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Fostering security? A meta-analysis of attachment in adopted children ☆

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ABSTRACT

Adopted children are hypothesized to be at risk of insecure attachment relationships because of their background of institutional care, maltreatment and neglect. We conducted two series of meta-analyses, one using only observational assessments of attachment and one using both observational and self-report assessments. Observational assessments showed that children who were adopted before 12 months of age were as securely attached as their non-adopted peers, whereas children adopted after their first birthday showed less attachment security than non-adopted children (d=0.80, CI=0.49–1.12). Regarding the overall effect for attachment security, adoptees were comparable to foster children. Adopted children showed more disorganized attachments compared to their non-adopted peers (trimmed d=0.36, CI=0.04–0.68), but again were comparable to foster children (trimmed d=0.35, CI=0.02–0.67). Compared to institutionalized children, adoptees were less often disorganized attached. When self-report measures of attachment were included no difference was found between adoptees and their non-adopted counterparts (trimmed d=0.12, CI=−0.02–0.26, 39 studies, N=2912 adopted children). Compared to institutionalized children, (early) adoption proves to be an effective intervention in the domain of attachment.

1. Introduction

Are adopted children less often securely attached to their adoptive parents than children reared by their biological parents? In a series of meta-analyses we examined adopted children's attachment relationships with their adoptive parents. Previous meta-analyses on the development of adoptees documented catch-up after adoption in various domains, for example in cognitive development (Van IJzendoorn, Juffer, & Klein Poelhuis, 2005) and physical growth (Van IJzendoorn, Bakermans-Kranenburg, & Juffer, 2007), but less so for learning problems (Van IJzendoorn et al., 2005) and clinical referrals (Juffer & Van IJzendoorn, 2005). The question to be addressed here is whether adopted children also show catch-up or delays in the domain of attachment relationships after the transition to their new families. As adopted children's characteristics and experiences show some similarities to those of foster children, we compared the outcomes for adopted children not only with children from biological families but also with outcomes for foster children.

Bowlby (1982, p. 371) stated about the nature of attachment relationships: "To say of a child that he (…) has an attachment to someone means that he is strongly disposed to seek proximity to and contact with a specific figure and to do so in certain situations, notably when he is frightened, tired or ill." Although the tendency to form attachment relationships is innate and universal, individual differences can be observed in the quality of attachment. Based on the attachment strategies children use when they face stressful situations, their attachment relationships can be classified as secure, insecure (avoidant or ambivalent) or insecure-disorganized. Secure children seek contact with their attachment figure when they are upset and are easily comforted. Insecure children, on the other hand, show signs of avoidance or resistance (Ainsworth, Blehar, Waters, & Wall, 1978). Disorganized attachment is considered the most insecure type of attachment, with disorganized children showing a breakdown of a consistent attachment strategy when dealing with a stressful situation (Main & Hesse, 1990).

Developing a secure attachment relationship or close bond with a parent or primary caregiver has long-term benefits for children, because of the impact on children's later adaptation, for instance through the development of emotion regulation (Cassidy & Shaver, 1999). Secure infants develop basic trust in their parents and they feel confident about their own ability to influence the world around them. This basic trust allows children to function autonomously and with confidence in their (social) problem solving abilities (Sroufe, Egeland, Carlson, & Collins, 2005; Weinfield, Sroufe, Egeland, & Carlson, 1999).

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Insecurely attached children are at risk for a more problematic development. For example, insecure attachment, in particular insecure disorganized attachment, has been associated with the development of externalizing behavior problems (e.g., Lyons-Ruth, Easterbrooks, & Cibelli, 1997) and subsequent child psychopathology (for a meta-analysis see Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999).

2. Adoption and the comparison with foster children

Every year, large numbers of children are placed in adoptive homes. In 2004 almost 45,000 children were adopted internationally worldwide (Selman, 2006). The number of domestic adoptions is difficult to estimate, as not all of these adoptions are officially registered (Placek, 2007). In the USA, 1.6 million children live with adoptive parents (Jones, 2008) and between 2 to 4 percent of the families include an adopted child. Annually about 20,000 children are adopted internationally in the USA (Brooks, Simmel, Wind, & Barth, 2005; Nickman et al., 2005) and 50,000 children are domestically adopted from the public system, whereas the practice of relinquishing an infant for domestic adoption is estimated at about 1% of babies born to never-married women (Jones, 2008). In Western-European countries, with the exception of the United Kingdom and Germany, there are relatively few domestic adoptions compared to the number of international adoptions (Selman, 2006), while adoptions from foster care are rare, again with the United Kingdom as an exception (Warman & Roberts, 2003).

In the USA there were 510,000 children in foster care in 2006 (Adoption and Foster Care Analysis and Reporting System, 2008). Because foster children experience comparable disruptions of early parent–child relationships as adopted children, we also compared the outcomes of adopted children with the outcomes of foster children. The background of adopted children shows some similarities with the background of children placed in foster homes. Both groups have experienced separation from their birth parents, and are placed in new families where they are cared for by foster or adoptive parents who usually show little (physical) resemblance to them. In addition, many adopted and foster children have experienced unfavorable conditions before placement. The majority of internationally adopted children have experienced neglect and maltreatment in institutional care before adoption (Miller, 2005; Tirella et al., 2008). In the same vein, many foster children have been the victim of neglect and/or repeated abuse before they enter the foster care system, as was confirmed in several large scale studies (Chernoff, Combs-Orme, Risley-Curtiss, & Heisler, 1994; Department for Children, Schools and Families, 2008; Lewit, 1993; Takayama, Wolfe, & Coulter, 1998), although not all children have experienced the same level of adversity before foster placement (e.g., Quinton, Rushton, Dance, & Mayes, 1998). Domestic adoptees may even resemble foster children more, as some domestic adoptees are former foster children (Testa, 2004). Nevertheless, there are also several marked differences between adopted and foster children. One of these differences is the permanency of the placement. Whereas the placements of adopted children are permanent, placements of foster children are often temporary. Adopted and foster children may also be placed out of their homes for different reasons. International adoptees are usually placed for cultural reasons, extreme poverty or family policy (e.g., the one-child policy in China; Johnson, 2004), while foster children for example are placed because of caretaker incapacity or absence, child protective reasons, or parental incarceration (Chernoff et al., 1994; Hayward & DePanfilis, 2007; Lewit, 1993). In addition, whereas adoption is a clear-cut situation in which children have been removed from their birth parents and, except in open adoption arrangement, have no contact with the birth parents, there is a high diversity of foster care arrangements, many implying contact and visits with the biological parent (Leathers, 2003; Sanchirico & Jablonka, 2000).

