Attachment, Cognitive, and Motor Development in Adopted Children: Short-term Outcomes after International Adoption

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Objective To examine infant attachment and developmental functioning shortly after international adoption. **Methods** At 14 months, infant–mother attachment and mental (MDI) and psychomotor (PDI) development were assessed in 70 internationally adopted children. Mean age at arrival was 5.5 months, mean stay in the adoptive family 8.7 months. **Results** Adopted children's MDI and PDI did not deviate from normative scores. Also, their secure–insecure attachment distribution was comparable with that of normative groups. However, more adoptees were disorganized attached (36 vs. 15% in normative groups). Temporary residence in a foster home in the country of origin before adoption was related to higher MDI and PDI, whereas disorganized attachment in the adoptive family was related to lower MDI and PDI scores. **Conclusions** The majority of internationally adopted children form secure attachment relationships and function at normative developmental levels shortly after adoption. Residence in a foster family before adoption may partly prevent developmental delays.

Key words disorganized attachment; foster care; international adoption; mental development; orphanage; psychomotor development.

In the current study we examined attachment, and cognitive and motor development in internationally adopted infants shortly after their placement in adoptive families. Each year more than 40,000 children are adopted worldwide. In 2005, most international adoptions in the USA (total: 22,728) were from China, Russia, and Guatemala, whereas in Europe (15,847 in 2003) children came from China, Russia, and Colombia (Selman, 2005). Often these children come from depriving backgrounds, including neglect, lack of medical care, and malnutrition in orphanages (Gunnar, Bruce, & Grotevant, 2000; Juffer & Van IJzendoorn, 2005; Miller, 2005). International adoption studies in infancy mainly concentrated on Romanian children adopted at the time of the fall of the Ceausescu regime. We do not know, however, whether the extreme deprivation in Romanian orphanages leading to developmental delays (Beckett et al., 2006; Morison, Ames, & Chisholm, 1995; O'Connor et al., 2000) and attachment disturbances (O'Connor et al., 2003), is also typical for infants adopted from other countries.

In infancy, formation of a secure attachment relationship (Bowlby, 1982) is a major developmental milestone. From an organizational perspective on human development, Sroufe, Egeland, Carlson, and Collins (2005, p. 42) describe attachment as a salient issue given its clear centrality to infant functioning and subsequent development. Secure infants derive comfort from their parent(s) and feel free to explore the environment. In normative situations about one-third of the infants develop an insecure organized attachment relationship: in stressful situations they avoid to seek comfort from the parent (insecure-avoidant) or they stay extremely focused on their parent (insecure-ambivalent), in either way resulting in a less competent exploration of the environment. Insecure attachment also predicts children's less optimal social development in childhood and adolescence (Sroufe et al., 2005; Stams, Juffer,

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& Van IJzendoorn, 2002). According to meta-analytic evidence, parental sensitivity—the ability to attune and react to children's signals adequately—stimulates the development of an organized secure attachment relationship (De Wolff & Van IJzendoorn, 1997).

Disorganized attachment is characterized as the absence or breakdown of an attachment strategy. Faced with stress, disorganized infants may react with undirected or misdirected movements, freezing or stilling behaviors, and expressions of fear (Main & Solomon, 1990). Disorganized attachment in early childhood predicts emotional dysregulation, externalizing problems, lower cognitive functioning in middle childhood (Moss, Cyr, & Dubois-Comtois, 2004; Stams et al., 2002; Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999), and dissociative behavior in adolescence (Carlson, 1998). Disorganized attachment is presumed to be the result of frightening parental behavior (Hesse & Main, 2006; Main & Hesse, 1990). The frightening nature of severe insensitivity and enduring unresponsiveness in orphananges may trigger children's attachment disorganization (Lyons-Ruth & Jacobvitz, 1999; Solomon & George, 1999). Vorria et al. (2003) indeed found that 66% of institutionalized Greek infants at the age of 13 months were disorganized attached, an extreme overrepresentation compared with the 15% disorganized attachment found in normative groups (Van IJzendoorn et al., 1999). These findings were replicated in a study by Zeanah, Smyke, Koga, Carlson, and the Bucharest Group (2005), examining institutionalized Romanian children's attachment at the age of 24 months, showing a remarkably similar rate of disorganized attachment (65%).

