

Intervening With Attachment and Biobehavioral Catch-Up to Reduce Behavior Problems Among Children Adopted Internationally: Evidence From a Randomized Controlled Trial

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Heather A. Yarger¹ , Teresa Lind^{2,3} , K. Lee Raby⁴, Lindsay Zajac⁵ , Allison Wallin⁵, and Mary Dozier⁵

Abstract

Children who have been adopted internationally often exhibit persistent behavior problems. The current study assessed the efficacy of the Attachment and Biobehavioral Catch-up intervention (ABC; Dozier & Bernard, 2019) for reducing behavior problems in 122 children adopted internationally. Behavior problems were measured via parent-report using the Brief Infant Toddler Social Emotional Assessment at a pre-intervention visit and after the intervention when children were between 18 and 36 months. Children's behavior problems were also observed using the Disruptive Behavior Diagnostic Observation Schedule (DB-DOS) after the intervention when children were 48 and 60 months. Parents who received ABC reported fewer child behavior problems than parents who received the control intervention immediately after the intervention through 1.5 years post-intervention. Additionally, children whose parents received ABC exhibited fewer behavior problems within the parent context of the DB-DOS when they were 48 months old (2 years post-intervention) than children whose parents received the control intervention. There were no significant intervention effects on children's observed behavior problems within the examiner contexts. These results support the efficacy of ABC in reducing behavior problems among children adopted internationally. Trial registration: ClinicalTrials.gov NCT00816621.

Keywords

parenting, intervention, international adoption, behavior problems

Group-based, institutional care represents a form of severe neglect that increases the risk that children will develop social-emotional and behavioral problems (Fox et al., 2011; Ghera et al., 2009). Although children who experience institutional care early in life demonstrate significant improvements in behavior problems following adoption (Juffer & van IJzendoorn, 2005; van IJzendoorn & Juffer, 2006), adopted children continue to experience challenges with regulating behavior (Dalen & Theie, 2014; Juffer & van IJzendoorn, 2005). Therefore, there is a need to develop effective interventions that reduce behavioral problems among this unique group of children. Attachment and Biobehavioral Catch-up (ABC; Dozier & Bernard, 2019) is a brief parenting intervention that has been shown to promote healthy developmental outcomes among children who have experienced neglect or forms of maltreatment (e.g., Bernard et al., 2012, 2015; Lind et al., 2017) and to improve social competence among children adopted internationally (Lind et al., 2020). Because international adoption itself represents an intervention by placing children into safe

and stable family environments (van IJzendoorn et al., 2007; van IJzendoorn & Juffer, 2005), it was unclear if the ABC intervention would further enhance child behavioral outcomes within this population. The current study investigated whether children whose parents were randomized to receive ABC demonstrated fewer behavior problems than children whose parents were randomized to receive a control intervention.

¹ Department of Psychology, University of Maryland, College Park, MD, USA

² Department of Psychiatry, University of California, San Diego, CA, USA

³ Child and Adolescent Services Research Center (CASRC), San Diego, CA, USA

⁴ Department of Psychology, University of Utah, Salt Lake City, UT, USA

⁵ Department of Psychological and Brain Sciences, University of Delaware, Newark, DE, USA

Corresponding Author:

Heather A. Yarger, 0112 Biology-Psychology Building, College Park, MD 20742, USA.

Email: hyarger@umd.edu

The Early Caregiving Environment and Social–Emotional Development

The quality of care children experience during the first few years of life serves as a key contributor to children's developing emotional and behavioral regulatory abilities (e.g., Bowlby, 1988; Cohn & Tronick, 1989). During the first few years of life, children develop self-regulatory abilities and strategies through reciprocal dyadic parent-child interactions (Kopp, 1989; Tronick & Gianino, 1986). By sensitively responding to children's needs especially during times of distress, parents serve as co-regulators and help children develop their own independent regulatory capabilities (Field, 1994; Sroufe, 1996). Alternatively, insensitive parenting places children at risk for difficulties with effective self-regulation, such as behavior problems (Calkins & Johnson, 1998; Halligan et al., 2013; Haltigan et al., 2013). Behavior problems in infancy and early childhood may persist into adolescence and adulthood (e.g., Tremblay et al., 2018), emphasizing the need for early intervention to prevent these problematic developmental trajectories.

Additionally, the first 2 years of life is an important period for the development of attachments to one's caregivers (Ainsworth et al., 1978; Bowlby, 1969). Children who form secure attachments to their caregivers are less likely to develop externalizing and internalizing behavior problems than insecurely attached children, with effects sustained through adolescence (e.g., Fearon et al., 2010; Groh et al., 2012). The robust and relatively long-term effects of attachment on children's development emphasize the importance of early intervention to promote the parent-child relationship.

Caregiving Experiences and Behavior Problems of Children Adopted Internationally

Depending on the country of origin, children without permanent families may experience institutional or group care and/or multiple transitions between foster families prior to adoption (Juffer & Rosenboom, 1997). Children living in an institution often experience conditions that are incompatible with their needs to form attachment relationships with a small number of caregivers, such as high caregiver-to-child ratios and frequent changes in caregivers (Gunnar et al., 2000). Long-term foster care can also be problematic for children's developing regulatory abilities and attachment relationships due to the lack of stability with caregivers and/or placements (Dozier & Lindhiem, 2006). These adverse early caregiving environments place children at increased risk for behavior problems (e.g., Humphreys et al., 2015; Tizard & Rees, 1975).

