
False Belief and Emotion Understanding in Post-institutionalized Children

Amanda R. Tarullo, *Institute of Child Development, University of Minnesota*, Jacqueline Bruce, *Oregon Social Learning Center* and Megan R. Gunnar, *Institute of Child Development, University of Minnesota*

Abstract

Deficits in social cognition may impair the ability to negotiate social transactions and relationships and contribute to socio emotional difficulties experienced by some post-institutionalized children. We examined false belief and emotion understanding in 40 institutional care-adopted children, 40 foster care-adopted children and 40 birth children. Both groups of adopted children were adopted internationally. Controlling for verbal ability, post-institutionalized children scored lower than birth children on a false belief task. Almost half of the post-institutionalized children performed below chance levels. The foster care group did not differ from either group on false belief understanding. The groups did not differ on emotion understanding after controlling for verbal ability. The results suggest that some post-institutionalized children are delayed in false belief understanding.

Keywords: theory of mind; emotion understanding; early deprivation; international adoption

Since 1995, over 130,000 children have been adopted internationally into the USA. (US Department of State, 2004). Many of these children have been reared in institutions around the world prior to adoption, and they exhibit delays in physical and behavioral development at adoption (Ames, 1997; Benoit, Jocelyn, Moddemann & Embree, 1996; Hostetter, Iverson, Thomas, McKenzie, Dole & Johnson, 1991; Johnson, 2000). These delays may be, partly or wholly, due to extended periods of social and physical privation, including malnutrition, poor medical care, inadequate cognitive and motor stimulation and lack of a stable and responsive caregiver (Gunnar, Bruce & Grotevant, 2000; Johnson, 2000). Following adoption, physical and behavioral development rebound remarkably, indicating that adoption represents a termination of the period of early deprivation (Ames, 1997; Johnson, 2000; Rutter, Andersen-Wood, Beckett, Bredenkamp, Castle & Groothues, 1999). That is, internationally adopted, post-institutionalized children experience inadequate care prior to adoption and generally responsive care in an enriched environment following adoption. Thus, post-institutionalized children provide an opportunity to study the effects of a

Correspondence should be addressed to Amanda Tarullo, University of Minnesota Institute of Child Development, 51 E. River Rd., Minneapolis, MN 55455, USA. Email: taru0007@umn.edu

circumscribed period of early deprivation without the ongoing deprivation that confounds the study of other populations who experience early deprivation (e.g., maltreated children born in the USA).

In contrast to the impressive recovery in physical growth and behavioral development in the months and years following adoption, socio-emotional difficulties persist and sometimes even increase over time in some children (Ames, 1997; Chisholm, 1998; O'Connor, Bredenkamp, Rutter & the ERA Study Team, 1999). Post-institutionalized children are at risk for developing disordered attachment relationships and have difficulty with emotional regulation and peer interactions (Chisholm, 1998; O'Connor et al., 1999; Tizard & Hodges, 1978). Moreover, they often exhibit indiscriminate friendliness, a disinhibited, superficial attempt to socially engage strangers (Chisholm, 1998; O'Connor et al., 1999). Some post-institutionalized children are observed to have quasi-autistic features (Rutter, Kreppner & O'Connor, 2001). Institutions range in quality of care, and it is frequently impossible to determine the level of privation that a post-institutionalized child has experienced (Gunnar et al., 2000). Yet it has been demonstrated that even when institutions provide adequate nutrition, healthcare and stimulation, some children still show persistent socio-emotional problems (Tizard & Hodges, 1978). Thus, socio-emotional problems may reflect the absence of a stable, responsive primary caregiver (Gunnar et al., 2000).

Delays in social cognitive abilities could contribute to indiscriminate friendliness and the other socio-emotional deficits displayed by some post-institutionalized children. Numerous studies of both typically developing and maltreated children have found that social cognitive abilities are positively associated with social competence and quality of peer relationships (Capage & Watson, 2001; Denham, McKinley, Couchoud & Holt, 1990; Dunn, 1995; Dunn & Cutting, 1999; Dunn & Hughes, 1998; Garner, 1996; Rogosch, Cicchetti, Shields & Toth, 1995). Conversely, delays in social cognitive abilities, such as perspective-taking and emotion understanding, may make it difficult to negotiate social interactions and interpersonal relationships. For example, children who have difficulty with perspective-taking may not be able to accurately predict how others will react to their behavior. Children who have difficulty reading emotional expressions and other social cues may not realize that a social partner is responding negatively to their behavior. O'Connor et al. (1999) proposed that difficulty in reading social cues could underlie the persistent social-emotional deficits observed in some post-institutionalized children.

Currently, very little is known regarding the social cognitive abilities of post-institutionalized children. To our knowledge, there is only one published study on this subject. In that study, post-institutionalized preschool children demonstrated difficulty with identifying basic emotions and with selecting appropriate facial expressions for happy, sad and fearful vignettes (Wismer Fries & Pollak, 2004). Given the lack of existing research on social cognitive abilities in post-institutionalized children, it may be helpful to consider the social cognitive abilities of other populations with a history of early adversity. These populations may provide insight into the role of early experience in the development of social cognitive skills, which could be then applied to the development of post-institutionalized children.

Two well-studied aspects of social cognition will be considered: false belief understanding and emotion understanding. False belief understanding refers to an appreciation that other people's beliefs may differ both from reality and from one's own perspective. Emotion understanding encompasses emotion recognition, affective perspective-taking and other aspects of affective processing (Pears & Fisher, 2005).

False Belief Understanding: Developmental Course and Impact of Adversity

A standard measure of false belief understanding is the unexpected transfer task in which children must predict where a protagonist will search for an object based on the protagonist's false belief regarding the object's location (Baron-Cohen, Leslie & Frith, 1985; Wimmer & Perner, 1983). Succeeding at the task requires attributing to the protagonist a belief that the child knows to be false. According to a meta-analysis by Wellman, Cross and Watson (2001), typically developing children show a developmental progression from a success rate of less than 20 percent at 30 months to a success rate of about 80 percent by the age of five.

Despite the general developmental improvement with age, there are individual differences in false belief understanding, and early social experiences predict these individual differences. The capacity to co-ordinate social attention in infancy has been longitudinally associated with false belief understanding in preschool (Charman, Baron-Cohen, Swettenham, Baird, Cox & Drew, 2001; Wellman, Philips, Dunphy-Lelii & LaLonde, 2004). A stable, responsive caregiver supports the development of secure attachment (Kochanska, 1998), and secure attachment has been both concurrently and longitudinally associated with false belief understanding (Arranz, Artamendi, Olabarrieta & Martin, 2002; Fonagy, Redfern & Charman, 1997; Meins, Fernyhough, Russell & Clark-Carter, 1998).

Specific delays in false belief understanding have been identified in several populations with a history of early adversity, including maltreated children and children with sensory impairments. Children who experience maltreatment are at risk for delayed false belief understanding compared with non-maltreated low-socioeconomic status children, after controlling for verbal ability (Cicchetti, Rogosch, Maughan, Toth & Bruce, 2003; Pears & Fisher, 2005). Some evidence suggests that late-signing deaf children (Courtin & Melot, 1998; Lundy, 2002; Peterson & Siegal, 2000; Woolfe, Want & Siegal, 2002), blind children (Peterson, Peterson & Webb, 2000) and children with cerebral palsy (Dahlgren, Dahlgren-Sandberg & Hjelmquist, 2003) show delays of several years in false belief understanding. These diverse populations share a history of early social deprivation, including a dearth of early experiences co-ordinating social attention. Maltreatment is associated with little co-ordination of social attention in caregiver-child interactions and with insecure or disorganized attachment relationships (Barnett, Ganiban & Cicchetti, 1999; Rogosch et al., 1995). Sensory impairments affect the resources that an infant has available to co-ordinate social interactions (Peterson et al., 2000), and research with deaf children indicates that delays in false belief understanding depend on the extent to which the sensory impairment interferes with the child's social communication (Courtin & Melot, 1998). Thus, the early social experiences that are associated with success on false belief tasks among typically developing children are compromised among children with delayed false belief understanding. These early social experiences, including co-ordinating social attention and developing a secure attachment, may have a role in the development of false belief understanding.

