.

We included mediational analyses to further confirm that higher levels of maternal behaviors for the high-intensity group explain the effect of the intervention on higher levels of the children’s developmental skills. For example, higher levels of total maternal responsiveness behaviors and decreased maternal physical intrusiveness helped explain the intervention effects on children’s increased engagement with the environment. Total maternal responsiveness also accounted for the intervention’s effect on children’s increased social engagement. Total maternal responsiveness as well as quality of verbal stimulation were important in understanding the effect of the intervention on complexity of toy play, and quality of maternal verbal stimulation, decreased physical intrusiveness, and total maternal responsiveness explained decreases in children’s negative affect. Collectively, the mediational analyses provide strong evidence that the composite of maternal behaviors (increases in positive parenting behaviors and avoidance of negativity and intrusiveness) were the likely mechanisms for changes in children’s development.

Strengths of the approach taken in the My Baby & Me intervention that may be important for understanding its effectiveness include beginning during the prenatal period with a range of supports for mothers (e.g., problem-solving skills, establishing daily routines, home safety, identification of a medical home) prior to the introduction of training in parent responsiveness. For teens and young adults with limited education, often single, and with elevated levels of mental health problems, especially depression, this focus may have helped to establish a trusting relationship between mothers and their coaches. It is noteworthy that the intervention was conducted on a relatively large scale in cities and towns across four states with mothers who varied in their cultural, ethnic, and racial backgrounds, suggesting broad cultural and psychosocial appropriateness of the program. One factor that may have limited a full evaluation of the impact of the My Baby & Me intervention was that the attrition rate approached 32%. Also, the mothers who attrited had lower scores on demonstrating objects and negative affect at 4 months compared to scores for the mothers who remained in the study. For various reasons, including families’ unstable lifestyles, multiple life stressors, time constraints, and variable motivation for change, it can be extremely challenging to keep families engaged in intervention and assessment protocols throughout such a lengthy intervention. As noted earlier, our attrition rate was comparable to or lower than that reported for similar long-term studies. Nonetheless, we recognize that for home-based interventions to succeed in altering parenting practices and improving child outcomes for a large segment of the at-risk population in our nation, the factors leading to

program dropout must be better understood and new approaches developed to sustain the engagement of a greater percentage of at-risk mothers.

Another limitation is that our intervention included a large number of sessions and diverse modules presented over a relatively long period. Multimodule interventions limit the ability to assess the independent contribution of each component to parent and child outcomes, and lengthy interventions are labor-intensive and costly. Although we were able to carry out this moderately large-scale study across four diverse sites, it may be challenging to scale up a program with such a large number of intervention modules and sessions.

It will be important to continue to evaluate the benefits of shorter, highly targeted interventions versus those that attempt to provide families with a broad range of support over a longer period. Shorter term interventions are likely to have lower levels of attrition and be more economically feasible. However, they may only be able to address the challenges of one developmental stage or one domain of family support, and may not be strong enough to provide longer term impact on parents and children. A study directly contrasting these two approaches, which has not occurred to our knowledge, could be highly informative to the field. It may also be fruitful to examine the value of a more strategically spaced intervention approach in which several focused modules, each comprising several sessions, could be scheduled along a timeline that targets specific developmental periods of challenge through the child's early years (e.g., bonding and establishing responsive caregiving routines in early infancy, encouraging toddlers' autonomy-seeking while setting appropriate limits, supporting pre-schoolers' school readiness skills). A randomized control study to test the efficacy of such an approach may be informative in determining how to best balance participant retention, adequate dosage and timing of intervention sessions, and cost-effectiveness. In this study, we judged that the balance achieved by adopting a more holistic (multimodular) approach to supporting mothers starting in pregnancy and lasting for the first 2.5 years of their child's life was justified, given the wide range of needs. Our approach seems to have helped to engage mothers in establishing strong relationships with their family coaches and contributed to improving key outcomes for both parents and children. As one of our participants stated: "If another mom was considering participating in this program, I would tell her that she should definitely do it, because it not only teaches her about her child, it helps her put into perspective goals that she needs to achieve to help her better herself for her and her child's future."