3. Attachment in adopted children

In some studies adopted children have been reported to show reactive attachment disorders (Zeanah, 2000; Zeanah et al., 2004) and indiscriminate friendly behavior (Chisholm, Carter, Ames, & Morison, 1995; Tizard & Rees, 1975). More insecure and disorganized attachments (Marcovitch et al., 1997) and non-optimal parent–child relationships (Fletcher, 1995) have been found in adoptees as well. There are several reasons to expect less attachment security in adopted children, as these children all experience separation from, and loss of their birth parents and other caregivers. According to attachment theory, these experiences of loss and separation may negatively influence the development of subsequent attachment relationships (Bowlby, 1982). In addition, many internationally adopted children have been in institutional care and have experienced deprivation, neglect and maltreatment. Children living in institutions often lack opportunities to develop selective attachment relationships, due to the limited amount and poor quality of contact with their caregivers (Gunnar, Bruce, & Grotevant, 2000; Howe, 2005; Palacios & Sánchez-Sandoval, 2005; Vorria et al., 2003). The debate about the effects of early deprivation on child development dates back more than half a century ago, when the World Health Organization initiated a study conducted by child psychiatrist John Bowlby. In a now famous report, Bowlby (1952) concluded that children suffered from the effects of institutional care, even when their physical needs (food, clothes, etc.) were met adequately. The children were deprived of parental care and missed out opportunities to develop stable and continuous attachment relationships. According to Bowlby, early deprivation leads to compromised child development and sets the stage for various mental health problems in children. As viable alternatives for institutional care Bowlby (1952, p.109) recommended adoption and foster care, because they provide children with 'substitute' parents.

As adoption implies separations, loss, and the development of attachment relationships to new parents, attachment theory (Bowlby, 1982) provides an appropriate theoretical framework for our study. In addition, adoption also implies risks (e.g., deprivation before placement) as well as protection (e.g., receiving nurturing care and stimulation from alternative parent figures) and therefore the perspective of risk and protective factors is also important. According to this theoretical perspective, an accumulation of risk factors leads to less optimal child development, whereas protective factors may buffer the negative effects of the risks, resulting in resilience in children (Rutter, 1990; Werner, 2000).

Recent neurobiological studies of institutional care suggest that these high stress environments influence brain development and attachment behaviors and may cause persistent cognitive and socio-emotional delays (Miller, 2005; Rutter, 2005, 2006; Rutter et al., 2004). Studies showing altered patterns of cortisol (Gunnar, Morison, Chisholm, & Schuder, 2001), neurocognitive impairment (Chugani et al., 2001), and changes in the production of neuropeptides (Fries, Ziegler, Kurian, Jacoris, & Pollak, 2005) after institutional care point to a critical role for early experience in the development of the brain systems underlying basic aspects of human social behavior and stress regulation. According to Gunnar and Kertes (2005) adverse experiences may affect the structure and function of the brain in three general ways. First, severe malnutrition and maltreatment can injure neural tissue; second, a lack of stimulation can affect the basic wiring plan of the brain and brain chemistry; and third, morphological and neurochemical adaptations to a non-optimal (institutional) environment may produce maladaptive responses to the post-institutional environment that limit (later) healthy behavioral and emotional development (Gunnar & Kertes, 2005, p. 49).

Two studies confirmed the disadvantageous effects of institutional care on attachment, with institutionalized children showing high rates of insecure attachment and especially high rates of disorganized

attachment (Vorria et al., 2003; Zeanah, Smyke, Koga, Carlson, & the BEIP Core Group, 2005). Although domestically adopted children not always experience institutional care, the neglect and maltreatment they often face in their birth families may also have a detrimental effect (Kaniuk, Steele, & Hodges, 2004). In particular maltreatment is a documented precursor of disorganized attachment (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Crittenden & Ainsworth, 1989; George, 1996; Van IJzendoorn et al., 1999), while experiences of parental neglect are reported to be a precursor of insecure (ambivalent) attachments (Egeland & Sroufe, 1981; Finzi, Ram, Har-Even, Shnit, & Weizman, 2001; Youngblade & Belsky, 1990).

Almost all children develop an affective bond with their caregiver, even maltreated children (Cicchetti & Barnett, 1991) or children struggling with autism (Rutgers, Van IJzendoorn, Bakermans-Kranenburg, & Swinkels, 2007). Based on the caregiver's reactions to their signals, children develop expectations (so-called *internal working models*) of how they will be treated by their attachment figures (Bowlby, 1982; Bretherton & Munholland, 1999). Children whose attachment signals are met by sensitive caregivers develop an internal working model of a safe and responsive world. In contrast, children who are responded to in an insensitive way may picture the world as an unpredictable place and they may not feel worthy of love. Children's internal working models are suggested to influence the development of new relationships, by shaping children's expectations and behavior (Bowlby, 1982; Sroufe et al., 2005). But Bowlby also hypothesized that 'working' models can change as a consequence of changing experiences, in particular in the first five years of life, and that corrective attachment experiences may compensate for early adversity (Bowlby, 1988). When transitions to responsive care are experienced, internal working models and attachment relationships may change correspondingly (Bowlby, 1973, 1988; Sroufe et al., 2005). Whether this process of accommodation also takes place after the placement of children with (sensitive) adoptive parents is a central question in the current set of meta-analyses. Research on attachment in adopted children shows equivocal outcomes. In some studies attachment of adopted children does not differ from the security of non-adopted children (e.g., Joseph, 2002) whereas other studies find fewer secure attachments in adopted children (e.g., O'Connor, Marvin, Rutter, Olrick, & Britner, 2003). With the current meta-analysis we attempted to answer the question whether adopted children show less attachment security than non-adopted children. We also tested whether adopted children show more disorganized attachment than non-adopted children.

4. Potential factors influencing attachment relationships in adoptive families

In this meta-analysis the influence of various moderators has been investigated, namely, age at placement, duration of placement, continent of origin, domestic or international placement, and transracial or same-race placement. From the perspective of risk and protective factors some moderators may imply risks (e.g., an older age at placement) or protection (e.g., a longer stay in the adoptive home). In particular, age at placement may be crucial for the development of a new relationship with the adoptive parent. When children receive warm and sensitive care, they generally develop basic trust in their caregivers during their first year of life (Bowlby, 1982). Several studies indeed found that children who were adopted in the first months of their lives, usually develop normative attachment relationships (e.g., Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2008), whereas children who were placed at later ages seem to be at greater risk for developing unfavorable attachment relationships (Marcovitch et al., 1997; Vorria et al., 2006).

The length of time the children have spent in their new family may also be a significant moderator. Children who have lived with their new parents for a longer period of time, and thus have spent more time in the care of a stable and usually nurturing parent, may have had more time to recover from prior adverse experiences. In a similar vein, Juffer and Van IJzendoorn (2005) meta-analytically found that children who had spent more than 12 years in their adoptive family showed a larger catch-up in terms of behavior problems than children who had lived in their adoptive homes for a shorter period of time.

In addition, continent of origin may be a relevant risk factor to take into account when explaining differences in adaptation. Children who originate from Eastern European countries, for example Romania, often have experienced severe deprivation (Castle et al., 1999; Miller, 2005; Morison, Ames, & Chisholm, 1995; Smyke et al., 2007), and may therefore show more problems with attachment than children adopted from other continents. Similar results were found in previous meta-analytic work: children who experienced more severe deprivation showed more behavior problems and lower cognitive competence than children from less deprived backgrounds (Juffer & Van IJzendoorn, 2005; Van IJzendoorn et al., 2005).

