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The Effect of Parenting Stress on Child Behavior Problems in High-Risk Children with Prenatal Drug Exposure

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Abstract

Objective—To examine the relationship between early parenting stress and later child behavior in a high risk sample and measure the effect of drug exposure on the relationship between parenting stress and child behavior.

Methods—A subset of child-caregiver dyads (n = 607) were selected from the Maternal Lifestyle Study, which is a large sample of children (n = 1388) with prenatal cocaine exposure and a comparison sample unexposed to cocaine. Of the 607 dyads, 221 were prenatally exposed to cocaine and 386 were unexposed to cocaine. Selection was based on the presence of a stable caregiver at 4 and 36 months with no evidence of change in caregiver between those time points.

Results—Parenting stress at 4 months significantly predicted child externalizing behavior at 36 months. These relations were unaffected by cocaine exposure suggesting the relationship between parenting stress and behavioral outcome exists for high-risk children regardless of drug exposure history.

Conclusions—These results extend the findings of the relationship between parenting stress and child behavior to a sample of high-risk children with prenatal drug exposure. Implications for outcome and treatment are discussed.

Keywords

disruptive behavior; parenting stress; high-risk children; prenatal drug exposure; cocaine

Introduction

Disruptive behavior disorders represent the most common mental health problem in preschool-age childhood [1] and have a complex etiology comprised of biological, psychological, and social factors [2]. Specific factors associated with child disruptive behavior problems have included child characteristics (e.g., temperament, prematurity), parent characteristics (e.g., parenting stress, depression), parent practices (e.g., discipline style), and socioeconomic status [3]. A transactional model has recently been proposed to explain the relationship between

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maternal distress and child disruptive behavior problems; child disruptive behaviors contribute to higher maternal stress, which in turn leads to increased child disruptive behavior problems [4].

Perceived parenting stress is associated with both parenting behaviors and child maladjustment [5]. Although there is some evidence that parenting behavior acts as a mediator between parenting stress and child outcome [6,7], a recent study demonstrated that parenting interactions do not mediate this relation [8]. In typically developing children, parenting stress is relatively stable over time and has been shown to directly predict later child functioning based on both observed and parental report of child behavior [8], as well as teacher report of child behavior [9]. However, the predictive relationship between parenting stress and child behavior has not been thoroughly examined in a high-risk sample of children, including children prenatally exposed to drugs.

Mothers who used drugs during pregnancy report higher levels of parenting stress and are more likely to engage in maladaptive parenting behaviors, such as abuse or neglect [10]. Negative environmental risk factors among substance-abusing mothers (e.g., cognitive impairment, chronic health problems) are associated with elevated levels of parenting stress and place their children at an increased risk for ineffective parenting parentices [11,12]. Maternal psychopathology largely accounts for the relationship between maternal drug use and unresponsive and negative parenting behaviors during parent-child interactions [13]. Additionally, mothers with higher ratings of psychological distress are more likely to perceive their infant's behavior as stressful [14].

Higher distress among mothers who used drugs during pregnancy has also been shown to have deleterious effects on their children. For example, maternal psychological distress and drug exposure (i.e., cocaine and alcohol) were both uniquely related to decreased cognitive functioning in the child [15]. Children prenatally exposed to cocaine were also found to perform better on several developmental domains when placed in nonparental care, in which the caregivers had significantly less parenting stress compared to those placed with their biological mothers [16]. Although not directly examined in this study, the difference in caregiver stress suggests that parenting stress may act as a mediator in the relationship between prenatal cocaine exposure and poor child outcome.

Despite the well documented evidence of concomitant elevated parenting stress and poor child outcome among mothers who used drugs during pregnancy, there is relatively little information on the predictive relation between early parenting stress and later child behavior in this population. Maternal psychological distress has been shown to be associated with higher levels of internalizing and externalizing symptoms in children prenatally exposed to cocaine [17], but the data were cross sectional and parenting stress was not examined as an independent variable. Caregiver depression was also shown to predict child behavior problems among preschool-age children with prenatal cocaine exposure; however, measures of depression and child behavior were collected at the same time point (i.e., 3-year follow-up) and caregiver stress was not examined as a predictor in this study [18]. Evidence providing support for the relationship between early parenting stress and later child behavior would be important in the development of early prevention and intervention programs for children prenatally exposed to drugs.

