

Security of Children's Relationships With Nonparental Care Providers: A Meta-Analysis

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Meta-analysis aggregated results of 40 investigations involving 2,867 children who averaged 29.6 ($SD = 8.6$) months of age when their attachments to care providers were assessed using either the Strange Situation (SS) or the Attachment Q-Set (AQS). As opposed to parents, secure attachments to nonparental care providers were less likely (using SS) or equally likely (using AQS), respectively. Secure child-care provider attachments were more likely in home- than center-based care, when the children were assessed longer after enrollment, and when they were girls. Whereas care providers' sensitivity to individual children predicted attachment security only in the small groups that characterize home-based settings, group-related sensitivity was a reliable predictor of secure child-care provider attachment, especially in child care centers.

The physical quality of child care facilities and its variations by child-adult ratios, levels of training, and staff stability largely affect children's development through their impact on care provider responsiveness and the quality of interactions and relationships with providers (Lamb & Ahnert, 2006; NICHD Early Child Care Research Network, 2000, 2002). Individualized relationships and affectional attachments not only play central roles in the development of social identity and sociability (Thompson, 1993), but are also vehicles by which education is accomplished and children's learning processes are mediated (Vygotsky, 1978). Children who believe in their own abilities and are interested in what they are learning from the curricula are much more likely to do well when they face intellectual challenges (OECD, 2004). Although research on children in out-of-home care settings has expanded significantly in recent years (Lamb & Ahnert, 2006), we still do not know much about children's relationships with nonparental care providers. Using meta-analysis, we thus attempted to summarize the extant data of this topic, aggregating across small samples in order to minimize between-

study variability and identifying key questions that should be the focus of research in the future.

Because differences in parental responsiveness affect the security of child-parent attachments (De-Wolf & van IJzendoorn, 1997), researchers have emphasized similarities between the features of care provided by parents and nonparental providers despite the unique roles and responsibilities of care providers supervising children in groups (Howes, 1999). As with their parents, young children indeed seek proximity and reassurance, especially from familiar nonparental providers, when they are distressed (Barnas & Cummings, 1994; Cummings, 1980; Farran & Ramey, 1977; Fox, 1977). Seeking clearer insight into these attachment-like phenomena, investigators later used the Strange Situation (SS: Ainsworth, Blehar, Waters, & Wall, 1978) or the Attachment Q-Set (AQS: Waters, 1995; Waters & Deane, 1985) to assess the security of children's relationships with nonparental care providers. Using these measures, some researchers found that children were as likely to develop secure attachments to care providers as to parents and that the security of these relationships was often concordant (e.g., Ainslie, 1990; Goossens & von IJzendoorn, 1990). Other researchers, however, reported that secure child-care provider attachments were less common than secure child-parent attachments and that children who were securely attached to their parents

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did not necessarily develop secure attachments to their care providers (e.g., Ahnert & Lamb, 2000; Ahnert, Lamb, & Seltenheim, 2000; Rottmann & Ziegenhain, 1988; Sagi et al., 1985, 1995). Similarly, the security of infant–mother and infant–father attachment often differs, suggesting that attachments to the two parents are shaped by specific interactional histories (Grossmann et al., 2002) even though the relationships develop interdependently (Fox, Kimmerly, & Schafer, 1991; see also van IJzendoorn & De Wolff, 1997).

Although it is widely believed that children’s relationships with nonparental care providers likewise reflect interactional histories, it is not clear whether internal working models developed in interaction with parents also affect attachments to nonparental providers (e.g., DeWolff & van IJzendoorn, 1998; van IJzendoorn, Sagi, & Lambermon, 1992). In the present study, we thus aimed to determine how commonly attachments between children and care providers are secure, how frequently the security of these relationships matches the security of these children’s attachments to their parents, and how interactional histories shape the security of attachments between children and their child care providers. Whereas Goossens and van IJzendoorn (1990) argued that, as with mother–child dyads, the security of attachments to care providers depends on the sensitivity of care providers toward individual children, other researchers have found no associations between measures of the care providers’ behavior and attachment security (e.g., Rottmann & Ziegenhain, 1988). Moreover, children in a group tend to develop relationships with their shared care providers that are of similar quality (Sagi et al., 1985, 1995) and the security of child–care provider attachment remains the same even when care providers change (Howes, Galinsky, & Kontos, 1998). The latter findings both suggest that attachment security is shaped primarily by group-directed rather than individual-focused behavior, with relationships between care providers and children reflecting group dynamics rather than the dynamics of individual dyads (Ahnert & Lamb, 2000; Ahnert et al., 2000). For this reason, we explored whether measures of group-directed behavior were more strongly associated with the security of children’s relationships in child care than were measures of the care providers’ behavior with individuals.

Highly trained care providers can appear even more sensitive than mothers in one-on-one free play situations (Goossens & van IJzendoorn, 1990), but dyadic sensitivity necessarily decreases in group care settings because care providers have to divide

their attention among multiple children (e.g., Goossens & Melhuish, 1996). We therefore hypothesized that if the security of child–care provider attachment was a function of the care providers’ individual-focused behavior, group size (or child–adult ratio) should moderate the security of children’s relationships. If the security of child–care provider attachment was determined by the providers’ group-directed behavior, however, group characteristics with respect to function and dynamics should affect the security of the children’s attachments.

Contemporary research on early peer groups suggests that, after toddlerhood, children are increasingly able to build relationships with peers and integrate themselves into peer groups. This opens up social worlds that offer different social experiences than adults do (Hartup & Moore, 1990). Early peer groups are gender segregated (e.g., Howes, 1988; Maccoby, 1998) and their qualities are shaped by gender-oriented behaviors as well as by past social experiences such as family backgrounds (Calkins, Gill, & Williford, 1999; Fabes et al., 1999; Farver & Branstetter, 1994; Klimes Dougan & Kistner, 1990) and histories of child care (Andersson, 1992; Field, 1991). If those factors shape care providers’ behaviors and thus the ground on which child–care provider relationships are built, children’s age and gender, social status, age at enrollment, and time post entry must affect the security of children’s relationships with their care providers. Howes and Smith (1995) found, for example, that secure child–care provider attachments became less likely as children grew older, perhaps because children find interactions with peers increasingly more interesting and rewarding than relationships with care providers. In the same study, girls were more likely to form secure relationships to their care providers than boys were. Because most care providers are female, gender-biased behaviors might lead them to interact more in line with girls’ expectations of adequate interactions (e.g., Leaper, 2002), thereby ensuring that girls form secure attachments more readily than boys do. In child care settings, however, this process could even be amplified by gender-based subgroup structures. Other researchers have shown that children from more socioeconomically advantaged families display more responsive and less conflicted social behaviors and thus adjust to relationships with care providers more easily than less advantaged children do (e.g., Elicker, Fortner-Wood, & Noppe, 1999). In addition, children might need sufficient opportunities to develop focused and specific relationships with care providers and thus form secure relation-

