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Risk-Taking and Sensation Seeking Propensity in Post-Institutionalized Early Adolescents

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Abstract

Background—Youth with histories of institutional/orphanage care are at increased risk for externalizing and internalizing problems during childhood and adolescence. Although these problems have been well described, the related adolescent behaviors of risk-taking and sensation seeking have not yet been explored in this population. This study examined risk-taking and sensation seeking propensity, and associations with conduct problems and depressive symptoms, in early adolescents who were adopted as young children from institutional care.

Methods—Risk-taking and sensation seeking propensities of 12- and 13-year-old post-institutionalized (PI; $n=54$) adolescents were compared to two groups: youth internationally adopted early from foster care (PFC; $n=44$) and non-adopted youth (NA; $n=58$). Participants were recruited to equally represent pre/early- and mid/late-pubertal stages within each group. Participants completed the youth version of the Balloon Analogue Risk Task (Lejuez et al., 2007) and the Sensation Seeking Scale for Children (Russo et al., 1991). Parents completed clinical ratings of participants' conduct problems and depressive symptoms.

Results—PI adolescents demonstrated lower risk-taking than PFC and NA peers. Pre/early-pubertal PI youth showed lower sensation seeking, while mid/late pubertal PI youth did not differ from other groups. PI adolescents had higher levels of conduct problems but did not differ from the other youth in depressive symptoms. In PI youth only, conduct problems were negatively correlated with risk-taking and positively correlated with sensation seeking, while depressive symptoms were negatively correlated with both risk-taking and sensation seeking.

Conclusions—Early institutional care is associated with less risk-taking and sensation seeking during adolescence. The deprived environment of an institution likely contributes to PI youth having a preference for safe choices, which may only be partially reversed with puberty. Whether this reflects hyporesponsiveness to rewards and how it relates to psychopathology are discussed.

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Keywords

Risk-taking; sensation seeking; international adoption; institutional care; adolescence

INTRODUCTION

Adverse care early in life is associated with increased risk of developing psychopathology. Children living in institutions for orphaned or abandoned children typically experience varying degrees of deprivation and display elevated symptoms of behavioral and emotional problems (Zeanah et al., 2009). Studies have also documented that when adopted away from these depriving situations into supportive, enriching family environments in early development these difficulties exist and often persist. For example, increased rates of externalizing and internalizing problems have been reported among post-institutionalized (PI) children relative to their non-adopted peers in early childhood not long after adoption (Fisher, Ames, Chisholm, & Savoie 1997; Maclean, 2003) as well as years after adoption during middle childhood (Wiik et al., 2011). While PI children may not be at increased risk for emotional and behavioral problems relative to other adopted children (e.g., Gunnar & van Dulmen, 2007), this may change with the transition to adolescence. When followed longitudinally, PI children were found to have higher rates of both internalizing and externalizing relative to domestically-adopted children at age 11 years that was not observed at age 6 years (Colvert et al., 2008; Sonuga-Barke, Schlotz, & Kreppner, 2010). Even when emotional and behavioral problems were observed at a higher rate in early and middle childhood, an additional increase in problems during adolescence was reported (Gunnar & van Dulmen, 2007). Therefore, the developmental period of adolescence may be associated with a greater risk of emotional and behavioral problems for PI youth than non-adopted children and children adopted from less depriving circumstances.

The increase in behavioral and emotional difficulties documented with the transition to adolescence is not specific to PI children. Indeed, it has been well-documented among typically developing children raised by their birth families that adolescence, particularly during the pubertal transition, is associated with increased emotional and behavioral difficulties (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Dahl, 2004; Spear, 2000). The onset of increased difficulties in emotion and behavior regulation has been linked to changes in reward sensitivity specific to this developmental period. During the transition to puberty, adolescents experience rapid increases in emotional arousal and reward sensitivity. At the same time, however, self-regulatory processes associated with frontal lobe networks are far from reaching full maturation. This apparent gap between maturing appetitive drives and less mature self-regulation may account for the well-documented increased prevalence of risk-taking and sensation seeking behaviors in adolescence (Steinberg, 2008). Correspondingly, the presence of externalizing disorders among adolescents has been linked with higher propensity for risk-taking (Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2006). While early institutional care has been linked with increased risk for externalizing disorders, to our knowledge, the propensity for risk taking and sensation seeking has not been reported previously for youth who have experienced deprivation and neglect early in life.

