



Emotion Regulation among Children in Foster Care Versus Birth Parent Care: Differential Effects of an Early Home-Visiting Intervention

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Abstract

Children involved with Child Protective Services (CPS) often show worse emotion regulation than non-involved children, with downstream effects on adaptive functioning. The current study uses two randomized control trials, one conducted with foster caregivers and one conducted with birth parents, to investigate the longitudinal effects of caregiver type (foster versus birth parent) and a home-visiting parenting intervention on emotion regulation among young children referred to CPS. Participants were 211 children referred to CPS during infancy or toddlerhood, of whom 120 remained with their birth parents and 91 were placed in foster care. Caregivers were randomly assigned to receive Attachment and Biobehavioral Catch-Up (ABC), a 10-session intervention designed to promote nurturing, sensitive, and non-intrusive caregiving, or a control intervention. Caregiver type moderated the effects of ABC on young children's observed anger dysregulation during a frustrating task at age 2 to 3 years. Among children remaining with their birth parents, children whose caregivers received ABC showed lower anger dysregulation than children whose caregivers received the control intervention. Children placed in foster care showed lower anger dysregulation than children with birth parents regardless of parenting intervention, and additionally showed higher adaptive regulation than children remaining with their birth parents. Adaptive regulation was not significantly associated with parenting intervention or the caregiver by intervention interaction. Results suggest that foster care placement may be protective for emerging emotion regulation skills among young children referred to CPS, and an attachment-based parenting intervention buffers risks of remaining in the home for young children's emotion dysregulation.

Keywords Emotion regulation · Child maltreatment · Foster care · Attachment · Parenting · Home-visiting intervention

The goal of the child welfare system is to protect children from abuse, neglect, and related adversities known to threaten healthy development. A minority of children referred to Child Protective Services (CPS) are placed in foster care, with the majority receiving services in their own homes (U.S. Department of Health and Human Services 2016). Further research is needed to clarify the relative risks of being placed in foster care versus remaining in the home following referral

to CPS, particularly with regard to children's self-regulatory development. Additionally, given the existence of empirically supported parenting interventions for families involved with CPS (Fisher et al. 2006), research is needed regarding the effectiveness of intervention in promoting adaptive development, including young children's emerging emotion regulation skills, across placement types.

According to the U.S. Department of Health & Human Services, 3.6 million allegations of maltreatment involving 6.6 million children were reported to Child Protective Services (CPS) in 2014. As a result of these referrals, 1.3 million children received child welfare services, including more than 200,000 who entered foster care that year (U.S. Department of Health and Human Services 2016). Notably, children referred to CPS and removed from the home are disproportionately very young. In 2014, more than one-quarter of child maltreatment victims were younger than 3 years, with the highest rates observed in infants under age one (U.S. Department of Health and Human Services 2016).

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Similarly, one-third of children entering foster care in 2017 were younger than three years old, and almost 20% were younger than 1 year old (U.S. Department of Health and Human Services 2018).

Early entry into the child welfare system is particularly concerning because of key developmental tasks that characterize infancy and toddlerhood. These tasks include establishing a sense of safety and security, forming attachment relationships, and co-regulating emotions and behaviors with the assistance of responsive caregivers. According to an organizational perspective on development, success in these early tasks lays the foundation for effective navigation of future challenges (Sroufe and Rutter 1984). Childhood maltreatment represents a failure of the caregiving environment to facilitate these developmental tasks, contributing to early patterns of emotional, behavioral, and physiological dysregulation and conferring risk for maladjustment across the lifespan (Cicchetti and Toth 2015; Dozier et al. 2013; Kaplow and Widom 2007).

Although foster care is intended to mitigate maltreated-related risks, removal from the home often involves additional challenges, including disruptions in attachment relationships, uncertainty about future caregiving arrangements, and variability in foster parents' emotional commitment to their foster children (Bernard and Dozier 2011; Newton et al. 2000). Young children in foster care show greater difficulty with emotional and behavioral regulation than demographically similar peers from community samples (Pears et al. 2010; Robinson et al. 2009). However, such studies do not disentangle effects of placement from the effects of maltreatment itself, and little is known about the costs and benefits of foster care placement compared with child welfare services in the home. Some studies suggest that school-age children remaining with their birth families have better behavioral outcomes than children who are placed in foster care, although this may be attributable in part to greater maltreatment severity experienced by children removed from the home (Doyle 2007; Jonson-Reid and Barth 2000). Other studies have found that children in foster care show more normative patterns of physiological regulation in toddlerhood (Bernard et al. 2010) and better cognitive outcomes in preschool (Zajac et al. 2019) than children who remain with their birth families, suggesting that foster care may be protective in the context of early maltreatment. Interpretation of these results is complicated by the impossibility of random assignment and the inherent confounding of maltreatment severity with placement decisions.

Emotion Regulation in the Context of Maltreatment and Foster Care

Emotion regulation, defined as the ability to modulate emotional arousal in support of goal-directed behavior (Thompson

and Meyer 2007), may be a particularly vulnerable developmental domain for children exposed to early adversity. Emotion regulation typically develops in the context of relationships with caregivers and is facilitated by a secure attachment relationship, parental modeling of adaptive regulation, and supportive responses to children's emotions (Eisenberg et al. 1998, 2010; Morris et al. 2007). During infancy and toddlerhood, parents are especially important co-regulators of infant emotion, behavior, and physiology (Calkins and Keane 2009). Successful experiences regulating distress with the help of a responsive caregiver prepare infants and toddlers to regulate their own emotions with increasing independence across development (Calkins 1994; Thompson and Meyer 2007). Of note, children may show biologically-based individual differences in the propensity to experience and express specific emotions (Rothbart 1981). Infants who are temperamentally prone to high negative affect may elicit less sensitive caregiving as parents' co-regulatory resources are depleted over time (Cole et al. 2004).