ships more readily if they start child care earlier and/or have been able to consolidate relationships for a longer time (e.g., Elicker et al., 1999; Matheson, 1992). We thus expected to find in the meta-analysis that secure child-care provider attachments would be more common if children were younger, were girls, had more advantaged socioeconomic status (SES) backgrounds, and/or were enrolled in child care earlier and for longer before assessment.

Many of these factors, however, are interrelated because parents select specific types of out-of-home care arrangements, perhaps emphasizing health and safety rather than educational curricula and programs when children are very young, for example (Britner & Phillips, 1995; Cryer & Burchinal, 1997). In their pursuit of individualized care by stable providers, parents of younger children tend to favor home over center-based child care arrangements that involve more diverse ages and group sizes as well as more care providers. In the present meta-analysis, we thus compared home- and center-based care facilities, hypothesizing that home-based care arrangements, involving younger children in smaller groups, might foster dyadic sensitivity, and therefore secure child-care provider attachments, more effectively than center-based facilities do.

Studies included in this meta-analysis relied upon two measures to assess child-care provider attachments: the SS and AQS. Although scores on the two measures are highly correlated (Sagi et al., 1995), they capture different aspects of relationships and involve different methodological approaches. Specifically, SS emphasizes the reliability with which adults provide security when children are distressed, whereas AQS explores supportive adult-child interactions in a variety of everyday situations. It is not clear whether either is more sensitive than the other to individual differences in the quality of child-care provider attachments or to the differences between child-parent and child-care provider attachments. Proponents of SS emphasize the narrow focus on children being consoled when distressed and feeling safe when protected by attachment figures because these are the hallmarks of attachment (Ainsworth et al., 1978; Lamb, Thompson, Gardner, & Charnov, 1985). Other researchers favor AQS because it examines attachment behaviors in diverse situations, and includes observations of attachment behaviors by children seeking and receiving positive attention, receiving support for exploration, and accepting assistance (Waters, 1995). Use of the SS involves judgments by highly trained raters who assess dyadic behavior in a brief laboratory procedure using a small number of discrete categories (Ainsworth

et al., 1978). By contrast, the AQS depends on time-consuming observations by trained observers who follow the child and make a number of ratings that are combined to yield a continuous measure of attachment security (Waters, 1995). Because most researchers use only one of these measures, we sought in the present meta-analysis to determine whether differences in the conceptual foci and methodological approaches were associated with systematic variations in the results obtained. We expected that the AQS might represent individual differences in children's relationships with their care providers better than the SS because the AQS is less situation specific. Finally, because the AQS was developed later than the SS, and the number of recognized SS categories has expanded over time as researchers have identified disorganized attachments and observed that some children appear unattached to specific individuals (Ahnert & Lamb, 2000; Ahnert et al., 2000; Main & Solomon, 1990), we also controlled in the analyses for the year of publication.

Method

Sample

Studies of child-care provider attachments were identified by searching electronic databases (PSY-CINFO, PSYINDEX; search terms: [care provider or caretaker or caregiver or child care] and attachment and [infant or child]), cross-referencing, browsing through library shelves, and pursuing referrals by researchers whom we contacted. The search retrieved articles from 1977 and continued until November 2005. We included all the studies we located, except one German study involving a clinical sample and two studies conducted by Howes and colleagues reporting data also reported in other publications that were included. Of the 24 reports identified, 1 was in German, 1 was in Italian, 1 was in Portuguese, and 21 were in English. Eighteen of the reports were journal articles, 3 were book chapters, and 3 were unpublished manuscripts. The reports described 40 investigations conducted between 1977 and 2003 (11 involved later observations of children who had also been studied earlier). The samples included 2,867 children averaging 29.6 months of age ($SD = 8.6$ months); 49.5% of the children were girls and 53.7% were firstborns. Time post enrollment averaged 8.3 months ($SD = 4.9$). Of the 40 investigations, 23 involved children in child care centers (including 5 studies in which the centers were on kibbutzim), 5 sampled children in home-based child care settings, and the remaining 12 included children

in both home- and center-based settings, although most of the children were in centers.

Demographic information about the various samples was not systematically reported but the children's socioeconomic backgrounds were quite diverse. Parents were heterogeneous with respect to ethnicity, educational level, SES, and family structure regardless of whether they made use of home-based care (e.g., Elicker et al., 1999) or center-based care (e.g., Mitchell-Copeland, 1996). Both upper-middle-class White families with high educational levels and less-educated African-American families were involved (e.g., Howes & Hamilton, 1992; Howes & Segal, 1993). Care providers in home-based settings were mainly registered and licensed (Elicker et al., 1999) and center-based care facilities provided care that ranged from excellent (e.g., Howes & Oldham, 2001) to bad (e.g., Howes & Smith, 1995). Overall, the research involved care of varied quality provided for children from diverse backgrounds.

Measures

Attachment security. In 11 investigations, child-care provider as well as child-mother (and, in some cases, child-father) attachments were assessed using SS (Ainsworth et al., 1978) or similar observational measures of separation-reunion sequences. The classification of attachment as either secure or insecure was made using videotapes, which made it possible to ensure that interrater reliability remained high. AQS (Waters, 1995; Waters & Deane, 1985) was used in 27 investigations. Ratings were typically made by observers (not by the care providers involved) who observed the child-care provider interactions for at least 2 hr. Reliability checks were made by repeated observations. Two investigations included both SS and AQS (see the Measure column in Appendix A).

