
DISORGANIZED INFANT ATTACHMENT AND PREVENTIVE INTERVENTIONS: A REVIEW AND META-ANALYSIS

MARIAN J. BAKERMANS-KRANENBURG, MARINUS H. VAN IJZENDOORN, AND
FEMMIE JUFFER
Leiden University

ABSTRACT: Infant disorganized attachment is a major risk factor for problematic stress management and later problem behavior. Can the emergence of attachment disorganization be prevented? The current narrative review and quantitative meta-analysis involves 15 preventive interventions ($N = 842$) that included infant disorganized attachment as an outcome measure. The effectiveness of the interventions ranged from negative to positive, with an overall effect size of $d = 0.05$ (ns). Effective interventions started after 6 months of the infant's age ($d = 0.23$). Interventions that focused on sensitivity only were significantly more effective in reducing attachment disorganization ($d = 0.24$) than interventions that (also) focused on support and parent's mental representations ($d = -0.04$). Most sample characteristics were not associated with differences in effect sizes, but studies with children at risk were more successful ($d = 0.29$) than studies with at-risk parents ($d = -0.10$), and studies on samples with higher percentages of disorganized attachment in the control groups were more effective ($d = 0.31$) than studies with lower percentages of disorganized children in the control group ($d = -0.18$). The meta-analysis shows that disorganized attachments may change as a side effect of sensitivity-focused interventions, but it also illustrates the need for interventions specifically focusing on the prevention of disorganization.

RESUMEN: La desorganizada afectividad del infante es un gran factor de riesgo en cuanto a la forma problemática de manejar la tensión y los posteriores problemas de conducta. ¿Se puede prevenir la aparición de desorganización en la afectividad? La presente revisión y meta-análisis cuantitativo de información narrativa considera 15 intervenciones preventivas ($N = 842$) que incluyen las desorganizadas afectividades del infante como una medida de resultado. La efectividad de las intervenciones va de las negativas a las positivas, con un alcance general de los efectos de $d = 0.05$ (n.s.) Las intervenciones efectivas comenzaron después de los seis meses de la edad del infante ($d = 0.23$). Aquellas intervenciones que se enfocaron en la sensibilidad sólo se mostraron significativamente más efectivas en reducir la desorganización de la afectividad ($d = 0.24$) que aquellas intervenciones que (también) se enfocaron en el apoyo y las representaciones mentales de los padres ($d = -0.04$). La mayor parte de las características de la muestra no se asociaron con diferencias en cuanto al alcance de los efectos, sin embargo, los estudios con niños bajo riesgo fueron más exitosos ($d = 0.29$) que los estudios con padres bajo riesgo ($d = 0.10$); y los estudios en casos de más altos porcentajes de afectividad desorganizada en los grupos de control

We thank the anonymous reviewers for their thoughtful comments on earlier drafts of this article. Direct correspondence to: Marian J. Bakermans-Kranenburg, Center for Child and Family Studies, Leiden University, PO Box 9555, NL-2300RB Leiden, The Netherlands; e-mail: bakermans@fsw.leidenuniv.nl.

INFANT MENTAL HEALTH JOURNAL, Vol. 26(3), 191–216 (2005)

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Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/imhj.20046

fueron más efectivos ($d = 0.31$) que los estudios con niños del grupo de control que presentaban porcentajes más bajos de desorganización ($d = 0.18$). El meta-análisis demuestra que las afectividades desorganizadas pudieran cambiar como un efecto lateral de las intervenciones enfocadas en la sensibilidad, pero también informa acerca de la necesidad de intervenciones específicamente enfocadas en la prevención de la desorganización.