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

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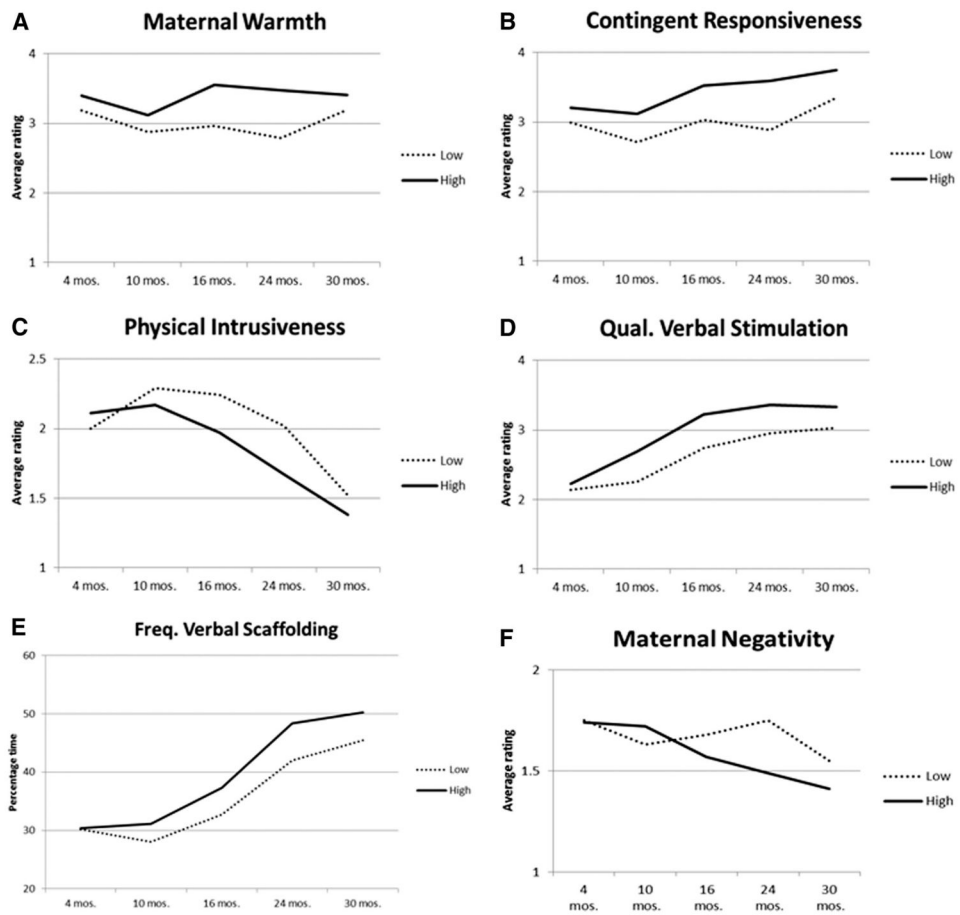
## References

Ainsworth, M., Blehar, M., Waters, E., Wall, S. Patterns of attachment: A psychological study of the strange situation. Hillsdale, NJ: Erlbaum; 1978.

