Parenting and Early Development Among Children of Drug-Abusing Women: Effects of Home Intervention

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ABSTRACT. *Objective.* To evaluate the efficacy of home intervention with drug-abusing women on parenting behavior and attitudes, and on children's development.

Design. A randomized, clinical trial of 60 drug-abusing women recruited prenatally and randomized into an intervention (n = 31) or comparison (n = 29) group. There were no group differences in gestational age, 1-minute Apgar scores, duration of hospital stay, or neonatal abstinence score. Intervention infants were slightly heavier ($P = .098$) and had slightly lower 5-minute Apgar scores ($P = .089$). Most mothers were single, African-American, multiparous, and non-high school graduates from low income families. Approximately 40% of the women were human immunodeficiency virus (HIV)-positive, all admitted to either cocaine and/or heroin use, and 62% had a history of incarceration. Intervention and comparison group women did not differ on any background variables.

Interventions. All children received primary care in a multidisciplinary clinic. Biweekly home visits were provided by a nurse beginning before delivery and extending through 18 months of life. The intervention was designed to provide maternal support and to promote parenting, child development, the utilization of informal and formal resources, and advocacy.

Measurements. Behavioral measures included self-reported ongoing drug abuse, compliance with primary care appointments, and an observation of the child-centered quality of the home (HOME Scale). Parenting attitudes were measured by the Child Abuse Potential Inventory (CAPI) and the Parenting Stress Index. The CAPI was administered before initiating the intervention and the Parenting Stress Index was administered when the children were 3 months of age. Both scales were repeated when the children were 18 months of age. Developmental status was measured with the Bayley Scales of Infant Development administered at 6, 12, and 18 months.

Analyses. Repeated measures multivariate analyses of variance were used to examine changes in parenting attitudes and children's development. Analyses of covariance were used to examine compliance with primary care appointments and the quality of the home. Logistic regression was used to examine ongoing drug abuse. Birth weight and maternal education were used as covariates in all analyses. To control for social desirability, the faking-good index of the CAPI was included as a covariate in analyses involving self-report measures.

Main results. Women in the intervention group were marginally more likely to report being drug-free ($P = .059$) and were compliant with primary care appointments for their children ($P = .069$). Based on the HOME Scale, women in the intervention group were more emotionally responsive ($P = .033$) and provided marginally more opportunities for stimulation ($P = .065$). At 18 months parents reported more normative attitudes regarding parenting and more child-related stress than they had initially, but the differences were not related to intervention status. At 6 months infants in the intervention group obtained marginally higher cognitive scores ($P = .099$); at 12 and 18 months there were no differences.

Conclusions. The findings suggest a cautious optimism regarding the efficacy of early home intervention among drug-abusing women in promoting positive behaviors. Subsequent investigations of home intervention should include larger sample sizes and more intensive options. *Pediatrics* 1994;94:440–448; *drug exposure, parenting, intervention, home visiting, child development*

ABBREVIATIONS. HIV, human immunodeficiency virus; SPICE, Special Parent/Infant Care and Enrichment; CAPI, Child Abuse Potential Inventory; PSI, Parenting Stress Index; RMANOVA, repeated measures analyses of variance.

High rates of drug abuse by women of childbearing age and the vulnerability of children of drug-abusing women highlight the need to develop intervention strategies to promote adaptive parenting practices among drug-abusing women.[1–3] Early research on prenatal drug exposure described growth deficits and neurodevelopmental problems that were apparent in the neonatal period.[4,5] However, more recent studies that have observed children throughout their preschool years have found few, if any, physiologically-related differences between drug-exposed children and well-matched comparison groups, and have emphasized the need to examine environmental challenges associated with maternal drug abuse.[6,7] This project evaluated a home intervention program designed to promote parenting and child development among drug-abusing women and their infants.

The environment that accompanies drug abuse often interferes with effective parenting. Drug abuse often occurs in the midst of poverty and is usually associated with inadequate nutrition, limited prenatal care, maternal mental health problems, and family instability.[8–11] The lifestyle of drug abuse and

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Parts of this paper were presented at the annual meetings of the Ambulatory Pediatric Association in Washington, DC, May 1993.

Received for publication Jun 16, 1993; accepted Mar 3, 1994.

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acquisition affords little time or support for parenting. Not only do drug-abusing women experience elevated levels of violence and stress,[12,13] but in comparison with drug-free women, they are more likely to have their children removed by the public child protection agency for allegations of abuse and neglect[14] and are less effective at using support to buffer stress.[15] Moreover, drug treatment programs are often designed for male addicts, with little or no attention directed toward the needs of women, particularly pregnant women or those with young children.[3,16] Thus, drug-exposed infants are at "double jeopardy" for developmental problems, confronted by both biological vulnerability that may affect their early growth and development, and environmental challenges that may interfere with their opportunities for receiving developmentally appropriate and stimulating parenting.[7,17,18]

Early intervention programs are often guided by a philosophy of compensation and provide enrichment to infants and families confronted by biological and/or environmental challenges.[19–21] Although early intervention is thought to promote developmental skills,[22] there are few criteria available to guide intervention efforts, particularly among families of drug-abusing women.

