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Attachment security as a mechanism linking foster care placement to improved mental health outcomes in previously institutionalized children

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Background: Children reared in institutions experience elevated rates of psychiatric disorders. Inability to form a secure attachment relationship to a primary caregiver is posited to be a central mechanism in this association. We determined whether the ameliorative effect of a foster care (FC) intervention on internalizing disorders in previously institutionalized children was explained by the development of secure attachment among children placed in FC. Second we evaluated the role of lack of attachment in an institutionalized sample on the etiology of internalizing disorders within the context of a randomized trial. **Methods:** A sample of 136 children (aged 6–30 months) residing in institutions was recruited in Bucharest, Romania. Children were randomized to FC (n = 68) or to care as usual (CAU; n = 68). Foster parents were recruited, trained, and overseen by the investigative team. Attachment security at 42 months was assessed using the Strange Situation Procedure, and internalizing disorders at 54 months were assessed using the Preschool Age Psychiatric Assessment. **Results:** Girls in FC had fewer internalizing disorders than girls in CAU (OR = 0.17, p = .006). The intervention had no effect on internalizing disorders in boys (OR = 0.47, p = .150). At 42 months, girls in FC were more likely to have secure attachment than girls in CAU (OR = 12.5, p < .001), but no difference was observed in boys (OR = 2.0, p = .205). Greater attachment security predicted lower rates of internalizing disorders in both sexes. Development of attachment security fully mediated intervention effects on internalizing disorders in girls. **Conclusion:** Placement into FC facilitated the development of secure attachment and prevented the onset of internalizing disorders in institutionalized girls. The differential effects of FC on attachment security in boys and girls explained gender differences in the intervention effects on psychopathology. Findings provide evidence for the critical role of disrupted attachment in the etiology of internalizing disorders in children exposed to institutionalization. **Keywords:** Institutionalization, childhood adversity, attachment, internalizing, depression, anxiety.

Introduction

In many parts of the world, abandoned or orphaned children are raised in socially depriving institutions. UNICEF estimates that 8 million children worldwide reside in such institutional settings. The number of children who are being placed in institutions is increasing (UNICEF, 2002), while opportunities for international adoption are diminishing. The number of international adoptions in the United States, for example, has declined by approximately 44% in the past 5 years (U.S. Department of State, 2009). These trends raise concerns about how societies will manage the substantial burden of health problems among previously institutionalized children.

Children raised in institutions exhibit myriad developmental abnormalities including stunted growth (Rutter and English Romanian Adoptees (ERA) Study Team, 1998) physical and mental health problems (Rutter and English Romanian Adoptees (ERA) Study Team, 1998; Rutter et al., 2001), cognitive and language deficits (Nelson et al., 2007; Rutter and English Romanian Adoptees (ERA) Study Team, 1998), and atypical social and emotional development (O'Connor et al., 2003; Zeanah et al., 2005), which frequently persist after children are removed from institutional care (Kreppner et al., 2007). High rates of psychiatric disorders among previously institutionalized children are particularly striking (Gunnar, van Dulmen, and The International Adoption Project Team, 2007; Hoksbergen et al., 2003; Rutter and English Romanian Adoptees (ERA) Study Team, 1998; Rutter et al., 2001; Stevens et al., 2008). The absence of a primary attachment figure has been posited to play a central role in explaining the detrimental mental health effects of institutionalization, given the critical importance of attachment for adaptive child development (Bowlby, 1951, 1982; Erickson, Sroufe, & Egeland, 1985; Matas, Arend, & Sroufe, 1978; Sroufe, 1983) and the consistently documented attachment disturbances

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among children reared in institutions (Chisolm, 1998; O'Connor, Bredenkamp, Rutter, and The English and Romanian Adoptees Study Team, 1999; O'Connor et al., 2003; Smyke, Dumitrescu, & Zeanah, 2002; Zeanah et al., 2005). Empirical data to support this claim, however, have been lacking. As such, it is unknown whether psychiatric disorders among previously institutionalized children are attributable to the lack of available attachment figures or whether providing opportunities for developing attachment security in this population would result in concomitant improvements in mental health.

The Bucharest Early Intervention Project (BEIP), a randomized controlled trial of foster care (FC) for institutionalized children, presented an opportunity to examine these questions. The study identified a sample of children living in institutions in Bucharest, Romania, and randomized them to be placed in high quality FC created and monitored by the investigators or to receive care as usual (CAU). The randomized design provided an opportunity to examine the ameliorating effect of placement into a family and, presumably, the formation of an attachment relationship with a caregiver on psychiatric outcomes. At 54 months, children in FC had lower rates of internalizing disorders than children in CAU (Zeanah et al., 2009). Notable gender differences in the effects of FC on psychiatric morbidity were observed such that girls in FC had lower levels of internalizing symptoms and disorders than girls in CAU, but no intervention effects were evident among boys. There were no intervention effects on the rates of externalizing disorders among the sample.