One of the difficulties in studying factors such as parenting stress in populations of cocaine using mothers is the high stressed environment in which the children are raised, and this likely to be true for the “exposed” group as well as the “comparison” group. Thus, it been suggested that cocaine be viewed as one of many risk factors in these children's environments [19]. The current study examines the relationship between early parenting stress and later child disruptive

behavior in a sample of children with prenatal cocaine exposure and their caregivers, and a comparison sample of non-cocaine exposed children. The sample was drawn from a longitudinal study of prenatal drug exposure, the Maternal Lifestyle Study [20,21]. The primary goal of this study was to test the predictive relationship between early parenting stress, based on a self-report measure, and caregiver-report of later child disruptive behavior. Although we examined the effects of cocaine, our main interest was to study parenting stress in a highly stressed population. We included a measure of early infant temperament in order to determine whether parenting stress had a unique and independent predictive validity over and above difficult early child characteristics that may be stable across development. Additionally, we examined the interaction between parenting stress and cocaine exposure on child disruptive behavior. Last, we assessed the frequency and clinical significance of child disruptive behavior in this high-risk sample.

Methods

Participants

Participants were drawn from the Maternal Lifestyle Study (MLS), an investigation of the effects of prenatal cocaine/opiate exposure on child outcome in a longitudinal follow-up from 1 month to 11 years in 1,388 children divided into an exposed group (n = 658) and a comparison group (n = 730) [22]. Infants were considered to be in the "exposed" group if there was either maternal report of cocaine or opiate use during the pregnancy based on hospital interview *or* positive meconium assay (positive enzyme multiple immunoassay test [EMIT] screen followed by positive gas chromatography/mass spectroscopy). Infants were considered to be in the comparison group if there was maternal denial of cocaine or opiate use and a negative EMIT screen for cocaine and opiate metabolites. Exposure groups were matched on prematurity, race, and sex. Infants were excluded from the MLS if they had a chromosomal abnormality, TORCH (*T*oxoplasmosis, *O*ther Agents, *R*ubella, *C*ytomegalovirus, and *H*erpes Simplex) infection confirmed before the 1-month assessment, or if the mother planned to move outside of the study catchment area. A history of maternal alcohol, marijuana, and nicotine use during the pregnancy was recorded during an interview and considered as background variables in both the exposed and unexposed groups.

MLS is conducted at four sites: Brown University, University of Miami, University of Tennessee, Memphis, and Wayne State University. MLS was given a "certificate of confidentiality" from the United States Department of Health and Human Services, which allowed the study to maintain participant confidentiality with regard to drug-use information. The certificate of confidentiality applied specifically to information regarding maternal use of drugs and left in force all reporting requirements with regard to suspicion of child abuse or neglect. Participants were fully informed of their rights and limits as study participants, including limits to confidentiality, and informed consent was obtained from all caregivers, as approved by review boards at each study site.

Procedure

For the current study, children were selected from the MLS sample if they had a "stable caregiver" between 4 and 36 months to ensure continuity across raters (i.e., the report of parenting stress at 4 months was from the same caregiver as the report of child disruptive behavior at 36 months).We defined "stable caregiver" as the same caregiver at both 4 and 36 months with no evidence of any change in caregivers between these time points. This resulted in a sub-sample of 607 children with complete data on measures of parenting stress at 4 months and child behavior at 36 months.

Although the exclusion of children without stable caregivers provides a methodologically stronger sample, it is important to recognize any differences between dyads included and excluded from this study. Excluded dyads did not differ on most demographic characteristics (e.g., birth weight, caregiver age, child gender and race), except that the excluded group had significantly lower SES, $t(1334) = -2.17$, $p = .030$, and were more likely to have been in the cocaine-exposed group than those retained for this study (56% vs. 36%; $\chi^2 = 52.33$, $p < .001$). In addition, excluded dyads did not differ on the primary outcome measures, including child externalizing behaviors at 36 months and overall parenting stress at 4 months, as well as infant temperament at 4 months. Among the specific scales of parenting stress, however, mothers in the excluded group reported higher rates of parenting stress unrelated to the child's behavior (i.e., Parental Stress), $t(1074) = 2.60$, $p = .010$, and parenting stress related to the parent-child relationship (i.e., Parent-Child Dysfunctional Interaction), $t(1074) = 2.61$, $p = .009$. There were no significant differences in parenting stress related to difficult child behavior (i.e., Difficult Child), $t(1074) = -0.57$, $p = .570$.