After adoption, most internationally adopted children show improvements with regard to developmental outcomes, including reduced levels of behavior problems (van IJzendoorn & Juffer, 2006), especially prior to the preschool age (e.g., Melås et al., 2014). However, meta-analytic results indicate that children who have been adopted internationally exhibit higher levels of social–emotional problems, including internalizing and

externalizing problems, than non-adopted children (Askeland et al., 2017; Hawk & McCall, 2010; Juffer & van IJzendoorn, 2005). Additionally, some adopted children show persistent behavior problems since adoption (Gunnar et al., 2007; Rutter et al., 2007). For example, Koss et al. (2014) found that children adopted internationally demonstrated significantly more parent-reported attention problems and teacher-reported externalizing problems at the start of kindergarten than their non-adopted peers. Children adopted internationally are also referred for mental health services more often than non-adopted children (van IJzendoorn & Juffer, 2006). These continued difficulties point to a need for interventions aimed at reducing behavioral problems for children adopted internationally.

The quality of care children adopted internationally receive post-adoption influences their behavioral adjustment through all stages of development. For example, among a sample of children adopted between 24 and 145 months, experiencing positive parenting within the adoptive family was associated with few emotional and behavioral problems (Hornfeck et al., 2019). Further, parental sensitivity during the first 2 years post-adoption was positively associated with emotion regulation abilities in a sample of 93 previously institutionalized internationally adopted children followed from 26 months through 71 months of age (Koss et al., 2020). Additionally, parental sensitivity early in life was negatively associated with delinquent behavior during adolescence among children adopted internationally into the Netherlands (van der Voort et al., 2013). Another risk factor placing children at risk for behavior problems is the development of insecure attachments to caregivers, which children adopted internationally experience at high levels (van den Dries et al., 2009). Taken together, these studies highlight the impact parenting quality and parent-child attachment relationships have on the short- and long-term behavioral adjustment of children adopted internationally.

Several interventions for children adopted internationally exist and have been shown to be effective at reducing behavior problems (Harris-Waller et al., 2018). Recent meta-analyses of parenting-focused intervention programs indicated that few interventions have been developed for internationally adopted children within the first 2 years of life (Schoemaker et al., 2019; for a notable exception see Juffer et al., 2005). Rather, the majority of interventions have been designed for children who were adopted at later ages. In addition, follow-up assessments of intervention effects years after the completion of the intervention have not been routinely examined, as the majority of studies reported post-intervention assessments within four months of the pre-intervention visit (Schoemaker et al., 2019). Importantly, Schoemaker et al.'s (2019) meta-analysis reported that interventions with a higher number of sessions were most effective at reducing behavior problems. Thus, questions remain as to whether a *brief* parenting intervention for children adopted internationally would lead to *long-term* reductions in behavior problems.

Attachment and Biobehavioral Catch-Up

Attachment and Biobehavioral Catch-up (ABC) is a parenting-focused intervention that was originally developed to improve parenting behavior among families with children who have experienced early adversity (Dozier & Bernard, 2019). ABC is a brief intervention, consisting of only 10 sessions. Interventionists use a manualized intervention and “in-the-moment commenting” (Caron et al., 2016; Dozier & Bernard, 2019) to encourage parents to respond in nurturing ways when children are distressed, to respond in sensitive ways when children are not distressed, and to consistently behave in non-frightening ways. Results of several randomized controlled trials have demonstrated the positive effects of ABC on parenting quality among parents involved with Child Protective Services (Yarger et al., 2016) and foster parents (Bick & Dozier, 2013; Raby et al., 2018). ABC has also been shown to be efficacious in improving children’s biological and behavioral regulatory abilities. Specifically, children whose parents were randomized to receive ABC exhibited higher rates of secure attachments to their caregivers, more normative diurnal hypothalamic-pituitary-adrenal axis functioning, less negative affect, fewer behavior problems, and more compliance than children whose parents received a control intervention (Bernard et al., 2012; Bernard et al., 2015; Dozier et al., 2006; Lind et al., 2014; Lind et al., 2019). Furthermore, ABC has been shown to improve cognitive skills—including executive functioning (Lind et al., 2017) and receptive language abilities (Raby et al., 2018)—among children in foster care. Finally, prior analyses with the current sample of families who adopted internationally indicated that ABC led to more increases in sensitive parenting (Yarger et al., 2019) and children’s social competence (Lind et al., 2020). The current study extends these earlier findings by examining ABC’s effects on behavior regulation in this sample of children adopted internationally.

Current Study

The goal of the current study was to assess whether a brief intervention aimed at enhancing parenting quality for young children adopted internationally results in fewer behavior problems than seen among children in a control group. We hypothesized that children adopted internationally whose parents were randomized to receive ABC would demonstrate fewer behavior problems on both parent-reported and observational measures of behavior problems than children whose parents were randomized to receive a control condition.

Method

Participants

Parents who adopted internationally were recruited from international adoption clinics and parent groups in the Mid-Atlantic region of the United States. Parents were eligible to participate in the study if they had a child who had been adopted from

outside of the United States that was 36 months old or younger. Presence of behavior problems was not a criterion for enrollment. The current sample consisted of 122 children (52.5% female) who enrolled, were randomized to receive either the ABC or the control intervention, and completed at least one assessment of behavior problems. Children ranged in age from 3.98 months to 46.46 months old at the time of entering parents’ care ($M = 17.00$ months, $SD = 7.73$), and children were on average 21.55 months old ($SD = 8.22$) at the time of the pre-intervention visit. Fifty (41.0%) of the children were adopted from China, 24 (19.7%) from Russia, 19 (15.6%) from South Korea, 15 (12.3%) from Ethiopia, 4 (3.3%) from Kazakhstan, and 23 (8.1%) from other countries. Ninety-four children (77.0%) and 45 children (36.8%) were reported to have experienced some time in institutional care or time in foster care prior to adoption, respectively. The majority of adoptive parents were White (93.4%), had either completed college (40.2%) or at least some post-bachelor education (42.6%), and were married (91.0%). More than half (57.4%) of the parents reported annual family incomes over \$100,000. See Table 1 for demographic information by intervention group.