RÉSUMÉ: L'attachement désorganisé du nourrisson est un facteur de risque majeur pour la gestion de stress problématique et les problèmes de comportement plus tard. L'apparition d'une désorganisation de l'attachement peut-elle être prévenue? Cet article et cette méta-analyse quantitative traite de 15 interventions préventives (N=842) qui ont inclu un attachement désorganisé du bébé en tant que mesure de résultat. L'efficacité des interventions allait du négatif au positif, avec un effet global de taille global de $d = 0,05$ (n.s.). Les interventions efficaces ont commencé après que les bébé aient atteint l'âge de six mois ($d = 0,23$). Les interventions concentrées sur uniquement la sensibilité ont été bien plus efficaces pour réduire la désorganisation de l'attachement ($d = 0,24$) que les interventions qui se concentraient (aussi) sur le soutien et les représentations mentales des parents ($d = -0,004$). La plupart des caractéristiques de l'échantillon n'étaient pas liées à des différences de taille dans les effets, mais les études avec des enfants à risque ont eu plus de succès ($d = 0,29$) que les études avec des parents à risque ($d = 0,10$), et les études sur les échantillons à plus haut pourcentages d'attachement désorganisé chez les groupes de contrôle étaient plus efficaces ($d = 0.31$) que les études avec des pourcentages moins élevés d'enfants désorganisés dans le groupe de contrôle ($d = -0,18$). Cette méta-analyse montre que les attachements désorganisés peuvent changer comme un effet secondaire d'interventions concentrées sur la sensibilité, mais elle montre aussi le besoin d'interventions spécifiquement concentrées sur la prévention de la désorganisation.

ZUSAMMENFASSUNG: Die chaotische Bindung ist ein wesentlicher Risikofaktor für problematisches Stressmanagement und spätere Verhaltensprobleme. Kann der Entwicklung von chaotischen Bindungsstörungen vorgebeugt werden? Der vorliegende literarische Überblick und die quantitative Metaanalyse enthält 15 vorbeugende Interventionen (N=842), die die chaotische Bindungsstörung als Zielvariable annahmen. Die Effektivität der Interventionen fand sich zwischen negativ und positiv, mit einem generellen Effektgröße von $d = 0.05$ (n.s.). Die effektiven Interventionen begannen beim sechsmonatigen Kind ($d = 0.23$). Die Interventionen, die sich auf Feinfühligkeit konzentrierten, waren in der Reduktion der Bindungsstörung signifikant effektiver ($d = 0.24$), als Interventionen, die sich (auch) auf Unterstützung und die elterlichen Repräsentationen bezogen ($d = 0.04$). Die Charakteristika der meisten Stichproben zeigten keine Unterschiede in der Größe der Effektivität, aber Studien mit Risikokindern waren erfolgreicher ($d = 0.29$), als Studien mit Risikoeltern ($d = -0.10$). Studien bei denen die Stichproben einen höheren Prozentsatz an Kindern mit chaotischer Bindungsstörung in der Kontrollgruppe hatten, waren effektiver ($d = 0.31$), als solche bei mit einem niedrigeren Prozentsatz an chaotisch bindungsgestörten Kindern in der Kontrollgruppe ($d = -0.18$). Die Metaanalyse zeigt, dass es möglich ist, dass sich die chaotische Bindung als eine Nebenwirkung eines Feinfühligkeitstrainings ändern kann; Es zeigt sich aber ebenso, dass es nötig ist konferenzen, um sie zu verhindern spezielle sich die chaotische Bindungsstörung zu auf.

抄録：乳児の混乱した愛着 disorganized attachment は、問題のあるストレス管理、および後の問題行動への、主要な危険因子である。愛着の混乱が発生することを予防可能だろうか？この物語レビュー narrative review と量的メタ分析には、15の予防的介入 (N=842) が含まれており、それらには、乳児の混乱した愛着が、結果を測定する基準 outcome measure として含まれていた。介入の有効性は、否定的から肯定的まで分布し、全体的な効果サイズは $d = 0.05$ (n.s.) だった。効果的な介入は、乳児の月齢が6カ月以降に開始された ($d = 0.23$)。感受性だけに焦点付けた介入 ($d = 0.24$) は、支持および親の心的表象にも焦点付けた介入 ($d = -0.04$) よりも、愛着の混乱を減少させるのに、有意に効果があった。大部分の調査対象の特徴は、効果のサイズの違いとは関連していなかったが、

危険のある子ども達の研究 ($d = 0.29$) は、危険のある親の研究 ($d = -0.10$) よりも成功し、対照群に混乱した愛着のパーセンテージがより高いサンプルの研究 ($d = 0.31$) は、対照群に混乱した愛着の子ども達のパーセンテージがより低い研究よりも、効果的だった。メタ分析から、感受性に焦点付けた介入の副作用として、混乱した愛着が変化するかもしれないことが示されるが、しかし混乱の予防に特異的に焦点付けている介入の必要性も明らかにする。