Post-institutionalized children share many of the experiences of early social deprivation that characterize populations with delayed false belief understanding. Children who are institutionalized lack a stable, responsive caregiver due to high staff turnover and high child-to-caregiver ratios. Children in an institutional setting typically experience several shifts of caregivers each day and have significantly less face-to-face social contact with caregivers than do family-reared infants (Lee, 2000; Zeanah, Nelson, Fox,

Smyke, Marshall, Parker et al., 2003). Studies of Romanian post-institutionalized infants indicate that they are less likely to be classified as securely attached to their adoptive parents and are at increased risk for various abnormal attachment patterns (Chisholm, 1998; O'Connor et al., 1999). Some post-institutionalized children seem unable to form a selective attachment of any type (Minde, 2003). Initial evidence also suggests that post-institutionalized children adopted later than at 12 months of age may have delays in initiating joint attention (Kroupina, Iverson, Gunnar & Johnson, 2002). Given that post-institutionalized children lack the early social experiences associated with the development of false belief understanding, it is reasonable to hypothesize that they might be at risk for delays in this domain.

Emotion Understanding: Developmental Course and Impact of Adversity

By approximately the age of three, typically developing children can accurately recognize and discriminate among facial expressions for basic emotions (Brown & Dunn, 1996; Denham, 1986; Walden & Field, 1982). Affective perspective-taking, the ability to predict emotional state based on situational cues, has been demonstrated in children as young as two and three years old using vignettes with puppets (Brown & Dunn, 1996; Denham, 1986), although this ability continues to develop during the preschool years. Attachment security has been related to emotion understanding both concurrently (Laible & Thompson, 1998) and longitudinally (Steele, Steele, Corft & Fonagy, 1999).

Consistent with the findings on false belief understanding, several studies report delayed emotion understanding among maltreated children. Maltreated children have demonstrated difficulties in emotion recognition (Camras, Grow & Ribordy, 1983; Camras, Ribordy, Hill & Martino, 1990; During & McMahon, 1991; Pollak, Cicchetti, Hornung & Reed, 2000) and in affective perspective-taking (Pears & Fisher, 2005; Rogosch et al., 1995). Maltreatment may influence emotion understanding by exposing children to disrupted caregiving and an atypical emotional environment (Denham, Zoller & Couchoud, 1994; Pollak et al., 2000). Maltreating caregivers show less positive emotion (Burgess & Conger, 1978) and more negative emotion (Lyons-Ruth, Connell, Zoll & Stahl, 1987) than non-maltreating caregivers, and they tend to be emotionally unstable and unpredictable (Barnett et al., 1999; Rogosch et al., 1995). Like maltreated children, institutionalized children are deprived of a stable, responsive context in which to learn regarding emotions, so we might expect them to exhibit delayed emotion understanding as well. A recent study provides initial support for this hypothesis: post-institutionalized preschool children demonstrated difficulty with emotion recognition and with selecting appropriate facial expressions for happy, sad and fearful vignettes (Wisner Fries & Pollak, 2004).

In sum, post-institutionalized children are deprived of early social experiences associated with the development of false belief understanding and emotion understanding, including a stable, responsive caregiver; individualized face-to-face social contact; opportunities for initiating joint attention and a secure attachment relationship. These early social experiences are also compromised among populations with demonstrated delays in false belief understanding and emotion understanding. Thus, there is reason to believe that post-institutionalized children may also be at risk for delays in false belief understanding and emotion understanding.

One challenge in research with post-institutionalized children is disentangling the developmental impact of the institutional rearing environment from the developmental impact of international adoption. Previous studies have compared early-adopted and

late-adopted post-institutionalized children. Although this approach controls for the duration of institutional care, all the children have experienced some period of institutional care. The inclusion of a comparison group of children who are internationally adopted from foster care can be helpful in this regard. These foster care children share the experience of being removed from their country of origin and adopted internationally. However, their social experience prior to adoption differs markedly from that of post-institutionalized children. In countries such as Korea, from which many children are internationally adopted from foster care, birth mothers often decide to put the child up for adoption before or shortly after birth, and the child is placed in foster care until an adoption can be arranged. Usually, only one or two children are placed in each foster home. In Korea, the government provides foster parents with extensive training, support and medical care (Children's Home Society and Family Services, 2005). Thus, these children likely have a stable, responsive caregiver and individualized face-to-face social contact while in foster care. Because foster care children are internationally adopted but are not as likely to experience early social deprivation, they constitute a valuable comparison group for post-institutionalized children.

Another challenge in assessing social cognitive abilities of post-institutionalized children is the role of language ability as a potential confounding variable. In typically developing populations, language ability has been associated with false belief understanding and emotion understanding (Astington & Baird, 2004; Astington & Jenkins, 1999; Cutting & Dunn, 1999; de Villiers, 2000; Smith & Walden, 1999). Furthermore, social cognitive delays often co-occur with language delays, as in the cases of autistic children and late-signing deaf children. Although the majority of post-institutionalized children do not appear to exhibit persistent language delays (Gunnar et al., 2000), the likelihood of language delay increases with the duration of institutionalization (Glennen & Masters, 1992). Thus, in assessing social cognitive abilities, language ability must be taken into account.

Studying social cognitive abilities and their correlates in children who are internationally adopted from institutions and from foster care is likely to be informative on multiple levels. Firstly, this research may help us to better understand the developmental impact of the institutional rearing environment, specifically the lack of a stable caregiver and scarcity of individualized attention. Identification of social cognitive delays among post-institutionalized children would provide some support for the proposal that difficulty in reading social cues contributes to socio-emotional deficits among some of these children. Secondly, assessing social cognitive abilities in post-institutionalized children has the potential to elucidate the role of early experience in the normative development of these abilities. Finally, the inclusion of a foster care group will expand our knowledge regarding this understudied population and help to distinguish the influence of the institutional rearing environment from the influence of experiencing international adoption.

The current study assessed false belief understanding and emotion understanding in six- and seven-year-old internationally adopted post-institutionalized children, along with comparison groups of internationally adopted children who lived in foster care prior to adoption and children reared with their biological families. This study was intended to address a gap in the literature as, to the best of our knowledge, there is only one published study of social cognitive abilities in post-institutionalized children (Wisner Fries & Pollak, 2004) and no previous studies of social cognitive abilities in children who are internationally adopted from foster care. False belief understanding was assessed using a standard unexpected transfer task, chosen

because it has been studied extensively and cross-culturally (Callaghan, Rochat, Lillard, Claux, Odden & Itakura, 2005; Wellman et al., 2001). Because typically developing children perform above chance levels at this task by the age of four or five (Wellman et al., 2001), failing the task at the age of six or seven would suggest a delay in false belief understanding. In this cross-sectional study it could not be determined whether poor performance indicated a temporary delay or a permanent deficit in social cognition abilities. In the interest of parsimony, the term 'delay' will be used throughout this article. Emotion understanding was assessed with three computerized measures designed for use with preschool children (Perlman & Pollak, 2003; Wismer Fries & Pollak, 2004), so that poor performance on these tasks among the six- and seven-year-olds in this study would also suggest delays. A measure of verbal ability was included because of the association between verbal and social cognitive abilities. Given the post-institutionalized children's history of early social deprivation, we expected that they would show delays in false belief understanding and emotion understanding compared with the children who are internationally adopted from foster care and to children raised by their biological families in the USA, even after controlling for verbal ability. We did not expect the children who are internationally adopted from foster care to show delays in false belief understanding or emotion understanding because they did not experience the early social deprivation of institutional rearing.

