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Developing Evidence-Based Interventions for Foster Children: An Example of a Randomized Clinical Trial with Infants and Toddlers

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Children who enter foster care have usually experienced maltreatment as well as disruptions in relationships with primary caregivers. These children are at risk for a host of problematic outcomes. However, there are few evidence-based interventions that target foster children. This article presents preliminary data testing the effectiveness of an intervention, Attachment and Biobehavioral Catch-up, to target relationship formation in young children in the foster care system. Children were randomly assigned to the experimental intervention that was designed to enhance regulatory capabilities or to a control intervention. In both conditions, the foster parents received in-home training for 10 weekly sessions. Post-intervention measures were collected 1 month following the completion of the training. Outcome measures included children's diurnal production of cortisol (a stress hormone), and parent report of children's problem behaviors. Children in the experimental intervention group had lower cortisol values than children in the control intervention. Also, the experimental intervention parents reported fewer behavior problems

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for older versus younger foster children. Results provide preliminary evidence of the effectiveness of an intervention that targets children's regulatory capabilities and serve as an example of how interventions can effectively target foster children in the child welfare system.

Children who are placed into foster care are often at high risk for problematic outcomes. First, they have often experienced a range of adverse conditions prior to placement, including neglect, abuse, and exposure to domestic violence (Kohl, Edleson, English, & Barth, 2005). In addition, placement into foster care, while providing a respite from problematic care, also involves a disruption in care. Further, foster placements are often not stable, such that some children experience moves from one home to another, or from foster care to birth home and back into foster care again.

Not surprisingly, foster children show increased risk for a host of long-term problems related to the regulation of behavior, including externalizing behavior, substance abuse, and criminal behavior (e.g., Clausen, Landsverk, Ganger, Chadwick, & Litrownik, 1998; McIntyre & Keesler, 1986; Pilowsky, 1995; Pottick, Warner, & Yoder, 2005; Racusin, Maerlender, Sengupta, Isquith, & Straus, 2005). Given that these children are at high risk for later problems, they represent an important group to target for intervention. Relatively few interventions for foster children have demonstrated effectiveness, although there are notable exceptions (e.g., Fisher, Burraston, & Pears, 2005). It is essential that interventions be designed so as to be sensitive to the developmental issues facing children of different ages.

We have focused on young children in foster care because we are especially interested in remediating the effects of early relationship disturbances on children's development. Also, intervention efforts appear most fruitful when provided early. We have identified several key issues that prove challenging for young children in foster care, and designed an intervention that specifically targets these issues. In this article, we briefly overview the state of foster care in the United States, and the effects of maltreatment and foster care on child development. To provide an example of the process involved when developing an evidence-based intervention, we describe the intervention we have designed and preliminary findings regarding the intervention's effectiveness.

Foster Care in the United States

Over 500,000 children are in formal foster care in the United States (USDHHS, 2006). Many children living in informal foster care arrangements (e.g., with relatives or neighbors) are uncounted in this number. About 14% of the children entering foster care are less than a year old, and 22% are between 1 and 5 years old (USDHHS, 2006). Thus, the associated disruptions in care and forming of new

attachments occur for many at a developmental point when forming and maintaining attachments is a key biologically based task. Overwhelmingly, children who enter foster care come from homes characterized by a multitude of problematic issues including poverty, substance abuse, mental and/or physical illness, and domestic violence (Stukes Chipungu & Bent-Goodley, 2004). Although foster care is intended as a temporary solution, children of all ages tend to stay in care for relatively long periods of time. Only 18% stay in foster care less than 1 month, with an additional 32% between 1 and 12 months. Twenty-one percent stay in foster care between 1 and 2 years, and 29% longer than 2 years (USDHHS, 2006). These disruptions in care prove problematic for children, with more disruptions associated with poorer outcomes (Jonson-Reid & Barth, 2000; Kurtz, Gaudin, & Howing, 1993; Leathers, 2002; Ryan & Testa, 2005).