Measures

Child Disruptive Behavior—The Child Behavior Checklist for Ages 2-3 (CBCL) is a 100-item questionnaire designed to assess child behavior problems using parent report [23]. Broadband scales for Internalizing, Externalizing, and Total Problems are derived. Test-retest reliability ranged from .74 to .96, and construct validity ranged from .84 to .90 [23]. The CBCL was administered at 36 months corrected age, and the Externalizing scale was used in the current study as a measure of child disruptive behavior.

Parenting Stress—The short form of the Parenting Stress Index (PSI-SF) is a 36-item questionnaire that queries attitudes and experiences of parenting a specific child [24] The PSI-SF yields a total score and 3 factor scores (Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child). Six-month test-retest reliability of subscales is .85, .68, and . 78, respectively. The PSI-SF was administered at 4 months corrected age, and the total score was used in the current study as a measure of parenting stress.

Infant Temperament—A modified version of the Infant Behavior Questionnaire (IBQ) [25] was administered as a parent-reported measure of infant temperament (modifications, approved by M. K. Rothbart, included simplification of language for the MLS population and reduction of response scale to 5 points). The IBQ yields 6 summary scales: Activity Level, Smiling and Laughter, Distress to Novelty, Distress to Limitations, Soothability, and Duration of Orienting. Coefficient alpha values for these scales range from .72 to .85. The IBQ was administered at 4 months, and the Distress to Limitations scale was used in the current study as a covariate. The Distress to Limitations scale was chosen because it is conceptually related to parenting stress and due to previous findings that parenting stress moderates the relationship between neonatal behavior and this measure of infant temperament [14]. In addition, correlations among the current sample between the Distress to Limitations scale and the PSI-SF Total score and CBCL Externalizing scale were higher than the other 5 summary scales. Together, these findings suggest the Distress to Limitations subscale would account for the most variance in the relationship between parenting stress and child behavior.

Data Analysis

Descriptive statistics, hierarchical linear regression, and hierarchical logistic regression were performed using SPSS, version 12.0. Differences in the demographic variables between the exposed and non-exposed groups were examined using independent *t*-tests for continuous variables (e.g., SES) and χ^2 analyses for categorical variables (e.g., child sex). A hierarchical linear regression analysis was performed to test whether prenatal cocaine exposure and early

parenting stress at 4 months predicted child disruptive behavior at 36 months of age. Additionally, we were interested in whether the relationship between early parenting stress and later child behavior was influenced by child exposure to cocaine. Finally, we measured the frequency of children at or above the clinical cutoff and conducted a logistic regression to determine whether early parenting stress predicts whether a child scores in the clinically significant range for disruptive behavior.

In both regressions, the CBCL Externalizing scale at 36 months was the dependent variable. CBCL Externalizing T-scores were used in the linear regression whereas a dichotomous variable of clinical cutoff (i.e., yes or no) was used in the logistic regression. Mother's age, SES, child gender, child race, prematurity, infant temperament, and MLS study site were all entered at step 1 as covariates. Infant temperament was used as a covariate to ensure that the measure of parenting stress is not just a measure of early temperament. Study site was used as a covariate because it has been a common finding that infants differed on a variety of MLS variables across study site. The remaining covariates were all demographic variables that have been previously shown to influence child disruptive behavior. Correlations between other drug use (i.e., alcohol, marijuana, and nicotine) and measures of parenting stress and child behavior were not significant, so we did not include these variables as covariates. Exposure status was entered at the second step and the PSI-SF Total score at 4 months was entered at the third step to model the main effect of exposure and parenting stress on child behavior. The interaction between the PSI-SF Total score and cocaine exposure was entered at the fourth step of the model.

Results

Descriptive Statistics

Demographic characteristics among the 607 participants included in the study were compared between the exposed and non-exposed groups. As noted in Table 1, the exposed group included significantly older mothers, $t(605) = -8.51$, $p < .001$, lower SES, $t(605) = 2.18$, $p < .029$, and fewer biological mothers as the identified caregiver at 4 months, $\chi^2 = 40.77$, $p < .001$. In the non-exposed group, 384 (99%) caregivers were the child's biological mother, whereas 2 (1%) caregivers were the child's foster mother. In the exposed group, identified caregivers were: 196 (89%) biological mothers, 3 (1%) biological fathers, 6 (3%) foster/adoptive mothers, 10 (4%) grandmothers, 4 (2%) aunts, and 2 (1%) other (i.e., biological father's partner and non-relative legal guardian). Overall, racial composition of the sample was 79% African American, 16% Caucasian, 4% Hispanic, and 1% Other. Due to the discrepancy in percentage of biological mothers between groups, we repeated all analyses using only dyads with a biological mother as the caregiver. These results did not differ than the findings using the entire sample described below.

