

THE EFFECTIVENESS OF AN ATTACHMENT-BASED INTERVENTION IN PROMOTING FOSTER MOTHERS' SENSITIVITY TOWARD FOSTER INFANTS

JOHANNA BICK AND MARY DOZIER

University of Delaware

ABSTRACT: Infants in foster care need sensitive, responsive caregivers to promote their healthy outcomes. The current study examined the effectiveness of the Attachment and Biobehavioral Catch-up Intervention, a short-term, targeted, attachment-based intervention program designed to promote sensitive caregiving behavior among foster mothers. Ninety-six foster mother–infant dyads participated in this study; 44 dyads were assigned to the Attachment and Biobehavioral Catch-up Intervention, and 52 dyads were assigned to a control intervention. Results of hierarchical linear modeling indicated that foster mothers who were assigned to the Attachment and Biobehavioral Catch-up Intervention showed greater improvements in their sensitivity from pre- to postintervention assessment time points when compared with foster mothers who were assigned to the control intervention. We conclude that a short-term, targeted, attachment-based intervention is effective in changing foster mothers' responsiveness to their foster infants, which is critical for foster infants' healthy socioemotional adjustment.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at <http://wileyonlinelibrary.com/journal/imhj>.

* * *

Inspired by Mary Ainsworth's initial observations of mothers and infants, research over the past 3 decades has demonstrated that sensitive maternal care is important for healthy infant development (Ainsworth, Bell, & Stayton, 1974; Ainsworth, Blehar, Waters, & Wall, 1978; Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2008a; Smith & Pederson, 1988). A variety of intervention programs have been effective in increasing low- and high-risk biological mothers' sensitive behavior toward their infants (Anisfeld, Casper, Nozyce, & Cunningham, 1990; Bakermans-Kranenburg, Juffer, & van IJzendoorn, 1998; Barnard et al., 1988; Heinicke et al., 1999; Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2008; Moss et al., 2011; Schuler, Nair, Black, & Kettinger, 2000; Seifer, Clark, & Sameroff, 1991; van den Boom, 1988, 1994; van Doesum, Riksen-Walraven, Hosman, & Hoefnagesls, 2008). The current study examined whether a brief intervention, Attachment and Biobehavioral Catch-up, could enhance sensitivity among foster mothers caring for foster infants. Intervention effectiveness was assessed within the context of a randomized clinical trial, in which foster mothers and infants were randomly assigned to the Attachment and Biobehavioral Catch-up (experimental) intervention or the Developmental Education for Families (control) intervention (Dozier & the Infant-Caregiver Laboratory, 2002).

Parental sensitivity has been defined as a parent's ability to accurately perceive his or her child's signals and promptly and effectively respond to these signals (Ainsworth et al., 1978). According to attachment theory, parental sensitivity is integral to the development of children's attachment security. Children who have sensitive parents generally develop trusting, secure attachments (van IJzendoorn, 1995). Secure infants typically turn to their parents for protection and comfort when they are distressed and use their parents as a secure base from which to explore the world (Ainsworth et al., 1978). When parents consistently reject or ignore children's bids for reassurance, children often develop avoidant attachments (Ainsworth et al., 1978). Even when distressed, avoidant infants appear as if they do not need their parents, and turn away from their parents when in need. Children whose parents are inconsistently responsive to their needs often develop resistant attachments (Ainsworth et al., 1978). Infants with resistant attachments tend to alternate between clinging to their parents and angrily pushing their parents away at times of need (De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987). When parents display behavior that is frightening, infants often develop disorganized attachments. Infants with disorganized attachments show a breakdown in their attachment behavior when in the presence of their caregivers (V. Carlson, Cicchetti, Barnett, & Braunwald, 1989; Main & Solomon, 1990).

In a recent meta-analysis, Bakermans-Kranenburg et al. (2008a) demonstrated that changes in maternal sensitivity (brought on by mothers' participation in a randomized intervention

Direct correspondence to: Mary Dozier, Department of Psychology, 114 Wolf Hall, University of Delaware, Newark, DE 19716; e-mail: mdozier@udel.edu.

INFANT MENTAL HEALTH JOURNAL, Vol. 34(2), 95–103 (2013)

© 2013 Michigan Association for Infant Mental Health

View this article online at wileyonlinelibrary.com.

DOI: 10.1002/imhj.21373

targeting maternal sensitivity) are significantly linked with changes in their children's attachment classifications ($d = .39$). In fact, intervention programs with the highest effect sizes for enhancing maternal sensitivity ($d > .40$) were found to be the most effective in promoting attachment security at postintervention assessments (Bakermans-Kranenberg et al., 2008a). Therefore, targeting maternal sensitivity through early intervention programs appears to be important for promoting infants' healthy socioemotional development (Bakermans-Kranenberg et al., 2008a).

THE ATTACHMENT AND BIOBEHAVIORAL CATCH-UP INTERVENTION

Past research has indicated that foster infants who do not receive sensitive care are at elevated risk for developing disorganized attachment classifications (Dozier, Stovall, Albus, & Bates, 2001), biobehavioral dysregulation (Dozier, Manni et al., 2006), and behavioral problems (Pears & Fisher, 2005). Although several intervention programs have been demonstrated as effective in promoting positive outcomes among preschool and school-age foster children (Fisher, Stoolmiller, Gunnar, & Burraston, 2007; Nilsen, 2007; Price, Chamberlain, Landsverk, & Reid, 2009), there is a dearth of interventions that specifically target the unique needs of foster infants. Therefore, the Attachment and Biobehavioral Catch-up Intervention was designed to target the specific needs of foster infants by enhancing foster mothers' sensitivity. The intervention program is based on three key issues that have been identified as important for this at-risk group of children.