In the current investigation, we explored the mechanisms that explained the intervention effects on internalizing psychopathology in the BEIP and the gender differences in those effects. A young child develops a secure attachment relationship with a primary caregiver when the caregiving relationship is predictable, sensitive, and responsive to the child's needs (De Wolff & van IJzendoorn, 1997; Koren-Karie, Oppenheim, & Doley, 2002; McElwain & Booth-LaForce, 2006; Sroufe, 1979; van IJzendoorn, 1995). Not surprisingly, attachment relationships fail to develop or are disrupted in children reared in institutional environments (Chisolm, 1998; O'Connor et al., 1999, 2003; Smyke et al., 2002; Zeanah et al., 2005) where child-to-caregiver to ratios are high and the quality of caregiving is poor (Zeanah et al., 2003). Moreover, in noninstitutionalized samples, insecure or disorganized attachment has been associated with risk for internalizing psychopathology in children (Allen, Moore, Kupermine, & Bell, 1998; Lee & Hankin, 2009; Lyons-Ruth, Easterbrooks, & Cibelli, 1997; McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004), including anxiety disorders and major depression (Abela et al., 2005; Warren, Huston, Egeland, & Sroufe, 1997), although findings have been somewhat inconsistent across studies (Brumariu & Kerns, 2010). We therefore examined whether development of attachment security explained the mental health benefits of the FC intervention.

Because those benefits were observed only among girls, we evaluated whether girls were more likely to develop a secure attachment to their caregivers following FC placement. Gender differences in attachment security have not been examined in studies of previously institutionalized children or of maltreated children whose caregivers participated in attachment-focused interventions (Cicchetti, Rogosch, & Toth, 2006; O'Connor et al., 1999, 2003; van den Boom, 1994). However, it is possible that girls are better able to elicit sensitive caregiving or to or benefit from such caregiving than boys after exposure to institutional rearing or other caregiver disruptions. We evaluated these two research questions in the current report.

Methods

Sample

The BEIP was the first randomized controlled trial of FC among children reared in institutional settings (Zeanah et al., 2003). A sample of 136 children (aged 6–30 months) was recruited from the six institutions for young children in Bucharest, Romania. Children were randomized to a FC intervention developed by the research team or to CAU. Comprehensive assessments of each child's health, cognitive ability, and psychosocial functioning were completed at initial entry into the study and at 42 months. Psychiatric disorders were assessed at 54 months.

Procedures

Participants were selected from each of the six institutions for young children in Bucharest. Physical examinations were completed on 187 children. Of this group, 51 were excluded from participation for medical reasons, ranging from genetic syndromes (e.g., Down syndrome), to fetal alcohol syndrome, to microcephaly (Figure 1). The remaining 136 children, many abandoned at birth, had lived in an institution for an average of 89% of their lives. Following a baseline assessment, half of the children (n = 68) were randomized to the FC intervention and half (n = 68) remained in institutional care. No differences were found between the intervention and control group in gender distribution, age, birth weight, or percentage of life spent in the institution, and no gender differences were observed in any of these baseline characteristics (Table 1). The mean age at FC placement was 22.97 months. By the 54-month assessment, 15 children were lost to follow-up, primarily due to adoption or return to their biological parents. The study design and methods have been described in detail previously (Zeanah et al., 2003).

The BEIP was initiated with support from the Secretary of State for Child Protection in Romania. Study procedures were approved by the local commissions

