Published in final edited form as:

J Abnorm Child Psychol. 2010 May ; 38(4): 459–470. doi:10.1007/s10802-009-9383-4.

Behavior Problems in Children Adopted from Psychosocially Depriving Institutions

Emily C. Merz and

Department of Psychology, University of Pittsburgh, 210 South Bouquet Street, Pittsburgh, PA 15260, USA

Robert B. McCall

Department of Psychology, University of Pittsburgh, 210 South Bouquet Street, Pittsburgh, PA 15260, USA; Office of Child Development, University of Pittsburgh, 400 North Lexington Avenue, Pittsburgh, PA 15208, USA

Emily C. Merz: ecm17@pitt.edu

Abstract

Behavior problems were investigated in 342 6- to 18-year-old children adopted from psychosocially depriving Russian institutions that provided adequate physical resources but not consistent, responsive caregiving. Results indicated that attention and externalizing problems were the most prevalent types of behavior problems in the sample as a whole. Behavior problem rates increased with age at adoption, such that children adopted at 18 months or older had higher rates than never-institutionalized children but younger-adopted children did not. There was a stronger association between age at adoption and behavior problems during adolescence than at younger ages at assessment. Children adopted from psychosocially depriving institutions had lower behavior problem rates than children adopted from severely depriving Romanian institutions in the 1990s. The implications of these results are that early psychosocial deprivation is associated with behavior problems, children exposed to prolonged early deprivation may be especially vulnerable to the developmental stresses of adolescence, and severe institutional deprivation is associated with a higher percentage of behavior problems after a shorter duration of exposure.

Keywords

Institutionalization; Behavior problems; Early childhood development

In the last decade over 200,000 children were adopted internationally into homes in the United States (U.S. Department of State 2006), and many of these children were raised in institutions prior to adoption. Post-institutionalized (PI) children are at higher risk for behavior problems than non-adopted children reared in their birth families and children adopted from non-institutional settings (MacLean 2003; Rutter et al. 2007). Psychosocial deprivation characteristic of institutions, including frequent changes in caregivers, high child-to-caregiver ratios, and the lack of responsive caregiving, might contribute to PI children's behavior problems (Hodges and Tizard 1989; Sonuga-Barke et al. 2008; Tizard and Hodges 1978). The aim of this study was to examine the behavioral functioning of children adopted from institutions characterized primarily by psychosocial deprivation.

Behavior Problems in Post-Institutionalized Children

PI children between 6 and 18 years of age are susceptible to a wide range of behavior problems, including attention, externalizing, internalizing, social, and autistic-like problems (see reviews, Gunnar 2001; MacLean 2003). These problems are more likely to occur in older-adopted PI children who were exposed to more prolonged institutional deprivation, and they are often found to persist or increase with time in an adoptive home. Comparisons with non-institutionalized adopted children suggest that PI children's behavior problems are unlikely to be solely a consequence of factors associated with placement into institutional care, such as poor prenatal care.

Specifically, PI children have higher rates of parent-reported *attention problems* than children reared in their biological families and non-institutionalized adopted children (Groza and Ryan 2002; Gunnar et al. 2007; Hoksbergen et al. 2004; Kreppner et al. 2001; Stevens et al. 2007). Their rates of attention problems increase with age at adoption. Teacher reports also reveal greater risk for attention problems (Kreppner et al. 2001; Le Mare and Audet 2002), and there is evidence for high rates of attention-deficit/hyperactivity disorder (ADHD) diagnoses in this population (Le Mare and Audet 2002; Miller et al. 2009).

A meta-analysis revealed that *externalizing problems* were more prevalent among children with adverse pre-adoption histories, mostly institutional rearing, than among those without such backgrounds (Juffer and van IJzendoorn 2005). PI children score higher on parent-report measures of externalizing problems than children reared in their biological families (Miller et al. 2009), and externalizing problem rates tend to be positively associated with age at adoption (MacLean 2003). PI children's externalizing problems may not be increased relative to non-institutionalized adopted children (Gunnar et al. 2007; Rutter et al. 2001, 2007).

There are fewer studies of PI children that have indicated higher rates of *internalizing problems*, such as depression and anxiety. A meta-analysis did not find elevated rates of internalizing problems (Juffer and van IJzendoorn 2005), and rates may not be higher than those of non-institutionalized adopted children (e.g., Gunnar et al. 2007). However, a longitudinal study revealed that PI children had higher rates of parent- and teacher-reported emotional difficulties than non-institutionalized domestically-adopted children at 11 but not 6 years of age (Colvert et al. 2008; Rutter et al. 2001), suggesting that perhaps older but not younger children are more likely to display internalizing problems.

PI children have been found to have higher rates of *social problems* with peers and adults than children raised by their biological families (Hoksbergen et al. 2004) and non-institutionalized adopted children (Groza and Ryan 2002; Gunnar et al. 2007). Social problem rates tend to be positively associated with age at adoption. There is also evidence for specific social difficulties such as superficial friendliness with strangers (i.e., indiscriminate friendliness; Chisholm 1998) and deficits in social cognition (Tarullo et al. 2007). PI children also score higher on the Child Behavior Checklist (CBCL; Achenbach and Rescorla 2001) Thought Problems subscale than children reared in their biological families (Hoksbergen et al. 2004) and non-institutionalized adopted children (Groza and Ryan 2002) suggesting that they may have an increased likelihood of autistic-like symptoms (Duarte et al. 2003; Rutter et al. 1999).

Early Psychosocial Deprivation

Institutions are commonly characterized by psychosocial deficiencies involving frequent changes in caregivers over time, low levels of caregiver-child social interaction, and caregiving that is generally impersonal, routine, and perfunctory rather than warm, affectionate, emotionally supportive, and contingently responsive (Gunnar 2001). For instance, the children in the current study were adopted from institutions in which nine or more different caregivers

often worked with a group of 12 to 14 children in a given week, and children were periodically “graduated” to new groups with different caregivers. By two years of age children had potentially experienced 60 to 100 caregivers (St. Petersburg–USA Orphanage Research Team 2005). Caregivers rarely initiated social interactions, responded to infants' social bids, responded promptly to emotional distress, or provided warmth and affection (Muhamedrahimov 1999). Institutions vary in the severity of these deficiencies. The severely or “globally” depriving Romanian institutions of the early 1990s were grossly deficient in psychosocial care and also lacking in physical resources including adequate nutrition and medical care (Rutter et al. 2007).

These early psychosocial deficiencies may contribute to PI children's higher rates of behavior problems. Responsive caregiving is theorized to support early childhood development across social, behavioral, cognitive, and language domains (Ainsworth et al. 1978; Bornstein and Tamis-LeMonda 1989) and there is evidence to support this link (Landry et al. 2006). Interventions in institutions that improved the psychosocial environment have produced substantial improvements in young children's development (Sparling et al. 2005; St. Petersburg–USA Orphanage Research Team 2008).

