

# Ongoing Maternal Drug Use, Parenting Attitudes, and a Home Intervention: Effects on Mother-Child Interaction at 18 Months

MAUREEN E. SCHULER, Ph.D.  
PRASANNA NAIR, M.D.  
MAUREEN M. BLACK, Ph.D.

*Department of Pediatrics, University of Maryland School of Medicine, Baltimore, Maryland*

**ABSTRACT.** This prospective study examined the effects of ongoing maternal drug use, parenting attitudes, and a home-based intervention on mother-child interaction among drug-using women and their children. At 2 weeks postpartum, mothers and infants were randomly assigned to either an Intervention (n = 67) or Control (n = 64) Group. Intervention families received weekly visits until 6 months postpartum and biweekly visits from 6 to 18 months by trained lay visitors. The home intervention was designed to increase maternal empowerment and promote child development. Control families received brief monthly tracking visits. Mother-child interaction was evaluated at 18 months through observation of play. Mothers who continued to use cocaine and/or heroin had lower competence scores ( $p < .05$ ); poor parenting attitude was also associated with lower competence scores during mother-child interaction ( $p < .05$ ). Although the intervention had no measured effect, ongoing maternal drug use and poor parenting attitudes were associated with less optimal maternal behavior during mother-child interaction. *J Dev Behav Pediatr* 23:87-94, 2002. Index terms: *drug-exposed infant, mother-child interaction, maternal drug use, parenting.*

The focus of much of the research on drug-using mothers and their infants has been on the short- and long-term effects of prenatal drug exposure. However, recent research<sup>1</sup> indicates that developmental and behavioral outcomes once thought to be specific to prenatal cocaine exposure are actually associated with other factors, such as the quality of the child's environment. Drug-exposed children raised in homes with ongoing parental drug use are more likely to display problems in cognitive development than drug-exposed children raised in drug-free environments.<sup>2,3</sup> Women who continue to use drugs after the infants are born are often unable to provide a stable, consistent, nurturing environment for their children.<sup>4-6</sup> Maternal drug use is associated with higher parenting stress<sup>7</sup> and poorer parenting attitudes,<sup>8,9</sup> and poor parenting attitudes such as a belief in harsh discipline were associated with less optimal maternal behavior during a parent-child observation session.<sup>10</sup> Factors such as ongoing maternal drug use and poor parenting attitudes may be associated with less optimal maternal and child behavior during mother-child interaction among substance-abusing mothers and their drug-exposed children.

Home-intervention programs have often been used with drug-using women and their children. Using community health nurses, one home-based program provided health education and a child-development curriculum over the first

12 months postpartum.<sup>11</sup> Although the number of home visits varied by family, the intervention led to better mother-infant interaction at 3 months postpartum. Another home-based program using community nurses provided a child-development curriculum and maternal support during biweekly home visits (mean number of visits = 12) over the first 18 months postpartum.<sup>12</sup> Infants in the Intervention Group had higher cognitive scores and a more stimulating and responsive home environment in comparison with Control infants. Previous research with the present population indicated that maternal behavior during mother-infant interaction at 6 months postpartum was associated with ongoing maternal drug use and Intervention Group status.<sup>13</sup> In the Intervention Group, drug use was not associated with maternal responsiveness. In the Control Group, mothers who continued to use drugs were less responsive to their babies than mothers who were drug free. Thus, a home intervention may lead to better maternal and child behavior during mother-child interaction.

The purpose of this research was to compare mother-child interaction among drug-using mothers who did and did not receive a home-based intervention. The present research differed from previous intervention research with drug-using mothers and their children because unlike previous research,<sup>11,12</sup> it included a Control Group and a home visitor to prevent attrition in the Control Group, and it extended the home intervention until the child was two years of age. We hypothesized that mothers and children in the Intervention Group would display significantly more positive behaviors during mother-child interaction than mothers and

Address for reprints: Maureen E. Schuler, Department of Pediatrics, University of Maryland School of Medicine, 655 W. Lombard Street, Suite 311, Baltimore, MD 21201; e-mail: mschuler@peds.umaryland.edu.

children in the Control Group. We also hypothesized that ongoing maternal drug use and poor parenting attitudes would be associated with worse maternal and child behaviors during mother-child interaction. Finally, previous research indicates that drug-using mothers benefited from an intervention despite ongoing maternal drug use. Therefore, we hypothesized that regardless of ongoing maternal drug use, mothers and children in the Intervention Group would display more positive behavior than mothers and children in the Control Group.

