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Determinants of Change in Maternal Sensitivity: Contributions of Context, Temperament, and Developmental Risk

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Abstract

Objective—Maternal sensitivity is a fundamental parenting construct and a determinant of positive child outcomes and healthy parent-child relationships. Few longitudinal studies have investigated determinants of sensitive parenting, particularly in a population of children at risk for developmental delay.

Design—This study modeled trajectories of maternal sensitivity observed in two independent parenting contexts at child ages 3-, 4-, and 5-years. The sample included $N = 247$ mother-child dyads, with $n = 110$ children classified as at risk for developmental delays. Predictors included maternal distress, child anger proneness, and developmental risk status.

Results—Maternal sensitivity changed during more demanding parenting tasks over the 3-year period but not during a low-demand task. Mothers of children with developmental risk, relative to mothers of typically developing children, and mothers of boys relative to mothers of girls, showed less sensitivity during more demanding parenting tasks.

Conclusions—Early developmental risk and child gender contribute to the nature of maternal sensitivity over time, but their contributions depend on the situational demands of the interaction. This contextualized view of sensitivity provides further evidence in support of parenting as a dynamic developmental process.

INTRODUCTION

The parent-child relationship represents a complex series of interactions shaped by the history of the relationship as well as the day-to-day contact between parents and children. Dynamic patterns of parenting emerge as parents respond to the demands of a given context, their children's influence, and their own individual characteristics (Belsky & Jaffee, 2006). Contemporary research has focused on exploring the determinants of parenting and changes in parenting behavior across time and context (van den Boom, 1997). In early childhood, maternal sensitivity is in part defined by the reciprocal nature through which parents respond to their children, suggesting flexibility in parenting behavior that adjusts to minute-by-minute demands of the situation. The extent to which parents are sensitive depends on how

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well the parents are able to shape their responses and interactions to the needs of the child (Ainsworth, 1969; Leerkes, Blankson, & O'Brien, 2009).

Investigating change in parenting behavior promotes better understanding of the parent-child relationship as well as the dynamic influence of parenting on child development. Moreover, it provides important information on aspects of the parenting environment that may be key to changing parenting behavior, thereby informing intervention research. Indeed, change in parenting behavior can be investigated across multiple dimensions, including directionality, influence of situational demand, and response to specific child behaviors or characteristics (Miller, McDonough, Rosenblum, & Sameroff, 2002; O'Brien, Johnson, & Anderson-Goetz, 1989). The current study investigates change in maternal sensitivity over time and across contexts, focusing on how change may be affected by maternal mental health and child characteristics.

Substantial empirical research exists supporting a variety of influences on parenting, including parents' psychological resources and biologic origins (Belsky & Jaffee, 2006; Goodman & Gotlib, 1999), child characteristics (Mertesacker, Bade, Haverkock, & Pauli-Pott, 2004; van den Boom & Hoeksma, 1994), and contextual aspects of ongoing interaction (Holden, 1997). However, much of this work has been cross-sectional (Mills-Koonce, Gariepy, Sutton, & Cox, 2008) and has neglected to investigate the effects of these influences of parenting behavior across time. Moreover, few studies have modeled trajectories of sensitivity into the preschool and early childhood years, with those studies primarily observing parent-child interactions within a single context (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007; Feldman, 2010; Feldman & Eidelman, 2009). These empirical shortcomings are reflected in much of the research on maternal sensitivity (van den Boom, 1997).

Sensitivity is most commonly characterized as a parent's ability to accurately perceive and interpret the signals of the child and then to respond promptly and appropriately. This conception implies a dynamic, interactive process between parent and child. Naturally, the specific behaviors and interactions that parents have with their children change over time. As children become more active social partners, unilateral maternal adaptation is replaced by mutual adaptation, or reciprocal adjustment (Feldman, 2007a). That is, there is more ebb and flow to the relationship as children become more socially influential.

However, this is not to say that sensitive parenting becomes less important in the preschool years than during infancy. In fact, changes in sensitivity between 15 months and 54 months, particularly declining levels of sensitivity, have been associated more with child outcomes than early attachment during infancy (NICHD, 2006). Furthermore, maternal sensitivity during preschool and middle childhood was more strongly related to child externalizing outcomes in 5th grade than early parenting (Bradley & Corwyn, 2007), suggesting that maternal sensitivity maintains its prominence across the preschool years and into middle childhood. However, longitudinal studies of sensitivity during the preschool period have demonstrated inconsistent results. There are reports of maternal sensitivity changing in relation to symptoms of depression (Campbell et al., 2007), and others that indicate stable, unchanging levels of sensitivity during the preschool period (Feldman, 2010; Feldman & Eidelman, 2009). Thus, it is not well established whether or how maternal sensitivity may change over time, particularly during the preschool period.

Irrespective of continuity, sensitive parenting has been implicated as a key determinant of developmental processes, including attachment security, cognitive and language development, and psychological health and emotion regulation (Ainsworth, 1979; Bowlby, 1969; Kelly, Morisset, Barnard, & Hammond, 1996). In contrast, low levels of sensitive

parenting have been associated with sub-optimal child functioning including behavior problems, maladjustment, and poorer cognitive functioning (Bradley & Corwyn, 2007; Campbell, 2002; National Institute of Child Health and Human Development, 1999). Given such dramatic influences on children's early development, identifying those factors that influence the nature of sensitive parenting across time and explicating the mechanisms through which sensitive parenting affects child development are critical to the construction of comprehensive models of parenting process.

Key determinants of maternal sensitivity include manifold parent and child characteristics as well as contextual influences. Rarely, however, have multiple influences, and interactions among them, been studied to better model the complexity of maternal sensitivity across time. Yet, that is precisely the level of attention necessary to capture the intricacies of emerging sensitivity across the preschool period (Bornstein, Hendricks, Haynes, & Painter, 2007).

A wealth of research supports the notion that stress and psychological well-being are individual adult characteristics that influence parenting behavior (Crnic & Low, 2002). Not only does stressful experience predict less maternal positivity (Crnic, Gaze, & Hoffman, 2005), and less optimal parent behavior (Belsky, Crnic, & Woodworth, 1995), the stability of stress over time (Östberg, Hagekull, & Hagelin, 2007) suggests that adverse influences are likely maintained. Stress is also related to lower psychological well-being in parents (Deater-Deckard, 1998). Parental distress negatively affects sensitivity through disruptions in the parent-child relationship, and mothers with more depressive symptoms are more likely to show increased negative affect, negative cognitions, apathy, lack of energy, and decreased engagement with the child (see Goodman & Gotlib, 1999, for review).