With the exception of foster children who were placed into foster care at birth, nearly all have experienced neglect or abuse prior to foster placement (Kohl et al., 2005). Therefore, for the most part, foster children represent a subset of maltreated children. Maltreated children are more likely than non-maltreated children to develop internalizing and externalizing behavior problems (Salzinger, Feldman, Hammer, & Rosario, 1993; Shonk & Cicchetti, 2001; Toth, Cicchetti, Macfie, Rogosch, & Maughan, 2000), as well as to show more social withdrawal, somatic complaints, depressive symptoms, and suicidal ideation than non-maltreated children (Kaufman & Cicchetti, 1989; Salzinger et al., 1993). Furthermore, they suffer from more cognitive deficits, academic difficulties (Eckenrode, Laird, & Doris, 1993; Egeland, Sroufe, & Erickson, 1983; Shonk & Cicchetti, 2001), and are more likely to show language delays (Katz, 1992; Law & Conway, 1992) than non-maltreated children. The evidence is mixed with regard to whether living with birth parents or placement into foster care is associated with better outcomes for children who have been maltreated (e.g., Lau, Litrownik, Newton, & Landsverk, 2003; Lawrence, Carlson, & Egeland, 2006).

Behavioral and Biological Dysregulation among Foster Children

A number of human and non-human studies suggest that maltreatment and disruptions in care may overwhelm children's capacities to cope, leading directly and indirectly to problems regulating physiology and behavior (e.g., Coe, Glass, Wiener, & Levine, 1983; De Bellis, 2005; Levine, Johnson, & Gonzalez, 1985). Whereas stress responses are mounted routinely under "normally" stressful conditions, challenges that are beyond what the organism has been equipped to deal with can result in long-term behavioral and biological consequences. For example, rodent pups separated from their mother for longer than she would be gone in the wild show lifelong deficits in the physiological stress response and in behavior (Graham, Heim, Goodman, Miller, & Nemeroff, 1999). Similarly, children who experience maltreatment and/or disruptions in care sometimes show persistent

changes in their stress response systems that may put them at risk for later problematic outcomes (Dozier et al., 2006; Pears & Fisher, 2005).

The competent caregiver functions to help the child develop regulatory capabilities (Field et al., 1986). The parent's provision of a responsive interpersonal world helps the child develop a sense of being able to regulate him or herself. For example, when the infant signals to the parent that he or she desires more (or less) stimulation, and the message is heeded, the infant develops a sense of being able to affect his or her world. Regulatory capabilities are at first dyadic, with the parent taking an important co-regulating role in scaffolding regulation. With effective, smooth dyadic regulation, the infant can gradually come to take over regulatory functions independently (Barnard, 1999). Dysregulation may occur when relationships are disrupted or when caregivers are unable to provide responsive care.

Broadly defined, dysregulation can be characterized as a breakdown in a system's normal functioning, or a chronic failure of the system to function in normal ways. Dysregulation may occur at behavioral, emotional, and neuroendocrine levels, as well as others. For example, behavioral dysregulation can be seen when a frightened child fails to go to his or her mother for protection, but instead moves into a corner. Emotional dysregulation cannot be observed, but may occur when a child experiences panic that is not relieved by the caregiver. Neuroendocrine dysregulation may occur when the hypothalamic-pituitary-adrenal (HPA) system does not maintain a typical diurnal pattern.

Maltreatment and foster care represent an extreme breakdown in this system of regulation. Not surprisingly, infants and young children who experience early maltreatment show dysregulation at behavioral and biobehavioral levels (Dozier et al., 2006; Kaufman & Charney, 2001; Pears & Fisher, 2005; Sanchez, Ladd, & Plotsky, 2001). Such children often show atypical patterns of cortisol production across the day (Dozier et al., 2006; Pears & Fisher, 2005). In particular, we have found that infants who have been maltreated show both low and high levels of cortisol production relative to comparison children. Our findings with infants and toddlers parallel those of Pears and Fisher with preschoolers in foster care.