## METHODS

### Subjects

The recruitment methods have been described previously<sup>13</sup> but are summarized here for clarity. Participants are part of an ongoing longitudinal randomized clinical trial among drug-using women and their infants. They were recruited from a university hospital, which serves a largely inner-city, African-American population. Women were eligible for recruitment if they and/or their infants had a positive urine toxicology screen at birth or if there was a history of recent drug use noted in the medical charts. Infants who were not being discharged into the care of their mothers were not eligible. Infants who had serious developmental or congenital problems that required special services (e.g., spina bifida) were not eligible because the services received by the infants often included a home-visiting component, which would have interfered with the randomization in the present study.

Of the drug-using women who were approached about participating in the study, 28% declined to participate. The mothers who declined to participate did so for various reasons: 41% said they were not interested in participating, 17% denied drug use, 27% preferred to receive primary pediatric care at another site, and 15% declined for other reasons (the baby's father refused, they had a transportation problem, or the mother was in another research program).

### Procedures

Eligible mothers were approached in the hospital shortly after giving birth. Mothers who agreed to participate signed a consent form approved by the Institutional Review Board of the University of Maryland and completed a short demographic and tracking form administered verbally. The mothers were given an appointment for a 2-week baseline visit. At the end of the baseline visit, the mothers were randomly assigned to the Intervention or Control Group. Mothers and their children were seen for clinic evaluation visits at 6, 12, and 18 months postpartum. Research assistants who were unaware of the intervention status of the mothers and children conducted all evaluation visits in a hospital clinic. All mothers were given information on drug treatment programs; however, treatment was not mandatory to participate in the study. Mothers were paid for each clinic evaluation visit and given bus tokens to get home.

As part of the 18-month evaluation visit, the mothers completed measures assessing maternal drug use over the last 6 months and parenting attitudes, and they were

videotaped with their child for 10 minutes during play. Two age-appropriate toys, a toddler-size table and chairs, and several adult chairs were provided. Mothers were instructed to play with their child as they would at home. The camera was in the room but an operator was not present.

### Home Visiting

Mothers in the Intervention Group received weekly home visits during the first 6 months postpartum and biweekly home visits from 6 to 18 months postpartum from one of two full-time lay visitors. The visitors were two middle-aged, African-American women who had previous experience making home visits and knew the community where the mothers lived. The visitors shared the caseload of families but each visitor was assigned to specific families. The mean number of visits made during the first 18 months was 19.9 (SD = 13.0, range = 0–57) and the mean length was 28.5 minutes (SD = 4.6). The intervention visitors met with a psychologist and a pediatrician weekly to track the progress of the families and to discuss concerns about the families.

One African-American full-time lay visitor was recruited to visit the Control families. Mothers in the Control Group received brief monthly home-tracking visits to reduce attrition. The mean number of home visits made to the Control families during the first 18 months was 7.7 (SD = 4.2, range = 0–17), and the mean length was 18.5 minutes (SD = 5.5). There was no curriculum followed for the Control visits. To keep the Control visits as short and structured as possible we created a one-page contact form. The visitor was instructed to complete the contact form and then leave. The contact form contained the date of the visit and the time spent in the home. The questions on the form included the following: who had custody of the target child, who was living in the home, whether the mother or child were in any special programs, the date of the child's next doctor's appointment, and whether the mother was planning on moving soon. The visitor also rated the cleanliness of the home. The Control worker met with a psychologist and a pediatrician for bimonthly supervisory meetings. These meetings were separate from the meetings involving the intervention visitors.