With respect to child contributions, temperament and developmental competence are both likely to be instrumental in affecting the nature of maternal sensitive behavior. Behavior that challenges parents may elicit harsher, less sensitive parenting (Crockenberg & McCluskey, 1986; Mills-Koonce et al., 2007; van den Boom & Hoeksma, 1994), although it is possible (albeit controversial) that negative emotionality may promote more sensitive parenting in some situations (Leerkes & Crockenberg, 2002). Children with difficult temperaments often require more external, parental support (Rothbart, Ellis, & Posner, 2004), and therefore could receive more sensitive parenting. However, when caregivers report greater stress and emotional distress, more difficult child temperaments are typically associated with less sensitive parenting behavior (Mertesacker et al., 2004). The complex nature of the connection between child negativity and maternal sensitivity is yet to be fully explicated, as are issues connecting early developmental risk and maternal sensitivity. Early developmental risk, such as prematurity and developmental delay, is associated with increased negative emotionality and behavior problems, less competent social interactions, and unclear emotional expression (Boström, Broburg, & Hwang, 2010; Feldman, 2007b). In turn, these child behaviors are associated with greater parenting stress and more psychological distress in the parents (Baker, Blacher, Crnic, & Edelbrock, 2002; Baker, Blacher, & Olsson, 2005), perhaps resulting in the lower levels of maternal sensitivity often reported in families of children with early developmental difficulties (Fenning, Baker, Baker, & Crnic, 2007; Feldman, 2007b; Niccols & Feldman, 2006).

Although parent and child contributions set the stage for maternal sensitivity, contextual demand may function to change the dynamics of parenting interactions. Maternal behavior varies significantly across situations (Seifer, Sameroff, Anagnostopolou, & Elias, 1992), and the degree to which parents experience challenge during interactions affects the quality of the behavior displayed as parents must make additional effort to remain calm and regulated under more challenging conditions (Kogan & Carter, 1996; Miller et al., 2002).

Alternatively, low challenge contexts (e.g., unstructured play) may allow for a more representative sample of behavior (Isabella, 1998; Miller et al., 2002), as emotional and instrumental demands during free-play are minimized. Given such contrasting perspectives, exploring parenting behavior in multiple contexts will help to refine the interconnections among relevant determinants and trajectories of sensitivity during the preschool period.

The current study investigated trajectories of maternal sensitivity in mothers of children aged 3- to 5-years, as continuity of sensitivity, and the conditions that account for it, remain understudied. Determinants of parenting including child temperament, early developmental risk, and maternal distress were captured early to allow prediction to trajectories of maternal sensitivity across the preschool period, which was assessed during different parenting contexts. The main aims for the study were to describe the change in maternal sensitivity during the preschool period; to investigate the negative effects of maternal distress, child temperament, and developmental delay on maternal sensitivity; and finally, to determine the extent to which parenting context moderates these processes.

METHODS

Participants

Participants included 260 mother-child pairs recruited from community agencies such as preschools, early intervention programs, and family resource centers in central Pennsylvania (Pennsylvania State University; 25% of the sample) and Southern California (UCLA; 75% of the sample) (see Baker, Blacher, Crnic, & Edelbrock, 2002). The study oversampled children with non-specific, non-syndromal developmental delays; the majority of these children presented with significant early language and cognitive delays. The exclusion criteria for the study included non-ambulation, severe neurological impairment, or a history of abuse. The subsample used in the current study included 247 mother-child dyads that participated in the laboratory assessment at age 3 years. Of this sample, 110 children were identified as having a developmental delay based on their scores on the Mental Development Index (MDI) of the Bayley Scales of Infant Development II (BSID II; Bayley, 1993). Children who scored below 85 were classified as developmentally delayed (DD) and represented 44.5% of the sample.

The distribution of ethnic categories was as follows: 63.6% European American, 7.3% African American, 4.9% Asian American, 2.4% “Other,” and 0.8% Native American, with 21.1% of participants identifying themselves as Hispanic American. Thirty percent of the families had an annual income of less than $35,000, 19.4% of mothers in the sample held a high school degree as the highest grade completed, and an additional 47.8% held at least a Bachelor’s degree.

Procedures

Families participated in laboratory visits when children were 3-, 4-, and 5-years old. At the initial visit at age 3 years, trained research assistants assessed the mental developmental level of each child, and mothers completed measures of family demographics, maternal mental health and stress, and children’s behavior.

Mother-child dyads participated in several videotaped tasks. First, mothers and their children participated in a free play exercise for 10 min; mothers were instructed to play with their children as they normally would at home. This was followed by a 3-min task where parents and children were asked to clean up.

Next, the children were presented with three problem-solving tasks that increased in difficulty from a warm up task to tasks that were of moderate and high levels of difficulty.

The tasks were designed to be developmentally appropriate for the respective groups. The tasks for the developmental delay group were more basic than the tasks for the typically developing group. For example, children and their parents in each group were asked to fold a paper airplane according to a model and directions. The airplane for the children with developmental delay was less complicated and had fewer folds than the airplane for the typically developing children. Following the airplane task, the dyads were asked to build a Lego® tower according to a model, and then to complete a puzzle. The mother was told to provide any help the child would need to complete the task, and the experimenters left the room. The problem solving tasks lasted 2, 3, and 5 min, respectively. The first warm-up problem-solving task was not included in analyses.

Measures

Developmental status—Scores on the MDI (Bayley, 1993; Robinson & Mervis, 1996) determined child developmental status at age 3 years. Children classified as developmentally delayed scored at least 1 *SD* below the mean (MDI ≤ 85). Children identified as DD differed significantly from the typically developing (TD) group of children on their mean MDI scores, $t(245) = 28.5$, $p < .001$. Typically developing children had a mean MDI of 104.5 (*SD* = 11.68), and developmentally delayed children had a mean MDI of 60.05 (*SD* = 12.82).

Maternal symptomatology—The Symptom Checklist-35 (SCL-35) is a 35-item short form of the Symptom Checklist-90 and Brief Symptom Inventory (Derogatis, 1994) and was used to measure perceived psychological distress. Mothers completed the SCL-35 during the assessment at age 3 years. Each participant rated perceived distress on each 5-point Likert item from 0 (*not at all*) to 4 (*extremely*). The total sum score on the SCL-35 was used to provide a measure of perceived distress, with higher scores (*range* = 0–140) indicating greater distress (coefficient α = .95).

Parenting stress—Parenting stress was assessed using the Parenting Daily Hassles questionnaire (PDH; Crnic & Greenberg, 1990). Mothers completed the PDH at the assessment at age 3 years. The PDH is a 20-item scale (α = .90) that asks the parent to rate the level of hassle associated with parenting tasks and typical, yet challenging child behaviors. Each event is likely to occur in routine daily life (e.g., “sibling arguments; fights that require a referee”). Parents rated each item on the perceived intensity of the hassle (i.e., 1=*no hassle* to 5=*big hassle*; *range* = 20–100).

