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Household chaos moderates the link between maternal attribution bias and parenting:

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Abstract

Objective—Parents who attribute child misbehavior to children's intentions and dismiss situational factors tend to show more hostility and less warmth in their parenting behavior, and are at greater risk for maltreatment. We extended this literature by investigating the role of household chaos as a moderator of the link between maternal attribution biases and parenting behaviors.

Design—The current sample included 160 mothers of 3- to7-year-old children. Mothers provided reports on their attribution biases and household chaos levels. Maternal negativity and positivity were measured using self-reports and observers' ratings.

Results—The links between attribution bias and parenting behavior were stronger in more chaotic environments, with the moderating effect of chaos being particularly strong for internal attribution bias.

Conclusions—The findings point to the importance of social cognitive biases in the etiology of maternal behavior in family contexts that lack order and predictability.

Keywords

attribution bias; household chaos; parenting

INTRODUCTION

Parenting behaviors and children's cognitive, social-emotional, and behavioral development are tightly linked (Belsky, Fearon, & Bell, 2007; Bernier, Carlson, & Whipple, 2010; Chang, Schwartz, Dodge, & McBride-Chang, 2003; Gaertner, Spinrad, & Eisenberg, 2008). A better understanding of the etiology of parenting behaviors would not only facilitate progress in promoting effective parenting strategies, but also advance our understanding of the fundamental processes of parent-child relationships in children's development. Individual differences in parenting are thought to arise from transactions among parents' personal attributes, children's characteristics, and contextual factors (Belsky, 1984). In the current study, we focused on two aspects in this model: parental attributes and contextual factors, while considering the potential role of child problem behaviors. In particular, we examined how the interplay between parental attribution of child misbehavior and household chaos influenced parenting behaviors.

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Maternal attributions of child misconducts in ambiguous situations and maternal parenting behaviors are tightly linked, but only in households that lack order and stability.

Attribution Bias and Parenting

"Attribution" refers to interpretations of causations of events and behaviors (Kelley & Michela, 1980). Parenting attributions refer to the assigned meanings and definitions of a child's behavior, and they play an important role in affecting how a parent behaves toward her or his child. Parental attribution biases typically are considered on two dimensions: internal or intentional, and external or situational. An internal attribution refers to parental perceptions of a child's behavior as dispositional and intentional, whereas an external attribution refers to parental perceptions of a child's behavior as situated in context, transitory and even accidental (Coplan, Hastings, Lagace-Seguin, & Moulton, 2002).

Previous studies have shown that parental internal attributions of children's problem behaviors in ambiguous situations covary with many aspects of parenting behaviors, including negative affectivity toward the child, overreaction in response to child misconduct, power assertion, and harsh discipline (Dix, Ruble, Grusec, & Nixon, 1986; Dix, Ruble, & Zambarabo, 1989; Miller, 1995; Nix et al., 1999; Smith & O'Leary, 1995; Strassberg & Treboux, 2000). Similarly, higher levels of internal attributions of children's misbehaviors are also more prevalent among abusive and neglectful mothers compared to nonabusive mothers (Azar & Hauser, 1993; Larrance & Twentyman, 1983), and among authoritarian compared to authoritative mothers (Dix & Reinhold, 1991; Hastings & Rubin, 1999). Experimental evidence supplements these correlational studies. For instance, Slep and O'Leary (1998) demonstrated that a mother who was made to believe that her child misbehaved intentionally responded to her child with more negative affectivity and harsher discipline than a mother who was told that her child misbehaved accidentally, suggesting that parental negativity can arise from an attribution of child intent to misbehave.

Attribution Bias and Parenting in Broader Family Contexts

Although the link between parental negativity and internal attribution of child problem behaviors has been established, the magnitude of this effect is far from unity and varies between studies. Thus, parents holding stronger internal attribution biases do not necessarily parent in a harsher and more negative way. For example, several studies have shown that internal attribution bias is associated with maternal negative affectivity and harsh discipline only when child behavior is challenging, not when the child is generally compliant and nonaggressive (Coplan et al., 2002; Katsurada & Sugawara, 2000). Such findings suggest that the connection between maternal attribution bias and caregiving behavior may be strongest in contexts that are challenging and stressful.

One of the most prominent effects of stressful situations is that they heavily tax parents' effortful regulatory resources and further limit the capacity to cognitively reappraise situations (Deater-Deckard, Chen, Wang, & Bell, 2012). Therefore, one potential explanation for a moderating effect of stressful circumstances is that, when effortful regulatory resources are taxed under stress, individuals' behaviors are more dependent on relatively non-effortful social cognitive processes. Questionnaire-based measures of attribution style, such as the one used in the current study, capture stable individual differences in memory-based explanatory processes of ambiguous situations that involve processing of information that typically is outside of conscious awareness (Bugental, Johnston, New, & Silvester, 1998; Fiske & Taylor, 1991). These stable individual differences potentially represent a "default" social cognitive response that tends to be activated in connection to behavior when other higher-order and more effortful regulatory resources are taxed under stressful circumstances, such as when child behavior is extremely challenging (Coplan et al., 2002). Our goal in the current study was to extend this line of research to examine the role of family household chaos as a stressor that may modulate the link between maternal attribution biases and parenting behaviors.

Household chaos indicates the level of disorganization in the family environment, including noise, crowding, and lack of routines. Chaos is an important proximal family environment indicator through which other environmental factors, such as SES, exert influences on various socioemotional and behavioral outcomes in all family members (Deater-Deckard et al., 2009; Evans, Gonnella, Marcynyszym, Gentile, & Sapekar, 2005; Evans & Wachs, 2010). Self-reported household chaos is a direct measure of the perceived chronic disorganization, uncertainty, and noise that are more proximal causes of distress and poorly regulated caregiving. It affects behavior, in part, by impairing executive functions that are critical to regulation of cognitions, emotions, and behaviors (Blair et al., 2007; Deater-Deckard, Wang, Chen, & Bell, 2012; Erickson, Drevets, & Schulkin, 2003). Therefore, in the current study, we chose to focus on household chaos as the crucial indicator of the broad family environmental context.

