HHS Public Access

Author manuscript

Dev Sci. Author manuscript; available in PMC 2018 May 01.

Published in final edited form as:

Dev Sci. 2017 May ; 20(3): . doi:10.1111/desc.12375.

To Trust or Not to Trust: Social Decision Making in Post-institutionalized, Internationally Adopted Youth

Clio E. Pitula, **Jennifer A. Wenner**, **Megan R. Gunnar**, and **Kathleen M. Thomas**
University of Minnesota

Abstract

Chronic parental maltreatment has been associated with lower levels of interpersonal trust, and depriving environments have been shown to predict shortsighted, risk-averse decision-making. The present study examined whether a circumscribed period of adverse care occurring only early in life was associated with biases in trust behavior. Fifty-three post-institutionalized (PI) youth, adopted internationally on average by one year of age, and 33 never-institutionalized, non-adopted youth (*M* age = 12.9 years) played a trust game. Participants decided whether or not to share coins with a different anonymous peer in each trial with the potential to receive a larger number of coins in return. Trials were presented in blocks that varied in the degree to which the peers behaved in a trustworthy (reciprocal) or untrustworthy (non-reciprocal) manner. A comparison condition consisted of a computerized lottery with the same choices and probabilistic risk as the peer trials. Non-adopted comparison youth showed a tendency to share more with peers than to invest in the lottery and tended to maintain their level of sharing across trials despite experiencing trials in which peers failed to reciprocate. In contrast, PI children, particularly those who were adopted over a year of age, shared less with peers than they invested in the lottery and quickly adapted their sharing behavior to peers' responses. These results suggest that PI youth were more mistrusting, more sensitive to both defection and reciprocation, and potentially more accurate in their trusting decisions than comparison youth. Results support the presence of a sensitive period for the development of trust in others, whereby conditions early in life may set long-term biases in decision-making.

According to Erikson (1963), negotiating the crisis between basic trust and mistrust is a critical stage of development. Indeed, a body of research has accumulated in support of the integral role played by trust in children's psychosocial adjustment (e.g., Rotenberg et al., 2005; see Bernath & Feshbach, 1995 for a review). For example, lower trust (i.e., a generalized expectancy that other individuals *will not* keep their word or promises, Rotter, 1967) has been shown to be associated with criminal and delinquent behaviors, social disengagement and irresponsibility, loneliness, peer rejection, and depression (Lester & Gatto, 1990; Rotenberg et al., 2010; Rotenberg, MacDonald & King, 2004; Rotter, 1980; Wentzel, 1991; Wright & Kirmani, 1977). Moreover, trust is viewed as an integral component of dyadic or close relationship competence (Chen, French, & Schneider, 2006; Larson, Whitton, Hauser, & Allen, 2007). However, it doesn't appear that more trust is

Correspondence concerning this article should be addressed to Clio Pitula, Institute of Child Development, University of Minnesota, 51 East River Road, Minneapolis, MN 55455. pitul001@umn.edu.

necessarily better. Recently, researchers have revealed a quadratic relationship between trust and adjustment: Rotenberg, Boulton, & Fox (2005) demonstrated that children in 5th and 6th grades who had both very low *and* very high trust beliefs in peers evidenced higher internalizing problems, lower self-perceived social acceptance, and lower peer-rated social preference. Thus, being under- or overly-trusting are both likely to be associated with problems with peer relationships and social behavior.

Given the role of trust in psychosocial adjustment, it is important to examine factors that predict the development of trust during childhood. The early caregiving environment is likely to be of particular importance, with individuals' experiences with attachment figures shaping their feelings of security and trust in others (Bowlby, 1980). There is some evidence that parental maltreatment jeopardizes the child's sense of trust and security in relationships with both parents and peers even years after the maltreating experiences (see Bernath & Feshbach, 1995; Cole & Putnam, 1992 for reviews; De Bellis, 2001; Pepin & Banyard, 2006; Gobin & Freyd, 2014). Rather than an overall bias towards mistrust, some researchers have argued that early parental abuse may actually lead to more *inaccurate* decisions, such as a tendency to trust untrustworthy people (Freyd, 1996; Zurbriggen & Freyd, 2004). This tendency is hypothesized to reflect impairments in the detection of trustworthiness, which are expected to arise from adaptive mechanisms that block awareness of the betrayal in order to allow the child to persist in critical attachment bonds with the abusing parent (Freyd, 1996; Zurbriggen & Freyd, 2004).

Thus, childhood may be an important period for establishing one's sense of trust in others. However, the extent to which there is a sensitive period for the impact of adversity on the development of trust remains unclear. In maltreated samples, it is difficult to separate the influence of early abuse from the impact of continued adverse parent-child relationships because these children often remain in their maltreating homes. The experience of post-institutionalized (PI), internationally adopted children affords a valuable opportunity to examine the developmental effects of a circumscribed period of maltreatment without the confounding experience of ongoing hardship (Tarullo, Bruce & Gunnar, 2007).

In orphanage settings, maltreatment often takes the form of profound psychosocial neglect, with multiple staff members providing minimal care in a setting primarily devoid of cognitive or social stimulation (Johnson, 2000). Adoption into a family in the United States typically results in a shift to very responsive care in an enriched environment and, consequently, rapid recovery of physical growth and improvements in behavioral development (Johnson, 2000). Nonetheless, difficulties in social and emotional functioning for many PI children persist long after adoption (for a review, see Gunnar 2001). In particular, previous research suggests that PI youth tend to act indiscriminately in their friendliness with unfamiliar people. This disinhibited social engagement (DSE, Lawler, Hostinar, Mliner, & Gunnar, 2014) is exemplified, for example, by a child who climbs into the researcher's lap within seconds of being introduced (Bruce, Tarullo, & Gunnar, 2009; O'Connor, Bredenkamp, Rutter, & English and Romanian Adoptees Study Team, 1999). PI youth, especially those adopted at older ages, are also more likely to experience problems with peer victimization and rejection (Pitula et al., 2014; Raaska et al., 2013). These difficulties may reflect deficits in using the behavior of others to decide whom to trust – as

observed in maltreated children (e.g., Freyd, 1996) – suggesting the relevance of examining trust in PI samples. Moreover, because one can determine precisely when the adversity ended by examining the timing of adoption, the use of a PI sample allows for the examination of the roles of duration and timing in the impact of adversity on trust. To our knowledge, no studies have examined the development of trust in PI children.

Early institutional neglect may affect trust behavior in several ways. One possibility is that institutional care predisposes children to be *more* trusting. The evidence for social disinhibition among PI youth, outlined above (e.g., Bruce et al., 2009; O'Connor et al., 1999), may suggest that PI children are more likely to trust in situations where typically developing children do not (e.g., walking off with a stranger). However, rather than indicating indiscriminate trust, socially disinhibited behaviors may also reflect a history of positive reinforcement of attention-seeking behaviors in the institution, such that children who were more affectionate towards staff and visitors received more attention and/or resources (Chisholm, 1998). This latter explanation for indiscriminately friendly behavior would not necessarily suggest altered thresholds for trust in others.

A second possibility for the impact of deprivation on trust, supported by additional theory and research, is that PI youth, by virtue of their early experiences with unreliable caregiving and insufficient resources, are biased *against* trusting others. This is consistent with previous research demonstrating lower rates of prosocial (i.e., sharing, helping) behaviors among PI participants compared with US-born youth raised in their natal families (Pitula et al., 2014). From the perspective of attachment theorists, trust is an essential component of a secure attachment relationship with parents and peers: early experiences with attachment figures who demonstrate trustworthiness or who model trust play an important role in determining children's penchants for trusting others, with emotionally available caregiving predicting greater feelings of security and trust in others (Bowlby, 1980; Laible, 2007). Conversely, traumatic or rejecting experiences with caregivers are expected to lead to the construction of low trust beliefs in others and/or a failure to develop trust (Bernath & Feshbach, 1995). It follows that PI youth, among whom secure attachment patterns are less frequent than among typically developing populations (Barcons et al., 2012; Chisholm, 1998; but see also Rutter, Kreppner, & Sonuga-Barke, 2009), might carry forward internal working models of others – adults and peers – as not trustworthy.