Children adopted from institutions in which deficiencies were limited primarily to psychosocial deprivation have been shown to display behavior problems. Tizard and Tizard (1971), Tizard and Hodges (1978), and Hodges and Tizard (1989) studied the outcomes of children adopted after 2 to 3 years from institutions in which physical resources were provided and the child-to-caregiver ratio was 3:1. However, the caregivers were discouraged from forming an emotional attachment to the children, and there was high staff turnover, with children experiencing an average of 24 caregivers in 24 months (Tizard and Tizard 1971). Children adopted from these institutions had more teacher-reported attention, externalizing, and peer problems than their non-adopted, working-class classmates at both 8 (Tizard and Hodges 1978) and 16 years of age (Hodges and Tizard 1989). However, this study had a small sample, only a few survey items representing each potential area of concern, and limited analyses of age at adoption. The current study examined behavior problems in a similar PI sample but had fewer limitations.

Age at Adoption

Studies have examined the age at adoption or length of deprivation beyond which children are at risk for problems. Children adopted from severely depriving Romanian institutions before 6 months may not be at risk of later problems, while those adopted after this age may be at an equally heightened risk regardless of how much longer they spent in an institution (Kreppner et al. 2007). Consistent with this finding, age at placement into foster care was not associated with psychiatric disorders in a sample of preschool-age children placed between 7 and 33 months (Zeanah et al. 2009). Results from other studies suggest that PI children adopted post-infancy have increased rates of behavior problems (Gunnar et al. 2007).

Age at Assessment

Studies indicate that the rate of behavior problems among PI children may increase from middle childhood to adolescence (Colvert et al. 2008; Gunnar et al. 2007; Verhulst and Versluis-den Bieman 1995). For typically-developing children reared from birth in families, adolescence is a time of increased behavior problems compared to younger ages, as children experience increased hormone levels, greater independence, less supervision, more conflict with adults, more sophisticated social interactions, and increased focus on peer relationships (Steinberg et al. 2006). A developmental psychopathology perspective suggests that behavioral outcomes are a result of ongoing transactions between the child and the environment, and prior adaptations influence how children respond to their current circumstances (Cummings et al.

2000). Thus, children with a history of institutionalization may be particularly vulnerable to the developmental stresses of adolescence (Hodges and Tizard 1989).

Current Study

In the current study, we examined behavior problems in 6-to 18-year-old children adopted from institutions in Russia that were acceptable with respect to physical resources but deficient in terms of psychosocial care (St. Petersburg–USA Orphanage Research Team 2005). Specifically, children in these institutions were provided with adequate medical care, nutrition (Kossover 2004), safety, sanitation, toys, and equipment but were exposed to frequent changes in care-givers, low levels of caregiver-child social interaction, and insensitive, unresponsive care.

Based on prior studies of behavior problems in PI children, we focused on parent-reported CBCL internalizing, externalizing, attention, social, and thought problems and posed several questions. First, we investigated whether children adopted from psychosocially depriving institutions showed higher rates of behavior problems than never-institutionalized children in the standardization sample. To validate reporting on behavior problems, we examined whether responses for mental health service use were consistent with CBCL responses. Second, we examined the association between age at adoption from psychosocially depriving institutions and later behavior problems. Given the variation in past results showing that adoption after 6 to 24 months is associated with a higher risk of problems, we compared children adopted before 9, between 9 and 17, and at or after 18 months of age, and also compared these groups to never-institutionalized children, expecting that higher behavior problem rates would be limited to children adopted after 9 or 18 months of age. We chose 9-month intervals both to examine age at adoption effects in a manner consistent with prior literature and to have a reasonable number of children in each group.

Third, we examined the extent to which other factors, such as poor birth circumstances and adoption, were associated with behavior problems. Behavior problem rates were examined in children who were adopted within the United States (U.S.) at young ages but not exposed to institutional deprivation. Fourth, we investigated an interaction between age at assessment and age at adoption in the prediction of behavior problems for children adopted from psychosocially depriving institutions. Behavior problems might increase more substantially during adolescence for older-adopted children who were exposed to more prolonged early deprivation than younger-adopted children.

Fifth, we examined the role of the severity of institutional deprivation in behavior problems given the long-voiced but as yet untested hypothesis that the quality of institutional care relates to PI children's problem rates. Behavior problem rates of children adopted from psychosocially depriving institutions were compared to those of two PI samples from already-published studies: 1) children adopted from institutions around the world representing varying levels of deprivation (Gunnar et al. 2007), and 2) those adopted from severely depriving Romanian institutions in the 1990s (Groza and Ryan 2002). Children adopted from psychosocially depriving institutions were expected to have similar rates of behavior problems to children adopted from institutions at varying levels of deprivation but lower rates than globally deprived children after accounting for age at adoption.

Method

Sample Description

Data on the *psychosocially deprived (PSD) group*, the primary focus of the study, came from three rounds of data collection. In 2001, questionnaires were sent to all adoptive parents on the

list of an adoption agency specializing in the placement of Russian children, and 254 were returned (40% response rate). In 2003, another round of questionnaires was sent to families who had adopted through this agency, and 235 questionnaires were returned (37% response rate). In 2008, a third round of questionnaires was mailed, and 512 surveys were returned (51% response rate). Response rates for data collected in 2001 and 2003 are likely to have been somewhat higher than what is shown here because the number of questionnaires that did not reach parents due to relocation was not factored into these figures.

PSD children were 6 to 18 years of age at assessment and 5 to 60 months of age at adoption ($N=342$). PSD institutions were carefully screened for relatively high quality by the adoption agency, and most were located in St. Petersburg, Russia. Children were excluded if they had an incomplete CBCL ($n=4$) or marked functional deficits (nine children diagnosed with autism and two with severe cognitive impairment). For the children who had CBCL data from more than one round of data collection ($n=76$), the most recent data were analyzed based on prior literature suggesting that older PI children are more vulnerable to behavior problems. Thus, CBCL data was collected in 2008 for 83% of the sample, in 2003 for 8%, and in 2001 for 9%. Characteristics of the PSD and other groups are given in Table 1.

The *non-deprived (ND) group* consisted of children born in the U.S. who were adopted within their first 6 months of life by families in the U.S. In 2003, parents who had adopted such children during the last 8 years through a local domestic adoption agency received the same questionnaire that was mailed to parents of PSD children. A total of 69 questionnaires were returned (41% response rate). The ND group ($N=42$) consisted of children who met the same inclusionary criteria as the PSD group.