Maternal sensitivity—Maternal sensitivity was coded from videos of the laboratory observation using the Parent-Child Interaction Rating System (PCIRS; Belsky, Crnic, & Gable, 1995). Sensitivity was defined as the degree to which the mother’s behavior with her child was child-centered. That is, sensitivity was considered to encompass the extent to which the mother was aware of and appropriately responded to the needs, moods, interests, and capabilities of the child. Markers of sensitivity included acknowledging child’s affect; contingent vocalizations by the parent; facilitating the manipulation of an object or child movement; appropriate soothing and attention focusing; evidence of good timing paced to child’s interest and arousal level; picking up on the child’s interest in toys or games; shared positive affect; encouragement of the child’s efforts; providing an appropriate level of stimulation when needed; and sitting on floor or low seat, at child’s level, to interact. The sensitive parent demonstrates the ability to adapt interactions to child’s mood and level of development.

Raters were blind to the child’s developmental status, but for some children it was impossible to avoid recognition of a developmental delay. Raters were instructed to rate each video individually, taking into account the needs and abilities of each child when

assessing the mother's behavior. There was no delineated set of behaviors that defined sensitivity; raters were instructed to be aware of the unique experience of each dyad. Sensitivity was measured on a 5-point scale ranging from the complete absence of the quality to the strong noticeable presence of the quality. The unweighted kappas (Cohen, 1960) for inter-rater reliability for 30% random samples of videos at the 3-, 4-, and 5-year time points were .76, .68, and .71, respectively.

Difficult temperament—The Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) is a 108 item, six scale parent-report instrument designed to examine temperament-related behavior in 16- to 36-month-old children. Items are rated on a 7-point scale ranging from 1 = *never* to 4 = *about half the time* to 7 = *always* during the past month. A not applicable option also is provided for use when the respondent has not seen the child in the particular situation in the past month. Mothers completed the TBAQ at the 3-year assessment. The current study utilized the *anger proneness* scale as a measure of child behavior associated with "difficult" child temperament. Anger was defined as crying, protesting, hitting, pouting, or other signs of anger in situations involving conflict with the caregiver or another child and is measured using 11 items. Internal consistency for the anger scale for this sample was $\alpha = .73$.

Overview of Analyses

Linear growth models for sensitivity were estimated using the SAS PROC Mixed with full information maximum likelihood estimation to account for missing data (Enders, 2010). Time (centered at age 3) was modeled at the individual level (Level 1) to represent linear change in sensitivity scores for each mother across child ages 3 to 5 years. Time-invariant predictors including child developmental status (TD=0; DD=1), maternal distress, and child anger proneness were included at Level 2 to assess how change in sensitivity (intercept and slope) differed across individuals. Family income and child gender (boys=1; girls=-1) were included as covariates to control for these variables in the analyses. Growth models were estimated separately for the free play and challenging task demands. Interactions terms between developmental status and maternal distress, and developmental status and child anger proneness, were included in subsequent analyses. To investigate the moderating effect of parenting demand on maternal sensitivity, difference scores were calculated to contrast maternal sensitivity between the problem-solving and free play tasks (problem-solving minus free play; see West, Aiken, Wu, & Taylor, 2007). The difference scores were then used as dependent variables in the growth model that included all predictors. The resulting coefficients from the growth model represented the interactions between the parenting task demand and the predictors.

RESULTS

Data Reduction

At each yearly measurement, maternal sensitivity in the challenge task was created as a mean composite of maternal sensitivity scores from the moderate and difficult problem-solving tasks. The easy problem-solving task was considered a warm-up exercise and was not included in analyses. Raters coded each task independently according to criteria that implicitly accounted for the level of difficulty. Ratings of maternal sensitivity across the two tasks showed large correlations per Cohen's (1988) norms (at 3 years, $r = .59$; at 4 years, $r = .60$; at 5 years, $r = .51$).

Z-score transformation—To represent the influence of the two measures of maternal distress, maternal symptomatology and maternal parenting stress were transformed into z-scores and averaged.

Descriptives and Correlations

Table 2 presents means, standard deviations, and effect sizes for the differences between the TD and DD groups on all variables. Statistically significant differences were found for anger proneness, maternal sensitivity at ages 3 and 5 during Challenge, and maternal sensitivity at age 3 during Free Play. Table 3 presents the correlations between the study variables across the TD and DD groups.

Trajectories of Maternal Sensitivity

Multilevel mixed models for change in sensitivity were initially analyzed separately within the challenge and free play tasks. The data were fit to multilevel models built from the random intercept model to the most complex model including predictor variables. Table 4 presents the equations for the multilevel mixed models used in the study (Models A through G). In the Challenge task, maternal sensitivity had a statistically significant intercept at age 3, $\gamma = 3.19$; $t(243) = 57.98$, $p < .01$, and a positive slope from age 3 to 5 years, $\gamma = 0.19$; $t(231) = 5.55$, $p < .01$. In Free Play, maternal sensitivity had a statistically significant intercept at age 3, $\gamma = 3.69$; $t(243) = 60.01$, $p < .01$, and a nonsignificant negative slope. The shapes of the growth models are depicted in Figure 1.

Determinants of Maternal Sensitivity

Table 5 reports the fixed effects results for Equation D, which modeled the growth in maternal sensitivity across ages 3 to 5 years with the initial intercept at age 3 predicted by developmental status (DD=1, TD=0), maternal distress, and child anger proneness, controlling for family income and child gender (boys=1, girls=-1). When predictors for both the intercept and the slope were included in the model (Equation E), there were no statistically significant effects on the slope of maternal sensitivity in either the Challenge or Free Play tasks. Thus, only analyses that included predictors for the intercept are discussed.

In the Challenge task, the initial level of maternal sensitivity for mothers of typically developing children was $M = 3.28$; $t(285) = 51.99$, $p < .01$. Developmental status had a statistically significant negative effect on the intercept at age 3, $\gamma = -0.21$; $t(226) = -2.54$, $p < .05$, with the presence of early developmental delay lowering the initial level of maternal sensitivity to $M = 3.07$. There were no other significant predictors in the model. There was a statistically significant, positive slope for maternal sensitivity, $\gamma = 0.18$; $t(225) = 5.27$, $p < .01$, and rates of change in sensitivity were held equal across mothers of children with DD and mothers of TD children. Figure 2 depicts the growth models for the TD and DD groups during the Challenge task. The model with predictors accounted for 29.1% of the total variance in sensitivity in the challenging task according to the pseudo R^2 statistic (Singer & Willett, 2003).

