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# Are Disinhibited Social Behaviors Among Internationally Adopted Children Mediated by the Attachment Environment or by Children's Difficulties with Inhibitory Control?

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**ABSTRACT**

Internationally adopted children show higher rates of disinhibited social behavior (DSB). Two competing explanations for DSB include difficulties in attachment specifically and deficits in inhibitory control more generally. This four-wave longitudinal study (a) documented the persistence of DSB among internationally adopted children and (b) tested the relative contributions of attachment environment versus inhibitory control difficulties in the persistence of DSB. Improvement in DSB was found 3 to 4 years post-adoption for the sample as a whole, although heterogeneity within the sample was present. Results from structural equation modeling and another test of mediation both indicated that the association between early deprivation and DSB was mediated by general difficulties with inhibitory control, not by attachment environment.

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Children who experience early adverse environments are at increased risk for a pattern of behaviors characterized by overly friendly interactions with unfamiliar adults. These children fail to show the wariness toward strangers that is developmentally appropriate and necessary for the safety of young children (Bakermans-Kranenburg et al., 2011). Called disinhibited social behavior (DSB) or "indiscriminate friendliness," key behavioral abnormalities include initiating verbal and physical contact with unfamiliar adults, wandering away from parents in unfamiliar places, and a willingness to go off with strangers. This pattern of behaviors has been found among currently institutionalized toddlers (Smyke, Dumitrescu, & Zeanah, 2002; Zeanah, Smyke, Koga, & Carlson, 2005), post-institutionalized children (Rutter et al., 2007), adopted foster children (Bruce, Tarullo, & Gunnar, 2009), non-adopted foster children (Pears, Bruce, Fisher, & Kim, 2010), and other

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populations who have experienced deprivation (Kay & Green, 2013; Minnis et al., 2013).

Children who are initially raised in orphanages but are then adopted into stable, loving families generally display improvement across a variety of domains including physical growth, stereotyped motor movements, cognition, and attachment (Beckett, Castle, Rutter, & Sonuga-Barke, 2010; Bos, Zeanah, Smyke, Fox, & Nelson, 2014), but DSB is reported by parents years after the adoption has occurred (Chisholm, 1998). In the English and Romanian Adoptees (ERA) Study, where DSB was measured using both parent questionnaires and ratings of the child interacting with the investigators, 54% of the 88 children adopted as infants and toddlers who were demonstrating DSB at age 6 were still demonstrating DSB at age 11 (Rutter et al., 2007) and 33% were still demonstrating DSB at age 15 (Kreppner et al., 2010). While the persistence of DSB has been examined in severely deprived young Romanian adoptees, the continuity of these symptoms has yet to be longitudinally studied in children from less depriving circumstances and/or those adopted at older ages.

## Specific aspects of deprivation associated with DSB

Studies linking deprivation with both observed and parent-reported DSB suggest that the most important aspect of deprivation is the *length of time* spent in pathogenic care (Bruce et al., 2009; Gleason et al., 2014). In the ERA Study (Rutter et al., 2007) children whose DSB symptoms persisted from age 6 to 11 were more likely than those not showing DSB symptoms to have spent more than 6 months in institutional care. Chisholm (1998) also found a threshold effect in which Romanian children adopted early (younger than 4 months old) did not differ from home-reared children on parent-reported DSB, while Romanian adoptees adopted later (older than 4 months) did display significantly higher rates of DSB than home-reared children. However, it may be that length of deprivation is the best predictor only for children who eventually escape institutionalization. Zeanah et al. (2005) found no association between caregiver-reported DSB and length of institutional care, but this sample consisted of currently institutionalized children still living in an adverse environment.

## Attachment as a mediator between deprivation and DSB

Several explanatory theories for DSB exist. Initially DSB was classified as a subset of reactive attachment disorder, with DSB symptoms indicating a lack of selective attachment. In the *Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV*, criteria for this disorder included history of pathogenic care, which was contended to be responsible for the disorder. Researchers from the ERA Study initially conceptualized DSB as an attachment issue in which a child displays "attachment-like" behaviors to parents and unknown adults alike. O'Connor et al. (2003) observed that children engaged in these "attachment-like" behaviors (i.e., strong

approach, initiating contact) despite a lack of reciprocity from the target adult and suggested that institutional environments provide little chance to form a selective attachment with a caregiver because high child-to-caregiver ratios limit interpersonal opportunities for play, joint attention, and conversation. Because children are not exposed to a pattern of predictable interactions, they are unable to form the mechanisms needed to regulate their exploratory behavior and maintain a reciprocal relationship with a caregiver, thereby leading to indiscriminate attachment-like behaviors. This research team also suggested that indiscriminate behaviors may be adaptively important for children, as positive and friendly affect is more likely to garner caregiver attention and affection. This theory of DSB is particularly convincing when placed within the context of a robust body of literature demonstrating that institutionalization dramatically decreases the chances of developing a secure attachment relationship (see Backermans-Kranenburg et al., 2011 for review; Chisholm, 1998).