Additionally, from a socioeconomic standpoint, the availability of resources – or lack thereof – in PI youths' early environments may also contribute to biases against trusting. Among adults, poor environments and the stress they induce have been shown to predict shortsighted, risk-averse decision making (see Haushofer & Fehr, 2014, for a review). Children adopted from depriving orphanages show similarly risk-averse strategies, for instance, tending to choose a smaller immediate payoff over larger, long-term gains (Bruce et al., 2009; Hostinar, Stellern, Schaefer, Carlson, & Gunnar, 2012; Pollak et al., 2010; see also Loman et al., 2014). Notably, similar effects can be experimentally produced in typically developing children when adults who control resources have proven themselves unreliable (Kidd, Palmeri, & Aslin, 2013). Kidd and colleagues (2013) demonstrated that, when the experimenter was shown to be untrustworthy by failing to deliver promised art supplies, children were more likely to select a smaller, certain reward over the

experimenter's promise of a larger but delayed prize. These findings suggest that children quickly learn to mistrust unreliable individuals to deliver on promises of later gains. Beyond influencing children's expectations of trustworthiness, unreliable and adverse environments are hypothesized to bias decision-making against risk via their impact on stress and negative emotions (Haushofer & Fehr, 2014). In the present study, we hypothesize that PI children's early experiences with unreliable caregiving shape their behavioral responses to continue to react as if conditions are still impoverished – that is, with suspicion and mistrust – even when the environment improves.

To examine the hypothesis that early deprivation leads to differences in trusting behavior, the present study compared PI youth with children reared in their birth families on a trust game (Berg, Dickhaut, & McCabe, 1995; see also Baumgartner, Heinrichs, Vonlanthen, Feshbacher, & Fehr, 2008; van den Bos, Westenberg, van Dijk, & Crone, 2010). Participants decided whether or not to transfer coins to a different anonymous peer in each trial, with trials varying in blocks by whether the peers behaved in a trustworthy (reciprocated, i.e., shared back) or untrustworthy (defected, i.e., did not share) manner. Previous research with adults has shown that oxytocin, a neuropeptide involved in social attachment and affiliation, increases trust during this game when administered intranasally to participants (Baumgartner et al., 2008; Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005). Children have also been shown to be sensitive to the level of trustworthiness of game partners, sharing more for players who have proved themselves to be trustworthy and less with untrustworthy partners (van den Bos, van Dijk, & Crone, 2011). The task adapted for use in the present study allowed for the assessment of several variables, including baseline trust (i.e., participants' responses without feedback), adaptation (i.e., learning) in response to high reciprocation, and adaptation in response to low reciprocation. To control for general risk taking tendencies, a comparison condition asked if participants wanted to invest their money in a computerized lottery. This allowed us to contrast social with nonsocial risk. Finally, previous researchers (e.g., Baumgartner et al., 2008) have argued that response latency during the trust game reflects the demands of different decision-making components involving risk and betrayal. Thus, we measured participants' response times to assess the length of time participants deliberated before answering.

We hypothesized that PI youth, particularly those who experienced longer durations of institutional care, would show lower baseline levels of trust with peers versus comparison youth. Because previous delay-of-gratification paradigms used with PI youth have confounded risk taking with human factors (e.g., trusting the experimenter to deliver on her promise of a later reward; Hostinar et al., 2012), we had little basis for predicting group differences in baseline lottery investments. With regard to learning, we expected that participants would be sensitive to variations in reciprocation rates, sharing more when the probability of reciprocation increased and sharing less when the probability of reciprocation decreased. However, we explored but did not make directional predictions for the impact of early deprivation on trust adaptation, given the absence of research in this area. Based on studies of domestic and international adoptees, we hypothesized that being older at adoption (i.e., older than one year of age) would be associated with greater differences in trusting behaviors (for a review, see Zeanah et al. 2011).

To provide an experimental basis for the ecological validity of the task, we examined associations between trust game performance and measures of real world trust. According to a review by Glaeser, Laibson, Scheinkman, and Soutter (2000), past sharing behavior is a better predictor of trust behavior than are beliefs about trust. However, other researchers have reported positive associations between general expectancies about trust and actual behaviors (Rotenberg, Fox, et al., 2005; Siegrist et al., unpublished manuscript). In the present study, we included measures of both general trust beliefs and sharing behaviors towards peers.

Method

Participants

Participants were 53 post-institutionalized (PI) and 33 never-institutionalized, non-adopted (NA) youth, aged 11.7 through 14.1 years (see Table 1 for demographic information). PI participants originated from nine countries, with the majority from China (35.8%), Russia (30.2%), India (15.1%), Colombia (3.8%), Slovakia (3.8%), Ukraine (3.8%) and Vietnam (3.8%). Most (86.7%) had spent at least 90% of their pre-adoption lives in institutional care (range = 53-100% of pre-adoption life in institution), with the duration of institutional care ranging from 3.5 to 48.0 months (M = 14.1, SD = 9.2). All PI participants were adopted by the time they were five and a half years old (M = 15.0 months, SD = 11.0, Med = 12.0 months, range 4.0 to 62.0 months).

Because we wanted to examine the impact of the *degree* of deprivation in addition to impact of having any deprivation at all, we divided the PI participants into earlier adopted (EA: adopted between 4 and 12 months) and later adopted (LA: adopted between 12.01 and 62 months) groups. We used age at adoption rather than duration of institutional care to form these groups because we were interested in the *timing* of neglect and deprivation; nevertheless, adoption age and duration of institutional care were highly correlated (r = .94, p < .001). Among NA participants (58.5% female), ethnicity was reported by parents to be 3.0% African American, 87.9% Caucasian, 3.0% Latino, and 3.0% multi-racial. Across all groups, the distribution for education level of the primary caregiving parent (this was the mother in 90% of cases) was 4.7% high school or GED graduate, 7.0% 2-year college or associate's degree, 53.5% bachelor's or 4-year college degree, and 34.9% postgraduate degree. Median yearly household income was $100,000; 7.0% of participating families had incomes at or below $50,000; 51.2% had incomes from $50,001 – $100,000; 18.6% had incomes from $100,001 - $150,000, and 14.0% had incomes greater than $150,000 (9.3% missing). NA and PI groups did not differ in terms of either primary caregiver education or family income.

Procedure

PI participants were recruited from a registry of parents who were interested in having their internationally adopted children participate in research. This registry reflected roughly 60-75% of all families adopting internationally from countries using institutional care in the time frame of the study (Hellerstedt et al., 2008). The parents (consent) and youth (assent) volunteered and completed data collection (70% of those contacted). The present analysis

was based on data from a much larger project, involving genetic assays, neuroimaging measures, parent-reported behaviors and problems, and measures of specific cognitive and social domains. For the larger study, PI youth were included if they would be 12-14 years old during the funding period and if they were adopted from institutional care. Of the original sample of 617 PI participants, a subset was recruited to participate in neuroimaging and behavioral measures. This subset was selectively recruited in order to stratify genotype (not examined here), sex, and region of the world from which they were adopted. In addition, all of these participants met the safety criteria for participation in an MRI scan. NA participants had no personal history of psychiatric diagnosis, and met safety criteria for imaging. This subset of participants completed two laboratory visits, one for behavioral testing and one for imaging. During the behavioral testing visits, participants completed a battery of behavioral tasks, including the trust game, and several questionnaires (see below). Youth participants were compensated $25 for the behavioral visit, and their parents were compensated for travel expenses.

Participants were individually tested on the trust game using a standard desktop computer. Before the task started, all participants received verbal instructions and were guided through several examples of the decision screens. Participants were told that they would be playing the game with anonymous peers who were logging in from various university labs and/or classrooms. The task was described as a trust game in which participants had to decide whether or not to trust an anonymous peer to reciprocate or repay their investment. In addition, teens were instructed that it was important that they do as well as possible; however, it was not specified how this would be accomplished. A log-on screen was displayed indicating that multiple individuals were logging into the game. On this log-on screen participants saw their own 4-digit identification number appear as well as 20 additional fictitious identification numbers. When the final identification number appeared the participant saw the message, “Enough players are logged on! Press any key to start.” After the game the participants were asked increasingly targeted questions to assess their belief in the deception. They were asked, “What did you think of the game? What was it like playing against other kids? Who do you think you were playing against?” If the participant indicated belief in the deception (87.2% believed manipulation, 9.3% did not, 3.5% did not provide a codable answer) the researcher told him or her that in reality there were no other people playing the game and explained the reason for the deception. The researcher then asked the participant for assent to use the data despite the deception. Two PI participants, both adopted before 12 months (EAs), withdrew assent and their trust game results are not included in analyses. There was no group difference in children's belief in the deception. Note that excluding the participants who did not believe the deception did not change the pattern of results, so these participants were retained in the final analyses. One additional participant (EA) was excluded for stopping the task early.