Maltreating parents often struggle to serve this co-regulatory role, failing to respond supportively to children's emotional needs and instead responding punitively or dismissively (Kim and Cicchetti 2010; Shipman et al. 2007; Shipman and Zeman 2001). They may also model heightened emotional reactivity, more negative expressiveness, and less effective regulatory strategies than non-maltreating parents (Cicchetti and Toth 2015; Wilson et al. 2008). The experience of childhood maltreatment thus increases young children's experience of negative emotions, such as anger, frustration, and fear, while simultaneously undermining the co-regulatory capacity of the parent-child relationship. As a result, young children exposed to child maltreatment would be expected to show more dysregulated expression of negative affect and lower use of adaptive regulation.

Consistent with theoretical predictions, child maltreatment has been linked to alterations in emotion processing and regulation across the lifespan (Camras et al. 1983; Cicchetti and Toth 2015; Jedd et al. 2015; Pollak et al. 2000). Children exposed to maltreatment have been reported to show more negative affect dysregulation and lower adaptive regulation than non-maltreated peers, with one longitudinal study suggesting that increases in negative dysregulation at age seven years developmentally precedes decrements in adaptive regulation at age eight (Kim-Spoon et al. 2013). Difficulty regulating emotions during frustrating tasks has been observed in young maltreated children living in foster care and with their birth families. Compared with non-maltreated peers, one- to three-year-old children in foster care showed higher anger intensity and lower positive affect intensity while completing a series of teaching tasks with their birth parent (Robinson et al. 2009). Similarly, among preschool-aged children living with their birth parents, family violence exposure (i.e., child maltreatment and interparental violence) predicted greater

frustration during laboratory tasks, including a mother-child joint problem-solving interaction and an emotionally challenging individual task designed to elicit frustration (Cipriano et al. 2011).

Such deficits in emotion regulation are concerning because difficulty managing negative emotions has been linked to long-term problems with social functioning, academic achievement, and emotional health (Cole et al. 2004; Eisenberg et al. 2010; Graziano et al. 2007; Zeman et al. 2006). Indeed, emotion dysregulation has been found to mediate the effects of early maltreatment on later psychopathology in middle childhood (Alink et al. 2009; Kim and Cicchetti 2010; Kim-Spoon et al. 2013) and adolescence (Egeland et al. 2002). Given the deleterious impact of early maltreatment on young children's self-regulatory development, as well as its salience as a predictor of long-term adjustment, the study of emotion regulation in the context of the child welfare system may be particularly important for understanding and promoting resilient functioning among young children exposed to early adverse care.

Attachment and Biobehavioral Catch-Up

Attachment and Biobehavioral Catch-up (ABC) is a home-based parenting intervention designed to enhance infants' and toddlers' ability to regulate their emotions, behaviors, and physiology by increasing parenting sensitivity (Dozier and Bernard 2019). ABC is delivered by parent coaches, who provide in-the-moment commenting and video feedback to scaffold targeted parenting behaviors: a) following the child's cues, b) responding with nurturance to children's distress, and c) avoiding frightening behaviors. Each of these intervention targets is expected to enhance parents' effectiveness at co-regulating children's emotions by promoting sensitive and supportive responses to children's affective cues, minimizing parental modeling of affective dysregulation, and reducing the likelihood that parental behavior will elicit overwhelming negative emotions from the child (Lind et al. 2014).

ABC has been shown to be effective at improving parenting sensitivity and enhancing child adjustment among families experiencing a range of adversities, including child maltreatment (Dozier and Bernard 2019). Randomized clinical trials with both foster parents and birth parents referred to CPS have demonstrated ABC's effectiveness in promoting parenting sensitivity (Bick and Dozier 2013; Lind et al. 2019), parent-child attachment security (Bernard et al. 2012; Dozier et al. 2009), and children's self-regulation of biology, affect, and behavior (Bernard et al. 2015a; Lind et al. 2014, 2017, 2019).

The current study combined data from two randomized control trials (RCTs), one evaluating the efficacy of ABC

among foster parents and one targeting birth parents whose children remained in the home following referral to Child Protective Services. Previously published studies from the foster care RCT demonstrated benefits of ABC for enhancing parenting sensitivity (Bick and Dozier 2013) and reducing attachment avoidance (Dozier et al. 2009). The RCT conducted with CPS-involved birth parents has yielded evidence that ABC enhances parenting sensitivity (Lind et al. 2019), infants' attachment organization and security (Bernard et al. 2012); normalizes diurnal cortisol production during toddlerhood (Bernard et al. 2015a) and the preschool period (Bernard et al. 2015b); and improves behavioral compliance in early childhood (Lind et al. 2019). Most relevant to the current study, a previously published paper from the foster care diversion trial found that children whose parents received the ABC intervention showed less negative affect during a mildly frustrating laboratory task (Tool Task; see below for more details) than children whose caregivers received a control intervention (Lind et al. 2014). However, no previous studies have investigated the effect of ABC on negative affect expression among young children in foster care, or on young children's adaptive emotion regulation during the laboratory challenge. Further, no previous studies have combined samples to evaluate the effect of placement on CPS-involved children's emotion regulation.