Recruitment of the *various levels of deprivation (VLD) group* occurred as part of the International Adoption Project (IAP; Gunnar et al. 2007) and is only briefly summarized here. All children who were internationally adopted by non-relatives in Minnesota from 1990 through 1998 were selected from the Minnesota Department of Human Services adoption records. In 2001, surveys were mailed to adoptive parents with children between the ages of 4 and 18. Parents returned completed surveys that included the CBCL for 1,948 adopted children (66% response rate). VLD children ($N=899$) were those who had spent 75% of their lives in institutions prior to adoption (see Table 1). Very little is known about the quality of these specific institutions, but they were likely to have varied in their levels of deprivation consistent with reports of institutions in different countries (Nelson et al. 2007).

Data collection procedures for the *globally deprived (GD) group* are described in detail in a prior publication (Groza and Ryan 2002). Parents of children adopted from Romania were recruited through 10 parent support groups located throughout the U.S. Data were collected in the fall of 1995 on 238 children (28–36% response rate) from families who agreed to be recontacted after a first round of data collection. Preliminary analyses gave little indication of sample bias (see Groza and Ryan 2002). The GD group ($N=97$) consisted of children in this sample who were adopted from institutions and met the same inclusionary criteria as the PSD group.

Survey Description for Each Group

The questionnaires mailed to PSD and ND families contained a battery of numerous assessments, including a 111-item questionnaire used in the IAP (Gunnar et al. 2007), the CBCL, an instruction sheet, a consent form, and a stamped return envelope. The instruction sheet described the purpose of the study and assured parents of confidentiality. Parents of VLD children also received the IAP survey and the CBCL, as described by Gunnar et al. (2007). Parents of GD children received a questionnaire on the children's background and family context and the CBCL (Groza and Ryan 2002).

Child Behavior Checklist for Ages 6–18 (CBCL; Achenbach and Rescorla

2001)—Parents report the extent to which each of 113 listed behaviors is true of their child on a 3-point Likert scale (0=not true; 1=somewhat or sometimes true; 2=very true or often true). Two broadband scales and three subscales of the CBCL were used in this study. The broadband *Internalizing Problems* scale (32 items) measures anxiety, social withdrawal, and depressive symptoms, and the broadband *Externalizing Problems* scale (35 items) measures aggressive and antisocial behavior. The *Attention Problems* subscale (10 items) indexes inattention, impulsivity, and over-activity. The *Social Problems* subscale (11 items) indexes social isolation, difficulty making friends, and peer rejection. The *Thought Problems* subscale (15 items) measures atypical behaviors, such as autistic-like features, obsessive thoughts, and hallucinations.

CBCL *T* scores were normed separately for boys and girls and adjusted for differences in levels of behavior problems during middle childhood (6–11) versus adolescence (12–18) based on a nationally-representative sample of nonreferred children in the United States (Achenbach and Rescorla 2001). The CBCL has well-documented reliability and validity for assessing behavior problems among nonadopted as well as adopted children from various ethnic backgrounds (e.g., Crijnen et al. 1999; Verhulst and Versluis-den Bieman 1995). For 17 PSD cases with isolated instances of missing CBCL data, the average of the subscale to which the missing item belonged was calculated, rounded to the nearest whole number (0, 1, or 2), and then entered in place of the missing item.

Pre-Adoption History—*Age at adoption* was defined as the age at which the child came into the parents' full-time care. Parent-reported time in an institution was strongly correlated with age at adoption in the PSD group, $r=0.77$, $p<0.001$, $n=298$, reflecting that most children were placed in institutions in the first few months of life. Age at adoption was used in analyses rather than time in an institution because it was more frequently and likely more accurately reported. The PSD, VLD, and GD children were grouped into those who were <9, 9–17, or ≥ 18 months of age at adoption.

PSD adoptive parents provided their child's birth weight and whether their child's birth was premature. Children were coded as low birth weight (LBW) if they weighed less than 2500 g (5 lb 8 oz). Prematurity was strongly associated with LBW, $\chi^2(1, N=188)=82.49$, $p<0.001$. Therefore, children reported to be either premature or LBW were coded as having *poor birth circumstances*. Birth data was available for 82% of the PSD children (282/342). Children whose parents did not provide birth information were older at adoption (29 vs. 15 months; $t(75)=6.01$, $p<0.001$) and assessment (10 vs. 9 years; $t(81)=3.15$, $p<0.001$) than children with birth data. Birth data may have been less frequently available to parents who adopted years ago. Nevertheless, conclusions regarding birth condition must be tempered by this sampling difference.

Post-Adoption History—Parents reported the child's date of birth and current date, and a measure of *age at assessment* was created using these dates. A measure of *years post-adoption* was obtained by subtracting age at adoption from age at assessment. *Parent education* was reported as the highest level of education completed: (a) less than high school degree; (b) high school or GED; (c) some college but no degree or associate degree (or other 2-year degree); (d) bachelor's degree; (e) master's degree; or (f) professional school and/or doctorate degree. These responses were dichotomized into those families in which the parent (s) had a *4-year college degree or more* vs. those with less education. *Family income* before taxes in the year prior to completion of the survey was reported in \$25,000 increments up to \$200,001+. Each income increment was assigned a numeric value from 1 for <\$50,000 to 8 for $\geq \$200,001$. Parents reported their marital status (married, partnered, separated, divorced, single never married, widowed), which was scored as 0=not married or 1=married including

partnered, to reflect children in two-parent households. Parents reported the presence or absence of *stressful family events* within the past year, including divorce, separation, or death of a family member (0=none, 1=any occurred). Finally, parents reported whether they had ever obtained *mental health treatment services* from a psychologist, psychiatrist, or social worker for their children (1=yes, 0=no).

Statistical Analyses

CBCL *T* scores were dichotomized as being in the borderline plus clinical range or not ($T \geq 61$; Gunnar et al. 2007; Achenbach 1991, pg. 58), and most of the statistical analyses reported here were conducted on these dichotomized behavior problem scores. $T \geq 61$ corresponds to the top 14% of the normative sample (Achenbach and Rescorla 2001). Group differences in the percentage of scores in the borderline plus clinical range were examined using chi square tests. Some analyses were conducted on continuously-scaled outcome variables. Specifically, hierarchical linear regression analyses were conducted to test the interactive effects of age at adoption and age at assessment on continuous behavior problem scores.

Results

This section is organized according to the research questions addressed in this study. In the PSD group, gender differences were not found for rates of clinical/borderline scores on the behavior problem scales ($\chi^2(1, N=342)=0.00$ to 0.71).