Pearson product-moment correlations were calculated between the measured variables, including the PSI-SF Total score, CBCL Externalizing scale, and IBQ Distress to Limitations subscale. As shown in Table 2, all three variables were significantly associated with each other before controlling for demographic variables and drug exposure.

Relationship between Early Parenting Stress and Later Child Behavior

Parenting stress at 4 months explained a significant amount of variance in child disruptive behavior (i.e., CBCL Externalizing scale) after controlling for maternal age, SES, child gender and race, prematurity, infant temperament, study site, and exposure status (see Table 3). Higher PSI-SF Total scores were associated with higher scores on the CBCL, suggesting that early parenting stress at 4 months predicts later child disruptive behavior at 36 months. Exposure to cocaine did not significantly predict later child behavior. IBQ Distress to Limitation scores,

however, explained a significant amount of variance in later CBCL scores, with higher IBQ scores being associated with higher scores on the CBCL. We conducted an additional regression to test for an interaction between IBQ and PSI-SF, but the interaction was not significant. The interaction between parenting stress and exposure status was not significant suggesting the relationship between early parenting stress and later child behavior was not influenced by cocaine exposure.

Given the overlap in some of the items on the PSI-SF Total scale and the CBCL Externalizing scale, we repeated the above regression model with each of the three subscales of the PSI-SF: Parental Distress, Parent-Child Dysfunctional Interaction, and Difficult Child. Both the Parental Distress and Difficult Child subscales significantly contributed to more variance in the model ($\Delta R^2 = .020$, $p < .001$ and ΔR^2 .019, $p < .001$, respectively). However, the Parent-Child Dysfunctional Interaction subscale did not contribute to significantly more variance in the model, $\Delta R^2 = .004$, $p = .102$.

Clinical Significance

To examine the clinical significance of the above findings, we first measured the frequency of children in the sample who scored above the clinical cutoff on the CBCL Externalizing Scale. Consistent with Achenbach's defined clinical cutpoint for research [23], children scoring a T-score of 60 or higher were considered to be in the clinical range whereas children scoring below a T-score of 60 were considered to be in the normal range. Forty percent of the children in the cocaine-exposed group were in the clinical range, and 41% of the children in the comparison group were in the clinical range. While the groups did not differ, the rate of clinically significant disruptive behavior across this entire sample of high-risk children is considerably higher than would be expected from the normative sample (i.e., 15%).

Discussion

The purpose of this study was to examine the predictive relationship between early parenting stress and later child disruptive behavior in a high-risk sample of children, including children with prenatal cocaine exposure. Results suggest that early parenting stress at 4 months significantly predicted child disruptive behavior at 36 months over and above several covariates, including maternal age, SES, child gender and race, prematurity status, and infant temperament. Both infant temperament and parenting stress had unique and independent effects on disruptive behavior suggesting that while early child characteristics are related to later child behavior, parenting stress may also maintain or perhaps exacerbate behavior. Follow-up analyses using other subscales of infant temperament led to similar findings. Parenting stress at 4 months accounted for an additional 2% of the variance in caregiver-reported child disruptive behavior above the several covariates.

These results are similar to previous research demonstrating the relationship between parenting stress and child behavior in a typically developing sample [8] and extend these findings to a sample of high-risk children. Maternal report of child behavior, however, was not different between children exposed to cocaine and matched controls. This finding was inconsistent with previous results of MLS [26], but the current study excluded children from unstable home placements that may have influenced the development of disruptive behavior. There was no difference in the relationship between parenting stress and child behavior among children prenatally exposed to cocaine and matched controls, suggesting that cocaine exposure does not influence the impact of early parenting stress on later child behavior in this sample. The lack of a significant difference between exposed and unexposed groups may be due to the high-risk nature of the sample. For example, rates of CBCL scores in the clinically significant range across the entire sample were considerably higher than would be expected in a normative sample. Similar to previous research [19], cocaine effects in this sample may not be visible in

the face of multiple and cumulative risk factors. Overall, the results illustrate the development of disruptive behavior in a high-risk sample of children and highlight the fact the prevention and early intervention efforts can build directly on work in other populations.