### Home-Intervention Protocol

The home-intervention protocol has been described previously<sup>13</sup> but is summarized here for clarity. The home intervention was developmentally oriented and was based on the program used by the Infant Health and Development Program (IHDP).<sup>14</sup> The IHDP program had three components: home-based intervention starting in the first year, child attendance at a child-development center, and parent group meetings starting the second year postpartum. The focus in the present paper is on the home-visiting protocol and parent-child interaction at 18 months of age.

As specified in the IHDP program, the home intervention had both a parent and child component. However, because the IHDP program was not focused on drug-using parents, we added information about drug use and drug treatment to the content of the home intervention. The goal of the parent

component was to increase maternal empowerment by enhancing the mothers' ability to manage self-identified problems by using existing services and family and social supports. The topics covered during the maternal component included housing, public assistance programs (e.g., WIC-supplementary nutritional services to Women, Infants, and Children), partner abuse, and the effects of drug use and drug treatment. To establish consistency in the content of the home visit, we created a personal contact form. The contact form documented the time spent with the family and the content and quality of the contact. It also contained information about the four levels of contact used during the maternal home intervention: relationship building between the mother and home visitor, caretaker's personal problems/concerns, child development, and health education.

The goal of the child component was to promote child development using a program of games and activities. The home visitors were trained to use the HELP at Home: Hawaii Early Learning Program,<sup>15</sup> which is a comprehensive curriculum containing 650 developmental skills for children aged birth to 36 months. An activity sheet to use as a guide to help parents learn about child development accompanies each developmental skill. The home visitors modeled the behavior/activity on the sheet. By teaching mothers appropriate ways to play with their children, our goal was to enhance the communication between mothers and children and to help the mothers provide a developmentally stimulating play environment.

## Measures

**Drug Use.** All the mothers in the present study had a history of cocaine and/or heroin use. As part of the 2-week evaluation, a drug form was given to the mothers. The drug form was a modified version of the drug form from the Addiction Severity Index (ASI).<sup>16</sup> Research indicates that the ASI has good internal consistency and acceptable levels of validity.<sup>17</sup> The mothers were asked about their use of cigarettes, alcohol, heroin, cocaine, marijuana, tranquilizers, amphetamines, barbiturates, and methadone during the pregnancy. The drug form also assesses the age of first use, frequency of use, last time used, and route of administration (IV, snort). Less than 5% of the mothers reported ever using tranquilizers, amphetamines, barbiturates, and hallucinogens; therefore, these drugs were dropped from the analyses.

As part of the 18-month evaluation visit, using the same drug form, mothers were asked about their current use of cigarettes, alcohol, heroin, cocaine, marijuana, tranquilizers, amphetamines, barbiturates, and methadone. Because of the wide variability in days of drug use (range: 0–180 d), maternal drug use was dichotomized. Mothers who reported that they had continued using cocaine and/or heroin over the last 6 months were given a score of 1. Mothers reporting that they had not used heroin and/or cocaine over the last 6 months were given a score of 0. Marijuana, alcohol, and methadone use were coded the same way (0 = no use, 1 = use).

**Parenting Attitudes.** Parenting attitudes were assessed using the Child Abuse Potential Inventory (CAPI).<sup>18</sup> Research indicates that the CAPI has good internal consistency<sup>18</sup> and acceptable levels of content and construct

validity.<sup>18,19</sup> The CAPI is composed of six subscales: distress, rigidity, unhappiness, problems with child, problems with family, and problems from others. The distress subscale measures feelings such as frustration, sadness, loneliness, and worry. The rigidity subscale assesses a parent's attitude toward the behavior of their child and is composed of items that indicate the parent believes the child should be obedient, should never cause trouble or disobey, and should be quiet and attentive. The unhappiness subscale is composed of items such as rarely laughing, not being happy, and not having close friends. The problems with child subscale assesses maternal perceptions that the child is slow, has special problems, and is bad. The problems with family subscale assesses difficulties in the respondent's familial relationships. Finally, the problems from others subscale indicates difficulties in social relationships. High scores on these subscales indicate worse parenting attitudes and signify a high potential for abuse.