However, several studies (Bruce et al., 2009; Chisholm, 1998; Kočovská et al., 2012; Pears et al., 2010; Rutter et al., 2007; Smyke et al., 2002, Zeanah, Smyke, & Dumitrescu, 2002) found no relationship between attachment security and DSB, such that a securely attached child could still display DSB. With respect to attachment quality *during* institutionalization, Smyke et al. (2002) identified moderate levels of indiscriminate behaviors via caregiver report in nearly all Romanian institutionalized children including those who had a preferred attachment figure. Chisholm (1998) found that children who were favorites in the institution had higher rates of parent-reported DSB than those who were not favorites. With respect to attachment quality post-institutionalization, Chisholm (1998) found that parent-reported DSB symptoms persisted in Romanian adoptees 3 years post-adoption even though their observed attachment quality improved. Rutter et al. (2007) found that the persistence of observed and parent-reported DSB in Romanian adoptees from age 6 to 11 was unrelated to observed attachment quality. Persistent caregiver-reported DSB despite improved attachment relationships was also documented in a sample of previously institutionalized Romanian children placed in foster care (Smyke et al., 2012). Such findings prompted both Chisholm (1998) and Smyke et al. (2002) to concur with O'Connor et al. (2003) that DSB can be adaptive in an unstable attachment environment, even as they challenged the view of attachment difficulties as a cause of DSB. That said, Chisholm (1998) did find that children with very *severe* DSB (willing to go off with strangers, wandering off without distress) were more likely to be insecurely attached than those with moderate DSB (extra-friendly, lacking shyness), which was unrelated to attachment security. This suggests that the association between deprivation and severe DSB might by mediated by attachment even if the association between deprivation and moderate DSB is not.

## General inhibitory control as a mediator between deprivation and DSB

A second theory has been suggested in which DSB is attributed to impaired biological programming resulting from early deprivation. Rutter et al. (2007) attribute the etiology of DSB to biological programming that can occur in institutional care during a sensitive period of development in which adaptive DSB responses change the functioning and structure of the child's brain. Specifically, DSB may function to give the brain needed social stimulation in deprived social environments (Chisholm, 1998). According to Bruce et al. (2009), insufficient stimulation results in executive functioning deficits.

Deficits in executive functioning manifest as both lower rates of inhibitory control and higher rates of inattention and overactivity (I/O). Studies examining cognitive measures of inhibitory control commonly find worse performance among international adoptees compared with non-adopted controls (Eigsti, Weitzman, Schuh, de Marchena, & Casey, 2011; Hostinar, Stellern, Schaefer, Carlson, & Gunnar, 2012; Merz, McCall, Wright, & Luna, 2013) and foster children (Roy, Rutter, & Pickles, 2004). Similarly, Kreppner, O'Connor, and Rutter (2001) found higher rates of I/O for institutionalized children and foster children compared to non-adopted controls. The fact that institutionalized children demonstrate both deficits in several types of executive functioning and higher rates of DSB lends support to the development process proposed by the Rutter et al. (2007) in which DSB is the result of deprivation mediated by executive functioning.

Additional support for this process has been provided by a cross-sectional study by Bruce et al. (2009). Using a sample of previously institutionalized Eastern European and Asian children adopted younger than 36 months, these researchers found that poor inhibitory control mediated the relationship between length of orphanage stay and DSB symptoms (both observed and parent-reported). This study provides an explanation for the persistence and high rates of DSB symptoms observed in international adoptees by demonstrating that early deprivation may negatively impact the development of brain regions such as the frontal lobe, resulting in inhibitory control deficits that remain relatively stable over time. This research team also found no relationship between DSB and parent-reported attachment with adoptive parents. Bruce et al.'s (2009) findings have been replicated by Pears et al. (2010), who reported that lower inhibitory control was a better predictor of caregiver-reported DSB than caregiver-reported attachment and severity of early maltreatment in a group of foster care children. However, Colvert et al. (2008) did *not* find a mediating effect of measures of executive functioning on parent-reported DSB. Given the variety of explanations and conflicting findings about the mediating role of attachment and inhibitory control on DSB, additional research is needed.

## Current study

The first aim of the current study was to examine the continuity of DSB symptoms in a group of internationally adopted children adopted at older ages and from less depriving circumstances as compared to other samples. To accomplish this, a longitudinal design consisting of four waves over 6 years was used. The second aim of our study was to test competing explanations for persistent DSB in this sample. Based on the many studies failing to find an association between attachment and DSB in severely deprived, younger samples, we hypothesized that inhibitory control would be the better predictor of persistent DSB in this sample and that it would mediate the relationship between length of time spent in institutional care and persistent DSB.