Caregivers of the children in the cocaine-exposed group did not report higher levels of parenting stress than caregivers of children in the control group. However, rates of clinically significant scores on the parental distress subscale across the entire sample were relatively high (i.e., 25% $\geq 85^{th}$ percentile). Despite the high rates overall, the lack of differences between groups were surprising and inconsistent with a previous study demonstrating significantly higher levels of parenting stress among substance-abusing mothers [10]. These conflicting findings may be due to potential differences between biological mothers and caregivers of children prenatally exposed to cocaine. The biological mothers who abused substances may experience unique stressors that are not evident in non-biological caregivers. However, the majority of caregivers in both groups were the biological mothers, and follow-up analyses suggested this factor did not affect our findings.

Additionally, mothers in the comparison sample in the current study had a history of other drug use (e.g., alcohol, marijuana, and nicotine) whereas mothers in the former study [10] had no known history of substance abuse. The use of other substances puts the comparison sample at further risk, and it would be difficult to find a unique effect of cocaine between two groups with multiple risk factors and overall high levels of parenting stress. Warner and colleagues [18] demonstrated similar findings with caregiver depression. Although depression predicted child disruptive behavior at 36 months, there was no significant difference in caregiver depression between cocaine-exposed and comparison groups. We conducted follow-up analyses in the current study and also found no differences in caregiver depression. In sum, the inconsistent findings in the literature highlight the need for future research examining differences in parenting stress among high-risk exposed and comparison samples.

For this study, we delineated specific criteria for the inclusion of participants drawn from the larger MLS sample. Caregivers changed frequently in this sample due to out-of-home placement and other related factors. This poses a methodological challenge to examining the specific effects of parenting stress of a single caregiver over time. Thus, we only included children who had the same caregiver at both 4 and 36 months without any evidence of change in caregiver status between those time points. Although this decreased our sample size from the full MLS sample, the resulting sample was large enough to allow for sufficient statistical power. One potential limitation, however, is that the selection of the analysis sample for this study could reduce the generalizability of our findings. Nonetheless, the consistent caregivers over time lend greater credence to the relationship between early parenting stress and later child behavior. Other strengths of the study include a large sample size, use of well-validated measures of parenting stress and child behavior, and inclusion of a control group matched on prematurity, race, and sex.

Despite the methodological strengths of the current study, there are some limitations that need to be addressed. First, children who were excluded from this study were more likely to be in the cocaine-exposed group. In addition, the primary caregivers excluded from the study had lower SES and higher rates of two specific domains of parenting stress (i.e., parental distress and parent-child dysfunctional interaction). These differences may explain the non-significant interaction effect between cocaine exposure and parenting stress because the most severe dyads may have been excluded. However, we re-ran the regression with the entire sample and found the same results in that early parenting stress predicts later child externalizing behavior but is not influenced by cocaine exposure.

Second, the use of caregiver report of child disruptive behavior is subject to rater bias and only represents one of many modes to assess child behavior. Direct observation of child behavior could provide more objective data, and teacher report could help confirm the presence of disruptive behavior in a preschool setting. A third limitation of the current study is the inability to control for all potential predictors of later child disruptive behavior. For example, genetics may play a significant role in the development of disruptive behavior disorders and was not measured in the current study. In addition, the current study does not include infant data prior to 4 months, which may also impact parenting stress and child behavior. Finally, the entire sample was primarily low income and African American limiting the generalizability of these findings to other populations.

In sum, this study demonstrates a predictive relationship between early parenting stress and later child behavior in high-risk children with and without drug exposure. These findings help describe the development of disruptive behavior over the first 3 years and highlight the impact of parental experience on child outcome. Parents who report greater stress have been found to be more authoritarian and negative in their interactions with their child [27], which increase the frequency of disruptive behaviors. Two large reviews of the past 40 years of the psychosocial treatment literature indicated parent-training interventions are the first line approach for the treatment of young children with disruptive behavior disorders [28,29], and a parent training intervention has been shown to lead to decreases in parenting stress in other at-risk child populations [30]. Given the current findings, parenting stress may be an important target of treatment that may impact on the transactional process and represents an important area of future research. Overall, the results highlight the need for early detection and intervention among parents with elevated levels of stress, regardless of history of substance abuse.