Most children raised under more typical circumstances show a pattern of cortisol production that has an early morning peak, followed by a sharp decline and near zero levels at bedtime (Price, Close, & Fielding, 1983; White, Gunnar, Larson, Donzella, & Barr, 2000). By 3 months of age, this general diurnal pattern emerges and is seen throughout the lifespan (Larson, White, Cochran, Donzella, & Gunnar, 1998; Price et al., 1983; White et al., 2000). The disruption in a basic biological system seen among young children in foster care is troubling. Although we do not yet have evidence that such disruption is associated with later disorder, these connections are expected to emerge as longitudinal research findings become available. Atypical production of cortisol characterizes individuals with a variety of disorders. Low levels of cortisol production are associated with conduct

disorder, antisocial personality disorder, and substance abuse, among other related problems (e.g., Graham et al., 1999; McBurnett, Lahey, Rathouz, & Loeber, 2000; Pajer, Garner, Rubin, Perel, & Neal, 2001; van Goozen, Matthys, Cohen-Kettenis, Buitelaar, & van Engeland, 2000). High evening levels are associated with depression (Board, Wadeson, & Persky, 1957; Gold, Goodwin, & Chrousos, 1988; Young, Carlson, & Brown, 2001). Thus, foster children's atypical production of cortisol may reflect a neurobiology that predisposes to later disorder. Hence, parents need to provide an environment that helps children develop their regulatory capabilities. A predictable, controllable interpersonal environment helps young children develop regulatory capabilities (Barnard, 1999; van den Boom, 1994, 1995).

Whereas much of the literature on the HPA axis has focused on stress reactivity, we have found that diurnal production of cortisol more sensitively detects disturbances in the system's functioning among young children (Dozier et al., 2006; Fisher, Gunnar, Dozier, Bruce, & Pears, in press; Pears & Fisher, 2005). This may be at least partially because stress reactivity is dampened for young children. Gunnar and Vazquez (2001) have suggested the possibility of a hyporesponsive period in stress reactivity, perhaps paralleling that seen in the first 2 weeks of life for rodents.

Attachment and Biobehavioral Catch-up: Targeting Regulatory Capacities among Young Foster Children

We have developed an intervention, Attachment and Biobehavioral Catch-up, that targets foster children's dysregulation both directly and indirectly (see Dozier, Dozier, and Manni [2002] for a full description of the intervention). We limit our description here to the components of the intervention that target dysregulation. The intervention targets dysregulation directly by helping foster parents create an environment that enhances regulatory capabilities. The first subcomponent helps caregivers learn to follow the child's lead, which has been associated with children's ability to regulate behavior and emotions (Barnard, 1999; van den Boom, 1994, 1997). The second subcomponent helps caregivers appreciate the value of touching, cuddling, and hugging their child, which has been associated with behavioral and biobehavioral regulation (Field et al., 2004; Field, Hernandez-Reif, Diego, Schanberg, & Kuhn, 2005). Finally, the third subcomponent helps caregivers create conditions that allow their children to express emotions, and to learn to recognize and understand emotions. Again, emotion expression and emotion understanding have been associated with better behavioral regulation (Schultz, Izard, & Bear, 2004).

The intervention also indirectly targets regulatory capabilities by helping foster parents provide nurturing care to their foster children. Only when parents behave in nurturing ways can foster children develop organized attachments to them (Dozier, Stovall, Albus, & Bates, 2001). However, two issues mitigate against

caregivers providing nurturing care. First, we have found that babies and toddlers tend to push caregivers away, behaving in ways that suggest that caregivers are not needed (Stovall & Dozier, 2000; Stovall-McClough & Dozier, 2004). In addition, caregivers' own issues sometimes make it difficult for them to behave in nurturing ways (Dozier et al., 2001). When children fail to develop organized attachments to caregivers, they are at risk for behavioral and biological dysregulation (Carlson, 1998; Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996).

The intervention is manualized and is conducted over 10 weekly sessions. Each session is highly interactive, with the parent discussing concepts, practicing with her baby, and discussing successes and failures in the use of concepts from the prior weeks. All sessions are videotaped so that the trainer can be supervised and fidelity can be assessed. In addition, parent and child are videotaped while interacting during the session so that the parent can see her progress in applying concepts. (These involve a second videotape camera so that supervision and fidelity assessments are not interrupted.) The table below indicates where each treatment objective is covered.