SS was never used to study child-care provider relationships in home-based care facilities, whereas AQS was used to explore children's relationships in center-based and home-based care. The concordance between the security of child-care provider and child-parent attachment in 17 of the AQS-based studies was presented in the form of cross-tabled information (SS) or correlation coefficients (AQS). To assess differences between categorical SS and continuous AQS measures, we also converted the continuous AQS scores into categorical assignments as suggested by Howes, Rodning, Galluzzo, and Myers (1990), with AQS values $> .33$ deemed secure and AQS values $< .33$ deemed insecure. In six studies, child-parent attachments were not studied, al-

though the researchers provided information about factors that might influence the security of child-care provider attachments.

Care provider behaviors. Almost 50% of the investigations included measures of care provider behavior using one or more of six measures: (1) Ainsworth, Bell, & Stayton (1974) *Sensitivity Scale*, which focuses on the promptness and adequacy of responses to individual children; (2) *Responsive Score*, which quantifies the percentage of intervals in which adults responded to children's social bids in responsive, elaborative, or intense ways (Howes & Smith, 1995); (3) *Level of Negative Adult Responses*, which assesses negative care provider behavior toward individual children in terms of the amount of *ignoring or harsh responses* (Howes, Rodning, Galluzzo, & Myers, 1990; Howes, Hamilton, & Philipson, 1998); (4) the *Empathy* (positive relationship) subscale of the *Global Rating Scale of Caregiver Behavior* (Ahnert et al., 2000; Arnett, 1989); (5) the *Involvement Score* (Andersson, Nagle, Roberts, & Smith, 1981); and (6) the *Adult Involvement Scale* (Howes & Stewart, 1987), which is used to indicate such behaviors as attentiveness to the group and the extensiveness of responses to children's social bids. Working independently, three developmental psychologists (including the first author) who had at least master's degrees in psychology judged whether these measures were best characterized as indices of individual or group-focused behavior (see Table 1). Their agreement was extremely high ($\kappa = .86$) and disagreement was discussed until agreement was reached. Scales (1), (2), and (3) were deemed to measure dyadic sensitivity, whereas scales (4), (5), and (6) were deemed to measure group-focused sensitivity. Dyadic sensitivity was defined as one-on-one positive caregiving behavior providing prompt and adequate responses to individual needs (Ainsworth et al., 1974). In contrast, group-focused sensitivity was defined by the care providers' child-oriented attitudes and the amounts of time they spent in positive proximate interactions with children while supervising the entire group (see the Group-level and Dyadic-level sensitivity columns in the Appendix A).

Child characteristics and context variables. Information was available concerning each sample and care environment studied, although individual level information was often missing. Child-care provider attachment security was correlated with the children's *ages* in 5 studies, with the children's *gender* in 5 studies, with *parental SES* in 6 studies, and with the *time* since enrollment in 10 studies. The majority of the studies only provided summary information

Table 1
Measures of Care Provider Behavior

Author	N	Age	Group-level sensitivity	Dyadic-level sensitivity
Ahnert et al. (2000)	40	15	<i>Empathy Scale</i>	<i>Sensitivity Scale</i>
Ahnert and Lamb (2000)	64	12	<i>Empathy Scale</i>	<i>Sensitivity Scale</i>
Andersson et al. (1981)	35	31	<i>Involvement Score</i>	
Elicker et al. (1999)	41	15	<i>Adult Involvement Scale</i>	
Elicker and Noppe (2000)	64	16	<i>Adult Involvement Scale</i>	
Goosens and van IJzendoorn (1990)	75	15		<i>Sensitivity Scale</i>
Howes and Hamilton (1992) Study 1, Waves 1 to 5	72–47	18–42	<i>Adult Involvement Scale</i>	
Howes and Oldham (2001)	10	21		<i>Sensitivity Scale</i>
Howes and Smith (1995) Subsample 1	840	34	<i>Adult Involvement Scale</i>	<i>Responsive Score</i>
Howes and Smith (1995) Subsample 2	357	34	<i>Adult Involvement Scale</i>	
Howes et al. (1998) Study 2, Waves 1 & 2	71 each	22–31	<i>Adult Involvement Scale</i>	<i>Harshness (reversed)</i>
Howes et al. (1998) Study 3, Waves 1 & 2	36 each	32–47	<i>Adult Involvement Scale</i>	<i>Harshness (reversed)</i>
Howes et al. (1990) Study 1	42	18	<i>Adult Involvement Scale</i>	<i>Ignorance (reversed)</i>
Howes et al. (1990) Study 2	60	19	<i>Adult Involvement Scale</i>	<i>Harshness (reversed)</i>
Rottmann and Ziegenhain (1988), see Ahnert and Lamb (2001)	31	19		<i>Sensitivity Scale</i>

N = sample size; Age = child age averaged (in months).

about the children's *child care history* (continued or disrupted/changed), *child–adult ratios* (the number of children per care provider), and *group size* (see relevant columns in the Appendix A).

Data Structure and Statistical Preparation

The first part of the data set for the present meta-analysis contained basic data, such as author(s), year of publication, study design characteristics (e.g., numbers of investigations and repetitions), sample sizes, type of care environments explored, and type of procedure used to measure attachment. The second part of the data set included information about the children's attachments in either categorical (SS) or continuous (AQS) form, and the relative frequency of secure attachment was weighted by sample size. Standardized *differences* between child–mother/father attachment and child–care provider attachments (d_{m_c} , d_{f_c}) were based on the percentages obtained from the SS or the means obtained from the AQS as suggested by Rosenthal (1991). We also recorded correlations (r_{m_c} , r_{f_c}) between child–mother/father attachment and child–care provider attachments as noted in the original papers or used reports of concordance/discordance to compute these correlations. The third part of the data set contained measures of associations between child–care provider attachments and measures of the care providers' dyadic or group-related sensitivity, time since enrollment, group size, child–adult ratio, and the children's personal characteristics such as age, gender, SES, and child care history (see Appendix

A). Means and standard deviations, χ^2 , or *F* values were also converted into standardized differences or correlation coefficients representing these associations when coefficients were not provided by the original researchers. When the same children were assessed on multiple occasions (e.g., in longitudinal studies) or were assessed using multiple measures (e.g., by two different attachment assessments), the measures were averaged across measurements.