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Infant disorganized attachment is a major risk factor for problematic stress management and later problem behavior. Therefore, the question whether early childhood interventions are effective in preventing attachment disorganization is highly relevant, and a review of intervention studies from the perspective of their effects on attachment disorganization is badly needed. Moreover, the question whether the emergence of attachment disorganization can be prevented has never been meta-analytically examined thus far. In the current article, we provide a narrative review of preventive intervention studies with infant disorganized attachment as an outcome measure, and we test meta-analytically whether these interventions were able to prevent infant attachment disorganization. We will first review the origins of disorganized attachment, then discuss the various types of interventions, aiming at enhancing positive parental behaviors and/or secure infant–parent relationships that have been developed, and then focus on the intervention studies that include disorganized attachment as an outcome measure.

In their first year of life, most infants develop an *organized* strategy to deal with the strains and stresses of separations, strange environments, illness, and other stressful or threatening events. Whereas secure, as well as insecure, avoidant or insecure ambivalent attachment relationships can be considered organized strategies adaptive to the child's environment (Main, 1990), some attachment relationships appear to be characterized by the absence or breakdown of an otherwise organized strategy, hence defined as *disorganized* (Main & Solomon, 1990). In particular, in studies on maltreated infants, the limits of the traditional Ainsworth coding system for the Strange Situation Procedure (SSP; Ainsworth, Blehar, Waters, & Wall, 1978) became apparent because many children with an established background of abuse or neglect nevertheless had to be forced into the secure category (Carlson, Cicchetti, Barnett, & Braunwald, 1989). The systematic re-analysis of about 200 cases from various samples that were difficult to classify in one of the three organized attachment categories suggested to Main and Solomon (1990) a basic similarity. The common denominator of the anomalous cases was the (sometimes momentary) absence or breakdown of an organized strategy to deal with the stresses of the SSP.

Disorganized attachment behaviors are considered to mirror the infant's acute dilemma in the face of stressful circumstances, therefore, in the SSP. The child's dilemma is that he/she cannot resolve the stress and anxiety he/she experiences because the parent is at the same time the source of fear and the only possible protective figure to which to turn. In the face of this paradoxical situation, leaving the child with "fright without solution" (Hesse & Main, 2000; Main, 1999), the infant's organized attachment strategy is expected to fall apart (Main & Hesse, 1990). Indices of disorganized attachment behavior as expressed in the SSP reflect this dilemma: sequential or simultaneous display of contradictory behaviors, such as distress and avoidance; undirected or misdirected movements and expressions; stereotypes and anomalous movements or postures; freezing or stalling behaviors; expressions of fear or apprehension regarding the parent; and clear indices of confusion and disorganization in the presence of the parent (Main & Solomon, 1990).

Several studies have shown that disorganized attachment in infancy is predictive of problematic stress management (Hertsgaard, Gunnar, Erickson, & Nachmias, 1995; Spangler & Grossmann, 1993, 1999; Willemsen-Swinkels, Bakermans-Kranenburg, Buitelaar, Van IJzendoorn, & Van Engeland, 2000), an elevated risk of externalizing behavior problems (e.g., Carlson, 1998; Hubbs-Tait, Osofsky, Hann, & Culp, 1994; Lyons-Ruth, Easterbrooks, & Cibelli, 1997), lower emotional health at school age (Carlson, 1998), and dissociation in adolescence (Carlson, 1998). A comprehensive meta-analysis examining 80 studies on disorganized attachment (Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999) documented significant effects of disorganized attachment on infants' physical stress reactions (combined effect size: $r = 0.24$), and on externalizing problems in school-aged children (combined effect size: $r = 0.29$). Disorganized attachment is not equivalent to Reactive Attachment Disorder (RAD) (O'Connor & Zeanah, 2003), although the inhibited type of RAD appears to have much in common with attachment disorganization (Howe, 2003). Actually, several behavioral indicators from the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and the International Classification of Diseases—10th revision (ICD-10) implicitly seem to refer to one of the behavioral categories of the coding system for disorganized attachment. Extreme indications of disorganization may be regarded as psychiatric disturbance with more or less severe symptoms and consequences (Van IJzendoorn & Bakermans-Kranenburg, 2003a). The association between disorganized attachment and later child psychopathology (for reviews, see also Green & Goldwyn, 2002; Lyons-Ruth & Jacobvitz, 1999) highlights the need to search for precursors and determinants of attachment disorganization. Compared to the organized patterns of attachment (avoidant, secure, and ambivalent), less is known about the underlying mechanisms and causal factors resulting in disorganized attachment.