Aim 1. PSD Group Behavior Problem Rates and Mental Health Service Use

The PSD group as a whole had higher rates of clinical/borderline scores on the CBCL Attention Problems, $\chi^2(1, N=780)=6.89, p<0.01$, and Externalizing Problems, $\chi^2(1, N=780)=4.94, p<0.05$, scales than the standardization sample rate of 14% (Achenbach and Rescorla 2001; see Table 2). In addition, 23% of PSD children were reported to have received mental health services. Chi-square tests revealed significant associations between using mental health services and scoring in the clinical/borderline range on all of the behavior problem scales ($\chi^2(1, N=342)=23.29$ to 53.31). These relations provide some supportive validity for the CBCL scales as used in this PSD sample.

Aim 2. PSD Group Behavior Problem Rates as a Function of Age at Adoption

Table 3 and Fig. 1 present the percentage of PSD children with clinical/borderline behavior problems as a function of three levels of age at adoption (<9, 9–17, and ≥ 18 months). Age at adoption was significantly positively associated with rates of clinical/borderline scores on the Internalizing, Externalizing, Attention, and Social Problems scales (see Fig. 1 for statistics). Follow-up chi-square tests indicated that children adopted <9 months and those adopted between 9 and 17 months did not differ significantly on rates of any CBCL behavior problems ($\chi^2(1, N=247)=0.00$ to 1.19). Children adopted ≥ 18 months had higher rates of clinical/borderline scores than those adopted between 9 and 17 months (Attention, $\chi^2(1, N=260)=7.57, p<0.01$; Social, $\chi^2(1, N=260)=28.65, p<0.001$; Internalizing, $\chi^2(1, N=260)=18.62, p<0.001$; and Externalizing Problems, $\chi^2(1, N=260)=5.43, p<0.05$) and <9 months (Attention, $\chi^2(1, N=177)=6.76, p<0.01$; Social, $\chi^2(1, N=177)=16.58, p<0.001$; Internalizing, $\chi^2(1, N=177)=11.67, p<0.01$; and Externalizing Problems, $\chi^2(1, N=177)=8.45, p<0.01$). Thus, children adopted ≥ 18 months had higher behavior problem rates than both of the younger-adopted groups, which did not differ from one another (see Fig. 1). In Table 3, percents in bold are significantly elevated relative to those in the standardization sample. Results indicated that only PSD children adopted ≥ 18 months had higher than expected rates of clinical/borderline behavior problems.

As an additional follow-up to examine a possible steplike association between age at adoption and behavior problem rates, we extended the 9-month interval size from 18 to 26 months, which resulted in acceptable sample sizes. Children adopted ≥ 27 months ($n=54$) did not have significantly higher behavior problem rates than those adopted between 18 and 26 months ($n=41$).

Aim 3. Other Potential Risk Factors

In the ND group of children adopted within the U.S. at young ages, percentages of clinical/borderline scores on the CBCL scales ranged from 10% to 17% (see Table 2). There were no significant differences between rates in the ND group and the standardization sample rate of 14% for any scale ($\chi^2(1, N=480)=0.13$ to 0.64). Thus, adoption at young ages under non-depriving conditions was not found to be related to higher rates of behavior problems.

In the PSD group, 40% of children were reported to have experienced poor birth circumstances. The association between poor birth circumstances and CBCL Thought Problems approached significance, $\chi^2(1, N=282)=3.36, p<0.10$, but associations with other CBCL behavior problems were not significant (Internalizing: $\chi^2(1, N=282)=0.53, ns$; Externalizing: $\chi^2(1, N=282)=0.004, ns$; Attention: $\chi^2(1, N=282)=1.63, ns$; Social: $\chi^2(1, N=282)=0.03, ns$). Associations with LBW and prematurity were then examined separately. For both of these birth variables, associations were generally non-significant; the association between prematurity and Thought Problems approached significance, $\chi^2(1, N=272)=2.85, p<0.10$. Thus, poor birth status does not appear to be confounded with behavior problems in the PSD group.

Aim 4. PSD Group: Interaction Between Age at Adoption and Age at Assessment

Categorically-Scaled Outcomes—Age at adoption was consistently associated with behavior problem rates among 12- to 18-year-old children but not among 6- to 11-year-old children (see Table 4). Likewise, adolescents adopted ≥ 18 months consistently had higher behavior problem rates than the CBCL standardization sample, whereas younger children adopted ≥ 18 months did not. As shown in Table 4, adolescents adopted ≥ 18 months appeared to be at especially high risk relative to the other groups. For example, their behavior problem rates ranged from 27–50% while rates ranged from 16–24% for older-adopted 6- to 11-year-old children. Older-adopted adolescents had significantly higher rates of Social Problems than younger children adopted ≥ 18 months, $\chi^2(1, N=95)=12.87, p<0.001$, and this comparison approached significance for Externalizing, $\chi^2(1, N=95)=3.10, p<0.10$, and Attention Problems, $\chi^2(1, N=95)=3.30, p<0.10$. In addition, older-adopted adolescents had significantly higher rates across scales than younger children adopted <18 months (Internalizing: $\chi^2(1, N=236)=20.59, p<0.001$; Externalizing: $\chi^2(1, N=236)=10.50, p<0.01$; Attention Problems: $\chi^2(1, N=236)=9.38, p<0.01$; Social Problems: $\chi^2(1, N=236)=58.33, p<0.001$).

Continuously-Scaled Outcomes—Hierarchical multiple regressions were conducted. Each of the five types of behavior problems was regressed on an ordered sequence of predictors. Variables were entered in the following order: step 1 was age at assessment (6–11, 12–18 years); step 2 was age at adoption ($<$, ≥ 18 months); and step 3 was age at assessment $\times$ age at adoption. Results of these analyses are presented in Table 5. The regression models were significant for Internalizing, $F(3,337)=6.76, p<0.001$, Externalizing, $F(3,337)=4.50, p<0.01$, Attention, $F(3,337)=6.53, p<0.001$, Social, $F(3,337)=19.58, p<0.001$, and Thought Problems, $F(3,337)=2.86, p<0.05$. The interaction between age at assessment and age at adoption accounted for unique variance in Externalizing and Social Problems. Follow-up analyses revealed that increasing age at adoption corresponded with higher Externalizing and Social Problems among adolescents. However, there were weaker associations between age at adoption and Externalizing and Social Problems among 6- to 11-year-old children (see Fig. 2).