The CAPI subscales are highly correlated; therefore, they could not all be used in the present analyses. The rigidity subscale was chosen to represent parenting attitudes for two reasons. First, research with at-risk children<sup>20</sup> indicates that parents who are harsh, insensitive, and rigid during mother-child interaction have children with lower competence scores than children of "nurturing" parents. The items in the rigidity subscale are the closest to this behavior. Second, the rigidity subscale was the only CAPI score that was significantly correlated with maternal behavior in the present study.

**Mother-Child Interaction.** Maternal and child behavior was assessed using videotaped observations of mothers and children during play at 18 months. The mother-child interactions were scored using rating scales<sup>21,22</sup> that have been used previously with this population<sup>13</sup> and in another population of at-risk, inner-city, African-American families.<sup>23</sup> Research indicates that these rating scales have good reliability and adequate validity.<sup>24</sup> These scales are based on the quality of the parent-child interaction; thus they are not tied to specific age-related behaviors in the child (Philip Cowan, personal communication, 1999). For example, parental warmth is based on a range of behaviors that include the following: the parent shows affection, laughs, hugs, and touches child; there is a feeling of connection between parent and child; and the parent provides reassurance, encouragement, and a generosity of affect. Each item on the parent-rating scale and child-rating scale represented a global rating of the behavior during the 10-minute interaction. Items were scored on a 5-point scale ranging from very low (1) to excessive (5). For example, excessive parental warmth is defined as indiscriminate affection expressed regardless of context; affection seems inauthentic. Because both a 1 and a 5 were nonoptimal, all items scored 5 were recoded to 1's before the analyses so that high scores represented positive behavior.

In the present study, 19 maternal behaviors were coded: pleasure, displeasure, confidence, respect for the child's autonomy, limit setting, expressiveness, maturity demands, precision, structure, warmth, coldness, anger, responsiveness, interactiveness, creativity, activity level, happiness, sadness, and anxiety; and 22 child behaviors were coded: warmth, coldness, dependency, autonomy

assertion, compliance, defiance, anger, enthusiasm, anxiety, frustration, expressiveness, planfulness, persistence, curiosity, creativity, precision in language, activity level, interactiveness, attentiveness, happiness, sadness, and shyness. Because a number of maternal scales (displeasure, coldness, anger, anxiety, frustration, sadness, shyness) and child scales (coldness, dependency, defiance, anger, anxiety, frustration, sadness, shyness) assessed negative behaviors, these behaviors were recoded before the analyses so that high scores on all behaviors were positive. Cronbach's alpha was used to measure the internal consistency of the maternal and child behaviors. The alpha coefficients were .96 and .92, respectively.

Trained coders who were unaware of the purpose of the research or the intervention status of the families scored the videotapes. There were two independent groups of coders: One group coded maternal behavior; the other group coded child behavior. All coders were trained until they reached over 90% agreement on the scales and interrater agreement was maintained through weekly reliability checks. During the training and weekly checks, the group coding maternal behavior, along with the trainer, would simultaneously code an interaction. Interrater agreement was defined as no more than a 1-point difference among the coders for each behavior. The group coding child behavior was trained the same way. Interrater agreement was calculated for each tape by summing the total number of behaviors scored correctly divided by the total number of behaviors scored. Approximately 14% of the tapes were used for interrater agreement checks for parent behavior, and the average interrater agreement was .94 (range = .83 to 1.0). Approximately 10% of the tapes were used for interrater agreement checks for child behavior, and the average interrater agreement was .93 (range = .80 to .99).

### Statistics

Statistical analyses were performed using SPSS 9.0 for Windows. The analyses in the present paper are based on intention to treat rather than the amount of intervention received,<sup>25</sup> because this method provides a conservative estimate of the intervention effect. Thus, mothers who were randomized into the Intervention Group were retained in that group, even if they refused all intervention ( $n = 1$ ). Analysis of variance (ANOVA) and  $[\text{chi}]^2$  analysis were used to determine whether there were any differences between the Control and Intervention mothers or children.