Procedure

Pre-intervention and post-intervention research assessments. Families who expressed interest in the study received a home visit from the project coordinator, and written informed consent was obtained upon agreement to participate. After pre-intervention assessments were conducted, a project coordinator randomly assigned families to the experimental intervention (Attachment and Biobehavioral Catch-up; ABC) or control intervention (Developmental Education for Families; DEF) using a randomly generated number sequence (with intervention assignment based on even versus odd digits) and simple randomization. Participants and research staff who collected the data were masked to intervention condition. Data for the present study were collected during the pre-intervention visits, the initial post-intervention follow-up visit, and visits conducted after completion of the intervention when children were 24, 30, 36, 48, and 60 months old. See Figure 1 for the Consolidated Standards of Reporting Trials (CONSORT) Flow Diagram. Approval for the conduct of this research was obtained from the University of Delaware Institutional Review Board.

Interventions. The experimental (ABC) and control (DEF) intervention were similar in structure, frequency, and duration. Both interventions consisted of 10 training sessions conducted in the families’ homes and were based on structured manuals. Individuals who administered the interventions (referred to as “parent coaches”) had at least a bachelor’s degree. All parent coaches participated in training prior to implementation of their intervention, and these trainings were followed by weekly group supervision to monitor and track fidelity throughout implementation of the interventions. Additional details

Table 1. Demographic Characteristics of Adoptive Children and Parents by Intervention Condition.

Variable	ABC (n = 61)	DEF (n = 61)	Test of Difference
Child age at pre-intervention visit (Months), M (SD)	21.13 (7.96)	21.94 (9.61)	$t(112) = 0.48, p = .63$
Region adopted, % (n)			$\chi^2(1, 122) = 0.18, p = .67$
Eastern Europe	23.0 (14)	26.2 (16)	
Other regions	77.0 (47)	73.8 (45)	
Child biological sex, % (n)			$\chi^2(1, 122) = 0.00, p = 1.00$
Male	47.5 (29)	47.5 (29)	
Female	52.5 (32)	52.5 (32)	
Child age at adoption, M (SD)	17.45 (7.67)	16.57 (7.83)	$t(118) = -0.62, p = .54$
Time institutionalized, M (SD)	11.02 (9.36)	9.99 (7.32)	$t(120) = -0.67, p = .51$
Household income, % (n)			$\chi^2(2, 118) = 0.16, p = .92$
\$40,000 - \$59,999	6.8 (4)	6.6 (4)	
\$60,000 - \$99,999	31.1 (19)	34.4 (21)	
More than \$100,000	59.0 (36)	55.7 (34)	
Marital status, % (n)			$\chi^2(2, 120) = 0.09, p = .77$
Married or living together	90.2 (55)	91.8 (56)	
Single	6.6 (4)	8.2 (5)	
Household education, % (n)			$\chi^2(3, 120) = 3.23, p = .36$
Completed high school	0.0 (0)	3.3 (2)	
Some college/trade school	13.1 (8)	14.8 (9)	
Completed college	36.1 (22)	44.3 (27)	
Post-baccalaureate degree	47.5 (29)	37.7 (23)	

Note. ABC: Attachment and Biobehavioral Catch-up; DEF: Developmental Education for Families. When the raw numbers do not add up to the total sample, this is due to families not answering those demographic questions.

regarding the number of interventionists and training is described in Lind et al. (2020) and Yarger et al. (2019).

Experimental intervention: Attachment and biobehavioral catch-up intervention (ABC). The ABC intervention sought to improve children's self-regulatory capabilities by enhancing parents' sensitivity (Dozier & Bernard, 2019). Three main parenting targets were the focus of the intervention: a) providing nurturance in response to children's distress, b) following the lead of their children, and c) avoiding frightening or intrusive behavior. For the current sample of families, parents' concerns about any indiscriminately sociable behavior was also discussed along with methods to manage these concerns. Parent coaches worked to change parenting behaviors through discussion of intervention targets, practicing parenting behaviors during structured activities, and watching videos designed to illustrate and reinforce target behaviors. In addition, parent coaches made "in-the-moment" comments about parent-child interactions throughout the sessions (Caron et al., 2016). Through these "in-the-moment" comments, parent coaches were able to point out when parents were behaving in sensitive ways, and were able to scaffold parents during more challenging moments. Both the quantity and quality of comments by the parent coach during sessions are linked to positive changes in parenting behavior in ABC (Caron et al., 2016). In addition to weekly supervision regarding their cases, parent coaches received weekly supervision and feedback regarding the frequency and accuracy of their "in-the-moment" comments.

Control intervention: Developmental education for families (DEF). The DEF intervention was adapted from a home-visiting program developed by Ramey and colleagues (1984) that was found to be effective in enhancing children's intellectual functioning when provided intensively and for a long duration (Brooks-Gunn et al., 1993; Ramey et al., 1984). For the current study, aspects of the intervention that targeted parental sensitivity were omitted in order to reduce any overlap with ABC targets. The DEF intervention was chosen as a control intervention given its positive outcomes on children's cognitive and developmental functioning and lack of overlap with ABC. The DEF intervention targeted three developmental areas: a) gross and fine motor skills, b) language acquisition, and c) cognitive development. During sessions, parent coaches discussed strategies to help children reach developmental milestones, practiced these skills with the parents and children, and used video feedback to review skills and demonstrate children's gains throughout the intervention.