Trust Game

In the trust game, half of the trials were Peer condition trials and half were Lottery. In the Peer condition trials, the participants were told that they were playing with a new peer each trial; in the Lottery condition trials they were told that they had the opportunity to play against the computer in a computerized lottery (see Figure 1 for pictorial representations of

the task as seen by participants; see Appendix for complete instructions). In the Peer condition (referred to as “Trust Rounds” in Appendix), both the participant and the (fictitious) other player started the trial with 6 coins. If the participant chose not to trust, the trial ended and each player kept his/her 6 coins. If the participant chose to trust, 3 of his/her coins were transferred to the other player and quintupled such that 15 coins were added to the other player's original 6. The participant then received feedback as to whether the other player chose to reciprocate or not. In reciprocation trials, all of the coins (3 from the participant, 21 from the other player) were divided evenly between the two players resulting in 12 coins per individual. In no-reciprocation (i.e., defection) trials, the other player kept the shared and multiplied coins and the participant was left with 3 coins. This feedback was provided via a pictorial representation of the outcome. For instance, if the other player reciprocated, the computer displayed the Peer decision tree with the majority of its “branches” (i.e., its paths and outcomes) faded to the same color as the background, with the exception of two outcome boxes that remained highly visible, showing equal re-distribution of 12 coins per player (i.e., the bottom two boxes in Figure 1a). In the Lottery condition, the participants could choose to either invest (play) 3 points in the lottery, or to not invest and keep the original 6 coins. If they won the lottery, they ended the trial with 12 coins. If they lost the lottery, they ended the trial with 3 coins. Again, feedback was provided graphically. Thus, the participant faced the same choices and probabilistic risk in Lottery trials as in Peer trials. The only difference between the two types of trials was that risk resulted from uncertainty regarding the unknown peer's behavior in the Peer trials, compared with a nonsocial, random process in the Lottery trials (Baumgartner et al., 2008).

The trust game consisted of 4 blocks, each block containing 12 Peer condition trials and 12 Lottery condition trials. The order of Peer and Lottery trials was randomly determined by the computer for each participant. During the first block, the baseline block, participants did not get feedback about the outcome of the trials (that is, whether the other player reciprocated sharing or whether they won the lottery). Reciprocation of sharing/investment varied in blocks 2-4. In block 2, feedback after each trial was manipulated to reflect a 70% overall reciprocation rate. In blocks 3 and 4, the feedback indicated a 30% overall reciprocation rate.

Questionnaire Measures

Demographics and background—A parent provided information about family income and education of the primary caregiving parent. Adoptive parents also provided information about their child's adoption history (birth country, age at adoption, duration of institutional care).

General Trust Scale

Participants completed the General Trust Scale (Baumgartner et al., 2008; Siegrist, Keller, Earle, & Gutscher, unpublished manuscript), a self-report measure assessing respondents' general beliefs in the trustworthiness of others. This measure consists of 10 items rated on a 6-point Likert scale from “Agree Totally” to “Disagree Totally” (e.g., *Most people are basically honest*). Mean scores were used in analyses, with higher scores indicating greater

trust beliefs. This scale showed acceptable internal consistency within the present sample (Cronbach's α = .61).

Prosocial Behavior—Parents reported on the frequency of their child's prosocial behavior on a 5-point Likert scale from “Never true” to “Almost always true”, using an adapted version of the Children's Social Behavior Scale – Teacher Report (Crick, 1996). This instrument was originally developed for use with teachers; the present version was adapted for parents with slight wording changes (e.g., “your child” instead of “this child”). The measure comprises items assessing physical and relational aggression and prosocial behavior. For the purposes of this study, only the subscale reflecting prosocial behavior was used (e.g., *Your child is friendly to most kids, even those s/he does not like very much*). Mean scores were used in analyses. This scale showed good internal consistency within the present sample (Cronbach's α = .79).

Results

Percent Sharing/Investing

To examine whether early rearing history differentially affected participants' sharing/investing responses, a repeated measures analysis of variance (ANOVA) was conducted with group (NA, EA, LA) as the between-subjects factor and block (1, 2, 3, 4) and condition (Peer, Lottery) as within-subjects factors. The percentage of trials on which the participant chose to share or invest (i.e., the number of trials with a sharing or investing response divided by the number of Peer or Lottery trials in the block) served as the dependent variable. Note that six participants (4 NA, 0 EA, 2 LA) were excluded from this analysis for failing to experience reciprocation rates within 20% of the target rate in any one block; these participants shared too infrequently for the computer program to reach target probability rates. However, these low-sharing participants were included in other analyses that did not involve the block(s) that had problematic reciprocation rates. Sex was examined as a covariate, but as it was not significantly related to the dependent measure it was not considered further.

Results showed that there was a significant effect of block on the percent of sharing or investing trials, Huynh-Feldt corrected $F(2.84, 210.32) = 12.31$, $p < .001$, $\eta_p^2 = .14$. The interaction of condition and group was marginally significant, $F(2, 74) = 2.91$, $p = .06$, $\eta_p^2 = .07$. As depicted in Figure 2, NA and EA youth showed higher overall sharing with peers than lottery investments, whereas LA youth showed the opposite pattern: they were more likely to invest in the lottery than to share with peers. However, these effects were qualified by a significant three-way interaction between block, condition, and group, $F(6, 142) = 2.32$, $p < .05$, $\eta_p^2 = .09$ (see Figure 3). To unpack the three-way interaction, tests of the three two-way interactions at specified levels of the third DV were conducted. Significant two-way effects were followed up with tests of simple effects. Follow-up tests indicate that LA youth shared less with peers than they invested in the lottery, and this difference was particularly pronounced in block 3 when peers were infrequently reciprocating ($p < .05$). In contrast, NA youth shared more with peers than they invested in the lottery, and this was particularly true in block 3 ($p < .05$). Moreover, LA children shared less with peers than did EA or NA

children, and this was particularly true in the first block (LA < NA, $p = .08$), before participants had information about peers' behavior, and in the third block (LA < EA; $p = .08$), when peers' reciprocation rates decreased.

Several additional research questions were examined. First, we examined whether there were group differences in the Lottery condition. Neither the main effect of group ($p = .88$) nor the interaction of block and group ($p = .11$) significantly predicted Lottery investments.

Second, we examined whether participants increased their sharing in response to feedback indicating high reciprocation rates. Participants shared significantly more in block 2 (high reciprocation) than in block 1 (no feedback) ($p < .01$). Thus, participants adjusted their behavior in response to high reciprocation. Next, we examined whether there were group differences in this pattern. For LA youth and EA youth, block significantly predicted sharing responses in the Peer condition, with higher sharing in block 2 than block 1 (ps < .05). However, among NA youth, the difference between sharing in blocks 1 and 2 was *not* significant. In other words, whereas EA and LA youth increased sharing when they received feedback about high reciprocation, NA youth did not significantly modulate their sharing responses, perhaps because their response rates were already quite high.

Additionally, we conducted tests to examine whether participants decreased sharing responses when they received feedback about *low* reciprocation rates in blocks 3 and 4. As expected, participants shared significantly less in blocks 3 and 4 (low reciprocation) than in block 2 (high reciprocation) (ps < .01). Again, participants appeared to learn about the change in reciprocation rates and adjust their behavior accordingly. Finally, we asked whether or not groups differed in this pattern of adjustment; LA youth shared significantly less in blocks 3 and 4 than in block 2 (ps < .05). However, for EA and NA youth, although the comparison of block 2 to block 4 was significant ($p < .05$), the difference between blocks 2 and 3 was not. Thus, whereas LA participants promptly decreased their sharing when given negative feedback, EA and NA youth persisted for one more block (i.e., block 3) before decreasing their sharing responses.