Finally, type of placement may be an important risk factor. In some domains, for example, problem behavior and mental health referrals, differences have been reported between international and domestic adoptees (Juffer & Van IJzendoorn, 2005), with international adoptees showing fewer behavior problems and mental health referrals. However, for other developmental domains, such as self-esteem, no differences have been found between international and domestic adoptees, or between same-race or transracial adoptees (Juffer & Van IJzendoorn, 2007; Van IJzendoorn et al., 2005). With regard to attachment we did not expect to find differences between the above mentioned groups, because early experiences of separation and loss, and/or neglect and maltreatment are assumed to be present in the majority of the adopted children.

Based on the literature presented above, we hypothesized that adopted children would show fewer secure and more disorganized attachments compared to children living with their biological parents. We expected that these differences would be larger in children who are adopted after their first birthday than in children adopted in their first year of life. We also hypothesized that children who have lived with their new parents for a longer period of time will show a more favorable relationship with the parent. Finally, we expected children who are born in Eastern European countries to show less secure and more disorganized attachment than children adopted from other continents.

5. Method

5.1. Literature search

To identify relevant studies three different search methods were used. First, we searched for relevant literature in the following electronic sources: PsycInfo (Psychological Literature), ERIC (Education Resource Information Center), Web of Science and PUBMED (U.S. National Library of Medicine). Throughout this search we used the keywords *adopt** or *foster** (an asterisk indicates that the search contained but was not limited to that word or word fragment) in combination with the terms *attachment, parent–child relationship, bonding*, and related terms such as *security, mother–child relationship, Strange Situation* and *AQS*. Second, we searched the reference lists of all collected studies to identify more relevant studies. Third, experts were asked to provide pertinent studies.

Studies were included if they reported on the attachment relationship, parent–child relationship or bond between the adopted or foster children and their adoptive/foster parents (hereafter: adopted children and adoptive parents). Both studies using observational assessments and self-report or parent-report measures were included. In order to examine the attachment relationships of the adoptees across their lifespan, no restriction was placed on the age at assessment. In the case of a study with more than one assessment (e.g., Juffer & Rosenboom, 1997), only the data from the first valid assessment was

included to guarantee that every adoptee was included only once in a meta-analysis. Studies measuring attachment relationships were excluded if: (1) the adopted sample was a clinical sample (e.g., Rosenthal et al., 1975); (2) the relationship between the adoptee and someone else than the caregiver was measured (e.g., Jensen, 2004); (3) the information in the study was not sufficient to compute an effect size (e.g., Judge, 2004); (4) attachment *style* was measured (e.g., Borders, Penny, & Portnoy, 2000) or (5) no comparison group was available (e.g., Brown, 2000; Hodges, Steele, Hillman, Henderson, & Kaniuk, 2005). The presence of a comparison group in the study was not required when studies reported on the distribution of attachment classification based on the (adapted) Strange Situation Procedure (see below), the Attachment Q-sort (Veríssimo & Salvaterra, 2006), or applied instruments for which a comparison group of another study could be used (e.g., Millham, 2003). We excluded studies measuring attachment style (e.g. Borders et al., 2000), since our study focuses on the attachment relationships of the adoptees with their adoptive parents, instead of on their romantic or intimate attachment relationships in general.

Attachment relationships can be measured using various instruments. The Strange Situation Procedure (SSP; Ainsworth et al., 1978) is an observational laboratory procedure used to assess infant attachment behavior. The SSP consists of eight 3-minute episodes during which two separations from, and reunions with, the parent occur. The attachment of the children in the SSP is classified based on the (in-) secure patterns of attachment behavior and the presence of disorganized attachment behavior. Some studies use an adapted SSP, with coding systems such as the Cassidy–Marvin system, the Main–Cassidy system, and Crittenden's Preschool Assessment of Attachment (PAA). As the traditional Ainsworth classifications can only be used in children up to 18 months of age, Cassidy and Marvin (1992) developed a classification system for preschool-age children. Crittenden (1992) did the same with her classification system and Main and Cassidy (1988) developed a classifications system for kindergarten-age children. These approaches use a procedure comparable to the Strange Situation Procedure, namely one or two separations and reunions (Solomon & George, 1999). The Attachment Q-Sort (AQS; Waters & Deane, 1985) is another observational measure used to assess attachment security. The AQS consists of 90 items, each describing specific behavioral characteristics of the child with an emphasis on secure-base behavior. After several hours of observation an observer sorts all cards into nine piles of 10 cards each, depending on how well the description fits the child. By comparing the child's profile with the behavioral profile of a prototypically secure child, a score for attachment security can be derived. The SSP and AQS are widely used and meta-analytically validated observational instruments for assessing attachment in infants and toddlers/preschoolers (Solomon & George, 1999; Van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004). The Cassidy–Marvin system, the Main–Cassidy system and Crittenden's PAA all have been found to be valid assessment instruments (Moss, Bureau, Cyr, Mongeau, & St-Laurent, 2004; Main & Cassidy, 1988; Teti & Gelfand, 1997), although some questions about the concordance among the systems have been raised as well (Crittenden, Claussen, & Kozlowska, 2007; Solomon & George, 1999). As part of our meta-analyses, we will therefore test whether including these measures will affect the results.

As the observational attachment measures have the best credentials in terms of validation, we were particularly interested in the outcomes of studies using the (adapted) SSP or the AQS: in our analyses they constitute the 'core set' of studies. To compare the effect sizes in this core set of studies on adopted children with studies on foster children, a separate set of meta-analyses for foster children was conducted, including again only studies that used the (adapted) SSP or the AQS. However, as attachment relationships of adopted children have also been assessed using questionnaires or projective measures we repeated the meta-analysis on adopted children using all types of measures in order to see if results converged (see Table 1 for all included studies and measures). One example of such a questionnaire is the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987). The IPPA consists of 28 items concerning the behavioral and affective/cognitive dimension of an adolescent's attachment relationships with their parents (Armsden & Greenberg, 1987). The IPPA was used in several studies with adopted children, e.g., the studies of Fischman (1996) and McGinn (2001).

For studies using the (adapted) SSP the distribution of (in-)security in the adopted group was compared to the normative distribution of ABC-classifications reported in the meta-analysis of Van IJzendoorn, Goldberg, Kroonenberg and Frenkl (1992; $k=21$, $N=1584$). Studies reporting on ABCD-classifications were compared with the normative distribution reported in the meta-analysis of Van IJzendoorn et al. (1999) for the distributions of (in-)security and (dis-)organization ($k=15$, $N=2104$). The mean security score of the AQS ($M=.32$, $k=28$, $N=2516$) from the meta-analysis of Van IJzendoorn et al. (2004) was used as a comparison for the studies using the AQS. The normative attachment scores presented in these meta-analyses were based on large samples and can therefore be seen as more reliable than the attachment scores of the often small-scale control groups presented in the studies themselves.