In Free Play, the initial level of sensitivity for mothers of TD children was $M = 3.67$; $t(288) = 51.64$, $p < .01$. There was no difference in the initial level of sensitivity for mothers of children with DD. Child anger proneness had a negative effect on maternal sensitivity, $\gamma = -0.20$; $t(227) = -3.21$, $p < .01$, such that higher levels of child anger proneness were associated with lower levels of maternal sensitivity at age 3. There was a negative slope for maternal sensitivity, $\gamma = -0.07$; $t(228) = -2.07$, $p < .05$, and rates of change in sensitivity were held equal across mothers of children with DD and mothers of TD children. Figure 2 also depicts the growth models for the TD and DD groups during Free Play. The model with predictors accounted for 15.5% of the total variance in sensitivity in the challenging task demand according to the pseudo R^2 statistic (Singer & Willett, 2003).

Interactions

No interactions were found between developmental status and maternal distress, or delay status and child anger proneness (Equation F, Table 4). The effects of maternal distress and child temperament on sensitivity were *not* moderated by child developmental status.

The prediction of the difference score of maternal sensitivity between the Challenge and Free Play tasks tested for interactions between predictor variables and task demand contexts (Equation G). With all of the intercept predictors included in the model, child age (time), developmental status, anger proneness, and child gender were predictors of the difference scores (Table 5). The interactions were probed graphically. Figure 1 depicts the Child Age x Task Demand interaction. Mothers were initially more sensitive during free play than during the challenge task at age 3, but the difference decreased over time. The rate of change differed significantly between the Free Play and Challenge tasks, $\gamma = 0.25$; $t(230) = 6.28$, $p < .01$. The slope was positive over the 3-year period for the Challenge task, but near zero for the Free Play task.

The Developmental Status x Task Demand interaction had an effect on the intercept of maternal sensitivity at age 3, $\gamma = -0.27$; $t(226) = -3.74$, $p < .01$. The graph of the interaction is represented in Figure 3. Mothers of children with and without DD showed similar levels of maternal sensitivity during free play. However, during the challenge task, mothers of children with DD showed significantly lower levels of maternal sensitivity at the initial 3-year assessment.

The Child Anger Proneness x Task Demand interaction had an effect on the age 3 intercept of maternal sensitivity, $\gamma = 0.12$; $t(224) = 2.46$, $p < .05$. The interaction is depicted in Figure 4. Higher levels of child anger proneness had a significant negative effect on maternal sensitivity in the Free Play task, whereas there was no significant effect during the Challenge task.

Finally, the Child Gender x Task Demand interaction had an effect on the intercept of maternal sensitivity at age 3, $\gamma = 0.10$; $t(226) = 2.69$, $p < .01$. The interaction is depicted in Figure 5. During the Free Play task, mothers of girls were initially more sensitive than mothers of boys at the 3-year assessment. There were no differences in sensitivity between mothers of boys and mothers of girls during the Challenge task.

DISCUSSION

This study explored contextual parenting demand as well as individual mother and child factors as determinants of maternal sensitivity across the preschool period. Contrasting change in sensitivity over time in mothers of typically developing children and mothers of children with early known developmental delays offers an opportunity for models of typical and atypical parenting processes to be cross-informative and expand understandings of both. Our findings suggest that maternal sensitivity depends to on the parenting demands that mothers face at these ages. When mothers faced relatively low parenting demand (e.g., unstructured free play) with their preschooler, sensitive responding was initially higher and tended to remain high over time. In contrast, with more challenging parenting demands involving teaching or behavior/emotion management, sensitivity was somewhat lower at younger ages but increased across the preschool years. This result suggests that maternal behavior changes to meet the demands of developmental stages as well as specific childrearing situations. As children's communication skills improve, mothers may become more adept at identifying and responding to their child's needs. Consistent with previous research, the more challenging parenting context revealed greater individual differences in

parenting behavior (Isabella, 1998; Miller et al., 2002), providing support for the need to observe behavior across multiple contexts.

Situational demand, however, did not fully explain the variability in maternal sensitivity observed across early childhood. A unique effect of developmental risk indicated that mothers of children with early developmental delay were less sensitive than mothers of typically developing children, corroborating previous research (Moran, Pederson, Pettit, & Krupka 1992; Niccols & Feldman, 2006). Moreover, the initial differences related to developmental delay did not change as a function of time of measurement, but persisted from 3 to 5 years of age. But again, the effect of developmental risk on sensitive parenting proved to be context-dependent as the effect held true only under conditions of challenge and did not affect the trajectory of maternal sensitivity over time. In contrast, when challenge was low, mothers of children with DD were equally sensitive over the 3 years of observations than mothers of TD children. Despite the fact that parenting in DD populations has been considered more problematic (see Marfo, 1992), our evidence in combination with others (Blacher & Baker, 2007) suggests that these parents are just as adept as parents of TD children, particularly during general, low demand interactions. Moreover, sensitive parenting in the context of developmental risk increases over time in situations that require teaching and/or managing the behavior of the child, just as with mothers of TD children.

Child anger proneness was a significant predictor of maternal sensitivity at age 3 during free-play, supporting previous research that children with more difficult, irritable temperaments receive less sensitive parenting (Belsky, 1984; Mills-Koonce et al., 2007). Moreover, this effect persisted across time of measurement, as the initial differences in sensitivity related to child anger proneness did not differ as a function of child age. This result was not found during the challenge task however, suggesting that child irritability does not create an additive adverse effect on sensitivity within the context of an already-stressful situation. During free play, child irritability may have been frustrating to mothers as they were attempting to play with their children, creating more of a direct effect on levels of sensitivity. Again, studying sensitivity in different contexts allows for a more nuanced understanding of its determinants.

Unexpectedly, mothers treated sons and daughters differently as a function of greater or lesser challenge in the parenting context. When the parenting demand was greater, no gender differences were apparent. However, during the low-demand situation, mothers of girls were more sensitive than were mothers of boys over the 3–5 year age range. This finding is consistent with previous work on parental emotional availability (Bornstein et al., 2008). This gender difference may be explained by gender-typed differences in socialization and play, whereby daughters are apt to have more relational and less autonomous play than boys, possibly fostering more sensitive responding from mothers (Ruble, Martin, & Berenbaum, 2006). Girls may also spend more time with their mothers than boys, becoming closer and more positively involved with them (Bornstein et al., 2008; Clarke-Stewart, 1973). Nonetheless, the specific mechanisms that drive the development of gender differences in maternal parenting behavior remain largely unknown.