In sum, NA children showed higher levels of risk (sharing) with peers than in lottery investments, and tended to maintain levels of sharing over trials despite experiencing trials when peers did not reciprocate. LA children shared less with peers than they invested in the Lottery, and they promptly changed their behavior based on whether peers reciprocated. EA children were somewhere in between. Their sharing and investing rates were about equal, but they also tended to be responsive to whether peers reciprocated.

Reaction Time

We also investigated group differences in reaction time. We performed a repeated measures ANOVA with the same factors as the sharing/investing analysis, using mean reaction time for Peer or Lottery trials as dependent measure. Nine participants (3 NA, 2 EA, 4 LA) were excluded from these analyses because their mean reaction time was more than two standard deviations from the mean. Results demonstrated significant within-subjects effects of block, Greenhouse-Geisser corrected $F(1.58, 110.50) = 110.34$, $p < .001$, $\eta_p^2 = .61$, and condition, $F(1, 70) = 63.97$, $p < .001$, $\eta_p^2 = .48$, and a between-subjects effect of group, $F(2, 70) =$

5.65, $p < .01$, $\eta_p^2 = .14$. However, these main effects were qualified by significant two-way interactions between block and condition, Huynh-Feldt corrected $F(2.71, 189.71) = 17.47$, $p < .001$, $\eta_p^2 = .20$, and between condition and adoption group, $F(2, 70) = 3.77$, $p < .05$, $\eta_p^2 = .10$. A test of simple effects of condition within block revealed that reaction times were slower for Peer trials than for Lottery trials in all blocks, although the effect was stronger in block 1 (mean difference = 963 ms, $F(1, 78) = 61.46$) than in blocks 2-4 (mean difference scores ranged from 220 to 346 ms, F values ranged from 9.77 to 11.53, all ps < .01). In other words, participants took longer to deliberate when they thought they were playing with peers than with the computer, and this difference was especially pronounced in block 1 when no feedback was provided. The condition by group interaction was probed with a test of simple effects of condition within group. Figure 4 displays the relevant means for this interaction. Thus, for both conditions, LA youth demonstrated slower reaction times than NA youth, and this effect was stronger for Peer than for Lottery trials, $F(2, 70) = 6.56$, $p < .001$ versus $F(2, 70) = 3.85$, $p < .05$.

Prosocial Behavior and Self-Reports of Trust

A third goal of the present study was to examine associations between task performance, early institutional care, and external (i.e., questionnaire) measures of trusting behaviors. Correlational analyses demonstrated that parent-reported prosocial behavior was significantly positively associated with self-reported trust beliefs ($r = .27$), rate of sharing with peers in blocks 1 ($r = .23$) and 3 ($r = .25$) of the trust game, and the *difference* in sharing between Peer and Lottery trials (i.e., percent sharing – percent investing) in blocks 1 ($r = .32$) and 3 ($r = .28$). Self-reported trust beliefs were associated with the Peer-Lottery sharing difference in block 1 of the trust game ($r = .31$) (all ps < .05). No other correlations were significant.

Discussion

The aim of the present study was to examine the role of early neglect and deprivation experienced as a function of institutional care as an infant and/or a young child in predicting adolescents' trust behavior. As expected, internationally adopted youth behaved differently during the trust game than did non-adopted, US-born comparison youth. Group differences were evident at baseline before participants received feedback about game partners' behavior, as well as in response to changes in the probability of reciprocation. Findings suggest that early institutional care is associated with basic mistrust and increased sensitivity to defection.

Assessment of baseline tendencies revealed that PI youth who had been adopted later (i.e., over 12 months), but not those who had been adopted earlier, showed a propensity to share less with peers than did non-adopted comparison youth. This is consistent with previous questionnaire research documenting lower rates of prosocial behaviors towards peers in PI youth, some of whom were also included in the present study (Pitula et al., 2014). The present findings further suggest that PI youth are less trusting of anonymous age mates about whose behaviors they have no previous information. The tendency to place less trust in others is consistent with previous literature describing lower trust in children who have

experienced prolonged parental maltreatment (see Bernath & Feshbach, 1995 for a review; Pepin & Banyard, 2006). The fact that children in our study were no longer experiencing adversity but still showed disruptions in trust behavior provides support for the presence of a sensitive period for the impact of neglect and deprivation on the development of trust. Our findings suggest that the first few years of life may be a sensitive period for the formation of critical neurobiological systems involved in decision making about trust. However, because age at adoption and duration of institutional care were highly correlated in our sample, we cannot rule out the possibility that it is the absolute duration of deprivation, rather than the timing, that is responsible for disruptions in trust development.

In the present study, group differences in baseline trust may reflect the impact of inconsistent parental care during critical developmental periods. In particular, early inconsistent care in the institution and sometimes prior to institutional placement is hypothesized to result in difficulties forming secure attachments with adoptive parents (Chisholm, 1998). In turn, insecure attachment patterns are expected to lead to the construction of low trust beliefs in people, which affect children's willingness to trust others (Bernath & Feshbach, 1995; Bowlby, 1980; Erikson, 1963; Mikulincer, 1998). However, we should note that we do not have information on the security of the youth's attachment to their adoptive parents.

Importantly, post-institutionalized youths' propensity to withhold trust is also consistent with recent socioeconomic models of poverty (Haushofer & Fehr, 2014). According to this view, the scarcity of resources in PI youths' early pre- and post-natal environments prior to adoption (e.g., Johnson, 2000) is expected to predict short-sighted, risk-averse decision making, including a preference for selecting current, certain gains over the promise of later, uncertain gains, even when these later gains are much larger. This tendency towards high temporal discounting – associated with poverty and economic losses (see Haushofer & Fehr, 2014 for a review) – may partially reflect a lack of *trust* in the environment to deliver on its promises of later goods (e.g., Kidd, Palmeri, & Aslin, 2013). The present results suggest that PI youth continue to behave as though they are still living in impoverished and highly unreliable environments, even though they are currently living in very favorable conditions in stable, well-resourced homes. In other words, the harshness of the early environment during the first year or two of life may have shaped neural systems to continue to behave as though conditions are impoverished, even when they are not. This may reflect mechanisms of predictive adaptation that would have increased survival in ongoing harsh environments, but may limit productivity in benign or resource-rich ones. Indeed, mistrusting adults and peers may serve a protective function in an environment of continued maltreatment risk, but in the context of caring parents and peers, withholding trust may result in the child missing out on important opportunities for social acceptance, interpersonal support, and the socialization of expected values, behaviors and skills (e.g., Rotenberg, Boulton & Fox, 2005; Wentzel, 1991). In this view, low trust develops via poverty's impact on stress and negative affect.

Interestingly, there were no group differences in participants' investment behavior during a computerized lottery condition. This is surprising, given previous research reporting decreased risk-taking and sensation seeking and increased temporal discounting (i.e.,

choosing the smaller, certain payoff over the larger, long-term gain) following institutional care among young children (Hostinar et al., 2012) and adolescents of a similar age to participants in the present study (Loman et al., 2014). It may be that, in these earlier studies, participants' judgments about risk took into account both non-social (i.e., random computer processes) *and* social elements (e.g., the experimenter keeping her promise to deliver later rewards). To date, research in PI youth has not examined social and non-social risk separately. In the present study, because the Peer and Lottery conditions differed only in the source of uncertainty involved (i.e., a game partner versus the computer), we were uniquely positioned to contrast social with non-social risk. The present findings suggest that the risk-aversion previously described in PI youth may be specific to interactions involving people. Bohnet and Zechhauser (2004) have argued that whereas decision-making in the trust game and its computer-mediated counterpart both involve risk aversion, the decision to trust involves an additional risk component, betrayal aversion. This is essentially an additional risk premium that balances the costs of being betrayed and, when highly valued, inhibits trust. Baumgartner et al. (2008) contend that trust decisions take longer than lottery decisions because participants need to consider betrayal aversion on top of risk aversion. Indeed, we found that all participants took longer to make decisions in Peer than Lottery trials; as participants became more familiar with the task, response times for both types of trials decreased. Moreover, LA youth had slower reaction times than NA participants, and this was particularly true for Peer trials, which may indicate that LA youth spent more time weighing the additional costs of betrayal. On the other hand, increased reaction times may also result from processing speed deficits, which may worsen as computations become more complex as in the case of the Peer trials, or may reflect factors such as boredom and distractibility. Ultimately, LA participants decided to share less frequently, which does suggest that they were more sensitive to and avoidant of betrayal.