Several studies have documented altered sensitivity to reward in children and adolescents with histories of deprivation and neglect. Children with histories of maltreatment or early life stress demonstrate altered reward processing and reduced reward sensitivity (Guyer et al., 2006; Mueller et al., 2012). Examining children with histories of institutionalization, Mehta and colleagues (2010) reported that adolescents adopted from Romanian orphanages into UK families did not recruit typical brain regions (i.e., ventral striatum) associated with reward anticipation. This finding of hypoactivation of the neural reward network was recently replicated within a different sample of PI adolescents (Goff et al., 2012).

Reduced sensitivity to reward has been previously described as a possible driving force for engagement in risky decisions and sensation-seeking behavior. The reward deficiency hypothesis (Comings & Blum, 2000) suggests that deviations in reward pathways may lead individuals to be less satisfied with natural rewards and thus engage in dangerous behaviors or drug and alcohol use to seek enhanced stimulation. Similarly, in the discussion of the development of risk-taking, insensitivity to reward value and the associated hypoactivation of neural reward pathways may be associated with increased risk-taking tendencies for adolescents (Bjork et al., 2004; Boyer, 2006). On the other hand, atypical reward sensitivity and neural hyporesponsiveness to reward have also been related to depressive symptoms in typically developing adolescents and adults. While it has been established that currently depressed adolescents demonstrate hypoactive reward-related brain activity (e.g., Forbes et al., 2006), a recent study also found that blunted neural responsiveness to reward precedes depression diagnoses and predicts more depressive symptoms in adolescent females (Bress, Foti, Kotov, Klein, & Kojak, 2013).

Notably, Goff and colleagues (2012) found hypoactivation of reward networks to be associated with higher depressive symptoms in their sample of PI adolescents. Depressive symptoms of anhedonia and apathy are by definition related to low engagement in activities; therefore, reduced sensitivity to reward could dampen sensation-seeking and risk-taking. Gatzke-Kopp (2011) also describes how exposure to adversity may have an effect on dopamine, which is critically involved in reward sensitivity and reward seeking behavior. Specifically, low dopamine may be associated with reduced goal-directed behavior and choice of conservative activities over those that require more energy, even when the reward is higher with the latter.

To examine the propensity for risk-taking and sensation seeking in youth with histories of deprivation and neglect, this study included adolescents internationally adopted from institutions (e.g., orphanages) into families in the United States. We compared their performance on the Balloon Analogue Risk Task-Youth Version (BART-Y; Lejuez et al., 2007), a computerized assessment of risk-taking propensity, and responses to the Sensation Seeking Scale for Children (SSSC) to those from adolescents born and raised in their birth families of similar education and income to the adopted children. A second comparison group of youth adopted early from foster care overseas, who did not experience institutional neglect was included to control for factors associated with being an abandoned infant (e.g., poverty, parental psychopathology) and/or being an adopted child (e.g., higher risk for emotional and behavioral problems; Miller, Fan, Christiansen, Grotevant, & Van Dulmen, 2000). Groups were sampled as either pre/early pubertal or mid/late pubertal in order to

capitalize on understanding the role of puberty during the transition to adolescence and to explore if and how early adversity history and puberty interact to yield distinct patterns of risk-taking and sensation seeking.