Attachment in Internationally Adopted Children

Only one study (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005) used a standardized procedure to assess attachment in internationally adopted children in infancy. Most infants (74%) were securely attached at 12 months, whereas 22% were disorganized and the sample did not deviate from normative groups on attachment classification. These early adopted children (mean age at arrival: 11 weeks) came from relatively favorable backgrounds: the Sri Lankan children were cared for by their birth mothers until placement, and the Korean and Colombian infants came from children's homes supported by Western agencies. The adoptive mothers' sensitivity was comparable with nonadoptive mothers' sensitivity (Juffer & Rosenboom, 1997; Juffer et al., 2005). In other studies, attachment was examined in preschoolers with instruments adapted to this situation. For example, Marcovitch et al. (1997) found that Romanian children adopted in Canada (age: 3–5 years) were less likely than nonadopted comparisons to be classified as securely attached (30 vs. 42%, respectively), and more likely to be insecure-controlling or insecure-other (comparable with infant disorganized attachment, 42 vs. 10%, respectively). In the UK, 4-year-old seriously deprived Romanian adoptees showed more insecure-controlling and insecure-other attachment (placed before 6 months: 48%; placed older: 59%) than nondeprived English children adopted before 6 months (20%) (O'Connor et al., 2003) These outcomes indicate that adopted children run the risk of developing insecure and disorganized attachment when they are placed at an older age and/or have experienced deprivation.

Mental and Psychomotor Development in Adopted Children

Except for one study (Pomerleau et al., 2005), most studies on adoptees' mental and motor development relied on parental reports shortly after adoption. For example, Morison et al. (1995) examined children adopted from Romanian orphanages to Canada. Retrospectively, parents described their adopted children as seriously delayed when they first met them: 84–91% children were behind in psychomotor development and all children were delayed in language development. After almost a year in the adoptive family, the delay reported by the parents was reduced to 59% for psychomotor development and 57% for language. Rutter and colleagues (Beckett et al., 2006; O'Connor et al., 2000; Rutter & the ERA Study Team, 1998) also had to rely on retrospective parent reports at UK entry of children adopted before the age of 2 years. Pomerleau et al. (2005) assessed cognitive and motor development at adoptive placement and after 3 and 6 months with the Bayley scales in a heterogeneous group (China, East Asia, and Russia) of internationally adopted infants. At arrival (mean age: 9–12 months) the children showed cognitive delays but their development improved after 3 and 6 months.

This study is the first to examine (in)secure/disorganized attachment and developmental functioning in internationally adopted infants shortly after adoption, taking into account adoptive mothers' sensitivity. We hypothesized that: (a) adopted children's attachment

behavior is more often insecure and disorganized than in normative groups; (b) adopted children's mental and psychomotor development is lagging behind compared with norms; and (c) based on an organizational perspective on development (Sroufe et al., 2005), we explored the relations between infant attachment and mental and motor development.

Method

Participants

Participants were 70 internationally adopted infants and their adoptive mothers. The children were placed before 12 months as the first child in Dutch intact two-parent White families. Three adoption agencies cooperated with the recruitment. All childless couples waiting for the arrival of their first child were eligible for the study. The participating families were representative for the group of adoptive families (nonresponse rate of 10%).