In the present study, participants adjusted their responses as a function of the behavior of a number of fictitious other players as each trial was presumably played with a different peer. When presented with a high probability of reciprocation (in the second block of trials), participants increased their sharing overall to maximize payoffs. When the probability of reciprocation decreased, participants generally decreased their sharing again in order to maximize gains while minimizing losses. This is consistent with previous research with similar tasks showing that participants are able to learn about probabilistic reciprocation rates and adjust their decision-making accordingly (e.g., in adults, Phan, Sripada, Angstadt, & McCabe, 2010; Baumgartner et al., 2008). However, there were group differences in participants' patterns of sharing. First, increases in sharing in response to a high probability of reciprocation were observed only for the PI youth and not for the non-adopted youth who were already sharing at a high level prior to receiving feedback. This may suggest that PI youths' baseline tendency is to assume that unknown peers are *not* trustworthy (or, at least that they repay trust less than 70% of the time); when peers are shown in fact to be trustworthy, trusting behaviors increase above baseline to maximize gains. In contrast, prior to receiving information about peers' trustworthiness, typically developing youth may have assumed that unknown peers would reciprocate more often than they would defect. When their assumptions were supported by peers' behaviors in the second block, this would not be expected to lead to a change in trusting behavior.

Group differences were also evident in response to decreased rates of reciprocation. Later adopted youth were quicker than both earlier adopted and non-adopted youth to change their behavior when faced with a higher probability of defection. In interpreting this finding, it is important to recall that youth were told that they were playing with a different peer in each trial. Thus, when reciprocation rates were high, this reflected the activity of a group of players who tended to reciprocate. When reciprocation rates fell to 30%, because it was a different player in each game trial, the question was how many *different* players had to fail to reciprocate before participants stopped trusting in their peers? What is not clear is whether to interpret the results as differences in participants' learning or as differences in their interpretation of the peers' behaviors. For instance, it may be that PI youth who have experienced deprivation until a later age are more sensitive to defection, or to decrements in trustworthiness, than are youth who were taken out of the depriving environment earlier or who never experienced this type of adversity. By this interpretation, EA and NA youth would have taken longer to become aware of the increase in defection. In other words, LA youth learned faster than NA and EA youth. This would be consistent with recent animal studies indicating that animals deprived early in life do learn when rewards are used but are faster to learn in aversive conditioning tasks (Bagot et al., 2009). Alternatively, it is also possible that all three groups learned equally quickly, but differed in their responses. Thus, NA and EA youth may have given each new game partner the benefit of the doubt, whereas LA youth were less forgiving of perceived defection and may have generalized early defectors' behavior to expect this from subsequent game partners. In environments with limited resources, where the impact of losing money or goods is potentially far greater, it may be most adaptive to withdraw one's trust as soon as any defection is announced. Interestingly, some researchers studying children who have experienced prolonged maltreatment have suggested that early abuse leads to more inaccurate trust decisions (Freyd, 1996; Zurbriggen & Feyd, 2004). Our findings suggest the opposite interpretation: later adopted PI youth were *more* accurate in their trusting decisions compared with control children, who persisted in trusting peers whose behavior was untrustworthy. However, a different pattern of results might have been observed had the youth been told that they were playing with one peer for the whole block of trials. Of course, we also cannot generalize to effects we might have observed had the youth been told they were playing with a parent or friend.

Support for the ecological validity of the trust game was obtained by examining associations between task performance and real world measures of beliefs and past behavior. Results provide suggestive evidence that self-reported general beliefs about trust and parent-reported prosocial behaviors towards peers were predictive of a tendency to share more with peers than to invest in the lottery. However, this was only the case in the block of trials without feedback. Once participants were receiving feedback, their own self-reported general beliefs about trust and parent-reports of prosocial behavior no longer predicted behavior. This finding is consistent with research conducted by Siegrist and colleagues (unpublished manuscript; see also Baumgartner et al., 2008), who found that scores on the General Trust Scale predicted young adults' behavior on a trust game, but only when information about game partners' trustworthiness was not available (see also Rotenberg, Boulton, & Fox, 2005). The link we found between trust behavior and prosocial tendencies is consistent with

research documenting positive associations between prosocial behavior and trust (e.g., Cadenhead & Richman, 1996), and supports assertions that the best predictor of laboratory trust behavior is past sharing/trusting behavior (Glaeser et al., 2000). Nevertheless, further research is needed to better understand how participants' laboratory performance in response to feedback relates to their interactions outside the laboratory. It should be noted that the lack of significant associations between the youth's self-report and their behavior in blocks 2-4 of the trust game also means that these general, consciously-accessible beliefs about trust were not mediating the group differences in trust behavior.

Limitations and Conclusions

While the present study had many strengths, there are several limitations worth noting. First, the sample size was relatively small. Although it was very similar to previous published research using the trust game (van den Bos et al., 2010; Baumgartner et al., 2008), we may have been underpowered to detect certain differences, such as between boys and girls. An additional limitation concerns the relationship of game partners to the participant. As mentioned previously, although interactions with anonymous others were the focus of the study because this allowed us to examine a more generalized form of trust, we are unable to generalize findings to interactions with friends, known peers, or parents, with whom trust behavior may differ (Bernath & Feshbach, 1995; Rotenberg, 1994). Relatedly, we did not control for the sex of participants' interaction partners, yet trust may be more important in same-sex versus opposite-sex friendships, especially for girls (Sharabany, Gershoni, & Hoffman, 1981). Thus, youth may be more likely to share with and/or be more sensitive to defection by same-sex partners. It is also important to acknowledge the possibility that, although all participants received the same instructions, participants may have differed in their objectives regarding the game (for instance, maximizing net gain versus “winning” against other players). Because this was not assessed, it is unclear whether variability in participants' perceived objectives impacted study findings. Finally, although we used an ecologically valid task that is known to correlate with actual trust behavior in the past (Glaeser et al., 2000), the trust game may be limited in advancing our understanding of the *processes* used to determine trust in the real world. For instance, while the present findings suggest that PI youth are able to use probabilistic monetary reciprocation to decide whom to trust, there are many social cues available in real life to decide when to trust or not trust others. Future research would benefit from examining trust adaptation among PI youth in response to real-world situations.

Limitations notwithstanding, the present findings provide evidence that conditions early in life set biases that affect preferences for trust in others. If conditions have been harsh early in life, the environment post infancy – even a highly favorable one – may not readily reset or alter these biases. Moreover, these biases may continue to influence decision making into adolescence and potentially into adulthood. Further research that directly assesses hypothesized social (e.g., attachment), cognitive (e.g., inner working models) and stress physiology (e.g., cortisol) mechanisms will best inform our understanding of how early life stress gets under the skin to influence trust behavior in youth who begin their lives under conditions of deprivation and socio-emotional neglect. By targeting key processes early in

life, it may be possible to intervene in maladaptive developmental pathways and set these youth on a more adaptive course.

Acknowledgments

Author Note: Thank you to project staff for their assistance with the coordination of this project, and to the families who participated. This research was supported in part by National Institute of Health grant P50-MH079513. Preparation of this manuscript was facilitated by a doctoral fellowship to C. Pitula from the Social Sciences and Humanities Research Council of Canada.

Appendix

Trust Game Instructions

Welcome to the Trust Game!

You are going to play an interactive online game with other anonymous players. During this game, it is important for you to do as well as you can. For this reason, it is very important that you pay attention to the instructions and that you ask any questions that you may have **before** the game starts.

This game will take about 15 minutes. During this game, you will be randomly paired with other kids who are participating in the game from our other locations. You will be paired with a different person each round. Some of the games are known as **Trust rounds** and you will be asked to take the role of either Player A or Player B. Player A is given several coins and must choose whether or not to trust Player B, and Player B must choose whether or not to repay that trust.

In the other rounds, you are participating in a computer lottery. In the **Lottery rounds**, you will not be playing with a person; you will be playing with a computer that makes a random decision.

The other players in the game are **anonymous**, which means you will never know who they are and they will never find out who you are. You and the other players are known only to one another by your identification numbers. You don't know these other kids – they are participating in this study from various locations, including other locations on this university campus and local after-school programs. They are all kids who are around your age. We will begin the game when we have enough players logged on!

[Tell participant that he/she has been randomly assigned to play the role of Player A.]