- Bavolek, SJ., Keene, RG. Adult-Adolescent Parenting Inventory (AAPI-2): Administration and development handbook. Park City, UT: Family Development Resources; 2001.
- Bayley, N. Bayley Scales of Infant Development. 3. San Antonio, TX: Psychological Corporation; 2006.
- Beck CT, Gable RK. Further validation of the postpartum depression screening scale. *Nursing Research*. 2001; 50:155-164. DOI: 10.1097/00006199-200105000-00005 [PubMed: 11393637]
- Bornstein MH, Tamis-Lemonda CS. Maternal responsiveness and cognitive development in children. *New Directions for Child and Adolescent Development*. 1989; 43:49-61. DOI: 10.1002/cd.23219894306
- Briggs-Gowan MJ, Carter AS, Irwin JR, Wachtel K, Cicchetti DV. Brief Infant-Toddler Social and Emotional Assessment: Screening for social-emotional problems and delays in competence. *Journal of Pediatric Psychology*. 2004; 29:143-155. DOI: 10.1093/jpepsy/jsh017 [PubMed: 15096535]
- Caldera D, Burrell L, Rodriguez K, Crowne SS, Rohde C, Duggan A. Impact of a statewide home visiting program on parenting and on child health and development. *Child Abuse & Neglect*. 2007; 31:829-852. DOI: 10.1016/j.chiabu.2007.02.008 [PubMed: 17822765]
- Darling N, Steinberg L. Parenting style as context: An integrative model. *Psychological Bulletin*. 1993; 113:487-496. DOI: 10.1037/0033-2909.113.3.487
- Derogatis, LR. Symptom Checklist 90-R: Administration, scoring, and procedures manual. 3. Minneapolis, MN: National Computer Systems; 1994.
- DuMont K, Mitchell-Herzfeld C, Greene R, Lee E, Lowenfels A, Rodriguez M, Dorabawila V. Healthy Families New York randomized trial: Effects on early child abuse and neglect. *Child Abuse & Neglect*. 2008; 32:295-315. DOI: 10.1016/j.chiabu.2007.07.007 [PubMed: 18377991]
- Duncan GJ, Dowsett CJ, Claessens A, Magnuson K, Huston AC, Klebanov P, Japel C. School readiness and later achievement. *Developmental Psychology*. 2007; 43:1428-1446. DOI: 10.1037/0012-1649.43.6.1428 [PubMed: 18020822]
- Dunst CJ, Kassow DZ. Caregiver sensitivity, contingent social responsiveness, and secure infant attachment. *Journal of Early and Intensive Behavior Intervention*. 2008; 5:40-56.
- Fergusson DM, Grant H, Horwood LJ, Ridder EM. Randomized trial of the Early Start program of home visitation: Parent and family outcomes. *Pediatrics*. 2006; 117:781-786. DOI: 10.1542/peds.2005-1517 [PubMed: 16510658]
- Fernandez MA, Eyberg SM. Predicting treatment and follow-up attrition in parent-child interaction therapy. *Journal of Abnormal Child Psychology*. 2009; 37:431-441. DOI: 10.1007/s10802-008-9281-1 [PubMed: 19096926]
- Frick T, Semmel MI. Observer agreement and reliabilities of classroom observational measures. *Review of Educational Research*. 1978; 48:157-184. DOI: 10.3102/00346543048001157
- Gross, RT., Spiker, D., Hayes, C. Helping low birth weight, premature babies: The Infant Health and Development Program. Stanford, CA: Stanford University Press; 1997.
- Howard KS, Brooks-Gunn J. The role of home-visiting programs in preventing child abuse and neglect. *The Future of Children*. 2009; 19:119-146. DOI: 10.1353/foc.0.0032 [PubMed: 19719025]
- Kearney MH, York R, Deatrick JA. Effects of home visits to vulnerable young families. *Journal of Nursing Scholarship*. 2000; 32:369-375. DOI: 10.1111/j.1547-5069.2000.00369.x [PubMed: 11140201]
- Landry SH, Smith KE, Swank PR. Responsive parenting: Establishing early foundations for social, communication, and independent problem-solving skills. *Developmental Psychology*. 2006; 42:627-642. DOI: 10.1037/0012-1649.42.4.627 [PubMed: 16802896]
- Landry SH, Smith KE, Swank PR, Assel MA, Vellet S. Does early responsive parenting have a special importance for children's development or is consistency across early childhood necessary? *Developmental Psychology*. 2001; 37:387-4033. DOI: 10.1037/0012-1649.37.3.387 [PubMed: 11370914]
- Landry SH, Smith KE, Swank PR, Guttentag C. A responsive parenting intervention: The optimal timing across early childhood for impacting maternal behaviors and child outcomes. *Developmental Psychology*. 2008; 44:1335-1353. DOI: 10.1037/a0013030 [PubMed: 18793067]