Session objective	Session number
Directly targeting regulatory capabilities	
Following child's lead	3, 4, 5
Touching, holding child	8
Responding to child's negative emotion	10
Indirectly targeting regulatory capabilities	
Providing nurturance	
When child pushes away	1, 2
When difficult for parent	6, 7
Reducing parent's frightening behavior	9

Present Study

This article presents findings from the first 60 children who completed post-intervention assessments as an example of developing evidence-based practice in the foster care system. All 60 children were randomly assigned to receive the Attachment and Biobehavioral Catch-up intervention or an educational intervention. The educational intervention, Developmental Education for Families, targets cognitive development, particularly the development of language for the young child. Both interventions consist of 10 individually administered sessions carried out at approximately weekly intervals. Foster parents were compensated $100 for the completion of the training and additionally received parent training credit hours from their child welfare agency. This article reports findings from the first follow-up, 1 month after the completion of the intervention. Measures included

in this study are morning and evening levels of cortisol production and problem behaviors as reported by parents. Additional measures, such as assessment of children's attachment in the Strange Situation, and children's handling of frustration in a challenging task, are being collected for these children. These measures have not yet been coded and are not available for this report. Further, in that participants are still being enrolled in this study, this report provides data for only a subsample of the full sample. Thus, this article reports short-term preliminary evidence for the intervention's effectiveness.

Method

The primary sample included the first 60 children who completed the experimental or control intervention. An additional 104 children were included in secondary analyses to allow comparisons with children who were not in the foster care system. Children from two mid-Atlantic states were included in this randomized clinical trial. Foster families were referred to the project at the time of initial infant placement. In order for children to participate, both foster parent and birth parent (or proxy) consent were required. Foster parents consented to their own participation, and birth parents (or proxies) consented to children's participation. The university's Institutional Review Board approved all procedures. Consent was high for foster parent agreement (86.6%), and very high for birth parent or proxy agreement (99%).

After enrollment, children were randomly assigned to one of the two intervention groups (Attachment and Biobehavioral Catch-up or Developmental Education for Families). Foster parents and birth parents were blind to condition, as were researchers responsible for entering data, assaying cortisol samples, and analyzing data.

Participants

Children from the foster care sample ranged in age at the time of the post-intervention assessments from 3.6 to 39.4 months (see Table 1). Half of the children were boys and half girls. Most (63%) of the children were African American, with 32% White, and 5% biracial. There were no significant differences in the two

Table 1. Descriptive Statistics

	Experimental group (ABC)				Control group (DEF)			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Child age (months)	19.01	9.64	3.90	39.40	16.30	7.42	3.60	33.60
AM cortisol	.41	.43	.00	1.97	.80	.91	.00	3.00
PM cortisol	.12	.13	.00	.58	.42	.69	.00	2.65
Behavior score	.29	.16	.03	.48	.31	.15	.06	.54

intervention groups with respect to child age, gender, or ethnicity. Forty-eight of the children were placed with foster caregivers of their same ethnicity, and 12 children were placed with caregivers of differing ethnicity. Two of the children were placed a second time during the study period with a different caregiver and continued participation in the study, whereas all the remaining children resided with the same caregiver throughout the period reported. In the cases where child placement changed, the complete intervention was repeated with the new caregiver. Fifty-six of the participating caregivers were female, and four of the caregivers were male.

Children from the typically developing group ranged in age from 20 to 60 months ($M = 30.8$, $SD = 4.0$). Fifty of the children were boys and 54 were girls. Fifty were African American and 54 were European American. Effects of ethnicity on dependent variables of interest did not approach significance.

Measures

Saliva sampling. The procedures used for collecting and assaying cortisol carefully followed established protocol (e.g., Gunnar & White, 2001). Experimenters trained foster parents to collect and store saliva samples in the caregivers' homes. Additionally, step-by-step pictorial directions of the sampling procedure were given to parents along with the sampling materials. Foster parents collected saliva samples from children two times daily over a 2-day period. The two assessments were when the child first woke up and at bedtime, and the caregivers were asked to collect the samples over two "typical" days for the child at home. Two days of data were collected to provide a reliable assessment of cortisol levels at each time of day.

Compliance caps (MEM tracking caps, Aardex, Corporation) were used. These caps were placed on vials containing the dental cotton rolls used for saliva sampling. When the cap was opened, a microchip recorded the time of opening, providing verification of sampling time. The use of such caps has been shown to enhance sampling compliance (Kudielka, Broderick, & Kirschbaum, 2003). Samples were used only if compliance cap data matched times recorded by parents within an hour. In the two cases in which data did not match, parents were asked to resample saliva.