The effects of chaos may be especially important in parental distress in the face of child challenging behaviors (Deater-Deckard et al., 2012; Mokrova, O'Brien, Calkins, & Keane, 2010). Our view is that it is precisely under conditions of chronic household chaos that effortful regulation of caregiving often becomes overwhelmed, and parenting behavior is more strongly tied to stable individual differences in parents' attributions of intent or situational influence in regard to child misbehavior. Thus, our hypothesis in the current study was that household chaos would moderate the association between attribution bias and parenting behavior, with the strongest link found in high-chaos households and the weakest link found in calm and ordered households—even after controlling for covarying socioeconomic risk factors, such as single parenthood, low education, and unemployment. In addition, given that child behavior problems may contribute to chaos in the households, and because these problem behaviors are known to influence the association between maternal attribution and parenting behaviors (Coplan et al., 2002; Katsurada & Sugawara, 2000), child behavior problems also were statistically controlled when testing the moderation effects of household chaos. Furthermore, we sought to examine both of the two major dimensions of attribution bias highlighted in prior parenting research—internal/intention bias and external/situation bias. Thus, we anticipated that more negative and less positive parenting behavior would be associated with stronger internal attribution and weaker external attribution particularly in the more chaotic home environments.

METHOD

Participants

The sample included 162 mother-child dyads (Deater-Deckard et al., 2012), although two families did not report household chaos data and so were excluded from analyses, for an effective sample of 160 families. Sample size for specific analyses varied slightly due to small amounts of missing data that varied across measures. Mothers were 21 to 52 years old (M = 32.72, SD = 6.28), and the target children were 33 to 88 months old (M = 57.18, SD = 15.73; 50% female). Most of the families participated in our laboratory in a small urban area (n = 110), after being recruited through community agencies and advertisements. We also invited mothers in a cohort of families in an ongoing longitudinal community study to participate in a visit to a nearby rural university laboratory (n = 50). Study "site" (urban = 1, rural university = 2) was included as a covariate in the analyses.

The ethnically and socioeconomically diverse sample was generally representative of the region. Self-reported ethnicity of the child's biological parents (mother/father) was: 76/71% European American, 13/19% African American, 1/1% Asian American, 6/5% multiple races, and 4/4% other. Four percent of mothers and 3% of fathers were reported to be Latin American. Just over two-thirds of the mothers were cohabiting or married and living with the child's biological father, with just under one-third being single mothers who separated or

divorced the child's father or were never married. For mother/father education: 21/31% high school diploma/GED or less, 28/29% some college or an associate's degree, 31/19% 4-year college degree, and 21/22% post-graduate degree. About one-quarter lived in an apartment, duplex, townhouse or mobile home, with three-quarters living in detached single family homes. Eighteen percent of the fathers and 44% of the mothers were unemployed.

Procedures

Mothers completed a questionnaire prior to the visit. At the beginning of the laboratory visit, the mother and child were seated at a table and were video recorded while completing three tasks together. These included an Etch-A-Sketch drawing toy task, doing a puzzle, and building a Duplo blocks model. Each task took 5 min. For the Etch-A-Sketch drawing task, the parent and child each was assigned a control knob and told not to touch the other's knob. They were asked to copy some simple line drawings provided to them, including a square and a smiling face. Next, the parent and child were asked to cooperate with each other to do a 25-piece puzzle. They were told to enjoy the puzzle game and to play just like when they were at home. There were no other rules to this task. The last task was to ask the parent to help the child build a Duplo blocks model. The parent was told to use verbal instructions only and to not touch or point to any block. Subsequently, the videos were observed and rated by trained coders using the Parent–Child Interaction System (PARCHISY; see Deater-Deckard, Pylas, & Petrill, 1997) which has been used with a wide range of children and families (e.g., Brophy & Dunn, 2002; Corapci, Radan, & Lozoff, 2006; Hughes & Ensor, 2006; Marks et al., 2006).

Measures

Socioeconomic risk—To represent the distribution of socioeconomic resources in the sample, we computed a socioeconomic risk index by summing across five binary (0 = *risk absent*, 1 = *risk present*) indicators. These were: single mother [1 (29% of sample), vs. 0 = married or cohabiting with child's father], low paternal education [1 = high school/GED or less (31% of sample), vs. 0 = some college or higher education], housing [1 = apartment, townhouse, duplex, mobile home (26% of sample) vs. 0 = separated single family home], low maternal education [1 = high school/GED or less (21% of sample), vs. 0 = some college or higher education], and paternal unemployment [1 = unemployed (18% of sample), vs. 0 = employed]. The indicators covaried (Spearman ρs from .21, $p < .01$, to .45, $p < .001$). Overall, the distribution of risks was: 0 risks ($n = 69$ or 43% of sample), 1 ($n = 34$, 21%), 2 ($n = 21$, 13%), 3 ($n = 20$, 13%), 4 ($n = 9$, 6%), 5 ($n = 7$, 4%).

Child behavior problems—Child behavior problems were measured using mother's report on the Child Behavior Questionnaire Short Form (CBQ-SF; Putnam & Rothbart, 2006). Items are rated on a 7-point Likert type scale. Three broad dimensions of child behaviors are captured by this questionnaire: surgency ($\alpha = .70$), negative affect ($\alpha = .70$), and effortful control ($\alpha = .64$). Higher scores on the surgency dimension generally represent higher activity level, more impulsiveness, and more enjoyment of high intensity pleasure. Negative affect measures individual differences in dimensions including anger/frustration, fear, sadness, discomfort, and difficulty in soothability. Lower effortful control scores mainly represent poorer attention regulation and impulse inhibition capacity.

Household chaos—Mothers reported the level of chaos in the household using a modified version of the Chaos, Hubbub and Order Scale (CHAOS, Matheny et al., 1995) that has been used in several studies in the United Kingdom (Coldwell, Pike, & Dunn, 2006, $\alpha = .56$; Pike, Iervolino, Eley, Price, & Plomin, 2006, $\alpha = .63$) and the United States (Deater-Deckard et al., 2009, inter-rater and test-retest reliabilities in .60 to .80 range). It includes six items that are rated on a 5-point Likert-type scale: “I have a regular morning

routine." (reverse scored), "You can't hear yourself think in our home.", "It's a real zoo in our home.", "We are usually able to stay on top of things." (reverse scored), "There is usually a television turned on somewhere in our home.", and "The atmosphere in our house is calm." (reverse scored). Scale reliability was acceptable and consistent with prior studies (α = .65).