## Methods

### *Participants*

The internationally adopted children were recruited through local adoption agencies and organizations offering support for adoptive families. Adoptive parents were screened via telephone interview to make sure the participating children met the following criteria: (a) adopted internationally within the last 5 years, (b) younger than 18 years old at the beginning of the study, (c) no known evidence of alcohol or drug exposure prenatally based on parent and pediatrician report, and (d) no known medical condition that might independently affect the child's performance on testing (i.e., epilepsy, Down syndrome, brain injury). No incentives were offered to families for participation in the study.

Forty-nine children (16 boys) met the criteria and participated at Wave 1. Children were adopted from a variety of regions including Southeast Asia ($n = 24$), Eastern Europe/North Asia ($n = 11$), Africa ($n = 10$), and the Caribbean and Central/South America ($n = 4$). Age at adoption ranged from 6 to 196 months, with an average age of 57.03 ($SD = 47.72$) months. Children adopted from Eastern Europe/North Asia were significantly older at the time of adoption ($M = 100.5$ months, $SD = 59.3$ months) than children adopted from other regions (Southeast Asia: $M = 40.8$ months, $SD = 39.0$ months; Africa: $M = 49.3$ months, $SD = 27.9$ months; Caribbean/Central and South America: $M = 54.5$ months, $SD = 39.0$ months). At the time of the first wave, the sample had spent an average of 20.95 ($SD = 18.94$) months in the adoptive home and ranged in age from 8 to 196 months, with an average age of 78.0 ($SD = 46.45$) months. Length of time in the adoptive home did not correlate with age at adoption or age at testing ($r = -0.26$ and $r = 0.14$, respectively). Children were an average of 88.11 ($SD = 46.91$, range = 19–208) months at the second visit, an average of 100.29 ($SD = 47.88$, range = 30–229) months at the third visit, and an average of 131.18 ($SD = 43.88$, range = 67–265) months at the final visit.

Concerning pre-adoptive care, 88% of the sample had spent some time in orphanage care, with an average stay of 26.47 months (range = 1–145 months, $SD = 34.1$), 35% experienced at least some time in a foster care setting (range = 1–103 months, $M = 24.41$ months, $SD = 26.34$ months), and 53% had spent some time living with biological family or relatives (range = <1–115 months, $M = 40.45$, $SD = 31.97$). Twelve children had a suspected history of abuse, although many parents had very limited information about pre-adoption conditions.

Regarding adoptive family factors, adoptive mothers had an average of 16.40 ($SD = 1.91$) years of education and fathers had a mean education of 16.6 ($SD = 2.05$) years. Including the adopted child, families had an average of 3.4 children in the family ($SD = 1.56$, range = 1–7).

## Procedure

Participants were initially involved in the study for 3 consecutive years (mean time from Wave 1 appointment to Wave 2 appointment = 11.61 months, $SD = 1.59$ months; mean time from Wave 2 appointment to Wave 3 appointment = 11.82 months, $SD = 1.48$ months). We then followed up approximately 3 years later, with Wave 4 occurring an average of 33.6 ($SD = 8.5$) months after the Wave 3 appointment. This approach was chosen to provide detailed information about the initial adjustment period into the adoptive home as well as a long-term follow-up visit. Of the original 49 participants, 43 participated in Waves 2 and 3. One family left the study after the Wave 3 appointment due to dissolution of adoption, leaving a total sample size of 42 for all analyses in the current report.

All visits were conducted with a primary caregiver and the adopted child. Parent consent was obtained for all forms and tests; child assent was also obtained. At each wave, children completed cognitive testing conducted by a trained member of the research team while parents completed standardized rating forms regarding the adopted child. These included measures of executive functioning, child behavior and emotional adjustment, and parent–child relationship quality. Parents also completed, at each wave, a semi-structured interview. The interview gathered information regarding the child's pre-adoptive care (Wave 1 only) and included the Disturbances of Attachment Interview (DAI; Smyke & Zeanah, 1999), which was administered at each wave. The visits took an average of 2.5 to 3 hours, with breaks given for the child during cognitive testing depending upon age and ability. Results of cognitive testing and various other aspects of children's adjustment have been reported previously by Helder et al. (2016).

## Measures

This study employed four focal constructs. The primary *independent* variable was duration of deprivation and the primary *dependent* variable was DSB at Wave 4. Two constructs were examined as mediators of the relationship between

deprivation and Wave 4 DSB: attachment environment and inhibitory control. The variables representing the mediators were constructed by averaging data from Waves 1 through 3. An averaging method was favored for two reasons. First, our sample size limited the number of variables that should be included in structural equation models (SEMs), and we could find no precedent in the literature for the use of any particular wave over another. Second, there are different trajectories of reported symptomatology in our data. Some parents reported difficulties already by Wave 1, whereas others parents did not report difficulties until Wave 2. Families also differed with respect to how much symptomatology was still being reported at Wave 3. Whether these patterns reflect actual difference in trajectories or only differences in parents' propensity to perceive and acknowledge symptomatology at different points in time is unclear, but we expected that mediator variables based on the average of the first three waves of data collection would provide a better indication of actual symptomology than any one particular wave. Thus, our focal analyses are based on these averaged ratings (although the strongest evidence of mediation was actually obtained in post hoc analyses employing ratings from Wave 2; see footnotes 1 and 2).