The current study addressed gaps in the literature by investigating multiple aspects of emotion regulation among young children referred to CPS who a) remained with their birth parents or b) were placed in foster care. Given evidence that foster care may be protective with regard to physiological regulation (Bernard et al. 2010), we anticipated that children in foster care would show less negative affect dysregulation and more adaptive regulation than CPS-referred children who remained with their birth families. Because ABC has been linked to better self-regulatory functioning among children in foster care (Lind et al. 2017) and among CPS-referred children remaining with birth parents (Bernard et al. 2015a; Lind et al. 2019), we expected that children whose caregivers received ABC would show lower negative affect dysregulation and more adaptive regulation across caregiver type. Given lack of prior research regarding differential effects of intervention among foster parents versus birth parents, we did not have a priori hypotheses regarding a potential interaction of intervention with caregiver type.

Methods

Participants

Participants were drawn from two randomized control trials (RCTs) evaluating the efficacy of an attachment-based parenting intervention for families involved with Child Protective

Services (CPS) due to maltreatment concerns during infancy or toddlerhood. One RCT focused on efficacy of the intervention among foster parents, who were referred to participate in the study by child welfare agencies in Pennsylvania, New Jersey, and Delaware. Out of 290 children initially enrolled in the study, 96 were retained for post-intervention data collection; many initially enrolled children did not complete research visits or intervention sessions due primarily to changes in caregivers, with new caregivers unable to be contacted or declining to participate. The second RCT focused on the efficacy of the intervention among birth parents participating in a foster care diversion program in Philadelphia; families were referred to participate by child welfare agencies in Pennsylvania. Families were involved with CPS for a range of reasons, including allegations of child abuse and neglect and/or the presence of established risk factors for child maltreatment, including exposure to domestic violence, parental substance use, and homelessness. Of the 210 families enrolled in the intervention, 183 participated in post-intervention follow-up.

The current study included all children whose caregivers participated in one of these trials when the child was an infant and who completed an assessment of emotion regulation in toddlerhood (M age = 27.8 months, $SD = 5.4$). Participants were 211 children of 198 caregivers, including 91 children of 83 caregivers from the foster care RCT and 120 children of 115 parents from the birth parent RCT. The current foster care sample is comparable to originally enrolled foster families in terms of caregiver education, household income, caregiver marital status, race/ethnicity, and child sex. Although the vast majority of foster caregivers were female, foster caregivers who participated in follow-up were more likely to be male than those who attrited (6.5% vs. 1.0%, $p = 0.01$). Regarding the RCT targeting birth parents, retained families do not differ significantly from attrited families in terms of caregiver education, race/ethnicity, and child sex. Relative to birth parents without follow-up data, birth parents in the current sample reported slightly higher household incomes ($M = 1.63$ vs. 1.36 on a 7-point scale, $p = 0.04$) and were more likely to be married (26.5% vs. 5.1%, $p < 0.001$).

Demographics of the current sample are presented in Table 1. No significant differences between foster families and birth families were observed for intervention, child sex, or caregiver sex. Children in foster care were older at the time of the emotion regulation assessment (M age = 29.5 months vs. 26.5 months, $p < 0.001$) than children living with their birth parents. Children and caregivers in the foster care group were more likely to be white/non-Hispanic (children: $p < 0.01$; caregivers: $p < 0.001$) and less likely to be Hispanic (children: $p < 0.05$; caregivers: $p = 0.001$) than participants in the birth parent group. Caregivers of children in foster care also were older, had higher household incomes, and were more highly educated (p 's < 0.001) than parents of children remaining with

their birth families. Caregivers in the foster care group were also more likely to be married or cohabitating ($p < 0.001$) and less likely to be single ($p < 0.001$) than caregivers in the birth family group. Regarding intervention experiences, groups did not significantly differ in number of sessions completed (foster care $M = 9.3$ sessions; birth parent $M = 9.6$ sessions; $p = 0.27$), age at intervention completion (foster care M age = 15.2 months; birth parent M age 13.7 months, $p = 0.14$) or in length of time elapsed between intervention and emotion regulation assessment (foster care M lag = 13.4 months; birth parent M lag = 11.7 months, $p = 0.17$).

Among children placed in foster care, the age of first separation from birth parents ranged from zero days (i.e., removed at birth) to 883 days (29.0 months), with a mean of 200 days (6.6 months). Of the 91 children in the foster care group, 25 were placed with relatives and 61 were placed with non-relatives; kinship status was unknown for the remaining five placements. Forty-three children were in adoptive or pre-adoptive placements, including 15 who had been adopted by the date the emotion regulation assessment was completed. Nine children initially placed in foster care had been reunified with their birth parents by the time of the toddlerhood visit, and three children originally remaining with their birth parents had been placed in foster care. Children were classified into groups based on their initial caregiver.

Procedures

The University of Delaware Institutional Review Board approved all study procedures. In general, the referral process was the same for the RCT involving children in foster care and the RCT involving families in the foster care diversion program. In both RCTs, families were referred to the study by child welfare agencies. Families were then contacted by research staff and invited to participate in the study, with written informed consent obtained from caregivers for themselves and legal guardians providing consent for children. In both RCTs, consent for longitudinal follow-up assessment was obtained at the time of the initial trials.

After completing a pre-intervention assessment, participating caregivers were randomized to receive either the Attachment and Biobehavioral Catch-up (ABC) intervention or a control intervention focused on promoting children's cognitive and motor development (Developmental Education for Families; DEF). The experimental and control intervention were similar in structure, format, and duration. Both interventions consisted of 10 h-long sessions delivered in the home by trained parent coaches who received weekly supervision, including review of session video-recordings.