Maternal attributions—Mothers reported their attributions about children's misbehaviors using the Parenting Possibilities Questionnaire (Nix et al., 1999). This measure includes 9 stories describing common events in everyday life in which a child misbehaves. Mothers are asked to imagine that the child in the story is their own child when they are completing the questionnaire. Mothers are given two possible explanations to account for each of the child behavior vignettes, and then asked to rate the degree to which the two explanations account for the child's misbehavior. One explanation is that the child's misbehavior is intentional (i.e., internal attribution bias), and the second explanation is that the child's misbehavior is situational or accidental (i.e., external attribution bias). All items are rated on a 4-point Likert-type scale and are averaged within the two dimensions, with 1 = *not why* to 4 = *probably why*. This results in two scores: internal/intention attribution bias (α = .73) and external/situation attribution bias (α = .65).

Maternal negativity and positivity—Maternal negativity and positivity were measured using self-reports and observers' ratings. Self-reported negativity (e.g., frustration, anger, disappointment) and positivity (e.g., happiness, pleasure) directed toward the child were measured using the Parent Feeling Questionnaire (Deater-Deckard, 1996). This measure includes 24 items that are rated on a 5-point Likert-type scale (1 = *definitely untrue*, 5 = *definitely true*). Positivity (α = .88) includes 11 items such as "I usually make an effort to praise my child for good behaviors.", and "I enjoy hugging and cuddling with my child." Negativity (α = .90) includes 13 items such as "I am not happy about my relationship with my child." and "every once in a while my child's behavior can bring out the worst in me."

Observers' ratings of maternal negativity and positivity also were collected. Trained coders used the PARCHISY global ratings system (Deater-Deckard et al., 1997) to rate mothers' behaviors during the three structured tasks (described in the Procedures) with the child, using the instrument's 7-point Likert-type scales (1 = *no occurrence of the behavior*, to 7 = *continual occurrence of the behavior*). Consensus coding was used, whereby two coders watched the interaction together without talking, completed independent ratings, and then discussed their scores and resolved any discrepancies. Scores were averaged across the three tasks. In the current study, we examined maternal negative affect (e.g., rejecting, frowning, cold/harsh tone), negative control (e.g. use of criticism, physical control of the dials, physical control of the child's hand/arm/body), conflict (e.g., mutual negative affect, tussling), positive affect (e.g., smiling, laughing), positive control (e.g. use of praise, explanation, open-ended questions), and reciprocity (e.g., shared positive affect, eye contact). Inter-rater reliabilities calculated using Cronbach's α were: .96 for negative affect, .83 for negative control, .94 for conflict, .94 for positive affect, .79 for positive control, and .93 for reciprocity. These six items were subjected to a principal component analysis with oblimin rotation. The results showed a two-component solution with negative affect, negative control, and conflict loading on one component, and positive affect, positive control, and reciprocity loading on the other component (within component loadings > .55, cross component loadings < .30; 66% of total variance explained by the two components). Therefore, an observed maternal negativity score was computed by averaging the negative affect, negative control, and conflict scores (Cronbach's α = .71), and an observed maternal positivity score was derived by averaging the positive affect, positive control, and reciprocity scores (Cronbach's α = .70).

RESULTS

In our data analysis plan, we began by computing descriptive statistics (Table 1) and bivariate correlations (Table 2). Then we estimated a hierarchical regression equation, statistically predicting maternal parenting variables to test our hypothesis by including estimation of the main effects of, and the two-way interaction between, attribution bias and chaos (Tables 3 to 6). We estimated eight equations to examine separately maternal negativity and positivity (2) based on parent and observer reports of parenting (2) and internal and external attribution bias (2). For any equation, if the hypothesized two-way interaction was significant, we conducted post-hoc probing of the interaction using estimation of simple slopes (Holmbeck, 2002) of the statistical prediction of parenting behaviors from attribution bias for high chaos (1 *SD* above sample mean) vs. low chaos (1 *SD* below sample mean) households (Table 8 and Figure 1).

Descriptive Statistics and Correlational Analyses

The average household had .98 of the 5 socioeconomic risk factors present, with wide distribution indicated by a standard deviation of 1.41 risk factors. Household chaos was somewhat skewed toward the calmer end of the distribution, with the mean (2.24) being below the mathematical midpoint of “3” on the 5-point scale for the instrument. However, the distribution of household chaos scores spanned nearly the entire range of the measurement scale, with one standard deviation represented as two-thirds of a point on its 5-point scale. Child behavior problems and maternal attribution scores all distributed normally. Mothers were more likely to attribute children's misbehaviors to external reasons than to internal reasons on average, $d = 1.79$, $t\ (155) = 11.12$, $p < .001$. During observations, mothers exhibited more positivity than negativity, $d = 3.39$, $t\ (156) = 21.15$, $p < .001$, and less variability in negativity compared to positivity. Observed negativity was skewed to the low end of the scale. Self-reported maternal positivity was skewed to the high end of the scale with restricted range, with most mothers reporting high levels of positive feelings toward their children. In contrast, mothers reported moderate levels of negativity on average, with scores distributing widely across the entire scale. Mothers reported more positive feelings than negative feelings toward their children on average, $d = 4.09$, $t\ (158) = 25.69$, $p < .001$. Given that observed maternal negativity and self-reported maternal positivity were skewed and kurtotic, we conducted natural log transformations of these variables (maternal positivity was reflected before the transformation), and obtained scores that more closely approximated a normal distribution. However, these transformations did not affect the results of the regression analyses. Therefore, we report results obtained using the untransformed variables.

Bivariate correlations are shown in Table 2. Mothers who participated at the rural university site had fewer socioeconomic risks and younger children. Lower socioeconomic risk was associated with lower child negative affect, lower levels of household chaos, lower internal attribution and higher external attribution, and higher observed positivity. Child age was not correlated with any of the main study variables. Generally, higher surgency and negative affect and lower effortful control were correlated with more household chaos, more internal and less external attribution, and more maternal negativity and less positivity. Higher household chaos was modestly associated with higher levels of internal attribution, higher self-reported negativity and lower self-reported positivity. There was a substantial negative correlation between internal and external attribution bias. Internal attribution bias was associated with less observed and self-reported positivity and with more self-reported negativity. External attribution bias was only significantly associated with higher observed positivity. Observed parenting was generally minimally correlated with self-reported parenting.

Hierarchical Regression Analyses Predicting Maternal Parenting Behaviors

Next, we turned to analyses to test the study hypothesis. We estimated a series of hierarchical regression equations (predictors centered) predicting variance in maternal negativity or positivity (observed and self-reported) from: step 1, laboratory site (1 = urban, 2 = rural university), socioeconomic risk, and child surgency, negative affect, and effortful control; step 2, household chaos and attribution bias (internal or external bias, depending on analysis as described below); step 3, attribution X chaos interaction. The results for internal attribution and external attribution are shown in the left and right columns respectively in Tables 3 through 6.