Measures

Parent-reported problem behavior. The Brief Infant-Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan & Carter, 2006) is a 42-item, nationally-standardized measure designed to assess parent perceptions of behavior problems and social competence in young children. The BITSEA yields two scores, a competence score and a total problem score (Karabekiroglu et al., 2010). The total problem score was used in the current study and comprises 31 items. Higher scores indicate higher levels of behavioral and emotional problems. In the

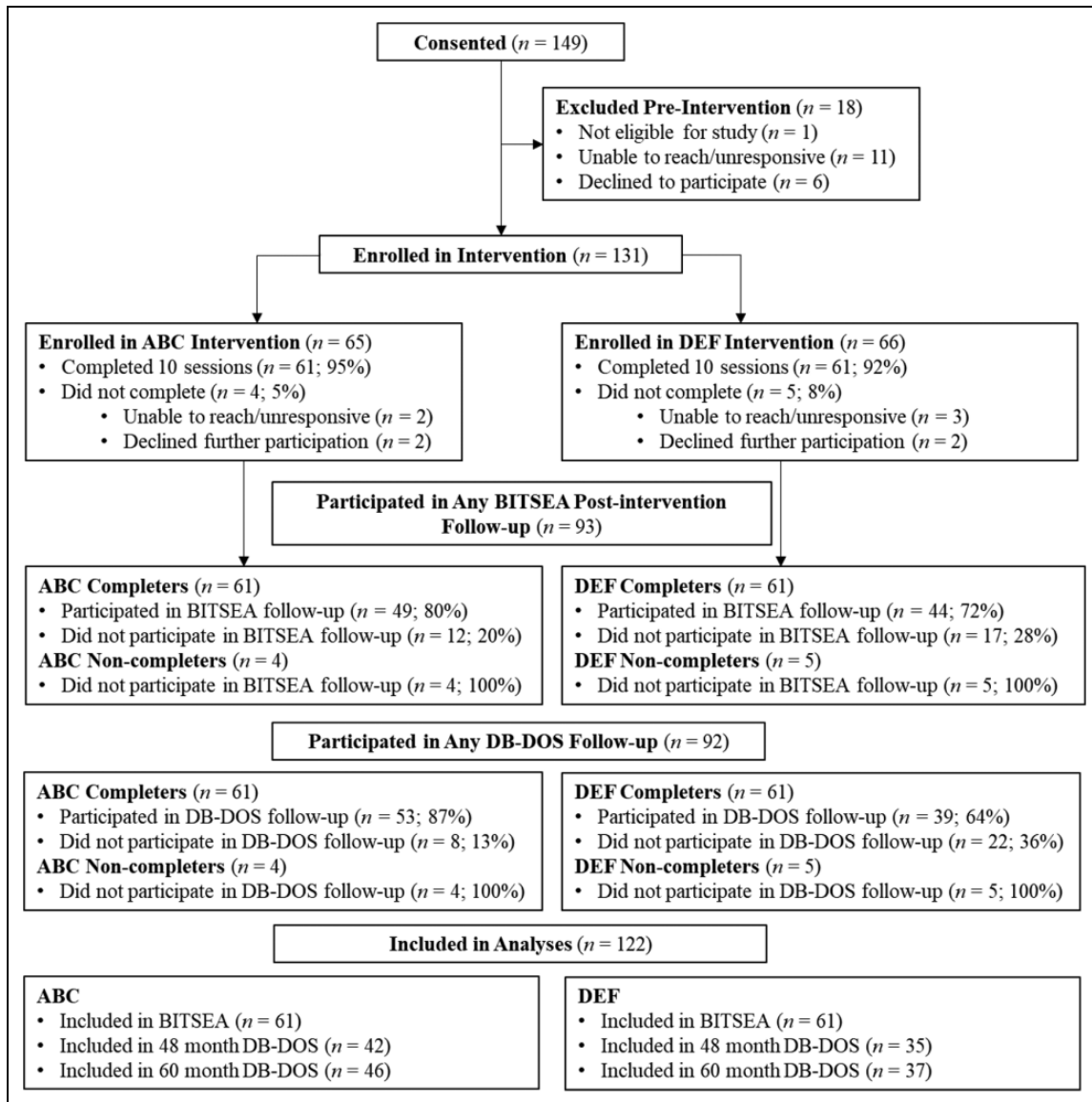


Figure 1. Consolidated standards of reporting trials (CONSORT) flow diagram. Note. DEF: Developmental Education for Families; ABC: Attachment and Biobehavioral Catch-up.

present study, the BITSEA was collected at the pre-intervention assessment ($\alpha = .73$), the initial post-intervention assessment ($\alpha = .63$), and additional post-intervention assessments when children were 24 months ($\alpha = .61$), 30 months ($\alpha = .56$), and 36 months ($\alpha = .73$). A total of 307 BITSEA questionnaires were completed by 119 families (114 completed a pre-intervention BITSEA and 93 families completed at least 1 post-intervention BITSEA). Because the BITSEA is validated for use with children aged 12 months to 36 months (Briggs-Gowan et al., 2004), the measure was discontinued after the child's third birthday. As a result, the sample sizes of those with available BITSEA data are smaller as children continue through the longitudinal follow-ups.