The adoptive mothers had a mean age of 33 years ($SD = 3$). They were older than Dutch mothers ($M = 29$ years; CBS, 2005) are at the time of the birth of their first child, $t(69) = 12.2$, $p < .001$. The majority of the children ($n = 56$; 80%) were born in Asia. They came from Taiwan (36 children, 19 girls), China (14 children, all girls), and South Korea (6 children, 2 girls). The remaining (hereafter: non-Asian) children were born in Colombia (10 children, 6 girls) and Ethiopia (4 children, 1 girl). No significant differences were found between Asian and non-Asian children with respect to the background variables gender, residence in the birth country (foster home or orphanage), health on arrival or age on arrival. The mean age on arrival of the 42 girls (60%) and 28 boys was 5.5 months ($SD = 2.9$ months, range: 1.5–12 months). Most infants ($n = 52$; 74%) were relinquished for adoption, whereas the remaining children were foundlings. All children had been living in an orphanage in their birth country but 18 children (26%) lived in a foster family for some time as well. Placement in a foster family seemed to be a local policy for some countries of origin (e.g., Ethiopia and South Korea). Residence in a foster family was associated with arrival after six months, χ^2 (1, $n = 70$) = 16.2, $p < .001$. Fifteen out of 18 (83%) children who had lived in a foster family arrived later than 6 months of age. Except for age on arrival, we found no indications that child background variables were related to placement in a foster family (cf. Johnson, 2004). According to anecdotal parent report during the home interview and adoption agency information most children experienced adversities before adoption (loss, separations, neglect).

Design and Procedure

During a home interview at the infant's mean age of 13.7 months ($SD = 0.07$, range 12.5–16.7) the adoptive mother provided information on parental age, education and profession, and on the infant's background. The mother's sensitivity was videotaped for later observation. Two weeks later, at a mean age of 14 months ($M = 14.2$, $SD = 1.0$, range 12.5–18.2) infant attachment and mental and motor development were assessed during a laboratory visit. Duration of children's relationship with their adoptive mother at this moment of testing ranged between 2.9 and 14.2 months ($M = 8.7$, $SD = 2.8$), and was strongly associated with children's age on arrival ($r = -.94$, $p < .001$). Because of this high correlation we only used age on arrival in the analyses. We corrected testing date for prematurity and ensured that the child had lived for 4 months with the adoptive mother before the assessment of attachment. For two children testing had to be done earlier (at 2.9 and 3.4 months) due to family holidays. All assessments (mental and motor development, attachment, and maternal sensitivity) were conducted with standardized instruments and recorded on video to ensure reliable coding by different trained coders, not aware of the other variables.

Measures

Infant's Health Condition

During the home interview mothers retrospectively rated children's health condition on arrival as: (a) less optimal, e.g., when the child was malnourished according to the pediatrician's diagnosis or if the child had to be hospitalized; or (b) good or normal. According to mothers' report, most children ($n = 48$; 69%) were healthy on arrival.

Family SES

Parental educational level and level of profession were rated using a standardized Dutch 1–6 point scale (Westerlaak, 1991). Educational level ranged from 1: only primary school to 6: university. Professional level ranged from 1: nonskilled work to 6: academic level. Between both parents, educational level and professional level correlated significantly, $r = .44$ ($p < .001$) and $r = .53$ ($p < .001$), respectively. The four indices were combined into one scale for Family SES after standardization ($\alpha = .82$).

Maternal Sensitivity

At the home visit, maternal–child interaction during two episodes of each 4–6 min was videotaped: reading from a children's book and singing a children's song together.

Maternal sensitivity was rated with a 9-point rating scale for sensitivity (Ainsworth, Bell, & Stayton, 1974, pp. 127–133). Maternal sensitivity consists of four components: (a) the mother's awareness of the signals of her infant, (b) an accurate interpretation of them, (c) an appropiate response to them, and (d) a prompt response. The scale describes each of the uneven points with point 9: *highly sensitive*—a mother who is exquisitely attuned to the baby's signals, responds to them promptly and appropriately, and 1: *highly insensitive*—a mother who seems geared almost exclusively to her own wishes, moods, and activity. Satisfactory intercoder reliability was established between two coders on 14 tapes ($r = .68$ for singing and $r = .92$ for reading). The ratings for the two episodes were averaged into one composite score.