Internal attribution bias—For observed maternal negativity (Table 3), none of the predictors was statistically significant except for child negative affect. For observed maternal positivity (Table 4), the full regression equation explained 26% of the total variance. After controlling for the effects of covariates in step 1, the main effect of internal attribution was statistically significant. In addition, the interaction term significantly predicted observed maternal positivity. For self-reported negativity (Table 5), the full regression equation explained 23% of the total variance. The main effect of household chaos explained a significant proportion of variance in self-reported negativity over and above the effects of the covariates. The two-way interaction between internal attribution and household chaos was significant. For self-reported positivity (Table 6), 19% of the total variance was explained. The main effect of household chaos was statistically significant after controlling for the effects of covariates. The interaction term significantly predicted self-reported positivity.

External attribution bias—For observed maternal negativity (Table 3), none of the predictors was statistically significant except for child negative affect. For observed maternal positivity (Table 4), the full regression equation explained 26% of the total variance. After controlling for the effects of covariates, neither of the main effects was significant. However, the interaction term predicted observed maternal positivity. For self-reported negativity and positivity (Tables 5 and 6), only the main effect of household chaos was statistically significant after controlling for the effects of the covariates.

Given that we conducted eight mutually dependent regression analyses, a sequential Bonferroni correction procedure (Benjamini & Hochberg, 1995; Holm, 1979) was done to compare the uncorrected versus the corrected results. The sequential Bonferroni correction procedure is designed to control for false discovery rate for independent test statistics. Therefore, the corrected results in the current analyses may represent test statistics that are overly conservative. In this test, the *p* values of the estimates are compared to their counterparts, and are ranked from the smallest to the largest. Subsequently, these *p* values are each compared to an α which is computed by the total number of tests divided by the product of the rank of the *p* value and .05 (i.e., false discovery rate). Statistical significance is indicated when a *p* value is smaller than its corresponding α level. This procedure suggested that all results concerning the uncorrected significance tests of the interaction terms remained the same, with one exception—the statistical interaction between internal attribution and chaos on self-reported positivity attenuated below significance after the correction.

Given the covariation between maternal negativity and positivity, and internal and external attribution variables, in a follow-up analysis we used a linear composite “high negativity and low positivity” score that represented overall observed maternal parenting behavior and another linear composite score that represented overall self-reported maternal parenting behavior. The observed maternal parenting behavior composite was computed by reverse

scoring the observed maternal positivity then averaging the two observed parenting scores. The self-reported maternal parenting behavior composite was computed using the same procedure. In addition, given the substantial correlation between internal and external attribution bias, we also obtained a linear composite "high internal attribution and low external attribution" score by reverse scoring the external attribution then averaging the two attribution scores. We estimated the same hierarchical regression equation described above, and results are shown in Table 7. The interactive effects between the attribution composite and household chaos predicted both parenting composites over and above the main effects as well as the effects of the covariates.

Given that the hypothesized moderating effect of chaos might actually be due to its covariation with higher levels of socioeconomic risk or higher levels of child behavior problems, we estimated the equations again to rule out these possibilities. We tested the same hierarchical regression equations but switched the socioeconomic risk or child behavior problems scores with the chaos score in each equation, treating chaos as a covariate in step 1, and socioeconomic risk (or child behavior problems) as main effects and moderators in steps 2 and 3. The two-way interactions between child behavior problems and attribution bias were not significant in any of the equations, thus ruling out the potential alternative explanation that the chaos moderating effect was due instead to child behavior problems. The two-way interactions between socioeconomic risk and attribution bias were statistically significant in only two out of ten equations; the socioeconomic risk by internal attribution interaction term significantly predicted variance in observed positivity and self-reported negativity. However, these effects were no longer significant after employing the sequential Bonferroni correction, suggesting that the moderating effect of socioeconomic risk was not consistent, nor could it explain the moderating effect of household chaos.

Post-hoc Probing of Statistical Interactions

For internal attribution bias (the left column of Table 8), the simple slopes analyses revealed a pattern that was consistent with the hypothesized moderating effect. Internal attribution bias was associated with less observed positivity, more self-reported negativity, and less self-reported positivity only in chaotic homes. In calm homes, there was no association between internal attribution and parenting. For external attribution bias (the right column of Table 8), there was only one significant two-way interaction, but this moderating effect was consistent with the hypothesized moderating effect. A stronger external attribution bias predicted maternal observed positivity only in chaotic homes, not in calm homes. For the overall observed and self-reported parenting behaviors (the lower part of Table 8), higher negativity and lower positivity was significantly (for observed parenting) or marginally significantly (for self-reported parenting) associated with higher internal and lower external attribution bias only in highly chaotic homes, not in calm homes.

DISCUSSION

Previous studies have demonstrated that parental social cognitive attributes are important predictors of parenting behaviors (Coplan et al., 2002; Strassberg & Treboux, 2000) and are linked to various child development outcomes (Nix et al., 1999). To advance our understanding of the processes underlying positive and negative parenting that are important sources of influences on child development, the current study addressed the need for research that emphasized contextual influences on the link between parental social-cognitive processes and parenting behaviors.

Attributing Intent in the Midst of Chaos

How parents behave toward their children is partially dependent on how they interpret their children's behaviors (Dix et al., 1989; Miller, 1995; Nix et al., 1999; Slep & O'Leary, 1998; Smith & O'Leary, 1995). In the current study, we found that the main effects of maternal attribution and parenting behaviors were modest ($|\beta|$ = .01 to .17). Therefore, not all mothers who believed that their children intentionally misbehaved treated their children harshly or with withdrawal of caring and attention. Thus, the major aim of the current study was to identify whether levels of household chaos, an important home contextual factor that influences parent and child self-regulation, could distinguish families in which parenting behaviors are more strongly tied to parental attribution bias.

Results were generally consistent with our hypothesis that household chaos moderated the association between attribution bias and parenting behavior, with the strongest link found in high chaos households and the weakest link found in calm and ordered households. Multiple regression equations for three out of four parenting outcome variables spanning two methods (i.e., observations and self reports) suggested that internal attribution bias was associated with more parental negativity and less parental positivity in chaotic households. The hypothesized moderating effect of chaos for parent external attribution bias was found for only one of four parenting variables, but that significant effect also was consistent with our prediction that external attribution bias would be most strongly linked with greater positivity in more chaotic households. One potential explanation for the different results for the interaction between chaos and internal vs. external attribution bias may be that internal attribution bias tends to elicit strong affective reactions whereas external attribution bias shows only modest affective reactions (Riemer, 1975). Therefore, any emotion felt or action taken by a parent toward her child may be more strongly tied to her internal attribution, rather than her external attribution, even though the two attribution biases are correlated (r = -.57).