Due to well-documented increase in externalizing problems in PI children and adolescents and the positive association between externalizing behavior and risk-taking, we expected that the PI adolescents might demonstrate higher risk-taking and sensation seeking propensity than their non-adopted peers. On the other hand, more recent work demonstrating reduced reward-sensitivity and associations with increased depressive symptoms in PI youth suggests that the PI adolescents might instead have a lower propensity toward risk-taking and sensation seeking behaviors.

An additional goal of this study was to explore whether risk-taking propensity and sensation seeking were associated with the well-documented behavioral and emotional difficulties in these youth. Therefore, we examined how performance on the BART and SSSC responses were associated with parent-reported measures of conduct problems and depressive symptoms. Based on previous literature (e.g., Crowley et al., 2006), we expected that across the sample, higher propensity for risk-taking and higher report of sensation seeking would be associated with higher levels of conduct problems. Following from the idea that low motivation and anhedonia are associated with less novelty seeking, we expected that lower propensity toward risk-taking and sensation seeking would be associated with higher levels of depressive symptoms.

METHODS

Participants

Participants included 156 early adolescents (M age = 12.9 years, $SD = 0.7$) divided into three groups based on early caregiving experience. PI youth ($n = 54$, 29 females) were internationally adopted after 8 months of age and spent at least 75% of their pre-adoptive lives in institutional (e.g., orphanage) care. Post-foster care youth (PFC; $n = 44$, 25 females) were internationally adopted before 8 months of age, primarily from foster care. Non-adopted youth (NA; $n = 58$, 28 females) were born and raised in their biological families in the United States (see participant characteristics in Table 1). Adolescents in the non-adopted group were raised in families who had similar educations and incomes to the internationally adopting PI and PFC families (78% of families had a parent with a 4-year college degree or higher; 73% of families had incomes > \$75,000).

Adolescents were recruited from registries of families who indicated interest in being contacted about child development research studies, one of birth families and the other of internationally-adopting families. Because these data were collected in combination with psychophysiological measures reported elsewhere (e.g., Quevedo, Johnson, Loman, Lafavor, & Gunnar, 2012) adolescents with a medical diagnosis were excluded from the study based on their parent-report of diagnosis during initial phone screening. Specifically, nineteen individuals were excluded due to diagnoses of cerebral palsy, severe hearing impairment, fetal alcohol syndrome, autism spectrum disorder, bipolar disorder, attention-deficit/hyperactivity disorder, and/or severe learning disability/intellectual disability.

Procedure

Approval for this study was granted by the university institutional review board. After providing informed assent and consent, participants and their parents completed a laboratory session at the university. Participants completed a risk-taking task and sensation seeking propensity, anxiety, and pubertal status questionnaires, along with other measures not discussed here. Parents completed a questionnaire battery including measures of their child's demographic characteristics, anxiety, conduct problems, depressive symptoms, and early life experiences.

Measures

Risk-taking—Risk-taking propensity was measured using the youth version of the Balloon Analogue Risk Task (BART-Y; Lejuez et al., 2007). The BART-Y is a computerized task in which the participant inflates balloons by pressing a mouse button. As the balloon inflates, points are accumulated; however, if the balloon explodes, all points for that balloon are lost. Because explosions occur at random, the participant needs to decide when to stop inflating each balloon and save the accumulated points. Participants were told that the size of their prize depended on the total points won in the game (30 balloons). Consistent with other research using the BART, risk-taking propensity was indexed by an adjusted average of pumps, that is, the average number of pumps pressed for balloons that did not explode (for rationale, see Lejuez et al., 2002). Test-retest reliability of this task is moderate to high in adolescent samples (White, Lejuez, de Wit, 2008).

Sensation seeking—Participants completed the Sensation Seeking Scale for Children measure of sensation seeking propensity (SSSC; Russo et al., 1991). This self-report measure consists of 26 forced-choice items for which the individual chooses which of two opposite statements is the most like him or her (e.g., “I’d like to try mountain climbing” or “I think people who do dangerous things like mountain climbing are foolish.”). The total sensation seeking score was used for the current study (sum of all questions; range 0–26). Cronbach’s alpha for the SSSC was .83.