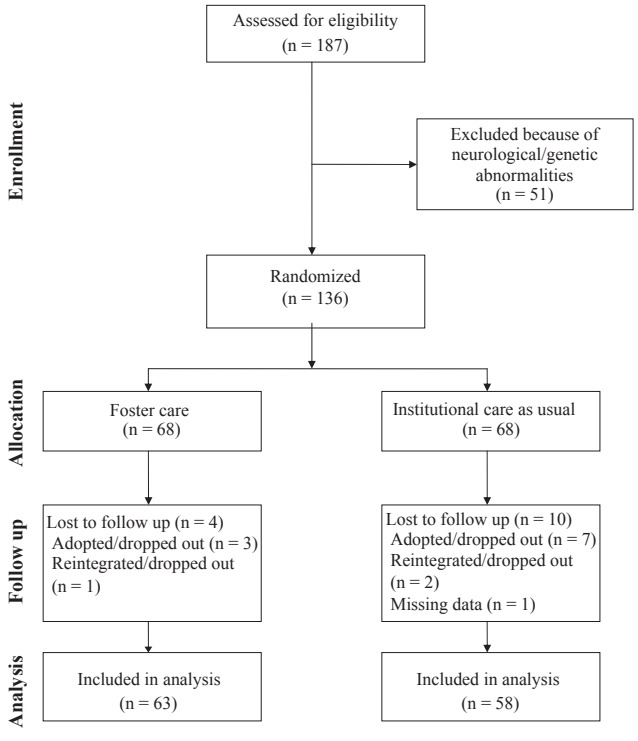

Figure 1 Study flow of participants from screening to analysis

on child protection in Bucharest, the Romanian ministry of health, an ethics committee including appointees from government and Bucharest University academic departments, and the institutional review boards of the institutions of the three principal investigators. A complete description of procedures employed to ensure ethical integrity has been published previously (Miller, 2009; Millum & Emanuel, 2007; Zeanah et al., 2006).

Intervention

Because FC was virtually nonexistent in Bucharest at the beginning of the study, the investigators created a network of foster homes with Romanian collaborators (Smyke, Zeanah, Fox, & Nelson, 2009; Zeanah et al., 2003). Foster parents were recruited through advertising, completed a background check, and were trained using a manual adapted for the study. FC was supported by social workers in Bucharest who received weekly consultation from US clinicians. Social workers assisted foster parents in managing problem behaviors and facilitated the establishment of warm, supportive, and committed relationships with their foster children. The FC intervention, described in more detail elsewhere (Smyke et al., 2009; Zeanah et al., 2003), was designed to be affordable, replicable, and grounded in developmental theory and research on caregiving quality and attachment.

Children not randomized to FC typically remained in institutional care, though over time, some were adopted (n = 7), some were returned to their biological families (n = 2), and others were placed in government FC that was created after the study began (n = 18). We implemented a policy of noninterference regarding the placement of children in the CAU group into families and did not interfere with the removal of these children from institutional care if they were selected for adoption or re-unification with their family of origin (for elaboration on the ethical issues involved in BEIP, see Zeanah et al., 2006).

Table 1 Baseline characteristics of institutionalized boys and girls randomized to the foster care intervention or usual care[a]

	Foster care (n = 68)	Usual care (n = 68)	p Value
Female [N (%)]	33 (49.3)	35 (51.5)	.797
Age, months [M (SD)]			
Age at institutionalization	2.6 (3.9)	2.4 (3.0)	.783
Age at randomization	20.9 (7.1)	20.8 (7.7)	.947
Birth weight, g [M (SD)]	2,733 (576.2)	2,847 (570.2)	.307
Gestation age, weeks [M (SD)]	37.0 (2.4)	37.6 (1.5)	.124
Head circumference for age percentile, cm [M (SD)]	32.3 (28.1)	25.2 (22.7)	.133
Height for age percentile, cm [M (SD)]	25.7 (22.5)	26.9 (23.1)	.781
Weight for age percentile, kg [M (SD)]	18.2 (19.4)	22.7 (24.6)	.264
Weight for height percentile, kg [M (SD)]	30.1 (27.2)	37.3 (29.6)	.163
Duration of institutionalization, weeks [M (SD)]	85.2 (23.0)	87.9 (17.9)	.470
	Girls (n = 68)	Boys (n = 68)	p Value
Age, months [M (SD)]			
Age at institutionalization	2.1 (3.5)	1.7 (3.4)	.321
Age at randomization	20.6 (8.1)	22.2 (7.2)	.256
Birth weight, g [M (SD)]	2,808 (642.3)	2,956 (492.4)	.932
Gestation age, weeks [M (SD)]	37.2 (2.2)	37.7 (1.5)	.409
Head circumference for age percentile, cm [M (SD)]	36.9 (28.2)	36.3 (28.0)	.895
Height for age percentile, cm [M (SD)]	38.7 (28.7)	32.8 (26.3)	.138
Weight for age percentile, kg [M (SD)]	29.9 (28.4)	29.0 (27.2)	.729
Weight for height percentile, kg [M (SD)]	37.5 (29.1)	42.6 (29.9)	.283
Duration of institutionalization, weeks [M (SD)]	48.8 (46.2)	57.7 (47.9)	.195

[a]None of these baseline characteristics was associated with internalizing symptoms or externalizing symptoms at 54 months.