Summary

In the current study, the relationship between early parenting stress and later child behavior and the effect of drug exposure on this relationship was examined in a high risk sample. A subset of child-caregiver dyads (n = 607) were selected from the Maternal Lifestyle Study. Of the 607 dyads, 221 were prenatally exposed to cocaine and 386 were unexposed to cocaine. Selection for the current study was based on the presence of a stable caregiver at 4 and 36 months with no evidence of change in caregiver between those time points. Results indicated that parenting stress at 4 months significantly predicted child externalizing behavior at 36 months. These relations were unaffected by cocaine exposure suggesting the relationship between parenting stress and behavioral outcome exists for high-risk children regardless of drug exposure history. These results extend the findings of the relationship between parenting stress and child behavior to a sample of high-risk children and emphasize the importance of identifying and treating parenting stress.

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References

1. Keenan K, Wakschlag LS. Can a valid diagnosis of disruptive behavior disorder be made in preschool children? Am J Psychiatry 2002;159:351–358. [PubMed: 11869995]

2. Steiner H, Remsing L. Practice parameter for the assessment and treatment of children and adolescents with oppositional defiant disorder. J Am Acad Child Adolesc Psychiatry 2007;46:126–141. [PubMed: 17195736]

3. Qi CH, Kaiser AP. Behavior problems of preschool children from low-income families: A review of the literature. Top Early Child Spec Educ 2003;23:188–216.

4. Barry TD, Dunlap ST, Cotten SJ, Lochman JE, Wells KC. The influence of maternal stress and distress on disruptive behavior problems in boys. J Am Acad Child Adolesc Psychiatry 2005;44:265–273. [PubMed: 15725971]

5. Deater-Deckard K. Parenting stress and child adjustment: Some old hypotheses and new questions. Clin Psychol: Res & Prac 1998;5:314–332.

6. Conger RD, Patterson GR, Ge X. It takes two to replicate: a mediational model for the impact of parents' stress on adolescent adjustment. Child Dev 1995;66:80–97. [PubMed: 7497831]

7. Deater-Deckard K, Scarr S. Parenting stress among dual-earner mother and fathers: Are there gender differences? J Fam Psychol 1996;10:45–59.

8. Crnic KA, Gaze C, Hoffman C. Cumulative parenting stress across the preschool period: Relations to maternal parenting and child behavior at age 5. Infant Child Dev 2005;14:117–132.

9. Anthony LG, Anthony BJ, Glanville DN, Naiman DQ, Waanders C, Shaffer S. The relationship between parenting stress, parenting behavior, and preschoolers' social competence and behaviour problems in the classroom. Infant Child Dev 2005;14:133–154.

10. Kelley SJ. Stress and coping behaviors of substance-abusing mothers. J Soc Pediatr Nurs 1998;3:103–110. [PubMed: 9743924]

11. Kettinger LA, Nair P, Schuler ME. Exposure to environmental risk factors and parenting attitudes among substance-abusing women. Am J Drug Alcohol Abuse 2000;26(1):1–11. [PubMed: 10718159]

12. Nair P, Schuler ME, Black MM, Kettinger L, Harrington D. Cumulative environmental risk in substance abusing women: Early intervention, parenting stress, child abuse potential, and child development. Child Abus & Neg 2003;27:997–1017.

13. Hans SL, Bernstein VJ, Henson LG. The role of psychopathology in the parenting of drug-dependent women. Dev Psychopathol 1999;11:957–977. [PubMed: 10624734]

14. Sheinkopf SJ, Lester BM, LaGasse LL, et al. Interactions between maternal characteristics and neonatal behavior in the prediction of parenting stress and perception of infant temperament. J Pediatr Psychol 2006;31:27–40. [PubMed: 15827350]

15. Singer L, Arendt R, Farkas K, Minnes S, Huang J, Yamashita T. Relationship of prenatal cocaine exposure and maternal postpartum psychological distress to child developmental outcome. Dev Psychopathol 1997;9:473–489. [PubMed: 9327234]

16. Brown JV, Bakeman R, Coles CD, Platzman KA, Lynch ME. Prenatal cocaine exposure: A comparison of 2-year-old children in parental and nonparental care. Child Dev 2004;75:1282–1295. [PubMed: 15260878]

17. Accornero VH, Morrow CE, Bandstra ES, Johnson AL, Anthony JC. Behavioral outcome of preschoolers exposed prenatally to cocaine: role of maternal behavioral health. J Pediatr Psychol 2002;27:259–269. [PubMed: 11909933]