Data Aggregation and Statistical Analysis

Dates of assessment varied greatly, and because these were associated with differences in the tendency to report frequencies, scores/values, and correlations, three different types of statistical analyses had to be used: Mantel–Haenszel χ^2 statistics (Fleiss, 1981; Shadish & Haddock, 1994), correlational statistics as recommended by Rosenthal (1991), and multiple linear regressions by Hedges (1994). In order to determine whether frequencies of secure attachments with parents and caregivers varied across the studies, we computed odds ratios, based on Mantel–Haenszel χ^2 statistics. Analyses of correlations between children's attachments and measures of the care providers' behavior or child and context characteristics were performed as recommended by Rosenthal (1991) with correlations first transformed using Fisher's *r* to *z* transformation and the mean *z*s then weighted by sample size $N - 3$. Because Rosenthal did not discuss the computation of confidence intervals (CIs), we used a formula suggested by Bushman and Wang (1995) to compute 95% CIs for

the mean correlations, $r \pm 1.96/\sqrt{(N-3k)}$ with N the sum of participants and k the number of investigations. Because studies using SS dichotomized attachment security (secure vs. insecure) usually underestimate correlational coefficients, these correlations were corrected before entering into analysis, as suggested by Hunter and Schmidt (1990).

In order to compare mean effect sizes with the effect sizes obtained in individual studies, mean effect sizes, z s, and CIs were later converted into an original metric of product-moment correlations. To assess the significance of mean effect sizes, z s, we computed unit-normal distributed Z s by dividing the sum of the weighted z values by the square root of the overall sample size. A χ^2 measure was used to test the homogeneity of the effect sizes, based on the squared deviations of the individual effect sizes from the overall mean, weighted by sample size. Significant χ^2 values indicated that effect sizes were heterogeneous even though we examined moderator variables that might explain the observed heterogeneity of effect sizes (Rosenthal, 1991). In order to assess the practical significance of the correlations, we computed the Binomial Effect Size Display (BESD), as described by Rosenthal (1991). If the distribution of the correlated variables (e.g., AQS and child's age) is subjected to a median split, the BESD indicates the percentage of children with above-average attachment security in the group with above-average levels on the second variable. In the case of significant correlations, we also computed the fail-safe N , which indicates the number of additional nonsignificant studies that would be needed to make a previously significant result no longer statistically significant. Finally, in order to test the simultaneous impact of some variables on child-care provider attachment security, we used weighted multiple linear regression analyses, following the approach outlined by Hedges (1994). Squared partial correla-

tions (η^2) served to estimate effect sizes for the individual variables.

Results

Security of Attachment to Care Providers and Parents

As shown in Table 2, 42% of the children were securely attached to their care providers whereas 60.2% and 66.2% were securely attached to their mothers and fathers, respectively, suggesting that secure child-care provider attachments seem to be less common than secure child-parent relationships. Mantel-Haenszel odds ratios (ORs) indicated that the children were significantly more likely to form secure attachments to their mothers (OR = 1.50, CI = 1.26-1.78, $Z = 4.55$, $p < .001$) and fathers (OR = 1.49, CI = 1.07-2.08, $Z = 4.23$, $p < .05$) than to their care providers. As indicated by the lack of overlap between the CIs, the ORs did not differ depending on whether attachments to mothers or fathers served as the reference group. This suggests significant discordance between the security of the child-parent and child-care provider attachments. The security of attachments to care providers and parents were, however, significantly correlated ($r = .14$, $Z = 3.81$, $p < .001$, with $k = 22$, $N = 733$ for child-mother, and $r = .35$, $Z = 4.36$, $p < .001$, with $k = 2$, $N = 159$ for child-father), suggesting some interdependence. By Cohen's (1992) criteria, however, these correlations were small to moderate. The BESD indicated that, in the group with above-average attachment security to mothers, 57% of the children would have above-average attachment security to care providers, as compared with 43% of children in the group with below-average attachment security to mothers. The numbers for fathers were 67.5% and 32.5%, respectively. Fail-safe N s indicated that 17 (attachment to mothers) and 9

Table 2

Likelihood of Secure and Insecure Attachments to Care Providers, Mothers, and Fathers

	Secure attachments (%)	Insecure attachments (%)
Child-care provider attachments assessed ($k = 39$; $N = 2,628$)		
Care providers	42.1	57.9
Linked assessments of child-care provider and child-mother attachments ($k = 25$; $N = 1,049$)		
Care providers	50.2	49.8
Mothers	60.2	39.8
Linked assessments of child-care provider and child-father attachments ($k = 8$; $N = 290$)		
Care providers	54.0	46.0
Fathers	66.2	33.8

k = number of investigations; N = number of participants.

(attachment to fathers) nonsignificant studies would be needed to eliminate these statistically significant correlations. Most importantly, however, there was a confound between measurement instrument (SS vs. AQS) and type of care environment (home- vs. center-based care) because no study of home-based care used the SS. We thus tested whether the observed difference between AQS and SS would also be found in the larger subsample (center-based studies). Children were more likely to be securely attached to their mothers than to their care providers when the SS was used (OR = 2.93, $Z = 3.93$, $p < .001$) but not when the AQS was used (OR = 1.13, $Z = .46$, *ns*).

Predicting the Security of Child-Care Provider Attachments

We first explored whether care providers' individual-focused or group-oriented behaviors were significantly associated with levels of child-care provider attachment security. Most interestingly, the care providers' group-related sensitivity was significantly associated with the security of attachment whereas their dyadic sensitivity was not (see Table 3). We further predicted that the younger the children, the more likely it would be that their relationships with care providers would be secure, that female gender and higher SES would be associated with a higher probability of secure relationships, and that the earlier the children were enrolled and the longer they spent in care, the more likely they were to be securely attached to the care provider. As Table 3 shows, age, gender, and parental SES were significantly correlated with the security of attachment, with girls, young children, children from higher socioeconomic backgrounds, and children who had

attended child care longer more likely to form secure relationships with their providers. By Cohen's (1992) criteria, however, these associations were small, and associations with age at enrollment were not statistically significant.