In our series of meta-analyses we drew on 39 adoption and 11 foster studies (reported in 39 publications), with 21 studies using the (adapted) SSP, seven studies using the AQS, six studies using the Parental Bonding Instrument (PBI; Parker, Tupling, & Brown, 1979), four studies using the IPPA (Armsden & Greenberg, 1987), six studies using a shortened version of the AQS (Chisholm et al., 1995) and six studies using other measures, such as the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985).

Of the 11 foster studies, five studies examined prenatally drugs-exposed foster children. To examine whether this affected the outcomes of the studies, we used prenatal drug exposure as a moderator in preliminary analyses. Because no difference was found between the two sets of studies, $Q(1)=0.002$, $p>.05$, the studies with the prenatally exposed children were included in the meta-analyses on foster children.

5.2. Data extraction

We conducted several moderator analyses. Given that moderator analysis is only relevant when the different subsets comprise of more than three studies each (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003), subsets that consisted of fewer than four studies were not included in the contrast analyses. We coded the following study characteristics: publication outlet, year of publication (<1995, 1995–1999, >2000 or in press) and continent of study (for example, North America or Europe). With regard to publication outlet, we tested the contrast between studies published in refereed journals and non-refereed publications (book, chapter article and presentation). As 13 of our studies were dissertations, we created a separate group for this type of publication.

We coded the sample sizes of the adoption and control groups, age at placement (before or after 12 months of age), age at assessment (0–4 years, 4–12 years, >12 years), time spent in the new family (0–1 years, 1–2 years, 2–12 years, >12 years), continent of origin (Asia, North America, Europe, other continents or several continents) and type of placement (international or domestic, and same-race or transracial). We also examined the influence of age at assessment. As we expected that age at placement would be an important variable for potential catch-up or delay, no specific expectations for age at assessment were formulated. For example, children who were assessed at age 4.5 could have been placed at different ages, e.g., 6 months versus 24 months of age. We expected that the influence of age at placement would overrule the influence of age at assessment. In the same vein, we expected that the time spent in the new family

Table 1
Attachment relationships of adoptees vs. non-adopted comparisons

Source	Na–Nc	Age at arrival, m	Age at study, y	Country of study	Measure (informant)	Core set (in)secure	Core set disorganized
Bartel, 2006[a]	123–9	≥12	0–4	USA	Shortened version AQS (P)	No	No
	106–9	≥12	0–4	USA	Shortened version AQS (P)	No	No
Caspers, Yucuis, Troutman, Arndt, & Langbehn, 2007	126–584	<12	>18	USA	AAI (O)	No	No
Chisholm, 1998[b, c]	26–2104	<12	4–12	Canada	SSP, Crittenden (O)	Yes	Yes
	43–2104	≥12	4–12	Canada	SSP, Crittenden (O)	Yes	Yes
Farina, Leifer, & Chasnoff, 2004[a]	29–8	≥12	0–4	USA	Shortened version AQS (P)	No	No
Feeney, Passmore, & Peterson, 2007	144–131	<12	>18	Australia	PBI – Care (S)	No	No
Fischman, 1996	173–69	n.r.	>18	USA	IPPA (S)	No	No
Fletcher, 1997	100–100	n.r.	>18	USA	PBI – Care (S)	No	No
Irhammar & Bengtsson, 2004[b]	40–584	≥12	>18	Sweden	AAI (O)	No	No
Joseph, 2002	30–30	≥12	>18	USA	IPPA – Trust (S)	No	No
Juffer et al., 2005[b, c]	78–2104	<12	0–4	Netherlands	SSP (O)	Yes	Yes
Juffer & Roosenboom, 1997[b]	30–2104	<12	0–4	Netherlands	SSP (O)	Yes	No
Lis, 2000[b]	8–1584	≥12	0–4	Poland	Separation-Reunion (O)	No	No
	8–1584	≥12	0–4	Poland	Separation-Reunion (O)	No	No
Marcovitch et al., 1997[b, c]	44–2104	≥12	0–4	Canada	SSP, Cassidy–Marvin (O)	Yes	Yes
McGinn, 2001	30–30	<12	12–18	USA	IPPA – Attachment (S)	No	No
Millham, 2003[a]	16–8	<12	0–4	USA	Shortened version AQS (P)	No	No
	15–8	<12	4–12	USA	Shortened version AQS (P)	No	No
Müller, Gibbs, & Ariely, 2002[b]	330–70	<12	n.r.	USA	IPPA – Attachment (S)	No	No
O'Connor et al., 2003[b, c]	43–2104	<12	4–12	UK	SSP, Cassidy–Marvin (O)	Yes	Yes
	49–2104	<12	4–12	UK	SSP, Cassidy–Marvin (O)	Yes	Yes
	39–2104	≥12	4–12	UK	SSP, Cassidy–Marvin (O)	Yes	Yes
Ongari & Tomasi, 2006[b, c]	6–2104	<12	0–4	Italy	SSP, Cassidy–Marvin (O)	Yes	Yes
Pace, Messina, Zavattini, & Santona, 2006[b]	11–2104	≥12	4–12	Italy	SSP, Main–Cassidy (O)	Yes	No
Paperny, 2004[b]	34–487	<12	n.r.	Canada	Adult Attachment Projective (S)	No	No
Passmore et al., 2005	50–50	<12	n.r.	Australia	PBI – Care (S)	No	No
	50–50	<12	n.r.	Australia	PBI – Care (S)	No	No
Rosnati & Marta, 1997	88–129	n.r.	12–18	Italy	Communication Scales (S)	No	No
Sabbagh, 1995[b, c]	21–2104	<12	0–4	Canada	SSP (O)	Yes	Yes
Singer et al., 1985 inter[b]	19–1584	<12	0–4	USA	SSP (O)	Yes	No
	27–1584	<12	0–4	USA	SSP (O)	Yes	No
Slobodnik, 1997	86–86	<12	>18	USA	PBI – Care (S)	No	No
Snider, 1997	66–79	<12	>18	USA	PBI – Care (S)	No	No
Tessier et al., 2005	538– n.r.	≥12	0–4	Canada	Shortened version AQS (P)	No	No
Tessier, Tarabulsy, & Moss, 2006[b, c]	64–2104	<12	0–4	Canada	SSP (O)	Yes	Yes
Van Londen, Juffer, & Van IJzendoorn, 2007[b, c]	55–2104	<12	0–4	Netherlands	SSP (O)	Yes	Yes
Veríssimo & Salvaterra, 2006[b]	106–2516	<12	0–4	Portugal	AQS (O)	Yes	No
Vorria et al., 2006[b]	61–2516	≥12	4–12	Greece	AQS (O)	Yes	No

Note. Na: number of adoptees; Nc: number of non-adopted controls; n.r.: data were not reported; Age at arrival, m: Age at arrival in months; Age at study, y: Age at study in years; (O): Observer Report; (P): Parent Report; (S): Self Report; AQS: Attachment Q-sort; AAI: Adult Attachment Interview; SSP: Strange Situation Procedure; PBI: Parental Bonding Instrument; IPPA: Inventory of Parent and Peer Attachment.