18. Warner TD, Behnke M, Hou W, Garvan CW, Wobie K, Eyler FD. Predicting caregiver-reported behavior problems in cocaine-exposed children at 3 years. J Dev Behav Pediatr 2006;27:83–92. [PubMed: 16682870]

19. Tronick EZ, Beeghly M. Prenatal cocaine exposure, child development, and the compromising effects of cumulative risk. Clin Perinatol 1999;26:151–171. [PubMed: 10214547]

20. Lester BM, ElSohly M, Wright LL, et al. The Maternal Lifestyle Study: drug use by meconium toxicology and maternal self-report. Pediatrics 2001;107:309–317. [PubMed: 11158464]

21. Bauer CR, Shankaran S, Bada HS, et al. The Maternal Lifestyle Study: drug exposure during pregnancy and short-term maternal outcomes. Am J Obstet Gynecol 2002;186:487–495. [PubMed: 11904612]

22. Lester BM, Tronick EZ, LaGasse L, et al. The maternal lifestyle study: effects of substance exposure during pregnancy on neurodevelopmental outcome in 1-month-old infants. Pediatrics 2002;110:1182–1192. [PubMed: 12456917]

23. Achenbach, TM. Manual for the Child Behavior Checklist/2-3. University of Vermont, Department of Psychiatry; Burlington, VT: 1992.
24. Abidin, RR. Parenting Stress Index. Pediatric Psychology Press; Charlottesville, VA: 1983.
25. Rothbart MK. Measurement of temperament in infancy. Child Dev 1981;52:569–578.
26. Bada HS, Das A, Bauer CR, et al. Impact of prenatal cocaine exposure on child behavior problems through school age. Pediatrics 2007;119:348–359.
27. Belsky J, Woodworth S, Crnic K. Trouble in the second year: three questions about family interaction. Child Dev 1996;67:556–578. [PubMed: 8625728]
28. Brestan EV, Eyberg SM. Effective psychosocial treatments of conduct-disordered children and adolescents: 29 years, 82 studies, and 5,272 kids. J Clin Child Psychol 1998;27:180–189. [PubMed: 9648035]
29. Eyberg SM, Nelson MM, Boggs SR. Evidence-based psychosocial treatments for children and adolescents with disruptive behavior. J Clin Child Adolesc Psychol 2008;37:1–23.
30. Bagner DM, Eyberg SM. Parent-child interaction therapy for disruptive behavior in children with mental retardation: a randomized controlled trial. J Clin Child Adolesc Psychol 2007;36:418–429. [PubMed: 17658985]
31. LaGasse LL, Seifer R, Lester BM. Interpreting research on prenatal substance exposure in the context of multiple confounding factors. Clin Perinatol 1999;26:39–54. [PubMed: 10214542]

Table 1

Demographic Characteristics of Exposed and Non-Exposed Groups

	Exposed (221)		Non-Exposed (386)		
	M (SD)	***N (%)***	***M (SD)***	***N (%)***	***P***
Birth weight (g)	2594 (805)		2662 (814)		.339
Mother age at birth	31.10 (5.02)		27.05 (5.99)		< .001
SES (continuous)	27.88 (10.28)		29.84 (10.90)		.029
PSI-SF (4 mo.)	70.54 (17.74)		69.08 (17.07)		.319
CBCL (36 mo.)	55.15 (9.87)		54.84 (10.38)		.721
Caregiver (bio mom)		196 (89)		384 (99)	< .001
Child sex (male)		116 (52)		203 (53)	.981
Child race (minority)		187 (85)		322 (83)	.844

Note. SES = Socioeconomic status; PSI-SF = Parenting Stress Index Short-Form; CBCL = Child Behavior Checklist.

[1]Socioeconomic status was measured by a revised version of the Hollingshead Index of Social Position,[31] which allows for the application of the SES measure to non-nuclear families. The scale retains the traditionally weighted educational and occupational scale scores.

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Table 2

Pearson Product-Moment Correlations between the Parenting Stress, Child Behavior, and Infant Temperament

Measure	1.	2.	3.
1. PSI-SF Total score	--		
2. CBCL Externalizing scale	.246*	--	
3. IBQ Distress to Limitations	.374*	.218*	--
Mean	71.67	55.89	2.51
SD	17.51	10.61	0.56

Note. PSI-SF = Parenting Stress Index – Short Form; CBCL = Child Behavior Checklist; IBQ = Infant Behavior Questionnaire.

* $p < .01$