As described above, ABC focused on enhancing caregiver nurturance (sessions 1 and 2), promoting sensitivity to child cues (sessions 3 and 4), and minimizing frightening behaviors (sessions 5 and 6). Sessions 7 and 8 involved identifying

Table 1 Demographics by caregiver type

	Birth Parents Group <i>n</i> = 120 (%)	Foster Care Group <i>n</i> = 91 (%)	Contrasts
Intervention (ABC)	49.2	46.2	ns
Child Sex (Female)	46.7	48.4	ns
Child Race/Ethnicity			
African-American	61.7	65.9	ns
White/Non-Hispanic	8.3	23.1	<i>BP</i> < <i>FC</i> **
Multiracial	16.7	7.7	<i>Ns</i>
Hispanic	13.3	3.3	<i>BP</i> > <i>FC</i> *
Caregiver Sex (Female)	96.7	93.4	ns
Caregiver Race/Ethnicity			
African-American	62.5	51.6	ns
White/Non-Hispanic	15.0	39.6	<i>BP</i> < <i>FC</i> ***
Multiracial	4.2	5.5	ns
Hispanic	15.8	2.2	<i>BP</i> > <i>FC</i> **
Caregiver Marital Status			
Married/Cohabiting	25.0	53.8	<i>BP</i> < <i>FC</i> ***
Single, Never Married	62.5	25.3	<i>BP</i> < <i>FC</i> ***
Separated, Divorced, or Widowed	6.6	6.6	ns
Caregiver Education			<i>BP</i> < <i>FC</i> ***
Less than High School	60.8	12.1	
High School Degree or GED	26.7	26.4	
Some College	4.2	26.4	
Baccalaureate Degree	0.8	11	
Post Baccalaureate Degree	0.8	2.2	
Household Income			<i>BP</i> < <i>FC</i> ***
< \$10,000/Welfare	54.2	15.4	
\$10,000–\$19,999	14.2	4.4	
\$20,000–\$29,000	10	22	
\$30,000–\$39,000	4.2	12.1	
\$40,000–\$59,000	1.7	8.8	
\$60,000–\$99,000	0	14.3	
More than \$100,000	0	11	

Percentages sum to less than 100% due to minority of missing data

BP birth parent, *FC* foster caregiver, *ns* nonsignificant

* *p* < 0.05, ** *p* < 0.01, *** < 0.001

aspects of caregivers’ childhood attachment experiences and/or current thought patterns that may interfere with behaving in nurturing or sensitive ways, in order to help caregivers to recognize and override these influences. Sessions 9 and 10 focused on consolidating gains and celebrating change using video feedback to highlight caregivers’ strengths.

DEF was adapted from a home-visiting program that was previously shown to enhance intellectual functioning (Ramey et al. 1982, 1984). Sessions involved teaching caregivers developmentally stimulating activities to do with their young children during daily life. Activities involving parental sensitivity were excluded to minimize overlap in intervention content.

Thirteen families had two children enrolled in the clinical trial, including eight sets of twins. Both siblings were assigned to the same intervention to minimize spillover effects.

Families with two children in the study received one “dose” of intervention, with both children present during sessions. In-vivo and video feedback from the parent coach was directed towards caregiver-child interactions with both children.

Enrolled families were invited to participate in yearly research visits between the ages of 2 and 4 years. The emotion regulation task was conducted at both the 24- and 36-month research visits. Data from the earliest available assessment were used for the current study to ensure that no participants had prior experience with the paradigm.

Measures

Emotion Regulation Children's post-intervention emotion regulation was assessed using the Tool Task (Matas et al. 1978), a structured parent-child interaction designed to elicit child frustration. The Tool Task involves a sequence of increasingly challenging problems intended to be too difficult for a young child to solve independently. At each stage, the child is asked to retrieve a small toy that is visible in a clear Plexiglass container but accessible only by using available tools in a specific way. Caregivers were instructed to allow their children to attempt the problem themselves for a few minutes, and then to give the child "any assistance that you think he (or she) needs."

Children's emotion expression and regulatory behavior were coded from video-recordings of the Tool Task using its corresponding manual (Sroufe et al. 1983). To assess emotion expression, children were rated on scales tapping anger (possible range 1–6), frustration directed toward the caregiver (possible range 1–7), global negative affect (possible range 1–4), and global positive affect (possible range 1–3). Children were also rated on regulation-relevant behaviors, including dependency (i.e., attention-, reassurance-, and help-seeking behavior; possible range 1–6), noncompliance (i.e., willingness to listen to and comply with the caregiver; possible range 1–6), persistence (i.e., ability to remain goal-oriented; possible range 1–5), enthusiasm (i.e., affective engagement in and enjoyment of the task; possible range 1–7), and coping (i.e., ability to remain organized as task difficulty increases; possible range 1–7). For all scales, a score of one reflects the lowest intensity and the maximum scale-point reflects the highest intensity of the construct being coded.

Coders were undergraduate and graduate students blind to other study data. Coders were trained by a senior graduate student to acceptable reliability on a set of training tapes prior to coding for the present study. Fifteen percent of tapes were double-coded and inter-rater reliability was assessed using intraclass correlations (*ICCs*). Interrater reliability was good to excellent, with *ICCs* ranging from 0.60 (global negative affect) to 0.83 (anger) and the majority of scales falling in the excellent range. Descriptive statistics are presented in Table 2 and reflect relatively low levels of negative affect expression and moderate levels of theoretically adaptive behaviors, such as coping, persistence, and enthusiasm. A prior study found that, in an overlapping sample of CPS-referred children who remained with their birth families, children whose parents received ABC showed lower negative affect expression (i.e., anger, frustration toward the caregiver, and global negative affect) than those whose parents received DEF (Lind et al. 2014). Other scales have not been previously analyzed, and Tool Task data have not been reported for children placed in foster care.