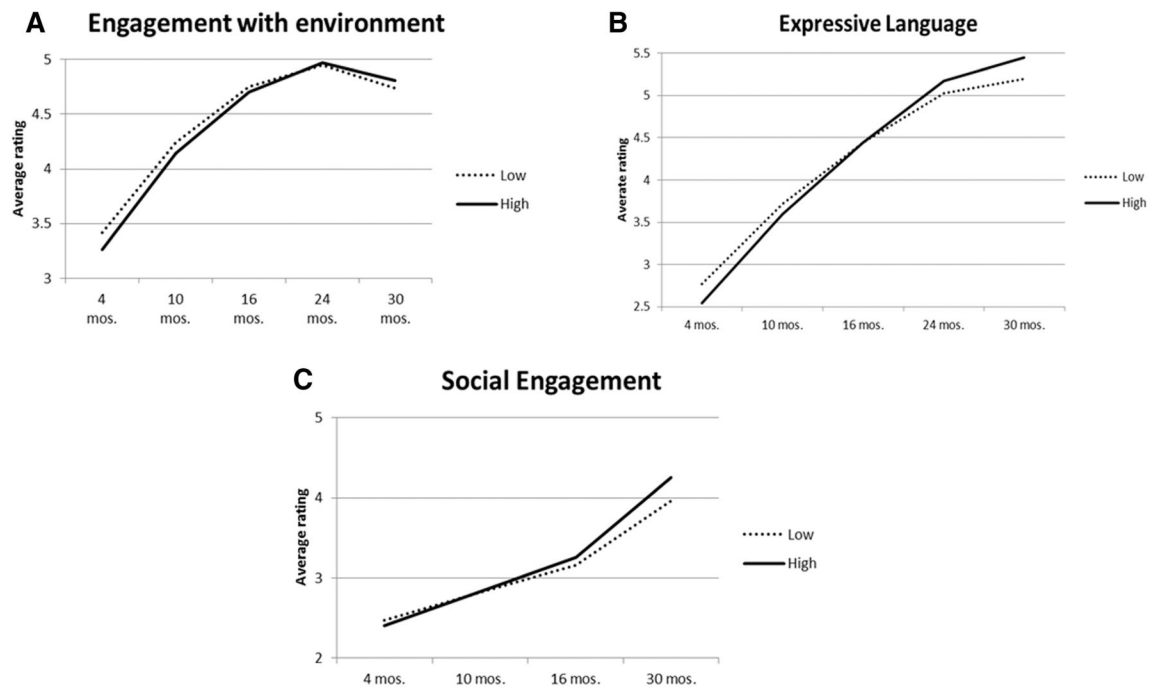
- Landry SH, Smith KE, Swank PR, Zucker T, Crawford AD, Solari EF. The effects of a responsive parenting intervention on parent–child interactions during shared book reading. *Developmental Psychology*. 2012; 48:969–986. DOI: 10.1037/a0026400 [PubMed: 22122475]
- Linares LO, Montalto D, Li M, Oza VS. A promising parenting intervention in foster care. *Journal of Consulting and Clinical Psychology*. 2006; 74:32–41. DOI: 10.1037/0022-006X.74.1.32 [PubMed: 16551141]
- Little, RJA., Rubin, DB. *Statistical analysis with missing data*. New York, NY: Wiley; 1987.
- Love JM, Chazan-Cohen R, Raikes H, Brooks-Gunn J. What makes a difference: Early Head Start evaluation findings in a developmental context. *Monographs of the Society for Research in Child Development*. 2013; 78(1)doi: 10.1111/j.1540-5834.2012.00699.x
- Lutzker, JR., Bigelow, KM. *Reducing child maltreatment: A guidebook for parent services*. New York, NY: Guilford Press; 2002.
- MacKinnon DP, Lockwood CM, Williams J. Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*. 2004; 39:99–128. DOI: 10.1207/s15327906mbr3901\_4 [PubMed: 20157642]
- MacPhee, D. *Knowledge of Infant Development Inventory*. Department of Psychology, University of North Carolina; Chapel Hill: 1981. Unpublished instrument
- Maxwell, SE., Delaney, HD. *Designing experiments and analyzing data*. Pacific Grove, CA: Brooks/Cole; 1990.
- McClure, VS. *Infant massage: A handbook for loving parents*. New York, NY: Bantam Books; 2000.
- McGuigan WM, Katzev AR, Pratt CC. Multi-level determinants of retention in a home-visiting child abuse prevention program. *Child Abuse & Neglect*. 2003; 27:363–380. DOI: 10.1016/S0145-2134(03)00024-3 [PubMed: 12686322]
- Milner, J. *The Child Abuse Potential Inventory [Manual]*. DeKalb, IL: Psytec; 1986.
- Nicolopoulou, A. Play, cognitive development, and the social world: Piaget, Vygotsky, and beyond. In: Lloyd, P., Fernyhough, C., editors. *Lev Vygotsky: Critical assessments: Vol. 2. Thought and language*. New York, NY: Routledge; 1999. p. 419-446.
- Olds D. The nurse–family partnership: An evidence-based preventive intervention. *Infant Mental Health Journal*. 2006; 27:5–25. DOI: 10.1002/imhj.20077 [PubMed: 28640426]
- Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*. 2008; 40:879–891. DOI: 10.3758/BRM.40.3.879 [PubMed: 18697684]
- Ramey CT, Bryant DM, Wasik BH, Sparling JJ, Fendt KH, LaVange LM. Infant Health and Development Program for low birth weight, premature infants: Program elements, family participation, and child intelligence. *Pediatrics*. 1992; 89:454–465. [PubMed: 1371341]
- Raudenbush, SW., Bryk, AS. *Hierarchical linear models*. 2. Thousand Oaks, CA: Sage; 2002.
- Shonkoff, JP., Phillips, DA. *From neurons to neighborhoods: The science of early child development*. Washington, DC: National Academies Press; 2000.
- Silovsky JF, Bard D, Chaffin M, Hecht D, Burris L, Owora A, Lutzker J. Prevention of child maltreatment in high-risk rural families: A randomized clinical trial with child welfare outcomes. *Children and Youth Services Review*. 2011; 33:1435–1444. DOI: 10.1016/j.childyouth.2011.04.023
- Slack KS, Berger LM, DuMont K, Yang MY, Kim B, Ehrhard-Dietzel S, Holl JL. Risk and protective factors for child neglect during early childhood: A cross-study comparison. *Children and Youth Services Review*. 2011; 33:1354–1363. DOI: 10.1016/j.childyouth.2011.04.024
- Small SA, Cooney SM, O'Connor C. Evidence-informed program improvement: Using principles of effectiveness to enhance the quality and impact of family-based prevention programs. *Family Relations*. 2009; 58:1–13. DOI: 10.1111/j.1741-3729.2008.00530.x
- Smith KE, Landry SH, Swank PR. The influence of decreased parental resources on the efficacy of a responsive parenting intervention. *Journal of Consulting and Clinical Psychology*. 2005; 73:711–720. DOI: 10.1037/0022-006X.73.4.711 [PubMed: 16173858]
- Sweet MA, Appelbaum MI. Is home visiting an effective strategy? A meta-analytic review of home visiting programs for families with young children. *Child Development*. 2004; 75:1435–1456. DOI: 10.1111/j.1467-8624.2004.00750.x [PubMed: 15369524]