For children older than 12 months, caregivers were instructed to moisten the end of the dental cotton roll by placing it briefly in the child's mouth. The cotton was then dipped in a vial containing 0.8 g of flavored beverage crystals (Pathmark™ cherry flavored drink mix) to promote salivation. The roll was placed back in the child's mouth and the child was encouraged to mouth the roll until it was wet with saliva. For children younger than 12 months, the flavored beverage crystals were not used to stimulate saliva both because no saliva stimulant is needed to obtain adequate samples for infants, and the use of sweetened crystals is not advised for

young infants. The caregivers were instructed to place the wet cotton roll into the provided pre-labeled salivette (Sardstedt catalog number 51-1534) and store the samples in the freezer until returning the entire set of diurnal saliva samples to the lab. When the sampling was completed, research staff returned to the caregiver's home to retrieve the samples.

Although flavored drink mixes and other sweeteners have been reported to affect values on the radio-immunoassay (RIA) (Schwartz, Granger, Susman, Gunnar, & Laird, 1998), recent controlled studies in our lab and in Gunnar's lab have indicated that the ELIZA enzyme-immunoassay (EIA), designed specifically for the measurement of salivary cortisol that we use (Salimetrics, Inc. High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit, catalog no. 1-1102/1-1112), is affected very little by low levels of the crystals (Gordon, Peloso, Auker, & Dozier, 2005; Talge, Donzella, Kryzer, Gierens, & Gunnar, 2005). In fact, in rigorous testing of the effect of the beverage crystals on cortisol measurement in adult volunteers, sample cortisol values varied less than 15% across all samples, and no significant differences were found between those samples collected with and those samples without the use of the drink mix (Gordon et al., 2005).

Caregivers were asked to indicate whether the child was teething, whether the child had had anything to eat or drink in the 30 minutes prior to sampling, and several other issues known to affect cortisol levels. Values were excluded when any of these conditions was indicated. Caregivers were also asked to indicate whether the child was sick or having other acute physical problems before beginning to take samples. If the child was experiencing such problems, assessments were delayed for 1 week or until the child's condition improved.

Cortisol assay. The saliva samples were stored in a freezer until they were assayed in our laboratory. Assays were performed using the Salimetrics, Inc. High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit (catalog no. 1-1102/1-1112). All samples from a child were run in duplicate on the same assay plate. Additionally, a collection of saliva from several different donors was pooled and frozen as a control. Samples of the control saliva were included on each assay plate. All samples were within an acceptable pH range, as demonstrated by an absence of color change when indicator (as part of the assay dilutant) was added. All values measured < 4 μg/dl and no pairs of samples differed by more than 15%. Inter- and intra-assay coefficients of variation for this study were below 7% and 4% respectively.

Problem behaviors: Parent daily report. Parents completed the infant-toddler or the preschool version of the Parent's Daily Report (PDR/IT) adapted from the PDR (Chamberlain & Reid, 1987) daily for 3 days at post-intervention assessments. The PDR and the PDR/IT have moderate stability over time and relate well to other problem behavior inventories (Pears & Fisher, 2005).

Interventions

For both interventions, parent trainers were professional social workers or psychologists with at least 5 years clinical experience. They administered 10 training sessions according to a structured training manual. All sessions were videotaped, allowing assessments of fidelity to the manual. Sessions took place in foster parent homes. To the extent possible, the format, duration, and frequency of the interventions were similar for the two interventions.

Experimental intervention: Attachment and biobehavioral catch-up intervention (ABC). The Attachment and Biobehavioral Catch-up Intervention is designed to help children develop regulatory capabilities. It targets three specific issues: helping caregivers learn to reinterpret children's alienating behaviors, helping caregivers over-ride their own issues that interfere with providing nurturing care, and providing an environment that helps children develop regulatory capabilities. The intervention is manualized, with the same issues introduced across the 10 sessions, regardless of child age. Intervention principles are held constant, but specific activities are varied to be appropriate for children of different ages or issues.