Instructions for Player A

Overview—Half of the games you will play will be Trust Rounds and half will be Lottery Rounds. In the Trust Rounds you will be playing as Player A.

Trust Rounds—In each Trust Round, you will be paired with another participant. There are two stages to the round – in the first stage, you decide whether or not to trust Player B by transferring coins to Player B OR not transferring coins. The coins that you transfer are multiplied by 3 before Player B receives them, so that Player B receives 3 times the number

of coins that you transfer. Then, if you transferred coins to Player B, in the second stage of the round, Player B must choose whether to keep most of the coins for him or herself OR share the coins equally with you. If Player B decides to give coins back to you, both of you will always end up with the same amount of coins. A different kid will be your partner in each of the Trust Rounds.

Both you and Player B start with 6 coins at the beginning of each round. As Player A, you must choose to transfer the 6 coins to Player B or keep them. Player B must then decide whether to keep most of the coins you gave him or her or share them equally.

Lottery Rounds—In the Lottery Rounds, all of the players in the game need to decide whether they want to invest coins in a random computer lottery. This is called playing the lottery. The computer will randomly determine whether the lottery will repay you for your investment. Every player starts each trial with 6 coins, and you can choose to invest or not. If you invest you have a chance to win, but remember, you can also lose in the lottery!

Feedback—During the first set of Trust and Lottery rounds you won't get to find out how the game turned out – if you trusted in the Trust game, you won't find out whether Player B shared or kept the coins. If you invested in the Lottery game, you won't find out whether you won or lost. Even though you won't know how these games turn out, continue to do your best. After 20 rounds, you will begin to learn the outcome of each game as soon as Player B responds or as soon as the lottery is played.

Playing the game—[Begin the task and walk participant through the **Trust outcomes diagram** on the screen, describing each option and its possible outcomes for both Player A and Player B.]

Let's begin with what happens when you are Player A and you are playing with another kid who is Player B. You and Player B both start with 6 coins. If you choose not to trust and do not transfer any money to Player B, you will both end up with 6 coins. If you choose to trust Player B and you transfer the 6 coins, this amount will be tripled so that Player B receives 18 coins from you. If Player B chooses not to repay your trust by keeping most of these coins for him or herself, you will end up with 3 coins and Player B will end up with 21 coins. However, if Player B repays your trust by sharing the coins with you, you will each end up with 12 coins.

On the chart, the blank spots will contain the Player ID number of the person you are playing with.

As Player A, you must choose whether or not to give coins to Player B by pressing either the 0 (give zero) or 6 (give 6) key on the keyboard. Player B will then be informed of your choice. Let's start by pressing 6.

[Go through Trust practice slides until the first Lottery slide appears. Walk participant through the **Lottery outcomes diagram** on the screen.]

If you do not play the lottery, you will keep your original 6 coins. If you invest in the lottery and lose, you will end up with 3 coins. If you win, you will end up with 12 coins.

In the Lottery Game, you will see this screen. You must choose whether or not to invest in the lottery by pressing on the keyboard either the 0 (invest zero) or 6 (invest 6). Let's start by pressing 6.

[Go through remaining Lottery practice slides and stop at "**Ready?**" screen.]

***

Remember, try to do as well as you can on this task!

Do you have any questions before we begin??—[Advance to log on screen and enter participant ID.]

References

Bagot RC, van Hasselt FN, Champagne DL, Meaney MJ, Krugers HJ, Joëls M. Maternal care determines rapid effects of stress mediators on synaptic plasticity in adult rat hippocampal dentate gyrus. Neurobiology of Learning and Memory. 2009; 92:292–300. DOI: 10.1016/j.nlm.2009.03.004 [PubMed: 19292996]

Barcons N, Abrines N, Brun C, Sartini C, Fumadó V, Marre D. Social relationships in children from intercountry adoption. Children and Youth Services Review. 2012; 34:955–961.

Baumgartner T, Heinrichs M, Vonlanthen A, Fischbacher U, Fehr E. Oxytocin shapes the neural circuitry of trust and trust adaptation in humans. Neuron. 2008; 58:639–50. DOI: 10.1016/j.neuron.2008.04.009 [PubMed: 18498743]

Berg J, Dickhaut J, McCabe K. Trust, reciprocity, and social history. Games and Economic Behavior. 1995; 10:122–142.

Bernath MS, Feshbach ND. Children's trust: Theory, assessment, development, and research directions. Applied and Preventive Psychology. 1995; 4:1–19. DOI: 10.1016/S0962-1849(05)80048-4

Bohnet I, Zeckhauser R. Trust, risk and betrayal. Journal of Economic Behavior & Organization. 2004; 55:467–484. DOI: 10.1016/j.jebo.2003.11.004

Bowlby, J. Attachment and loss: Vol 3 Loss, sadness, and depression. New York: Basic Books; 1980.

Bruce J, Tarullo AR, Gunnar MR. Disinhibited social behavior among internationally adopted children. Development and Psychopathology. 2009; 21:157–171. [PubMed: 19144228]

Christian Cadenhead A, Richman CL. The effects of interpersonal trust and group status on prosocial and aggressive behaviors. Social Behavior and Personality: An International Journal. 1996; 24:169–184.

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]

Chen, X.French, D., Schneider, B., editors. Peer Relationships in Cultural Context. New York: Cambridge Univ. Press; 2006.

Cole PM, Putnam FW. Effect of incest on self and social functioning: A developmental psychopathology perspective. Journal of Consulting and Clinical Psychology. 1992; 60:174–184. DOI: 10.1037//0022-006X.60.2.174 [PubMed: 1592946]

Crick NR. The role of overt aggression, relational aggression, and prosocial behavior in the prediction of children's future social adjustment. Child Development. 1996; 67:2317–2327. [PubMed: 9022243]

De Bellis MD. Developmental traumatology: The psychobiological development of maltreated children and its implications for research, treatment, and policy. Development and Psychopathology. 2001; 13:539–564. DOI: 10.1017/S0954579401003078 [PubMed: 11523847]

Erikson, EH. Childhood and society. New York: W. W. Norton & Company; 1963.

Freyd, JJ. Betrayal trauma: The logic of forgetting abuse. Cambridge, MA: Harvard University Press; 1996.

Glaeser EL, Laibson DI, Scheinkman Ja, Soutter CL. Measuring Trust. Quarterly Journal of Economics. 2000; 115:811–846. DOI: 10.1162/003355300554926

Gobin RL, Freyd JJ. The impact of betrayal trauma on the tendency to trust. 2014; 6:505–511.

Gunnar, MR. Effects of early deprivation: findings from orphanage-reared infants and children. In: Nelson, Luciana, editors. Handbook of developmental cognitive neuroscience. Cambridge, MA: MIT; 2001. p. 619-629.

Haushofer J, Fehr E. On the psychology of poverty. Science. 2014; 344:862–867. [PubMed: 24855262]

Hellerstedt WL, Madsen NJ, Gunnar MR, Grotevant HD, Lee RM, Johnson DE. The International Adoption Project: Population-based surveillance of Minnesota parents who adopted children internationally. Maternal and Child Health Journal. 2008; 12:162–171. [PubMed: 17562147]

Hostinar CE, Stellern SA, Schaefer C, Carlson SM, Gunnar MR. Associations between early life adversity and executive function in children adopted internationally from orphanages. Proceedings of the National Academy of Sciences. 2012; 109(Supplement 2):17208–17212.

Johnson DE. Long-term medical issues in international adoptees. Pediatric Annals. 2000; 29:234–241. [PubMed: 10782479]

Kidd C, Palmeri H, Aslin RN. Rational snacking: Young children's decision-making on the marshmallow task is moderated by beliefs about environmental reliability. Cognition. 2013; 126:109–114. [PubMed: 23063236]

Kosfeld M, Heinrichs M, Zak PJ, Fischbacher U, Fehr E. Oxytocin increases trust in humans. Nature. 2005; 435:673–676. [PubMed: 15931222]

Laible D. Attachment with parents and peers in late adolescence: Links with emotional competence and social behavior. Personality and Individual Differences. 2007; 43:1185–1197. DOI: 10.1016/j.paid.2007.03.010

Larson JJ, Whitton SW, Hauser ST, Allen JP. Being close and being social: Peer ratings of distinct aspects of young adult social competence. Journal of Personality Assessment. 2007; 89:136–148. [PubMed: 17764391]

Lawler JM, Hostinar CE, Mliner SB, Gunnar MR. Disinhibited social engagement in postinstitutionalized children: Differentiating normal from atypical behavior. Development and Psychopathology. 2014; 26:451–464. [PubMed: 24621789]

Lester D, Gatto J. Interpersonal trust, depression, and suicidal ideation in teenagers. Psychological Reports. 1990; 67115:424–443.