Conduct problems and depressive symptoms—Parents completed the parent version of the adolescent Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004), a norm-referenced, standardized measure of emotional and behavioral problems in children. T scores from the Conduct Problems (11 items) and Depression (12 items) subscales were used in the current study. Conduct Problems measures socially deviant and disruptive behaviors such as cheating, stealing, lying, and running away. Depression measures feelings of unhappiness, sadness, and stress resulting in difficulty with activities of daily living or suicidal thoughts (Reynolds & Kamphaus, 2004). Reliability coefficients were .87 for Conduct Problems subscale and .86 for Depression subscale.

Pubertal status—Pubertal status was measured with the widely used self-report Pubertal Development Scale (PDS; Petersen et al., 1988) which yielded a total score ranging from 1.0 to 4.0 with lower scores indicating endorsement of fewer puberty characteristics. Consistent with the previous report on this sample (Quevedo et al., 2012), adolescents with PDS score

< 2.5 were classified as pre/early-pubertal and those ≥ 2.5 were classified as mid/late-pubertal. Despite attempts to control for age during scheduling, there was a 6 months age difference between the pubertal groups [M age pre/early-pubertal = 12.72 ($SD = .67$), M age mid/late-pubertal = 13.16 ($SD = .66$)], $F(1,154) = 16.90, p < .001$, age was included as a covariate.

Anxiety—Because risk-taking and sensation seeking can be suppressed by anxiety, anxiety measures were obtained for use as covariates. Participants and their parents completed self- and parent-report versions of the Spence Children's Anxiety Scale (SCAS; Muris, Merckelbach, Ollendick, King, & Bogie, 2002). Self- and parent-reports of participants' anxiety were significantly correlated, $r(135) = .37, p < .001$. Cronbach's alphas for the child and parent SCAS were .89 and .97, respectively. To create an overall composite anxiety score that included both child and parent reports, SCAS total scores were standardized and averaged. This anxiety measure was used as a covariate to confirm that differences in risk-taking and sensation seeking were not caused by differences in trait anxiety. Groups did not differ in anxiety level, $F(2, 132) = .015, ns$.

Data Analysis

To confirm the presence of group differences in conduct problems and depression, GLM analyses of variance with group (3 levels) by sex (2 levels) by pubertal status (2 levels) were performed. Age was not included as a covariate for conduct problems or depressive symptoms because age-normed t-scores were used as the dependent variable. GLM analyses of variance were also conducted with group (3 levels), sex (2 levels) and puberty (2 levels) as factors and risk-taking (number of pumps) and sensation seeking (total SSSC score) as dependent measures. Age and the summary anxiety score were entered as covariates. Significant main effects were evaluated at α level of .05 with Tukey's HSD post-hoc tests. Significant interactions were explored using simple effects analyses. Pearson's correlations were used to test associations both for the sample combining all three groups and for each group individually.

RESULTS

Conduct Problems and Depressive Symptoms

There was a significant main effect of group on conduct problems, $F(2, 140) = 3.23, p < .05$. Post-hoc analyses indicated that PI adolescents had higher levels of conduct problems than PFC and NA adolescents (PI: $M = 47.8, SD = 8.3$; PFC: $M = 44.6, SD = 4.7$; NA: $M = 45.3, SD = 6.5$). There were no main effects of or interactions with sex or pubertal status.

Groups did not differ in depressive symptoms, $F(2, 140) = .36, ns$ (PI: $M = 47.2, SD = 6.7$; PFC: $M = 46.4, SD = 6.3$; NA: $M = 46.1, SD = 6.4$). There were also no main effects of sex or pubertal status on depressive symptoms.

Risk-Taking

There was a main effect of group on average pumps (adjusted) on the BART-Y, $F(2, 136) = 12.77, p < .001, \eta_p^2 = .16$. Post-hoc analyses indicated that PI and PFC adolescents

completed fewer pumps on the BART-Y than NA adolescents, with PI and PFC groups not differing significantly (see Figure 1A). No main effects of or interactions with sex or pubertal status were observed.