A review of information on early intervention programs designed to promote parenting among women at risk for premature or low birth weight infants[23] yields recommendations that may be useful in developing intervention programs to promote parenting among drug-abusing women. First, the intervention should be based on a theory of behavior change so that information is gained about the effectiveness of the intervention and the underlying processes.[24] Second, the theory (and the intervention) should integrate environmental influences, such as family stress and support and access to external services[7,15] with personal influences, such as childrearing beliefs and practices.[25,26] Third, because drug abuse is an enduring problem that affects many aspects of daily life,[11,12] the intervention should be both frequent and longitudinal with the objective of establishing a therapeutic alliance between mothers and interventionists.[25,27] Fourth, drug-abusing women may benefit from a direct approach in which there are opportunities to model and practice parenting behavior, rather than a more indirect approach in which parenting is merely discussed.[28] Fifth, the interventionist should be professionally trained to assist the mother and infant with their physiological, emotional, and behavioral needs.[28] Because drug abuse is a chronic relapsing problem,[29] the interventionist must be sensitive to subtle emotional and behavioral changes in the mother that might be related to changing patterns of drug abuse. Thus, a home-visiting program based on an ecological model[30] that begins prenatally and extends over the first 18 months of life with a nurse as the interventionist may be an optimal program for drug-abusing women and their infants.

Home-based intervention has received increased attention in recent years.[31,32] However, evidence regarding the efficacy of home visiting programs in promoting children's health and development has been sparse.[28,31–33] This project was designed as a randomized, clinical trial to test the efficacy of a home-based intervention program in promoting positive behaviors and attitudes among drug-abusing women and development among their children. In addition, although the project was designed to provide the same number of visits to all families, we hypothesized that those families who received more visits would demonstrate better outcome.

METHODS

Sample

Women were recruited from the prenatal clinics of a large metropolitan, teaching hospital. Women were eligible for recruitment if they reported prenatal cocaine or heroin use on a questionnaire. Fewer than 10% of the women who were approached refused to sign the informed consent, which had been approved by the Institutional Review Board of the university.

Seventy women with self-reported drug abuse agreed to participate in the project. Sixty mothers and babies completed the initial assessment procedures. Nine women were noncompliant with initial procedures and one woman had a miscarriage.

The participants in this project were primarily single, African-American, low income, inner-city, multiparous, polydrug abusers who had not completed high school. All women had used heroin and/or cocaine, 40.5% of the women were positive for human immunodeficiency virus (HIV) infection, 62% had a history of incarceration, 18% had been victims of violence, and 16% had been raised in foster homes. There were no differences between the families randomized into the intervention group and those in the comparison group on maternal demographic characteristics, drug abuse, or HIV status; paternal age or education; or infant gender, 1-minute Apgar scores, presence of neonatal abstinence syndrome, or length of hospital stay (see Table 1). However, the children in the intervention group weighed marginally more at birth than the children in the comparison group and had marginally lower 5-minute Apgar scores.

Design

The project was designed as a randomized, clinical trial of home intervention with blinded assessments. All infants received their primary health care in a multidisciplinary clinic dedicated to the treatment of infants born to substance-abusing women and/or women who were HIV infected (SPICE—Special Parent/Infant Care and Enrichment). Each family was observed by a primary health care provider and a social worker, with specialty staff if needed. Clinical visits were scheduled at 1, 2, 4, 6, 8, 10, 12, 15, and 18 months of age and evaluation visits were scheduled at 3, 6, 12, and 18 months. Mothers received transportation and compensation for evaluation visits.

Immediately after recruitment and initial data collection, mothers were randomly assigned to either the intervention or comparison group. Families in the intervention group received hour-long home visits from a community health nurse beginning with two visits scheduled before birth and continuing with biweekly visits for the first 18 months of the child's life. Families in the comparison group received no home visits. Regardless of their group assignment, all families were evaluated at regularly scheduled intervals in the SPICE Clinic and all women were encouraged to enroll in drug treatment programs.