### *Duration of deprivation*

In keeping with previous research that has demonstrated duration of institutionalization as highly predictive of DSB (Bruce et al., 2009; Chisholm 1998; Gleason et al., 2014; Rutter et al., 2007), duration of deprivation was defined as the number of months the child had resided in an orphanage, as reported by parents at Wave 1. The five children who had not experienced orphanage care received a zero on this variable, resulting in a mean of 28.4 ($SD = 36.2$) months for this variable for participants included in this report.

### *DSB*

DSB was assessed using four items from the DAI (Smyke & Zeanah, 1999). The four items were failure to check back in unfamiliar places, lack of reticence with unfamiliar adults, nonaggressive physical contact with strangers, and willingness to go off with a stranger. Items were followed by specific examples, permitting the interviewer to probe for behaviors typical of children of various ages and developmental levels. The DAI has been utilized across a wide age range including older children (Humphreys, Nelson, Fox, & Zeanah, 2017) and adolescents (Elovainio, Raaska, Sinkkonen, Mäkipää, & Lapinleimu, 2015). The interviewer then rated each item on a scale from 0 to 2, based on parent responses to interview questions and the follow-up clarification probes. Totaling the ratings for the four items resulted in a possible score of 0 to 8 points, with higher numbers indicating higher rates of DSB. The four DSB items showed excellent internal reliability at each of the four waves ($\alpha = .803$, .863, .911, and .843, respectively). Total scores from all four waves were used to examine the persistence of DSB over time. Scores at Wave 4 served as the dependent variable in the mediational analyses. Wave 4 was chosen

**Table 1.** Descriptive data for focal variables.

| | Wave 1 | | Wave 2 | | Wave 3 | | Wave 4 | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Disinhibited social behavior | 1.69 | 1.94 | 1.05 | 1.85 | 0.71 | 1.58 | 1.17 | 1.96 |
| Inhibitory control | 57.28 | 12.85 | 56.93 | 15.2 | 56.3 | 14.39 | 58.74 | 15.29 |
| Attachment environment | 46.78 | 12.08 | 49.83 | 11.47 | 47.63 | 10.78 | 47 | 10.97 |

so that potential mediators (the average of Waves 1–3) would temporally precede our dependent variable.

### *Attachment environment*

Attachment environment was assessed with the Attachment Index from the Parent Relationship Questionnaire (Kamphaus & Reynolds, 2006). As stated in the manual, this 11-item index measures "the affective, cognitive, and behavioral relationship between a parent and child that results in feelings of closeness, empathy, and understanding on the part of parent for the child." Items assess parents' perceptions of their ability to detect and appropriately deal with their child's emotions (e.g., "I know what to do to calm down my child") as well as the level of closeness between parent and child. As such, this index is more a measure of the parent's competency and satisfaction with the relationship than the child's attachment model/security classification. Standardized scores on this index were calculated using age-based norms for the measure, resulting in *t*-scores (standardization sample $M = 50$, $SD = 10$), with higher scores indicating better attachment environment. See Table 1 for descriptive data from the current study sample for each wave.

### *Inhibitory control*

Inhibitory control was measured utilizing the Inhibit Scale from the Behavior Rating Inventory of Executive Function filled out by parents at each wave (Gioia, Isquith, Guy, & Kenworthy, 2000). This measure assesses the extent to which children can stop inappropriate behavior and resist impulses. Parent responses were transformed to standardized *t*-scores using gender- and age-based norms. Scores for this scale have a mean of 50 and a standard deviation of 10 in the standardization sample, with higher scores representing greater difficulties with inhibition. Because higher scores represent greater difficulties with inhibition, this variable was reverse-coded for the SEM analyses to aid in interpretation of coefficients. Scores presented in Table 1 are *not* reverse-coded, to permit easy comparison with published norms.