Issue 1: Foster Infants Fail To Elicit Nurturance

Previous research has established that foster infants often push away caregivers at times of need rather than turning to them for support (Stovall & Dozier, 2000; Stovall-McClough & Dozier, 2004). This is especially problematic because foster parents often respond "in kind" to foster infants' alienating behaviors (Stovall & Dozier, 2000; Stovall-McClough & Dozier, 2004). Because foster infants "look fine" even when they are distressed, foster parents tend to respond to this alienating behavior in a complementary fashion and fail to provide nurturing care when infants need it most (Stovall-McClough & Dozier, 2004). When foster infants become fussy or push away foster parents when distressed, foster parents often become frustrated themselves and respond angrily to this behavior (Stovall-McClough & Dozier, 2004). To target this issue, the Attachment and Biobehavioral Catch-up Intervention helps foster parents reinterpret foster infants' signals and provide nurturing care even when foster infants do not elicit it.

Issue 2: Behavioral and Neuroendocrinological Dysregulation among Foster Infants

Foster infants are often at high risk for biological, behavioral, and emotional dysregulation (Dozier, Manni et al., 2006; Dozier, Peloso et al., 2006; Fisher, Gunnar, Chamberlain, & Reid, 2000).

The Attachment and Biobehavioral Catch-up Intervention systematically targets this dysregulation by helping foster parents "follow their infants' lead" during routine parent-child interactions. Based on past research, foster parents are taught the importance of behaving in synchronous ways with children during play (Barnard & Morisset, 1995; van den Boom, 1994) and responding effectively to their foster infants' signals and cues (Ainsworth et al., 1974; van den Boom, 1994). In contrast to the first intervention target in which foster parents are instructed to "take the lead" by providing nurturance even when foster infants reject it, this second target helps foster mothers follow their infants' lead by responding synchronously to their infants cues when appropriate.

Issue 3: Attachment Disorganization among Foster Infants

Infants in foster care are at high risk for developing disorganized attachment classifications (Dozier et al., 2001). This is especially concerning given that disorganized attachment classifications are associated with psychological and behavioral adjustment issues in the long term (E.A. Carlson, 1998; Lyons-Ruth, Easterbrooks, & Cibelli, 1997). Overwhelming and frightening parental behavior has been identified as a predictor of disorganized attachment (Schuengel, Bakermans-Kranenburg, & van IJzendoorn, 1999). Therefore, the third intervention component specifically targets foster mothers' tendencies to display frightening behaviors toward foster infants during parent-infant interactions.

OVERVIEW OF ATTACHMENT AND BIOBEHAVIORAL CATCH-UP SESSIONS

The Attachment and Biobehavioral Catch-up program consists of ten 1-hr sessions that are conducted in the foster mothers' home. The intervention sessions are delivered in a manualized format that specifically tailors sessions to meet the needs of each foster mother. During each session, parent trainers deliver the session content while also attending to the ongoing interactions between the foster mothers and infants. Parent trainers work diligently to encourage foster mothers' sensitivity by praising even the subtlest instances that arise during parent-infant interactions. During sessions, foster mothers' attention also is gently directed to foster infants' signals that go unnoticed.

Session 1 and 2: The Importance of Sensitive Responsiveness, Even When the Child Does Not Elicit It

During Sessions 1 and 2, parent trainers present the importance of nurturance and sensitivity for foster infants' healthy development. Foster infants' alienating behaviors are placed within the context of the previous adverse experiences and separation(s) from birth parents that infants face prior to entering foster care. Parent trainers discuss the importance of responding therapeutically to foster infants' needs and behaviors by providing sensitive care even when

foster infants do not elicit it. During both Sessions 1 and 2, parent trainers and foster parents discuss instances in which their infant may have needed them over the previous week. The last portion of the session is dedicated to “video-feedback” on mother–infant interactions over the previous session. During the feedback portion of the session, parent trainers highlight instances in which foster mothers either successfully responded to their foster infant’s need or may have had difficulty doing so due to the foster infant’s alienating behavior.

Session 3 and 4: Following the Foster Infant’s Lead with Delight

During Sessions 3 and 4, parent trainers introduce the concept of “following the foster infant’s lead.” During Session 3, parent trainers stress the importance of paying attention to foster infants’ signals during a play interaction. Parent trainers support the foster parents in responding sensitively to their foster infant’s cues when reading books and playing together with blocks. During Session 4, parent trainers help the foster parents create an environment in which their foster infant develops a sense of mastery and control. Foster parents are encouraged to “follow their child’s lead” during parent–infant interactions. For younger children, foster parents are encouraged to allow their child to take the lead in a feeding activity. For older foster children (ages ≥ 20 months), foster parents are helped to follow the child’s lead in making a snack. During this interaction, foster mothers support the child’s efforts and encourage the child to take the lead in the activity. Similar to previous sessions, parent trainers provide “in the moment” feedback during the actual parent–child interactions and when reviewing the video clips of the past session.

Session 5 and 6: Monitoring Frightening Behavior

During Session 5, parent trainers discuss the importance of behaving in nonthreatening or frightening ways with foster infants. Parent trainers first review videos of unknown parents’ frightening parental behavior and discuss the negative consequences of such behavior for foster infant development. Foster parents are guided through a parent–infant “puppet interaction” with their own foster infant. Foster parents are helped to notice their own infant’s subtle signs of being frightened, overwhelmed, or overstimulated and are coached to respond sensitively to these cues. During Session 6, foster parents discuss how most adults have experiences in which they remember being frightened by a caregiver or close adult when they were young. In reflecting on their own experiences as children, foster parents are helped to take their foster infant’s perspective. This conversation sets the stage for the more personal topics that will be introduced in sessions that follow.