Observed behavior problems. The Disruptive Behavior Diagnostic Observation Schedule (DB-DOS; Wakschlag, Briggs-Gowan,

et al., 2008a; Wakschlag, Hill, et al., 2008b) assesses children's abilities to regulate their behavior and emotions and their social-emotional reciprocity. During the DB-DOS, children complete a series of frustrating tasks in three different contexts: parent present, examiner present, and examiner busy. In the Parent context, the child interacts with the parent, who is instructed to engage in a series of activities with his or her child. In the Examiner Present context, the child is asked to complete a series of tasks while the examiner responds to all of the child's cues and participates in the activities with the child. During the Examiner Busy context, the examiner retreats to the corner of the room and interacts minimally, so that the child is required to independently complete a different series of tasks. The DB-DOS was collected when children were 48 months and 60 months. Children were too young at pre-intervention for assessments using this measure.

Table 2. Means and Standard Deviations for Outcome Variables and Age at Visit by Intervention Condition.

Visit	ABC			DEF		
	Mean Score (SD)	Mean Age Months (SD)	n	Mean Score (SD)	Mean Age Months (SD)	n
BITSEA						
Pre-intervention	9.02 (5.40)	21.13 (7.96)	55	10.33 (5.40)	21.94 (9.61)	59
0 – 6.99 months post-intervention	6.69 (4.14)	26.25 (6.79)	62	9.30 (3.52)	25.92 (7.30)	54
7 – 12.99 months post-intervention	7.12 (4.80)	31.40 (5.50)	19	8.80 (6.27)	29.50 (5.50)	15
13 – 18.99 months post-intervention	6.33 (2.72)	35.01 (4.91)	15	8.36 (4.67)	35.21 (2.89)	11
19 – 28 months post-intervention	8.13 (3.56)	37.17 (1.23)	8	7.13 (3.48)	36.35 (3.15)	8
DB-DOS						
48-month Examiner Present	1.54 (1.96)	50.18 (1.89)	42	1.32 (1.80)	50.26 (1.86)	34
48-month Examiner Busy	1.74 (2.49)	–	42	1.91 (2.88)	–	33
48-month Parent	3.89 (3.60)	–	41	5.60 (4.10)	–	35
60-month Examiner Present	0.73 (1.22)	65.96 (6.51)	46	0.95 (2.42)	65.37 (6.11)	37
60-month Examiner Busy	1.21 (2.19)	–	46	1.30 (2.82)	–	37
60-month Parent	3.33 (3.09)	–	46	3.32 (3.57)	–	37

Note. ABC: Attachment and Biobehavioral Catch-up; DEF: Developmental Education for Families; BITSEA: Brief Infant Toddler Social Emotional Assessment; DB-DOS: Disruptive Behavior Diagnostic Observation Schedule. For the BITSEA, parents completed multiple visits during each time-bin in some cases. Data analyses in HLM accounted for duplicate assessments of each parent-report of behavior problems. Briggs-Gowan et al. (2004) identified cutoffs for the Behavior problems scale of the BITSEA as low as 13; however, these vary depending on age and sex of the child.

Separate teams of undergraduate and graduate students were trained by a reliable DB-DOS coder in order to code the child’s behavior within one of the three contexts of the DB-DOS. Items were scored using a 0-3 scale. Six items were summed to obtain the *Behavioral Regulation Problems* scale, which assesses the child’s compliance, aggression, and oppositionality. The behavioral regulation problems scale was used for the current study because it has been shown to be a reliable and valid assessment of problems with emotion and behavior regulation (Wakschlag, Briggs-Gowan, et al., 2008a; Wakschlag, Hill, et al., 2008b). Two coders rated 18%–20% of DB-DOS videos and showed good inter-rater reliability via single measures one-way random effects models. Specifically, all interclass correlation estimates were between .75 and .91. When two codes were available, the average of the two codes was calculated prior to summing the items. See Table 2 for means, standard deviations, and sample size at each time-point by intervention group.

Data Analytic Strategy

Descriptive statistics, bivariate correlations, chi-square tests, and analyses of variance (ANOVA) were completed using Statistical Package for the Social Sciences (SPSS) version 24.0. Full maximum likelihood estimation was used to account for missing data and an intent-to-treat analysis was used.

We conducted piecewise linear growth models for BITSEA data rather than separate analyses for each time-point. This reduced the number of analyses and therefore the risk of a Type 1 error. These analyses allowed for variability in the number and spacing of time-points and accounted for the non-independence of repeated measures of parent-reported child problem behavior. The first linear component (Piece 1) captured change between pre-intervention parent-reported behavior problems and the first follow-up visit after completion

of the intervention. The second linear component (Piece 2) captured change in parent-reported behavior problems across all follow-up visits after completion of the intervention. In order to examine whether intervention-related differences in parenting behavior remained significant at each follow-up time-point, we re-centered the model’s intercept by re-coding the time variables. Specifically, time was recoded with respect to time since completion of the intervention in 6-month intervals. For example, the pre-intervention visit was coded as “-1,” the first post-intervention visit through 6 months post-intervention was coded as “0,” 7 months post-intervention through 12 months post-intervention was coded as “1” and so on. See Table 2 for means, standard deviations, and sample size at each time-point by intervention group.