Control intervention: Developmental education for families (DEF). The Developmental Education for Families Intervention is of the same duration (10 hour-long sessions) and frequency (weekly) as the Attachment and Biobehavioral Catch-up intervention. The educational intervention was borrowed partly from the home visitation component of the early intervention program developed by Ramey and colleagues (Ramey, McGinness, Cross, Collier, & Barrie-Blackley, 1982; Ramey, Yeates, & Short, 1984). This intervention was designed to enhance cognitive, and especially linguistic, development. The intervention has been successful in improving intellectual functioning when provided intensively and for a long duration in day care settings (Brooks-Gunn, Klebanov, Liaw, & Spiker, 1993). Components that involve parental sensitivity to child cues were excluded in our version of the intervention so as to keep the interventions distinct. Although the intervention is manualized, specific activities take into account child's developmental level.

Results

Cortisol

Differences in cortisol production between the two groups were analyzed as 2 (Intervention Group: Attachment and Biobehavioral Catch-up/Developmental Education for Families) $\times$ 2 (Time of day: wake-up, bedtime) analyses of variance. Cortisol value (in μg/dl) was the dependent variable, intervention group was the independent variable, and time of day was the within-subject variable.

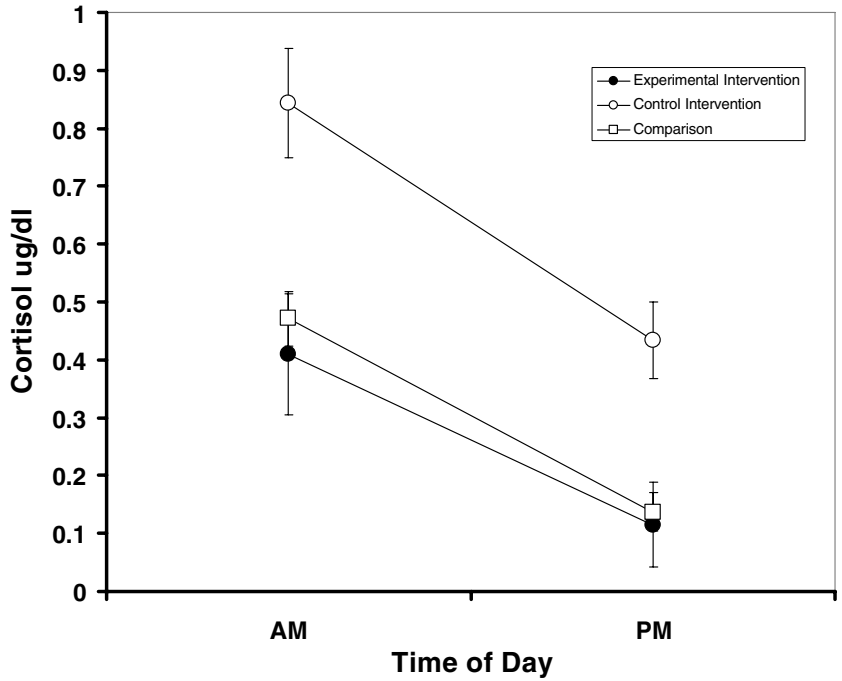

Fig. 1. Post-intervention cortisol slopes for foster children in Attachment and Biobehavioral Catch-up intervention, for foster children in Developmental Education for Families intervention, and for comparison children.

A main effect for Intervention Group emerged, $F(1,46) = 4.55$, as can be seen in the two solid lines of Figure 1 (see Table 2 for analysis of variance results). Children in the Developmental Education for Families Intervention group showed higher cortisol values than children in the Attachment and Biobehavioral Catch-up Intervention group.

To assess which of the two groups was more similar to typically developing children, we included data from 104 children who had never been in foster care.