Associations between specific family phenomena and later infant disorganization have been established in several studies (for an overview, see Lyons-Ruth & Jacobvitz, 1999; Van IJzendoorn et al., 1999). In samples of *maltreated* children, a disproportionate number of infants appeared to be classified as disorganized attached (Carlson et al., 1989; Cicchetti & Barnett, 1991). In addition, parental *unresolved loss or trauma*, as assessed in the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985), appeared to be significantly associated with infant disorganized attachment (for a meta-analysis, see Van IJzendoorn, 1995). Furthermore, *marital discord* (Owen & Cox, 1997) and *parental depression* (in particular bipolar depression, e.g., Teti, Messinger, Gelfand, & Isabella, 1995) have been suggested as precursors of disorganization. Main and Hesse's (1990) hypothesis of a link between *frightening or frightened parental behavior* and disorganized attachment has been tested and demonstrated in four studies (Abrams, 2000; Lyons-Ruth, Bronfman, & Parsons, 1999; Schuengel, Bakermans-Kranenburg, & Van IJzendoorn, 1999; True, 1994; True, Pisani, & Oumar, 2001). Schuengel et al. (1999) also documented the protective role of secure mental representations of attachment. Unresolved, but (alternate) secure mothers showed significantly less-frightening behavior towards their babies than did unresolved insecure mothers. Moreover, the link between unresolved loss and disorganized infant attachment was only apparent in the group with mothers who were both unresolved and (alternate) insecure (Schuengel et al., 1999).

Parental insensitivity is supposed to be associated with "organized" insecurity (avoidance and ambivalence; De Wolff & Van IJzendoorn, 1997), but not with disorganized attachment (Main & Hesse, 1990). However, in a meta-analytic synthesis of studies conducted so far, a small but significant association between parental (in)sensitivity and disorganization was found (Van IJzendoorn et al., 1999). Lyons-Ruth and Jacobvitz (1999) hypothesized that parental (in)sensitivity, as assessed using Ainsworth's sensitivity scale (Ainsworth, Bell, & Stayton, 1974), may not be sufficiently differentiated and specific to predict infant disorganization. Postulating a model of unbalanced relationships predicting attachment disorganization, Lyons-

Ruth and colleagues (Lyons-Ruth, Bronfman, & Atwood, 1999) described two relational patterns in which the parent either coercively opposes and counters the initiatives of the child by negative and intrusive behavior, or withdraws from the interaction by being (extremely) unresponsive to the needs of the child. Solomon and George (1999) hypothesized that a profound lack of response, or “a failure to terminate” the child’s attachment system, may lead to infant disorganization.

Finally, attachment disorganization does not appear to be due to *child characteristics* in general, therefore, gender or temperament. Nevertheless, Spangler, Fremmer-Bombik, and Grossmann (1996) found that attachment disorganization was best predicted by newborn behavioral organization in terms of orienting ability and regulation, and in a first molecular genetic study, Lakatos et al. (2000, 2002) found an association between the dopamine D4 receptor gene polymorphism and attachment disorganization. Adopted children also may be at risk for attachment disorganization, particularly when they lived in disturbing, depriving, or otherwise adverse circumstances before they were placed for adoption (Marcovitch et al., 1997; Rutter et al., 1998). Adopted children may have experienced “fright without solution” (Main, 1999) resulting from unmet attachment needs or profound lack of response. Indeed, Vorria et al. (2003) found an excessive high percentage of disorganized attachment (66%) in infants raised in Greek institutions compared to home-reared children and to normative samples (about 15%, see Van IJzendoorn et al., 1999). Disorganization may be the result of adverse experiences before adoption placement, (additional) negative experiences in the adoptive family, or both. Lastly, children with medical or physical problems (e.g., neurological abnormalities, Down’s syndrome) are supposed to be at risk for elevated rates of attachment disorganization (Van IJzendoorn et al., 1999). Children with neurological problems may show behavioral patterns that are isomorphic to disorganized behaviors, but originate from a different source, and they may thus be liable to become “false-positives” in coding for disorganization (Barnett et al., 1999; Pipp-Siegel, Siegel, & Dean, 1999).