Sessions 7 and 8: Recognizing Own Issues That Affect Caregiving

Sessions 7 and 8 focus on foster mothers’ own experiences of being parented, and how those experiences may affect their parenting toward their foster infant. During these sessions, parent trainers

help foster mothers think through their experiences with their own caregivers, and reflect on how these experiences may shape their reactions to their foster infant’s bids for nurturance and sensitive care. For example, foster parents may recall growing up in an environment in which nurturance or sensitivity to distress was discouraged, making them more prone to ignoring or downplaying instances of their own foster infant’s distress. Other foster mothers may disclose having a parent who was frightening at times of limit setting or discipline, and they may recognize their tendencies to display similar behavior toward their own foster infant.

During these sessions, foster mothers are helped to become aware of how these experiences may influence their own parenting of their foster infants. Parent trainers frame these influences as “voices from the past” that may prevent foster mothers from responding sensitively at certain times. Parent trainers stress that recognizing these “voices” is a strength that will allow foster parents to “override” their automatic reactions to respond insensitively and instead respond in a more sensitive manner. Moreover, being able to recognize one’s own “voices from the past” is framed as the key to becoming a sensitive, nurturing parent.

Sessions 9 and 10: The Importance of Touch and Emotion Expression and Consolidation of Gains

During Session 9, parent trainers discuss the benefits of engaging in close physical contact with their foster infants. After reviewing research related to the importance of touch and cuddling for promoting infants’ biobehavioral regulation, well-documented among groups of infants born in high-risk environments (Field, Grizzle, Scafidi, Abrams, & Richardson, 1996), foster parents participate in a close physical interaction with their infant. During Session 10, parent trainers and foster parents discuss the importance of helping their child understand and express a range of emotions for future development. Foster parents are encouraged to label their foster infant’s emotions and encourage the expression of both positive and negative emotions (Izard, Fine, Mostow, Trentacosta, & Campbell, 2002).

In addition to these topics, the primary focus of these last sessions is to consolidate the skills foster parents have developed over the 10 sessions. To conclude the last session and program, foster parents review the three primary intervention targets covered throughout the intervention program. Parent trainers highlight the foster parent’s progress over the 10 sessions and celebrate their efforts to respond more sensitively to the foster infant in their care.

EFFECTIVENESS OF THE ATTACHMENT AND BIOBEHAVIORAL CATCH-UP PROGRAM

The Attachment and Biobehavioral Catch-up program has been implemented in several populations of high-risk mothers and infants. Effectiveness of the intervention has been demonstrated in a randomized clinical trial of substance-abusing birth mothers whose infants were identified as being at risk for neglect (Bernard et al.,

2012). Results from this randomized clinical trial revealed that at postintervention assessments, children assigned to the Attachment and Biobehavioral Catch-up Intervention were classified as securely attached to their mothers more often than were children who received the control intervention (Bernard et al., 2012). There also is evidence that foster infants assigned to the Attachment and Biobehavioral Catch-up Intervention showed improved neuroendocrinological stress regulation, fewer behavioral problems, and less avoidance of their foster mothers, when compared with foster mothers and infants who received the control intervention (Dozier et al., 2009; Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008; Dozier, Peloso et al., 2006). However, whether the Attachment and Biobehavioral Catch-up program also is effective in improving foster mothers' sensitive responsiveness to foster infants has not yet been examined.

CURRENT STUDY

The current study examined the effectiveness of the Attachment and Biobehavioral Catch-up Intervention in promoting sensitive behavior among foster mothers. Its design was influenced by past research indicating that short-term, targeted interventions that incorporate video-feedback techniques are the most effective in enhancing maternal sensitivity (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

Ninety-six foster mothers, who were randomized into the Attachment and Biobehavioral Catch-up Intervention (the experimental intervention) or the Developmental Education for Families Intervention (the control intervention), were examined in this study. We hypothesized that foster mothers in the Attachment and Biobehavioral Catch-up Intervention would show greater improvements in their maternal sensitivity from pre- to postintervention assessments when compared with foster mothers in the control intervention group.

METHOD

Participants

The sample consisted of 96 foster parent–infant dyads. Foster mothers and infants were included in this study if they completed the 10-session intervention, the pre-intervention assessment of maternal sensitivity, and at least one postintervention assessment of maternal sensitivity. All foster parents were female. Foster parents were selected for this study if they were caring for foster children who were 22 months of age or younger. Foster mothers ranged in age from 24 to 74 ($M = 45$, $SD = 10.7$) years. Racial composition of the population of foster mothers included 43% African American, 46% White non-Hispanic, 7% Hispanic, and 4% biracial. Family income ranged from less than \$10,000 to greater than \$100,000 ($Mdn = \$50,000$). In terms of marital status, 68% of the foster mothers were married, 21% were single, 7% were divorced, and 4% were widowed. With regard to educational status, 19% of the foster mothers had not completed high school, 41% had completed

high school, 24% had completed an associate's or trade degree, 12% had completed college, and 4% had completed postcollege graduate education (for additional sample details, see Dozier et al., 2008).

Infants ranged from 1 month to 22 months of age at the start of the intervention ($M = 9.9$, $SD = 6.05$). About half (48%) of the foster infants were girls ($n = 46$). Racial composition of the population of foster infants in this study included 59% African American, 28% White non-Hispanic, 6% Hispanic, 1% Asian American, and 6% biracial.

Study Design

Foster mothers and infants were randomly assigned to the Attachment and Biobehavioral Catch-up Intervention or the Developmental Education for Families Intervention, resulting in 44 foster mothers who received the experimental intervention and 52 foster mothers who received the control intervention. Foster parents were visited weekly in their homes for 10 sessions for both intervention programs. All sessions were video-recorded. Both the foster parent and infant were present during each session. Parent trainers who had extensive experience working with parents and infants delivered intervention sessions for both programs.