### *Overview of data analyses*

The first aim of the study was to examine the persistence of DSB over time. We did this in two ways. First, we computed a one-way repeated measures analysis of

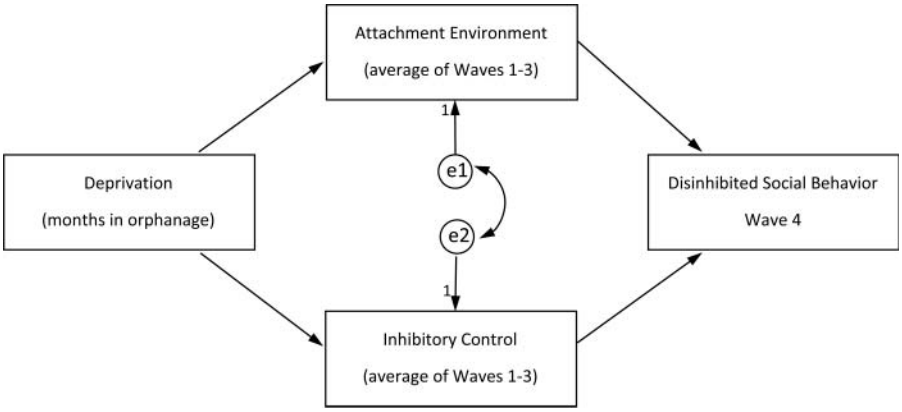


**FIgure 1.** Initial model tested (Model 1).



variance (ANOVA). Significant main effects from one visit to the next (e.g., Wave 1 to Wave 2) were examined using the Sidak correction for multiple comparisons. Next, we examined the trajectories of each child individually, tabulating the number of children who improved, worsened, or stayed the same across the four waves of the study. This was done to approximate the descriptive statistics available for the ERA sample (Rutter et al., 2007).

The second aim of the study was to test competing explanations for the relationship between duration of deprivation and DSB. To establish whether this relationship was *more likely* mediated by attachment environment or general inhibitory control (or both), we tested a series of three SEMs using AMOS. As shown in Figure 1, the initial model (henceforth Model 1) included paths from length of deprivation to both of the proposed mediators and paths from both proposed mediators to DSB. A direct path from deprivation to DSB was not included in the model, as this path would have exhausted the degrees of freedom in the model, making the model untestable. We then tested a second model (Model 2), in which we retained the path from attachment environment to DSB and omitted the path from inhibitory control to DSB, and a third model (Model 3), in which we retained the path from inhibitory control to DSB and omitted the path from attachment environment to DSB.

Model fit was evaluated based on three commonly used fit indices: the model chi-square, the root mean square error of approximation (RMSEA), and the comparative fit index (CFI). Both the chi-square and RMSEA are *absolute fit* indices that indicate how well a specified a priori model fits the data (Hooper, Coughlan, & Mullen, 2008). The chi-square is the original and traditional measure for assessing model fit. Chi-square values with a $p$ value *greater* than .05 are considered a good fit (i.e., the data and the proposed model are *not* significantly different). Although some researchers (e.g., Barrett, 2007) believe that the chi-square should be the only index interpreted, a review of SEM publications indicates that "virtually all papers" also report the RMSEA (Kenny, 2008, p. 6). The RMSEA indicates how

well a model with optimal parameters would fit the population's covariance matrix and has come to be regarded as one of the most informative indices due to its bias toward parsimony (i.e., the RMSEA will choose the model with the lesser number of parameters; Hooper et al., 2008). Lower RMSEAs are better than higher ones. Values less than .05 are generally considered to be indicative of a "good" fit; values higher than .07 (Hooper et al., 2008) or .08 (Kenny, 2008) have been deemed unacceptable. The third fit index employed in this research, the CFI, is an *incremental fit* index. Incremental fit indices compare the obtained chi-square value to a baseline model in which all variables are uncorrelated. The CFI is one of the most popularly reported incremental indices because it is relatively unaffected by a small sample size. CFIs range from 0 to 1, with values $\geq .95$ currently recognized as indicating a good fit (Hooper et al., 2008).

Upon identifying the more likely of the two hypothesized mediators, we next computed the direct effect of deprivation on DSB and the indirect effect through the more likely mediator simultaneously. These effects were computed using the SPSS "Mediate" command, a downloadable SPSS custom macro file for regression analyses recommended by Preacher and Hayes (2008). In this procedure, the variable to be mediated is entered in step 1 and the possible mediator is entered in step 2. The indirect effect of the mediator and the associated 95% confidence interval is then estimated with a bias-corrected bootstrapping method. Researchers can select the number of bootstrapped to resample; we selected 10,000. Significance of the mediator is indicated when the obtained 95% confidence interval does *not* include zero.

## Results

### *Aim 1: Establishment of the persistence of DSB over time*

Mean scores for DSB at all four waves are presented in Table 1. Results from the repeated measures ANOVA revealed a statistically significant improvement in DSB symptoms over time, although the assumption of sphericity was violated; thus, the Greenhouse-Geisser correction was utilized, $F(2.38, 95.28) = 4.67$, $p = .008$. Post hoc tests showed a significant reduction in DSB scores from Wave 1 to Wave 3 ($p = .02$), with Wave 3 ratings not significantly different from the Wave 4 ratings, which showed a curious uptick.