Aim 5. Comparisons Among the Post-Institutionalized Groups (PSD, GD, and VLD)

Table 2 presents the percentage of clinical/borderline cases on each CBCL scale for the three PI groups and chi-square tests comparing behavior problem rates in the PI groups. The VLD group had significantly higher rates of clinical/borderline Attention and Social Problems than the PSD group, but there were no other significant differences between these two groups. The GD group had higher rates of clinical/borderline scores on most of the CBCL scales than the PSD and VLD groups. Comparisons to the standardization sample of never-institutionalized children (described above for PSD group) revealed that the VLD group had higher rates of clinical/ borderline Externalizing, Attention, Social, and Thought Problems. The GD group had higher rates of all behavior problems than the standardization sample.

The three PI groups were then compared within age at adoption bands (<9, 9–17, and ≥18 months; see Table 3). There were no differences among the PI groups adopted <9 months. Among children adopted between 9 and 17 months, the GD group rates of clinical/borderline Externalizing, Attention, and Thought Problems were higher than both the PSD and VLD group rates, which did not differ from one another. Among children adopted ≥18 months, the GD group rates of clinical/borderline Attention and Thought Problems were higher than both the PSD and VLD group rates. The three PI groups adopted <9 months did not have higher behavior problem rates than the never-institutionalized standardization sample. GD children adopted between 9 and 17 months had consistently higher rates than the standardization sample, while VLD and PSD children did not. All three PI groups adopted ≥18 months had behavior problem rates that were elevated above the standardization sample.

Discussion

The purpose of this study was to examine behavior problems among children adopted from psychosocially depriving institutions that provided adequate nutrition, medical care, toys, and activities but were characterized by frequent changes in caregivers, low levels of caregiver-child social interaction, and insensitive, unresponsive caregiving. Even in the absence of severe physical deprivation, early institutional rearing was associated with a higher risk of attention and externalizing problems relative to never-institutionalized children raised continuously in families, consistent with previous findings for children adopted from psychosocially depriving institutions (Hodges and Tizard 1989; Tizard and Hodges 1978). Rates of behavior problems increased significantly with age at adoption, such that children who were exposed to institutional deprivation for longer than their first 18 months had higher behavior problem rates than never-institutionalized children but younger-adopted children did not.

Although confounding risk factors cannot be entirely ruled out (see below) and causal attributions cannot be made, these results are consistent with the hypothesis that low levels of caregiver warmth, emotional support, and contingent responsiveness in the institution may contribute to PI children's behavior problems. Responsive caregiving from a few consistent caregivers is thought to support the development of various skills, including the ability to regulate attention, emotion, and behavior to attain one's goals. Specifically, responsive caregiving during early childhood may facilitate the development of inhibitory control (e.g., Kochanska et al. 2000; Olson et al. 2002), or the ability to withhold responses to irrelevant stimuli while pursuing a longer-term goal (e.g., Berlin et al. 2003). There is evidence to suggest that children exposed to early institutional deprivation have inhibitory control deficits (Pollak et al. 2009) which may increase their vulnerability to attention problems (Kreppner et al. 2001). Thus, the lack of responsive caregiving in the institution may contribute to self-regulatory deficits that produce an increased likelihood of behavior problems.

Results of the current study indicated that higher behavior problem rates were unlikely to have resulted from certain other factors. Poor birth circumstances such as low birth weight or

prematurity were not significantly associated with an increased likelihood of behavior problems for children adopted from psychosocially depriving institutions. This is consistent with other studies of PI children (Bruce et al. 2009; Kreppner et al. 2007). In addition, adoption at young ages under non-depriving conditions was not associated with behavior problems, consistent with findings from prior studies (Rutter et al. 2007). Finally, confounding factors, if they were responsible for higher behavior problem rates, would have to be distributed according to age at adoption. Although some have argued that healthier children are selectively adopted earlier, studies designed to reduce the possibility of selection bias have nonetheless found age at adoption effects (Rutter et al. 2007).

Stronger positive associations between age at adoption and social and externalizing problems were found during adolescence than when children were assessed at younger ages. Changes occurring in adolescence may be especially challenging to children who were exposed to prolonged institutional deprivation during early childhood. For example, older-adopted PI adolescents may not have developed the self-regulatory skills that facilitate successful transitions to independence. Older-adopted PI adolescents may also be impaired in their social understanding (Tarullo et al. 2007), which may put them at a disadvantage during a developmental period that emphasizes peer interactions and romantic relationships. Social skills deficits and difficulties with peers may underlie both social and externalizing problems. Here, one limitation of the cross-sectional study design must be noted. Adolescents were adopted some years before the 6- to 11-year-old children and thus may have been exposed to more severe institutional deprivation. However, all of the children in the sample were adopted between 1993 and 2003 during which time no major changes were made in the quality or level of deprivation of institutions in Russia according to the directors of two of the institutions for young children represented here (N. Nikiforova and D. Penkov, personal communication, October 16, 2009).

The psychosocially deprived and varying levels of deprivation groups were susceptible to the same types of behavior problems relative to never-institutionalized children, and these groups did not differ on rates of most behavior problems. In both groups, adoption after 18 but not 9 months was associated consistently with increased behavior problem rates. The similarities between these two groups bolster the validity of the findings for the psychosocially deprived group and are consistent with the idea that psychosocial deficiencies that tend to characterize institutional care might contribute to PI children's behavior problems.

Children adopted from globally depriving institutions in the current study had higher rates of all types of behavior problems than the other two less severely deprived PI groups despite presumably having similar pre-institutional backgrounds. Children adopted from globally depriving institutions were exposed to more severe deprivation including inadequate physical resources, such as nutrition and medical care, and child-to-caregiver ratios ranging from 10–30:1 (vs. 4–6:1 in psychosocially depriving institutions; Chisholm 1998; Rutter et al. 2007; St. Petersburg-USA Orphanage Research Team 2005). Higher child-to-caregiver ratios are consistent with narrative reports describing globally depriving institutions as grossly neglectful with regard to caregiver-child social interactions and caregiver consistency and responsiveness.

Behavior problem rates were increased for children adopted after 9 months of age from globally depriving institutions but only after 18 months for the other two PI groups exposed to less severe deprivation. Taken together with past results (Gunnar et al. 2007; Rutter et al. 2007), these findings suggest that behavior problem rates increase for children adopted from globally depriving institutions after 6–9 months of age and for children adopted from psychosocially depriving institutions after 18–24 months. It is possible that these different results reflect a severity of deprivation effect; institutions characterized by more severe psychosocial

deprivation in combination with insufficient physical resources may be harmful at younger ages or shorter durations of exposure.

Rates did not increase further when adoption from psychosocially depriving institutions occurred after 27 months. This suggests that exposure to institutional deprivation before 27 months is associated with higher rates of later behavior problems, although researchers have voiced concerns about making inferences about sensitive periods from studies of PI children (Gunnar 2001; MacLean 2003).