After simultaneously accounting for both mother- and child-related stressors in the models, mother-related distress did not predict maternal sensitivity, in contradiction to our hypotheses. One explanation may be insufficient statistical power to detect effects. Our sample was community-based, with 17% (41 mothers) reporting elevations in depressive symptomology. Meta-analyses indicate that the negative association between depression and positive maternal behavior may be relatively weak (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Larger sample sizes in a community study or oversampling of cases with maternal depression are likely needed to detect this effect (Campbell, Cohn, & Meyers, 1995;

Forman, O'Hara, Stuart, Gorman, Larsen, & Coy, 2007; Garai, Forehand, Colletti, Reeslund, Potts, & Compas, 2009).

Developmental status predicted maternal sensitivity during the more demanding parenting tasks, even after taking into account all other predictors. In contrast, in contexts that place lower demands on parents, the presence of risk for developmental delay did not differentially influence maternal parenting behavior. Taken together, these results suggest that appropriate and *successful* scaffolding of the child by the mother during more challenging tasks might influence ratings of sensitive parenting. That is, mothers who succeeded in appropriately scaffolding and completing the problem-solving tasks may have appeared to be more sensitive than mothers who had more difficulty completing the tasks with their child, even if they were in fact equally sensitive. Further research needs to better address the connections between scaffolding and sensitivity, identifying a clearer differentiation between these constructs.

Our three waves of data collection limited the investigation of growth trajectories in the present study to linear models; additional waves would allow the investigation of non-linear trajectories that might better account for the changes in sensitivity over a more extended developmental period. In addition, maternal distress was not reported longitudinally, but instead reflected a single measurement point at age 3 to predict trajectories of sensitivity. However, the design also had significant strengths including the unique opportunity to observe the same mother-child pairs in two contexts at three time points, providing a more complete picture of how mothers' parenting behavior changed across time and contexts (Holden & Miller, 1999). Further, the use of multiple variables of influence to address mother, child, and contextual factors allowed examination of a more comprehensive assessment of the determinants of maternal sensitivity across time. Greater attention to repeated measurement across time, particularly taking into account child-related changes in parenting behavior as well as sources of contextual influence, will help to further explicate the dynamic nature of maternal sensitivity and its effects on child development.

IMPLICATIONS FOR PRACTICE, APPLICATION, AND POLICY

Results from this study inform emerging perspectives on developmental risk, and offer critical comparisons to normative populations that advance our understanding of the importance of core parenting constructs such as maternal sensitivity. There are a number of applied implications for professionals working with families, particularly those who implement parenting interventions. First, parenting interventions would benefit from examining parent-child interactions across different contexts to provide a more complete understanding of nature of parenting processes. Differences between contexts may better identify specific strengths and weaknesses, and suggest more targeted and effective interventions. This may be especially salient for interventions for parents of young children at developmental risk, as these parents may have somewhat greater difficulty when parenting demand is increased such as with challenging teaching tasks. Interventions may consider the specific inclusion of scaffolding techniques or teaching styles that are more effective with children with delays. Finally, our results suggest the need to factor child emotional reactivity into consideration when helping parents to respond more sensitively to children. Although parents appear to be able to accept some anger when children face challenging circumstance, they are less prepared to behave sensitively when contextual demands on children are minimal.

In sum, maternal sensitivity during early childhood is influenced by both the parenting context and specific child characteristics. Developmental risk and child gender contribute to maternal sensitivity over time, but their contributions depend on the situational demands of

the interaction. This contextualized view of sensitivity supports emerging models of parenting as a dynamic developmental process.

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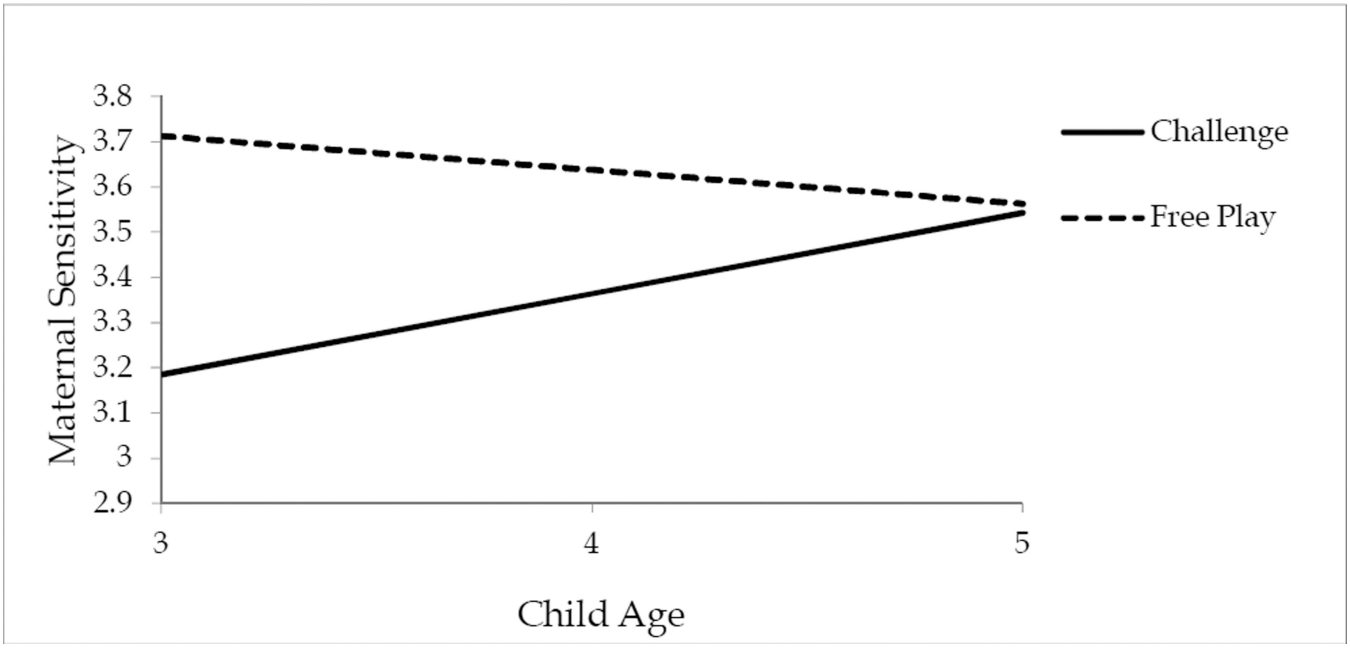

Figure 1.
Growth Model: Interaction between age and task demand.