All 96 foster mother–infant dyads received a pre-intervention home visit, the 10-session experimental or control intervention, and multiple postintervention visits. The pre-intervention session took place 1 week prior to the onset of the intervention program. All children were assessed 30 days after the completion of the intervention program. Children also were assessed when they reached 12 or 24 months of age so that children's development could be compared to that of a normative group of children at equivalent stages in development. Children who were 9.5 months old or younger when they completed the 10 intervention sessions were eligible to receive a 30-day postintervention assessment and a postintervention assessment when they reached 12 months and 24 months of age. This occurred in 54 cases. Children who were older than 9.5 months when they completed 10 intervention sessions were eligible to complete only the 30-day postintervention assessment and a postintervention assessment when they were 24 months of age, as they were too old for the postintervention session that occurred when children were 12 months of age. This occurred in 42 cases.

Intervention sessions for both programs occurred once a week for 10 weeks. Sessions in both programs lasted about 1 hr. Maternal sensitivity was assessed at the pre-intervention visit and the 30-day postintervention assessment, the postintervention assessment that took place when children were 12 months of age, and the postintervention assessment that took place when children were 24 months of age for both the experimental and control interventions. Parent trainers' fidelity to the treatment program was examined on a weekly basis during a group supervision meeting. Clinical supervisors viewed video recordings of previous intervention sessions and monitored parent trainers' adherence to intervention manual.

The Attachment and Biobehavioral Catch-up Intervention. Foster caregivers in the Attachment and Biobehavioral Catch-up Intervention program participated in 10 sessions designed to target three critical needs faced by infants in foster care. First, foster caregivers learned to re-interpret their infants' signals when foster infants displayed alienating behaviors when distressed (Stovall & Dozier, 2000; Stovall-McClough & Dozier, 2004). In particular, caregivers were helped to understand that the infants in their care needed nurturance, even if it was not apparent. Second, foster caregivers were helped to behave in synchronous ways with their foster infants (Dozier et al., 2001). Third, caregivers were helped to avoid behaving in intrusive or overwhelming ways (Barnard, 1999; van den Boom, 1994). During the intervention sessions, parent trainers provided "in the moment" and video-based feedback on the quality of the foster mothers' sensitive behavior.

Developmental Education for Families Intervention. The Developmental Education for Families Intervention is a 10-session intervention program designed to enhance the cognitive and linguistic development of infants. Components of this intervention are based on Ramey, McGinness, Cross, Collier, and Barrie-Blackley's (1982) and Ramey, Yeates, and Short's (1984) early intervention for infants in a daycare setting. During the sessions, foster parents received psychoeducational training regarding infant development. Foster parents participated in developmentally appropriate activities focused on supporting their infant's cognitive and linguistic development. Foster parents also received "in the moment" and video-based feedback on their abilities to promote the cognitive and linguistic development of their foster infants.

Maternal Sensitivity

Maternal sensitivity in the current study was operationally defined to be consistent with Ainsworth et al.'s (1974) definition of maternal sensitivity. Specifically, maternal sensitivity was assessed as a caregiver's skillfulness in "perceiving [her] infant's signal, interpreting the signal correctly, selecting an appropriate response, and implementing the response effectively" (van den Boom, 1994, p. 1467). In the current study, foster mothers' sensitivity was assessed during a 10-min play interaction. Assessments of foster mothers' sensitivity took place at multiple time points: the pre-intervention visit, the 30-day postintervention assessment, the postintervention assessment that took place when children were 12 months of age, and the postintervention assessment that took place when children were 24 months of age. During the play interaction, foster mothers were asked to play with their infant "as they usually would" for 10 min. These interactions were video-recorded. Maternal sensitivity (observed during this play interaction) was scored on a 5-point Likert scale, with higher levels of sensitivity receiving higher scores and lower levels of sensitivity receiving lower scores.

Foster mothers received a rating of 5 if they were able to appropriately and consistently adjust their behavior to respond to their infant's cues for the duration of the interaction. For exam-

ple, if the foster infant preferred to clap together blocks (rather than stack the blocks, for example), a highly sensitive foster parent would follow along with the infant's preference. If the infant showed enjoyment in an activity, a highly sensitive foster mother would respond to the infant's cues by showing delight. If an infant showed distress or tired of a particular activity, a highly sensitive foster mother would adjust her behavior accordingly by soothing the infant and/or offering alternative activities. High levels of sensitive behavior also included responding to the infant's signals of overstimulation. Foster mothers who showed moderate levels of sensitivity or a combination of sensitive and insensitive behavior received moderate scores on this scale. Foster mothers who displayed consistently insensitive behavior received a 1 on this scale. Insensitive behavior was defined as harsh, intrusive, controlling, or disengaged maternal behavior.

All coders passed a reliability test prior to coding maternal sensitivity. Coders were blind to the group assignment of the mother-infant dyads. Interrater reliability was assessed for 25% of the sample. Excellent interrater reliability, assessed with the single measure absolute agreement intraclass correlation (ICC), was calculated for ratings of maternal sensitivity, $ICC = .85$, $p < .001$.

RESULTS

Randomization Check

First, we explored whether foster mothers and infants assigned to each intervention program differed in terms of their demographic characteristics. No differences in foster infants' age, duration of placement with their current foster caregiver, previous number of foster placements, or foster parents' age were found between infants assigned to the Attachment and Biobehavioral Catch-up Intervention or the Developmental Education for Families Intervention (Table 1).