Sensation Seeking

There was a main effect of group on sensation seeking propensity, $F(2, 132) = 3.95, p < .05, \eta_p^2 = .056$, with lower sensation seeking in PI compared to PFC and NA adolescents, who did not differ significantly. Importantly, this group effect interacted with pubertal status, $F(1, 132) = 3.57, p < .05$. Pre/early-pubertal PI adolescents reported lower sensation seeking, but mid/late-pubertal PI adolescents did not differ in sensation seeking from the other groups (see Figure 1B). There was also a main effect of sex, $F(1, 132) = 5.16, p < .05$, with higher sensation seeking in males ($N = 70, M = 13.60, SD = 4.63$) compared to females ($N = 81, M = 11.21, SD = 5.31$).

Relations between Risk-Taking and Sensation Seeking

Risk-taking and sensation seeking were positively correlated in the NA and PFC groups, $r(56) = .32, p < .05$, and $r(43) = .36, p < .05$, respectively. In contrast, risk-taking and sensation seeking were not correlated in the PI group (see Table 2). For this reason, correlations with behavioral and emotional problems were computed separately for each task.

Relations with Conduct Problems and Depressive Symptoms

Collapsed across groups, there were no significant associations between risk taking or sensation seeking and conduct problems. However, as shown in Table 2, when examined within group, in the PI group only, conduct problems was negatively correlated with risk-taking behavior and positively correlated with sensation seeking propensity.

Examined for all groups combined, no associations between risk taking and sensation seeking and depressive symptoms were obtained. However, in the PI group only, severity of depressive symptoms was negatively correlated with risk-taking behavior and sensation seeking propensity (see Table 2).

DISCUSSION

This study highlights the significant association of adverse early life experiences on behavior during the transition to adolescence. Results confirm that PI adolescents not only have higher levels of conduct problems than their non-adopted peers, but they also had higher levels of conduct problems than the PFC adolescents. These findings confirm and replicate previous findings of increased rates of conduct problems with the transition to adolescence for youth with histories of institutional care (Colvert et al., 2008; Gunnar & van Dulmen, 2007; Sonuga-Barke, Schlotz, & Kreppner, 2010). This suggests that early institutional care may lead to increased risk for conduct problems later in development over and above the disruptions experienced with early adoption and overseas foster care. Interestingly, the PI adolescents in the current sample were not reported to have higher levels of depressive symptoms than their peers. The findings of only increased conduct

problem symptoms and no increased depressive symptoms were somewhat surprising, especially given what has been reported previously for PI youth at the transition to adolescence and given that internalizing and externalizing symptoms often co-occur in early adolescence (Patterson, DeBarryshe, & Ramsey, 1989). The literature involving typically developing children has suggested that the depressive symptoms may be related to academic failure and/or peer rejection associated with conduct problems (e.g., Patterson et al., 1989). It is possible that PI youth do not experience the same onset of academic failure or peer rejection first in adolescence as indeed, PI children have been reported to struggle academically starting already in middle childhood.

This is one of the first studies to explicitly assess sensation seeking and risk-taking propensity in PI youth. While the previous literature suggested that PI adolescents may have either higher *or* lower levels of sensation-seeking and risk-taking propensity, the current results clearly indicate that PI adolescents have lower risk-taking and sensation-seeking propensities than their non-adopted peers. Additionally, PFC youth generally did not differ from NA youth, although they did demonstrate less risk-taking than NAs on the BART task. Therefore, as has been previously reported for attention and executive functioning (e.g., Loman et al., 2013; Maclean, 2003; Merz & McCall, 2011), the deprivation associated with early institutionalization, over and above risks associated with adoption, affects sensation seeking and risk-taking propensities years after adoption.