Method

Participants

The participants were 120 six- and seven-year-olds with equal numbers in each of the following groups: the *institutional care* (IC) group had spent at least 75 percent of their lives prior to adoption in institutions and no more than six months in family-based care, and at the time of adoption were at least 12 months old and no more than 36 months old; the *foster care* (FC) group had spent at least 75 percent of their lives prior to adoption in a family-based setting (e.g., foster care or relative care) and no more than two months in institutional care, and at the time of adoption were no more than 36 months old; and the *birth children* (BC) group were born in the USA and reared with their biological families. All the adopted children were born outside the USA and were adopted by families living in the mid-western USA.

The FC and BC groups served as comparison groups for the IC children and were matched for age and sex. Thus, each group contained 30 girls and 10 boys and there were no age differences between the groups (IC: $M = 6.85$, $SD = .56$, range = 6.02–7.88; FC: $M = 6.86$, $SD = .60$, range = 6.02–7.98; BC: $M = 6.86$, $SD = .55$; range = 6.05–7.88). The IC and FC groups differed in terms of country of origin (see Table 1) because at the time these children were born, their countries of origin generally had either a family-based system or an institutional system in place to care for wards of the state. As a result, as Table 1 shows, there is very little overlap in nationality for the IC vs. the FC groups. The type of care was largely determined by the system that the child's country of origin had in place, rather than by any factors specific to the child. Children from the IC and FC groups differed in age at adoption (see Table 2) because countries using foster care rather than institutional care tend also to have procedures in place that permit international adoption when children are younger. Thus, the age at adoption needed to be considered in the analyses.

Table 1. Country of Origin by Group

| Institutional Care | | Foster Care | |
|--------------------|--------------|-------------|--------------|
| Country | <i>N</i> (%) | Country | <i>N</i> (%) |
| China | 17 (42.5) | Korea | 32 (80.0) |
| Russia | 6 (15.0) | Guatemala | 5 (12.5) |
| Romania | 5 (12.5) | China | 2 (5.0) |
| Bulgaria | 3 (7.5) | Chile | 1 (2.5) |
| India | 3 (7.5) | | |
| Ukraine | 3 (7.5) | | |
| Korea | 1 (2.5) | | |
| Peru | 1 (2.5) | | |
| Poland | 1 (2.5) | | |

Table 2. Early Care Experiences by Group

| Early Care Variable | Group | |
|---------------------------------------|---|--|
| | Institutional Care <i>M</i> (<i>SD</i> ; <i>Range</i>) | Foster Care <i>M</i> (<i>SD</i> ; <i>Range</i>) |
| Months in birth parents' care | .46 (1.35; 0–6) | .23 (.84; 0–4) |
| Months in institutional care** | 17.73 (7.09; 10–36) | .38 (.59; 0–2) |
| Months in foster care** | .06 (.23; 0–1) | 6.95 (4.28; 2–22) |
| Months in unknown care | .23 (.73; 0–3) | .03 (.16; 0–1) |
| Age at adoption (months)** | 18.58 (6.76; 12–36) | 8.00 (5.19; 2–25) |
| Number of prenatal risk factors* | .95 (1.04; 0–3) | .49 (.76; 0–3) |
| Number of early care risk factors** | 1.80 (1.04; 0–4) | .33 (.66; 0–3) |
| Years in the USA at time of testing** | 5.30 (.82; 3.11–6.71) | 6.19 (.76; 3.94–7.63) |

* $p < .05$, ** $p < .001$.

All parents completed a demographic questionnaire regarding their marital status, employment, education, income, their own racial background, family composition and age. The families of the children in the IC, FC and BC groups were quite similar demographically (see Table 3), differing on only a few variables. The parents of the birth children were significantly younger than the parents of both groups of adopted children, respondent: $F(2,110) = 22.34$, $p < .001$; partners: $F(2,105) = 16.55$, $p < .001$. There was a group difference in marital status, $\chi^2(2, N = 120) = 6.76$, $p < .05$. Parents in the IC group were significantly less likely to be married than parents in the FC group. This is likely to reflect policy differences in the countries of origin because many countries that use foster rather than institutional care for abandoned infants also

Table 3. Descriptive Statistics Regarding Family Characteristics

| Variable | Group | | |
|---|--------------------|-------------|----------------|
| | Institutional Care | Foster Care | Birth Children |
| <i>Respondent</i> (% mothers) | 85.0 | 87.5 | 92.5 |
| <i>Marital status*</i> (% married or living with a partner) | 82.5 | 97.5 | 95.0 |
| <i>Number of children M (SD)</i> | 2.1 (1.1) | 2.1 (.9) | 2.5 (.9) |
| <i>Age M (SD)</i> | | | |
| Respondent** | 45.4 (4.5) | 45.5 (4.2) | 39.2 (5.1) |
| Partner** | 46.8 (5.0) | 45.9 (5.1) | 40.5 (5.1) |
| <i>Race</i> (% Caucasian) | | | |
| Respondent | 100.0 | 97.5 | 97.5 |
| Partner | 100.0 | 94.9 | 92.1 |
| <i>Education</i> (% with four-year college degree) | | | |
| Respondent | 72.5 | 80.0 | 70.0 |
| Partner | 72.7 | 76.9 | 71.1 |
| <i>Employment</i> (% full time) | | | |
| Respondent | 40.0 | 37.5 | 27.5 |
| Partner | 81.8 | 87.2 | 89.5 |
| <i>Income</i> (% > \$75,000) | 53.8 | 65.8 | 59.0 |

* $p < .05$, ** $p < .001$.

require that children be adopted by two-parent married couples. Parental age and marital status were not significantly related to any of the measures of interest and thus were not included in any further analyses.

Procedures

Both groups of internationally adopted children were recruited from the International Adoption Project Registry, a database that, at the time it was used for this study, consisted of over 2,000 internationally adopted children whose families were interested in participating in research. Of the 110 adoptive families contacted, 80 (73 percent) agreed to and completed testing. The children reared with their biological families were recruited from a department-maintained participant list. All measures were obtained during a two-and-a-half-hour laboratory visit as part of a larger study. The measures described here were all collected during the first one-and-a-half hours of the session, interspersed with other behavioral and physiological measures.

Measures

Life History. The parents of the adopted children completed a questionnaire regarding their children's early care history, including their country of origin, age at adoption, type of care, suspected prenatal risk factors and suspected maltreatment. From this

questionnaire, two risk indices were computed: a prenatal risk index and an early care risk index. The prenatal risk index was created by summing the number of prenatal risk factors that parents knew or suspected their child to have experienced, including prenatal exposure to alcohol or drugs, prenatal malnourishment and premature birth (possible range 0–3). The early care risk index was created by summing the number of early care risk factors that parents knew or suspected their child to have experienced, including any indication of physical abuse, physical neglect or social neglect, three or more living arrangements prior to adoption and belonging to a minority group discriminated against in the child's country of origin (possible range 0–5).

Verbal Ability. The *Wechsler intelligence scale for children, third edition* (WISC-III) vocabulary subscale was used to assess general verbal abilities. The vocabulary subscale is a highly reliable measure of verbal comprehension and expression and is highly correlated with overall IQ scores (Wechsler, 1991). Raw scores were converted to standard age-normed scores.

False Belief Understanding. False belief understanding was assessed using a standard unexpected transfer task (Baron-Cohen et al., 1985). In this task, the experimenter acted out a brief story with dolls in which the protagonist put an object in one location, and in the protagonist's absence, another doll moved the object to a new location. To pass the trial, the child had to demonstrate that he or she remembered where the object was originally, knew its true location, and expected the protagonist to look for the object in its original location. Thus, to succeed at the task, the children had to attribute a belief to the doll that they themselves knew to be false. The first trial was immediately followed by a second trial with the previous two locations plus an additional location. For this second trial, a different hidden object was used, and the same two dolls were used but their roles were reversed. The same three questions were posed for the second trial (see Appendix A). On the two-location trial, two children answered the reality question incorrectly, indicating that they did not know the object's true location. On the three-location trial, one child answered the reality question incorrectly and one child answered the memory question incorrectly. All other children answered the memory and reality questions correctly. Each trial was scored as 0 or 1.