Data Analytic Plan

Data were analyzed using hierarchical linear modeling (HLM 6.0; Raudenbush & Bryk, 1992). HLM allows for the examination of individual change in development over time by calculating estimates of within- and between-individual variation in repeatedly measured growth measurements. Foster mothers' sensitivity was

TABLE 1. Demographic Information Across Intervention Groups

Variable	Intervention Group	
	ABC ($n = 44$)	DEF ($n = 52$)
Child age (in months)	$M = 10.0$ ($SD = 7.3$)	$M = 12.1$ ($SD = 6.8$)
Previous placements	$M = 1.3$ ($SD = .57$)	$M = 1.3$ ($SD = .70$)
Placement duration (in months)	$M = 3.1$ ($SD = 3.3$)	$M = 3.1$ ($SD = 3.6$)
Parent age (in years)	$M = 44.6$ ($SD = 11.2$)	$M = 46.3$ ($SD = 10.2$)

ABC = Attachment and Biobehavioral Catch-up; DEF = Developmental Education for Families.

TABLE 2. Bivariate Correlations between Foster Parent Maternal Sensitivity and Child and Caregiver Demographic Variables

Variable	FM Sens	FM Age	FM Edu	FM Inc	Child Age	Plc Dur	Ch prv plc
1	1	–	–	–	–	–	–
2	–.131	1	–	–	–	–	–
3	.219*	–.001	1	–	–	–	–
4	.091	.040	.431**	1	–	–	–
5	.064	–.145	–.208*	–.009	1	–	–
6	.236*	–.023	.140	–.029	.190	1	–
7	–.088	.112	–.108	–.015	.355**	–.114	1

FM Sens = foster mother sensitivity scores; FM age = foster mother age; FM edu = foster mother educational level; FM Inc = foster mother household income; Plc Dur = foster infant placement duration with foster mother; Ch prv plc = previous number of foster placements of foster infant.
* $p < .05$.

the dependent variable in the model. A “time variable” was calculated by subtracting the date of the pre-intervention assessment from the date of each of the three postintervention assessments. The time variable was centered around the pre-intervention assessment time point. Therefore, time “zero” was the date of the pre-intervention assessment. Time since the pre-intervention assessment (or time since the zero point) was included as a Level 1 variable. Intervention type was included as a Level 2 predictor.

Analyses

First, we assessed whether pre-intervention maternal sensitivity scores were associated with child and caregiver demographic variables and placement characteristics. Foster mothers’ maternal sensitivity at the pre-intervention assessment was not associated with the foster child’s gender, age, or previous number of placements. In addition, sensitivity was not associated with caregiver racial or ethnic background, marital status, age, or yearly income. However, foster caregivers’ educational status and the duration of the current foster placement was positively associated with foster mothers’ maternal sensitivity levels. Therefore, these two variables were added as covariates in subsequent analyses (for correlations, see Table 2).

To ensure that postintervention differences in maternal sensitivity were not due to pre-intervention group differences, maternal sensitivity levels at pre-intervention assessments across intervention groups were examined. Prior to starting the intervention, maternal sensitivity levels did not differ across intervention groups, $\beta_{01} = -0.04$, $t(94) = -.01$, $p = .88$. There was no significant variation in foster mothers’ intercept values of maternal sensitivity, $\chi^2 = 75.70$, $df = 72$, $p = .36$. Next, we examined whether intervention type was associated with change in foster mothers’ sensitive scores. Results of this model indicated that intervention type predicted the degree to which foster mothers’ maternal sensitivity levels changed from pre- to postintervention time points, $\beta_{01} = .08$, $t(94) = 2.58$, $p < .05$. Also, slope estimates (change in maternal sensitivity over time) did not significantly vary across

TABLE 3. Multilevel Modeling Intercept and Slope Coefficients in Foster Parent Maternal Sensitivity

	Coefficient	SE	T	df	p
Intercept Estimates					
(β_{00}) Intercept (DEF)	2.210	0.171	12.93	91	<.001
(β_{01}) Intervention (DEF = 0, ABC = 1)	–0.052	0.257	–0.20	91	0.839
(β_{02}) Foster Mother Education	0.291	0.136	2.13	91	0.036*
(β_{03}) Placement Duration	0.113	0.051	2.21	91	0.030*
(β_{04}) Foster Infant Age	0.008	0.024	0.37	91	0.713
Slope Estimates					
(β_{10}) Intercept (DEF)	0.002	0.028	0.096	91	0.924
(β_{11}) Intervention (DEF = 0, ABC = 1)	0.089	0.039	2.296	91	0.024*
(β_{12}) Foster Mother Education	–0.011	0.020	–0.590	91	0.557
(β_{13}) Placement Duration	–0.008	0.007	–1.224	91	0.224
(β_{14}) Foster Infant Age	–0.003	0.004	–0.643	91	0.522

ABC = Attachment and Biobehavioral Catch-up; DEF = Developmental Education for Families.

foster mothers after accounting for intervention type, $\chi^2 = 82.62$, $df = 72$, $p = .18$. As indicated by these results, foster mothers who received the Attachment and Biobehavioral Catch-up Intervention showed greater increases in their maternal sensitivity scores from pre- to postintervention time points than did foster mothers who participated in the Developmental Education for Families Intervention program.