Because of this "V" pattern in which mean DSB scores first declined and then reversed direction, we examined whether DSB scores over time might be a function of age at time of testing. (Theoretically, this would mean that DSB means something different depending on the age of the child). Several types of analyses yielded no relationship between DSB and age at testing or time in the adoptive home. A striking lack of association between individual child factors and DSB was evident regardless of whether we tested for linear or quadratic associations or employed age as a continuous variable or category/stage (i.e., 0–2, 2–6, 6+ at Wave 1).

We also tabulated the various trajectories of DSB over time to facilitate comparison with the ERA sample. Although the tabulations in the two studies are not equivalent, they are conceptually similar in some regards. We employed a continuous measure of DSB based on four items coded 0 to 2. We have four data points across an approximately 6-year span for children of various ages, all adopted less than a year prior to the start of our study. Tabulations from the ERA Study are based on data collected at ages 6 and 11 for children who had been adopted by age 42 months (i.e., at least 2.5 years prior to the age 6 data collection). The ERA team used three items coded 0 to 2 and coded children into three DSB categories: none, mild (scores of 1–3), or moderate (scores of 4 or more). Based on these categories, Rutter et al. (2007) provided a flowchart specifying how many children in each of the categories at age 6 were in the same or a different category at age 11. In brief, the coding and time span are similar across the two studies, but measurement tool, age of child, and time since adoption are not.

Of our 42 adoptees, 11 showed no DSB at any wave (26% compared to 34% in the ERA Study). Another 11 exhibited DSB at the first wave but were symptom-free by Wave 4 (26%; ERA = 46% by age 11). The remaining are best characterized as follows: five experienced a reduction in symptoms (12%; ERA = 39%), four remained stable (10%; ERA = 19%), seven experienced an increase in symptoms (17%, ERA = 8%), and four showed at least one reversal of direction across our four waves (10%; no ERA equivalent). If we consider *only our adoptees who demonstrated DSB*, 65% were still demonstrating symptoms 5 to 6 years post-adoption (compared to 57% of the ERA adoptees experiencing symptoms 7–11 years post-adoption [Rutter et al., 2007][1] and an estimated 41% experiencing DSB 11 to 15 years post-adoption [Kreppner et al., 2010]).[2] Together, our sample and the ERA sample provide evidence of a *group reduction* in DSB over time, marked heterogeneity in individual trajectories, and persistent DSB for many internationally adopted children.

### *Aim 2: Determining whether the relationship between deprivation and persistent DSB is more likely mediated by attachment environment or inhibitory control*

Results from the SEM suggested that the effects of deprivation on DSB were mediated by inhibitory control, not attachment environment. As previously stated, Model 1 included paths through both of the proposed mediators. This model yielded an acceptable chi-square value ($\chi^2$ (1) = 1.65, $p$ = .20) and CFI (.97) but an unacceptable RMSEA (.13). Moreover, the parameter estimate associated with the path from attachment environment to DSB was not significant ($\beta$ = −.12, $p$ = .47). Given this, it was not surprising that Model 2 (attachment environment as the only mediator) did not fit the data at all ($\chi^2$ (2) = 7.27, $p$ = .03; RMSEA = .26; CFI = .26) or that the best fitting model was Model 3 (inhibitory

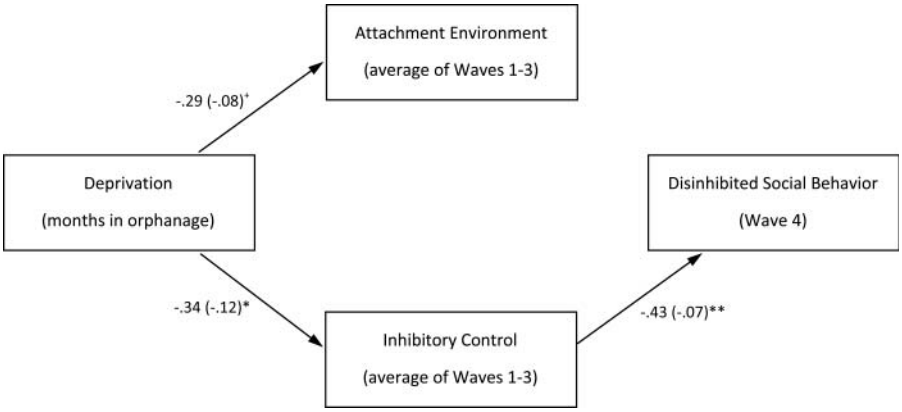


**FIgure 2.** Best fitting model (Model 3) with standardized (unstandardized) path coefficients.

control as the only mediator[3]), which yielded an acceptable fit per all three fit indices ($\chi^2$ (2) = 2.28, $p$ = .32; RMSEA = .06; CFI = .98). Model 3 is depicted in Figure 2. Both standardized and unstandardized coefficients are presented in Figure 2. The former were included to permit the comparison of paths within the model; the latter were included to permit comparison of the SEM coefficients with the coefficients obtained with the Preacher and Hayes (2008) procedure, which does not provide standardized coefficients.