Because of the associations between infant disorganized attachment and later maladaptive social behaviors, the question whether early childhood interventions are effective in preventing attachment disorganization is highly relevant. The last decennium saw a large number of interventions aiming at harmonious parent–child interactions and/or a secure infant–parent relationship. In a recent meta-analysis, we were able to trace more than 80 intervention studies that tried to promote parental sensitivity and/or “traditional” secure attachment relationships (see Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003; Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005a). Some of these interventions were based on psycho-dynamic principles; others used a more educational or cognitive–behavioral approach. What these interventions had in common was their goal: They aimed at enhancing positive parental behaviors, such as responsiveness, sensitivity, or involvement, on the basis of the assumption that these behaviors are beneficial for a child’s concurrent and later social and emotional development.

The interventions varied in intensity, timing, and focus, and they were divergent in outcome measures. Some interventions were confined to a limited number of sessions in a short period; others included weekly individual meetings starting before birth and continuing for several years. Concerning the focus of the intervention, program approaches and goals can be distinguished in interventions aiming at enhancing parental sensitivity, affecting the parents’ mental representation, or providing social support—or any of the possible combinations of these approaches (Bakermans-Kranenburg et al., 2003; Egeland, Weinfield, Bosquet, & Cheng, 2000). When these studies reported on infant attachment security as an outcome measure, the more recent studies often included the Main and Solomon (1986, 1990) category for disorganized attachment, thus offering the opportunity to evaluate the intervention’s effectiveness not only in promoting attachment security, but also in preventing or reducing attachment disorganization.

The question whether early childhood interventions are effective in preventing attachment disorganization has never been meta-analytically examined thus far. Nevertheless, intervention studies are important for two reasons. First, the problematic consequences of disorganization strongly appeal for effective interventions. If we were able to provide meta-analytical evidence for the effectiveness of certain types of interventions, new interventions could profit from these insights, and that would be of great clinical importance. Second, correlational studies preclude the drawing of inferences about causality. As an alternative, intervention studies that manipulate parental behavior may shed light on the etiology of attachment disorganization. In 15 studies, infant disorganized attachment was observed as one of the outcome measures of an intervention. In this article, we review these 15 intervention studies, provide a quantitative synthesis of their effects on disorganization, and try to explain differences in findings between studies on the basis of study characteristics (Mullen, 1989; Rosenthal, 1991, 1995).

First, we present a descriptive overview of the intervention studies and we evaluate them as successful or unsuccessful from the perspective of their effects on attachment disorganization. In this narrative review, our most important question was whether interventions were able to prevent infant attachment disorganization, but we also tried to establish whether the effectiveness of the intervention was associated with intervention features or sample characteristics. Second, in a meta-analytic synthesis, we tested whether the combined intervention efforts showed a significant effect in terms of preventing or decreasing disorganized attachment, and whether this combined effect was robust across the various studies. Third, we looked for study, intervention, and sample characteristics that might predict some of the variation in effect sizes between the various studies, and we determined under what conditions the interventions were most effective. In sum, we tested whether interventions were able to prevent infant attachment disorganization, and whether the effectiveness of the intervention was associated with intervention features or design and sample characteristics.