Finally, we examined whether intervention type predicted foster mothers’ change in maternal sensitivity from pre- to postintervention assessments, when controlling for foster infants’ placement duration and foster mothers’ educational levels, as these variables were correlated with maternal sensitivity scores in preliminary analyses. Given meta-analytic evidence indicating that intervention effectiveness depends on child age (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2008b), we also included foster infant age as a Level 2 covariate for the intercept and slope estimates. Similar to the original model, foster mothers’ pre-intervention starting values did not significantly differ across intervention groups, $\beta_{01} = -0.05$, $t(91) = -.20$, $p = .84$, when controlling for covariates. Foster mothers’ educational level, $\beta_{01} = .29$, $t(91) = 2.13$, $p < .05$, and the duration of the foster infants’ current placement, $\beta_{01} = .11$, $t(91) = 2.21$, $p < .05$, were significantly associated with pre-intervention maternal sensitivity levels (i.e., intercept estimates), but not with the change in maternal sensitivity over time (i.e., slope estimates) (see Table 3). Similar to previous results, intervention type continued to predict the degree to which foster mothers’ maternal sensitivity levels changed from pre- to postintervention time points, $\beta_{01} = .09$, $t(91) = 2.29$, $p < .05$, after controlling for foster infants’ age, placement duration, and foster mothers’ educational level. There was no significant variation in foster mothers’ intercept estimates of maternal sensitivity, $\chi^2 = 74.49$, $df = 69$, $p = .30$, and the change in maternal sensitivity from pre- to postintervention assessments, $\chi^2 = 84.72$, $df = 69$, $p = .09$.

As a last step in these analyses, we were interested in understanding how much of the variance in foster mothers' maternal sensitivity scores was explained by this final model. Therefore, we examined the reduction in within-individual variability of this full model (including these covariates and predictors at Levels 1 and 2), when compared to the null model (with no predictors). Results of our computation indicated that the final model (including the intervention type and covariates) reduced the within-individual variance of the null model by 10.5%. Therefore, this final model explained a significant portion of the variance in foster mothers' sensitivity scores.

DISCUSSION

The current study examined the effectiveness of the Attachment and Biobehavioral Catch-up Intervention in improving foster mothers' sensitivity through a randomized clinical trial. Foster mothers were randomly assigned to the Attachment and Biobehavioral Catch-up Intervention or the Developmental Education for Families Intervention. Greater improvements in maternal sensitivity emerged for foster mothers who participated in the Attachment and Biobehavioral Catch-up Intervention, when compared with foster mothers who participated in the Developmental Education for Families Intervention. These results suggest that a short-term, targeted, attachment-based intervention model is not only effective in enhancing maternal sensitivity among biological mothers, as demonstrated in previous research (Bakermans-Kranenburg et al., 2003), but also among foster mothers whose relationships with their foster infants are often temporary or of unknown duration. These results are exciting, given that foster infants need sensitive caregiving from foster parents and given elevated rates of disorganized attachment classifications, behavioral problems, and biobehavioral dysregulation among foster children (Dozier, Manni et al., 2006; Dozier et al., 2001).

Previous research has suggested that interventions that improve maternal sensitivity among biological mothers are successful in promoting attachment security among their infants (Bakermans-Kranenburg et al., 2008a); therefore, we are particularly excited about the findings from the current study. Among foster parents and infants, preliminary evidence has indicated that foster infants whose caregivers received the Attachment and Biobehavioral Catch-up Intervention showed less avoidant behavior at times of stress, when compared with infants whose caregivers received a control intervention (Dozier et al., 2009). Therefore, whether improvements in foster infants' outcomes are mediated by changes in maternal sensitivity, brought on by the Attachment and Biobehavioral Catch-up program, should be explored in future research.

A particular strength of the current study is that despite our fairly limited behavioral observation of foster mothers' sensitivity during a play period, we were able to demonstrate the effectiveness of the Attachment and Biobehavioral Catch-up Intervention in improving foster mothers' behavior. Some have argued that observations of mother-child interactions across longer time periods may be more appropriate for capturing idiosyncratic manners in

which mothers respond to their infant's distress (Pederson, Moran, Sitko, & Campbell, 1990). In considering our 10-min play assessment, we were more likely to observe foster mothers' abilities to adjust their behavior to infants' requests, respond to cues of overstimulation, or show delight in and encouragement of the infants' behaviors. We had fewer opportunities to observe foster mothers' responses to foster infants' distress at times when their infants' attachment systems became activated, such as when the infants were hurt, separated from their caregiver, or frightened. Given the limited range of maternal behaviors we could observe using our assessment technique, we find our current results even more promising. However, we acknowledge the importance of examining whether the intervention leads to changes in caregiving-response contexts beyond a play interaction, such as when infants become distressed, are separated from their caregivers, or are frightened and need support.

The effectiveness of the Attachment and Biobehavioral Catch-up Intervention in improving foster mothers' behavior introduces several directions for future research. First, it will be important to understand the specific ways in which the Attachment and Biobehavioral Catch-up Intervention is effective in enhancing maternal sensitivity. Are foster mothers more sensitive in contexts beyond those that involve parent-infant play? Do the specific changes in maternal sensitivity predict improvements in foster infants' outcomes? If so, how soon and in what areas do we see improvements in infant development? Second, besides the data from the current study, we have preliminary data that the intervention also is effective for biologically related, at-risk biological mothers and infants. However, we know less about whether this intervention is appropriate for additional populations of parents caring for nonbiologically related children (i.e., children raised by relatives or adopted domestically or internationally). Third, we theorize that providing "in the moment" feedback is the necessary and effective ingredient for change in our program. However, in the spirit of defining how and for whom treatments work, it will be important to empirically test this theory in future work. Despite these remaining questions, the results from the current study are exciting in that they suggest the strong potential for early attachment-based intervention programs to improve parental behavior, and most important, promote healthy development among a particularly vulnerable group of at-risk infants.

REFERENCES

- Ainsworth, M.D.S., Bell, S.M., & Stayton, D.F. (1974). Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals. In M.P.M. Richards (Ed.), *The integration of a child in the social world* (pp. 99-135). New York: Cambridge University Press.
- Ainsworth, M.D.S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Hillsdale, NJ: Erlbaum.