Two principal components analyses were run to reduce the number of maternal and child interaction behaviors. Only those behaviors with factor loadings above .50 were retained. Nine maternal behaviors were selected to form an observed maternal competence factor: confidence, respect for child's autonomy, creativity, responsiveness, interactiveness, precision, limit setting, structure, and maturity demands (factor loadings ranged from .52 to .87). Thirteen child behaviors were selected to form an observed child responsiveness factor: enthusiasm, persistence, compliance, creativity, attentiveness, warmth, lack of coldness, lack of defiance, lack of anger, lack of anxiety, lack of frustration, happiness, and lack of sadness (factor loadings ranged from

.54 to .75). The eigenvalues for both factors exceeded 1. The correlation between maternal competence and child responsiveness was .25 ( $p < .01$ ), indicating modest overlap.

Two hierarchical multiple linear regression analyses were run to examine the association among intervention status (Control vs Intervention), ongoing maternal drug use, parenting attitudes, and mother or child behavior during play. Maternal age at entry was positively correlated with maternal competence, so it was used as a covariate. In previous research with the same population,<sup>13</sup> higher infant birth weight was associated with better maternal and child behavior during mother-child interaction at 6 months, so it was also used as a covariate.

### RESULTS

At 18 months postpartum, 174 (90 Control, 84 Intervention) families completed the evaluation visit. Originally, 258 mothers and their infants were enrolled for randomization to either the Control or Intervention Groups. Thirty-one dyads were lost before the 2-week baseline visit (Table 1), therefore 227 dyads were randomly assigned to either the Intervention ( $n = 114$ ) or Control ( $n = 113$ ) Groups. An additional 53 families were lost after the 2-week visit (Table 1). There was no significant difference in rate of attrition between the Control and Intervention Groups at 18 months. Of the 113 Control families originally randomized to the Control Group, 90 (79.6%) were seen at the 18-month visit. Of the 114 Intervention families randomly assigned to the Intervention Group, 84 (73.7%) were seen at the 18-month visit.

The present study included 131 families (64 Control, 67 Intervention). Observation data were dropped from 35 families because someone other than the mother had custody of the child at 18 months, and data from eight families were lost due to mechanical difficulties (the camera was out of focus or knocked off balance).

Mothers in the present study were significantly more likely to be married (7.6% vs 1.3%), receiving WIC-supplementary nutritional services to Women, Infants, and Children (65% vs 39%) and less likely to be involved with protective services at birth (12% vs 21%) than mothers or caregivers who were originally enrolled in the study but who are not included in the present study. There were no other

**Table 1. Reasons for Subject Loss Before and After 2-Wk Baseline Visit**

	Before 2-Wk Visit ( $n = 31$ )	After 2-Wk Visit ( $n = 53$ )
Infant died	1	3
Infant in foster care	9	24
Families not found	4	9
Family withdrew	2	1
Family noncompliant	15	0
Families moved out of state	0	4
Error in recruitment	0	3
Mother entered long-term residential drug treatment	0	1
Noncompliant with scheduled visit	0	8

**Table 2. Maternal and Infant Characteristics for Control and Intervention Groups**

	Control (n = 64)		Intervention (n = 67)		p value
	Mean	SD	Mean	SD	
<b>Maternal characteristics</b>					
Age at entry, yr	27.7	5.3	27.1	5.4	.17
Education, yr	11.0	1.8	11.0	1.5	.83
Age 1st pregnancy, yr	19.2	4.5	18.2	4.3	.53
<b>Days of drug use during last 6 mo of pregnancy</b>					
Cigarettes	141.6	72.8	140.6	73.3	.94
Alcohol	10.0	18.6	11.6	28.4	.71
Marijuana	6.2	18.8	11.7	36.4	.29
Cocaine	21.4	39.6	33.3	48.7	.13
Heroin	33.1	55.4	45.8	66.9	.25
Methadone	30.6	64.3	23.9	57.1	.54
	N	%	N	%	
Single	61	95	60	90	.32
Unemployed	62	97	67	100	.23
African-American	62	97	62	93	.44
	Mean	SD	Mean	SD	
<b>Infant characteristics</b>					
BW	2830.7	466.7	2755.1	412.5	.33
HC, cm	32.9	1.4	32.9	2.5	.97
Birth length, cm	48.4	3.2	47.7	2.9	.21
Gestational age, wk	38.9	2.1	38.3	2.3	.13
1-min Apgar	8.1	1.0	8.0	1.1	.43
5-min Apgar	9.0	0.3	8.9	0.5	.15
	N	%	N	%	
Gender, Male	34	53	29	43	.29
Preterm, <37 wk	7	11	13	19	.13