- Toth SL, Rogosch FA, Manly JT, Cicchetti D. The efficacy of toddler–parent psychotherapy to reorganize attachment in the young offspring of mothers with major depressive disorder: A randomized preventive trial. *Journal of Consulting and Clinical Psychology*. 2006; 74:1006–1016. DOI: 10.1037/0022-006X.74.6.1006 [PubMed: 17154731]
- U.S. Department of Education. Healthy start, grow smart. 2002. Available from <http://www2.ed.gov/parents/earlychild/ready/healthystart/index.html>
- van den Boom DC. Do first-year intervention effects endure? Follow-up during toddlerhood of a sample of Dutch irritable infants. *Child Development*. 1995; 66:1798–1816. DOI: 10.2307/1131911 [PubMed: 8556900]
- Van Zeijl J, Mesman J, Van IJzendoorn MH, Bakermans-Kraneburg MJ, Juffer F, Alink LRA. Attachment-based intervention for enhancing sensitive discipline in mothers of 1- to 3-year-old children at risk for externalizing behavior problems: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2006; 74:994–1005. DOI: 10.1037/0022-006X.74.6.994 [PubMed: 17154730]
- Wagner, M., Cameto, R., Gerlach-Downie, S. Intervention in support of adolescent parents and their children: A final report on the Teen Parents as Teachers demonstration. Menlo Park, CA: SRI International; 1996.
- Welsh MC, Pennington BF. Assessing frontal lobe functioning in children: Views from developmental psychology. *Developmental Neuropsychology*. 1988; 4:199–230. DOI: 10.1080/87565648809540405
- Whitman, TL., Borkowski, JG., Keogh, DA., Weed, K. Interwoven lives: Adolescent mothers and their children. Mahwah, NJ: Erlbaum; 2001.
- Woodcock, RW., McGrew, KS., Mather, N. Woodcock–Johnson III Tests of Achievement. Itasca, IL: Riverside; 2003.
- Woodcock, RW., Muñoz-Sandoval, AF., McGrew, KS., Mather, N. Bateria III Woodcock–Muñoz: Pruebas de habilidades cognitivas [Woodcock–Muñoz III Tests of Achievement]. Itasca, IL: Riverside; 2005.
- Zimmerman, IL., Steiner, VG., Pond, RE. Preschool Language Scale, Fourth Edition (PLS–4). San Antonio, TX: Psychological Corporation; 2002.