Emotion Understanding. Three computerized tasks assessed emotion understanding using a touch-screen monitor. For each of the eight trials of the emotion identification task, the computer displayed four digitized photographs of an adult (Ekman, 1976, four trials) or child (Camras et al., 1990, four trials) with different facial expressions of emotion. A computer automated voice asked the child to select the happy, sad, mad or scared face on the touch screen monitor. The faces remained on the screen until the child responded. A longer version of this task has been used with post-institutionalized four- and five-year-olds (Wisner Fries and Pollak, 2004). Next, for the emotion situation task, the computer presented 16 vignettes of situations between a parent and child. The situations were narrated by automated male and female voices and illustrated with race-neutral and emotion-neutral drawings. After each vignette, four digitized faces were displayed (using the same set of photographs from the emotion identification task) and the computer asked the child to select the facial expression that matched how the protagonist was feeling. The protagonists included an equal distribution of boys, girls, mothers and fathers. Variants of this task have been used previously with young children, including maltreated and post-institutionalized children

(e.g., Camras & Allison, 1985; Wismer Fries & Pollak, 2004). The final computerized task assessed the children's understanding of the antecedents of different emotions (Perlman & Pollak, 2003). For this task, the children were asked to 'teach' a robot about happy, sad and angry emotions. The robot was presented with an emotion and attempted to provide an explanation for this emotion (e.g., 'The mom is feeling happy because . . . her little girl hugged her'). The children were then asked to evaluate the accuracy of the robot's explanation by awarding the most appropriate prize (from a small prize with a black star on it to a big prize with many brightly colored stars). The children's scores on this task reflected their accuracy in evaluating the robot's explanations averaged across 27 trials (Perlman & Pollak, 2003). The scores on the three measures of emotion understanding—emotion identification task, emotion situation task and the emotion antecedents task—were significantly but modestly correlated, $r = .25$, $-r = .39$. Given the relative independence of these three tasks, they were analyzed separately.

Analysis Plans

We began by examining pre-adoption experiences and verbal ability to identify confounding factors that needed to be statistically controlled. We evaluated group differences in pre-adoption experiences and tested the relation of these pre-adoption experiences to our outcome measures, scores on false belief understanding and emotion understanding tasks. We then assessed group differences in verbal ability and the relation of verbal ability to false belief understanding and emotion understanding. For subsequent analyses, pre-adoption variables and verbal ability were included as covariates if they were significantly related to both the variables being examined in a given analysis. Thus, the covariates changed across analyses depending on which variables were under examination (e.g., the false belief understanding task and group or an emotion understanding task and group). Before proceeding to the main analyses, we tested the relation between scores on the false belief understanding and emotion understanding tasks. This analysis was included to indicate the extent to which the tasks reflected independent aspects of social cognition vs. a unified social cognitive ability. We then examined group differences in false belief understanding and the three emotion understanding tasks, with follow-up analyses including the appropriate covariates.

Results

Potential Confounding Factors in Relation to False Belief Understanding and Emotion Understanding

Pre-adoption Factors. As shown in Table 2, the FC children were significantly younger at adoption than the IC children, $t(78) = 7.85$, $p < .001$, and thus the FC children had been in the USA for longer than the IC children at the time of testing, $t(78) = 5.03$, $p < .001$. The IC children also had significantly more prenatal risk factors, $t(77) = 2.26$, $p < .05$, and early care risk factors, $t(78) = 7.57$, $p < .001$, compared with the FC children. We then examined whether the pre-adoption variables related to our outcome measures. None of these pre-adoption variables were significantly related to the children's false belief understanding scores. Additionally, none of the individual events used to create the prenatal and early care risk factors were significantly associated with false belief understanding. Therefore, none of the

Table 4. Vocabulary and Emotional Understanding Task Results by Group

| | Institutional Care <i>M (SD; Range)</i> | Foster Care <i>M (SD; Range)</i> | Birth Children <i>M (SD; Range)</i> |
|---------------------------------------|--|-------------------------------------|--|
| Vocabulary (standard score)* | 10.0 (3.4; 2–17) | 12.1 (3.2; 6–19) | 12.2 (2.8; 6–19) |
| Emotion identification (% correct) | 81.5 (13.5; 38–100) | 84.7 (11.6; 50–100) | 86.4 (11.9; 50–100) |
| Emotion situation (% correct) | 60.8 (13.6; 20–88) | 64.7 (14.2; 31–100) | 65.9 (10.9; 38–94) |
| Emotion antecedents (% correct)* | 87.0 (14.0; 50–100) | 85.6 (16.5; 42–100) | 92.9 (9.2; 47–100) |

* $p < .01$.

pre-adoption variables were included as a covariate in analyses of false belief understanding. The emotion identification task was also not related to any of the pre-adoption variables. The emotion situation task was correlated with prenatal risk, such that increasing number of prenatal risk factors was associated with poorer performance on the emotion situation task, $r(77) = -.24, p < .05$. Thus, prenatal risk was designated as a covariate for subsequent analyses involving the emotion situation task and group status because prenatal risk was related to both of these variables. Performance on the emotion antecedents task was correlated with length of time living in the USA for both the IC and FC groups, $r(79) = .25, p < .05$, and with age at adoption for the FC group, $r(39) = -.34, p < .05$. Because length of time in the USA was related both to performance on the emotion antecedents task and to group status, it was included as a covariate in subsequent analyses involving these two variables. Age at adoption was highly inversely correlated with length of time living in the USA, $r(80) = -.77, p < .001$, so it was not included as an additional covariate. However, for all analyses in which length of time in the USA was used as the covariate, substituting age at adoption produced very similar results.

Given that 32 of our 40 FC children were from Korea, the country of origin was confounded with the type of care. Therefore, we examined the country of origin within the IC group, comparing children from China to children from Eastern Europe (Russia, Romania, Ukraine, Poland, and Bulgaria). Chinese and Eastern European children did not differ in their performance on false belief understanding or any emotion understanding task, so the country of origin was not included as a covariate in any subsequent analyses. Data comparing Chinese and Eastern European adoptees on their pre-adoption experiences and verbal ability are available upon request.

Verbal Ability. A one-way analysis of variance (ANOVA) revealed a significant group difference on the WISC III vocabulary subscale, $F(2,116) = 6.65, p < .01$. Post-hoc Bonferroni analyses indicated that the IC group scored significantly lower than both the FC and BC groups (see Table 4). For the full sample, the vocabulary scores were positively related to false belief understanding, $F(2,116) = 6.36, p < .01$, and to the emotion situation and emotion antecedent tasks, $r(117) = .42, p < .001$ and $r(117) = .40, p < .001$, respectively. Because verbal ability was related to group status

Table 5. Number of False Belief Trials Passed by Group

| Number of False Belief Trials Passed | Group | | |
|--------------------------------------|------------------------------------|-----------------------------|--------------------------------|
| | Institutional Care <i>N</i> (%) | Foster Care <i>N</i> (%) | Birth Children <i>N</i> (%) |
| 0 | 17 (42.5) | 12 (30.0) | 6 (15.0) |
| 1 | 5 (12.5) | 7 (17.5) | 7 (17.5) |
| 2 | 18 (45.0) | 21 (52.5) | 27 (67.5) |

and to all outcome variables except emotion identification, it was included as a covariate in subsequent analyses involving any combination of these variables.

Association between False Belief Understanding and Emotion Understanding

To examine the relation between the false belief understanding and emotion understanding, we conducted a multivariate ANOVA in which the three emotion understanding tasks were dependent variables examined as a function of false belief understanding. The results of the analysis yielded no significant relations between false belief understanding and any of the emotion understanding tasks.