Attachment

Infant–mother attachment was assessed with Ainsworth's Strange Situation Procedure (SSP; Ainsworth, Blehar, Waters, & Wall, 1978). During the SSP, children's reactions to a stranger and two short separations from the mother are coded and classified. Secure children may be (mildly) distressed by these events but they seek and find comfort from the mother upon reunion. Insecure avoidant children do not seek proximity and they avoid the mother upon reunion. Insecure ambivalent children passively or angrily cling to their mother but they cannot be comforted. Finally, disorganized attachment can be described as a breakdown of children's attachment strategy (see Introduction section). To ensure that the children had developed an attachment relationship with the adoptive mother, children had lived in the family for at least 4 months before the assessment (see before).

The videotaped SSPs were coded without any knowledge of the child or family by the third author who received extensive training from Dr Brian Vaughn, Dr Mary Main, and Dr Erik Hesse. We used a dichotomized index for attachment security (B: secure vs. non-B: insecure), and a dichotomized index for disorganized behavior (D: disorganized vs. non-D: nondisorganized). Tapes were rated for the secure/insecure categories based on Ainsworth et al.'s (1978) coding system, and for the disorganized/nondisorganized categories based on Main and Solomon's (1990) guidelines. During coding, the D category is superimposed on the secure/insecure categories. Thus, children showing disorganization are classified as D/B or D/non-B, dependent on their secure/insecure attachment. Children showing no attachment disorganization are classified as B or non-B (meaning: non-D/B and non-D/non-B). Based on 10 cases, interrater reliability with a second experienced coder (Dr. Marian Bakermans-Kranenburg) turned out to be satisfactory. Agreement on the secure/insecure classifications was 100% ($\kappa = 1.0$) and on the classifications for (non)disorganized attachment 90% ($\kappa = .87$).

Eight children (11%; 5 girls, 3 boys) were difficult to classify, because they did not show enough characteristics of an attachment strategy toward their mother to allow classification into one of Ainsworth et al.'s (1978) categories. They also failed to receive a score as high as at least 5 for specific D-behaviors to be classified as disorganized according to Main and Solomon's (1990) system. These infants seemed flat in their emotional expression toward their mother during the reunion episodes or they did not seem to discriminate between their mother and the stranger. They were, therefore, labeled as ''unattached'' or ''cannot classify'' (Hesse, 1999). In the analyses with attachment security (B vs. non-B) they were forced-classified, two as secure and six as insecure. In the analyses with disorganized attachment (D vs. non-D) they were included in the disorganized (D) group, as recommended by Hesse (1999) on theoretical grounds. To check the empirical basis of this decision we tested for differences between the ''unattached'' children and the other disorganized children in our study. Chi-squared tests and a *t*-test showed that the ''unattached'' children did not differ from the other disorganized children regarding gender, coming from an (non-) Asian country, temporary stay in a foster family in the country of origin, age on arrival, and health condition on arrival ($p > .40$). Also, the scores of the ''unattached'' children on the other outcome measure, mental development and motor development, did not deviate from the other disorganized children's scores ($p = .23$ and $p = .34$, respectively).

Attachment security (B/non-B) was not associated with disorganization (D/non-D), $\chi^2(1) = 1.46$, $p = .28$. Without the unattached children the same outcome was found ($p = .88$).

Mental and Psychomotor Development

Developmental functioning was assessed with the Dutch version of the Bayley Scales of Infant Development (BSID; Bayley, 1969; Van der Meulen, & Smrkovsky, 1983) by different pairs of trained research assistants. Assistants were trained by observing videotapes from a standard assessment and from a pilot study, and by practicing several training cases. At the time of the study, a translated revised version of the BSID was not yet available. Van der Meulen and Smrkovsky (1983) used a national representative Dutch sample ($n = 1283$) and reported an internal consistency of .89 for the mental

scale at 14 months and .86 for the psychomotor scale. Reliable coding of the assessment was enabled by recordings from a video camera, set standard pointing towards the infant (seated on the mother's lap), monitoring the infant's movements. All BSID assessments were scored by two trained research assistants who were unaware of infant attachment and maternal sensitivity. Interrater reliability on 17 tapes was $r = .95$ for mental development and $r = .95$ for motor development. For two infants BSID-scores could not be obtained due to illness of one infant and the personal situation of the other child's parent.