- Anisfeld, E., Casper, V., Nozyce, M., & Cunningham, N. (1990). Does infant carrying promote attachment? An experimental study of the effects of increased physical contact on the development of attachment. *Child Development*, 61, 1617–1627. doi:10.2307/1130769
- Bakermans-Kranenburg, M.J., Juffer, F., & van IJzendoorn, M.H. (1998). Interventions with video feedback and attachment discussions: Does type of maternal insecurity make a difference? *Infant Mental Health Journal*, 19, 202–219. doi:10.1002/(SICI)1097-0355(199822)19:2<97::AID-IMHJ1>3.0.CO;2-W
- Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Juffer, F. (2003). Less is more: Meta-analysis of sensitivity and attachment interventions in early childhood. *Psychological Bulletin*, 129, 195–215. doi:10.1037/0033-2909.129.2.195
- Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Juffer, F. (2008a). Less is more: Meta-analytic arguments for the use of sensitivity-focused interventions. In F. Juffer, M.J. Bakermans-Kranenburg, & M.H. van IJzendoorn (Eds.), *Promoting positive parenting: An attachment-based intervention* (pp. 59–74). New York: Taylor & Francis Group/Erlbaum.
- Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Juffer, F. (2008b). Earlier is better: A meta-analysis of 70 years of intervention improving cognitive development in institutionalized children. *Monographs of the Society for Research in Child Development*, 73, 279–293. doi:10.1111/j.1540-5834.2008.00498.x
- Barnard, K.E. (1999). *Beginning rhythms: The emerging process of sleep-wake behaviors and self-regulation*. Seattle: NCAST, University of Washington.
- Barnard, K.E., Magyary, D., Summer, G., Booth, C.L., Mitchell, S.K., & Spieker, S. (1988). Beginning rhythms: The emerging process of sleep-wake behaviors and self-regulation. *Psychiatry*, 51, 248–253.
- Barnard, K.E., & Morisset, C.E. (1995). Preventive health and developmental care for children: Relationships as a primary factor in service delivery with at risk populations. In H.E. Fitzgerald, B.M. Lester, & B. Zuckerman (Eds.), *Children of poverty: Research, health and policy issues* (pp. 167–195). New York: Garland.
- Bernard, K., Dozier, M., Bick, J., Lewis, E., Lindhiem, O., & Carlson, E. (2012). Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. *Child Development*, 83, 623–636.
- Carlson, E.A. (1998). A prospective longitudinal study of attachment disorganization/disorientation. *Child Development*, 69, 1107–1128. doi:10.2307/1132365
- Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K.G. (1989). Finding order in disorganization: Lessons from research on maltreated infants' attachments to their caregivers. In D. Cicchetti, & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 494–528). New York: Cambridge University Press.
- De Wolff, M., & van IJzendoorn, M.H. (1997). Sensitivity and infant attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68, 571–591. doi:10.2307/1132107
- Dozier, M., & the Infant-Caregiver Laboratory. (2002). *The Attachment and Biobehavioral Catch-up Intervention: A training manual for foster parents*. Unpublished manual, University of Delaware, Newark.
- Dozier, M., Lindhiem, O., Lewis, E., Bick, J., Bernard, K., & Peloso, E. (2009). Effects of a foster parent training program on young children's attachment behaviors: Preliminary evidence from a randomized clinical trial. *Child & Adolescent Social Work Journal*, 26(4), 321–332. doi:10.1007/s10560-009-0165-1
- Dozier, M., Manni, M., Gordon, M.K., Peloso, E., Gunnar, M.R., Stovall-McClough, K. et al. (2006). Foster children's diurnal production of cortisol: An exploratory study. *Child Maltreatment*, 11, 189–197. doi:10.1177/1077559505285779
- Dozier, M., Peloso, E., Lewis, E., Laurenceau, J., & Levine, S. (2008). Effects of an attachment-based intervention of the cortisol production of infants and toddlers in foster care. *Development and Psychopathology*, 20(3), 845–859. doi:10.1017/S0954579408000400
- Dozier, M., Peloso, E., Lindhiem, O., Gordon, M.K., Manni, M., Sepulveda, S. et al. (2006). Developing evidence-based interventions for foster children: An example of a randomized clinical trial with infants and toddlers. *Journal of Social Issues*, 62, 767–785. doi:10.1111/j.1540-4560.2006.00486.x
- Dozier, M., Stovall, K.C., Albus, K.E., & Bates, B. (2001). Attachment for infants in foster care: The role of caregiver state of mind. *Child Development*, 72, 1467–1477. doi:10.1111/1467-8624.00360
- Field, T., Grizzle, N., Scafidi, F., Abrams, S., & Richardson, S. (1996). Massage therapy for infants of depressed mothers. *Infant Behavior & Development*, 19, 107–112.
- Fisher, P.A., Gunnar, M.R., Chamberlain, P., & Reid, J.B. (2000). Preventive intervention for maltreated preschool children: Impact on children's behavior, neuroendocrine activity, and foster parent functioning. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39, 1356–1364. doi:10.1097/00004583-200011000-00009
- Fisher, P.A., Stoolmiller, M., Gunnar, M.R., & Burraston, B.O. (2007). Effects of a therapeutic intervention for foster preschoolers on diurnal cortisol activity. *Psychoneuroendocrinology*, 32(8–10), 892–905. doi:10.1016/j.psyneuen.2007.06.008
- Goldsmith, H.H., & Alansky, J.A. (1987). Maternal and infant temperamental predictors of attachment: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 55(6), 805–816. doi:10.1037/0022-006X.55.6.805
- Heinicke, C.M., Fineman, N.R., Ruth, G.G., Recchia, S.L., Guthrie, D.D., & Rodning, C.C. (1999). Relationship-based intervention with at-risk mothers: Outcome in the first year of life. *Infant Mental Health Journal*, 20(4), 349–374. doi:10.1002/(SICI)1097-0355(199924)20:4<349::AID-IMHJ1>3.0.CO;2-X
- Izard, C.E., Fine, S., Mostow, A., Trentacosta, C., & Campbell, J. (2002). Emotion processes in normal and abnormal development and preventive intervention. *Development and Psychopathology*, 14(4), 761–787. doi:10.1017/S0954579402004066
- Juffer, F., Bakermans-Kranenburg, M.J., & van IJzendoorn, M.H. (2008). Methods of the video-feedback to promote positive parenting alone, with sensitive discipline, and with representational attachment discussions. In F. Juffer, M.J. Bakermans-Kranenburg, & M.H. van IJzendoorn (Eds.), *Promoting positive parenting: An attachment-based intervention* (pp. 22–36). London: Erlbaum.