Group Differences in False Belief Understanding

Children who failed both trials of the false belief task were performing below chance levels, and thus were below the anticipated developmental level for false belief understanding in six- and seven-year-olds. In the IC group, 17 children (42.5 percent) failed both trials, compared with six children (15 percent) in the BC group and 12 children (30 percent) in the FC group. A chi-square analysis including all three groups indicated significant group differences in the likelihood of failing both trials, χ^2 (2, $n = 120$) = 7.34, $p < .05$ (see Table 5). Follow-up analyses indicated that the IC group was significantly more likely to fail both trials than the BC group. The FC group was intermediate to the other two groups and did not differ from either group.

To assess whether the group difference on the false belief task could be attributed to the group difference in verbal ability, a multinomial logistic regression was conducted with false belief understanding regressed onto group status, and vocabulary scores were included as a covariate. Data for one child from the FC group for the vocabulary subtest were missing and thus could not be included in this analysis. The overall model was significant, χ^2 (3, $n = 119$) = 8.01, $p < .05$. Group status contributed significantly to this model, with the IC children significantly more likely than the birth children to have failed both trials of the false belief task, even after taking verbal ability into account, $B = 1.34$ (SE = .57), $p < .05$.

As Table 5 indicates, the response pattern was bimodally distributed with most children either consistently failing or consistently passing the two trials. However, 19 children had one trial wrong and one trial right. The responses to each trial were examined separately to explore the response patterns of these inconsistent responders. Table 6 presents responses to the two-location and three-location trials by group. The

Table 6. False Belief Task Results by Trial and Group

| Outcome by Trial | Group | | |
|-----------------------|------------------------------------|-----------------------------|--------------------------------|
| | Institutional Care <i>N</i> (%) | Foster Care <i>N</i> (%) | Birth Children <i>N</i> (%) |
| <i>Two location</i> | | | |
| Pass | 22 (55.0) | 23 (57.5) | 30 (75.0) |
| Fail | 18 (45.0) | 17 (42.5) | 10 (25.0) |
| <i>Three location</i> | | | |
| Pass | 19 (47.5) | 26 (65.0) | 31 (77.5) |
| Fail | 21 (52.5) | 14 (35.0) | 9 (22.5) |

performance gap between groups widened slightly for the three-location trial because a few more IC children failed whereas a few more FC and BC children passed. The McNemar test, a non-parametric method for comparing binary distributions for related samples, was used to contrast performance on the two-location and three-location trials. Performance on the two-location trial vs. the three-location trial did not differ significantly for the overall sample or within any of the groups. It should be noted that the children who failed the three-location trial all did so by choosing the location where the object really was (as opposed to the empty distracter location).

Group Differences in Emotion Understanding Tasks

Descriptive statistics for the three emotion understanding tasks by group are presented in Table 4. One-way analyses of variance indicated that the groups did not differ in their performance on the emotion identification or emotion situation tasks. For the emotion antecedent task, a one-way ANOVA revealed a significant group difference, $F(2,117) = 3.23, p < .05$. Post-hoc Bonferroni analyses showed that the FC group scored lower on the antecedents of emotion task than the BC group, with the IC children scoring intermediate to the other two groups and not differing significantly from either group. To assess whether this group difference could be attributed to covariates of the emotion antecedent task, the emotion antecedent task performance was regressed on group status, vocabulary and years in the USA. When either covariate—vocabulary or years in the USA—was included in the model, group was no longer a significant predictor of performance on the emotion antecedent task, $F(2,116) = 2.84, n.s.$; $F(2,117) = 2.25, n.s.$

Discussion

We expected that children in the post-institutionalized group would show a delay on a standard false belief task and three emotion understanding tasks compared with children in the FC and BC groups, even after controlling for verbal ability. Consistent with our prediction, the post-institutionalized children scored lower on the false belief task than the birth children, and this difference persisted after statistically controlling for verbal ability. The FC group scored intermediate to the other two groups on the false

belief task and did not differ from either group. In contrast to our hypothesis, the post-institutionalized group did not differ from the other groups in performance on the emotion understanding tasks. The implications of each of these findings are considered below.

On average, typically developing children show a developmental progression from performing at below chance levels on false belief tasks at the age of three to performing at above chance levels by the age of five (Wellman et al., 2001). Because the children in the current study were six and seven years old, they would be expected to perform at above chance levels on a false belief task. In fact, 42.5 percent of the post-institutionalized children performed at *below* chance levels on this task, compared with 30 percent of the foster care children and 15 percent of the birth children. Performing at below chance levels on the false belief task has been interpreted as indicating that the child attributes his or her own perspective to others, even in the face of information indicating that others should hold different beliefs. Our results would seem to suggest that close to half of the institutionally reared children exhibit this response pattern.

It may seem surprising that 15 percent of the birth children performed at below chance levels. A meta-analysis by Wellman et al. (2001) suggested that a five-year-old child has about an 80 percent likelihood of passing a single false belief trial. The birth children in the current study performed at approximately this level, with 75 percent passing the first trial and 77.5 percent passing the second trial. Although these success rates are well above chance, they are somewhat lower than might be expected for six- and seven-year-olds, perhaps because of sampling error or subtle variation in the task administration. It should be noted that individual studies often deviate from the average success rates reported by Wellman et al. (2001). For example, only 43 percent of five-year-olds passed a false belief task in a study by Hughes, Adlam, Happe, Jackson, Taylor and Caspi (2000). The current findings speak of the importance of including a typically developing comparison group that experiences the identical testing situation as the at-risk group, rather than relying on published norms.

Because language ability and false belief understanding are often associated, we examined whether these group differences in false belief understanding could be explained by group differences in verbal ability. The post-institutionalized group's verbal ability, although still within the average range, was significantly lower than the verbal ability of the other two groups. Jenkins and Astington (1996) found that among three- to five-year-old children, those with verbal ability at or above the verbal level of a typical 49-month-old were much more likely to succeed at false belief tasks than were children with verbal abilities below the 49-month threshold. Cicchetti et al. (2003) reported a similar linguistic threshold effect among three- to eight-year-old maltreated children. In the current sample of six- and seven-year-olds, a verbal ability below a 49-month level would indicate a profound language delay. All but one child in the current study had a verbal ability that was more than adequate to pass the false belief task according to the Jenkins and Astington threshold. Nonetheless, verbal ability and false belief understanding were closely linked in our sample. Verbal ability may have been acting as a proxy for global delay, and therefore is likely to relate to most of the outcome measures. Verbal ability partially explained the difference between the post-institutionalized children and birth children in false belief understanding, a finding consistent with the assertion of Astington and Jenkins (1999) that language ability is crucial to developing a theory of mind. Yet after controlling for verbal ability, post-institutionalized group membership was still related to delays in false belief understanding.

There are several possible explanations for the association between institutional care and performance on a false belief task several years after adoption. Although post-institutionalized children as a group had experienced more severe early deprivation than the FC group, none of the specific pre-adoption experiences we assessed—including prenatal exposure to alcohol and other drugs, prenatal malnourishment, preterm birth, physical abuse and neglect, social neglect, country of origin and age at adoption—were related to false belief understanding. Our measures of prenatal risk and early care risk were retrospective reports by the adoptive parents, who may not have entirely accurate information, and it would be desirable to replicate these findings with more direct, prospective measures. Based on our data, however, these specific early risk factors do not appear to account for the association of institutional care history with false belief task performance.

One possibility is that because children in institutional care lack individualized attention from a stable, responsive caregiver, they have fewer opportunities to observe discrepancies between self and other perspectives, which may delay the realization that the self and others do not always perceive and understand the world in the same way. Due to the high staff turnover and child-caregiver ratio, children in institutionalized settings are deprived of face-to-face social contact (Lee, 2000; Zeanah et al., 2003). Having experienced this early social deprivation, post-institutionalized children often exhibit persistent attachment problems (Chisholm, 1998; Minde, 2003; O'Connor et al., 1999) and preliminary evidence suggests that they may be delayed in initiating joint attention (Kroupina et al., 2002). Given that joint attention and a secure attachment relationship both predict false belief understanding (Arranz et al., 2002; Charman et al., 2001; Fonagy et al., 1997; Meins et al., 1998; Wellman et al., 2004), it is not surprising that post-institutionalized children would be at risk for delayed false belief understanding.