Table 2. Analysis of Variance for Cortisol Levels

Source	*df*	*F*	*p*
		Within subjects	
Time of day	1	29.04	.00
Time of day × Intervention type	1	.63	.43
Error	46		
		Between subjects	
Intervention type	1	4.55	.04
Error	46		

Table 3. Post Hoc Comparisons Between Three Groups Using Least-Square Differences

Group comparisons (I–J)				
(I)	(J)	Mean difference	Std. error	*p*
Experimental group (ABC)	Control group (DEF)	−.37	.11	.00
	Typically developing	−.04	.08	.61
Control group (DEF)	Experimental group (ABC)	.38	.11	.00
	Typically developing	.33	.09	.00
Typically developing	Experimental group (ABC)	.04	.08	.61
	Control group (DEF)	−.33	.09	.00

Analyses were conducted as described above, but with three levels of Intervention Group. Again, a main effect for Intervention Group emerged, $F(3,198) = 5.24$, $p < .002$. Post hoc analyses revealed differences between the control intervention group and the other two groups (p values $< .001$), but not between the experimental intervention group and the typically developing group (p values $> .20$) (see Table 3). An examination of the means reveals a similar pattern of results for the experimental intervention group and the typically developing children.

Behavior Problems

Differences in parent-reported behavior problems were analyzed as 2 (Intervention Group: Attachment and Biobehavioral Catch-up/Developmental Education for Families) × 2 (age: 0–17 months; 18–36 months) analyses of variance. Age was included as a variable in these analyses both because it had been associated with problem behaviors in preliminary analyses, and because we had doubted whether the concept of problem behaviors was meaningful for infants. The total problem behavior score was the dependent variable.

An Intervention group × Age interaction emerged. $F(1,42) = 4.75$, $p < .05$, as can be seen in Figure 2 (see also Table 4). Parents in the Attachment and Biobehavioral Catch-up intervention group reported fewer behavioral problems for toddlers than infants, $r = –.475$, $p < .05$, which was not the case for parents in the Developmental Education for Families intervention, ns. The Intervention group main effect was not significant, nor were differences significant when considering only the toddler group, $p > .10$.

Discussion

The results of this study are exciting in suggesting that a time-limited manualized intervention for foster parents is effective in enhancing foster children's regulatory capabilities. Children whose caregivers received the Attachment and Biobehavioral Catch-up intervention showed more typical production of cortisol than children whose caregivers received the control intervention. Parents in the

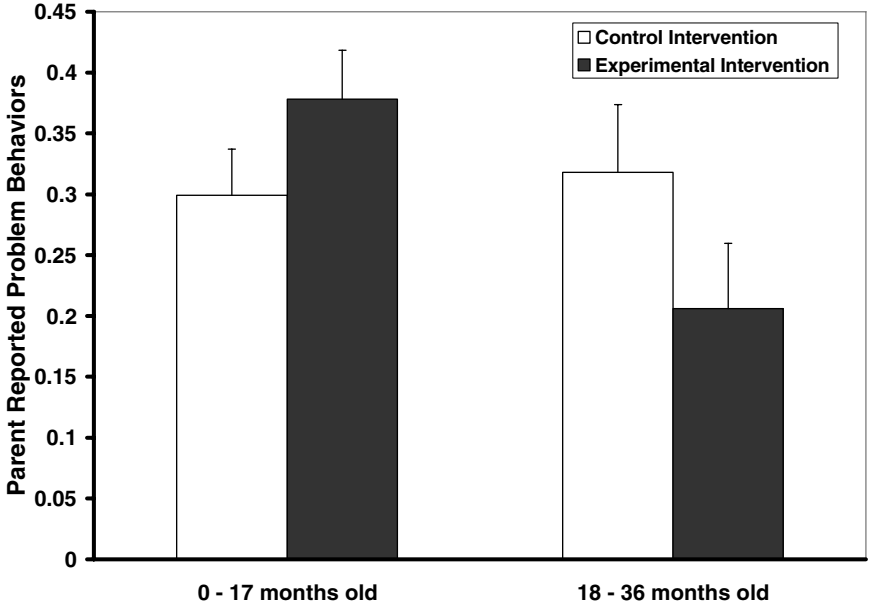

Fig. 2. Post-intervention problem behaviors for foster infants and toddlers in Attachment and Biobehavioral Catch-up intervention and for foster infants and toddlers in Developmental Education for Families intervention.

experimental intervention also reported relatively fewer problem behaviors for older versus younger children.

Young foster children appear especially susceptible to dysregulation at behavioral, emotional, and physiological levels (Dozier et al., 2006; Pears & Fisher, 2005). If an intervention can enhance the regulatory capabilities of young foster children, it would have high public health significance. This intervention appears to have such effects, with experimental intervention children resembling children who have never been in foster care, but differing from children who have received an alternative intervention.