BW, birth weight; HC, head circumference; SD, standard deviation.

significant group differences between those dyads included in the present study and those dyads that were not.

**Maternal and Infant Characteristics**

Table 2 shows the maternal and child characteristics of both groups. The Control and Intervention mothers were similar in age at entry into the study, years of education, age

at first pregnancy, race, employment, marital status, and days of prenatal drug use (all  $p > .13$ ). The Control and Intervention children were similar in birth weight, birth length, head circumference, gestational age, Apgar scores, and gender (all  $p > .13$ ).

Correlation analyses revealed that there was no association between any drugs used during the pregnancy and

**Table 3. Group Differences on Predictor and Outcome Variables Measured at the 18-Month Visit**

	Control (n = 64)		Intervention (n = 67)		p value
	Mean	SD	Mean	SD	
<b>Mother-child interaction</b>					
Observed maternal competence <sup>a</sup>	2.7	0.4	2.8	0.4	.72
Observed child responsiveness <sup>a</sup>	3.1	0.3	3.1	0.3	.73
<b>Child Abuse Potential Inventory</b>					
Maternal rigidity <sup>b</sup>	31.3	18.4	34.7	19.1	.27
	N	%	N	%	
<b>Drug use during last 6 mo</b>					
Alcohol	37	58	39	58	1.0
Marijuana	20	31	17	25	.56
Methadone	10	16	11	16	.54
Cocaine and/or heroin	23	36	29	43	.24

SD, standard deviation.

<sup>a</sup>Higher scores optimal.

<sup>b</sup>Higher scores worse.

**Table 4. Hierarchical Regression Analysis for Variables Predicting Observed Maternal Competence**

Variable	B	SE B	Beta	p value
Step 1				
Infant birth weight	-.000	.000	-.087	.33
Maternal age at entry	.012	.006	.177	.04
Ongoing alcohol use	.016	.069	.022	.81
Ongoing marijuana use	.017	.074	.021	.82
Ongoing methadone use	.128	.088	.129	.15
Step 2				
Group	.025	.064	.034	.69
Step 3				
Rigidity score	-.004	.002	-.198	<.05
Step 4				
Ongoing cocaine/heroin use	-.136	.065	-.183	<.05
Step 5				
Group X ongoing cocaine/heroin use	-.149	.131	-.338	.26

Note: Total  $R^2 = 0.13$ ,  $F(9, 121) = 2.07$ ,  $p = .03$ .  $R^2 = .06$  for Step 1;  $R^2_{\text{change}} = .001$  for Step 2;  $R^2_{\text{change}} = .04$  for Step 3;  $R^2_{\text{change}} = .04$  for Step 4;  $R^2_{\text{change}} = .01$  for Step 5.

either maternal competence or child responsiveness during mother-child interaction. Because there were no significant correlations between prenatal drug use and outcome, and all the infants in the present study were drug-exposed, prenatal drug use was dropped from later analyses.

### Follow-Up at 18 Months

At 18 months, Control and Intervention families were similar in observed maternal competence, observed child responsiveness, and the Child Abuse Potential Inventory (CAPI) rigidity score (all  $p > .27$ , Table 3). The mothers in both groups were also similar in their report of ongoing cocaine and/or heroin, alcohol, marijuana, and methadone use at 18 months postpartum (all  $p > .24$ , Table 3). As Table 3 shows, 36% of the Control mothers and 43% of the Intervention mothers reported ongoing cocaine and/or heroin use at 18 months postpartum.