[a] The children in this study were compared with the comparisons in an other study.

[b] The children were compared with a normative distribution or normative score.

[c] Observational studies used in the secondary analyses.

would overrule the influence of age at assessment. Number of placements prior to adoption, social economic status of the adoptive parents as well as prevalence of pre-adoption adversity could not be used as moderators, because these variables were often not reported in the pertinent studies. Studies were coded as one of the categories of a moderator when at least 75% of the sample could be grouped into that category. Studies in which less than 75% of the sample could be included in one category of the moderator were coded as 'mixed'. Furthermore, we examined in the samples with domestically adopted children whether more than 75% of the children were reported to have been adopted from foster care. We concluded that there were no studies that met this criterion (for example, only 5 out of the 106 children in the study of Veríssimo and Salvaterra (2006) and none of the children in the study of Vorria et al. (2003) were adopted from foster care).

For studies that used the (adapted) SSP and provided information about the number of children classified as disorganized (e.g., Dozier, Stovall, Albus, & Bates, 2001; Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2005), controlling (e.g., Marcovitch et al., 1997) or disorganized/controlling and insecure-other/Cannot Classify (e.g., O'Connor et al., 2003) two effect sizes were derived, one for attachment security and one for attachment disorganization.

6. Meta-analytic procedures

We conducted five meta-analyses, four for the core set of studies with observational measures of attachment and one for the entire set of adoption studies. For the core set we conducted separate meta-analyses for adoptive and foster studies, both for attachment security and attachment disorganization. Some study outcomes could be directly inserted into Borenstein, Rothstein, and Cohen's (2000) Comprehensive Meta-Analysis (CMA) program. Other outcomes had to be re-computed or transformed before they could be inserted into CMA. For the studies in which the (adapted) SSP was used, we employed Wilson Effect Size Calculator (Lipsey & Wilson, 2001) to compare the distributions of the adoption samples with the normative distribution. Eventually for all studies Cohen's *d* was computed. According to Cohen's criteria, *d*s of 0.20, 0.50, and 0.80 represent small, moderate, and large effect sizes, respectively (Cohen, 1988). Because we hypothesized that adopted children would show less

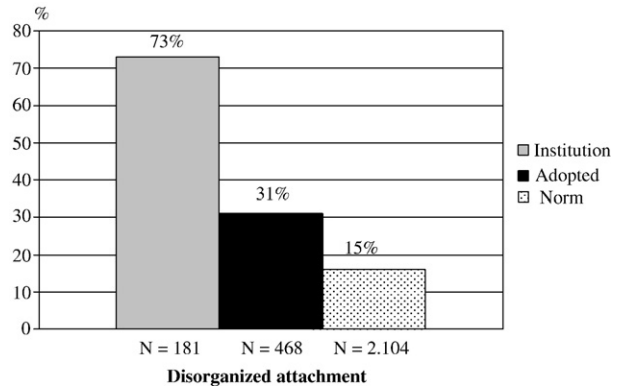

Fig. 1. Percentages of disorganized attachment classifications based on the Strange Situation Procedure. Results are reported for adoptees (k=11), institutionalized children (k=2, Vorria et al., 2003; Zeanah et al., 2005), and normative data (k=15) from Van IJzendoorn et al. (1999). All percentages differ significantly from each other at p<.01.

secure and more disorganized attachment (see Introduction) than the comparison group, the effect sizes of studies presenting outcomes in this direction were given a positive sign. A negative sign was given to the outcomes of studies where the adopted children showed more secure or less disorganized attachment. To examine whether outlying effects sizes were present, all effect sizes were transformed into Fisher's Z which were standardized. The study of Golombok, Cook, Bish, and Murray (1995) had an outlying effect size (d=−2.28) which exceeded the preset limit of z<−3.29 (Tabachnick & Fidell, 2007). To avoid an excessive influence this study was not included in the meta-analysis.

The effect sizes within one subset of a moderator can be homogeneous or heterogeneous. This homogeneity was tested with the Q statistic (Lipsey & Wilson, 2001). When the effect sizes were homogeneous, the fixed effect parameters were used. Random effect parameters were used when the effect sizes within one subset were heterogeneous. To test the influence of moderators, the Q statistic for between-group differences was calculated (Borenstein et al., 2000). This statistic indicates significant differences between the subgroups of a moderator. When one or more of the subsets were heterogeneous, random effect models were used. Fixed models were used when all subsets were homogeneous. When moderators could not be tested due to the small size of the subsets, the overlap of the 85% Confidence Intervals (CI) of the subsets was examined (Bakermans-Kranenburg et al., 2003; Goldstein & Healy, 1995). This provides a global test of the contrasts between combined effects of subsets grouped by moderators.

A publication bias may arise when non-significant findings remain unpublished. The results of these possibly missing studies can be estimated using Duval and Tweedie's 'trim and fill' method (Duval & Tweedie, 2000a,b). In this method a scatter plot (called a funnel plot) is created in which the effect sizes of the studies are plotted against the sample size or standard error. If the plot is shaped like a funnel no publication bias is present. However, due to the reduced chance for smaller and non-significant studies to be published, studies from the bottom left hand corner may be missing (the 'file-drawer' problem; Mullen, 1989). With the trim and fill method these missing studies are filled in and an (adjusted) effect size is calculated. We also examined the stability of the results. In this 'jackknife' procedure it is analyzed whether the overall effect size changes significantly when the combined effect sizes are calculated after the successive removal of one effect size (Borenstein et al., 2000). For each meta-analysis we also calculated the number of studies with a non-significant result that would be required to bring the combined effect size of a meta-analysis to a non-significant level (fail-safe number; Mullen, 1989).

7. Results

First, a secondary analysis was conducted to compare the distributions of attachment classifications of adopted children with the normative distribution of non-adopted children. Secondly, the outcomes of the meta-analyses are presented. We start with the analyses of the adopted children concerning attachment security and attachment disorganization in the core set of studies (based on observational assessments), after which the comparison with the foster children is reported. We conclude with a broad-band meta-analytic approach of all adoption studies, using all types of measurements.

7.1. Secondary analyses

In order to compare the distributions of attachment classifications of adoptees with attachment distributions of normative, non-adopted children, the combined attachment distribution of the adopted sample was calculated. We collected all studies that used the SSP and reported on the ABCD-classification of adoptees (k=11 studies). For an overview of these studies, see Table 1. The distribution of attachment classification in normative samples is 62% secure 15% avoidant, 9% ambivalent, and 15% disorganized (Van IJzendoorn et al., 1999; N=2,104). The analyses revealed that the adopted children showed a significantly different distribution, χ^2 (3, N=2572)=106.41, p<.05. Adopted children showed fewer secure attachments, 47% secure, and more disorganized attachments, 31% disorganized, than non-adopted children (k=11, n=468 adopted children). It should be noted, however, that the adoptees compared favorably to children in institutional care regarding disorganized attachment and secure attachment (see Introduction; 73% disorganized and 11% secure, 2 studies, N=181; Vorria et al., 2003; Zeanah et al., 2005) (see Fig. 1). Based on these secondary analyses, which suggested that adoptees were more often disorganized and showed fewer secure attachments than their non-adopted counterparts, we examined the attachment relationships of adoptees in more depth in several meta-analyses.