Program Description

Two part-time community health nurses were recruited to implement the home visiting component of the program with the shared caseload of 31 families. Candidates were selected based on their experience with children and families and with drug-abusing women, their commitment to the concerns of urban families, and their cultural sensitivity. The nurses met with a pediatrician and psychologist for weekly review and supervisory meetings to track the progress of the families and to develop alternate strategies when necessary. Because many of the families lived in dangerous neighborhoods, an armed, nonuniformed escort was provided to

TABLE 1. Demographic Background of Intervention and Comparison Families

	Intervention (N = 31) Mean ± SE	Comparison (N = 29) Mean ± SE	P*
Baby			
Birth weight, g	3047 ± 117	2792 ± 95	.098
Apgar (1 minute)	7.5 ± .4	8.1 ± .2	
Apgar (5 minutes)	8.7 ± .2	9.0 ± .1	.089
Dubowitz score	38.8 ± .5	38.3 ± .4	
Preterm	19%	31%	
Low birth weight	16%	28%	
Neonatal abstinence	32%	39%	
Hospital stay, d	5.8 ± 1.3	6.4 ± 1.6	
Gender (male)	45%	59%	
Ethnicity (African-American)	88%	90%	
Mother			
Parity	2.4 ± .3	2.2 ± .2	
Age, y	26.4 ± .9	27.9 ± .7	
Education, y	10.9 ± .4	11.0 ± .4	
Marital status (single)	100%	93%	
Human immunodeficiency virus (positive)	45%	35%	
Substance Use			
Heroin	80%	93%	
Cocaine	83%	85%	
Alcohol	52%	41%	
Cigarettes	97%	97%	
Social History			
Incarceration	55%	69%	
Violence	16%	21%	
Foster care	16%	17%	

* Unless otherwise noted, P values are >.10.

accompany the nurses at their discretion. Both nurses remained throughout the duration of the study and observed the same caseload of families.

The home visiting program was based on an ecological model[30] with four objectives: 1) forming a therapeutic alliance with the mother; 2) supporting the mother with attention to her personal, family, and environmental needs; 3) providing opportunities to model and promote healthy parent-child interaction and development; and 4) providing information about child care, child development, safety, community resources, and advocacy. The Carolina Preschool Curriculum[34] and the Hawaii Early Learning Program[35] were used as curriculum guides for the parent-child interaction and information phases of the intervention. Women were given handouts describing normal child development and activities to promote their child's development.

In addition to the formal child development curriculum, the home visiting nurses directed their attention to the issues raised by the women. Common concerns included maladaptive relationships with extended family members (including abuse), affordable housing, and financial problems. By providing support and serving as both a catalyst and a respondent, the nurses encouraged the women to become advocates for themselves and their children. After each contact, the nurses completed a personal contact record that documented the time spent with the family, the content and quality of the visit, and goals and objectives for subsequent visits.

The cost of the home visiting program was determined by calculating the salary for the nurses, plus the funds spent on training, supervision, educational materials, transportation, and the escort service, and then dividing by the number of families who were in the intervention group. The estimate is $1655 per year per child.

Procedure

After the prenatal recruitment and before randomization or intervention, the women completed the Child Abuse Potential Inventory (CAPI).[36] The *CAPI* includes a 77-item physical abuse scale that can be divided into six factor scores (distress, rigidity, unhappiness, problems with child and self, problems with family, and problems with others). Respondents indicate whether they agree or disagree with each statement. Psychometric properties of the scale indicate high internal consistency coefficients for the total abuse score (.92 to .98) with slightly lower, though still acceptable, coefficients for the six factor scores.[36] When only the African-American subjects were considered, the rates of internal consistency remained above 0.85. Acceptable levels of content and construct validity have been reported based on studies comparing the factors from the CAPI and constructs associated with child abuse.[36] The internal consistency of the total abuse scale, based on coefficient alpha calculated from the sample, was 0.84.

The CAPI also includes three validity scales (lie, random response, and inconsistency scales). Milner[36] recommends that if any of the three scales is elevated, the response distortion indices (faking-good, faking-bad, and random-response) should be calculated. All three indices were calculated on the sample. No respondents met criteria for the faking-bad or random-response index. During prenatal administration of the CAPI 19% of the intervention group mothers and 10% of the comparison group mothers met criteria for the faking-good index ($\chi^2 = 0.95$, $P = .329$). During the 18-month evaluation the percentages were 35% for the intervention group and 17% for the comparison group ($\chi^2 = 2.54$, $P = .110$). The faking-good index was used as a covariate for analyses involving self-report measures.

When the children were 3 months of age their mothers completed several subscales from the Parenting Stress Index (PSI).[37] The PSI represents areas of stress in the mother-child relationship. Three of the subscales in the child domain were included: mood (5 items), reinforces parent (6 items), and demandingness (9 items). Respondents use a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" with "not sure" at the midpoint. Low scores are optimal and high scores represent more stress. The stability of the PSI is high, as measured by internal consistency and test-retest reliability.[37] The concurrent, construct, discriminant, and predictive validity of the scale have been examined through studies reported by Abidin and others.[37] After examining the internal consistency of the child domain of the PSI among the sample, it was found that coefficient alpha was 0.85, indicating an acceptable level of stability.