METHOD

Procedure

Intervention studies were collected using three different search strategies (Mullen, 1989; Rosenthal, 1991). First, PsycINFO, Dissertation Abstracts, and Medline were searched with keywords “attachment,” “sensitivity” (or related terms, e.g., responsiveness), and “intervention” (or related terms such as “preventive” or “therapeutic”). Second, the references of the collected papers, books, and book chapters were searched for relevant intervention studies. Third, experts in the field were asked to mention relevant intervention studies. We selected interventions that started before children’s mean age of 54 months. The intervention studies included middle-class families with healthy infants, as well as clinical and at-risk populations. In some cases, additional information was requested from the author(s). Case studies were excluded, as well as unpublished studies or interventions that were only reported at meetings or conferences. We included those intervention studies that assessed disorganized attachment with the Main and Solomon (1986, 1990) coding system for disorganization/disorientation, or atypical attachment with Crittenden’s (1995) Preschool Assessment of Attachment system as one of the outcome measures.

Narrative Review

We found ten papers reporting on 15 interventions with data on disorganized attachment (in combination with data on sensitivity and/or the “traditional” secure, insecure-avoidant, and

TABLE 1. *Intervention Studies: Descriptives and Effect Sizes*

Study	N	Number of Sessions	Start ¹	Focus	Effect on Disorganized Attachment		
					d ²	90 % CI ³	p
Gelfand, Teti, Seiner, & Jameson (1996)	61	29	7	Sensitivity Support	0.16	(-0.27 ~ 0.59)	.27
Cooper & Murray (1997) study I*	58	15	2	Support	0.11	(-0.38 ~ 0.60)	.36
Cooper & Murray (1997) study II*	57	10	2	Representation Sensitivity	-0.22	(-0.71 ~ 0.28)	.24
Cooper & Murray (1997) study III*	57	10	2	Representation	-0.17	(-0.66 ~ 0.32)	.29
Cohen et al. (1999) study I	34	14	21.5	Representation Sensitivity	0.38	(-0.85 ~ 1.62)	.30
Cohen et al. (1999) study II	32	15	19	Representation	0.00	(-1.24 ~ 1.24)	.50
Juffer, Bakermans-Kranenburg, & Van IJzendoorn (2005b) study I*	48	2	6	Sensitivity	0.05	(-0.45 ~ 0.55)	.43
Juffer, Bakermans-Kranenburg, & Van IJzendoorn (2005b) study II*	80	3	6	Sensitivity	0.50	(0.11 ~ 0.89)	.02
Van den Boom (1988)	100	3	6	Sensitivity	0.13	(-0.20 ~ 0.47)	.25
Sajaniemi et al. (2001)	48	20	6	Sensitivity	0.53	(0.04 ~ 1.03)	.04
Egeland & Erickson (1993)	135	30	-4	Sensitivity	-0.49	(-0.78 ~ -0.20)	<.01
Heinicke et al. (1999)	64	42	-2	Representation Support Sensitivity	0.36	(-0.06 ~ 0.78)	.08
Lyons-Ruth et al. (1990)	38	47	5	Representation Support Sensitivity	0.30	(-0.33 ~ 0.92)	.21
Bakermans-Kranenburg, Juffer, & Van IJzendoorn (1998) study I*	15	4	7	Sensitivity	-0.41	(-1.39 ~ 0.59)	.24
Bakermans-Kranenburg, Juffer, & Van IJzendoorn (1998) study II*	15	4	7	Sensitivity Representation	-0.21	(-1.19 ~ 0.76)	.35

¹ Age of child in months at start intervention (see Table 2).

² Effect size.

³ 90% confidence interval of the effect size.

* In studies with more than one intervention program, the control group was divided according to the number of programs.

insecure-resistant attachment categories). One intervention study that included disorganized attachment, but without exact data on the distribution of D versus non-D, could not be included (Gowen & Nebrig, 1997). It should be noted that the effectivity of the interventions on disorganized attachment behavior was not tested in the majority of the studies; therefore, the effect sizes and significance of the effects (presented in Table 1) were derived from the data of the individual studies and were (often for the first time) computed as part of the current meta-analysis. The interventions were implemented in a range of samples: clinically depressed mothers (Cooper & Murray, 1997; Gelfand, Teti, Seiner, & Jameson, 1996) or clinically referred infants (Cohen et al., 1999); families with infants at risk due to international adoption (Juffer,

Bakermans-Kranenburg, & Van IJzendoorn, 2005b), irritability (Van den Boom, 1994), or extreme low birth weight (Sajaniemi et al., 2001); low-SES mothers with multiple problems (Egeland & Erickson, 1993; Heinicke et al., 1999; Lyons-Ruth, Connell, & Grunebaum, 1990), or insecure mothers (Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 1998). For an overview of the included studies, see Table 1. In the review, we first describe interventions that were implemented in clinically referred groups, followed by interventions implemented in groups that were at risk due to unfavorable child and/or parent characteristics.