Statistical Analyses

To prevent small subsamples we collapsed the birth countries into two groups (Asian and non-Asian) and the insecure organized groups (avoidant and resistant) into one group (non-B). With Chi-squared tests (attachment) and *t*-tests (mental and motor development) we investigated whether adoptees deviated from normative groups and whether significant relations with background variables (gender, birth country, residence in the country of origin, health on arrival, and age on arrival) were revealed. We then explored whether attachment was related to developmental functioning, adopting a multivariate approach (regression analyses). The number of predictors was adequate for our sample size (Stevens, 2002).

Results

Attachment

Secure versus Insecure

Most adopted children ($n = 43$; 61% B) were securely attached to their mother. The secure–insecure distribution in this sample was comparable ($p = .53$) with the normative distribution in the metastudy by Van IJzendoorn and Kroonenberg (1988; $n = 1990$; 65% secure). Chi-squared tests did not reveal significant relations between background variables and (in)security. Contrary to expectations, maternal sensitivity was not associated with (in)secure attachment ($r = .05$, $p = .66$).

Disorganized Attachment

Twenty-five children (36%) were classified as disorganized. This percentage was significantly higher than the normative rate (15%) found in a meta-analysis on disorganized attachment ($n = 2104$; Van IJzendoorn et al., 1999), χ^2 (1, $n = 70$) = 23.56, $p < .001$.[1]

[1]Post hoc, when the eight ''unattached'' children were excluded the percentage D was 27% (17/45), again significantly higher than the normative rate, χ^2 (1, $N = 62$) = 7.50, $p = .006$.

Chi-squared analyses revealed no significant relations with background variables. Maternal sensitivity was not associated with disorganized attachment ($r = .02$, $p = .86$).

Mental (MDI) and Psychomotor Development (PDI) Index

The adopted children had an average MDI that did not deviate from the MDI of the national Dutch standard group (Van der Meulen & Smrkovsky, 1983), $t(67) = .96$, $p = .34$, ($M_{adopted} = 98.24$, $SD = 15.19$; $M_{norm} = 100$, $SD = 15$). Regarding PDI the adopted children also were comparable with normative children, $t(67) = .10$, $p = .92$ ($M_{adopted} = 99.82$, $SD = 15.15$; $M_{norm} = 100$, $SD = 15$). On MDI, 16% of the infants scored <1 *SD* (< 85) and on PDI 10%. MDI and PDI correlated significantly, $r = .70$, $p < .001$. Girls scored higher on MDI than boys, $t(66) = 2.43$, $p = .02$. The *t*-tests did not reveal significant relations between other child background variables (birth country, residence in birth country, health on arrival, or age on arrival) and MDI or PDI. Contrary to expectation, children who were adopted after 6 months did not score lower on MDI ($p = .10$) or PDI ($p = .32$) than children adopted before 6 months. We examined whether stay in a foster family protected these children against the expected negative effects of a longer stay. The 13 children who only stayed in an orphanage and arrived after 6 months did not have a lower MDI than the 15 late-arriving children who lived for some time in a foster family ($p = .12$). However, the 15 foster children had a higher PDI than the 13 orphanage children ($M_{foster\ family} = 104.27$, $SD = 9.04$; $M_{orphanage} = 90.00$, $SD = 21.32$), $t(15.70) = 2.24$, $p = .04$ (equal variances not assumed). Maternal sensitivity correlated significantly with MDI, $r = .27$, $p = .03$. More sensitivity was associated with higher mental levels in the adoptee. For motor development, the association between maternal sensitivity and PDI was in the same direction but failed to reach significance, $r = .22$, $p = .07$. Maternal education and family SES were not associated with either MDI ($p > .24$) or PDI ($p > .11$).