When the children were 6, 12, and 18 months of age, the mothers and children participated in scheduled evaluation visits. The Bayley Scales of Infant Development[40] were administered by trained psychologists who were blinded to the intervention status of the families. The scales have been standardized on a national sample of children ranging in age from 2 to 30 months. The scales yield a Mental Developmental Index and a Psychomotor Developmental Index, both of which have a mean of 100 and a standard deviation of 16.

During the 18-month visit the CAPI and PSI were repeated. At approximately 30 months, a home visit was made to all families by

a research assistant who had no prior information regarding the families. The child-centered quality of the home environment was rated using the HOME Scales.[38] The HOME is an observation scale that has been widely used in child development research and has shown a strong relationship between home environment and subsequent intellectual development and academic achievement.[39] It consists of 45 items organized into six scales (emotional and verbal responsivity of the mother, avoiding restriction and punishment, organizing the physical and temporal environment, providing appropriate play materials, maternal involvement with the child, and opportunities for variety in daily stimulation) that describe the quality of the home environment.

Compliance with pediatric health care visits was evaluated by collecting information on the number of appointments scheduled and the percent of appointments kept over the 18-month study period. When appointments were missed, families were automatically rescheduled and when appointments were kept, a future appointment was made. Special attention was given to telephone and postcard notification regarding appointments.

Ongoing drug abuse was evaluated by asking women about their drug behavior during the 6-, 12-, and 18-month evaluations. Women were advised that we had a Certificate of Confidentiality and that all information was confidential. Women who repeatedly reported no drug abuse after delivery were included in the drug-free group; women who admitted to drug abuse since delivery were included in the drug abuse group. Women who were in a methadone program were placed in the treatment group.

Data Analysis

In keeping with the requirements of a randomized, clinical trial,[41] the analyses in this paper were based on the intention to provide intervention, rather than on the amount of intervention received. The number of contacts (visits and phone calls) ranged from 0 (two mothers refused all intervention) to 75, with a mean of 25 and a standard deviation of 19. The number of home visits ranged from 0 to 32, with a mean of 12 and a standard deviation of 9. The average length of the home visits was just under 1 hour.

For initial efficacy tests of applied research, Lipsey[42] has recommended that the alpha be set at .10, rather than the standard .05. Although this approach increases the possibility of a Type I error (erroneously reporting a difference), it decreases the likelihood of a Type II error (reporting no differences when differences exist).

Raw scores for the two assessment scales chosen to represent attitudes toward parenting (CAPI and PSI) were converted to Z-scores using the normative sample. Independent t tests were used to compare scores from the two groups of drug-abusing women with normative scores. Both scales were administered early in the intervention (CAPI before intervention and PSI at the 3-month evaluation) and repeated at the 18-month evaluation.

Maternal behavior was measured by three procedures: 1) home observation, 2) compliance with primary care, and 3) self-reported drug use. Analysis of covariance was used to assess scores on the HOME and compliance with primary care. Intervention status served as the independent variable and birth weight and maternal education were the covariates. Self-reported drug abuse was coded as either present (also included methadone treatment) (1) or absent (0). A hierarchial logistic regression was used in which birth weight, maternal education, and the faking-good index were entered as a block, followed by intervention status.

Multivariate repeated measures analyses of variance (RMANOVA) were used to examine changes in maternal attitude and children's development over time. The RMANOVA is a conservative analysis in which individual changes in performance are measured against initial performance.[43] Thus, the possibility of finding false positives is reduced. To examine changes in attitude, intervention status was the independent variable; birth weight, maternal education, and the faking-good index were the covariates, and scores from the CAPI and PSI were dependent variables. To examine changes in developmental status, intervention status was the independent variable, birth weight and maternal education were the covariates, and Bayley scores served as dependent variables. When multivariate tests were significant, univariate tests were done to determine the location of the effect.

To determine if there was a relationship between the number of visits received and outcome, the correlation between the number of home visits the family received and the change in parent or child variables under investigation was examined, after controlling for birth weight, maternal education, and the faking-good index (when the measure was based on self-report).

RESULTS

Attrition

At the conclusion of the 18-month study period, complete data were available on 43 of the original 60 families (72%). Two of the infants died (one of sudden infant death syndrome and one of acquired immunodeficiency virus), six mothers were incarcerated or abandoned their babies, four mothers transferred their infants' primary care to another clinic, and five were noncompliant. There were no differences between the families who completed the study and those who did not on intervention status, demographic variables, or CAPI administered prenatally (see Table 2).