An exploratory factor analysis using maximum likelihood estimation and oblimin rotation was conducted in order to identify latent factors underlying the nine scales reflecting child emotion expression and regulatory behaviors during the Tool Task. Two factors were identified based on visual identification of the scree plot and eigenvalues greater than 1. This was further supported using parallel analysis, an alternative technique that identifies the point at which eigenvalues derived from observed data are smaller than those derived from a random dataset of the same size, and thus likely to reflect random noise. Parallel analysis was conducted using the psych package (Revelle 2018) in R (R Core Team 2016) and corroborated a two-factor solution.

The factor analytic solution is presented in Table 2. The first factor was defined by behaviors associated with adaptive regulation (both in terms of strategies used and affective outcomes): coping, enthusiasm, persistence, and positive affect all loaded positively, whereas dependency and noncompliance loaded negatively. Standardized pattern loadings ranging from |0.52| to |0.93| and this factor accounted for 59.24% of the variance in child behavior. The second factor comprised child anger, frustration toward the caregiver, and global negative affect (loadings 0.67–0.94). This factor, reflecting negative affect dysregulation, accounted for an additional 12.20% of the variance in child behavior.

Adaptive regulation and negative affect dysregulation composites were computed by reverse coding dependency and noncompliance, and then standardizing and averaging the relevant indicators. Composites were negatively correlated at $r = -0.66$ ($p < 0.001$), indicating that approximately 44% of the variance of the two constructs was shared and 56% was independent.

Demographic Covariates Caregivers reported on their own and their child's date of birth, sex, and racial/ethnic background, as well as their own education level, household income, and marital status. Education level was coded on a five-point scale from 1 – *Less than high school* to 5 – *More than 4-year college degree*. Household income was coded on a seven-point scale from 1 – *Welfare/Less than \$10,000 a year* to 7 – *Over \$100,000 a year*. Caregiver education and household income were strongly correlated ($r = 0.61$, $p < 0.001$), and were standardized and averaged to form an overall measure of household socioeconomic status (SES). Marital status was dummy-coded (1 = married/cohabitating; 0 = not married/cohabitating).

Caregiver and child age, sex, and minority race/ethnicity, as well as caregiver marital status and household SES, were evaluated as potential demographic covariates. Given age-related increases in self-regulatory development, particularly across early childhood (Thompson and Meyer 2007; Zelazo and Carlson 2012), we expected child age to be negatively associated with anger dysregulation and positively associated

Table 2 Descriptive statistics and two-factor solution for child behavior codes from Tool Task

Scale	Descriptive statistics			Factor Loadings	
	Mean	SD	Range	I	II
Anger	1.70	1.26	1.0–6.0	0.00	0.94
Frustration toward the caregiver	1.59	1.23	1.0–7.0	0.05	0.85
Global negative affect	1.59	0.86	1.0–4.0	–0.21	0.67
Global positive affect	1.70	0.68	1.0–3.0	0.73	–0.19
Coping	4.30	1.72	1.0–7.0	0.91	0.04
Enthusiasm	4.42	1.61	1.0–7.0	0.93	0.07
Persistence	3.28	1.04	1.0–5.0	0.59	–0.05
Dependency	2.95	1.39	1.0–6.0	–0.57	–0.31
Noncompliance	2.45	1.43	1.0–6.0	–0.52	0.04
Variance accounted for by factor	–	–	–	59.24%	12.20%
Cumulative variance explained	–	–	–	59.24%	71.45%
Eigenvalue	–	–	–	5.33	1.10

Exploratory factor analysis using maximum likelihood extraction and oblimin rotation. Standardized factor loadings from the pattern matrix are presented. Loadings for the assigned factor are in bold

with adaptive regulation. Furthermore, given evidence that self-regulatory development is impaired in the context of sociodemographic risk (Blair and Raver 2012), we anticipated that household SES would be negatively related to anger dysregulation and positively related to adaptive regulation. Other demographic variables were not expected to relate to Tool Task performance.

Plan for Analysis Focal analyses were two univariate analyses of covariance (ANCOVA), one predicting anger dysregulation and one predicting adaptive regulation. Independent variables were Caregiver Type (foster caregiver vs. birth parent) and Intervention (ABC vs. DEF), with child age as a continuous covariate. Analyses used all participants with available outcome data. Within the sample of available cases, we included all children whose caregivers were randomized to a given intervention, regardless of whether or not the full intervention was completed, consistent with an intent-to-treat approach. The majority of caregivers (91.9%) completed all ten sessions, and rates of completion did not significantly differ by intervention or caregiver type.

Consistent with recommendations from Miller and Chapman (2001), we did not initially control for SES because this was expected to remove meaningful variance in the difference between foster and birth family households. However, we planned robustness checks controlling for household SES and any other demographic covariates significantly associated with Tool Task performance at the bivariate level. We additionally planned follow-up analyses a) excluding one child from each of 13 sibling pairs, and b) excluding the 12 children (nine in the foster care group and three in the birth family group) whose caregiver type had changed by the time of the Tool Task assessment.