**Figure 1.**

(A) Maternal warmth during parent–child play as a function of group and time. (B) Maternal contingent responsiveness as a function of group and time. (C) Maternal physical intrusiveness as a function of group and time. (D) Maternal quality (qual.) of verbal stimulation as a function of group and time. (E) Frequency (freq.) of maternal verbal scaffolding as a function of group and time. (F) Maternal negativity as a function of group and time. Mos. = months.



**Figure 2.** (A) Child engagement with environment as a function of group and time. (B) Child expressive language as a function of group and time. (C) Child social engagement as a function of conditions and time. Mos. = months.



**Table 1**

Maternal and Child Demographic and Risk Variables for Low- and High-Intensity Treatment Groups

Maternal demographic variable	Pregnancy and postpartum			
	Low intensity		High intensity	
	%	<i>N</i>	%	<i>N</i>
Maternal age status				
Adult	24.04	87	22.45	81
Adolescent	26.06	94	27.45	99
Race/ethnicity				
Black or African American	51.6	99	51.2	104
White Non-Hispanic	10.4	20	11.3	23
Black Hispanic	0.0		0.5	1
Multiracial Hispanic	2.6	5	1.5	3
Asian	0.5	1	1.5	3
Other race	0.5	1	0.0	
Multiracial	1.6	3	2.0	4
Maternal educational level				
Grade 8	3.1	12	4.8	19
Grade 9–12	39.9	157	39.6	156
General educational development	4.3	17	5.8	23
Community college or vocational program	0.6	2	1.1	4
Child gestational age (weeks)	39.34	1.80	39.58	1.68
Maternal age at child's birth	20.72	4.70	20.87	5.33
Global psychiatric symptoms severity index (SCL-90)	52.19	13.15	51.44	11.44
Postpartum depression (1 month)	76.22	23.15	77.33	23.42
Literacy estimates (WJ-III/Muñoz)				
Letter-Word Identification	86.01	2.41	87.67	1.60
Word Attack	88.70	15.65	89.90	16.74
Maternal drug and alcohol use	0.24	1.34	0.13	0.85
Child abuse potential (CAPI)	151.66	90.67	149.75	85.53
Parental rigidity (CAPI)	27.88	16.97	32.24	16.54
Parental empathy (AAPI-2)	36.71	5.32	37.04	5.17
Parental role reversal (AAPI-2)	22.02	5.04	21.93	4.32
Parental corporal punishment (AAPI-2)	33.45	4.54	33.04	4.75
Parental mastery (Pearlin total)	109.17	14.03	109.32	14.63
Knowledge of infant development				
KIDI total	48.18	5.65	48.93	6.05