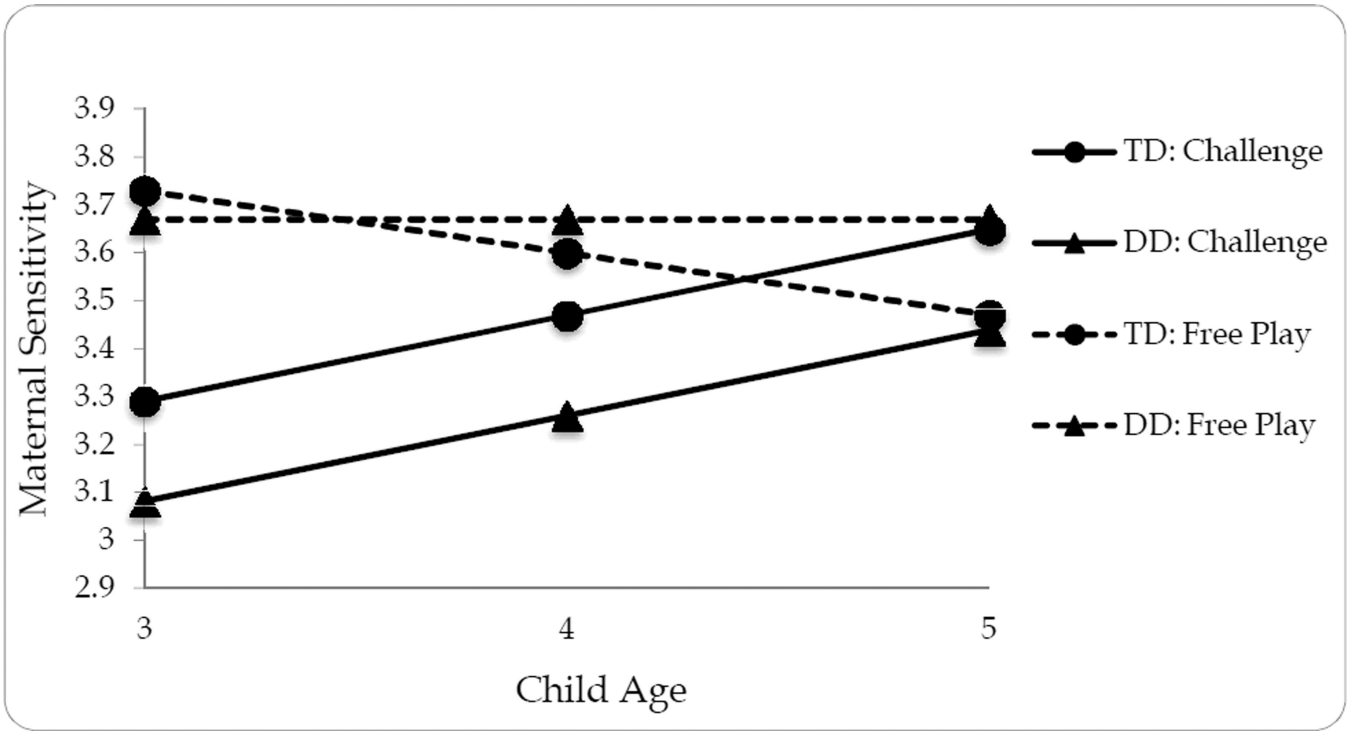

Figure 2.
Growth model: Sensitivity as a function of age during the Challenge and Free Play tasks for the TD and DD groups.

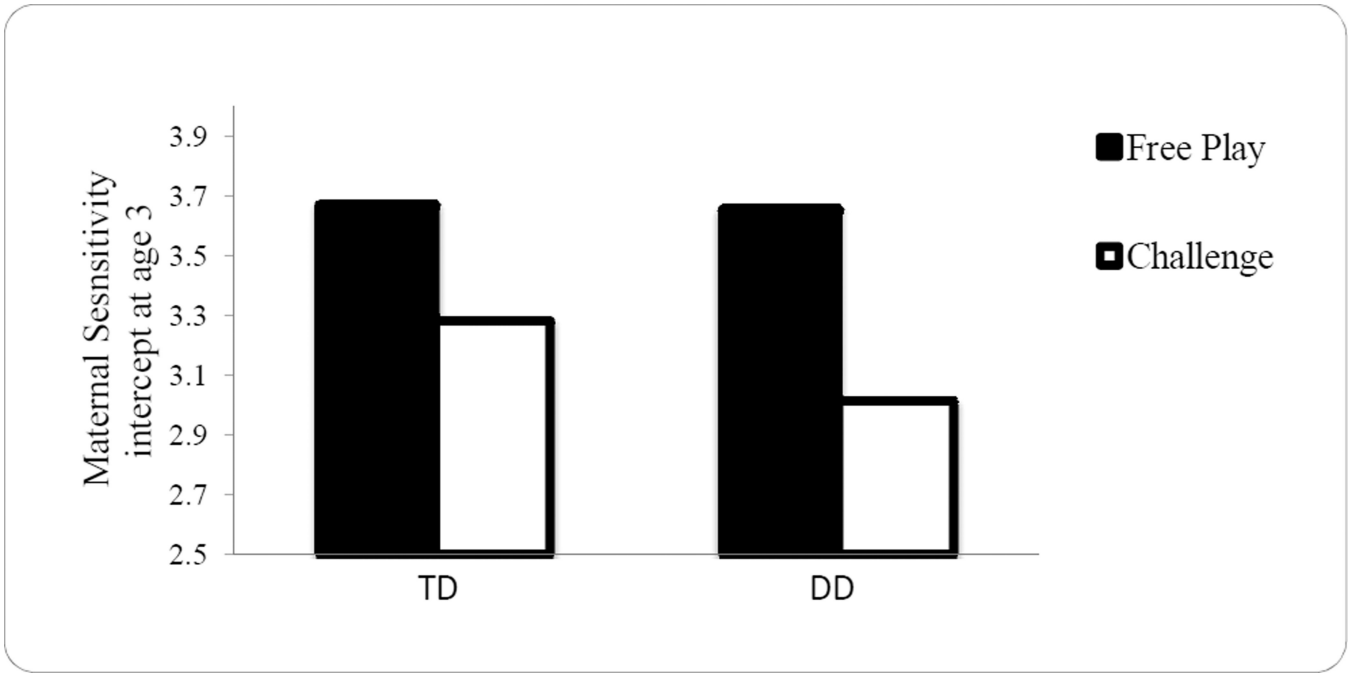

Figure 3.
Interaction between developmental status and task demand in the prediction of maternal sensitivity at age 3.