Clinically referred groups. Gelfand et al. (1996) studied 73 clinically depressed mothers of 3- to 13-month-old infants who received interventions at home ($n = 37$) or usual care ($n = 36$). The home-visiting service was implemented by six experienced public-health nurses who were coached by supervisors in order to plan individualized programs for the depressed mothers. In 29 home visits (at 1- to 3-week intervals), the nurse provided the mother with information about her child's developmental progress and recommended and demonstrated effective parenting techniques. Intervention techniques included modeling warm, positive interactions with the infant; offering mild suggestions that would not tax the mother; and building the mother's confidence by approving of her parenting skills (Gelfand et al., 1996, p. 411). The home visitors also advocated home-safety measures and good healthcare practices and encouraged the mothers to use community services. Socially isolated mothers were encouraged to get out of the house more often. In general, the nurses served as the mother's advocates and provided both information and emotional support. The outcomes showed that the intervention did not increase sensitivity or attachment security (in terms of the organized attachment strategies A, B, and C) ($n = 61$). The intervention appeared to have a positive effect on attachment disorganization, but the difference was small: 10 (32%) children were classified as disorganized in the intervention group versus 12 (40%) children in the control group (for effect size and statistical significance of the effect, see Table 1).

Cooper and Murray (1997) randomly assigned primiparous women who suffered from postpartum depression to a control group with routine primary care ($n = 48$) or one of three different intervention groups: (1) nondirective counseling ($n = 42$), which provided the mothers with the opportunity of airing their feelings about any current concern, such as marital problems or financial difficulties (i.e., focus on support); (2) cognitive-behavioral therapy ($n = 41$), with advice about managing particular infant problems and encouragement of the mother's examining her pattern of thinking about her infant and herself as a mother (i.e., focus on sensitivity and representation); and (3) dynamic psychotherapy ($n = 41$), focusing on the mother's representation of her infant by exploring the mother's own early attachment history (i.e., focus on representation). The interventions were conducted in the mother's home by six professional intervenors on a weekly basis from 8 weeks to 18 weeks postpartum. The outcomes showed that none of the three interventions resulted in increased maternal sensitivity or a larger number of securely attached infants. Nondirective counseling was not effective with respect to disorganized attachment (6 children, 14%) in comparison to the control group (9 children, 19%). Cognitive-behavioral therapy (12 children, 29%) and dynamic psychotherapy (11 children, 27%) seemed to have resulted in an increased number of disorganized infant attachment.

Cohen et al. (1999) compared two forms of randomly assigned psychotherapeutic center-based interventions in a group of 67 clinically referred infants (12 to 30 months old) and their mothers, which had been implemented by four professional therapists. In some cases, problems were manifested as infant problems, for example, sleeping or behavior problems; in other cases, referrals were made due to maternal depression and feelings of failure in bonding or attachment. One type of intervention was infant-led psychotherapy, which was delivered through a program called Watch, Wait, and Wonder (WWW). The intervention combined a behavioral approach