### Observed Maternal Competence, Ongoing Maternal Drug Use, and Parenting Attitudes

In the first hierarchical multiple linear regression, the dependent variable was observed maternal competence.

Maternal age at entry and infant birth weight were entered on the first step. To prevent ongoing alcohol, marijuana, and methadone use from being confounded with the effects of ongoing cocaine and/or heroin use, they were also entered on the first step. Group status (Control vs Intervention) was entered on the second step. The CAPI rigidity score was entered on the third step. Ongoing cocaine and/or heroin use was entered on the fourth step. Finally, the Group x Ongoing Cocaine and/or Heroin Use interaction was entered to examine whether the association between ongoing drug use and observed maternal competence differed for those in the Intervention and Control Groups. The overall equation was significant ( $p < .05$ ). There were two significant predictors of observed maternal competence: ongoing cocaine and/or heroin use and maternal rigidity (all  $p < .05$ , Table 4).

### Observed Child Responsiveness, Ongoing Maternal Drug Use, and Parenting Attitudes

In the second hierarchical multiple linear regression, the dependent variable was observed child responsiveness. Maternal age at entry and infant birth weight were entered

**Table 5. Hierarchical Regression Analysis for Variables Predicting Observed Child Responsiveness**

Variable	B	SE B	Beta	p value
Step 1				
Infant birth weight	.000	.000	.022	.81
Maternal age at entry	-.001	.005	-.024	.79
Ongoing alcohol use	.041	.052	.076	.43
Ongoing marijuana use	.024	.056	.040	.67
Ongoing methadone use	.008	.067	.011	.91
Step 2				
Group	.018	.049	.033	.71
Step 3				
Rigidity score	-.002	.001	-.035	.71
Step 4				
Ongoing cocaine/heroin use	-.034	.051	-.061	.51
Step 5				
Group X ongoing cocaine/heroin use	-.077	.103	-.236	.46

Note: Total  $R^2 = 0.019$ ,  $F(9, 121) = 0.26$ ,  $p = .98$ .  $R^2 = .01$  for Step 1;  $R^2_{\text{change}} = .001$  for Step 2;  $R^2_{\text{change}} = .001$  for Step 3;  $R^2_{\text{change}} = .004$  for Step 4;  $R^2_{\text{change}} = .005$  for Step 5.

on the first step. To prevent ongoing alcohol, marijuana, and methadone use from being confounded with the effects of ongoing cocaine and/or heroin use, they were also entered on the first step. Group status (Control vs Intervention) was entered on the second step. The CAPI rigidity score was entered on the third step. Ongoing cocaine and/or heroin use was entered on the fourth step. Finally, the Group x Ongoing Cocaine and/or Heroin Use interaction was entered to examine whether the association between ongoing drug use and observed child responsiveness differed for those in the Intervention and Control Groups. The overall equation was not significant ( $p > .05$ , Table 5).

## DISCUSSION

Despite a relatively intensive intervention, the intervention had no measured effect on mother-child interaction at 18 months postpartum. However, ongoing maternal cocaine and/or heroin use was a significant predictor of observed maternal competence during mother-child interaction at 18 months. Mothers who reported ongoing cocaine and/or heroin use had lower competence scores than mothers who reported no cocaine and/or heroin use. Other research indicates that ongoing parental drug use is associated with less optimal cognitive development among drug-exposed children.<sup>2,3</sup> Drug abuse is a chronic relapsing disease, yet very few researchers examine the effects of ongoing maternal drug use on maternal and child outcomes. It is important that researchers consider not only prenatal drug exposure but also ongoing parental drug use.

Poor parenting attitude as measured by the Child Abuse Potential Inventory (CAPI) rigidity subscale was a significant predictor of observed maternal competence. As rigidity scores went up, maternal competence went down. Other researchers also found that poor parenting attitudes as measured by the CAPI were associated with more negative parenting during a parent-child observation session.<sup>9</sup> Elevated CAPI scores may be associated with a higher potential for child abuse. What is important to note is over 60% of the substance-abusing mothers in the present study scored within the normal range on the CAPI. Future research needs to examine other factors such as depression, which may be associated with poor parenting attitudes among substance-abusing women.