Because all of the significant correlations with attachment security (except child gender) were heterogeneous, we identified the children's child-care history as an important moderator variable, distinguishing between associations involving children who had remained in the same care setting (continuous histories) as opposed to those who had changed their arrangements (discontinuous histories). More specifically, associations between group-related sensitivity and children's secure attachments to care providers were stronger in studies of children with continuous, $r = .37$, 95% CI .27-.47, $Z = 5.87$, $p < .001$, $k = 7$, $N = 267$, $\chi^2(6) = 3.91$, *ns*, rather than discontinuous, $r = .11$, CI .07-.16, $Z = 4.30$, $p < .001$, $k = 6$, $N = 1,597$, $\chi^2(10) = 12.44$, *ns*, child care histories. With regard to child age, there were negative associations with attachment security among children with discontinuous, $r = -.32$, CI $-.37$ to $-.27$, $Z = -5.30$, $p < .001$, $k = 3$, $N = 1,414$, $\chi^2(2) = 5.30$, *ns*, but no significant associations among those with continuous, $r = .08$, CI $-.06$ to $.20$, $Z = 1.07$, $k = 4$, $N = 225$, $\chi^2(3) = 3.13$, *ns*, child care histories. In addition, time post entry was positively associated with the security of attachment to care providers among children with continuous, $r = .28$, CI .11-.45, $Z = 3.23$, $p < .001$, $k = 6$, $N = 151$, $\chi^2(5) = 2.26$, *ns*, but not with discontinuous, $r = .04$, CI $-.10$ to $.18$, $Z = 0.63$, $N = 222$, $\chi^2(5) = 19.71$, $p < .01$, child care histories. Heterogeneity in the associations between parental SES and attachment security occurred because the studies involved different types of care

Table 3
Correlates of Secure Child-Care Provider Attachments

Variables	<i>k</i>	<i>N</i>	<i>r</i>	95% confidence interval		<i>t</i>	Homogeneity of effect sizes	BESD	Fail-safe <i>N</i>	
Dyadic sensitivity of care provider	10	1,339	.04	-.01	.09	1.63	10.34	.52	.48	
Group-related sensitivity of care provider	11	1,880	.15	.10	.20	6.44***	33.12**	.57	.43	30
Child's age	7	1,639	-.26	-.31	-.21	-10.58***	43.21***	.37	.63	53
Child's female gender	5	1,569	.24	.19	.29	9.44***	4.65	.62	.38	61
Parental SES	6	2,99	.15	.03	.28	2.51**	12.16*	.575	.435	5
Age at enrollment	5	222	-.02	-.16	.12	-0.35	0.88	.49	.51	
Time post entry	10	408	.12	.02	.22	2.36*	35.03***	.56	.44	13

k = number of investigations; *N* = number of participants; *r* = weighted mean effect size; SES = socioeconomic status; Homogeneity = significant values indicate that effect sizes were heterogeneous; BESD = Binomial Effect Size Display; Fail-safe *N* could only be computed for significant effect sizes.

* $p < .05$, ** $p < .01$, *** $p < .001$.

arrangements (home- vs. center-based care) and not because of the children's child care histories, which did not differ. In home-based care, there was a significant relationship between SES and attachment security, $r = .40$, CI .10–.70, $k = 2$, $Z = 2.59$, $p < .05$, whereas no such association was found when children attended child care centers, $r = .05$, CI $-.08$ to $.18$, $Z = 0.66$, $k = 4$, $N = 223$, $\chi^2(3) = 1.02$, *ns*.

Associations Between Security of Child–Care Provider Attachments and Care Provider Behaviors

To determine whether group size and child–adult ratio affected the associations between child–care provider attachment security and either group-related or dyadic sensitivity, four weighted simple linear regressions with group size and child–adult ratio as independent variables and either the attachment–group-related sensitivity correlation indexes (r_{group}) or the attachment–dyadic sensitivity correlation indexes (r_{dyadic}) as dependent variables were computed (all indexes are listed in the Appendix A). Up to 18 studies were available for these analyses, ensuring an adequate predictor-to-number of studies ratio (e.g., Hedges & Olkin, 1985; Shadish & Haddock, 1994). Group size ($B = -.02$, $\beta = -.41$, $Z = -2.22$, $p < .05$) and child–adult ratio ($B = -.01$, $\beta = -.55$, $Z = -2.10$, $p < .01$) significantly affected the associations between attachment and dyadic sensitivity but not the association between attachment and group-related sensitivity ($B = .01$, $\beta = .26$, $Z = 0.36$ and $B = -.02$, $\beta = -.25$, $Z = -0.33$, *ns*), suggesting that associations between child–care provider attachment security and dyadic sensitivity were evident only in small groups with low child–adult ratios (see Figure 1(a) and (b)).

Type of Care Environment, Assessment Procedures, and Year of Publication

In five weighted multiple linear regression analyses, we examined the associations between predictor variables such as type of care environment (home- vs. center-based or mixed care), the procedure used to assess attachment (AQS vs. SS), and the year of publication on the likelihood of attachment security to care providers, correlations between the security of child–mother and child–care provider attachment (r_{m_c}), concordance between the security of child–mother and child–care provider attachment (d_{m_c}), and correlations between care providers' dyadic or group-related sensitivity and the security of child–care provider attachment (Table 4). According to these analyses, secure attachments were

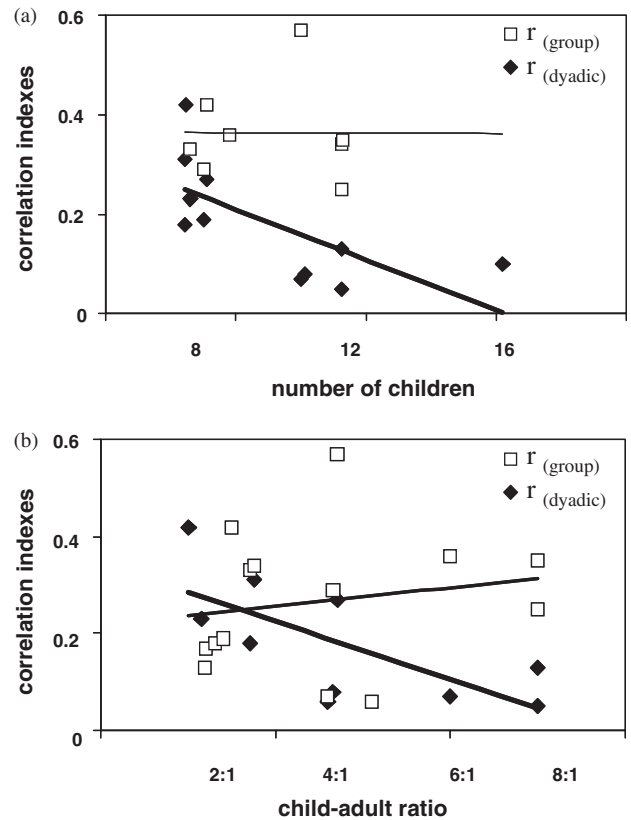


Figure 1. (a) Correlations between measures of child–care provider attachment security and care provider sensitivity (group-related vs. dyadic-related) as related to group size. (b) Correlations between measures of indexes of child–care provider attachment security and care provider sensitivity (group-related vs. dyadic-related) as related to child–adult ratio.