Interestingly, group differences in sensation seeking were only observed before the pubertal transition. Pre/early-pubertal PI youth demonstrated lower sensation seeking than PFC and NA youth, but the groups did not differ among mid/late-pubertal participants. This finding could suggest a developmental delay in sensation seeking for the PI children, followed by catchup and typical levels of sensation seeking after the pubertal transition. Alternatively, it is possible that puberty may increase plasticity in these systems and allow them to recalibrate to non-deprived conditions. Indeed, analysis of the cortisol awakening response for this same sample demonstrated atypical cortisol patterns among pre/early-pubertal but not among mid/late-pubertal PI youth (Quevedo et al., 2012). Neurobiological changes associated with pubertal development might foster opportunities for positive developmental change and decreased impact of early life adversity in the context of the supportive adoptive home.

The findings of lower sensation seeking and risk-taking in PI youth are not simply due to the PI adolescents being more cautious as anxiety was controlled for statistically. Instead, taken together with evidence that higher depressive symptoms among PI youth in this sample were associated with lower risk-taking and lower sensation seeking, PI adolescents appeared to have low motivation to seek out thrilling activities. In other words, it seems likely that lower risk taking and sensation seeking in PI youth may have reflected hyporesponsiveness to reward. Reduced sensitivity to reward and positive stimuli has been suggested to be related to favoring safe over risky choices in other samples with adversity histories (Guyer et al., 2006). Additionally, as noted earlier, there is an emerging literature outlining that youth with histories of institutionalization demonstrate altered reward processing and reduced reward sensitivity (e.g., Goff et al., 2012; Mehta et al., 2010). Stress early in life has been associated with low dopamine functioning, which in turn has been associated with behaviors that take

advantage of what is readily available over expending effort for a large reward (Gatzke-Kopp, 2011). Therefore, it is possible that PI youth have less interest in taking risks because they are less motivated by the rewards the risks might bring. On the BART-Y, for the PI youth, their sensitivity to the larger future rewards may not have been strong enough to motivate them to risk giving up the rewards they already had received. From an evolutionary perspective, responding to what is available over an uncertain, potentially higher reward may be adaptive in unstable, high stress environments wherein the goal is immediate survival.

Despite the PI youth having higher conduct problems as a group, they did not demonstrate increased risk-taking and sensation seeking. Surprisingly, in this sample as a whole, reported conduct problems were not associated with risk-taking and sensation seeking. Further exploration revealed that for PI adolescents only, higher conduct problems were associated with higher sensation-seeking, but with lower risk-taking propensity. This combination of findings makes it difficult to argue that increased conduct problems in PI adolescents are due to heightened propensity for risk-taking and sensation seeking. Additionally, the sensation seeking responses and risk-taking performance were not correlated for the PI adolescents, despite being related for the other two groups. This may indeed suggest that the measures were assessing something different for the PI youth. While the SSSC appears face valid, the BART-Y may have captured PI adolescents' propensity toward immediate gratification, or perhaps anxiety about loss, rather than risk-taking propensity. There is indeed emerging evidence that PI youth have difficulty waiting for delayed rewards (Hostinar, Stellern, Schaefer, Carlson, & Gunnar, 2012; Loman, 2012) and that PI children hoard items (e.g., food, Fisher et al., 1997). While the BART has been utilized with other high-risk samples (e.g., substance abuse; Crowley et al., 2006), there are no other published studies involving children with a history of institutional deprivation. It will be important for future studies to consider how the response to delay and/or hoarding behaviors relate to BART-Y performance for PI youth. This emphasizes the need to examine deprivation-specific psychological problems when studying this population (e.g., Kumsta et al., 2010).