Loman MM, Johnson AE, Quevedo K, Lafavor TL, Gunnar MR. Risk-taking and sensation-seeking propensity in postinstitutionalized early adolescents. Journal of Child Psychology and Psychiatry. 2014; 55:1145–1152. [PubMed: 24552550]

Mikulincer M, Shaver PR. Attachment theory and intergroup bias: evidence that priming the secure base schema attenuates negative reactions to out-groups. Journal of Personality and Social Psychology. 2001; 81:97. [PubMed: 11474729]

O'Connor TG, Bredenkamp D, Rutter M. English and Romanian Adoptees (ERA) Study Team. Attachment disturbances and disorders in children exposed to early severe deprivation. Infant Mental Health Journal. 1999; 20:10–29.

Pepin EN, Banyard VL. Social support: A mediator between child maltreatment and developmental outcomes. Journal of Youth and Adolescence. 2006; 35:612–625. DOI: 10.1007/s10964-006-9063-4

Phan KL, Sripada CS, Angstadt M, McCabe K. Reputation for reciprocity engages the brain reward center. Proceedings of the National Academy of Sciences of the United States of America. 2010; 107(29):13099–104. DOI: 10.1073/pnas.1008137107 [PubMed: 20615982]

Pitula CE, Thomas KM, Armstrong JM, Essex MJ, Crick NR, Gunnar MR. Peer victimization and internalizing symptoms among post-institutionalized, internationally adopted youth. Journal of Abnormal Child Psychology. 2014; 42:1069–1076. [PubMed: 24619483]

Pollak SD, Nelson CA, Schlaak MF, Roeber BJ, Wewerka SS, Wiik KL, et al. Gunnar MR. Neurodevelopmental effects of early deprivation in post institutionalized children. Child Development. 2010; 81:224–236. [PubMed: 20331664]

Raaska H, Lapinleimu H, Sinkkonen J, Salmivalli C, Matomäki J, Mäkipää S, et al. Experiences of school bullying among internationally adopted children: Results from the Finnish Adoption (FINADO) Study. Child Psychiatry and Human Development. 2012; 43:592–611. [PubMed: 22362203]

Rotenberg KJ. Loneliness and interpersonal trust. Journal of Social and Clinical Psychology. 1994; 13:152–173.

Rotenberg KJ, Addis N, Betts LR, Corrigan A, Fox C, Hobson Z, et al. Boulton MJ. The relation between trust beliefs and loneliness during early childhood, middle childhood, and adulthood. Personality & Social Psychology Bulletin. 2010; 36:1086–100. DOI: 10.1177/0146167210374957 [PubMed: 20585058]

Rotenberg KJ, Boulton MJ, Fox CL. Cross-sectional and longitudinal relations among children's trust beliefs, psychological maladjustment and social relationships: are very high as well as very low trusting children at risk? Journal of Abnormal Child Psychology. 2005; 33:595–610. DOI: 10.1007/s10802-005-6740-9 [PubMed: 16195953]

Rotenberg KJ, Fox CL, Green S, Ruderman L, Slater K, Stevens K, Carlo G. Construction and validation of a children's interpersonal trust belief scale. British Journal of Developmental Psychology. 2005; 23:271–292. DOI: 10.1348/026151005X26192

Rotenberg KJ, MacDonald KJ, King EV. The relationship between loneliness and interpersonal trust during middle childhood. The Journal of Genetic Psychology. 2004; 165:233–49. DOI: 10.3200/GNTP.165.3.233-249 [PubMed: 15382815]

Rotter JB. A new scale for the measurement of interpersonal trust. Journal of Personality. 1967; 53:651–655.

Rotter JB. Interpersonal trust, trustworthiness, and gullibility. American Psychologist. 1980; 35:1–7. DOI: 10.1037//0003-066X.35.1.1

Rutter M, Kreppner J, Sonuga-Barke E. Emanuel Miller Lecture: Attachment insecurity, disinhibited attachment, and attachment disorders: where do research findings leave the concepts? Journal of Child Psychology and Psychiatry. 2009; 50:529–543. [PubMed: 19298474]

Sharabany R, Gershoni R, Hofman JE. Girlfriend, boyfriend: Age and sex differences in intimate friendship. Developmental Psychology. 1981; 17:800.

Siegrist M, Keller C, Earle T, Gutscher H. Effects of General Trust on Cooperation in the Investment Game and in a Social Dilemma. unpublished manuscript.

Tarullo AR, Bruce J, Gunnar MR. False belief and emotion understanding in post-intitutionalized children. Social Development. 2007; 16:57–78.

Van den Bos W, van Dijk E, Crone EA. Learning whom to trust in repeated social interactions: A developmental perspective. Group Processes & Intergroup Relations. 2011; 15:243–256. DOI: 10.1177/1368430211418698

Van den Bos W, Westenberg M, van Dijk E, Crone EA. Development of trust and reciprocity in adolescence. Cognitive Development. 2010; 25:90–102. DOI: 10.1016/j.cogdev.2009.07.004

Wentzel KR. Relations between social competence and academic achievement in early adolescence. Child Development. 1991; 62:1066–1078. [PubMed: 1756656]

Wright TL, Kirmani A. Interpersonal trust, trustworthiness and shoplifting in high school. Psychological Reports. 1977; 41:1165–1166. [PubMed: 601143]

Zeanah, CH., Gunnar, MR., McCall, RB., Kreppner, JM., Fox, NA. Sensitive periods. In: McCall, RB.van IJzendoorn, MH.Juffer, F.Groark, CJ., Groza, VK., editors. Children without permanent parents: Research, practice, and policy Monographs of the Society for Research in Child Development. Vol. 76. 2011. p. 147-162.

Zurbriggen, EL., Freyd, JJ. The link between childhood sexual abuse and risky sexual behavior: The role of dissociative tendencies, information- processing effects, and consensual sex decision mechanisms. In: Koenig, LJ.Doll, LS.O'Leary, A., Pequegnat, W., editors. From child sexual abuse to adult sexual risk: Trauma, revictimization, and intervention. Washington, DC: American Psychological Association; 2004. p. 135-157.doi:10.1037/ 10785-007

Research highlights

- Using a developmentally appropriate trust game, trust behavior was examined in post-institutionalized (PI) adolescents internationally adopted as infants or young children.
- PI youth, particularly those who were adopted after one year of age, were less trusting of anonymous peers than were never-institutionalized, non-adopted (NA) youth.
- In contrast with NA youth, who tended to maintain their level of trust despite experiencing trials in which peers did not reciprocate, PI adolescents were more sensitive to perceived defection.
- PI youth also appeared more sensitive to high reciprocation; in fact, findings suggest that PI youth may have been more accurate than comparison youth in their trusting decisions.
- Results suggest that early deprivation may influence long-term biases in trust behavior, which persist even years after the environment has improved.