However, it is worth noting that we were not able to replicate the interactive effect between attribution and chaos in all four parenting outcomes. Specifically, although the interactive effect between internal attribution and chaos predicting observed maternal negativity was in the hypothesized direction, it did not reach statistical significance. We suspect that the most direct explanation for the nonsignificant effect is that the anticipated effect was attenuated due to the restricted variance in the observed negativity scores. Recall that descriptive statistics showed that the standard deviation of observed negativity was about half of the comparable standard deviation of observed positivity.

These discrepant results, together with the low correlations between observed and self-reported parenting behaviors, called for caution when interpreting results obtained using different measures of parenting behaviors, as each of the observational and self-reported measures has its own shortcomings and advantages. The major disadvantage of the brief observation method is that it may not have been long enough for us to sample enough parenting behaviors that adequately represent a parent's day-to-day parenting activities, especially harsh parenting behaviors. In addition, parents and children were aware that they were being observed during the tasks, and this situation may have influenced the frequency and thus variance of socially undesirable behaviors such as expressions of anger or hostility. However, observed behaviors permit relatively less biased assessments because parents' self-perceptions are not involved (Bornstein, Cote, & Venuti, 2001). The major disadvantage of self-reported parenting is that it involves subjective self-perceptions and may sometimes capture behaviors that are valued by a parent more than actions that are actually taken (Goodnow, 2002). Therefore, self-reports may be biased toward sampling more desired and valued parenting behaviors such as positivity toward one's child, and this may have further constrained the distribution of such behaviors toward the very high end of the scale. The

main advantage of self-reported parenting compared to brief observation is that it is based on a wide time period and a variety of settings. Given that each method has its own advantages and disadvantages, observational and self-reported measures may have complemented each other and captured parenting behaviors from two different perspectives (Bornstein et al., 2001). Future studies would benefit from focusing on resolving measurement issues that seek to identify the overlapping and discrepant effects for different measures of parenting.

Turning to the moderating effect of chaos, why would parent behavior be more strongly tied to stable individual differences in caregivers' attribution biases under conditions of chronic household chaos? Our interpretation is that chaos reflects a powerful source of demand and strain on parents' and children's self-regulation capacities (Evans & Wachs, 2010). High levels of chaos characterized by unpredictability, crowding, and noise contribute to chronic stress at physiological, emotional, and behavioral levels, which further impair executive capacities including effortful regulation of attention and behaviors (Blair et al., 2007; Erickson et al., 2003; Evans, Hygge, & Bullinger, 1995; Mokrova et al., 2010). Under these highly stressful conditions that heavily tax effortful regulatory capacities, nonexecutive or noneffortful cognitive processing is enhanced (Arnsten, 2000) and is potentially weighted more heavily in connection to behaviors. This conclusion is consistent with our previous findings concerning the role of executive regulation in parenting behaviors. When faced with challenging child behaviors, parents with better executive memory and attention regulation are enabled to evaluate situations and to reappraise and regulate their own emotions and behaviors in an effort to respond effectively to mitigate children's problematic behaviors. However, the modulation effect of executive regulation on parenting is minimized in highly chaotic households (Deater-Deckard et al., 2012), a condition that allows for a "default" response that is more strongly tied to memory-based attribution biases (D'Agostino & Fincher-Kiefer, 1992; Gilbert, Krull, & Pelham, 1988).

To our knowledge, the current study may be the first to examine the modulation effect of household chaos on the link between parental social cognition and parenting behaviors. To enhance confidence in the current interpretation of the results, future studies could focus on the following two questions. Are other aspects of relatively automatic social cognitive processes, such as parental rearing attitude (i.e., beliefs concerning how to rear a child), also differentially related to parenting behaviors in differentially chaotic households? Furthermore, which specific aspects of household chaos play a crucial role in enhancing the link between parental attribution and parenting behaviors; is it chronic noise, stress, fatigue, lack of certainty in the environment, or something else?

It is unlikely that the moderating effect of household chaos was due to its covariation with socioeconomic risks or child behavior problems. We estimated the same regression equations in which we switched the socioeconomic risk or child behavior problems variables with the chaos variable; none of the moderating effects of socioeconomic risk or child behavior problems was significant after the sequential Bonferroni correction. Therefore, our study indicated that compared to various child behavior problems and socioeconomic risks, such as low parental education and single parenthood, household chaos was a more direct indicator of the chronic disorganization and uncertainty that are more proximal causes of poorly regulated caregiving. This interpretation is consistent with previous literature which suggests that household chaos plays an important role in the etiology of poor parenting, even after controlling for socioeconomic risks (Coldwell et al., 2006; Evans & Wachs, 2010; Pike et al., 2006).

This is not to say that socioeconomic risks are irrelevant to the etiology of parenting and family functioning. On the contrary, we found that, in comparison to household chaos, level

of socioeconomic risk was more strongly associated with higher maternal internal attribution bias (r = .29) and lower external attribution bias (r = -.21). In addition, more extreme levels of socioeconomic distress have been found to exacerbate the strong and deleterious link between high levels of household chaos and poor executive function performance in mothers (Deater-Deckard et al., 2012). Thus, although socioeconomic risks may not be directly linked with poorly regulated caregiving, it may potentially serve as a key indicator in identifying mothers who are more likely to attribute children's misbehaviors in their intentions or situational influences.