*Note.* SCL-90 = Symptom Checklist-90; WJ-III/Muñoz = Woodcock-Johnson, Third Edition, and Bateria III Woodcock-Muñoz; CAPI = Child Abuse Potential Inventory; AAPI-2 = Adult-Adolescent Parenting Inventory-2; KIDI = Knowledge of Infant Development Inventory.

Table 2

Maternal and Child Means and Standard Deviations From Landry Ratings and Brief Infant–Toddler Social and Emotional Assessment (BITSEA) Scales

Variable	4 months		10 months		16 months		24 months		30 months	
	High ( <i>n</i> = 146)	Low ( <i>n</i> = 160)	High ( <i>n</i> = 119)	Low ( <i>n</i> = 146)	High ( <i>n</i> = 96)	Low ( <i>n</i> = 140)	High ( <i>n</i> = 95)	Low ( <i>n</i> = 138)	High ( <i>n</i> = 97)	Low ( <i>n</i> = 128)
Maternal observed										
Positive affect	3.38 (1.19)	3.28 (1.13)	3.33 (1.08)	3.28 (1.10)	3.59 (1.10)	3.30 (1.08)	3.05 (1.23)	2.87 (1.15)	2.46 (1.02)	2.57 (1.07)
Warmth	3.42 (1.13)	3.22 (1.06)	3.14 (1.19)	2.89 (1.18)	3.61 (1.16)	2.98 (1.18)	3.51 (1.08)	2.81 (1.10)	3.46 (0.91)	3.21 (0.85)
Contingent responsiveness	3.23 (1.09)	3.01 (1.10)	3.13 (1.20)	2.74 (1.11)	3.58 (1.01)	3.05 (1.16)	3.62 (1.05)	2.89 (0.98)	3.80 (1.00)	3.38 (1.00)
Physical intrusiveness	2.11 (0.84)	2.00 (0.79)	2.15 (0.87)	2.29 (0.90)	1.93 (0.83)	2.24 (0.99)	1.65 (0.77)	2.02 (0.85)	1.37 (0.59)	1.51 (0.69)
Negativity	1.75 (0.83)	1.73 (0.98)	1.72 (0.86)	1.65 (0.78)	1.55 (0.75)	1.67 (0.92)	1.47 (0.79)	1.75 (0.90)	1.38 (0.71)	1.54 (0.73)
Demonstrating/physical teaching	2.20 (0.95)	2.12 (0.88)	2.68 (0.98)	2.42 (0.87)	2.72 (1.00)	2.48 (0.94)	2.99 (0.90)	2.71 (0.84)	3.06 (0.81)	3.04 (0.77)
Quality of verbal stimulation	2.23 (1.02)	2.16 (1.00)	2.71 (1.13)	2.27 (1.01)	3.25 (1.09)	2.74 (1.09)	3.39 (1.01)	2.95 (0.98)	3.37 (0.90)	3.05 (0.85)
Verbal scaffolding <sup>a</sup>	30.46 (18.82)	30.58 (19.33)	30.88 (16.04)	28.14 (15.02)	37.21 (15.00)	32.98 (17.36)	47.66 (16.84)	42.14 (16.75)	49.87 (13.27)	45.85 (15.66)
Child observed										
Engagement with environment	2.84 (1.03)	2.65 (1.06)	1.63 (0.76)	1.62 (0.61)	1.28 (0.57)	1.23 (0.52)	1.23 (0.53)	1.26 (0.55)	1.11 (0.32)	1.14 (0.36)
Expressive language	2.25 (1.07)	2.46 (1.11)	4.37 (1.61)	4.51 (1.47)	4.09 (1.74)	4.01 (1.59)	4.73 (1.60)	4.80 (1.47)	5.78 (1.29)	5.41 (1.47)
Receptive language	2.45 (0.97)	2.57 (1.08)	4.39 (1.34)	4.54 (1.32)	4.83 (1.44)	4.46 (1.38)	4.95 (1.32)	5.07 (1.28)	6.10 (0.97)	6.02 (1.14)
Social engagement	2.36 (0.96)	2.46 (0.97)	2.96 (1.01)	3.00 (0.86)	3.16 (1.08)	2.91 (1.00)	3.17 (0.99)	3.14 (0.97)	4.27 (0.73)	4.04 (1.01)
Negative affect	2.00 (0.82)	1.94 (0.83)	1.66 (0.72)	1.84 (0.78)	1.80 (0.98)	1.80 (0.89)	1.65 (0.78)	1.71 (0.79)	1.25 (0.44)	1.39 (0.60)
Cooperation					2.23 (1.00)	2.27 (0.93)	2.08 (0.88)	2.09 (0.88)	1.87 (0.72)	1.96 (0.84)
Complexity toy play							4.52 (1.59)	4.49 (1.56)	3.83 (1.13)	3.59 (1.14)
BITSEA										
Competence					16.64 (3.00)	16.15 (3.26)	16.81 (3.17)	16.87 (3.21)	18.05 (2.85)	17.29 (3.15)
Problems					15.78 (8.24)	16.75 (8.81)	15.26 (7.91)	16.75 (8.23)	13.25 (7.02)	14.83 (8.00)