Relations between Attachment and Developmental Functioning

Secure (B) children had a higher MDI than insecure (non-B) children, $t(39.41) = 2.67$, $p = .01$ (Table I). Also, children without attachment disorganization (non-D) scored higher on MDI than disorganized (D) children, $t(66) = 4.58$, $p < .001$. Attachment disorganization was associated with lower PDI, $t(66) = 3.57$, $p < .001$.

Table I. Mean Scores on Mental (MDI) and Psychomotor (PDI) Development for Attachment Security (Secure vs. Insecure) and Attachment Disorganization (Non-D vs. D)

		Mental developmental index (MDI)		Psychomotor developmental index (PDI)	
	n	*M*	*SD*	*M*	*SD*
Security					
Secure (B)	42	102.24**[a]	12.01	102.52	12.22
Insecure (non-B)	26	91.77	17.65	95.46	18.40
Disorganization					
Non-disorganized (non-D)	44	103.70***[b]	11.60	104.30***[b]	9.86
Disorganized (D)	24	88.21	16.07	91.63	19.46

[a]B > non-B; [b]non-D > D. $^{**}p < .01$; $^{***}p < .001$.

Table II. Multiple Hierarchical Regression Analyses on MDI and PDI and Inter-correlations

	Mental developmental index			Psychomotor developmental index			Correlations						
Predictor	R^2	ΔR^2	β	R^2	ΔR^2	β	MDI	PDI	1	2	3	4	5
Step 1: child background	.22	.22**		.16	.16*								
1 gender			.38***			.21[1]	.29*	.12					
2 residence			.31*			.38**	.07	.18[1]	−.12				
3 age on arrival			−.42**			−.38**	−.23*	−.18[1]	.17	.41***			
Step 2: family background	.29	.07*		.21	.05*								
4 maternal sensitivity			.26*			.24*	.27*	.22*	.25*	.10	.23[1]		
Step 3: attachment	.46	.17**		.30	.09*								
5 B vs. non-B			.20[1]			.11	.34**	.23*	.19	.13	−.03	.05	
6 D vs. non-D			.38***			.29*	.49***	.40***	.00	.10	−.16	.09	.14

Total model: F (6, 61) = 8.58*** (MDI) and F (6, 61) = 4.44*** (PDI). Step 1 (child background): F-change (3, 64) = 6.16*** (MDI) and F-change (3,64) = 4.10** (PDI); Step 2 (maternal sensitivity): F-change (1, 63) = 5.49* (MDI) and F-change (1, 63) = 4.31* (PDI); Step 3 (attachment): F-change (2, 61) = 9.63*** (MDI) and F-change (2, 61) = 3.89* (PDI).
[1]$p > .05$ and $\leq .10$; $^{*}p < .05$; $^{**}p \leq .01$; $^{***}p \leq .001$.

However, security of attachment (B vs. non-B) was not related to PDI, $t(66) = 1.90$, $p = .09$.

Controlling for the influence of important background factors, two multiple hierarchical regression analyses were conducted with MDI or PDI as dependent variable (Table II). The following child background variables were entered in Step 1: gender, residence in the birth country (in orphanage only or in foster family temporarily), and age on arrival. As an index of quality of parenting maternal sensitivity was entered in Step 2. We included two distinct indices of attachment in Step 3, with the aim to investigate the relative contribution of attachment (in)security (B vs. non-B) and of attachment disorganization (D vs. non-D) to children's developmental functioning.