Within the sampling frame of the current study, missing data from focal variables were minimal, ranging from 0% (anger dysregulation, adaptive regulation, child demographics) to 8.5% (household SES). Data were considered to be missing at random. For ANCOVAs including covariates with missing data, multiple imputation with fully conditional specification was conducted using the mice package (Groothuis-Oudshoorn and Van Buuren 2011).

Results

Descriptive statistics and zero-order correlations among primary study variables are presented in Table 3. As expected, child age and SES were both negatively associated with anger dysregulation and positively associated with adaptive regulation. Caregiver age was negatively associated with anger dysregulation and was retained as a covariate for future analyses. All other demographic variables were excluded from further analyses.

Of note, within the foster care group, independent-samples t-tests revealed no significant differences in anger dysregulation or adaptive regulation based on foster placement type (relative versus non-relative, $p = 0.99$; adoptive/pre-adoptive versus non-adoptive, $p = 0.34$).

Anger Dysregulation

In ANCOVA analyses, main effects emerged for Caregiver Type [$F(1, 206) = 15.24, p < 0.001$] and Intervention [$F(1, 206) = 9.82, p = 0.002$], qualified by a significant Caregiver Type x Intervention interaction [$F(1, 206) = 5.49, p = 0.02$].

Table 3 Descriptive statistics and bivariate correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Anger dysregulation	–											
2. Adaptive regulation	–0.66***	–										
3. Caregiver type (foster)	–0.25***	0.21**	–									
4. Intervention (ABC)	–0.15*	0.08	–0.03	–								
5. Child age (months)	–0.22***	0.36***	0.28***	0.09	–							
6. Child sex (female)	0.06	–0.02	0.02	0.00	0.05	–						
7. Child minority race	0.06	–0.10	–0.21**	–0.00	–0.12	0.07	–					
8. Caregiver age (years)	–0.15*	0.11	0.61***	0.07	0.19**	–0.01	–0.10	–				
9. Caregiver sex (female)	–0.12 [†]	0.10	–0.08	–0.01	0.09	–0.01	0.10	–0.11	–			
10. Caregiver minority race	0.05	–0.04	–0.28***	–0.07	–0.09	0.03	0.63***	–0.16*	0.07	–		
11. Caregiver marital status	–0.12	0.04	0.36***	0.00	0.18*	–0.01	–0.22**	–0.29***	–0.09	–0.30***	–	
12. Household SES	–0.19**	0.16*	0.61***	0.06	0.30***	0.03	–0.30***	0.54***	–0.17*	–0.37***	0.42***	–
Means (% if dichotomous)	0.00	–0.00	43.1%	47.9%	27.81	47.4%	85.3%	34.79	95.2%	73.9%	41.4%	–0.03
Standard Deviation	0.90	0.79	–	–	5.38	–	–	11.32	–	–	–	0.90

For caregiver type, 1 = foster care, 0 = birth family. For ABC intervention, 1 = ABC, 0 = DEF. For child and caregiver sex, 1 = female, 0 = male. SES = Socioeconomic status (mean of Z-scored education and household income rating). For minority race, 1 = non-White, 0 = White/non-Hispanic

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Child age was additionally associated with anger dysregulation [$F(1, 206) = 7.02, p = 0.002$] in the expected direction. Estimated marginal means for each combination of caregiver type and intervention are presented in Fig. 1. Among children whose caregivers received the comparison intervention, anger dysregulation was significantly higher for children remaining with their birth parents [$M = -0.24, 95\% CI (-0.48, -0.00)$] than those placed in foster care [$M = 0.40, 95\% CI (0.19,$

$0.62)$; contrast = $0.64, p < 0.001$]. This corresponds to a large effect size of foster care placement within the DEF group (Cohen's $d = -0.73$ using estimated marginal means). There was no significant difference by caregiver type among children whose caregivers received ABC [foster care $M = -0.17, 95\% CI (-0.44, 0.09)$; birth family $M = -0.08, 95\% CI (-0.30, 0.14)$; contrast = $0.09, p = 0.61$]. There was not a main effect of intervention on anger dysregulation for children placed in

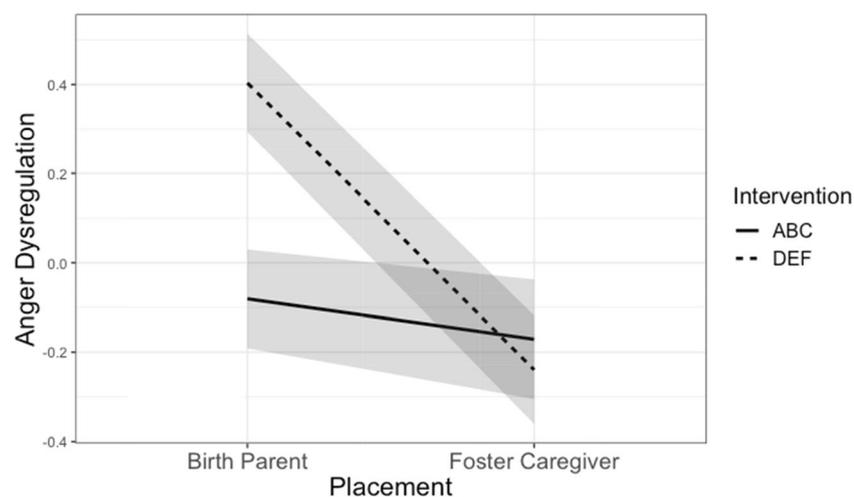


Fig. 1 Estimated marginal means of anger dysregulation for caregiver type by intervention group. Note: Caregiver Type by Intervention interaction is significant, $p < 0.05$. Among children whose caregivers received the comparison intervention, anger dysregulation was significantly higher for children remaining with their birth parents than for children living with foster parents ($p < 0.001$). There was no