Limitations and Conclusions

There are several limitations to the current study. First, as described above, our observation may not have been sufficiently long to sample enough parenting behaviors, especially harsh parenting behaviors. In addition, the fact that parents and children were aware that they were being observed during the tasks may have influenced the frequency of socially undesirable behaviors such as expressions of anger or hostility. Second, the main effect of household chaos only significantly predicted self-reported parenting but not observed parenting which potentially suggests that the main effect of household chaos on self-reported parenting may reflect a shared method effect. Third, the abbreviated 6-item version of the CHAOS scale had a relatively lower reliability than the full 15-item version of the scale. Although difference in number of items may partially explain the difference in reliability between the two versions of the same scale, it also suggests that the current abbreviated household chaos measure may not reliably capture the full range of chaotic factors that exist in households (Evans & Wachs, 2010). Future studies would benefit from using more extensive interviews and home observations of family environment to strengthen the confidence in the environment measures. Fourth, the correlational nature of the current study prevented us from making causal inferences. To exclude other alternative explanations in the current results, rigorous quasi-experimental and experimental designs are needed. Last, although child behavior problems were statistically controlled when testing the moderation effect of household chaos, the current study did not systematically integrate child effects into our conceptualization of the relation between maternal attribution and their parenting behaviors. Theoretically, children's attributes play important roles in influencing various aspects of family functioning (Belsky, 1984). Among a variety of child attributes, problem behaviors such as aggression, hyperactivity, inattention, and noncompliance may be particularly important. These problem behaviors contribute to increases in maternal internal attribution (Synder, Cramer, Afrank, & Patterson, 2003; Wilson, Gardner, Burton, & Leung, 2006) and harsh parenting practices (Deater-Deckard, 2004), and exacerbate the negative impact of internal attribution on maternal negativity (Coplan et al., 2002; Katsurada & Sugawara, 2000). In addition, having a child with these behavior problems in the family makes it harder to maintain a calm and ordered household. Child behavior problems are intertwined not only with parenting behaviors, but also with how parents' interpret daily events involving the child and the broader family environment. As such, future studies would benefit from systematically integrating these behavior problems in children when examining parenting and family processes.

IMPLICATIONS FOR PRACTICE, APPLICATION, AND POLICY

The current study points to the importance of taking parental social-cognitive attributes and broader family context into consideration when examining the etiology of parenting behaviors. High levels of chaos in households exert deleterious effects on the parent-child relationship, parental welfare, and child development (Evans & Wachs, 2010). In chaotic households, parental internal attribution of children's misbehaviors predicts more parental harsh negativity and less warm sensitivity that serve to reinforce children's challenging

behavior problems (Nix et al., 1999) and interferes with parental engagement with interventions to reduce these challenging behavioral problems (Morrissey-Kane & Prinz, 1999). Therefore, prevention and intervention programs that target parents' attributions regarding children's behaviors (e.g., Sanders et al., 2004) may potentially yield greater improvements in parents' caregiving strategies and children's healthy development when they first address strategies for promoting routines and calm environments in chaotic homes (Deater-Deckard et al., 2009; Weisner, 2010), because the stress and feelings of uncertainty arising from a chaotic environment can potentially compromise attempts to implement home-based interventions. To our knowledge, few published intervention/prevention parenting programs have targeted reductions in household chaos. However, results from several studies that target reduction in noise and household instability in routines seem to show positive results for reducing family chaos and improving parent and child well-being (Brooks-Gunn, Johnson, & Leventhal, 2010; Weisner, 2010). Given that even mothers with strong internal/intentional attribution biases can provide alternative and non-punitive explanations for child misbehaviors *if given adequate time without pressure* (Snarr, 2005), supporting families as they strive to reduce the constraints and stressors placed on them by living in chaos—even those with strong internal attribution biases—would enable more parents to reflect on child behavior and enact non-punitive methods of discipline and caregiving.

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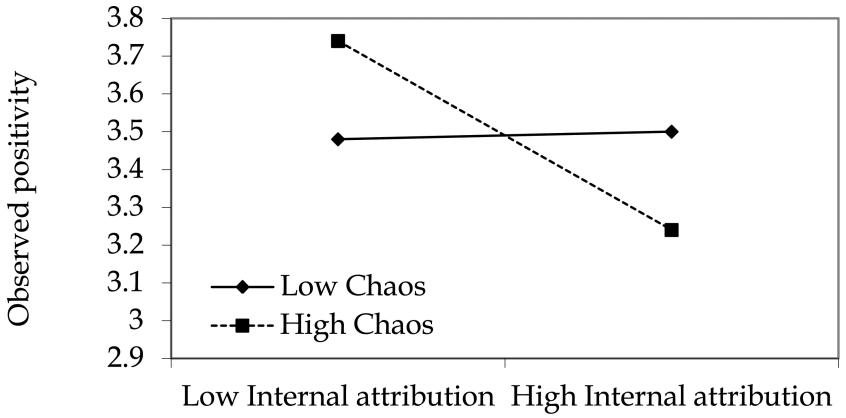