Assessment

Attachment was assessed using the Strange Situation Procedure (Ainsworth, Blehar, Waters, & Wall, 1978) prior to randomization while all children were living in institutions (Zeanah et al., 2005) and the preschool version of the procedure at 42 months (Smyke, Zeanah, Fox, Nelson, & Guthrie, 2010). Coders blinded to children's group status were trained to reliability in the MacArthur Preschool System, which was used to determine classifications of attachment at 42 months of age: secure, and several types of insecure, including avoidant, ambivalent-dependent, disorganized-controlling, and insecure-other (Cassidy, Marvin, & The MacArthur Working Group, unpublished manuscript). For analysis purposes, children were divided into secure versus insecure attachment groups. Three-quarters (n = 120) of the assessments were double-coded to assess reliability. As reported previously, agreement for secure versus insecure coding was excellent (κ = .83, percent agreement = 91.7%; Smyke et al., 2010). Coders also assigned a continuous rating of security using a scale ranging from 1 (*no security evident*) to 9 (*most secure*; Cassidy et al., 1992). Interrater reliability for this scale was excellent (r = .87; Smyke et al., 2010). We also created a dichotomous variable coding whether each child's attachment changed from absent or incompletely formed at baseline to secure at 42 months.

Psychiatric disorders were assessed at 54 months using a structured diagnostic interview for young children, the Preschool Age Psychiatric Assessment (PAPA; Egger, Ascher, & Angold, 1999; Egger et al., 2006). This instrument collects information from a caregiver about the presence, frequency, and duration of psychiatric symptoms and generates DSM–IV diagnoses (American Psychiatric Association., 1994). We examined both internalizing and externalizing disorders and symptom counts to increase power due to the small sample size (see Zeanah et al., 2009). Internalizing disorders considered here included major depression, dysthymia, separation anxiety disorder, social phobia, specific phobia, generalized anxiety disorder, and posttraumatic stress disorder. Externalizing disorders included attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder. Symptom counts represent that total number of symptoms reported by the child's caregiver that were included in the diagnostic criteria for internalizing disorders and externalizing disorders. The PAPA has been demonstrated to have comparable reliability to structured diagnostic interviews used with adults and older children (Egger et al., 2006). The interview was translated into Romanian and back-translated into English and retention of original meaning was assessed by bilingual study staff. The PAPA was administered by trained study interviewers.

For both the PAPA and the Strange Situation Procedure, biological or FC mothers completed the assessments for noninstitutionalized children. An institutional caregiver completed the assessments for children living in institutions. Caregivers who worked with the child regularly and knew the child well were selected. If the child had a favorite caregiver, agreed upon by staff consensus, the favorite caregiver completed the assessments.

Analysis methods

All analyses used an intent-to-treat approach. Group differences in attachment security were examined using cross-tabulations and univariate analysis of variance with intervention group as the between-subjects factor. Associations of the intervention and of attachment with internalizing symptoms were examined using linear regression; association with internalizing disorders were examined using logistic regression. Logistic regression coefficients and their standard errors were exponentiated to create odds ratios (ORs) and 95% confidence intervals (CIs). Statistical significance was evaluated using two-sided .05-level tests.

Results

Intervention effects on psychopathology

As we reported previously, the FC intervention had ameliorative effects on internalizing symptoms and disorders in girls but not boys (Zeanah et al., 2009). Girls in the FC group had lower levels of internalizing symptoms, β = −0.37, p = .004, and fewer symptoms of both anxiety, β = −0.34, p = .009, and depression, β = −0.34, p = .009, than girls in the CAU group (Table 2). Females randomized to FC also were less likely to have internalizing disorders than females in

Table 2 Psychopathology in institutionalized children randomized to the foster care intervention or usual care at 54 months, stratified by gender

	Foster care (n = 63)	Usual care (n = 58)	p Value[a]
Females			
Internalizing symptoms, *M* (*SD*)	3.0 (1.6)	5.2 (3.8)	.004
Anxiety symptoms	2.3 (1.0)	3.6 (2.5)	.009
Depression symptoms	0.7 (0.8)	1.6 (1.7)	.009
Internalizing disorders, *N* (%)[b]	4 (13.3)	14 (48.3)	.006
Externalizing symptoms, *M* (*SD*)	4.9 (1.0)	6.6 (1.3)	.278
ADHD symptoms	3.6 (0.8)	4.8 (1.1)	.377
ODD/conduct disorder symptoms	1.3 (0.3)	1.9 (0.4)	.296
Externalizing disorders, *N* (%)[c]	5 (17.2)	4 (16.0)	.903
Males			
Internalizing symptoms, *M* (*SD*)	5.6 (3.4)	4.9 (2.4)	.372
Anxiety symptoms	4.2 (2.5)	3.5 (1.7)	.190
Depression symptoms	1.3 (1.3)	1.4 (1.1)	.879
Internalizing disorders, *N* (%)	10 (30.3)	14 (48.3)	.150
Externalizing symptoms, *M* (*SD*)	9.5 (1.4)	9.7 (1.4)	.931
ADHD symptoms	6.2 (0.9)	6.7 (1.0)	.692
ODD/conduct disorder symptoms	3.3 (0.6)	3.0 (0.5)	.657
Externalizing disorders, *N* (%)[c]	10 (33.3)	11 (40.7)	.563