significant effect of caregiver type on anger dysregulation among children whose caregivers received ABC ($p = 0.61$). Similarly, among children remaining with their birth parents, children whose caregivers received ABC showed significantly lower anger dysregulation than children whose caregivers received DEF ($p < 0.01$). There was no significant effect of intervention among children in foster care ($p = 0.70$)

foster care [ABC $M = -0.17$, 95% $CI (-0.44, 0.09)$ vs. DEF $M = -0.24$, 95% $CI (-0.48, -0.00)$; contrast = -0.07 , $p = 0.70$]. Consistent with previously published findings (Lind et al. 2014), a main effect of intervention emerged for birth children, with children in the ABC group showing lower anger dysregulation than children in the DEF group [ABC $M = -0.08$, 95% $CI (-0.30, 0.14)$ vs. DEF $M = 0.40$, 95% $CI (0.19, 0.62)$; contrast = 0.48 , $p < 0.01$].

Given bivariate associations between demographic covariates and Tool Task performance, the ANCOVA predicting anger dysregulation was repeated controlling for household SES and caregiver age. Neither household SES nor caregiver age significantly predicted anger dysregulation. Caregiver Type, Intervention, and the Caregiver \times Intervention interaction continued to predict anger dysregulation controlling for demographic covariates. In planned follow-up analyses, findings were robust when excluding one sibling from each of 13 sibling pairs, and when excluding children whose caregiver type had changed by the time the Tool Task was completed.

Adaptive Regulation

Adaptive regulation was positively associated with Caregiver Type [$F(1, 206) = 2.67$, $p = 0.03$] and child age [$F(1, 206) = 23.24$, $p < 0.001$]. Children placed in foster care showed a modest advantage in adaptive regulation over children who remained with their birth parents ($\eta_p^2 = 0.02$). Adaptive regulation was not significantly related to intervention or the interaction between intervention and caregiver type. Estimated marginal means for each combination of caregiver type and intervention are presented in Fig. 2. Of note, assessment of linear contrasts indicated that the difference in adaptive regulation between children in foster care versus children remaining with their birth parents was significant only for families in the comparison condition (caregiver contrast for DEF group = -0.32 , $p = 0.03$; caregiver contrast for ABC group = -0.07 ,

$p = 0.65$). This discrepancy should be interpreted with caution given the nonsignificance and small effect size of the interaction term ($\eta_p^2 = 0.01$).

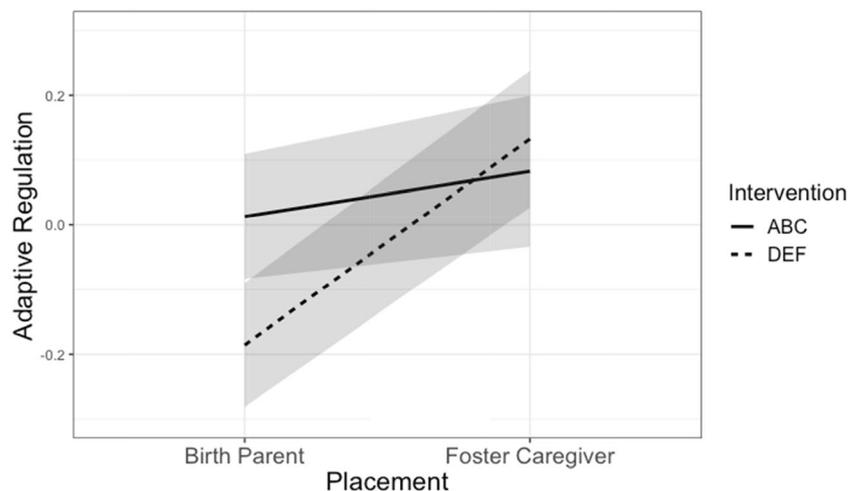
The ANCOVA predicting adaptive regulation was repeated controlling for household SES and caregiver age as a planned robustness check. The effects of caregiver type and child age were robust to these additional demographic controls, neither of which significantly predicted adaptive regulation. Findings were also unchanged when excluding one sibling from each of 13 sibling pairs. The association between caregiver type and adaptive regulation declined in magnitude ($\eta_p^2 = 0.02$ vs. 0.01) and became nonsignificant [$F(1, 194) = 2.71$, $p = 0.10$] when excluding children whose caregiver types had changed.

Discussion

The purpose of this study was to evaluate the effects of caregiver type and intervention on emotion regulation skills among young children referred to CPS due to concerns about child maltreatment. Based on prior research, we anticipated that placement in foster care (versus living with birth parents) and an attachment-based parenting intervention (versus a developmentally-focused comparison intervention) would each be associated with better emotion regulation among toddler-aged children, as evidenced by better regulation of negative affect and greater use of adaptive regulatory behaviors during a mildly stressful laboratory interaction.

Hypotheses were partially supported. In ANCOVAs predicting anger dysregulation, caregiver type and intervention were each associated with children's negative affect expression during a frustrating task in the expected direction. This corroborates expectations that foster care placement would be an organizing influence for young children exposed to maltreatment-related risk, and that the ABC intervention

Fig. 2 Estimated marginal means of adaptive regulation for caregiver type by intervention group. Note: Caregiver Type by Intervention interaction is nonsignificant ($\eta_p^2 = 0.01$)



would help young children co-regulate negative emotions in the presence of primary caregivers. Main effects were qualified by a significant Caregiver by Intervention interaction. The difference between caregiver types was significant only for children who received the comparison intervention; children whose birth parents received the ABC intervention did not differ significantly from children in foster care with regard to anger dysregulation. This suggests that ABC serves a protective function, buffering young children's emotion regulation skills from additional risks associated with remaining in the home following CPS involvement.