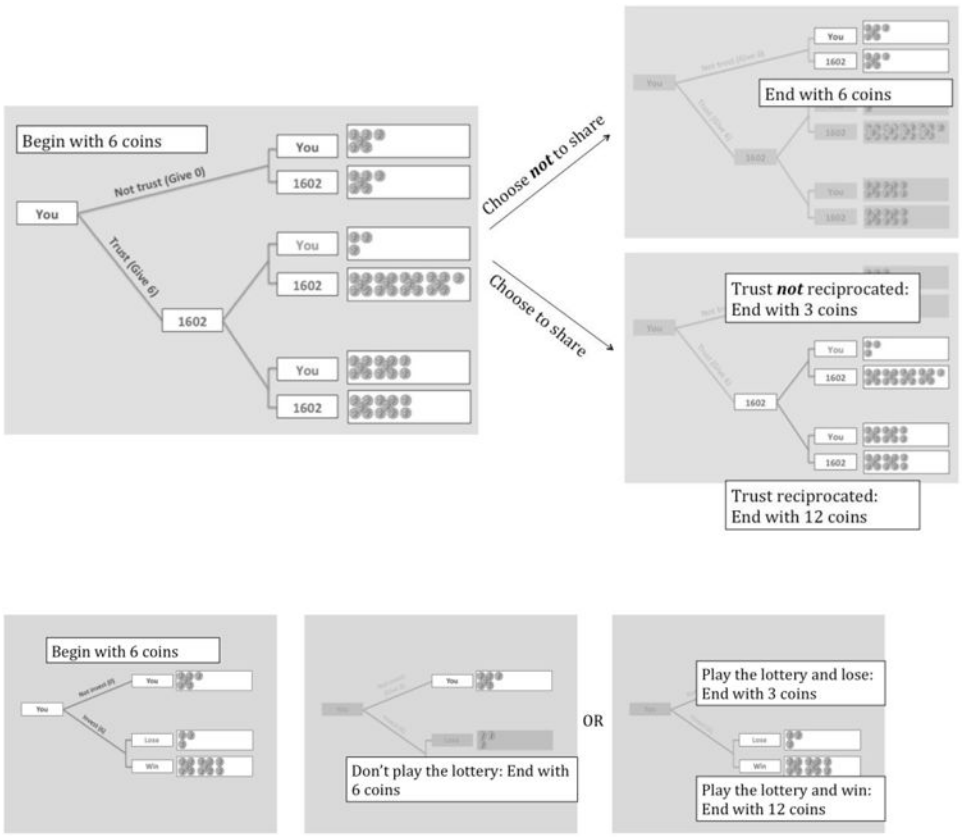


Figure 1.

Representations of decision trees shown in Peer (a) and Lottery (b) trials. Text boxes are added here for the reader's benefit; participants obtained these same instructions verbally.

a) Example of the decision tree shown during a Peer trial, with option to share or not.

b) Example of the decision tree shown during a Lottery trial, with option to invest or not.

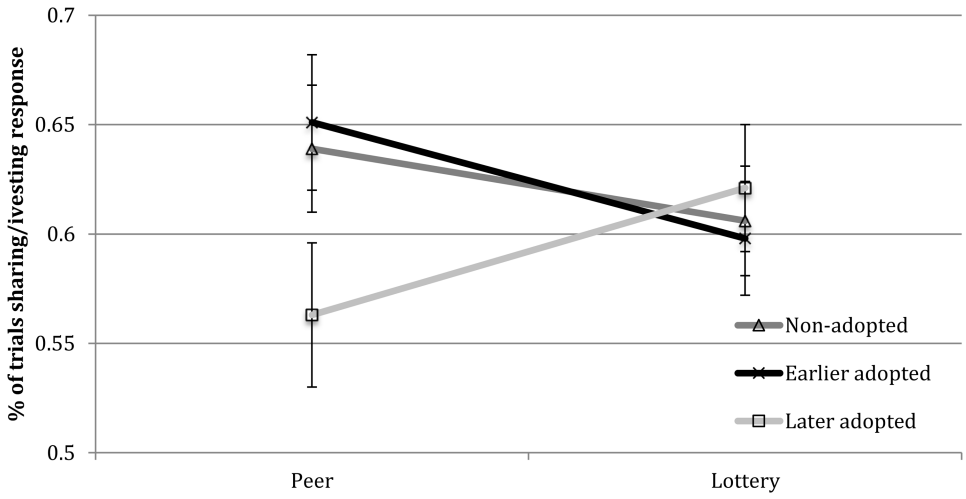
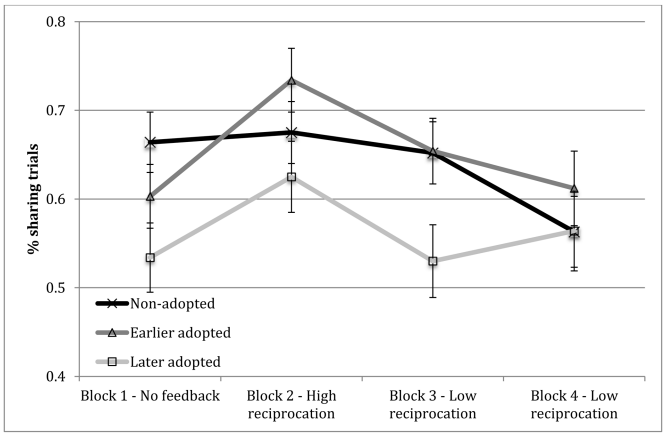


Figure 2.

Mean percentage of trials in each condition where participants in each group trusted peers or invested in the lottery. Standard error bars are shown.

a)



b)

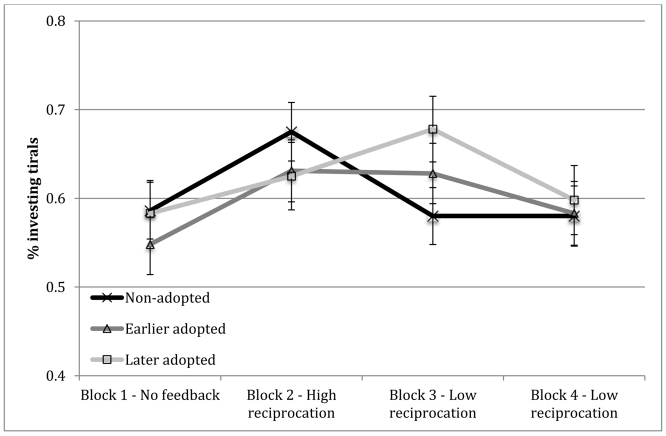


Figure 3.

Percentage of trials in each block where participants trusted peers (a) and invested in the lottery (b). Standard error bars are shown.

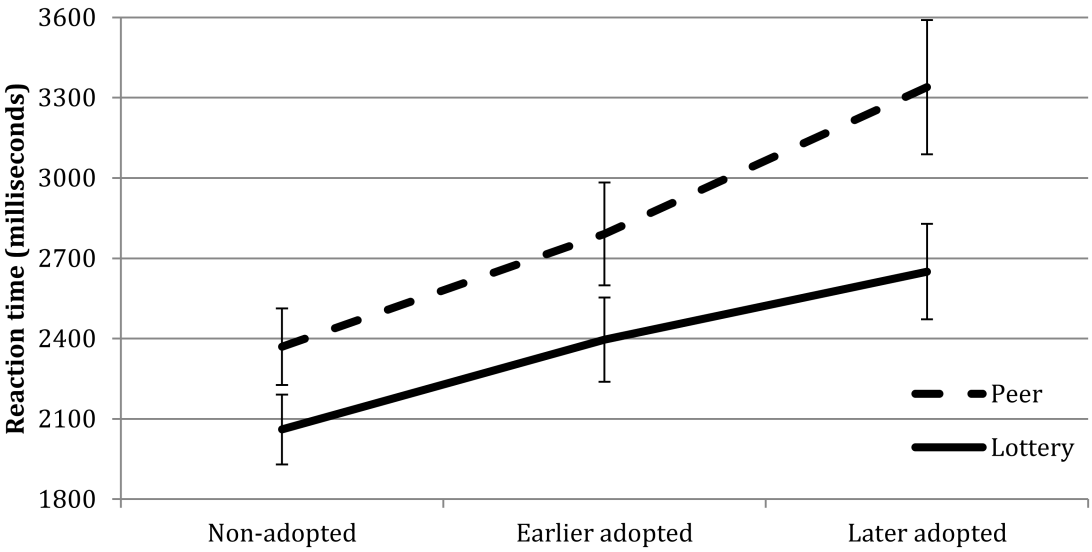


Figure 4.

Reaction time in milliseconds, averaged across all four blocks, for responses during Peer and Lottery trials, by group. Standard error bars are shown.

Table 1

Participant Demographic Information

Variable	Non-adopted	Earlier adopted	Later adopted
Sample size *n*	33 (24 females)	29 (20 females)	24 (15 females)
Age at assessment *M(SD)*	12.8 years (.4)	12.9 years (.6)	12.9 years (.7)
Age at adoption *M(SD)*	--	9.0 months (2.2)	22.3 months (12.9)
Time in institution *M(SD)*	--	8.7 months (2.3)	20.6 months (10.2)
% of pre-adoption life in institution *M(SD)*	--	97.1% (5.4)	95.2% (11.0)