ADHD, attention-deficit/hyperactivity disorder; ODD, oppositional defiant disorder.
[a]Based on linear regression models predicting symptom outcomes and logistic regression model predicting disorders. [b]Internalizing disorders included major depression, dysthymia, and the anxiety disorders (separation anxiety disorder, specific phobia, social phobia, generalized anxiety disorder, and posttraumatic stress disorder). [c]Externalizing disorders included ADHD, ODD, and conduct disorder.

CAU, OR = 0.17, p = .006. By contrast, boys in the FC group had equivalent levels of internalizing symptoms, β = 0.12, p = .372, anxiety, β = 0.17, p = .190, depression, β = –0.02, p = .879, and internalizing disorders, OR = 0.47, p = .150, as boys in CAU. The FC intervention had no effect on externalizing symptoms or on the prevalence of externalizing disorders in either girls or boys.

Intervention effects on attachment

We examined the effect of the intervention on dichotomous indicators of attachment security (secure vs. absent or incompletely formed) at baseline and 42 months, on the dichotomous variable indicating whether each child's attachment changed from absent or incompletely formed at baseline to secure at 42 months, and on the continuous measure of security at 42 months. The proportion of females with secure attachment at baseline did not differ across groups, OR = 1.1, p = .933 (Table 3). By 42 months, girls in FC were more like to be securely attached than girls in CAU, OR = 12.5, p < .001. A greater proportion of girls in FC became securely attached from baseline to 42 months than in CAU, OR = 6.6, p = .029. Finally, girls in FC had higher scores on the continuous measure of attachment security than girls in CAU, $F(1, 61) = 31.2$, p < .001.

Intervention effects on attachment in boys were notably different. The proportion of boys with secure attachment did not differ in the FC and CAU groups at baseline, OR = 1.1, p = .906, or 42 months, OR = 2.1, p = .205. The proportion of boys who became securely attached from baseline to 42 months also did not differ in the FC group compared to the CAU group, OR = 2.2, p = .250. By contrast, boys in FC had higher scores on the continuous measure of attachment security at 42 months than boys in CAU, $F(1, 61) = 7.8$, p = .007. [These findings mirror those reported previously by Smyke et al. (2010) although the final sample reported here includes 10 children that were not included in this previous analysis. Those children were excluded from that study due to concerns about not meeting study inclusion criteria. Subsequent medical exam of these children revealed that they did, indeed, meet the criteria. Thus, they were included in the current analyses.]

Table 3 Attachment security of institutionalized children randomized to the foster care intervention or usual care at baseline and 42 months, stratified by gender

	Foster care (n = 63)	Usual care (n = 58)	p Value[a]
Females			
Baseline secure attachment, N (%)[b]	5 (22.7)	5 (23.8)	.933
42-Month secure attachment, N (%)[c]	19 (63.3)	4 (12.1)	<.001
Change from insecure /incompletely formed to secure, N (%)[d]	9 (40.9)	2 (9.5)	.029
42-Month attachment security, M (SD)	5.0 (1.6)	2.9 (1.3)	<.001
Males			
Baseline attachment security, N (%)	4 (14.8)	4 (16.0)	.906
42-Month secure attachment, N (%)	12 (35.3)	6 (20.7)	.205
Change from insecure /incompletely formed to secure, N (%)	8 (29.6)	4 (16.0)	.250
42-Month attachment security, M (SD)	4.2 (1.7)	3.1 (1.4)	.007

[a]Based on logistic regression models predicting dichotomous attachment security and linear regression model predicting continuous attachment security. [b]At baseline, 49 children in the foster care group (22 females and 29 males) and 46 in usual care (21 females and 25 males) completed the Strange Situation Procedure. [c]At 42 months, 64 children in the foster care group (30 females and 34 males) and 62 in usual care (33 females and 29 males) completed the Strange Situation Procedure. [d]Percentages calculated from the total number of children for whom data on attachment security were available at both baseline and 42 months.