more common in earlier than later studies, and more frequent in home-based than in center-based/mixed care (see Table 4; first line). Because no studies in home-based care used the SS, however, and the observed difference between home- and center-based care might in part reflect differences in measurement strategies, we subsequently analyzed only studies in which the AQS was used. Here, too, we found that children were significantly more likely to be attached to their care provider in home-based care (59%) than in center-based/mixed care (39.8%; OR = 2.18, CI 1.51–3.14; $Z = 4.19$, $p < .001$). Consequently, type of care had an impact on the concordance of attachment security to mothers versus care providers in the present regression analyses, and this was stronger for children in home-based care than for children in centers; the concordance was also higher in studies using the AQS rather than the SS and higher in earlier than in recent studies (Table 4; second and third lines). (Similarly, the concordance between the security of child–father and child–care provider

Table 4
Multiple Linear Regression Analyses

	Center- vs. home-based				SS vs. AQS				Year of publication				(Constant)			
	κ	B	β	t	η^2	B	β	t	η^2	B	β	t	η^2	B	t	R ²
Likelihood of secure attachment to care provider	22	.20	.31	2.58**	.10	-.06	-.15	-1.05	.00	-.01	-.34	-2.32*	.04	21.82	2.37*	.14
Correlations between child–mother and child–care provider attachment security ($r_{m,c}$)	15	-.20	-.23	-1.19	.05	-.09	-.26	-1.29	.06	.01	.20	0.99	.04	-13.68	-0.98	.15
Concordance between child–mother and child–care provider attachment security ($d_{m,c}$)	17	-.48	-.76	-3.66***	.18	-.39	-.76	-3.64***	.18	.02	.39	2.25*	.05	35.58	2.23*	.40
Correlations between care providers’ dyadic sensitivity and child–care provider attachment security	10	-.15	-.61	-2.16*	.35	-.04	-.13	-0.44	.01	.01	.35	1.17	.09	-27.29	-1.17	.45
Correlations between care providers’ group-related sensitivity and child–care provider attachment security	12	-.08	-.30	-1.96*	.08	-.28	-.54	-3.17**	.23	-.00	.09	0.55	.01	-8.10	-0.55	.31

Note. Home-based care was coded as 1 and center-based/mixed care as 0; Attachment Q-Set (AQS) was coded as 1 and Strange Situation (SS) as 0. η^2 (squared partial correlations) = representing variance explained as part of total variance by individual variable. * $p < .05$, ** $p < .01$, *** $p < .001$.

attachments was higher when the AQS rather than the SS was used to measure attachment ($B = .25$, $\beta = .68$, $Z = 3.92$, $p < .001$), although there were no relevant studies in which children from home-based care facilities were sampled.)

Correlations of the security of attachment with the care providers’ dyadic and group-related sensitivity were stronger in studies of home-based/mixed care than center-based care. By contrast, correlations between child–care provider attachment security and care providers’ group-related but not dyadic sensitivity were stronger when the SS rather than the AQS was used (Table 4; fourth and fifth lines). Inadequate amounts of these data were available for analysis, however, precluding further examination of the association between measurement instrument (SS vs. AQS) and type of care environment (home- vs. center-based care).

Discussion

There is a growing literature concerned with the impact of relationships between young children and their nonparental care providers on children’s later behavioral and socioemotional functioning (e.g., Cugmas, 2003; Howes et al., 1998; Millione, Corsano, & Cassibba, 2005; Oppenheim, Sagi, & Lamb, 1988). The results of this meta-analysis, including assessments of almost 3,000 children, yield important insights into the development and nature of these relationships. It is clear that young children develop close relationships with their primary nonparental care providers and that the nature of these relationships can be described using measures of child–mother attachment that assess secure base behavior. The security of children’s relationships with their parents (both mothers and fathers) and care providers were modestly but significantly intercorrelated, suggesting that children construct intertwined internal working models of significant relationships to adults even as the characteristics of interaction with particular individuals shape the quality of specific relationships. The data do not permit us to determine how internal working models of multiple attachments are interrelated, and whether or not they are hierarchically structured (Bowlby, 1973; Bretherton 1985).

Secure child–care provider attachments were less common than secure child–parent attachments when Ainsworth et al.’s (1978) SS was used, and discordance was common. In contrast, Waters’s (1995) AQS revealed greater concordance between the security of child–mother and child–care provider attachment, and the likelihoods that children would be securely

attached to mothers and care providers were equally high. In addition, secure attachments to care providers were more common in home-based care arrangements than in center-based care. These results suggest that child–parent and child–care provider attachments represent specific adaptations to care environments with different qualities and affordances, and differences in the behavioral emphases of the SS and the AQS may help explain this. The SS clearly emphasizes the security-seeking and proximity-promoting behaviors that characterize children’s interactions with teachers less than those with parents (Ahnert, Rickert, & Lamb, 2000). In contrast, the AQS captures a variety of child behaviors including security seeking, attention seeking, and support seeking and assistance seeking in the context of exploration (Booth, Kelly, Spieker, & Zuckerman, 2003). Because this heterogeneous array of behaviors is assessed, similarities between different relationships may be easier to discern. Most importantly, however, the AQS may reflect relationship qualities in group settings better than the SS, and may therefore specify the value of care providers’ sensitivity better.