Contrary to expectations, the home intervention had no overall effects on observed maternal competence or observed child responsiveness during mother-child interaction at 18 months. This contradicts previous research that indicates that an intervention with drug-using women leads to better mother-infant interaction.<sup>11</sup> However, there was no Control Group in the Hofkosh et al. study,<sup>11</sup> and the assessors were not blind to the mother's drug history. All the families in the present study continued to live in poverty, as indicated by the fact that over 90% of the families were receiving social services at 18 months. Poverty is associated with higher family stress, maternal depression, and inadequate social support.<sup>26</sup> Drug use among women is associated with depression, violence, and negative life events.<sup>27</sup> These multiple-risk factors associated with poverty and ongoing drug use may overwhelm the drug-using mother making it

difficult to attend to the intervention. Another possible explanation for the lack of an intervention effect is that those mothers in the Control Group also received some intervention. Although, we felt a home visitor for the Control Group was needed to prevent attrition, it is possible that some intervention occurred in these families, which may have attenuated the effects of the "intervention" among families in the Intervention Group.

Ongoing maternal drug use and poor parenting attitude were not significant predictors of observed child responsiveness during mother-child interaction. One possible explanation for this finding is that the mother was not the only caregiver for the child. Research indicates that in substance-abusing families, many different adults may be caring for the children.<sup>28</sup> Another possible explanation for this finding may be the temperament of the child. A child with an "easy" temperament is adaptable, positive, and presents few problems.<sup>29</sup> The effects of ongoing maternal drug use and poor parenting attitude on child behavior may have been buffered by the presence of another caregiver or a child with an easy temperament. Future research needs to examine not only child temperament but also the effects of informal and formal care provided by other family members and whether these other caregivers are drug users.

The data presented here must be interpreted with caution. First, participants included only those families in which the infant was discharged at birth into the mother's care. Drug-exposed infants who are discharged into the care of mothers who continue to use drugs may be at greater risk than drug-exposed infants who are placed with another caregiver. Second, mothers in the present study volunteered to participate; therefore, this group may not be representative of all drug-using mothers but may be representative of those who volunteer. Third, analyses in this study were based on the intention to treat model. Although many mothers accepted the home visits, some mothers were noncompliant with home visits. This variability in acceptance among drug-using mothers has been found before.<sup>12</sup> Future research needs to examine differences between mothers who accept the intervention and those who do not.

Another limitation in the present study is that ongoing maternal drug use was based on self-report. Maternal self-report is frequently used to assess ongoing drug use, although the accuracy of this method has been questioned.<sup>30</sup> Maternal self-report scales are low in cost, readily available, generally well standardized, and easily administered.<sup>31</sup> In the present study, more than one-third of the mothers admitted continued cocaine and/or heroin use. Although the validity of maternal self-report has been questioned,<sup>30</sup> the mothers in the present study may have felt more comfortable admitting ongoing drug use because of the continuity of the research team, and because all the mothers were admitted drug users.

Finally, there were some significant differences between families who remained in the present study and those who did not. Mothers in the present study were more likely to be married, although the percentage of married mothers overall was small (4%). The mothers in the present study were also more likely to be receiving WIC-supplementary nutritional services to Women, Infants, and Children and less likely to be involved with protective services than caregivers not in

the present study. This difference may be explained by the fact that families in which the mother no longer had care for the child, even if they were still involved in the study, were dropped from the analyses in the present paper. Alternate caregivers may have been ineligible for WIC because of income, and the placement of the child with an alternate caregiver is often done with protective service involvement.

In summary, ongoing maternal drug use and poor parenting attitude were associated with less optimal maternal behavior during mother-child interaction at 18 months. More longitudinal research is needed to determine how to decrease

maternal drug use and promote positive parenting among substance-abusing mothers. Future intervention research needs to address the chronic and relapsing nature of substance abuse and design intervention programs that include drug treatment.

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