Attachment and psychopathology

Attachment security was associated with internalizing psychopathology in both girls and boys. Females with secure attachment at 42 months had lower levels of internalizing symptoms, β = –0.41, p < .001, including anxiety symptoms, β = –0.40, p < .001, and depression symptoms, β = –0.35, p = .002, at 54 months. The prevalence of internalizing disorders was lower among girls with secure attachment than among girls with insecure attachment, OR = 0.29, p = .035. Higher scores on the continuous measure of attachment security were associated with lower levels of internalizing symptoms, β = –0.49, p < .001, and of anxiety, β = –0.42, p < .001, and depression, β = –0.49, p < .001.

Boys with secure attachment at 42 months had lower levels of anxiety symptoms, β = –0.30, p = .006, depressive symptoms, β = –0.33, p = .003, and internalizing symptoms, β = –0.35, p = .002, at 54 months. Internalizing disorders were less common among boys with secure attachment as compared to insecure attachment, OR = 0.25, p = .021. Higher scores on the continuous attachment measure were associated with lower levels of internalizing symptoms, β = –0.41, p < .001, and of anxiety, β = –0.36, p < .001, and depression, β = –0.39, p < .001.

Mediating role of attachment in intervention effects for females

To determine whether the intervention effects on internalizing psychopathology in girls were mediated through attachment security, we first examined our dichotomous attachment indicator at 42 months. Intervention effects on internalizing symptoms in

females were fully mediated by attachment security (Table 4). Intervention effects on total internalizing symptoms, $\beta = -1.42$, $p = .105$, and symptoms of anxiety, $\beta = -0.73$, $p = .194$, and depression, $\beta = -0.68$, $p = .090$, were no longer significant when dichotomous attachment security was added to the model. Attachment security at 42 months explained 36.6% of the intervention effect on total internalizing symptoms, 44.7% of the intervention effect on anxiety symptoms, and 26.1% of the intervention effect on depressive symptoms. By contrast, the intervention effect on internalizing disorders remained significant when dichotomous attachment security at 42 months was added to the model, OR = 0.19, $p = .025$. Attachment security at 42 months explained 10.5% of the intervention effect on internalizing disorders.

Intervention effects on both internalizing symptoms and disorders were fully mediated by our indicator of whether attachment security changed from absent or incompletely formed at baseline to secure by 42 months. After accounting for changes from absent or incompletely formed to secure attachment, intervention effects were no longer evident for internalizing symptoms, $\beta = -1.03$, $p = .214$, anxiety symptoms, $\beta = -0.58$, $p = .359$, depressive symptoms, $\beta = -0.45$, $p = .164$, or internalizing disorders, OR = 0.33, $p = .246$. Change in attachment status from baseline to 42 months explained 54.0% of the intervention effect on total internalizing symptoms, 56.1% of the intervention effect on anxiety symptoms, 51.1% of the intervention effect on depressive symptoms, and 48.5% of the intervention effect on internalizing disorders.

Similarly, intervention effects on internalizing symptoms and disorders were fully mediated by the continuous measure of attachment security. Intervention effects for internalizing symptoms, $\beta = -1.12$, $p = .217$, anxiety symptoms, $\beta = -0.74$, $p = .218$, depressive symptoms, $\beta = -0.38$, $p = .353$, and internalizing disorders, OR = 0.29, $p = .098$, were no longer significant after adding continuous attachment security to the model. The continuous measure of attachment security explained 50.0% of the intervention effect on total internalizing symptoms, 43.9% of the intervention effect on anxiety symptoms, 58.7% of the intervention effect on depressive symptoms, and 41.4% of the intervention effect on internalizing disorders.

Discussion

Girls reared in Romanian institutions who were placed in FC evidenced lower levels of internalizing psychopathology than girls who remained in institutional care. Our findings suggest that the emergence or development of attachment security is the mechanism through which the intervention had ameliorative effects on anxiety and depression. Girls placed into families developed a secure attachment to a primary caregiver (Smyke et al., 2010). This improvement in attachment status, in turn, protected them against the development of internalizing symptoms and anxiety and mood disorders in early childhood.