HLM Student Version 7.03 software was used for these analyses (Raudenbush et al., 2011; Raudenbush & Bryk, 2002). The level-1 (within-persons) variable was time. The level-2 variable (between-persons) was intervention group (Intervention: 0 = DEF, 1 = ABC). Models were estimated using the following equations:

$$\text{Level-1 Model: } \text{Behavior}_{it} = \pi_{0i} + \pi_{1i}(\text{Piece } 1_{it}) + \pi_{2i}(\text{Piece } 2_{it}) + e_{it}$$

$$\text{Level-2 Model: } \pi_{0i} = \beta_{00} + \beta_{01}(\text{Intervention}_i) + r_{0i}$$

$$\pi_{1i} = \beta_{10} + \beta_{11}(\text{Intervention}_i) + r_{1i}$$

$$\pi_{2i} = \beta_{20} + \beta_{21}(\text{Intervention}_i) + r_{2i}$$

Results

Preliminary Analyses

Sample attrition. Seventy-six percent of the sample completed at least one follow-up BITSEA ($n = 93$), and 72.1% ($n = 88$)

completed both a pre and at least one follow-up BITSEA. In addition, 75.4% ($n = 92$) completed at least one DB-DOS assessment. To assess whether differential attrition threatened the validity of the results for the BITSEA and DB-DOS analyses, the characteristics of children who completed the follow-up assessments and those who did not were compared. For parent-reported behavior problems on the BITSEA, there were no significant differences between the groups with regard to intervention group, duration of institutional care, children's biological sex, child race or ethnicity, parent race or ethnicity, parent education, marital status, or family income. Significant differences were observed between those that completed a follow-up BITSEA versus those that did not with regard to child age at entering parent care, such that children were older at the time of entering the adoptive home if no BITSEA follow-up was completed than children who had a BITSEA follow-up completed ($t = 2.18, p < .03$). Further, child age at the pre-intervention assessment was significantly different between those that completed a follow-up BITSEA and those that did not ($t = 3.95, p < .01$). This is plausible given the age limitations of the BITSEA questionnaire, such that it is only valid for children aged 12 months to 36 months, and the average age at the time of the pre-intervention BITSEA in the group that did not have a follow-up BITSEA was 27.5 months ($SD = 12.0$ months).

For the assessment of observed child behavior problems on the DB-DOS, no significant differences were found between families who participated in the follow-up assessments and those who did not with regard to duration of institutional care, child age at entering the adoptive home, children's biological sex, children's race or ethnicity, parents' race or ethnicity, family income, parents' education, or marital status (all p -values > 0.05). Child age at time of the pre-intervention visit was significantly different between groups that had a follow-up DB-DOS and those that did not ($t = 4.90, p = .01$). As similarly reported in Lind et al. (2020), more families who received ABC participated in the 48 month and 60 month visits than families who received DEF (87% vs. 64%). As reported below, children who were randomized to receive the ABC or DEF interventions did not significantly differ on parent-reported behavior problems at the pre-intervention visit ($p = 0.24$). Therefore, it seems unlikely that there were systematic differences between the two groups with regard to behavior problems prior to the intervention.

Possible covariates. The number of months spent in institutional care prior to adoption was positively correlated with BITSEA scores at the pre-intervention visit ($r = .27, p < .01$) and first follow-up intervention visit ($r = .32, p < .01$). Duration of institutionalization was not significantly associated with behavior problems at the 24 month ($r = -.01, p = .97$), 30 month ($r = .20, p = .46$), or 36 month follow-ups ($r = .23, p = .09$). Children's biological sex (0 = female, 1 = male) was also significantly associated with the pre-intervention BITSEA ($r = .20, p = .03$), but not the first follow-up ($r = .04, p = .30$), 24 month ($r = -.03, p = .89$), 30 month ($r = .27, p = .31$), or 36 month follow-ups ($r = .12, p = .40$). Child age at the time of the pre-intervention visit was positively associated

with the pre-intervention BITSEA ($r = .20, p = .03$) but was not consistently significantly associated with post-intervention visits (i.e., first follow-up: $r = .11, p = .30$, 24 month: $r = -.39, p = .03$, 30 month: $r = .02, p = .94$, 36 month: $r = .04, p = .78$). Therefore, these variables were not included as covariates in the analyses of BITSEA data.

The number of months spent in institutional care prior to adoption was positively associated with observed child behavior problems during the DB-DOS 48-month Parent context ($r = .28, p = .02$) and 48-month Examiner Busy context ($r = .34, p < .01$), but not the 48-month Experimenter Present context or any of the 60-month contexts. Children's biological sex (0 = female, 1 = male) was not significantly associated with any of the 48-month DB-DOS contexts, but it was significantly associated with all three contexts at 60-months (Parent: $r = .26, p = .02$; Examiner Busy: $r = .26, p = .02$; Examiner Present: $r = .25, p = .02$). Age at time of the applicable DB-DOS assessment was not significantly correlated with behavior regulation during any of the contexts. Therefore, we examined the effects of the intervention on the 48-month DB-DOS both with and without controlling for time institutionalized and on the 60-month DB-DOS both with and without controlling for gender and time institutionalized.

Primary analyses

Two-piece model of change in parent-reported behavior problems

Pre-intervention levels of behavior problems. Children who were randomized to receive the ABC or DEF interventions did not significantly differ on parent-reported behavior problems at the pre-intervention visit ($p = 0.24$).