Having identified inhibitory control as the more likely mediator of the effects of deprivation on DSB, we then estimated the magnitude of this mediation. Results of the Preacher and Hayes (2008) bootstrapping method yielded an $R^2$ for the model of .22 ($F$ = 5.52, $p$ < .01) and a *total effects* unstandardized coefficient of .0179 ($t$ = 2.18, $p$ < .05). This total effect comprised a nonsignificant direct effect of deprivation on Wave 4 DSB ($b$ = .0113, $t$ = 1.37, $p$ = .18) and a significant indirect effect of deprivation on Wave 4 DSB through the averaged inhibitory control variable ($b$ = .0066, confidence interval = .0002 through .0161, i.e., the interval does *not* include zero). These results indicate that the effects of deprivation on lingering DSB approximately 6 years post-adoption (Wave 4) were mediated by these children's general difficulties with inhibitory control.[4]

## Discussion

The first aim of our study was to examine the persistence of DSB over time in a sample of internationally adopted children in order to replicate and extend findings from the ERA Study to a more diverse sample (i.e., less severe deprivation, older age at adoption). Despite differences in samples and method, our findings replicated the findings of the ERA: DSB lessened over time for the group as a whole, but many international adoptees continued to demonstrate DSB many years post-adoption.

The second aim of our study was to examine competing theories for the etiology of DSB. Our study indicated that poor inhibitory control mediated the association between length of deprivation and persistent DSB, whereas attachment environment did not. This mediational relationship was established using a longitudinal design, lending further validation to prior cross-sectional research examining the role of inhibitory control in the manifestation of DSB (Bruce et al., 2009; Pears et al., 2010). This finding is also consistent with prior research that found no relationship between attachment security and DSB (Bruce et al., 2009; Chisholm, 1998; Kočovská et al., 2012; Pears et al., 2010; Rutter et al., 2007, Smyke et al., 2002).

In addition to informing theories of emotional socialization, the current study validates the recategorization of DSB as distinctive from reactive attachment disorder in the *DSM-V*. The current study also has therapeutic applications. As parents and clinicians attempt to develop interventions to address DSB, a focus upon improving general inhibitory skills should be the primary emphasis. "Tips" to help children delay gratification are popular on parenting websites, but we know of no systematic intervention program designed to train international adoptees in this critical skill. Knowledge from this and related studies should also be used to counsel adoptive parents. The finding that the attachment relationship does not play a significant role in the persistence of DSB is especially important for parents who may view their child's lack of discrimination as an indication of their own failure to facilitate a high-quality attachment relationship. Counselors should also stress the need for continued parental vigilance, irrespective of the current attachment relationship.

While DSB is often exemplified as a young child crawling into the lap of an unknown adult, its persistence and/or appearance in adolescence is likely to be expressed in more "mature" ways (e.g., high self-disclosure or initiation of physical touch with casual acquaintances, failure to come home at night). Further research should focus on identifying the specific behavioral manifestations and levels of DSB into adolescence and adulthood as well as the *meaning* of these behaviors. Bowlby (1952) speculated that elevated rates of "promiscuity" seen among adolescents who had experienced maternal deprivation were motivated by a need to experience intimacy without the possibility of rejection that is inherent in committed relationships. An alternative hypothesis is that the behavior to which Bowlby referred is fully attributable to low levels of behavioral inhibition (met with typical levels of adolescent sexual desire). As children in studies of international adoption become adolescents and young adults, researchers will have the opportunity to identify adolescent-specific manifestations of DSB. In examining the meaning of these behaviors, our finding that *current* DSB in this sample was not mediated by children's attachment relationships with adoptive parents should not be interpreted as evidence that *future* DSB will be unrelated to attachment needs.

Additional research should also be conducted to determine other post-adoptive family factors that may play a role in the persistence of DSB. Some studies have