These findings have implications for research, practice, and policy. First, we provide strong evidence for the critical role of the lack of attachment in the etiology of internalizing disorders in children exposed to institutionalization. Although numerous observational studies have documented an association between attachment security and child internalizing psychopathology (Abela et al., 2005; Allen et al., 1998; Lee & Hankin, 2009; Lyons-Ruth et al.,

Table 4 Mediating role of attachment security in the effect of the foster care intervention on internalizing psychopathology of institutionalized females at 54 months

	Intervention model[a]	*p* Value	Mediation model[b]	*p* Value	% Attenuation[c]
Dichotomous attachment security, 42 months					
Internalizing symptoms, β (*SE*)	−2.24 (0.75)	.004	−1.42 (0.86)	.105	36.6
Anxiety symptoms	−1.32 (0.49)	.009	−0.73 (0.56)	.194	44.7
Depression symptoms	−0.92 (0.34)	.009	−0.68 (0.40)	.090	26.1
Internalizing disorders, OR (95% CI)	0.17 (0.04, 0.6)	.006	0.19 (0.05, 0.82)	.025	10.5
Change in attachment security, baseline to 42 months					
Internalizing symptoms, β (*SE*)	−2.24 (0.75)	.004	−1.03 (0.81)	.214	54.0
Anxiety symptoms	−1.32 (0.49)	.009	−0.58 (0.62)	.359	56.1
Depression symptoms	−0.92 (0.34)	.009	−0.45 (0.31)	.164	51.1
Internalizing disorders, OR (95% CI)	0.17 (0.04, 0.6)	.006	0.33 (0.05, 2.16)	.246	48.5
Continuous attachment security, 42 months					
Internalizing symptoms, β (*SE*)	−2.24 (0.75)	.004	−1.12 (0.89)	.217	50.0
Anxiety symptoms	−1.32 (0.49)	.009	−0.74 (0.59)	.218	43.9
Depression symptoms	−0.92 (0.34)	.009	−0.38 (0.40)	.353	58.7
Internalizing disorders, OR (95% CI)	0.17 (0.04, 0.6)	.006	0.29 (0.07, 1.26)	.098	41.4

[a]Intervention model includes dummy variable for the intervention and shows the total intervention effect on each of the four internalizing outcomes. [b]Mediation model includes dummy variable for intervention effect *and* attachment security variable from Column 1 and shows the magnitude of the intervention effect after controlling for attachment security. [c]Proportion of intervention effect on each internalizing outcome that is explained by intervention effect on attachment security.

1997; McCartney et al., 2004; Warren et al., 1997), findings have been inconsistent across studies (Brumariu & Kerns, 2010), and firm conclusions regarding the explanatory role of attachment in the etiology of internalizing disorders cannot be made in the absence of an experimental design. Our use of a randomized intervention allows considerably stronger causal inferences to be drawn about the role of attachment in the onset of child internalizing pathology than these previous observational studies. Developmental processes that are altered as a result of a randomized intervention and that confer protection against negative outcomes can be inferred to be true risk factors for those outcomes (Cicchetti & Hinshaw, 2002; Coie et al., 1993; Kraemer et al., 1997). Here, we demonstrated experimentally that placement into a family allowed for the development of attachment security for girls and explained their lower rates of internalizing psychopathology. FC did not result in similar improvements in attachment security for boys and thus did not protect them against the development of internalizing disorders. Together, these findings provide clear evidence for the importance of lack of attachment figures – and hence the absence of attachment – in the development of anxiety and depression in children exposed to institutionalization.

Our findings suggest an explanation for the gender differences in the positive mental health effects of the intervention. At 42 months, a greater proportion of girls randomized to FC had secure attachment than girls who remained in institutional care, whereas the proportion of boys with a secure attachment did not differ across conditions. These results suggest that boys had a more difficult time developing a secure attachment to a caregiver following removal from institutional care. Why might this have occurred? The most obvious explanations include gender differences in potential risk factors (e.g., birth weight, problem behaviors in infancy, age at placement) or greater caregiving quality for girls compared to boys either in the institutions prior to randomization or in foster family placements. Neither of these explanations is consistent with our data. As described previously, we found no gender differences in a wide range of preintervention risk markers, and further analysis suggested no gender differences in behavior problems or disorganized attachment at baseline. It is notable that prior research was unable to identify developmental precursors of attachment disturbances in previously institutionalized Romanian children adopted into the United Kingdom (O'Connor et al., 1999), further suggesting that baseline developmental differences are not responsible for these effects. Subsequent analysis also revealed no gender differences in caregiving quality in institutional settings at baseline or in foster families at 42 months [assessed using the Observational Record of Caregiving Quality (NICHD Early Child Care Research Network, 1996; see Smyke et al., 2007 for details)]. Thus, no differences were observed in the *quantity* of specific caregiving behaviors or the *quality* of caregiver responses to children's behavior in the foster families of boys and girls. However, it is possible that girls were better able to elicit more sensitive caregiving in nuanced ways that were not detectable by our observational measure. It is also possible that caregivers perceived boys to be more difficult to manage or found them more difficult to connect with emotionally, despite having comparable levels of psychopathology as girls at the time of FC placement. Alternatively, it may be that institutional deprivation has a more profound deleterious effect on boys' ability to develop a secure attachment postinstitutionalization. Some studies have found that the absence of a father is associated with greater attachment disturbances in maltreated male infants compared to females (Carlson, Cicchetti, Barnett, & Braunwald, 1989). Because institutional caregivers were predominantly female, the absence of a male caretaker in the institution may have been more detrimental for boys. Although we were unable to determine conclusively the explanation for gender differences in the effects of our FC intervention on attachment security, these findings raise a number of important questions that warrant examination in future research regarding gender differences in attachment development in children exposed to institutional rearing, psychosocial deprivation and maltreatment.