The reported findings are somewhat limited by the small sample size. However, studies involving unique samples of PI and PFC samples are often relatively small and the effect sizes associated with group differences in sensation seeking and risk-taking propensities were medium to large in this sample. While the sensation seeking and risk-taking results warrant replication, the current findings do coincide with the emerging literature on reward sensitivity and response to delay in PI youth, in addition to findings reported for maltreated samples. The reported findings may also have been limited by the recruitment criteria excluding children with a medical diagnosis in order to facilitate collection of psychophysiological methods reported elsewhere (Quevedo et al., 2012). This sampling parameter somewhat limits generalizability of findings across post-institutionalized and internationally adopted adolescents as would be available from a more diverse sample. Notably, there were no parent reported medical diagnoses of conduct disorder or major depression meaning that children with previously identified clinically significant problems were not excluded from the study nor did children with such medical diagnoses bias our findings. On the other hand, a primary strength of the current study was inclusion of the PFC group. PI adolescents differed from PFC adolescents, who in turn did not differ from NA

adolescents on most of the outcomes, suggesting that PI effects were related specifically to institutionalization and not factors associated with being adopted.

CONCLUSION

Overall, the present findings indicate that an early history of institutionalization is associated with less sensation seeking and risk-taking during adolescence. The early stress associated within the unpredictable environment of an institution likely contributes to PI youth having a preference for safe over risky choices and choosing immediate gratification over waiting for larger rewards. This type of response pattern may in fact have been adaptive within the context of institutional care. While lesser sensation seeking risk-taking during adolescence could be considered a positive result associated with institutional care, these results were also associated with increased depressive symptoms, which may both be associated with underlying neurological hyporesponsiveness to reward. It is also possible that these results may represent a slowed developmental trajectory, given that sensation seeking is lowest for PI youth who have not yet completed their pubertal transition. Future studies will benefit from assessing sensation seeking and risk taking propensities in a longitudinal sample. It is also worth considering that development is the result of ongoing transactions between the developing child and the environment. Indeed, Audet and LeMare (2010) reported that current authoritarian parenting was associated with fewer behavior problems (i.e., inattention and overactivity) in children adopted later from institutions, but with more behavior problems in those who were adopted earlier. Future studies will benefit from including measures of parenting and other social relationships. Lastly, incorporating assessments of sensation seeking, risk taking, and behavioral and emotional problems in relation to functional magnetic resonance studies of reward sensitivity in PI youth will aid the understanding of long-term phenotypic consequences of early deprivation and neglect.

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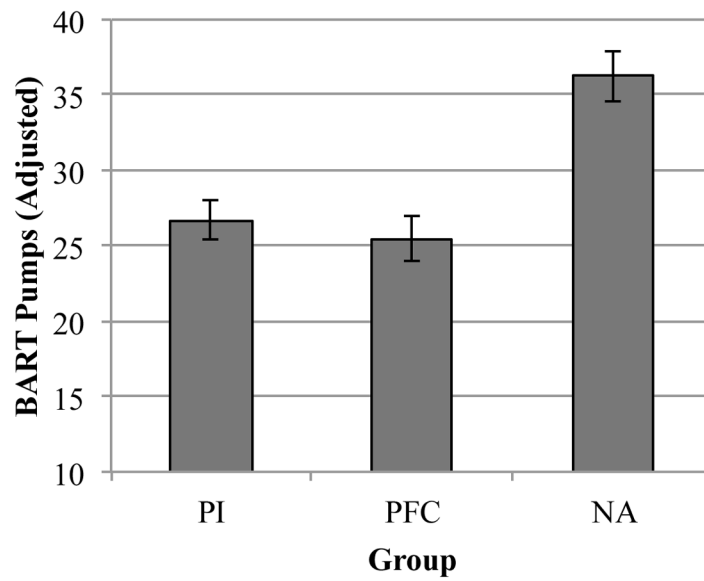
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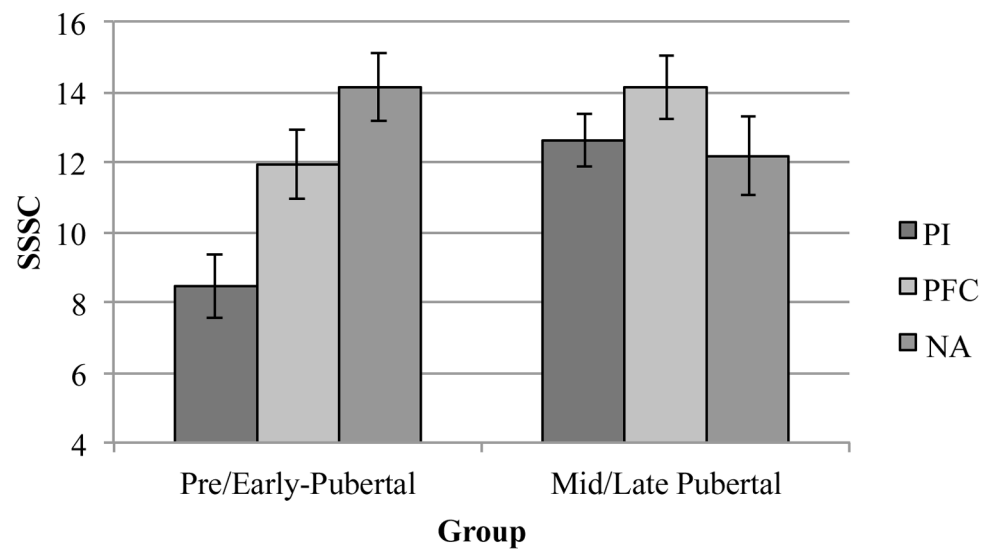
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Key Points