Note. Standard deviations in parentheses.

<sup>a</sup>Percentage of maternal attention-directing events that included a verbal scaffold.

Table 3

Ninety-Five Percent Confidence Intervals for Mediated Effect of Observed Maternal Behaviors (Average 16/24 Months) on Observed and Mother-Reported Child Behaviors (Average 24/30 Months)

Mediator	Engagement with environment	Expressive language	Social engagement	Complexity of toy play	Negative affect	BITSEA problems
Total (impact of all maternal variables)	[.0314, .1554]*	[-.0292, .0921]	[.0254, .1579]*	[.0257, .1504]*	[.0467, .1833]*	[-.1708, -.0517]*
Warmth	[-.0788, .0832]	[-.0636, .0863]	[-.0616, .0716]	[-.1293, .0139]	[-.1308, .0098]	[-.0733, .0610]
Contingent responsiveness	[-.0881, .0693]	[-.0386, .1191]	[-.0230, .1420]	[-.0251, .1283]	[-.0495, .1073]	[-.0675, .0744]
Physical intrusiveness	[.0117, .1262]*	[-.0101, .0873]	[-.0256, .0717]	[-.0490, .0399]	[.0133, .1152]*	[-.1086, -.0116]*
Negativity	[-.0491, .0251]	[-.0870, -.0092]*	[-.0360, .0199]	[-.0030, .0579]	[-.0036, .0743]	[-.0385, .0234]
Quality of verbal stimulation	[.0387, .0776]	[-.0236, .0820]	[-.0350, .0653]	[.0019, .1180]*	[.0102, .1254]*	[-.0945, .0106]
Verbal scaffolding	[-.0102, .0513]	[-.0205, .0340]	[-.0156, .0406]	[-.0068, .0515]	[-.0189, .0380]	[-.0422, .0206]
Demonstrating/physical teaching	[-.0170, .0531]	[-.0608, .0091]	[-.0479, .0212]	[-.0189, .0510]	[-.0413, .0215]	[-.0251, .0295]
Positive affect	[-.0070, .0344]	[-.0405, .0086]	[-.0023, .0500]	[-.0148, .0264]	[-.0020, .0411]	[-.0397, .0064]

Note. BITSEA = Brief Infant-Toddler Social and Emotional Assessment.

\*  $p < .05$ .