Behavior Among Parents

Over the 18-month study period 24% of the women reported that they were drug-free, 57% admitted to ongoing drug abuse, and 18% reported that they had been involved in a methadone program (although one-third of the women also admitted to ongoing drug abuse). When drug-free women were compared with drug-abusing and methadone women, the overall logistic model was significant ($\chi^2(1) = 3.95$, $P = .047$). Women in the home intervention program were marginally more likely to report that they were drug-free than were women in the comparison group ($P = .059$) (see Table 3).

Although the overall percent of appointments kept was relatively low (57%), mothers in the intervention group were marginally more compliant with their children's primary care appointments during the 18-month study period than mothers in the comparison group (62 vs 51%) ($F = 3.47$, $P = .069$). Women were scheduled for approximately 20 appointments over the 18-month period because both kept and missed appointments were followed with rescheduled appointments.

When the overall HOME score was considered, children in the intervention group were marginally more likely to be living in a child-centered home than were children in the comparison group ($F = 3.78$, $P = .065$). The mothers in the intervention group had higher scores than mothers in the comparison group on two of the six subscales: a) emotional and verbal responsivity of the mother ($F = 4.98$, $P = .033$) and b) opportunities for variety in daily stimulation ($F = 3.66$, $P = .061$) (see Table 4).

Attitudes Among Parents

During their prenatal assessment, both groups of women obtained scores on the CAPI that were significantly above the norms, signifying an elevated potential for abuse (intervention $t = 6.87$, $P < .01$, comparison $t = 8.74$, $P < .01$) (see Table 5). At the readministration of the CAPI during the child's 18-month evaluation, women in the intervention group reported total abuse scores that did not differ significantly from the norms. In contrast, the women in the

TABLE 2. Comparison of Families Who Completed the Study and Those Lost to Follow-Up*

	Completed Study		Lost to Follow-Up	
	Intervention (N = 20) Mean ± SE	Comparison (N = 23) Mean ± SE	Intervention (N = 11) Mean ± SE	Comparison (N = 6) Mean ± SE
Baby				
Birth weight, g	3033 ± 162	2834 ± 117	3072 ± 153	2628 ± 96
Apgar (1 minute)	7.7 ± .4	8.1 ± .2	7.1 ± .8	7.8 ± .6
Apgar (5 minutes)	8.7 ± .2	9.0 ± .1	8.7 ± .1	9.0 ± .3
Dubowitz score	38.3 ± .8	38.5 ± .5	39.7 ± .5	37.7 ± .8
Preterm	25%	30%	9%	33%
Low birth weight	20%	22%	9%	50%
Neonatal abstinence	35%	36%	27%	50%
Hospital stay, d	8.2 ± 3.0	7.0 ± 2.0	6.4 ± 2.4	4.3 ± .7
Gender (male)	50%	61%	36%	50%
Ethnicity (African American)	75%	78%	91%	50%
Mother				
Parity	2.3 ± .4	2.1 ± .3	2.5 ± .4	2.5 ± .6
Age, y	27.0 ± 1.4	27.7 ± .8	25.4 ± 1.3	28.7 ± .9
Education, y	10.8 ± .5	10.9 ± .5	11.1 ± .6	11.0 ± .6
Marital status (single)	90%	100%	100%	100%
Human immunodeficiency virus (positive)	45%	35%	46%	33%
Substance Use				
Heroin	84%	91%	73%	100%
Cocaine	79%	86%	91%	80%
Alcohol	50%	52%	54%	0%
Cigarettes	95%	96%	100%	100%
Social History				
Incarceration	55%	65%	55%	83%
Violence	15%	17%	18%	33%
Foster care	15%	13%	18%	17%
Child Abuse Potential Inventory				
Total abuse score	.95 ± .31	1.31 ± .28	1.45 ± .39	2.05 ± .64

* All P values are >.10.

TABLE 3. Logistic Regression For Self-Reported Ongoing Drug Abuse*

Variable	Odds Ratio	P	Confidence Intervals
Birth weight	1.00		(1, 1)
Maternal education	1.11		(.80, 1.55)
Faking-good index	4.42		(.41, 48.42)
Intervention status	.23	.059	(.05, 1.07)

* Overall model, $X^2 = 3.95$, $P = .047$.

comparison group continued to report total abuse scores that were significantly elevated in reference to the norms ($t = 7.43$, $P < .01$). Women in the intervention group had significantly elevated scores in two of six subtests, whereas women in the comparison group had elevated scores in all six subtests.