Our results corroborate and extend previous findings of delays in false belief understanding among children who have experienced early social deprivation. Previous research focused on maltreated children (Cicchetti et al., 2003) and children in the US foster care system (Pears & Fisher, 2005), populations that were continuing to experience adverse rearing environments at the time of testing. Our finding of false belief understanding delays in post-institutionalized children suggests that even children who have been removed from the adverse rearing environment and acquired a stable, responsive caregiver and an enriched home environment may still show a delayed development of false belief understanding. Early social deprivation may interfere with developmental precursors of social cognition, so that the requisite groundwork is not laid for subsequent social cognitive development.

Of course, early relational experience constitutes only one of several potential explanations for group differences in false belief task performance. Succeeding at the false belief task requires multiple competencies beyond an understanding of false belief. For example, Zelazo and Frye's cognitive complexity theory suggests that success at the false belief task is contingent on the development of executive function to allow for self-awareness and complex planning (Frye, Zelazo & Palfai, 1995; Zelazo & Frye, 1998). Poor inhibitory control has also been shown to interfere with false belief task performance (Carlson & Moses, 2001). These executive functions cannot be overlooked, given recent evidence that institutional care may predispose children to hyperactivity and inattention (Roy, Rutter & Pickles, 2000). Executive function tasks, as well as less cognitively complex theory of mind tasks, would help to differentiate the contributions of these factors to false belief task performance.

Although the post-institutionalized group as a whole was more likely than the BC group to fail the false belief task, some post-institutionalized children performed above chance levels on the task, and age at adoption did not account for these differences. Heterogeneous outcomes among post-institutionalized children have been noted across multiple socioemotional and cognitive domains. Rutter et al. (2001) found that, although age at adoption related to the likelihood of typical social functioning in post-institutionalized Romanian children, poor outcomes were by no means inevitable, even among children who had spent two or more years in institutions. We do not yet understand why some children who experience institutional care later show delays, whereas others perform at the developmentally expected level. More research is needed to examine whether heterogeneity in social cognitive abilities can help to explain heterogeneity in socioemotional functioning.

Our second prediction was that children in the post-institutionalized group would score significantly lower than the FC and BC on computerized measures of emotion understanding and that this difference would persist after controlling for verbal ability. This hypothesis was not supported. There were no group differences on measures of emotion identification or affective perspective-taking. On a measure of understanding the antecedents of emotion, there was a small but statistically significant group difference, with the FC group scoring lower than the BC and the IC children intermediate to the other two groups. Although this difference was statistically significant, it may not be meaningful. All three groups did well on the antecedents of emotion task, with group means ranging from 86 percent accuracy for the FC group to 93 percent accuracy for the BC. Additionally, the group difference on the emotion antecedents task was no longer significant after accounting for either of the covariates for this task, that is, verbal ability or duration of residence in the USA.

In the current study the emotion understanding tasks were developed for significantly younger children. The emotion identification and emotion antecedents tasks both appeared close to ceiling level for all three groups. Performance on the emotion situation task, although not at ceiling, had a somewhat restricted range of variation. That is, a few items were missed by the majority of children, and the remaining items were answered correctly by most children. These tasks may not have been sensitive enough to detect subtle deficits in emotion understanding for this age group. Wismer Fries and Pollak (2004) found that post-institutionalized preschool children performed more poorly than a comparison group on the emotion identification and emotion situation tasks. In the current study, post-institutionalized six- and seven-year-olds did not differ from either comparison group on these same tasks. Taken together, these studies suggest post-institutionalized children may exhibit a delay in emotion understanding, rather than a deficit.

False belief understanding was not related to any of the emotion understanding measures. This finding is consistent with the assertion of Cutting and Dunn (1999) that false belief understanding and emotion understanding may be distinct facets of social cognition. Differential performance has been documented among tasks assessing different aspects of social cognition (Holmes, Black & Miller, 1996) and even among different types of false belief tasks (Naito, 2003). Thus, we cannot make generalizations regarding social cognition abilities in post-institutionalized children based on their performance on a single false belief task. More research is needed in this population with an extended battery of social cognition tasks, assessing understanding of belief, desire, intention, emotion and belief–desire reasoning.

Another limitation of the current study is that our group of birth children had highly advanced verbal ability, so they may not have served as an ideal comparison group for the post-institutionalized children. The birth children in this study lived in homes where the income and education of the parents were comparable to those of the adopted children. Children reared in affluent, educationally enriched home environments are more likely to have advanced verbal abilities (Dollaghan, Campbell, Paradise, Feldman, Janosky & Pitcairn, 1999). As a case in point, the foster care children, 80 percent of whom were adopted into this higher economic and parental education environment during their first year of life, also had above average verbal skills that did not differ significantly from those of the birth children. Controlling for home environment is important because there is some indication that socioeconomic status and the mother's educational level contribute to false belief understanding, with conflicting results as to whether this association is independent of verbal ability (Cutting & Dunn, 1999) or is a product of verbal ability (Hughes, Deater-Deckard & Cutting, 1999; Murray, Woolgar, Briers & Hipwell, 1999). Although it would be desirable to match birth children to the post-institutionalized children both on home environment and on verbal ability, these goals may be at odds with each other.

Lastly, our pre-adoption experience data is based on parent report, which is potentially inaccurate for two reasons. Adoptive parents do not necessarily have direct knowledge of their children's pre-adoption level of deprivation, and their retrospective estimate may well be informed by their children's current functioning. In longitudinal research it would be helpful to collect these data as soon as possible after the child's arrival. When direct knowledge of the child's prenatal and early care experiences is not available, one option is to rely on more objective pre-adoption variables that we would expect to provide some indication of the level of deprivation experienced, such as the age at adoption and the country of origin. In this study, neither of these objective variables was related to false belief understanding or emotion understanding.

In conclusion, the post-institutionalized children as a group appeared less developmentally advanced than the birth children in terms of their false belief understanding. They were also less advanced than both the birth children and the foster care children in terms of their verbal ability (although, on average, their verbal ability is still in the average range). The delay in false belief understanding persisted even after statistically controlling for verbal ability. There were no group differences in emotion understanding after accounting for confounding variables, but the tasks may have been too easy for this age group. Importantly, there was significant within-group heterogeneity on all of these outcome measures.

In future research the concurrent and long-term clinical implications of social cognitive delays need to be studied. Post-institutionalized children appear to be at increased risk for attachment-related disturbances such as indiscriminate friendliness and a lack of awareness of social boundaries and social cues, as well as for quasi-autistic features (Rutter et al., 2001). Problems with perspective-taking may contribute to these socio-emotional problems by making it difficult to interpret social cues. Future studies should examine how social cognition relates to these specific domains of socioemotional functioning in post-institutionalized populations. Finally, we must attempt to account for the heterogeneous outcomes in socio-emotional functioning and social cognition among children who have experienced early adversity. This attempt must include an effort to differentiate the impact of lacking a stable, responsive caregiver from the impact of other types of early adversity that frequently co-occur in institutionalized populations, such as malnutrition or prenatal alcohol exposure.

Although much more work is clearly necessary in these areas before firm conclusions can be drawn, the current findings do suggest that the impact of early social deprivation on social cognition abilities may be a fruitful avenue to pursue to elucidate the development of social cognition in both typically developing and at-risk populations. This line of research also has the potential to contribute to our understanding of the factors underlying the socio-emotional problems evident in some post-institutionalized children.