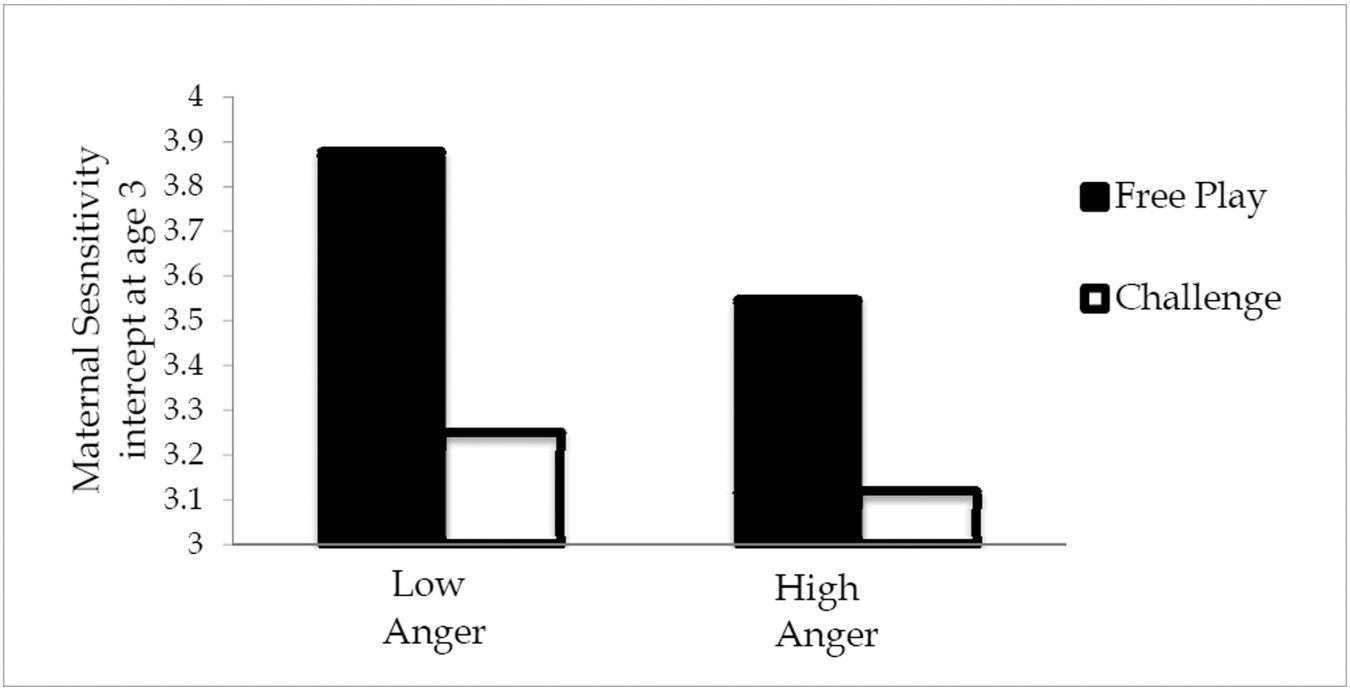

Figure 4.
Interaction between child anger proneness and task demand in the prediction of maternal sensitivity at age 3. High anger = one standard deviation above the mean of child anger proneness (.84); low anger = one standard deviation below the mean of child anger proneness (−.84).

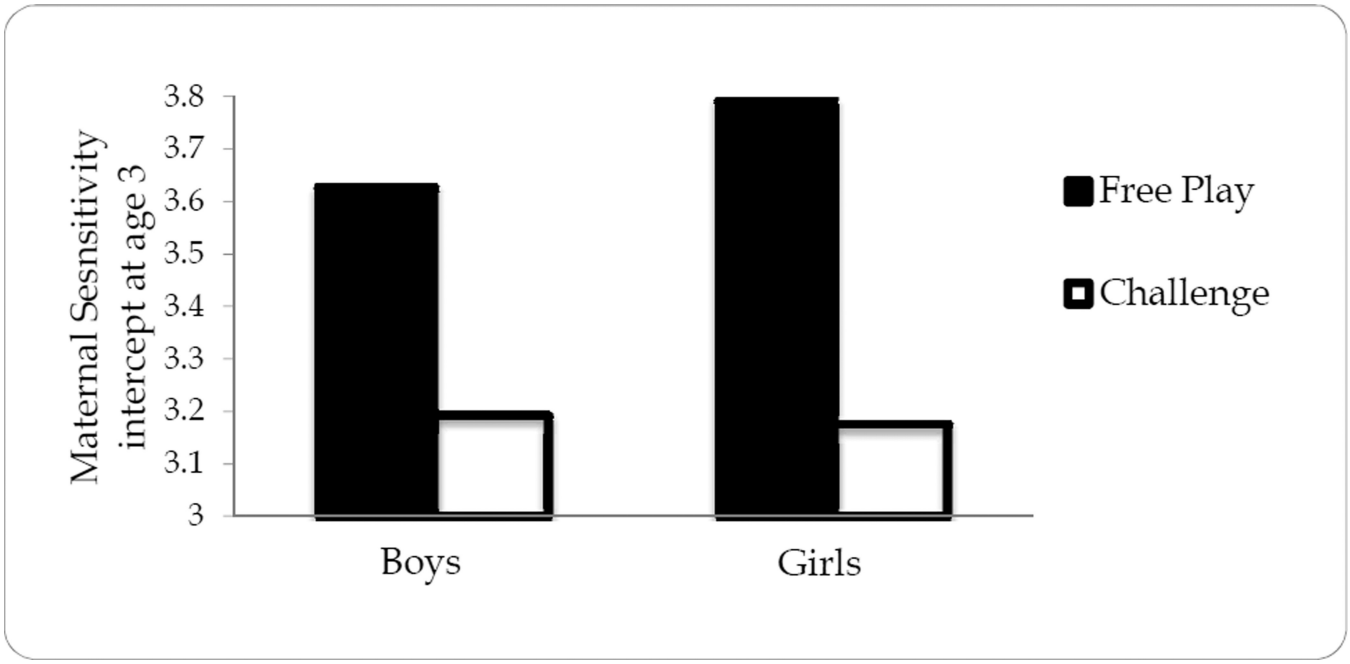

Figure 5.
Interaction between child gender and task demand in the prediction of maternal sensitivity at age 3.

TABLE 1

Demographic Characteristics of the Typically Developing and Developmentally Delayed Samples

Variables	TD (*n*=137)	DD (*n*=110)	χ^2 (*df*)	Cohen's *d*
Categorical variables				
Child gender (% male)	51.1%	66.4%	5.84 (1) *	.31
Maternal ethnicity[a] (% Hispanic)	13.1%	30.9%	17.16 (5) **	-
Maternal marital status[b] (% married at child age 3)	89.8%	79.1%	5.62 (2)	-
Continuous variables	*M (SD)*	*M (SD)*	t (df)	Cohen's *d*
Bayley MDI[c]	104.57 (11.68)	60.05 (12.82)	28.48 (245) ***	3.63
Family income[d]	4.8 (1.8)	3.9 (1.99)	3.7 (244) ***	.47

Note. χ^2 tests and *t*-tests compare TD versus DD groups.