How could a brief intervention have such effects? At an anecdotal level, we have found many foster parents to be relieved to have behavioral strategies to help

Table 4. Analysis of Variance for Behavior Problems (Between Subjects)

Source	*df*	*F*	*p*
Intervention type	1	.14	.71
Child age	1	3.06	.09
Intervention type × Child age	1	4.75	.04
Error	42		

them interact with their foster children more effectively. Although parent trainers are only present in the home for a total of about 10 hours, we think that they help provide foster parents with skills that have cascading effects on parent–child interactions. We have targeted regulatory deficits in ways not dissimilar to other short-term interventions with demonstrated effectiveness (Bakersman-Kranenburg, van Ijzendoorn, & Juffer, 2003; van den Boom, 1995). Although the population targeted here is higher risk than targeted by these other interventions, the task is similar to helping parents to enhance their children's regulatory capabilities. It seems that these strategies for enhancing children's regulatory capabilities are powerful.

Our findings with regard to improving children's ability to regulate behavior are less compelling than our findings regarding the regulation of glucocorticoid production. Although the findings are promising, they should be regarded as very preliminary. Nonetheless, differences are in the direction of experimental intervention parents reporting fewer behavior problems for their toddlers relative to younger infants (a statistically significant finding) and relative to reports for control group toddlers (a non-significant difference).

A number of intervention strategies could be developed for children in foster care. We have targeted the regulatory issues of young children for several reasons. First, non-human primate and rodent work (Levine et al., 1985; Sanchez et al., 2005; Wiener & Levine, 1983) suggests that caregiving disruptions are especially dysregulating for infants. A stable caregiving system supports regulation during this time period, and disruptions are associated with dysregulation. Children who have experienced other types of adversity, such as institutionalization and maltreatment, show problems regulating physiology and behavior as well (Bugental, Martorell, & Barraza, 2003; Gunnar, Morison, Chisholm, & Schuder, 2001). In addition, the long-term problems that characterize foster children span a large range, but include difficulty regulating behavior and emotions. For example, foster children are at greatly increased risk of developing substance abuse problems and antisocial behaviors (Pottick et al., 2005; Racusin et al., 2005).

We focus our intervention efforts on young children rather than older children because we assume that the longer children experience maltreatment and disrupted attachments, the more difficult it will be to effect change through therapeutic interventions. Although our intervention appears powerful in this context, we expect that it would function as palliative in cases where children experience many disruptions in care. Nonetheless, Fisher and his colleagues (Fisher et al., in press) have been successful in intervening with older children, targeting their regulatory capabilities in developmentally appropriate ways.

Limitations

The results of this study should be interpreted cautiously given the small sample size and the brief time frame. We look forward to extending these findings

as we continue to enroll children in the study and continue to follow children postintervention. Given the robustness of the findings and the large effect size, we are optimistic that these findings will be supported as the sample size is expanded and the time frame extended. It will be particularly important to examine conditions under which the intervention is most and least effective as the sample size is increased, questions that cannot be examined with the current small sample. We stress the importance of not generalizing these findings to children of different ages than those included here. Cortisol, in particular, tends to show atypical patterns when children have experienced early adversity, regardless of child age. However, the particular patterns that emerge may be age-specific (Dozier et al., 2006; Pears & Fisher, 2005).

Conclusions

In conclusion, we suggest the importance of developing evidence-based treatments for children in foster care. This is a high-risk group that shows a number of regulatory problems. These problems are seen at the time that children are in foster care, and appear predictive of later long-term problems (McIntyre & Keesler, 1986; Pilowsky, 1995; Pottick et al., 2005; Racusin et al., 2005). We expect that the earlier interventions can occur, the less likely there will be long-standing problems. Interventions with preschoolers have focused successfully upon regulatory problems as well (Fisher et al., in press), though addressing those in somewhat different ways than addressed here. We suggest the importance of developing evidence-based services for these high-risk children, and helping child welfare agencies make the move to implement such services. We have provided early results from a randomized clinical trial as an example of how this process of developing evidence-based treatments for foster children might proceed.

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