References

- Ames, E. W. (1997). *The development of Romanian orphanage children adopted into Canada*. Final report to Human Resources Development, Canada. Burnaby, Canada: Simon Fraser University.
- Arranz, E., Artamendi, J., Olabarrieta, F., & Martin, J. (2002). Family context and theory of mind development. *Early Child Development & Care*, *172*, 9–22.
- Astington, J. W., & Baird, J. A. (2004). Why language matters for theory of mind. *International Society for the Study of Behavioral Development Newsletter*, *1*, 7–8.
- Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relation between language and theory of mind development. *Developmental Psychology*, *35*, 1311–1320.
- Barnett, D., Ganiban, J., & Cicchetti, D. (1999). Maltreatment, negative expressivity, and the development of Type D attachments from 12- to 24-months of age. *Monographs of the Society for Research in Child Development*, *64*, 97–118.
- Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a ‘theory of mind?’ *Cognition*, *21*, 37–46.
- Benoit, T. C., Jocelyn, L. J., Moddemann, D. M., & Embree, J. E. (1996). Romanian adoption: The Manitoba experience. *Archives of Pediatric and Adolescent Medicine*, *150*, 1278–1282.
- Brown, J. R., & Dunn, J. (1996). Continuities in emotion understanding from three to six years. *Child Development*, *67*, 789–802.
- Burgess, R., & Conger, R. (1978). Family interaction in abusive, neglectful and normal families. *Child Development*, *49*, 1163–1173.
- Callaghan, T., Rochat, P., Lillard, A., Claux, M. L., Odden, H., Itakura, S., et al. (2005). Synchrony in the onset of mental-state reasoning: Evidence from five cultures. *Psychological Science*, *16*, 378–384.
- Camras, L. A., & Allison, K. (1985). Children’s understanding of emotional facial expressions and verbal labels. *Journal of Nonverbal Behavior*, *9*, 84–94.
- Camras, L. A., Grow, G., & Ribordy, S. (1983). Recognition of emotional expressions by abused children. *Journal of Clinical Child Psychology*, *12*, 325–328.
- Camras, L. A., Ribordy, S., Hill, J., & Martino, S. (1990). Maternal facial behavior and the recognition and production of emotional expression by maltreated and nonmaltreated children. *Developmental Psychology*, *26*, 304–312.
- Capage, L., & Watson, A. C. (2001). Individual differences in theory of mind, aggressive behavior, and social skills in young children. *Early Education & Development*, *12*, 614–628.
- Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children’s theory of mind. *Child Development*, *72*, 1032–1053.
- Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Cox, A., & Drew, A. (2001). Testing joint attention, imitation, and play as infancy precursors to language and theory of mind. *Cognitive Development*, *15*, 481–498.
- Children’s Home Society and Family Services (2005). *International adoption: Korea*. Retrieved 20 April 2005 from http://www.childrenshomeadopt.org/Korea_Adoptions.html.
- Chisholm, K. (1998). A three year follow-up of attachment and indiscriminate friendliness in children adopted from Romanian orphanages. *Child Development*, *69*, 1090–1104.
- Cicchetti, D., Rogosch, F. A., Maughan, A., Toth, S. L., & Bruce, J. (2003). False belief understanding in maltreated children. *Development and Psychopathology*, *15*, 1067–1091.
- Courtin, C., & Melot, A. M. (1998). Development of theories of mind in deaf children. In M. Marschark (Ed.), *Psychological perspectives on deafness*, (Vol. 2, pp. 79–102). Mahwah, NJ: Lawrence Erlbaum.

- Cutting, A. L., & Dunn, J. (1999). Theory of mind, emotion understanding, language, and family background: Individual differences and interrelations. *Child Development, 70*, 853–865.
- Dahlgren, S., Dahlgren-Sandberg, A., & Hjelmquist, E. (2003). The non-specificity of theory of mind deficits. *European Journal of Cognitive Psychology, 15*, 129–155.
- de Villiers, J. G. (2000). Language and theory of mind: What are the developmental relationships? In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.), *Understanding other minds: Perspectives from developmental cognitive neuroscience* (pp. 83–123). Oxford: Oxford University Press.
- Denham, S. A. (1986). Social cognition, prosocial behavior, and emotion in preschoolers: Contextual validation. *Child Development, 57*, 194–201.
- Denham, S. A., McKinley, M., Couchoud, E. A., & Holt, R. (1990). Emotional and behavioral predictors of preschool peer ratings. *Child Development, 61*, 1145–1152.
- Denham, S. A., Zoller, D., & Couchoud, E. A. (1994). Socialization of preschoolers' emotion understanding. *Developmental Psychology, 30*, 928–936.
- Dollaghan, C. A., Campbell, T. F., Paradise, J. L., Feldman, H. M., Janosky, J. E., & Pitcairn, D. N., et al. (1999). Maternal education and measures of early speech and language. *Journal of Speech, Language, and Hearing Research, 42*, 1432–1443.
- Dunn, J. (1995). Children as psychologists: The later correlates of individual differences in understanding of emotions and other minds. *Cognition and Emotion, 9*, 187–201.
- Dunn, J., & Cutting, A. L. (1999). Understanding others, and individual differences in friendship interactions in young children. *Social Development, 8*, 201–219.
- Dunn, J., & Hughes, C. (1998). Young children's understanding of emotions within close relationships. *Cognition and Emotion, 12*, 171–190.
- During, S., & McMahon, R. (1991). Recognition of emotional facial expressions by abusive mothers and their children. *Journal of Clinical Child Psychology, 20*, 132–139.
- Ekman, P. (1976). *Pictures of facial affect*. Palo Alto, CA: Consulting Psychologists Press.
- Fonagy, P., Redfern, S., & Charman, T. (1997). The relationship between belief–desire reasoning and a projective measure of attachment security (SAT). *British Journal of Developmental Psychology, 15*, 51–61.
- Frye, D., Zelazo, P. D., & Palfai, T. (1995). Theory of mind and rule-based reasoning. *Cognitive Development, 10*, 483–527.
- Garner, P. (1996). The relations of emotional role-taking, affective/moral attributions, and emotional display rule knowledge to low-income school-age children's social competence. *Journal of Applied Developmental Psychology, 17*, 19–36.
- Glennen, S., & Masters, M. (1992). Typical and atypical language development in infants and toddlers adopted from Eastern Europe. *American Journal of Speech-Language Pathology, 11*, 417–433.
- Gunnar, M. R., Bruce, J., & Grotevant, H. (2000). International adoption of institutionally reared children: Research and Policy. *Development & Psychopathology, 12*, 677–693.
- Holmes, H. A., Black, C., & Miller, S. A. (1996). A cross-task comparison of false belief understanding in a Head Start population. *Journal of Experimental Child Psychology, 63*, 263–285.
- Hostetter, M., Iverson, S., Thomas, W., McKenzie, D., Dole, K., & Johnson, D. (1991). Medical evaluation of internationally adopted children. *New England Journal of Medicine, 325*, 479–485.
- Hughes, C., Adlam, A., Happe, F., Jackson, J., Taylor, A., & Caspi, A. (2000). Good test–retest reliability for standard and advanced false belief tasks across a wide range of abilities. *Journal of Child Psychology and Psychiatry, 41*, 483–490.
- Hughes, C., Deater-Deckard, K., & Cutting, A. L. (1999). 'Speak roughly to your little boy?' Sex differences in the relations between parenting and preschoolers' understanding of mind. *Social Development, 8*, 143–160.
- Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology, 32*, 70–78.
- Johnson, D. E. (2000). The impact of orphanage rearing on growth and development. In C. A. Nelson (Ed.), *The effects of adversity on neurobehavioral development: Minnesota symposia on child psychology* (Vol. 31, pp. 113–162). Mahwah, NJ: Lawrence Erlbaum.
- Kochanska, G. (1998). Mother–child relationship, child fearfulness, and emerging attachment: A short-term longitudinal study. *Developmental Psychology, 34*, 480–490.