7.2. Attachment security and disorganization of adoptees in the core set of studies

7.2.1. Attachment security

The core set consisted of 17 adoption studies measuring attachment security using the SSP or the AQS (reported in 13 publications; Table 1). Instead of using the classical SSP (Ainsworth et al., 1978), we also included studies that used the adapted SSP (see Method), such as the Cassidy–Marvin system, the Main–Cassidy system, and Crittenden's PAA. Before including these studies in the meta-analyses, we tested if including these measurements influenced the effect size of the total core set. The removal of the study using the Main–Cassidy system and the exclusion of the two studies using Crittenden's PAA,

Fig. 2. Risk of insecure attachment for adoptees placed before or after their first birthday (k=17).

Table 2
Attachment relationships of foster children vs. non-fostered comparisons

Source	Nf–Nc	Age at arrival, m	Age at study, y	Country of study	Measure (informant)	Core set (in)secure	Core set disorganized
Chew, 1998[a]	7–2516	≥12	0–4	USA	AQS (O)	Yes	No
	24–2516	≥12	0–4	USA	AQS (O)	Yes	No
Cole, 2005[a]	46–2104	<12	0–4	USA	SSP (O)	Yes	Yes
Dozier et al., 2001[a]	50–2104	<12	0–4	USA	SSP (O)	Yes	Yes
Lamb et al., 1985	6–6	<12	0–4	USA	Adapted SSP (O)	Yes	No
Oosterman, 2007[a]; Oosterman, & Schuengel, 2007	61–2516	≥12	4–12	Netherlands	AQS (O)	Yes	No
Ponciano, 2002[a]	49–2516	<12	0–4	USA	AQS (O)	Yes	No
	27–2516	≥12	0–4	USA	AQS (O)	Yes	No
Rodning et al., 1991[a]	11–2104	<12	0–4	USA	SSP (O)	Yes	Yes
	7–2104	<12	0–4	USA	SSP (O)	Yes	Yes
Swanson et al., 2000[a]	12–2104	<12	0–4	USA	SSP (O)	Yes	Yes

Note. Nf: number of foster children; Nc: number of non-fostered controls; n.r.: data were not reported; Age at arrival, m: Age at arrival in months; Age at study, y: Age at study in years; (O): Observer Report; AQS: Attachment Q-sort; SSP: Strange Situation Procedure.
[a] The children were compared with a normative distribution or normative score.

both individually resulted in a (minimal) change of 0.01 for both the normal and the adjusted effect size. As sufficient studies using the classical SSP and the Cassidy–Marvin system were present, we used a moderator-analysis to test for differences between the effect sizes of both types of measurements. No significant differences were found ($Q(1)=3.17$, $p>.05$). In the total set of adoption studies a modest but significant effect size was found ($d=0.34$, $CI=0.11–0.57$, $n=722$ adoptees) in a heterogeneous set of 17 studies (see Table 3). The funnel plot showed a publication bias. With the trim-and-fill procedure, five studies were trimmed and replaced, resulting in a non-significant adjusted effect of $d=0.20$ ($CI=-0.02–0.43$). This suggests that adopted children are as securely attached to their parents as non-adopted controls. The fail-safe number was $k=57$. The jackknife procedure yielded a similar point estimate and the same CIs.

Because of the heterogeneity of the set of studies, several moderators were tested. As only two adoption studies in the core set used the AQS, the contrast between AQS and SSP was not tested. However, the 85% CIs around the point estimate of both subsets did overlap, suggesting that no differences between the effect sizes of the subsets were present.

The difference between the effect sizes of the children adopted before and after 12 months of age was significant, $Q(1)=15.68$, $p<.01$ (see Fig. 2). Children who were adopted before 12 months of age showed secure attachments as often as non-adopted children ($d=0.08$, $CI=-0.09–0.25$, $n=524$ adoptees) in a homogeneous set of 12 studies. However, children adopted after 12 months of age showed significantly less attachment security than non-adopted children in a homogeneous set of 5 studies, $d=0.80$ ($CI=0.49–1.12$, $n=198$ adoptees). Continent of origin was not a significant moderator, $Q(1)=0.95$, $p>.05$ when all the European children were grouped together. However, when the Eastern European adoptees were analyzed separately, continent of origin was a significant moderator, $Q(1)=5.73$, $p<.05$. Asian adoptees showed the same level of attachment security as non-adopted children ($d=0.12$, $CI=-0.13–0.36$, $n=227$ adoptees) in a homogeneous set of 4 studies, while Eastern European adoptees showed less attachment security than non-adopted children ($d=0.58$, $CI=0.29–0.87$, $n=216$ adoptees) in a homogeneous set of 6 studies. The set of studies with children adopted from other European countries or from North America was too small to be included in the analyses. The other moderators, such as age at assessment, time in family, same- or transracial placement, international or domestic placement, publication outlet and year of publication were not significant.[1]

7.2.2. Attachment disorganization

We examined whether adopted children were more often classified as disorganized in the SSP than their non-adopted controls. Eleven studies reporting on the number of disorganized children were included (reported in 8 publications, see Table 1).

A significant positive effect size for disorganized attachment was found, $d=0.46$ ($CI=0.14–0.77$, $n=468$ adoptees) in a heterogeneous set of outcomes. The funnel plot showed some publication bias. With the trim-and-fill procedure 2 studies were trimmed and replaced, resulting in a significant adjusted effects of $d=0.36$ ($CI=0.04–0.68$). This means that more adopted children showed disorganized attachment compared to their non-adopted counterparts. No significant moderators or non-overlapping CIs were found. The fail-safe number was $k=42$. The point estimate and CIs computed with the jackknife procedure remained the same.[2]

7.3. Comparison with foster children

Eleven foster studies (reported in 8 publications; Table 2) measured attachment security using the SSP or the AQS. In this homogeneous set of 11 studies a non-significant effect size was found ($d=0.07$, $CI=-0.16–0.30$, $n=300$ foster children). A publication bias was indicated in the funnel plot. With the trim-and-fill procedure three studies were trimmed and replaced, resulting in a non-significant adjusted effects of respectively $d=-0.06$ ($CI=-0.27–0.15$). This means that the foster children are as securely attached to their foster parents as children reared in their biological family. This converges with the non-significant overall effect size found for the group of adoptees.