- Previous research indicates that post-institutionalized (PI) youth are at increased risk for externalizing and internalizing disorders, which have been linked with sensation seeking and risk-taking during adolescence.
- This is the first study to examine risk-taking and sensation seeking propensity in PI youth.
- PI adolescents demonstrated decreased risk-taking and decreased sensation seeking relative to same-aged peers.
- The decreased risk-taking and sensation seeking were both related to higher depressive symptoms for PI youth.
- The findings raise questions regarding reduced sensitivity to reward for PI children and the impact of early stress on developing dopaminergic systems.



A)



B)

Figure 1. Group differences in mean (A) number of adjusted pumps on the BART task and (B) sensation seeking score on the SSSC. Error bars represent \pm SEM.

Table 1

Participant Descriptive Statistics by Group

	Post-Institutionalized <i>n</i> = 54 <i>M</i> (<i>SD</i>)	Post-Foster Care <i>n</i> = 44 <i>M</i> (<i>SD</i>)	Non-Adopted <i>n</i> = 58 <i>M</i> (<i>SD</i>)
Age at session (yrs)	12.9 (0.6)	12.8 (0.7)	13.0 (0.8)
Age at adoption (mos)	25.3 (19.3)	4.2 (1.7)	-
Time in institution (mos)	22.3 (15.9)	0.7 (1.0)	-
Region of origin (<i>n</i>)			
Eastern Europe	28	0	-
Asia	21	30	-
Central & South America	4	14	-
Africa	1	0	-

Table 2

Correlations Among Risk-Taking, Sensation Seeking, Conduct Problems, and Depressive Symptoms by Group

Post-Institutionalized	Risk-Taking	Sensation Seeking	Conduct Problems	Depressive Symptoms
Risk-Taking	1	-	-	-
Sensation Seeking	.02	1	-	-
Conduct Problems	-.31*	.29*	1	-
Depressive Symptoms	-.30*	-.35*	.37**	1
Post-Foster Care				
Risk-Taking	1	-	-	-
Sensation Seeking	.36*	1	-	-
Conduct Problems	.14	.30	1	-
Depressive Symptoms	-.05	-.04	.28	1
Non-Adopted				
Risk-Taking	1	-	-	-
Sensation Seeking	.32*	1	-	-
Conduct Problems	.06	.18	1	-
Depressive Symptoms	-.06	-.01	.49**	1

* $p < .05$,

** $p < .01$