However, when multivariate analyses were calculated using covariates, the two groups did not differ in their pattern of scores over the intervention period. For both groups the scores on the CAPI tended to become more normative over time (Wilk's lambda $F = 3.34$, $P = .075$).

When changes in PSI scores were evaluated with multivariate analyses, women reported less normative scores over time (Wilk's lambda $F = 3.31$, $P = .033$), but there was no difference in changes related to intervention group status (see Table 6). When independent t tests were used to compare PSI scores with normative data, at the 18-month evaluation both groups of women reported elevated levels of stress in comparison with normative standards.

TABLE 4. Unadjusted Means and Standard Error of Measurement (SEM) for HOME Scores

	Intervention		Comparison		P*
	M	(SEM)	M	(SEM)	
Total	35.1	(1.2)	31.4	(1.5)	.061
Emotional and verbal responsivity	9.2	(0.3)	7.7	(0.5)	.033
Avoiding restriction	5.9	(0.3)	5.1	(0.4)	
Organizing environment	5.5	(0.2)	5.3	(0.1)	
Providing play materials	7.3	(0.3)	6.7	(0.2)	
Maternal involvement	3.8	(0.4)	3.3	(0.4)	
Opportunities for variety in stimulation	3.9	(0.3)	2.8	(0.3)	.065

* Unless otherwise noted, P values are >.10.

Children's Developmental Status

The intervention by time interaction of the RMANOVA examining children's cognitive development over time was significant (Wilk's lambda $F = 3.67$, $P = .035$), indicating that the cognitive development of the children in the intervention and comparison groups did not follow the same progression over time (see Table 7). The children in the intervention group had marginally higher cognitive scores at 6 months ($F = 2.84$, $P = .099$). By 12 and 18 months, there were no differences in scores. When children's psychomotor development was examined, there

TABLE 5. Unadjusted Means and Standard Error of Measurement (SEM) for Child Abuse Potential Inventory Over 18 Months (Z scores)

	Prenatal				18 Months			
	Intervention		Comparison		Intervention		Comparison	
	M	(SEM)	M	(SEM)	M	(SEM)	M	(SEM)
Total Abuse Score*	1.1	(0.2)†	1.4	(0.2)†	0.3	(0.2)	1.2	(0.3)†
Distress	0.7	(0.2)†	1.1	(0.3)†	0.0	(0.2)	0.9	(0.3)†
Rigidity	1.4	(0.3)†	1.0	(0.2)†	1.1	(0.3)†	1.0	(0.2)†
Unhappiness	0.9	(0.3)†	1.5	(0.3)†	0.3	(0.2)	0.9	(0.3)†
Problem-child/self	0.2	(0.2)	0.0	(0.2)	0.2	(0.1)	0.8	(0.3)†
Problem-family	0.5	(0.3)†	1.5	(0.3)†	0.1	(0.2)	0.7	(0.3)†
Problem-others	0.7	(0.1)†	0.9	(0.1)†	0.5	(0.2)†	0.8	(0.2)†

* Low score optimal.
† Different from norm, $P < .05$.

TABLE 6. Unadjusted Means and Standard Error of Measurement (SEM) for Child Domain of Parenting Stress Index from 3 to 18 Months (Z scores)

	3 Months				18 Months			
	Intervention		Comparison		Intervention		Comparison	
	M	(SEM)	M	(SEM)	M	(SEM)	M	(SEM)
Mood*	0.1	(0.2)	0.1	(0.2)	0.1	(0.2)	0.3	(0.2)†
Reinforces parent*	1.0	(0.1)†	0.9	(0.1)†	1.0	(0.2)†	1.6	(0.2)†
Demandingness*	−0.3	(0.2)	−0.1	(0.2)	−0.4	(0.2)†	0.3	(0.2)
Total*	0.2	(0.1)	0.3	(0.1)†	0.3	(0.1)†	0.8	(0.1)†

* Low score optimal.
† Different from norm, $P < .05$.

TABLE 7. Unadjusted Means and Standard Error of Measurement (SEM) for Cognitive and Motor Scores Over 18 Months

	6 Months				12 Months				18 Months			
	Intervention		Comparison		Intervention		Comparison		Intervention		Comparison	
	M	(SEM)	M	(SEM)	M	(SEM)	M	(SEM)	M	(SEM)	M	(SEM)
Cognitive	103.3	(2.9)	93.4	(3.0)	106.9	(3.0)	98.9	(4.1)	94.9	(3.5)	96.7	(3.4)
Motor	106.5	(2.6)	97.0	(3.1)	105.1	(3.7)	101.1	(3.5)	100.7	(9.1)	100.0	(2.4)

was no difference between the two groups over time.