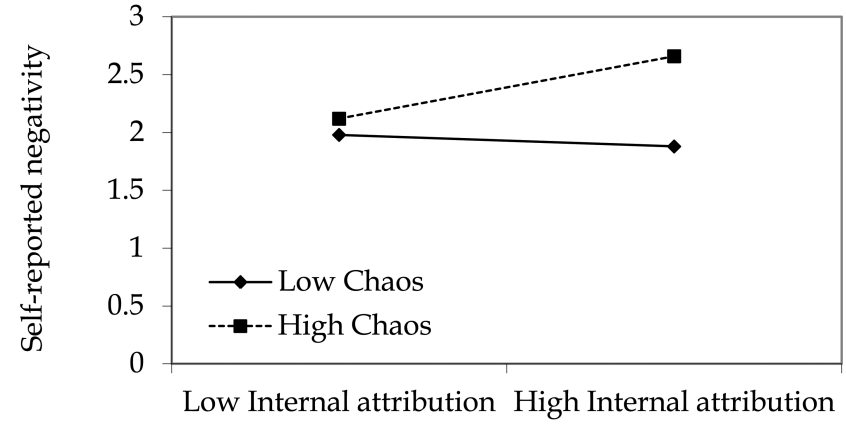

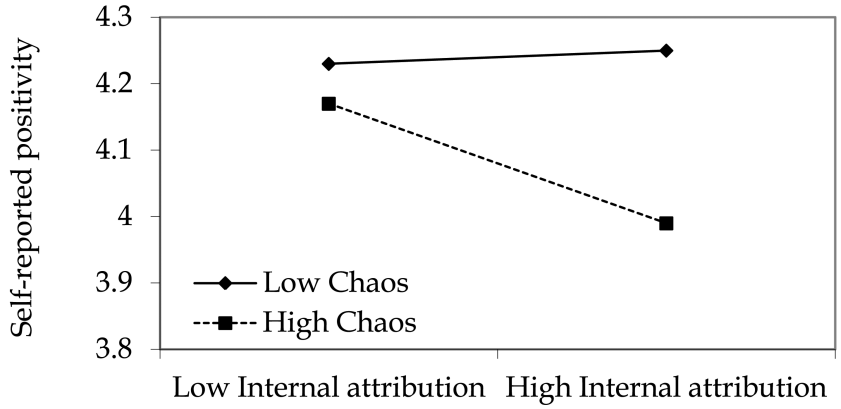

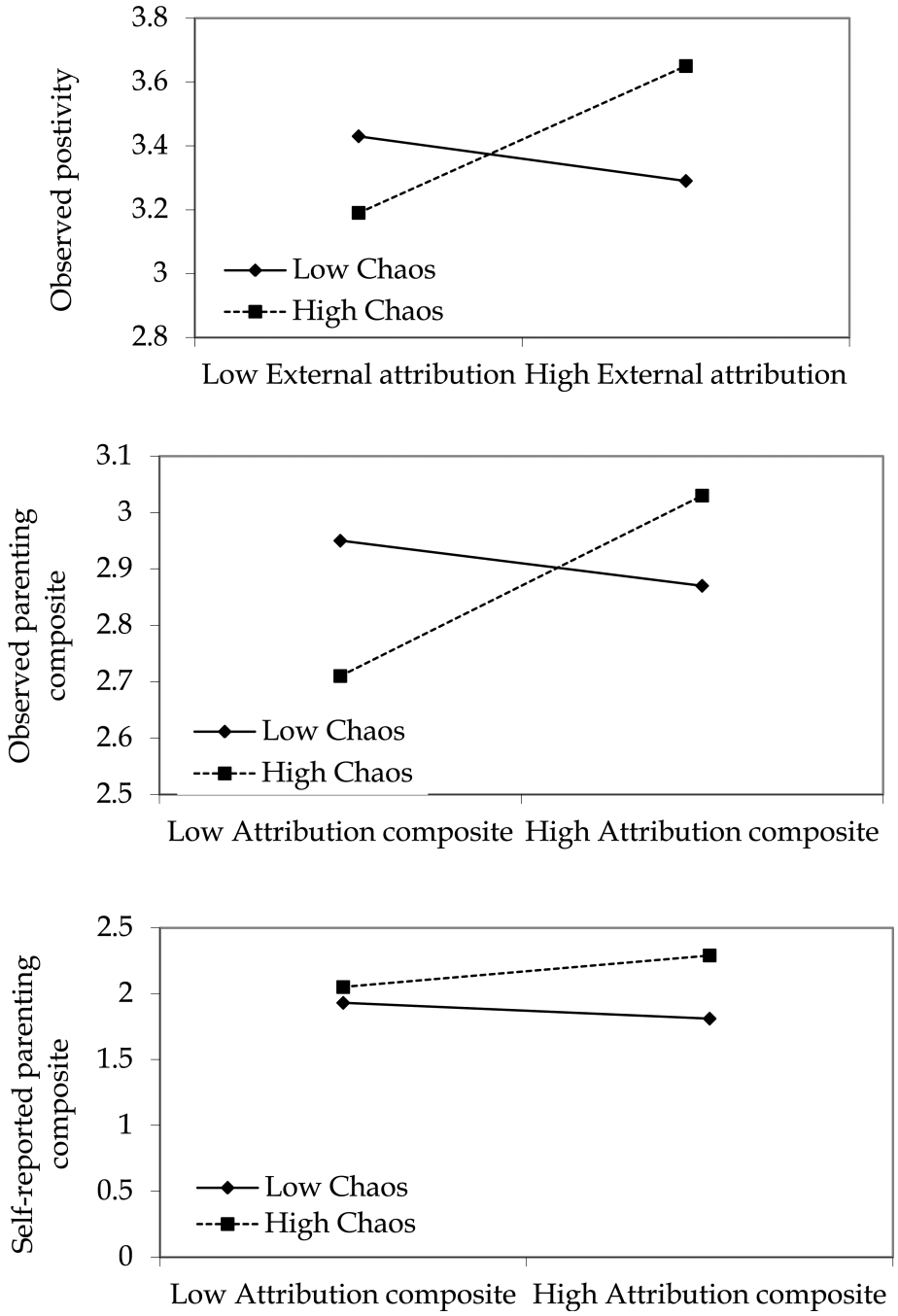

Figure 1.
Simple slopes for statistical prediction of parenting from attribution bias at low (-1 *SD*) and high (+1 *SD*) levels of chaos.

TABLE 1

Descriptive Statistics of Main Study Variables

	M	*SD*	Skewness	Kurtosis	Minimum	Maximum	Scale Range
SES risks	.98	1.41	1.35	.78	.00	5.00	.00-5.00
Surgency	4.73	.76	-.07	.03	2.26	6.67	1.00-7.00
Negative affect	3.95	.75	-.05	-.02	1.73	5.80	1.00-7.00
Effortful control	5.18	.60	-.13	-.36	3.53	6.58	1.00-7.00
Household chaos	2.24	.67	.44	-.27	1.00	4.00	1.00-5.00
Internal attribution	2.26	.53	.22	-.39	1.00	3.60	1.00-4.00
External attribution	3.02	.44	-.10	-.35	2.00	4.00	1.00-4.00
Negativity (o)	1.30	.36	2.58	9.29	1.00	3.22	1.00-7.00
Positivity (o)	2.65	.61	.28	.11	1.28	4.61	1.00-7.00
Negativity (s)	2.47	.87	.32	-.82	1.00	4.38	1.00-5.00
Positivity (s)	4.70	.43	-3.26	14.58	2.00	5.00	1.00-5.00

Note. (o) = observed; (s) = self-reported.

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TABLE 2

Bivariate Correlations between Study Variables

	1.site	2	3	4	5	6	7	8	9	10	11	12
2.SES	-.31***											
3.Child age	-.79***	.20*										
4.Surgency	-.05	.09	.08									
5.Negative affect	-.14	.26**	.05	.00								
6.Effortful control	-.08	-.02	.04	-.14	-.20*							
7.Household chaos	-.07	.25**	.09	.20*	.25**	-.26**						
8.Internal attribution	-.06	.29***	.01	.12	.28**	-.15	.18*					
9.External attribution	.10	-.21**	-.12	-.17*	-.11	.19*	-.10	-.57***				
10.Negativity(o)	-.15	.14	-.03	.08	.29***	-.17*	.06	.15	-.07			
11.Positivity(o)	-.03	-.38***	.02	-.15	-.14	.08	-.10	-.27**	.22**	-.31***		
12.Negativity(s)	.02	-.07	-.02	.23**	.16*	-.24**	.30***	.16*	-.11	.03	-.04	
13.Positivity(s)	.08	-.12	-.05	-.15	-.15	.31***	-.29***	-.17*	.05	-.14	.24**	-.49***

Note. (o) = observed; (s) = self-reported.