This study had a number of limitations. First, children were adopted from psychosocially depriving institutions in Russia and the former Soviet Union making results less generalizable to children adopted from institutions outside this region. Children adopted from Russia and Eastern Europe may have higher rates of behavior problems than those from other areas of the world possibly due to higher rates of prenatal alcohol exposure (Gunnar et al. 2007). Second, prenatal effects and birth family characteristics are confounded with institutional deprivation, but the results for birth circumstances, children adopted at young ages within the U.S., and age at adoption speak against these confounds. Third, behavior problems were measured solely using parent report, which leaves open the possibility of rater bias. However, studies that used teacher report data have produced similar results to those using parent report (Miller et al. 2009; Rutter et al. 2007). Fourth, response rates for children adopted from psychosocially depriving institutions, which ranged from 40–50%, are lower than the 65% of one of the largest international adoption follow-ups (Verhulst and Versluis-den Bieman 1995) but higher than the 28–36% of the largest follow-up of Romanian adoptees (i.e., GD group; Groza and Ryan 2002). Families who completed surveys in 2001 were not different from those who did not respond on income or parental age, suggesting that the families in this sample were representative of the larger group on some variables. Fifth, it was not ideal to use the CBCL standardization sample as a never-institutionalized comparison group because assessments were made at different times and using different protocols than other groups.

Despite these limitations, this study adds to the literature by focusing on children adopted from institutions with deficiencies limited primarily to psychosocial deprivation. Other strengths include a large sample size and other post-institutionalized comparison groups. These results suggest that efforts should be made to facilitate the transition of children to family care environments (Nelson et al. 2007), to make this transition as early as possible, and to improve institutions, because they are not likely to disappear very soon. Institution improvements could include assigning primary caregivers, reducing the number of different caregivers, stopping “graduations” to new age groups, reducing group size, and training caregivers to provide sensitive responsive care, changes that have been shown to substantially improve the developmental status of resident children (Sparling et al. 2005; St. Petersburg–USA Orphanage Research Team 2008). In addition, this study highlighted the need to consider supportive interventions and professional services for parents of children exposed to institutional deprivation during early childhood.

Acknowledgments

This research was supported by NICHD grants HD39017 and HD050212 to Robert B. McCall and Christina J. Groark. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NICHD or NIH. The authors thank Larisa Mason, Mary Graber, and the participating families who made this study possible. The authors are also grateful to Megan Gunnar and Victor Groza for contributing data and for their helpful comments on an earlier version of this manuscript. The authors also thank Larry Fish for guidance with statistical analyses and Johana Rosas, Megan Julian, and Brandi Hawk for their assistance with the database.

References

- Achenbach, TM. Manual for the child behavior checklist/4–18 and 1991 profile. Burlington: University of Vermont, Department of Psychiatry; 1991.
- Achenbach, TM.; Rescorla, LA. Manual for the ASEBA school-age forms and profiles. Burlington: University of Vermont, Research Center for Children, Youth, and Families; 2001.
- Ainsworth, MDM.; Blehar, MC.; Waters, E.; Wall, S. Patterns of attachment. Hillsdale: Erlbaum; 1978.
- Berlin L, Bohlin G, Rydell A. Relations between inhibition, executive functioning, and ADHD symptoms: a longitudinal study from age 5 to 8 1/2 years. *Child Neuropsychology* 2003;9:255–266. [PubMed: 14972704]
- Bornstein, MH.; Tamis-LeMonda, CS. Maternal responsiveness and cognitive development in children. In: Bornstein, MH., editor. *Maternal responsiveness: Characteristics and consequences*. San Francisco: Jossey-Bass; 1989. p. 49–61.
- Bruce J, Tarullo AR, Gunnar MR. Disinhibited social behavior among internationally adopted children. *Development and Psychopathology* 2009;21:157–171.
- Chisholm K. A three year follow-up of attachment and indiscriminate friendliness in children adopted from Romanian orphanages. *Child Development* 1998;69:1092–1106. [PubMed: 9768488]
- Colvert E, Rutter M, Beckett C, Castle J, Groothues C, Hawkins A, et al. The delayed onset of emotional difficulties following severe early deprivation: findings from the ERA study. *Development and Psychopathology* 2008;20:547–567. [PubMed: 18423094]
- Crijnen A, Achenbach T, Verhulst F. Problems reported by parents of children in multiple cultures: the CBCL syndrome constructs. *American Journal of Psychiatry* 1999;156:569–574. [PubMed: 10200736]
- Cummings, EM.; Davies, PT.; Campbell, SB. *Developmental psychopathology and family process*. New York: Guilford; 2000.
- Duarte CS, Bordin IAS, de Oliveira A, Bird H. The CBCL and the identification of children with autism and related conditions in Brazil: pilot findings. *Journal of Autism and Developmental Disorders* 2003;33(6):703–707. [PubMed: 14714937]
- Groza V, Ryan SD. Pre-adoption stress and its association with child behavior in domestic special needs and international adoptions. *Psychoneuroendocrinology* 2002;27(1/2):181–198. [PubMed: 11750778]
- Gunnar, MR. Effects of early deprivation: Findings from orphanage-reared infants and children. In: Nelson, CA.; Luciana, M., editors. *Handbook of developmental cognitive neuroscience*. Cambridge: MIT; 2001. p. 617–629.
- Gunnar MR, van Dulmen MHM, Team IAP. Behavior problems in post-institutionalized internationally adopted children. *Development and Psychopathology* 2007;19:129–148. [PubMed: 17241487]
- Hodges J, Tizard B. Social and family relationships of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines* 1989;30:77–97.
- Hoksbergen R, Rijk K, van Dijkum C, ter Laak J. Adoption of Romanian children in the Netherlands: behavior problems and parenting burden of upbringing for adoptive parents. *Developmental and Behavioral Pediatrics* 2004;25(3):175–180.
- Juffer F, van IJzendoorn MH. Behavior problems and mental health referrals of international adoptees: a meta-analysis. *Journal of the American Medical Association* 2005;293(20):2501–2515. [PubMed: 15914751]
- Kochanska G, Murray KT, Harlan ET. Effortful control in early childhood: continuity and change, antecedents, and implications for social development. *Developmental Psychology* 2000;36:220–232. [PubMed: 10749079]
- Kossover, R. Analysis of dietary composition and nutritional adequacy in Russian orphans living in Baby Home No 13. Minneapolis: University of Minnesota; 2004. Unpublished manuscript
- Kreppner JM, O'Connor TG, Rutter M. Can inattention/overactivity be an institutional deprivation syndrome? *Journal of Abnormal Child Psychology* 2001;29:513–528. [PubMed: 11761285]
- Kreppner JM, Rutter M, Beckett C, Castle J, Colvert E, Groothues C, et al. Normality and impairment following profound early institutional deprivation: a longitudinal follow-up into early adolescence. *Developmental Psychology* 2007;43(4):931–946. [PubMed: 17605526]