Five studies reported on the number of disorganized foster children (reported in 4 publications, see Table 2). For these studies an effect size comparable with that of the adopted children was found, $d=0.41$ ($CI=0.07–0.74$, $n=126$ foster children) in a homogenous set of outcomes. A publication bias was shown in the funnel plot. With the trim-and-fill procedure 2 studies were trimmed and replaced, resulting in a significant adjusted effects of $d=0.35$ ($CI=0.02–0.67$). This means that, again comparable with adoptees, the foster children showed more disorganized attachment compared to children reared by their biological parents. The fail-safe number was rather small, $k=5$. The combined effect size computed with the jackknife procedure became non-significant when the studies of Dozier et al. (2001) or Cole (2005) were removed, with adjusted effect sizes of respectively 0.30 ($CI=-0.10–0.71$) and 0.38 ($CI=-0.02–0.78$). The 85% CI intervals for both attachment security and disorganization in studies with adoptees versus foster children did overlap, indicating that adopted children have comparable rates of insecure and disorganized attachment as foster children.

[1] Tables with data not presented in the article may be requested from the authors.

[2] See footnote 1.

Table 3
Meta-analytic results[a] of the core set of studies comparing the security of attachment of adoptees with non-adopted controls

	k	*d*	Na	95% CI	*Q*	*Q* for contrast	*p*
Total set	17	0.34**	772	0.11–0.57	33.39**		
Sample characteristics							
Measurement						n.a.	
SSP/adapted SSP	15	0.31***	555	0.14–0.48	14.77		
AQS[b]	2	0.19	167	−0.40–0.78	16.29***		
Age arrival						15.68	.00
<12 months	12	0.08	524	−0.09–0.25	16.90		
>12 months	5	0.80***	198	0.49–1.12	0.81		
Age assessment						2.68	.10
0–4 years	10	0.18	450	−0.08–0.45	18.71*		
4–12 years[c]	7	0.55***	272	0.29–0.81	6.90		
Time in family						1.06	.59
0–12 months	6	0.13	220	−0.12–0.38	5.89		
13–24 months	4	0.53**	135	0.16–0.89	1.60		
25–74 months	7	0.34	367	−0.02–0.69	22.92**		
Placement						0.48	.49
Domestic	4	0.19	243	−0.26–0.64	16.59**		
International	11	0.32**	462	0.13–0.50	13.77		
Not reported[d]	1	0.90	11	−0.62–2.43			
Mixed[d]	1	0.73	6	−1.68–3.14			
Continent of origin						0.95	.62
Europe	9	0.42*	432	0.35–0.82	7.27		
Asia	4	0.12	227	−0.13–0.36	4.34		
North America[b]	2	0.37	46	−0.26–1.00	0.42		
Not reported[d]	2	0.86	17	−0.43–2.14	0.01		
Transracial placement				0.59	.44		
Yes	5	0.15	296	−0.09–0.38	5.27		
No	10	0.40*	459	0.09–0.70	26.18**		
Not reported[d]	2	0.86	17	−0.43–2.14	0.01		

Note. Na: Number of adoptees.
n.a.: not applicable; * $p<.05$; ** $p<.01$; *** $p<.001$.
[a] For trimmed effect sizes see Results section.
[b] Subsets with fewer than 4 studies were excluded from the contrast.
[c] The oldest children in the core set were 7 years of age (placed in the subset '4–12 years', see Method).
[d] Excluded from the contrast.

7.4. Attachment relationships of adoptees: broad-band approach

In the meta-analysis focusing on all types of measurements, 39 studies (reported in 31 publications, see Table 1) measuring the attachment relationship of adoptees were included. The comparison of the adoptees with the non-adopted controls showed a small but significant effect size ($d=0.24$, $CI=0.10–0.37$, $N=2912$ adoptees) in favor of the comparisons, see Table 3. However, the funnel plot showed a publication bias. With the trim-and-fill procedure eight studies were trimmed and replaced, resulting in a non-significant adjusted effect of $d=0.12$ ($CI=-0.02–0.26$). The fail-safe number was $k=230$. The point estimate and CIs computed with the jackknife procedure remained the same. To account for the heterogeneity of the studies in the subset, various moderators were tested. However, no significant moderators were found.[3]

8. Discussion

Because of the untoward early life experiences that many adopted children endured we expected fewer secure attachments and more attachment disorganization in adopted children compared to non-adopted children. Overall, the (trimmed) results of our meta-analyses of a core set of studies with observational attachment measures showed that adopted children were as securely attached as their non-adopted counterparts. However, children who were adopted after their first birthday showed significantly less attachment security than non-adopted children and this effect size was large. As hypothesized, we found more disorganized attachments among adopted children in the core set of studies. When studies using self-report measures, such as questionnaires and interviews, were added to the meta-analysis the effects were no longer significant. According to this broad-band meta-analytic approach adoptees had similar attachment relationships with their adoptive parents as their non-adopted counterparts. The broad-band meta-analysis did not reveal any influence of age at arrival. These results suggest that self-report measures may not be as sensitive as observational measures in revealing a clinically meaningful age effect.

8.1. Attachment disorganization

As expected, based on the presence of risk factors before the adoption, adopted children showed more disorganized attachment than non-adopted children. This finding may be explained by the children's experiences of maltreatment and neglect before their placement in an adoptive family. The findings for attachment disorganization were independent of age at placement: Both early and later placed adoptees showed more disorganized attachments. This outcome converges with Dozier and Rutter's (2008) suggestion, that children are particularly vulnerable for caregiving experiences during their first year of life. Experiences of maltreatment, deprivation and neglect during the infant's first weeks or months may have long-lasting consequences for the development of the *organization* of attachment. Thus, not only adoptees placed after their first birthday, but also adoptees who have experienced adverse conditions only during their first months of life may be more prone to develop disorganized attachments. Besides institutionalized children, the best comparison group of biological parent–child dyads may be maltreated children whose attachment is assessed around their first birthday. Researchers studied maltreated children as young as 13 months of age and found high rates of disorganized attachment: 82% to 93% (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Cicchetti, Rogosch, & Toth, 2006). The overrepresentation of disorganized attachments in maltreated children converges with the high rates of disorganized attachments in institutionalized children (Vorria et al., 2003; Zeanah et al., 2005). Contrasting the findings on disorganized attachment of maltreated and institutionalized children (73% to 93%) with our meta-analytic findings for adopted children (31% disorganized attachment) suggests that adopted children show an impressive although incomplete catch-up after their placement (31% vs. 15% in normative groups).

8.2. Moderators of attachment security and disorganization

Few of the potential moderators appeared to make a significant difference for attachment security and disorganization. Study characteristics such as publication outlet, year of publication, and continent of study were not associated with any of the effect sizes. We did find that Eastern European children were less often securely attached than Asian adoptees. As Eastern European children are suggested to have experienced the most severe deprivation (e.g., Miller, 2005; Rutter et al., 2004), which may negatively influence the development of new attachment relationships after placement, this outcome was expected. Unfortunately, we were not able to study the influence of continent of origin in combination with the influence of age at placement and thereby disentangle the influences of both moderators, as all Asian children were placed before their first birthday.