Number of Home Visits

The partial correlations between the number of home visits and outcome variable revealed significant relationships with drug-free status ($r = .53$, $P = .002$) and compliance with primary care ($r = .48$, $P = .016$), such that women who received more home visits were less likely to report ongoing drug abuse and were more compliant with primary care. In addition, women who received more home visits provided a marginally more stimulating home environment ($r = .28$, $P = .053$). The correlations between the number of home visits and scores on the CAPI, PSI, and children's developmental status were in the expected direction, but did not reach significance.

DISCUSSION

The present findings demonstrate cautious optimism regarding the efficacy of home intervention in promoting positive behavior among an extremely high-risk group of women (single, low income, African-American, polydrug abusers). The women in the intervention group reported marginally more responsible behavior in reducing their drug abuse, complying with primary care appointments, and providing a responsive and stimulating environment for their children. Moreover, women who received more visits were more likely to comply with their children's primary care and to be drug-free. Finally, children in the intervention group achieved marginally better cognitive development during infancy, although differences did not persist into toddlerhood.

Methodological Considerations

There are several potential biases in this project that should be considered when interpreting the findings. First, by recruiting women prenatally women who had not received prenatal care were not included and therefore the women with the greatest number of environmental stressors or personal problems and the most vulnerable infants may have been eliminated. Thus, the families who participated in the project may not be representative of all drug-abusing women and children. Second, although there were no identified differences between families who remained in the evaluation and those who did not, there may have been important differences in the women's motivation or ongoing drug behavior that influenced their parenting and their children's

development. Third, because all women received comprehensive services through a multidisciplinary clinic, the effects of the intervention may have been attenuated. Fourth, although many women welcomed the home visitors and were cooperative with the visits, there were also women who were resistant and noncompliant. Thus, differences associated with the number of home visits received may reflect maternal acceptance rather than program efficacy. This variability in acceptance is not uncommon in intervention research and subsequent analyses should examine differences between acceptors and nonacceptors.[44] Fifth, changes in ongoing drug abuse were based on self-report and were not verified through urinalysis. A sixth potential bias concerns the magnitude of the effect necessary to find significant differences given the limited sample size. Although the findings were consistent with theoretical expectations and previous empirical findings and the alpha was set at .10 as recommended in initial efficacy tests,[42] the possibility of Type II errors cannot be eliminated. Caution should be taken until the findings are replicated in a larger investigation or across multiple sites.

Another limitation involves using the Bayley Scales. Although they are regarded as an excellent assessment of the cognitive and motor skills of infants and toddlers,[45] they rely heavily on sensorimotor skills and are not as stable or predictable as intelligence scores administered to school age children.[46] Moreover, the Bayley Scales do not assess attention or self-regulation, factors that have been associated with deficits among school-age children of drug-abusing women.[7] Thus, predictions based on scores from the Bayley Scales should be made with caution.

Finally, the relationship between maternal drug abuse and intervention may depend on the pattern of the abuse. In the present sample, the women were primarily intravenous drug abusers with almost no reported crack abuse. Due to the limited sample size, we were not able to determine if the effects of the intervention varied as a function of the type and pattern of prenatal drug abuse.

On the positive side, this study was conducted following the guidelines of a randomized clinical trial.[41] The intervention and comparison groups were equivalent (with a marginal difference in birth weight and 5-minute Apgar scores) before the intervention, evaluators were blinded, and steps were taken to ensure that the families actually received the intervention. In keeping with the ecological theory guiding the intervention, the evaluation included indices of parenting behavior and attitudes and children's development, gathered through multimodal methods. Using covariates for the infants (birth weight) and mothers (maternal education), we attempted to ensure that differences between the intervention and comparison groups could be attributed to the intervention. In addition, when self-report measures were used as outcome, the possibility of relying on socially desirable responses was reduced by including a faking-good index as a covariate.

Behavior Among Parents

Formal drug treatment was not provided as part of the intervention; yet, the women in the intervention group were marginally more likely to alter their drug behavior. Although drug behavior was measured through self-report rather than urine analysis, it was gathered over multiple evaluation sessions in an environment of comprehensive care and trust. Moreover, the potential confound of giving socially desirable responses was controlled in the analyses. There may be several explanations for the relationship between intervention and ongoing drug abuse. The relatively strong association between the number of home visits and drug-free status suggests that women who were receptive to the family-focused home visitor may have benefitted from the intervention, thereby acquiring the skills to stop their drug abuse. On the other hand, women who were drug-free may have been more open to the home intervention. Regardless of the direction of effect, drug treatment programs for parents of young children may be more effective if they include parenting and skill-building activities in a supportive context.