MDI

The model (Table II) was significant for mental development, F (6, 61) = 8.58, $p < .001$, explaining 46% of the variance. In Step 1, background variables explained about half of the variance in MDI (22%). Being a girl, staying in a foster family for some time in the country of origin, and arriving at a younger age were protecting factors for adopted children's mental development. In Step 2, maternal sensitivity predicted child mental development ($\beta = .26$, $p = .02$). Controlling for child and family variables, attachment disorganization ($\beta = .38$, $p < .001$) predicted children's mental development. Children classified as disorganized attached (D) showed lower levels of mental development than nondisorganized (non-D) children. Attachment security (B vs. non-B) tended to be a significant predictor ($p = .051$).

PDI

The model was also significant for motor development, F (6, 61) = 4.44, $p = .001$, explaining 30% of the variance. Staying in a foster family for some time and arriving at a younger age were protecting factors for children's motor development. Maternal sensitivity also predicted PDI ($\beta = .24$, $p = .04$). Controlling for child factors and sensitivity, disorganized attachment predicted motor development ($\beta = .29$, $p = .01$). Disorganized attached children (D) showed lower levels of motor development than nondisorganized (non-D) children.

Attachment security (B vs. non-B) was not significant as a predictor ($p = .33$). Post hoc, we repeated the same regressions without the eight ''unattached'' children, resulting in similar outcomes for the prediction of mental and motor development.[2]

Discussion

We found that international adoptees placed before their first birthday were not at risk as far as infant attachment security is concerned (B vs. non-B), but they were more often disorganized than normative children. Disorganized attachment involves higher risks of behavior and cognitive problems. However, 64% of the adoptees did not develop disorganized attachment. Compared with the high rates of disorganized attachment in children's homes (66 and 65%, see Introduction section), we found a much lower postadoption percentage (36%). The overrepresentation of disorganized attachment in our study converges with findings on deprived, late-adopted children (O'Connor et al., 2003; Van IJzendoorn & Juffer, 2006), whereas Juffer et al. (2005) reported a normative percentage of disorganized attachment (22%). However, the adoptees in the latter study arrived significantly younger (11 weeks), $t(69) = 8.27$, $p < .001$, than the children in our study (24 weeks). Early age on arrival seems to protect against the development of disorganized attachment.

Because parental sensitivity is an empirically established determinant of infant attachment (De Wolff & Van IJzendoorn, 1997), the finding that maternal sensitivity was not related to children's attachment security in our sample was unexpected. An explanation might be that the episodes to observe sensitivity (singing and reading together) were relatively short and triggered mainly sensitive task-oriented behavior from the mothers, whereas sensitivity to signals of distress could not be coded. Future research should also include observations of parental sensitivity to infant distress (McElwain & Booth-LaForce, 2006).

Contrary to our expectations, the adopted children were not lagging behind on mental and motor development and this finding may be seen as indicative for their resilience. Although other studies reported delays on arrival (Morison et al., 1995; O'Connor et al., 2003; Pomerleau et al., 2005), we did not assess mental and motor development on arrival and therefore technically we cannot speak of a catch-up. However, in our study older age on arrival predicted lower MDI and PDI scores, pointing to larger delays when arriving at a later age. Therefore, we argue that in our study catch-up after adoption seems plausible (cf. Van IJzendoorn, Juffer, & Klein Poelhuis, 2005).

Rutter, O'Connor and the ERA Study Team (2004) examined several explanations for developmental catch-up at age 6 in their seriously deprived sample of adoptees. Duration of institutional deprivation was the strongest predictor for cognitive outcome. High stress environments may influence brain development and attachment behaviors and may cause persistent cognitive delay (Rutter et al., 2004). Several studies have shown that children in orphanages are at a risk for developmental delays (Lin, Cermak, Coster, & Miller, 2005). Often children are kept in their cribs for long hours. Our study showed that a temporary stay in a foster family before adoption was protective against mental and motor delay in the first year of life. Probably, these children were offered more opportunities for social interaction, play, and practising motor skills. In the same vein, in a study including international adoptees from Guatemala, foster-reared children showed better growth and development than orphanage-reared children (Miller, Chan, Comfort, & Tirella, 2005).