Post-intervention levels of behavior problems. As hypothesized, children whose parents received ABC reported significantly fewer parent-reported behavior problems at the first post-intervention visit than children whose parents received the DEF intervention (see Table 3). Specifically, children in DEF were estimated to show mean levels of behavior problems of 9.17 (β_{00}) at the first post-intervention visit, whereas children in ABC were estimated to have mean levels of behavior problems of 6.99 ($\beta_{00} + \beta_{01}$). This difference represents a medium effect size ($d = 0.68$). The average rates of change from pre- to post-intervention (i.e., piece 1 slope) and during the follow-up periods (i.e., piece 2 slope) were not statistically significantly different for DEF or ABC. However, there were significant individual differences in the variance (14.41, $p < .01$) of the mean rate of change from pre- to post-intervention. The significant effect of the intervention on parent-reported behavior problems remained significant when re-centering the intercept through 13 – 18.99 months post-intervention ($\beta_{01} = -2.02, p = .046$), representing a medium effect size ($d = 0.55$). The effect of the intervention was no longer significant when re-centering the intercept to 19 – 28 months post-intervention ($\beta_{01} = -1.94, p = .13$). See Figure 2 for HLM-estimated intercepts and slopes across time.

Table 3. Parameter Estimates for Linear Growth Model of Parent-Reported Behavior Change as a Function of Intervention Group Centered at First Post-Intervention Visit.

Fixed Effects	Coefficient	SE	t-ratio	p-value
Intercept: mean level of behavior problems at post-intervention for DEF (β_{00})	9.17	0.56	16.31	<.001
ABC effect on intercept β_{01}	-2.18	0.80	-2.72	.008
Piece 1 slope: mean rate of change in behavior problems from pre- to post-intervention for DEF (β_{10})	-1.07	0.70	-1.52	.130
ABC effect on piece 1 slope (β_{11})	-.99	0.99	-1.00	.321
Piece 2 slope: mean rate of change in behavior problems from initial post-intervention visit to additional follow-up visits (β_{20})	-.07	0.27	-.27	.791
ABC effect on piece 2 slope (β_{21})	.08	.38	.21	.830

Level-2 Random Effects	SD	Variance	p-value
Intercept variance, r_{0i}	3.37	11.37	<.001
Piece 1 slope variance, r_{1i}	3.80	14.41	<.001
Piece 2 slope variance, r_{2i}	0.25	0.06	.352

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

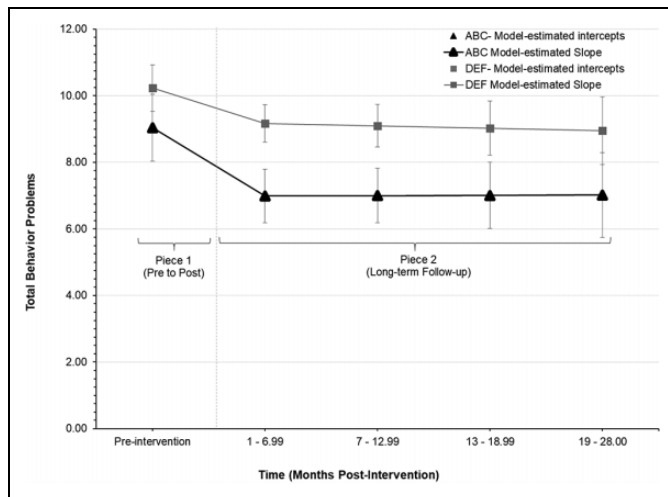


Figure 2. Change in parent-reported behavior problems from pre-intervention to 28 months post-intervention. Note. ABC: Attachment and Biobehavioral Catch-up. DEF: Developmental Education for Families.

Differences in observed behavior regulation problems. Next, we examined differences between children’s behavior problems using one-way analyses of variance, including group (i.e., ABC or DEF) as the independent variable and behavior regulation problems as the dependent variable. Separate analyses were performed for each of the three contexts at each age (48-months, 60-months): Parent, Examiner Present, and Examiner Busy. See Figure 3 for results.

Age 4 results. In the Parent context, children in the ABC group scored lower than children in the DEF group, $F(1, 75) = 4.02, p = .05$. This represents a medium effect size ($d = 0.46$). Next, we controlled for time institutionalized as this variable was associated with the outcome. Intervention group continued to predict differences in behavior regulation, $F(1, 75) = 5.52, p = .02$. This difference represented a medium effect size ($d = 0.45$). Within the Examiner Present context, the

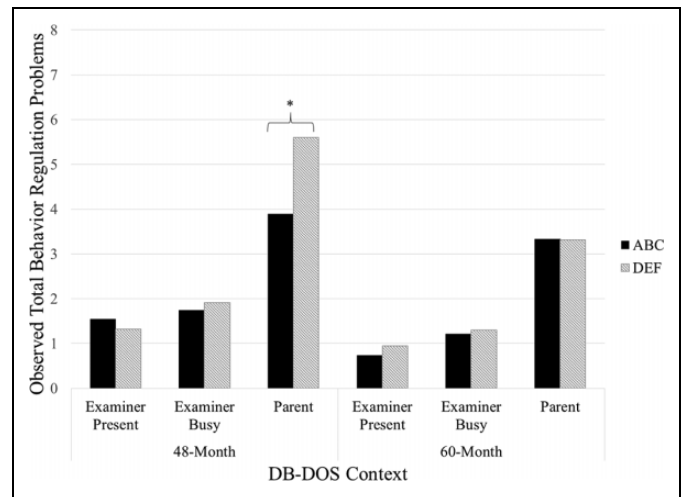


Figure 3. Observed behavior regulation problems on the Disruptive Behavior Diagnostic Observation Schedule by intervention group when children were 48 and 60 months old. Note. * $p < .05$ when controlling for time institutionalized. ABC: Attachment and Biobehavioral Catch-up. DEF: Developmental Education for Families.

difference between groups was not significant, $F(1, 75) = .26, p = 0.61, d = 0.12$. Similarly, within the Examiner Busy context, the difference between groups was not significant, $F(1, 75) = .08, p = 0.78, d = 0.06$. Decisions about statistical significance of these results did not change when controlling for time institutionalized.