- Lyons-Ruth, K., Easterbrooks, M.A., & Cibelli, C.D. (1997). Infant attachment strategies, infant mental lag, and maternal depressive symptoms: Predictors of internalizing and externalizing problems at age 7. *Developmental Psychology*, 33, 681–692. doi:10.1037/0012-1649.33.4.681
- Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M.T. Greenberg, D. Cicchetti, & E. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 161–182). Chicago: University of Chicago Press.
- Moss, E., Dubois-Comtois, K., Cyr, C., Tarabulsy, G.M., St-Laurent, D., & Bernier, A. (2011). Efficacy of a home-visiting intervention aimed at improving maternal sensitivity, child attachment, and behavioral outcomes for maltreated children: A randomized control trial. *Development and Psychopathology*, 23(1), 195–210. doi:10.1017/S0954579410000738
- Nilsen, W. (2007). Fostering futures: A preventive intervention program for school-age children in foster care. *Clinical Child Psychology and Psychiatry*, 12(1), 45–63. doi:10.1177/1359104507071055
- Pears, K., & Fisher, P.A. (2005). Developmental, cognitive, and neuropsychological functioning in preschool-aged foster children: Associations with prior maltreatment and placement history. *Journal of Developmental and Behavioral Pediatrics*, 26, 112–122. doi:10.1097/00004703-200504000-00006
- Pederson, D.R., Moran, G., Sitko, C., & Campbell, K. (1990). Maternal sensitivity and the security of infant–mother attachment: A Q-sort study. *Child Development*, 61, 1974–1983. doi:10.2307/1130851
- Price, J.M., Chamberlain, P., Landsverk, J., & Reid, J. (2009). KEEP foster-parent training intervention: Model description and effectiveness. *Child & Family Social Work*, 14, 233–242. doi:10.1111/j.1365-2206.2009.00627.x
- Ramey, C.T., McGinness, G.D., Cross, L., Collier, A.M., & Barrie-Blackley, S. (1982). The Abecedarian approach to social competence: Cognitive and linguistic intervention for disadvantaged preschoolers. In K. Borman (Ed.), *The social life of children in a changing society* (pp. 145–174). Hillsdale, NJ: Erlbaum.
- Ramey, C.T., Yeates, K.O., & Short, E.J. (1984). The plasticity of intellectual development: Insights from preventative intervention. *Child Development*, 55, 1913–1925. doi:10.2307/1129938
- Raudenbush, S., & Bryk, A. (2002). *Hierarchical linear models: Applications and data analysis methods: Advanced quantitative techniques in the social sciences* (2nd ed.). Newbury Park, CA: Sage.
- Schuengel, C., Bakermans-Kranenburg, M.J., & van IJzendoorn, M.H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology*, 67, 54–63. doi:10.1037/0022-006X.67.1.54
- Schuler, M.E., Nair, P., Black, M.M., & Kettinger, L. (2000). Mother–infant interaction: Effects of a home intervention and ongoing maternal drug use. *Journal of Clinical Child Psychology*, 29, 424–431. doi:10.1207/S15374424JCCP2903_13
- Seifer, R., Clark, G.N., & Sameroff, A.J. (1991). Positive effects of interaction coaching on infants with developmental disabilities and their mothers. *American Journal on Mental Retardation*, 96, 1–11.
- Smith, P.B., & Pederson, D.R. (1988). Maternal sensitivity and patterns of infant–mother attachment. *Child Development*, 59(4), 1097–1101. doi:10.2307/1130276
- Stovall, K.C., & Dozier, M. (2000). The development of attachment in new relationships: Single subject analyses for 10 foster infants. *Development and Psychopathology*, 12, 133–156. doi:10.1017/S0954579400002029
- Stovall-McClough, K.C., & Dozier, M. (2004). Forming attachments in foster care: Infant attachment behaviors during the first two months of placement. *Development and Psychopathology*, 16, 253–271.
- van den Boom, D. (1988). *Neonatal irritability and the development of attachment: Observation and intervention*. Leiden, The Netherlands: Leiden University.
- van den Boom, D.C. (1994). The influence of temperament and mothering on attachment and exploration: An experimental manipulation of sensitive responsiveness among lower-class mothers with irritable infants. *Child Development*, 65, 1457–1477. doi:10.2307/1131511
- van Doesum, K.M., Riksen-Walraven, J., Hosman, C.H., & Hoefnagels, C. (2008). A randomized controlled trial of a home-visiting intervention aimed at preventing relationship problems in depressed mothers and their infants. *Child Development*, 79(3), 547–561. doi:10.1111/j.1467-8624.2008.01142.x
- van IJzendoorn, M. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin*, 117, 387–403. doi:10.1037/0033-2909.117.3.387