Because some researchers evaluated care providers using measures of the promptness and adequacy of their responses to individual children similar to those used to measure parental responsiveness (Ainsworth et al., 1974) whereas others used group-focused measures of responsiveness, we were able to examine the differential impact of the two types of responsiveness on emerging child–care provider relationships. The meta-analyses showed that children’s relationships with care providers, especially in centers, were predominantly associated with measures of the care providers’ behavior toward the group as a whole. Clearly, group interaction is the modal interaction in child care centers; even when care providers are engaged in one-on-one interaction with individuals, they have to pay attention to the rest of the group, too. Only in small groups was the security of relationships with care providers predicted by measures of dyadic responsiveness similar to those that predict the security of children’s primary attachments (DeWolff & van IJzendoorn, 1997; van IJzendoorn & De Wolff, 1997). Consistent with this, Galinsky, Howes, and Kontos (1995) reported that the security of infant–care provider attachments in home-based care improved after the care providers participated in a training program that enhanced the sensitivity of care they provided, although we are unaware of training programs that focus on different types of sensitivity (see van IJzendoorn, Juffer, & Duyvesteyn, 1995) and the present results suggest the need for research focused on group dynamics.

As expected, characteristics of the care settings such as group size and child–adult ratio appeared to moderate the association between the care providers’ behavior and the security of the children’s relationships with them. Sensitive care providers clearly need to monitor children’s emotional needs, and in small groups (or those with low child–adult ratios) they may be able to respond to almost every social bid. They cannot do so in large groups, however; therefore the association between responsiveness and attachment security is attenuated, just as it is in large family units (Ahnert, Meischner, & Schmidt, 2000). The present meta-analyses also show that characteristics others than group size become important, especially in center-based settings. Most strikingly, child–care provider attachment security significantly varied depending on child gender, with girls developing secure relationships with their care providers more often than boys did. Unfortunately, the evidence is based on only five studies but there was great homogeneity. One might speculate that gender (an individual characteristic of a child) becomes a powerful group structuring feature when a sufficient number of peers congregate. Researchers have shown that such subgroups create specific cultures of behavior and interaction (e.g., Denham & Holt, 1993; Denham et al., 2001; Sebanc, Pierce, Cheatam, & Gunnar, 2003). Because they are responsible for groups of children, care providers need to respect and respond to these groupings, and may do so in gender-biased ways because most care providers are female. Clearly, it would be important to examine characteristics and dynamics of peer groups more thoroughly in the context of research on the behavior of care providers.

Howes and Smith (1995) reported that secure relationships were more common when children were younger, but the present meta-analyses do not support this conclusion. Only when children had discontinuous histories of child care were the older children less likely to form secure attachments to their care providers. This underscores the importance of stable care experiences during the time that children are forming attachments with their care providers. Not surprisingly, time post entry was positively associated with secure attachment to care providers whereas age at enrollment (ranging between 12 and 48 months) had no effect on attachment security. On the basis of SES backgrounds, the security of children’s attachments to care providers varied, but only when children were in home-based care arrangements. In child care centers, SES background appeared to be less important. Perhaps child care providers in centers understand better than

providers in home-based arrangements their professional need to focus on children and their adaptation to group life regardless of the children's family backgrounds.

The studies included in the present meta-analysis were conducted in a variety of cultures over a 25-year period, providing insight into the factors shaping the development of attachments to nonparental providers in a range of sociocultural circumstances. Interestingly, secure attachments to care providers were more common in earlier than in later studies and the concordance between child-mother and child-care provider attachments was also higher in earlier studies, suggesting, perhaps, that both child care environments and research techniques had changed over time. Especially in the last two decades, child care settings (especially centers) worldwide have placed increased emphasis on educational curricula designed to facilitate success at school and have, in the process, focused increasingly on cognitive rather than emotional effects. During the same period, researchers have developed better techniques for assessing children's relationships and social competence, perhaps making descriptions and assessments of children's attachments more sensitive and reliable. This may account for declines over time in the proportion of child-parent and child-care provider attachments that were rated secure, ensuring that the level of concordance between child-mother and child-care provider attachment security did not change.

Several limitations of this meta-analysis should be acknowledged. First, only 13% of the studies sampled home-based settings and thus the quality of care in these settings may have been more homogeneous and unrepresentative than in the large number of child care centers sampled. Second, some correlates of attachment security (such as parental SES and time in child care) were examined in only a few studies and effect sizes for some variables were small; therefore, further research is necessary before confidence can be placed in these results. Third, studies in home-based settings did not use the SS, and we were not able to assess associations between dyadic sensitivity and the security-seeking aspects of attachment security in home-based settings. Fourth, comparative studies of child-father attachment were relatively rare, and thus it was not possible to examine the concordance between child-father and child-care provider attachments adequately (see also DeWolff & van IJzendoorn, 1998). Fifth, no study provided information about numbers and recency of changes in child care providers because all researchers examined attachments between specific

children and care providers. Clearly, however, children are most likely to form relationships with those who are stable (and thus most available), most dedicated, and (often) the head teachers in the child's group, although we do not know whether and when particular child-care provider relationships might have an enduring impact despite changes in care providers over the preschool years.

Overall, secure relationships with care providers were more common in home-based than in center-based facilities. Does this mean that home-based settings facilitate the development of emotionally supportive relationships with care providers, whereas child care centers have difficulty providing the types of care that promote secure child-adult relationships? Associations between security and the care providers' dyadic sensitivity were similar in the two settings, whereas associations between security and the care providers' group-focused sensitivity were more marked in center-based care. Because groups in home-based settings are very small and the providers are typically not professionals, children's relationships with providers in home-based settings (like attachments to mothers) are almost exclusively associated with dyadic sensitivity. In contrast, care providers in center-based settings have to deal sensitively with larger and more diverse groups of children and, as a result, the factors shaping the quality of child-care provider relationships in these contexts differ from those known to shape child-mother attachments. It may also be harder to form relationships with care providers when children are well integrated into the peer groups and are less interested in getting care providers' attention. In other words, different frequencies of secure attachments may not reflect the level of care provider sensitivity but such other factors as the type of environment. In the present meta-analyses, it appears that the security of child-care provider relationships is affected by factors that have not been considered relevant in research on the security of child-parent attachment. In child care centers, to be specific, the group-oriented sensitivity of care providers, rather than the sensitivity of their responses to individual children, seems to affect the relationships. We need to focus further research on interaction processes involving care providers and on group structuring factors before limiting our focus to the individual characteristics and relationships between children and care providers. To help care providers understand the differential nature of "mother-like" dyadic sensitivity and "professional" group-focused sensitivity, however, we need to know much more about care providers' responses to

the daily challenges that arise when caring for groups of children in dynamic subgroupings, of which gender might be one important characteristic. Because it is difficult for care providers to address the needs of children in various subgroups adequately, we need to identify and delineate the types of care provider strategies and care environments (e.g., group structures) that best promote secure child-care provider relationships. Thus, it is necessary to link research on care provider behaviors and relationships with research on early peer groups. We also need many more studies that carefully examine the factors within the entire care ecology of the children. Supportive child-care provider relationships have important implications for children's later education (Howes et al., 1998; Oppenheim et al., 1988), and it is important to ensure equivalent opportunities for all children.