[a]Maternal ethnicity: African American (DD: 2.7%; TD: 10.9%); Asian American (DD: 2.7%; TD: 6.6%); European (DD: 60%; TD: 66.4%); Hispanic American (DD: 30.9%; 13.1%); Native American (DD: 0.9%; TD: 0.7%); "Other" (DD: 2.7%; TD: 2.2%).

[b]Maternal Marital Status: Married (DD: 79.1%; TD: 89.8%); Separated/Divorced (DD: 7.3%; TD: 2.9%); Never Married (DD: 13.6%; TD: 7.3%).

[c]Mental Developmental Index.

[d]Family Income measured on 1 to 7 scale; 1 = $0-$15,000, 4 = $35,001-$50,000, 7 = >$95,001.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 2

Descriptive Statistics Split by Developmental Status

	TD	DD	*t (df)*	Cohen's *d*
Maternal distress	20.8 (19.9)	24.3 (18.4)	−1.37 (237)	.18
Maternal parenting stress	45.7 (10.5)	47.4 (14.6)	−1.05 (240)	.13
Child anger proneness	3.1 (.83)	3.3 (.84)	−2.0 (237) *	.24
Challenge Context				
Maternal sensitivity age 3	3.3 (.79)	2.8 (.89)	4.2 (241) ***	.59
Maternal sensitivity age 4	3.6 (.83)	3.4 (.84)	1.63 (217)	.24
Maternal sensitivity age 5	3.6 (.75)	3.3 (.88)	3.1 (207) **	.37
Free Play Context				
Maternal sensitivity age 3	3.8 (.95)	3.5 (1.0)	2.4 (240) *	.31
Maternal sensitivity age 4	3.6 (.94)	3.6 (.90)	−.11 (218)	.01
Maternal sensitivity age 5	3.6 (.95)	3.5 (.88)	.84 (208)	.11

Note. M (SD).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 3

Correlations among study variables

	1.	2.	3.	4.	5.	6.	7.	8	9.	10.	11.	12.
1. Sensitivity age 3 challenge												
2. Sensitivity age 4 challenge	.53***											
3. Sensitivity age 5 challenge	.28***	.46***										
4. Sensitivity age 3 free play	.57***	.45***	.36***									
5. Sensitivity age 4 free play	.45***	.53***	.33***	.49***								
6. Sensitivity age 5 free play	.31***	.69***	.37***	.38***	.47***							
7. Maternal Symptoms	−.11	−.18**	−.24**	−.10	−.22**	−.21*						
8. Parenting daily Hassles	−.08	−.11	−.17*	−.07	−.16*	−.17*	.39***					
9. Child anger	−.12	−.13*	−.21**	−.16*	−.25***	−.27***	.33***	.54***				
10. Bayley MDI	.27***	.14*	.24***	.18**	.02	.05	−.07	−.06	−.19**			
11. Child gender	−.10	.05	−.00	−.07	−.11	−.12	.06	.11	.11	−.14		
12. Family income	.36***	.31***	.25***	.33***	.32***	.32***	−.19**	−.11	−.13*	.20**	−.01	

*$p < .05$.

**$p < .01$.

***$p < .001$.

TABLE 4

Taxonomy of Mixed Models for Change Fitted to the Maternal Sensitivity Data

Model	Composite Model
A	$\hat{Y}_{ti} = \gamma_{00} + (\varepsilon_{ti} + \varsigma_{0i})$ [Means model]
B	$\hat{Y}_{ti} = \gamma_{00} + \gamma_{10}\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$ [Unconditional growth model]
C	$\hat{Y}_{ti} = \gamma_{00} + \gamma_{01}\text{Income}_{i} + \gamma_{02}\text{ChildGender}_{i} + \gamma_{10}\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$
D	$\hat{Y}_{ti} = \gamma_{00} + \gamma_{01}\text{Income}_{i} + \gamma_{02}\text{ChildGender}_{i} + \gamma_{03}\text{Status}_{i} + \gamma_{04}\text{Distress}_{i} + \gamma_{05}\text{Anger}_{i} + \gamma_{10}\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$
E	$\hat{Y}_{ti} = \gamma_{00} + \gamma_{01}\text{Income}_{i} + \gamma_{02}\text{ChildGender}_{i} + \gamma_{03}\text{Status}_{i} + \gamma_{04}\text{Distress}_{i} + \gamma_{05}\text{Anger}_{i} + \gamma_{10}\text{Time}_{ti} + \gamma_{11}\text{Status}_{i}*\text{Time}_{ti} + \gamma_{12}\text{Distress}_{i}*\text{Time}_{ti} + \gamma_{13}\text{Anger}_{i}*\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$
F	$\hat{Y}_{ti} = \gamma_{00} + \gamma_{01}\text{Income}_{i} + \gamma_{02}\text{ChildGender}_{i} + \gamma_{03}\text{Status}_{i} + \gamma_{04}\text{Distress}_{i} + \gamma_{05}\text{Anger}_{i} + \gamma_{06}\text{Status}_{i}*\text{Anger}_{i} + \gamma_{07}\text{Status}_{i}*\text{Distress}_{t} + \gamma_{10}\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$
G	$\hat{Y}\text{Diff}_{ti} = \gamma_{00} + \gamma_{01}\text{Income}_{i} + \gamma_{02}\text{ChildGender}_{i} + \gamma_{03}\text{Status}_{i} + \gamma_{04}\text{Distress}_{i} + \gamma_{05}\text{Anger}_{i} + \gamma_{10}\text{Time}_{ti} + (\varepsilon_{ti} + \varsigma_{0i} + \varsigma_{1i}\text{Time}_{ti})$

Note. $\hat{Y}_{ti}$ = Maternal Sensitivity from child age 3 to 5 years; $\hat{Y}\text{Diff}_{ti}$ = The difference score in maternal sensitivity between the Challenge and Free Play tasks from child age 3 to 5 years; Status = developmental delay (0=TD, 1=DD); ChildGender = child gender (boy = 1, girl = −1); Time = age in years.

TABLE 5

Fixed Effects for Models of Change in Sensitivity, Intercept-only Model

	Predictors	Challenge Coefficient (*SE*)	Free Play Coefficient (*SE*)	Interactions with Task Demand Coefficient (*SE*)
Initial status	Intercept (child age 3)	3.29 (.06)***	3.7 (.07)***	−.38 (.06)***
	Status	−.21 (.08)*	.08 (.09)	−.27 (.07)***
	Family income	.11 (.02)***	.14 (.02)***	−.03 (.02)
	Child gender	.01 (.04)	−.08 (.05)	.10 (.04)**
	Maternal distress	−.09 (.06)	−.05 (.06)	−.05 (.05)
	Child anger proneness	−.08 (.06)	−.20 (.06)**	.12 (.05)*
Rate of change	Time	.18 (.06)***	−.07 (.04)*	.25 (.04)***

Note. $N = 247$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.