An explanation for the lack of developmental delay may be found in the research on cognitive development in poverty samples in the USA (Black, Hess, & Berenson-Howard, 2000; Mackner, Black, & Starr, 2003). In these studies, decline in cognitive development in underprivileged children was not seen until late toddlerhood. Infancy seems to ecologically protect young children against cognitive delay (Black et al., 2000). Maybe in our sample the effect of adversity simply did not show up yet. Another explanation could be that there was an actual delay, but that we were not able to assess it due to the so-called Flynn effect (Flynn, 1999). Flynn discovered a population raise in IQ of .30 IQ point every year (age: 2–48 years). We used the 1983 Dutch standard group, so maybe our sample actually is lagging somewhat behind. However, Van Bakel and Riksen-Walraven (2002) used the same norm group for their Dutch representative sample ($n = 129$) in the same time period and found a mean MDI of 103 ($SD = 17$), not different from the 1983 sample or from our sample.

[2]Post hoc, excluding the eight ''unattached'' children, the model was significant for MDI, F (6, 53) = 5.47, $p < .001$, explaining 38% of the variance. Attachment security was not significant as a predictor ($\beta = .16$, $p = .15$) whereas attachment disorganization again uniquely predicted mental development ($\beta = .32$, $p = .006$). For PDI, the model was significant, F (6, 53) = 3.24, $p = .009$, explaining 27% of the variance. Again, attachment security did not significantly predict psychomotor development ($\beta = .11$, $p = 38$) whereas attachment disorganization was a significant predictor ($\beta = .27$, $p = .03$).

In Romanian adoptees, cognitive functioning at age 6 was not associated with adoptive parents' educational level (Rutter et al., 2004) but with parents' interactional style (Croft et al., 2001). Comparably, whereas SES was not associated with cognitive development, in our multivariate analyses maternal sensitivity predicted MDI (cf. Stams et al., 2002). However, as a consequence of our cross-sectional design, we cannot definitely conclude whether maternal sensitivity causally influenced development.

Our findings suggest that attachment and developmental progress in adopted children are interdependent, at least in infancy. In the same vein, a study on nonadopted children (Van Bakel & Riksen-Walraven, 2002) found comparable concurrent relations between attachment security and mental development assessed with the Bayley Scales. An important premise of the organizational perspective is that central aspects of individual functioning originate in the organization of early primary relationships (Sroufe et al., 2005). If the organization of early relationships fails or is compromised as is the case in orphanages, children's social and cognitive development may be negatively affected.

Four limitations of our study should be mentioned. First, the children in our sample form a relatively heterogeneous group from several countries, and they were all adopted to the Netherlands. We cannot be sure that our findings can be generalized to adoptees from other countries of origin to other countries of destination. Second, we examined short-term outcomes of children internationally adopted at an early age. Therefore, our findings may not generalize to international adoptees placed at older ages or adoptees who have been living in their adoptive family longer. Third, as the sample size in our study was modest, our findings should be replicated in larger samples. Fourth, we used a cross-sectional design with concurrent assessments of attachment and development. Therefore, definite causal inferences about the influence of attachment on developmental functioning cannot be drawn. In future studies, this relation should also be examined in longitudinal studies.

Clinical Implications

We examined development and attachment in adoptees shortly after the arrival from the relatively ''new'' countries of origin, China, and Taiwan. Nowadays, the largest numbers of international adoptees to the USA, Canada and Europe come from China. Children internationally adopted before their first birthday appear to function at remarkably normative developmental levels. Importantly a (temporary) stay in a foster family in the country of origin may partly prevent developmental delay in adopted children-to-be.

We found an unusually large number of unattached adopted children who were lagging behind in mental development. The developmental prospects of the unattached children may be problematic and they may be worthy of special clinical interest. A substantial minority of adoptees develop disorganized attachment, which is associated with lower levels of concurrent developmental functioning. Attachment-based interventions may be needed to prevent attachment disorganization (Juffer et al., 2005), and to test whether these interventions also result in children's increased developmental competence.

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