- Landry SH, Smith KE, Swank PR. Responsive parenting: establishing early foundations for social, communication, and independent problem-solving skills. *Developmental Psychology* 2006;42(4): 627–642. [PubMed: 16802896]
- Le Mare, L.; Audet, K. Attention abilities of Romanian orphans ten years after being adopted to Canada. Poster presented at the International Society for the Study of Behavioral Development; Ottawa, Ontario. August 2–5; 2002.
- MacLean K. The impact of institutionalization on child *development*. *Development and Psychopathology* 2003;15:853–884. [PubMed: 14984130]
- Miller L, Chan W, Tirella L, Perrin E. Outcomes of children adopted from Eastern Europe. *International Journal of Behavioral Development* 2009;33(4):289–298.
- Muhamedrahimov, RJ. New attitudes: Infant care facilities in St. Petersburg, Russia. In: Osofsky, JD.; Fitzgerald, HE., editors. *WAIMH handbook of infant mental health. Perspectives on infant mental health*. Vol. 1. New York: Wiley; 1999. p. 245–294.
- Nelson, CA., III; Zeanah, CH.; Fox, NA. The effects of early deprivation on brain-behavioral development: The Bucharest Early Intervention Project. In: Romer, D.; Walker, EF., editors. *Adolescent psychopathology and the developing brain: Integrating brain and prevention science*. New York: Oxford; 2007. p. 197–217.
- Olson SL, Bates JE, Sandy JM, Schilling EM. Early developmental precursors of impulsive and inattentive behavior: from infancy to middle childhood. *Journal of Child Psychology and Psychiatry* 2002;43:435–447. [PubMed: 12030590]
- Pollak SD, Nelson CA, Schlaak MF, Roeber BJ, Wewerka SS, Wiik KL, et al. Neurodevelopmental effects of early deprivation in post-institutionalized children. *Child Development*. 2009
- Rutter M, Andersen-Wood L, Beckett C, Bredenkamp D, Castle J, Groothues C, et al. Quasi-autistic patterns following severe early global privation. *Journal of Child Psychology and Psychiatry* 1999;40:537–549. [PubMed: 10357161]
- Rutter M, Kreppner JM, O'Connor TG. Specificity and heterogeneity in children's responses to profound institutional privation. *British Journal of Psychiatry* 2001;179:97–103. [PubMed: 11483469]
- Rutter M, Beckett C, Castle J, Colvert E, Kreppner J, Mehta M, et al. Effects of profound early institutional deprivation: an overview of findings from a UK longitudinal study of Romanian adoptees. *European Journal of Developmental Psychology* 2007;4(3):332–350.
- Sonuga-Barke EJS, Beckett C, Kreppner J, Castle J, Colvert E, Stevens S, et al. Is sub-nutrition necessary for a poor outcome following early institutional deprivation? *Developmental Medicine & Child Neurology* 2008;50(9):664–71. [PubMed: 18754915]
- Sparling J, Dragomir C, Ramey SL, Florescu L. An educational intervention improves developmental progress of young children in a Romanian orphanage. *Infant Mental Health Journal* 2005;26(2):127–42.
- Steinberg, L.; Dahl, R.; Keating, D.; Kupfer, DJ.; Masten, AS.; Pine, D. The study of developmental psychopathology in adolescence: Integrating affective neuroscience with the study of context. In: Cicchetti, D.; Cohen, D., editors. *Developmental psychopathology*. 2nd. New York: Wiley; 2006. p. 710–741.
- Stevens SE, Sonuga-Barke ES, Kreppner JM, Beckett C, Castle J, Colvert E, et al. Inattention/overactivity following early severe institutional deprivation: presentation and associations in early adolescence. *Journal of Abnormal Child Psychology* 2007;36:385–398. [PubMed: 17965931]
- Tarullo AR, Bruce J, Gunnar MR. False belief and emotion understanding in post-institutionalized children. *Social Development* 2007;16(1):57–78.
- The St. Petersburg–USA Orphanage Research Team. Characteristics of children, caregivers, and orphanages for young children in St. Petersburg, Russian Federation. *Journal of Applied Developmental Psychology: Child Abandonment* 2005;26(Special Issue):477–506.
- The St. Petersburg–USA Orphanage Research Team. The effects of early social-emotional and relationship experience on the development of young orphanage children. *Monograph of the Society for Research in Child Development* 2008;73(3) Serial No. 291.
- Tizard B, Hodges J. The effect of early institutional rearing on the development of eight-year-old children. *Journal of Child Psychology and Psychiatry and Allied Disciplines* 1978;19:99–118.

- Tizard, J.; Tizard, B. The social development of two-year-old children in residential nurseries. In: Schaffer, HR., editor. The origins of human social relations. New York: Academic; 1971. p. 147-163.
- US State Dept. 2006. Online at http://travel.state.gov/family/adoption/stats/stats_451.html
- Verhulst FC, Versluis-den Bieman HJ. Developmental course of problem behaviors in adolescent adoptees. *Journal of the American Academy of Child and Adolescent Psychiatry* 1995;34:151–159. [PubMed: 7896648]
- Zeanah CH, Egger HL, Smyke AT, Nelson CA, Fox NA, Marshall PJ, et al. Institutional rearing and psychiatric disorders in Romanian preschool children. *American Journal of Psychiatry* 2009;166(7): 777–785. [PubMed: 19487394]

Fig. 1.

Percentage of clinical/borderline scores on the CBCL scales for PSD children adopted <9, 9–17, and ≥18 months. The horizontal line at 14% represents the rate of T scores ≥61 in the standardization sample. Chi-square tests of differences in the percentage of clinical/borderline scores across three levels of age at adoption (behavior problems in same order as figure): χ^2 (2) = 23.64, $p < 0.001$; 9.93, $p < 0.01$; 8.64, $p < 0.05$; 36.13, $p < 0.001$; 1.45, ns

Fig. 2.
Predicted levels of CBCL Social Problems as a function of age at adoption for PSD children who were 6–11 and 12–18 years of age at assessment