Practically, we identified a mechanism underlying the ameliorative effects of FC on internalizing psychopathology. This mechanism has implications for interventions targeting children raised in deprived environments. Specifically, they point to the importance of promoting the development of a secure attachment relationship for children who have been orphaned or abandoned. Several existing interventions hold promise in this regard. Intervention techniques that teach caregivers to attend appropriately and respond contingently to infant needs have demonstrated efficacy in improving attachment security among children with difficult temperaments and in at-risk families (Heinicke et al., 1999; Klein Velderman, Bakermans-Kranenburgh, & Juffer, 2006; van den Boom, 1994). These techniques also have been applied successfully with foster parents and ameliorated attachment security in foster infants and preschoolers (Dozier, Higley, Albus, & Nutter, 2002; Fisher & Kim, 2007). This evidence indicates that attachment security can be ameliorated in children who have confronted a wide range of adverse early rearing environments. Our findings suggest that the implementation of such interventions may prevent the onset of anxiety and depression in children raised in such circumstances.

From a policy perspective, our results argue strongly for removing children from institutional care and placing them in families to promote the development of secure attachment to caregivers. Our

findings indicate that secure attachment relationships are critical for adaptive mental health functioning in previously institutionalized children. In the absence of such relationships, the probability of adverse mental health outcomes in this population is quite high. Because institutionalization remains common in many parts of the world (UNICEF, 2002, 2007) policy efforts to promote the placement of orphaned children into foster families represent an important public health priority. These findings also have policy implications for the much larger population of children who have experienced serious disruptions in their relationships with caregivers. Our findings suggest that placement in families whenever possible remains the preferred option. In families, these children also likely have a considerably greater opportunity to form secure attachment relationships with caregivers.

Findings should be interpreted in light of the following limitations. First, the study included only children from Romanian institutions, which may be characterized by more extreme deprivation than in other settings (Zeanah et al., 2003). Findings may not generalize to populations of institutionalized children who experienced less severe deprivation, and therefore, warrant replication in other samples and cultural contexts. Second, because none of the children in our sample were younger than 6 months of age at baseline we could not evaluate the effects of early placement into FC. Given that placement before 6 months is associated with advantageous attachment outcomes (Chisolm, 1998; Rutter et al., 2007), early FC may result in even greater effects on attachment and psychopathology. Third, behaviors observed in the Strange Situation at the baseline assessment while all children lived in the institutions suggest that in the absence of consistent caregivers and in an environment of severe psychosocial deprivation infants and young children may be unable to effectively organize even basic attachment responses. Fourth, the nature and quality of the child–caregiver relationship were assuredly different for children living in institutional settings versus foster families. These differences were unlikely to create systematic reporting bias, however. Institutional caregivers engaged in virtually all activities of daily living with children in their care, and there is no reason to believe that they were unable to accurately report on individual differences in behavior and emotions among these children. There is even less reason to suspect reporting bias that differed by gender. Finally, despite randomization to groups a number of children in the CAU group were removed from institutional care over the course of the study. As such, our estimates of the effects of institutionalization on attachment and psychopathology are likely conservative.

Girls removed from institutional care and placed into foster families were able to develop secure attachments to their new caregivers, and these attachment relationships protected them from the development of internalizing disorders. FC programs for orphaned and maltreated children represent important targets for research, practice, and policy attention.

Authors' contribution

Drs. McLaughlin, Zeanah, Fox, and Nelson all had access to the data and contributed to writing the manuscript. Drs. Zeanah, Fox, and Nelson conceived and implemented the BEIP study. Dr. McLaughlin conceived the current paper and conducted all data analysis.

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Key points

- Inability to develop a secure attachment relationship to a primary caregiver is thought to explain the elevated rates of internalizing disorders in children exposed to institutionalization.
- Study findings show that changes in attachment status are a primary mechanism explaining the ameliorative effects of a foster care intervention on internalizing disorders among previously institutionalized children.
- Capitalizing on a randomized study design, we show that absence of or unformed attachment plays a critical role in the development of internalizing disorders among children exposed to institutional rearing.

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