failed to find associations between DSB and parental education, maternal cognitive abilities, family risk factors (maternal depression and mental health, changes in mother's partner, marriage relationship quality), socioeconomic status, and parenting stress (Rutter et al., 2007; Chisholm, 1998). Castle, Beckett, Rutter, and Sonuga-Barke (2010) have pointed out that adoptive families are screened before selection, leading to high-quality, homogeneous adoptive homes, which may account for these findings. These researchers also note that it can be difficult to confirm the causality of the relationship between post-adoption factors, such as parenting stress, and child behavior (Castle et al., 2010). However, other studies have indicated that parental factors such as the emotional availability of parents (Garvin, Tarullo, Van Ryzin, & Gunnar, 2012) and maternal sensitivity (Van, Juffer, Van Ijzendoorn, Bakermans-Kranenburg, & Alink, 2012) *do* impact the manifestation of DSB, and Love, Minnis, and O'Conner (2015) concluded in a review article that post-adoption caregiver quality is associated with DSB symptoms. In light of the current findings, it is important to note that executive functioning has also been shown to be sensitive to the quality of parental care (Blair, Raver, & Berry, 2014). This suggests that post-adoption family factors could play a role in the manifestation of DSB due to the impact of inhibitory control on its persistence. To the best of our knowledge, the role of post-adoption parenting styles (as opposed to sensitivity or quality) and discipline practices on the persistence of DSB symptoms have yet to be examined, although discipline has been examined as it relates to other areas of functioning among international adoptees. One study examining I/O in internationally adopted children found that authoritarian parenting predicted lower I/O scores when the child had experienced extensive deprivation but higher I/O scores when the child had minimal deprivation (Audet & Le Mare, 2011). It is plausible that discipline practices could also influence the presence and persistence of DSB.

### Limitations

Our study has several limitations involving sample and measures. Concerning the sample, our desire to conduct a comprehensive examination over four different waves necessitated a relatively small sample size, which limited our ability to include a large number of paths in our SEMs. The sample is also heterogeneous with respect to age at adoption (although analyses failed to identify any association between age and DSB, so this limitation is not as concerning as it might be). Finally, because we recruited via advertisement, offering written evaluations of each child, we may have attracted parents particularly motivated to receive feedback on particularly troubled children.

Concerning measures, parents had very little or no specific information about the child's pre-adoptive care so we were unable to specifically measure the severity of deprivation a child experienced before adoption. Although prior research (reviewed in the Introduction) suggests that length of deprivation is a

better predictor of DSB than degree of deprivation, it would have been preferable to be able to test both. In addition, our measure of inhibition was derived from the parent report. Ideally, we would have used a composite of both parent report and direct testing with the children. However, due to the age limits of the cognitive measure and the limited number of participants who were old enough to complete the measure at early waves of the study, only parent-rated inhibition was used. Finally, our measure of attachment was selected because the same tool could be used to cover a broad age range necessary for this longitudinal study. This measure focuses primarily on the parents' contribution to and perception of the attachment relationship, preventing us from formally ruling out lingering attachment insecurity (in a security-promoting environment) as the mediator of DSB.

### *Conclusions*

The current study contributes to the literature by examining DSB in a sample of children adopted internationally at older ages, from less deprived situations than samples used in prior studies. Like the ERA Study, the current study provides further evidence that DSB tends to lessen over time for the sample as a whole, even as it persists for many individuals within the sample. More important, the current study provides a direct test of the competing explanations for persistent DSB, confirming that DSB is more likely a function of deficient inhibitory control than troubles in the parent–child bond. These findings offer important information for clinicians and parents of internationally adopted children regarding the etiology and persistence of DSB. Future research should focus on the progression of DSB into adolescence and adulthood, as well as post-adoptive family factors that play a role in the amelioration, sustaining, or emergence of DSB post-adoption.

## Notes

1. According to Rutter et al. (2007), 83 children experienced DSB at age 6 and 45 of these (54%) were still demonstrating DSB at age 11. In addition, 6 children who were symptom-free at age 6 experienced symptoms at age 11. Our computation is 51/89 = 57%.
2. According to Kreppner et al. (2010), 15 of the ERA Study children with symptoms at both ages 6 and 11 no longer had symptoms at age 15. Kreppner et al. did not account for the 6 children who were symptom-free at age 6 but demonstrated symptoms at age 11. In addition, one child seems to have fallen out of the sample, because Rutter et al. reported 45 children demonstrating DSB at age 11 but Kreppner et al. computed persistence as 29/44. Our estimation is (51 − 15) / 88 = 41%.
3. Further support for inhibitory control as the more likely mediator of deprivation and DSB was garnered from a series of post hoc analyses in which we employed attachment relationship and inhibitory control ratings at individual waves as substitutes for the averaged-across-waves variables employed as mediators in the focal analyses. In other words, we reran all three models, three times, first using Wave 1 scores as the mediators, then Wave 2 scores, and then Wave 3 scores (always predicting Wave 4 DSB). Wave 2 data yielded an

excellent fit of the model to the data ($\chi^2$ (2) = 1.43, $p$ = .49; RMSEA = .00; CFI = 1.00). More important, the pattern of fit was constant across all three waves: Model 3 (inhibitory control as the only mediator) always fit better than Model 1 (both attachment relationship and inhibitory control tested as mediators), which always fit better than Model 2 (attachment relationship as the only mediator).

4. As with the post hoc SEM analyses, post hoc individual-wave analyses using the Preacher and Hayes (2008) bootstrapping method also revealed that the mediation effect was strongest at Wave 2.

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