Table 1

Descriptive Data on 342 PSD, 899 VLD, 97 GD, and 42 ND Children

	PI groups			Non-I group
	PSD	VLD	GD	ND
Mean (<i>SD</i>) age (years) ^a	10.12 (3.35)	8.83 (3.47)	6.74 (1.89)	12.27 (3.42)
Boys / girls ^a	150/192	319/580	43/54	23/19
Mean (<i>SD</i>) months at adoption	16.14 (11.75) ^b	29.5 (30.7)	27.49 (24.71)	1.55 (2.19)
Birth region	Russia (292), FSU (50)	Asia (443), Russia/ E. Europe (267), Latin America/ Carib. (182)	Romania (97)	USA (42)
Mean (<i>SD</i>) years post-adoption ^a	8.73 (3.17)	6.4 (2.6)	4.45 (0.62)	11.90 (3.56)
Two-parent household	92%	85%	91%	93%
Parents with 4-year college	68%	71%	–	74%
Mean income	\$100,000 to \$125,000	\$107,500	\$73,000	–
Stressful event	3%	4.3%	–	–

PI post-institutionalized, Non-I non-institutionalized, FSU former Soviet Union, E. Europe Eastern Europe, Carib. Caribbean, – unavailable

^a significantly different across PI groups

^b significantly different from VLD, GD groups

Table 2Percentage of PSD, VLD, GD, and ND Children with Clinical/Borderline Behavior Problems ($T \geq 61$)

CBCL scales	PI groups		ND group (N=42)	Comparison across PI groups		Comparisons between PI groups			
	PSD (N=342)	VLD (N=899)	GD (N=97)	χ^2 (2, N=1338)		PSD-VLD χ^2 (1, N=1241)	PSD-GD χ^2 (1, N=439)	VLD-GD χ^2 (1, N=996)	
Internalizing	13%	12%	23%	12%	8.81*	0.17	5.70*	8.78**	
Externalizing	20%	19%	35%	10%	13.93***	0.12	9.75**	13.76***	
Attention Problems	21%	28%	46%	17%	24.57***	6.25*	24.82***	14.10***	
Social Problems	14%	22%	28%	10%	13.29**	9.95**	10.16**	1.69	
Thought Problems	19%	22%	44%	12%	28.58***	1.35	26.13***	23.75***	

Bold percentages are significantly higher than the never-institutionalized standardization sample rate (14%; N=438) *PI* post-institutionalized*
 $p < 0.05$,**
 $p < 0.01$,***
 $p < 0.001$

Table 3

CBCL scales	Age at adoption (months)											
	<9				9-17				≥18			
	PSD <i>n</i> =82	VLD <i>n</i> =216	GD <i>n</i> =21	χ^2 (2)	PSD <i>n</i> =165	VLD <i>n</i> =248	GD <i>n</i> =29	χ^2 (2)	PSD <i>n</i> =95	VLD <i>n</i> =435	GD <i>n</i> =47	χ^2 (2)
Internalizing	7%	12%	0%	3.97	7%	8%	21%	5.85	27%	17%	34%	11.40**
Externalizing	12%	8%	14%	1.93	18%	13%	31%	7.21*	30%	30%	47%	5.53
Attention	17%	16%	0%	4.11	18%	25%	48%	12.57**	32%	43%	66%	15.16***
Social	6%	10%	0%	3.36	7%	20%	31%	17.37***	32%	30%	38%	1.34
Thought	16%	13%	24%	2.01	18%	17%	52%	20.25***	22%	27%	49%	12.14**

Bold percentages are significantly higher than the CBCL standardization sample rate (14%; $N=438$). Sample sizes for the chi square tests are 319, 442, and 577 for the <9, 9–17, and ≥ 18 month group comparisons, respectively. Follow-up tests; 9–17 mos: Externalizing, PSD-VLD, $\chi^2(1)=2.16$, PSD-GD, $\chi^2(1)=2.54$, VLD-GD, $\chi^2(1)=6.77^{**}$, Attention, PSD-VLD, $\chi^2(1)=2.66$, PSD-GD, $\chi^2(1)=12.74^{***}$, VLD-GD, $\chi^2(1)=7.07^{**}$, Social, PSD-VLD, $\chi^2(1)=12.90^{***}$, PSD-GD, $\chi^2(1)=14.43^{***}$, VLD-GD, $\chi^2(1)=1.83$, Thought, PSD-VLD, $\chi^2(1)=0.11$, PSD-GD, $\chi^2(1)=15.58^{***}$, VLD-GD, $\chi^2(1)=19.23^{***}$; ≥ 18 mos: Internalizing, PSD-VLD, $\chi^2(1)=5.46^{*}$, PSD-GD, $\chi^2(1)=0.67$, VLD-GD, $\chi^2(1)=8.10^{**}$, Attention, PSD-VLD, $\chi^2(1)=4.20^{*}$, PSD-GD, $\chi^2(1)=15.17^{***}$, VLD-GD, $\chi^2(1)=9.03^{**}$, Thought, PSD-VLD, $\chi^2(1)=0.93$, PSD-GD, $\chi^2(1)=10.59^{**}$, VLD-GD, $\chi^2(1)=10.00^{**}$.

^{*} $p<0.05$,
$$p < 0.01, **$$

 $p < 0.001$

Percentage of PSD Children with Clinical/Borderline Behavior Problems ($T \geq 61$) by Age at Adoption and Age at Assessment

Table 4

CBCL scales	Age at assessment (years)			
	6-11		12-18	
	Age at adoption (months)		Age at adoption (months)	
	< 18 <i>n</i> =192	≥ 18 <i>n</i> =51	< 18 <i>n</i> =55	≥ 18 <i>n</i> =44
Internalizing	7%	22%	7%	32%
Externalizing	17%	22%	13%	39%
Attention Problems	19%	24%	11%	41%
Social Problems	6%	16%	11%	50%
Thought Problems	19%	18%	11%	27%

Chi square statistics given in the table indicate whether age at adoption was significantly associated with behavior problems at each level of age at assessment. *Bold* percentages are significantly higher than the CBCL standardization sample rate (14%; *N*=438)

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

Table 5
Hierarchical Regression Analyses: Predicting Behavior Problem *T* scores in the PSD Group from Age at Assessment $\times$ Age at Adoption

Predictor	Internalizing		Externalizing		Attention		Social		Thought	
	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
1 Age at assessment ^a	0.10	0.01 ⁺	0.06	0.00	0.11	0.01 [*]	0.22	0.05 ^{***}	0.09	0.01
2 Age at adoption ^b	0.22	0.05 ^{***}	0.16	0.02 ^{***}	0.19	0.03 ^{***}	0.27	0.07 ^{***}	0.11	0.01 [*]
3 Age at assessment $\times$ age at adoption	0.15	0.00	0.36	0.01 [*]	0.33	0.01 ⁺	0.60	0.03 ^{***}	0.24	0.01

^a categorical variable (6–11, 12–18 years)

^b categorical variable (<, $\geq$ 18 months)

⁺ $p < 0.10$

^{*} $p < 0.05$

^{**} $p < 0.01$

^{***} $p < 0.001$