Women in the intervention group were marginally more responsible in complying with their children's primary health care appointments over the 18-month study period. It is not clear whether they were more motivated to comply with clinic recommendations or whether their attendance was related to subtle pressure exerted by the home visitor. Yet even under optimal conditions (multidisciplinary specialty clinic with consistent providers trained to address medical, family, and psychosocial issues; free transportation; frequent reminders regarding appointments; repeated scheduling of missed appointments; compensation for evaluation visits; and ongoing contact with the visiting nurse), women attended only 62% of the scheduled pediatric appointments over 18 months of their child's life. Compliance is a serious concern in intervention research,[47] and these figures indicate that substantial efforts are necessary to maintain pediatric health seeking behavior among these women.

Women who received the intervention were more emotionally responsive and provided more opportunities for stimulation than comparison group women. These findings suggest that women who received the intervention were more aware of their child's emotional needs and more resourceful in providing stimulation, particularly because both areas were emphasized within the home visiting curriculum. A responsive, stimulating home environment should continue to contribute to healthy development among young children.[48,49]

Attitudes Among Parents

The children in this sample entered life at significant risk for child abuse, based on the elevated maternal scores on the CAPI. Although the scale was administered prenatally, most of the women had older children and therefore their responses probably reflected their parenting experiences, rather than their perceptions. The improvement in scores among project participants suggested that the women reduced their level of child abuse potential. Their ex-

posure to normative expectations toward children in the SPICE Clinic may have promoted a more positive attitude toward parenting and child rearing.

Both groups of women reported more stress associated with caring for their children at 18 months of age than they had at 3 months of age. These findings suggest that the women may have been threatened by the challenges of a demanding toddler. Thus, parenting stress may be dependent on the changing demands posed by developing children.

Children's Development

The marginally significant developmental difference found at 6 months suggests either that early home intervention may stimulate early cognitive development or that group assignment was not equivalent. However, the lack of differences at 12 and 18 months may mean that a more intensive intervention, such as a center-based program, is necessary to sustain developmental advantages beyond early infancy. In an evaluation of home and center-based intervention, Wasik and colleagues[50] also found that home intervention was not sufficient to change children's developmental status; whereas children who were enrolled in a full-day center-based program demonstrated developmental advantages as early as 12 months of age.

During the second year of life, acquiring language skills is a primary developmental task and language assumes an increasing role in administering tests and evaluating children's development. The association between early drug exposure and language delays[10] provides additional evidence for the need for a more intensive, language-based intervention.

Implications

Home visiting has been proposed as a promising strategy to promote healthy parenting among high-risk women.[31] Yet home visiting can be a difficult strategy to implement. Concerns regarding safety, cultural sensitivity, therapeutic goals, and quality control must be addressed. It was found that close supervision and support were necessary to enable the home visitors to help families cope with the multiple, unexpected issues that arose. Program compliance was a constant concern, and success was often dependent on the resourcefulness of the home visitors in tracking the location of the families and in maintaining a strong therapeutic relationship.

The findings from this group of extremely high-risk families offer some encouragement, particularly reducing drug abuse. However, caution is warranted. Drug abuse is a chronic, relapsing condition. Many women in this project were embedded in a drug culture in which they were few rewards for drug abstinence. Economic demands were often overwhelming and with their limited education and job skills, some women felt they had no option other than to return to illicit drug activities for their economic support.

Although home visiting may be a useful intervention in promoting positive parenting behavior, it should not be expected to satisfy all the needs of these vulnerable families and should be supplemented by other services.[51] The most effective intervention programs include home intervention, together with medical, educational, and family services.[52,53] Thus, the intervention may have been more effective if involvement in family support centers, center-based early intervention programs, high school equivalency programs, or job training had been included.

Because children's development is dependent on parent and family influences,[30] intervention programs that are focused exclusively on children's development are unlikely to lead to long-term success. In contrast, intervention programs that contribute to positive changes in the family and the child's primary social context, the home, are much more likely to continue to exert a positive influence on the child after the intervention has ended.

Thus, there may be a "window of opportunity" during pregnancy and infancy when home intervention facilitates parenting behavior and children's development. However, these findings need to be confirmed in subsequent studies to determine their generalizability. Future investigators may also extend these findings by examining other aspects of home intervention that have not been adequately evaluated, including the use of professional versus lay home visitors, the frequency and duration of the visits, and the introduction of more intensive intervention during toddlerhood. Finally, long term follow-up is necessary to determine if the positive changes demonstrated during the intervention period continue once the intervention has ended. Recent reports highlight that although there may be enduring effects of home intervention programs on parental care giving[54] and on children's academic performance,[55] additional information is necessary to identify how environmental factors facilitate and maintain positive behavioral change.[56]

ACKNOWLEDGMENT

Support for this research was provided by Grant 90-CA-1318 from the National Center on Child Abuse and Neglect.

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