Age 5 results. No significant intervention effects were observed during the 60-month follow-up in observed behavior. These results remained when controlling for gender and time institutionalized.

Discussion

The current study investigated whether a parenting-based intervention reduced the behavior problems of children adopted

internationally. Results provide support for the hypothesis that children of parents who received the ABC intervention demonstrate fewer behavior problems than children whose parents received a control condition. Specifically, at the first post-intervention assessment, children whose parents were randomized to receive ABC had significantly fewer parent-reported levels of behavior problems than children whose parents were randomized to receive the control condition. These reductions in parent-report behavior problems persisted 1.5 years post-intervention. Further, children whose parents received ABC exhibited fewer behavioral regulation difficulties during a structured observational task with their parents when they were approximately 4 years old than children who received the control intervention. Those differences were observed an average of 2.00 years ($SD = .86$) post intervention. No differences in children's behavioral regulation difficulties were observed when children were interacting with a researcher, and no differences were observed when children were approximately 5 years old.

These findings build upon results of several randomized controlled trials demonstrating the efficacy of ABC in promoting healthy developmental outcomes among other groups of children who have experienced early adversity, such as CPS-referred samples (e.g., Bernard et al., 2012; Bernard et al., 2015; Lind et al., 2014) and children in foster care (Lind et al., 2017; Raby et al., 2018). Lind et al. (2019) found that CPS-involved children whose parents were randomized into ABC exhibited greater compliance than children whose parents were randomized into a control condition, and Dozier et al. (2006) demonstrated that ABC was efficacious at reducing behavior problems in foster children. This is the first randomized controlled trial to demonstrate the effectiveness of ABC in reducing behavior problems among internationally adopted children.

Although effects of ABC were observed on parent-reported behavior problems at each follow-up time-point through 18.99 months post-intervention on the BITSEA, no intervention effects were observed on the slope. This suggests that children in both ABC and the control condition demonstrated reductions in parent-reported behavior problems over time. Although the rate of change in behavior problems over time may not have been significantly influenced by the intervention, results suggest that ABC set children on a trajectory of fewer behavior problems earlier than those in DEF. Results also indicated that intervention effects on the BITSEA were no longer significant 19–28 months post-intervention. However, this must be interpreted with caution as there were fewer children with data available to assess at this final time-point (i.e., $n = 16$). The reduction in sample size at the final time-point is partly due to the age range of children enrolled in our study, such that if children enrolled at a later age they would have fewer BITSEAs included in the analysis given that we collected these up until children reached 36 months. However, results suggest that ABC has the potential to reduce problem behaviors in children adopted internationally that goes above and beyond

the effect of children entering a safe and stable family environment after adoption.

Children randomized to receive ABC demonstrated significantly fewer behavioral regulation problems during the parent contexts but not during the examiner contexts of the DB-DOS at age 48 months than children who received the control intervention. Notably, both groups of internationally adopted children exhibited fewer behavioral regulation difficulties in the examiner contexts than in the parent context at both ages. Therefore, there may have been floor effects that interfered with an ability to detect intervention-related differences in these contexts. The effect of ABC on observed behavior regulation problems was no longer statistically significant when children were 5 years old. Examination of mean levels of behavior regulation problems in Figure 3 suggests that the lack of statistical significance between intervention groups at age 5 may be due to children who received DEF “catching-up” to children who received ABC regarding levels of behavior regulation problems. This result may suggest that the effect of ABC on children's observed behavior problems weakens with time. However, additional follow-up data are needed to evaluate this.

Previous meta-analyses of interventions that have been developed to reduce behavior problems in children adopted internationally have failed to include control conditions or random assignment to intervention groups (Chobhthaigh & Duffy, 2019) and have indicated that interventions with a higher number of sessions were most effective at reducing behavior problems (Schoemaker et al., 2019). Further, few interventions have been developed to intervene within the first few years of life (Schoemaker et al., 2019). The current experimental study addresses these important gaps. Additionally, this study demonstrates that a *brief* parenting intervention is effective at reducing behavior problems when previous work has suggested longer-term interventions are necessary to observe such change (Schoemaker et al., 2019). Other study strengths include the longitudinal assessment of behavior across time via a validated parent-report measure and a validated observational assessment. This study also used a sample of children adopted internationally that experienced a wide range of early pre-adoption caregiving experiences including severe neglect due to institutionalization.

This study is also characterized by several limitations. We did not have a pre-intervention observational assessment of children's social-emotional functioning because children were too young to permit a DB-DOS assessment at that time. However, we did have parent-report of relevant problem behavior at the time of the pre-intervention assessment (BITSEA), which demonstrated no significant differences between parent-reported behavior problems. An additional important limitation of this study is the lack of a gold-standard approach to monitoring intervention fidelity. However, a measure of intervention fidelity has been developed and utilized in more recent evaluations of ABC (Caron et al., 2018). Finally, the current study did not include assessments of behavior from multiple contexts (e.g., school, home) or from multiple

informants (e.g., teachers, parents, peers), pointing to another area of future research.

In conclusion, this study provides evidence that ABC, a brief parenting intervention, can reduce behavior problems among children adopted internationally. These findings underscore the importance of intervening early to promote positive development in children adopted internationally, such that it may place children on a long-term trajectory with fewer behavior problems into childhood and adolescence.


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ORCID iDs

Heather A. Yarger  <https://orcid.org/0000-0001-8031-0700>

Teresa Lind  <https://orcid.org/0000-0003-4524-9638>

Lindsay Zajac  <https://orcid.org/0000-0002-2305-4699>

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