Although for example Rosenthal, Groze, Curiel, and Westcott (1991) and Singer, Brodzinsky, Ramsay, Steir and Waters (1985) reported fewer positive parent–child relationships in transracial adoptees compared to same-race adoptees, we did not replicate these results. Attachment findings were independent of type of placement – domestic or international – and same-race or transracial placements. However, as Rosenthal et al. (1991) primarily attributed the differences to differing characteristics at adoptive placement, and

[3] See footnote 1.

Singer et al.'s (1985) study was based on a small sample size (n = 19 transracially adopted infants), the results of the meta-analysis are not unexpected. The fact that parents and children do not share the same race or the same country of origin may not be essential for the development of new attachment relationships. The (changed) environment provided by the parents is probably of more significance. In the same vein, similarities between same-race and transracial adoptees have been found in a meta-analysis on self-esteem (Juffer & Van IJzendoorn, 2007).

Age at assessment and time in the family were not significant moderators either. We had hypothesized that children would need some time before they could profit from the new family environment. However, as all but one of the studies examining children who had lived in their adoptive family for less than a year reported on children who had lived with their new family for at least eight months, these results are not that surprising. Eight months may be sufficient time to develop a secure attachment relationship with the new parents. Moreover, with the exception of one study, all studies examining children who had lived in their adoptive family for less than a year reported on early placed children, who are expected to develop secure attachment relationships as often as non-adopted children. In the same vein, Stovall-McClough and Dozier (2004) reported that early placed foster children already began to show secure attachment behaviors within the first two months of their placement.

As expected, age at placement was a significant moderator for attachment security in adoptees, with early placed adoptees showing secure attachments as often as non-adopted children. Children who are placed before their first birthday may have experienced deprivation for shorter periods of time than later placed adoptees, resulting in a more normative development of attachment relationships (Bowlby, 1982). Alternatively, it may be easier for early placed children to become securely attached because they are placed with new parents and receive sensitive care in a stage when attachment is still developing (Ainsworth et al., 1978; Bowlby, 1982). It may be easier to *prevent* insecure attachment than to *change* insecure attachment.

8.3. Comparison with foster children

To compare adoptees with foster children we conducted additional meta-analyses for foster children's attachment security and disorganization. The effect sizes for attachment security of the adopted and foster children were comparable, as were the effect sizes for attachment disorganization (adoptees, d = 0.36; foster children, d = 0.35). As mentioned above, the high rate of disorganized attachment of the adopted children may be explained by the influence of the adverse circumstances these children experienced before their placement. The same might be true for the foster children, as many of them have also experienced maltreatment and/or neglect before placement (e.g., Chernoff et al., 1994).

8.4. Limitations

Although publication bias was present in all sets of studies, most effect sizes remained significant after correction for such a bias through the trim-and-fill procedure. The effect size for the total set of studies on attachment relationships was small before trimming (d = 0.24), and lost its significance after trimming. Similarly, in the core set, the effect size for attachment security in the adoptive group was not significant after trimming. The fact that studies had to be trimmed and filled may point to a file-drawer problem (Mullen, 1989), suggesting that non-significant results in this field are not published as much as significant outcomes. Rosenthal (1991, p. 106) suggested that a fail-safe number of $5k + 10$ (k = number of studies included) is a general criterion for robustness. This criterion was not achieved for any of the sets, suggesting that the outcomes of our meta-analyses must be interpreted with some caution.

Foster care arrangements may differ in the USA and Europe (for example offering adoption from foster care or not; Jones, 2008; Warman & Roberts, 2003). One of the limitations of our meta-analyses is that only one of the foster care studies was conducted outside of the USA (Oosterman, 2007). With the jackknife procedure (see Method) the meta-analytic outcomes were similar when this specific foster care study was removed from the analyses.

Because a relatively limited number of studies were available for our meta-analysis, we could only examine broad categories – for example, continents of origin instead of separate countries – and within the broad categories contrasting study outcomes may remain hidden until more primary studies become available. A risk factor like deprivation or pre-placement adversity is an important predictor of child development. Unfortunately, this moderator could not be included in the meta-analyses since in many studies insufficient information about the care background of the children was reported. Moreover, important details of the children's caregiving history could not be taken into account because they were unknown in many studies (e.g., number of placements). Similarly, we could not include adoptive parents' sensitivity or parenting behavior, or their attachment representation.

In our meta-analyses we have compared children adopted before and after one year of age. It would be interesting to distinguish more subgroups, for example children adopted between one and two years of age, and children adopted after two years of age. Unfortunately, the set of observational studies including children adopted after their first birthday was too small to conduct this analysis.

8.5. Clinical implications

Interventions in adoptive families may be needed to support parents' sensitivity and enhance adopted children's attachment security (Juffer et al., 2008). A meta-analysis of intervention studies showed that interventions that successfully increase parental sensitivity are also successful in enhancing attachment security. Furthermore, a dose–response relation was revealed: interventions with larger effects on sensitivity resulted in larger effects on attachment security (Bakermans-Kranenburg et al., 2003). An intervention aimed at promoting adoptive parents' sensitivity not only resulted in increased maternal sensitivity but also in a reduced number of disorganized attachments (Juffer et al., 2005). However, the children in this study were placed at a very early age (M = 10 weeks) and we do not know whether these findings can be generalized to (somewhat) older placed children. Comparably, Stovall and Dozier (2000), using detailed diaries to study the development of attachment in foster children, concluded that foster parents of late placed foster children not only need to be sensitive to promote secure attachments, but also need to provide 'therapeutic caregiving' by challenging the foster children's alienating behavior. Promising intervention studies in foster families targeting children's attachment behavior as well as their biobehavioral stress regulation point to positive effects on attachment security and neurobiological adaptation (Dozier, 2003; Dozier, Albus, Fisher, & Sepulveda, 2002; Dozier, Higley, Albus, & Nutter, 2002; Fisher, Gunnar, Dozier, Bruce, & Pears, 2006). Further research on the influence of parenting behavior on children's attachment behavior after the adoptive placement may reveal new insights into how adopted children become securely attached. In addition, intervention studies with adoptive families may show how insecure attachment strategies can be changed, how long this process usually takes and which behavioral and neurobiological mechanisms can be held responsible for recovery.

9. Conclusion

In conclusion, this meta-analysis suggests that adopted children can overcome early adversity and risks and form secure attachments

as often as their normative counterparts. The same was true of foster children. These outcomes lend support to Bowlby's (1952, 1988) hypothesis that corrective attachment experiences may enhance attachment security. But this catch-up is not without limits: Children who are adopted after their first birthday are less capable of developing secure attachments. Moreover, the adoptees show disorganized attachments more often than their normative peers, and again we found comparable outcomes in foster children. Adopted children are however considerably less often disorganized than institutionalized children (Vorria et al., 2003; Zeanah et al., 2005). Therefore, adoption may be seen as an effective intervention (Juffer & Van IJzendoorn, 2006), offering children who lack the care of their birth parents the chance to develop more secure attachment relationships.

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