- Kroupina, M., Iverson, S., Gunnar, M. R., & Johnson, D. E. (2002). Social and communication skills of post-institutionalized children. *Pediatric Research*, *51*, 20A.
- Laible, D. J., & Thompson, R. A. (1998). Attachment and emotional understanding in preschool children. *Developmental Psychology*, *34*, 1038–1945.
- Lee, K. (2000). Crying patterns of Korean infants in institutions. *Child: Care, Health, and Development*, *26*, 217–228.
- Lundy, J. (2002). Age and language skills of deaf children in relation to theory of mind development. *Journal of Deaf Studies and Deaf Education*, *7*, 41–56.
- Lyons-Ruth, K., Connell, D., Zoll, D., & Stahl, J. (1987). Infants at social risk: Relations among infant maltreatment, maternal behavior, and infant attachment behavior. *Developmental Psychology*, *23*, 223–232.
- Meins, E., Fernyhough, C., Russell, J., & Clark-Carter, D. (1998). Security of attachment as a predictor of symbolic and mentalising abilities: A longitudinal study. *Social Development*, *7*, 1–24.
- Minde, K. (2003). Assessment and treatment of attachment disorders. *Current Opinion in Psychiatry*, *16*, 377–381.
- Murray, L., Woolgar, M., Briers, S., & Hipwell, A. (1999). Children's social representations in dolls' house play and theory of mind tasks, and their relation to family adversity and child disturbance. *Social Development*, *8*, 179–190.
- Naito, M. (2003). The relationship between theory of mind and episodic memory: Evidence for the development of autoegetic consciousness. *Journal of Experimental Child Psychology*, *85*, 312–336.
- O'Connor, T. G., Bredenkamp, D., Rutter, M., & ERA Study Team (1999). Attachment disturbances and disorders in children exposed to early severe deprivation. *Infant Mental Health Journal*, *20*, 10–29.
- Pears, K. C., & Fisher, P. (2005). Emotion understanding and theory of mind among maltreated children in foster care: Evidence of deficits. *Development and Psychopathology*, *17*, 47–65.
- Perlman, S., & Pollak, S. D. (2003, April). *Appraisal of the causes of emotional events in maltreated and typically developing children*. Poster presented at the biennial meeting of the Society for Research in Child Development, Tampa.
- Peterson, C. C., Peterson, J., & Webb, J. (2000). Factors influencing the development of a theory of mind in blind children. *British Journal of Developmental Psychology*, *18*, 431–447.
- Peterson, C. C., & Siegal, M. (2000). Insights into a theory of mind from deafness and autism. *Mind and Language*, *16*, 77–99.
- Pollak, S., Cicchetti, D., Hornung, K., & Reed, A. (2000). Recognizing emotion in faces: Developmental effects of child abuse and neglect. *Developmental Psychology*, *36*, 679–688.
- Rogosch, F. A., Cicchetti, D., Shields, A., & Toth, S. L. (1995). Parenting dysfunction in child maltreatment. In M. Bornstein (Ed.), *Handbook of parenting* (Vol. 4, pp. 127–159). NJ: Erlbaum: Hillsdale.
- Roy, P., Rutter, M., & Pickles, A. (2000). Institutional care: Risk from family background or pattern of rearing? *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *41*, 139–149.
- Rutter, M., Andersen-Wood, L., Beckett, C., Bredenkamp, D., Castle, J., & Groothues, C. (1999). Quasi-autistic patterns following severe early global privation. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *40*, 537–549.
- Rutter, M., Kreppner, J. M., & O'Connor, T. G. (2001). Specificity and heterogeneity in children's responses to profound institutional privation. *British Journal of Psychiatry*, *179*, 97–103.
- Smith, M., & Walden, T. (1999). Understanding feelings and coping with emotional situations: A comparison of maltreated and nonmaltreated preschoolers. *Social Development*, *8*, 93–116.
- Steele, H., Steele, M., Corft, C., & Fonagy, P. (1999). Infant–mother attachment at one year predicts children's understanding of mixed emotions at six years. *Social Development*, *8*, 161–178.
- Tizard, B., & Hodges, J. (1978). The effect of early institutional rearing on the development of eight-year-old children. *Child Development*, *43*, 337–358.
- US Department of State (2004). Immigrant VISAS issued to orphans coming to U.S. Retrieved 15 October 2004 from http://travel.state.gov/family/adoption_resources_02.html

- Walden, T. A., & Field, T. M. (1982). Discrimination of facial expressions by preschool children. *Child Development*, *53*, 1312–1319.
- Wechsler, D. (1991). *Wechsler intelligence scale for children* (3rd ed.). San Antonio, TX: The Psychological Corporation.
- Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, *72*, 655–684.
- Wellman, H. M., Phillips, A. T., Dunphy-Lelii, S., & LaLonde, N. (2004). Infant social attention predicts preschool social cognition. *Developmental Science*, *7*, 283–288.
- Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, *13*, 103–128.
- Wisner Fries, A. B., & Pollak, S. D. (2004). Emotion understanding in post-institutionalized Eastern European children. *Development and Psychopathology*, *16*, 355–369.
- Woolfe, T., Want, S. C., & Siegal, M. (2002). Signposts to development: Theory of mind in deaf children. *Child Development*, *73*, 768–778.
- Zeanah, C. H., Nelson, C. A., Fox, N. A., Smyke, A. T., Marshall, P., Parker, S. W., et al. (2003). Designing research to study the effects of institutionalization on brain and behavioral development: The Bucharest Early Intervention Project. *Development and Psychopathology*, *15*, 885–907.
- Zelazo, P. D., & Frye, D. (1998). Cognitive complexity and control: II. The development of executive function in childhood. *Current Directions in Psychological Science*, *7*, 121–126.

Acknowledgments

Support for this research was provided by National Institute of Mental Health (NIMH) grant MH59848 to Megan R. Gunnar. Support to Jacqueline Bruce for preparing this article was also partially provided by NIMH and Office of Research on a Minority Health grant MH46690 and National Institute on Drug Abuse grant DA17592. Thanks to the Center for Neurobehavioral Development at the University of Minnesota for generously providing space and equipment to run this study and to Manfred van Dulmen for consulting on statistical methods. We are grateful for the time and enthusiasm of the families who participated.

Appendix A. False Belief Task Script

Setup: Child and Experimenter (E) are seated across a table from each other. The box is on the table between them, to E's left, and the inverted cup is to E's right. E brings out the two dolls.

'Now I'm going to tell you a story about Sally and Andy. This is Sally. This is Andy. Can you show me which one is Sally? And which one is Andy? Great!'

Make sure the child can name the dolls correctly before continuing. Keeping both Sally and Andy in the scene, bring out the toy car.

'Here's Sally with her toy car. Sally puts her car underneath the cup. Now Sally has to go away to school'.

After Sally puts the car under the cup, move Sally out of sight under the table.

'Andy takes the car out from under the cup and hides it in the box. Then he goes outside to play'.

After Andy moves the car, replace lid on the box and take Andy out of sight under the table. Then bring out Sally. For each question, circle child's response. If the child doesn't answer, repeat the question. If the child gives multiple responses, use only the first one. Make a note if the child refuses to answer or gives some answer besides cup or box. Pointing is an acceptable mode of answering. Don't give feedback about answers.

Trial 1 Belief Question: 'Here comes Sally again, she's home from school now. Where will Sally look for her car?'

Trial 1 Reality Question: 'Where is the car really?'

Trial 1 Memory Question: 'Where was the car at the beginning?'

Put car away. Set up for Trial 2: The box is to E's left, the cup in the center, and the bottle to E's right. Bring out both dolls and the coin.

'Here is Andy with his coin. Andy puts his coin in the box. Now Andy goes to ride his bike'.

After Andy puts coin in box and replaces lid, move Andy out of sight under the table.

'Now Sally takes the coin out of the box and hides it in the bottle. Now it's time for Sally to go to the playground'.

After Sally removes the coin from box, she replaces the lid, puts the coin in the bottle and replaces that lid, move Sally out of sight under the table. Bring Andy back.

Trial 2 Belief Question: 'Andy is back from riding his bike. Where will Andy look for his coin?'

Trial 2 Reality Question: 'Where is the coin really?'

Trial 2 Memory Question: 'Where was the coin at the beginning?'

'Okay! We are all done playing with Sally and Andy!'