* $p < .05$

** $p < .01$

*** $p < .001$.

TABLE 3

Standardized Coefficients and Explained Variance for Hierarchical Regression Equations Predicting Observed Maternal Negativity

	Internal Attribution			External Attribution		
	Stepl	Step2	Step3	Step1	Step2	Step3
Site	-.11	-.11	-.10	-.11	-.11	-.12
SES risk	.07	.07	.05	.05	.07	.06
Surgency	.07	.08	.08	.07	.08	.07
Negative affect	.25**	.26**	.25**	.25**	.26**	.25**
Effortful control	-.13	-.14	-.13	-.12	-.13	-.13
Attribution	---	.04	.06	---	.01	.02
Chaos	---	-.07	-.07	---	-.06	-.07
Attribution × chaos	---	---	.12	---	---	-.12
Δ R^2	.13**	.01	.01	.12**	.00	.01
Δ F	4.20	.47	2.06	3.92	.29	2.08
Δ df	5, 140	2, 138	1, 137	5, 143	2, 141	1, 140

*$p < .05$

***$p < .001$.

**$p < .01$

TABLE 4

Standardized Coefficients and Explained Variance for Hierarchical Regression Equations Predicting Observed Maternal Positivity

	Internal Attribution			External Attribution		
	Stepl	Step2	Step3	Step1	Step2	Step3
Site	-.15	-.14	-.17*	-.15	-.16	-.14
SES risk	-.40***	-.37***	-.33***	-.40***	-.38***	-.37***
Surgency	-.14	-.12	-.12	-.13	-.12	-.10
Negative affect	-.05	-.03	.00	-.06	-.06	-.04
Effortful control	.02	.01	.00	.04	.02	.02
Attribution	---	-.17*	-.19*	---	.13	.13
Chaos	---	.02	.00	---	.03	.04
Attribution × chaos	---	--	-.24**	---	---	.25**
Δ R^2	.18***	.03	.05**	.18***	.02	.06**
Δ F	6.21	2.17	9.66	6.47	1.46	11.12
Δ df	5, 140	2, 138	1, 137	5, 143	2, 141	1, 140

* $p < .05$

** $p < .01$

*** $p < .001$.

TABLE 5

Standardized Coefficients and Explained Variance for Hierarchical Regression Equations Predicting Self-Reported Negativity

	Internal Attribution			External Attribution		
	Stepl	Step2	Step3	Step1	Step2	Step3
Site	.00	-.00	.02	.00	.01	.00
SES risk	-.14	-.21*	-.25**	-.12	-.18*	-.18*
Surgency	.21**	.16*	.15*	.21**	.17*	.16*
Negative affect	.16	.10	.07	.17*	.13	.12
Effortful control	-.18*	-.12	-.11	-.16*	-.11	-.11
Attribution	---	.11	.12	---	-.04	-.04
Chaos	---	.25**	.27**	---	.25**	.24**
Attribution × chaos	---	---	.21**	---	---	-.11
Δ R^2	.13**	.06**	.04**	.12**	.05*	.01
Δ F	4.23	5.58	7.32	4.13	4.73	2.05
Δ df	5, 147	2, 145	1, 144	5, 150	2, 148	1, 147

***$p < .001$.

*$p < .05$

**$p < .01$

TABLE 6

Standardized Coefficients and Explained Variance for Hierarchical Regression Equations Predicting Self-Reported Positivity

	Internal Attribution			External Attribution		
	Stepl	Step2	Step3	Step1	Step2	Step3
Site	.06	.06	.05	.06	.06	.06
SES risk	-.04	.02	.05	-.07	-.04	-.04
Surgency	-.12	-.07	-.07	-.10	-.08	-.08
Negative affect	-.07	-.01	.01	-.07	-.04	-.04
Effortful control	.27**	.21*	.21*	.28**	.25**	.25**
Attribution	---	-.08	-.10	---	-.07	-.07
Chaos	---	-.22*	-.23**	---	-.20*	-.20*
Attribution × chaos	---	---	-.16*	---	---	.01
Δ R^2	.12**	.05*	.02*	.13**	.04*	.00
Δ F	3.82	4.06	3.93	4.27	3.24	.01
Δ df	5, 147	2, 145	1, 144	5, 150	2, 148	1, 147

***$p < .001$.

*$p < .05$

**$p < .01$

TABLE 7

Standardized Coefficients and Explained Variance for Hierarchical Regression Equations Predicting Observed and Self-Reported Parenting

	Observed Parenting Composite			Self-reported Parenting Composite		
	Stepl	Step2	Step3	Step1	Step2	Step3
Site	.07	.06	.07	-.02	-.02	-.01
SES risk	.33***	.31***	.29***	-.08	-.14	-.16
Surgency	.13	.12	.11	.20*	.16	.15
Negative affect	.16*	.15	.12	.15	.10	.08
Effortful control	-.08	-.07	-.07	-.23**	-.18*	-.18*
Attribution composite	---	.14	.15	---	.05	.05
Chaos	---	-.05	-.05	---	.26**	.27**
Attribution × chaos	---	---	.25**	---	---	.17*
Δ R^2	.18***	.02	.06**	.14***	.06**	.03*
Δ F	6.36	1.69	11.86	5.00	5.51	4.96
Δ df	5, 144	2, 142	1, 141	5, 151	2, 149	1, 148

* $p < .05$

** $p < .01$

*** $p < .001$.

TABLE 8

Standardized Simple Slopes for Statistical Prediction of Maternal Negativity and Positivity from Attribution Bias at Low (-1 SD) and High (+1 SD) Levels of Chaos

	Internal Attribution		External Attribution	
	Low Chaos	**High Chaos**	**Low Chaos**	**High Chaos**
Negativity (observed)	---	---	---	---
Positivity (observed)	.02	-.40***	-.10	.36**
Negativity (self-report)	-.06	.31**	---	---
Positivity (self-report)	.04	-.24*	---	---

	Low Chaos	High Chaos
Parenting composite (observed)	-.09	.39***
Parenting composite (self-report)	-.11	.20+

Note. --- interaction term not significant so simple slopes not estimated.

+ $p < .06$

* $p < .05$

** $p < .01$

*** $p < .001$.