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Appendix A

Table A1
 Characteristics of Studies Included in the Meta-Analysis

Author	N	Age	Setting	Measure	Attachment security to CP compared with				Correlations between infant-CP attachment and security					
					CP (%)	M (%)	F (%)	F (%)	Group-level sensitivity (r_{group})	Dyadic-level sensitivity (r_{dyadic})	Time post entry (r_{month})	Age gender (r_{age})	Female gender (r_{gender})	SES (r_{SES})
Ahnert et al. (2000)	40	15	CB	SS	20	50	.63	.08	.35	.07	-.07	.30	.13	2
Ahnert and Lamb (2000)	64	12	CB	SS	39	49	.19	.10	.25	.13	.07	.06	.09	2
Ainslie (1990)	34	13	CB	SS	53	62	.18	.50						
Andersson et al. (1981)	35	31	CB	SS	67	67	.00	.13	.41				.37	2
Cassiba (1994)	24	22	CB	AQS			.10	.37			.06			2
Cassiba et al. (2000)	86	27	CB	AQS			.82							
Cummings (1980)	30	21	CB	SS			.00	.02	.36				.38	2
Elicker et al. (1999)	41	15	HB	AQS	69	63	-.13	.05	.30		.34			2
Elicker and Noppe (2000)	64	16	CB	AQS			.22				-.01			1
Fox (1977)	122	15	CB	SS	57	68	.64	.22	.14	.19				2
Goossens and van IJzendoorn (1990)	75	15	CB	SS			.14	-.13	.16					2
Howes and Hamilton (1992) Study 1, Wave 1	72	18	Mix	AQS	65	81	83	.34	.36	.13		.05		1
Howes and Hamilton (1992) Study 1, Wave 2	63	24	Mix	AQS	60	84	75	.53	.31	.17				1
Howes and Hamilton (1992) Study 1, Wave 3	58	30	Mix	AQS	55	79	88	.51	.68	.19				1
Howes and Hamilton (1992) Study 1, Wave 4	53	36	Mix	AQS	70	87	100	.40	.65	.07				1
Howes and Hamilton (1992) Study 1, Wave 5	47	42	Mix	AQS	71	78	91	.06	.34	.11		-.10		1
Howes and Hamilton (1992) Study 2, Wave 1	106	12	Mix	SS	61									
Howes and Hamilton (1992) Study 2, Wave 2	42	21	Mix	AQS	60			.02						
Howes and Hamilton (1992) Study 2, Wave 3	84	36	Mix	AQS	80									
Howes and Hamilton (1992) Study 2, Wave 4	86	48	Mix	AQS	64	62		.23	.06					1
Howes and Oldham (2001)	10	21	CB	AQS	70					.31				1

Table A1. (Continued)

Author	N	Age	Setting	Measure	Attachment security to CP compared with				Correlations between infant-CP attachment and security										
					CP (%)	M (%)	F (%)	($d_{m,c}$)	($d_{f,c}$)	($r_{f,c}$)	F level sensitivity (r_{group})	Dyadic-level sensitivity (r_{dyadic})	Time post entry (r_{month})	Female gender (r_{gender})	SES (r_{SES})	Child care history			
Howes and Segal (1993)	16	25	HB	AQS	47														
Howes and Smith (1995)	1,379	34	Mix	AQS	32														
Howes and Smith (1995)	840	34	CB	AQS								.08	.02						
Subsample 1																			
Howes and Smith (1995)	357	34	HB	AQS								.09							
Subsample 2																			
Howes et al. (1998) Study 2, Wave 1	71	22	HB	AQS	56							.32	.18	.23					
Howes et al. (1998) Study 2, Wave 2	71	31	HB	AQS	68							.34	.05		.26				
Howes et al. (1998) Study 3, Wave 1	36	32	CB	AQS	36							.07	.07	.50					
Howes et al. (1998) Study 3, Wave 2	36	47	CB	AQS	86							.57	.08						
Howes et al. (1990) Study 1	42	18	Mix	AQS															
Howes et al. (1990) Study 2	60	19	Mix	AQS	66	77	.24	.28				.42	.27	-.15					
Matheson (1992) Wave 1	23	16	CB	AQS	67	100	.89	.00					.23	-.05					
Matheson (1992) Wave 2	23	46	CB	AQS	76	67	-.21	.20						.15					
Mitchell-Copeland (1996), DeMulder, Denham, Schmidt, and Mitchell (2000)	55	45	CB	AQS	60	54	-.12	.37											
Oppenheim et al. (1988) (based on Sagi et al., (1985)	59	13	CB	SS	49	53	.64	.07	.33										
Rottmann and Ziegenhain (1988) see Alhert and Lamb (2001)	31	19	CB	SS	32	49	.48	-.09											
Sagi et al. (1985)	84	13	CB	SS	45	48	.54	.06	.14	.05	.36								
Sagi et al. (1995) Sample 1	79	13	CB	SS and AQS	53														
Sagi et al. (1995) Sample 2	79	13	CB	SS and AQS	56														
Verissimo, Duarte, Monteiro, Santos, and Meneses (2004)	50	41	CB	AQS	48	52	.12												

N = sample size; age averaged (in months); CP = care provider; M = mother; F = father; CB = center-based child care; HB = home-based child care; SS = Strange Situation (or modified separation - reunion-sequences); AQS = Attachment Q-set; $d_{m,c}/r_{m,c}$ = difference/correlation of child - mother and child - care provider attachment security; $d_{f,c}/r_{f,c}$ = difference/correlation of child - father and child - care provider attachment security; child care history = 1, discontinuous; 2, continuous. Duplicate results from the studies by Howes and Rodning (1990) and Howes and Hamilton (1992) have been eliminated.