Anger dysregulation was quite low among children in foster care regardless of intervention group, which suggests that out-of-home placement may mitigate emotional lability among young children referred to CPS. Alternately, this may reflect a pattern of dampened emotional expression sometimes observed among maltreated children (Maughan and Cicchetti 2002; Shipman and Zeman 2001), and believed to reflect a conditional adaptation to an unpredictable and frightening environment (Rogosch et al. 1995). Emotional overcontrol, even when associated with positive behavioral outcomes, would be expected to result in wear-and-tear on physiological systems (Brody et al. 2013). However, in other research, foster care placement was associated with more normative regulation of cortisol production (Bernard et al. 2010), supporting the inference that lower anger dysregulation is adaptive and foster care placement is protective for young children's emerging self-regulation. Findings were robust to demographic controls, suggesting that the buffering function of foster care is not attributable solely to sociodemographic advantages of foster parents.

Hypotheses related to adaptive regulation were also partially supported. Caregiver type significantly predicted children's adaptive regulation during the Tool Task, such that children in foster care showed higher levels of adaptive regulatory behaviors, including coping, persistence, and enthusiasm, than children remaining with their birth parents. This is consistent with predictions and with findings that foster care placement was associated with lower anger dysregulation (averaged across intervention group).

Neither intervention nor the Caregiver by Intervention interaction significantly predicted children's adaptive regulation. These null findings may suggest that ABC initially functions to reduce young children's negative lability rather than enhance their adaptive regulatory behaviors. This is consistent with an organizational perspective on development: although co-regulatory processes were not explicitly measured in the current study, infants and toddlers are expected to rely largely on caregivers to co-regulate distress before mastering adaptive self-regulatory techniques involving in persisting and coping with stressors. Later in childhood, we may expect to see corresponding increases in adaptive regulatory behaviors associated with the ABC intervention. This developmental progression would be consistent with prior research indicating that

increased emotional lability preceded difficulty with adaptive regulation among children exposed to early maltreatment (Kim-Spoon et al. 2013).

Although the interaction term was nonsignificant and small in size ($\eta_p^2 = 0.01$), post-hoc linear contrasts of estimated marginal means revealed that differences in adaptive regulation by caregiver type were significant only for families receiving the comparison intervention. The nonsignificant caregiver effect within the ABC group provides preliminary evidence that ABC may buffer risks to adaptive regulation associated with remaining in the home following CPS referral; however, this should be interpreted with caution given the nonsignificant interaction. Assessing placement and intervention effects later in childhood, as self-regulation becomes increasingly developmentally salient, may help to clarify the potentially protective role of ABC in promoting adaptive regulation among CPS-referred children remaining with their birth families.

The main effect of caregiver type on child adaptive regulation was robust to demographic controls, corroborating the finding that foster care confers self-regulatory advantages beyond those associated with SES. However, the association between foster care placement and better adaptive regulation became nonsignificant when excluding children whose caregiver type had changed by the date of the Tool Task. Comparison of estimated marginal means indicated that adaptive regulation for the foster care group declined after excluding nine children who had been reunified with their birth parents ($EMM = 0.06$ vs. 0.11). Although cell sizes are too small to draw conclusions about the effects of different foster care experiences, future research should evaluate effects of placement timing and duration on children's self-regulatory development.

This study is characterized by several strengths, including high potential for impact on child welfare policy and practice. Causal inference is strengthened by randomization to intervention group, which provides a strong test of theoretical models of clinical change. Additional strengths include observational assessment of emotion regulation and collaboration with child welfare services to identify a high-risk community sample of young children affected by maltreatment. Despite these strengths, the current study is limited by the inherent confounding of maltreatment severity and placement decisions, as well as lack of access to CPS records that would allow us to characterize differences in maltreatment-related risk. Additionally, we did not have a low-risk comparison group, preventing us from making normative judgments about typical levels of negative emotion expression, nor did we assess individual differences in child temperament that may have shaped parenting behavior, response to intervention, and children's self-regulation.

Future research should seek to identify specific parenting behaviors associated with intervention effects and foster care placement advantages. Children's emerging emotion

regulation skills should be assessed longitudinally across development in order to describe trajectories of dysregulation and adaptive regulation among CPS-referred children. Additionally, associations between emotion regulation skills and child functioning should be evaluated to assess the long-term impact of child welfare placements and parenting interventions on child outcomes across domains.

Overall, findings indicate that foster care placement is associated with enhanced emotion regulation among young children referred to CPS due to concerns about early maltreatment. Results further suggest that the ABC intervention buffers risks to emotion regulation associated with remaining at home following referral to CPS. This study contributes to a small literature regarding the impact of placement decisions on child development and adds to a growing body of evidence that an attachment-based parenting intervention enhances young children's self-regulation long after the intervention is complete. Results have the potential to inform child welfare services and enhance emotion regulation outcomes among young children exposed to maltreatment-related risk.

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Compliance with Ethical Standards

Conflict of Interest The authors declare they have no conflicts of interest to report.

Ethical Approval This study was conducted in accordance with the principles of the Helsinki Declaration.

Informed Consent Approval was obtained from the Institutional Review Board of the University of Delaware.

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