with representational issues. Mothers were given the opportunity to explore with the therapist intergenerational (representational) issues, although a specific and ultimate goal of WWW was to enable the mother to follow her infant's lead (behavioral approach). For half of each session, the mother was instructed to get down on the floor to observe her infant and to interact only at her child's initiative. According to the authors, this method places the mother in the position of being more sensitive. The second intervention was mother–infant Psychodynamic Psychotherapy (PPT), based on Fraiberg's (Fraiberg, Adelson, & Shapiro, 1975) and Lieberman's (Lieberman, Weston, & Pawl, 1991) psychotherapeutic use of the mother–infant interaction in the session. The focus was on the mother gaining insight into herself and how she related to her child, for example by differentiating the needs of her infant from her own needs. The two treatment groups were similar with regard to infant age and other child and maternal characteristics. No control group was included, so intervention effects are based on differences between pre- and posttests. Neither the mean number of sessions nor the mean length of treatment differed significantly between the two treatment groups. Cohen et al. (1999) reported that after about 15 sessions both WWW and PPT were successful in reducing infant-presenting problems and in reducing maternal intrusiveness. Although both interventions appeared to be effective regarding maternal sensitivity, they differed in effectiveness with respect to attachment security and disorganization (although less so at the six-month follow up, see Cohen, Lojkasek, Muir, Muir, & Parker, 2002). Infants in the WWW group were significantly more likely than infants in the PTT group to move towards either a secure or organized attachment relationship at the posttest (in the WWW group, 12 of 34 infants, 35%, and in the PTT group, 4 of 32 infants, 12.5%). In the PTT group, three children classified as disorganized at the pretest were not rated as disorganized at the posttest, but three other children were disorganized after the intervention. In the WWW group, the number of disorganized attachment decreased from pre- to posttest: one child was disorganized only after the intervention, but five other children rated as disorganized at the pretest were classified as non-disorganized at the posttest.

In sum, it appeared to be difficult to bring about changes in disorganized attachment in these clinically referred groups. The most successful intervention was Cohen et al.'s (1999) Watch, Wait, and Wonder program, which instructed the mother to follow the infant's lead.

Children at risk. Continuing with interventions that were implemented in groups that were at risk for diverging reasons, we first focus on a study where the risk was only on the infant's side. Juffer et al. (2005b) described the results of two types of intervention with adoptive families. The children were adopted from Sri Lanka, South Korea, and Colombia. All children came in their adoptive home before 6 months of age. For 90 adoptive families, the adopted child was their first child; 40 families had birth children and a first adopted child. The mothers were the primary caregivers in all families, and they were predominantly from middle-class or upper-middle-class backgrounds (Stams, Juffer, Rispen, & Hoksbergen, 2000; Stams, Juffer, Van IJzendoorn, & Hoksbergen, 2001). One of the interventions used a personal book focusing on sensitive parenting (i.e., the name of the child was integrated in the text, which comprised suggestions for sensitive parenting and playful interactions), and the other intervention consisted of the same personal book and three additional home visits with video feedback (Juffer, Hoksbergen, Riksen-Walraven, & Kohnstamm, 1997). The intervenor showed the mother a videotape of herself interacting with her child and commented on selected fragments of the film. The two intervention programs both aimed at enhancing sensitive responsiveness, with the ultimate goal of promoting secure infant–parent attachment relationships and infant competence. Families were randomly assigned to a control group ($n = 49$), the book-only group ($n = 30$), or the video-feedback group ($n = 49$). The book-only group involved families without birth children; in both the video-feedback group and the control group, 60% of the families

were without birth children and 40% with birth children. The interventions were implemented by female psychologists between the sixth and the ninth month of the infant's age. The book-only program did not bring about significant changes in maternal sensitiveness or infant security (A, B, C). The video-feedback intervention was effective in enhancing maternal sensitive responsiveness, but it did not increase infant security on the level of the organized attachment strategies (A, B, C). The intervention with the personal book did not result in a decreased number of disorganized attached infants (6 children in the intervention group, 20%, versus 11 children in the control group, 22.4%). In contrast, the intervention with video feedback was significantly effective in preventing disorganized attachment (3 disorganized infants in the intervention group, 6.1%, versus 11 disorganized children in the control group, 22.4%).

Van den Boom's (1994) study involved 100 low socioeconomic status (SES) mothers with an irritable firstborn infant, randomly assigned to two intervention groups and two control groups. In a Solomon four-group design (intervention groups and control groups *with* and *without* pretests), the effectiveness of a short-term home-based intervention was tested. There were three intervention sessions with a female psychologist when the infants were between 6 and 9 months old. During everyday interactions, the mothers received personal feedback on sensitive soothing of the baby, as well as stimulation of reciprocal attunement. The analyses did not show pretest effects, so the two intervention groups were combined into one intervention group ($n = 50$), and the two control groups were combined into one control group ($n = 50$). After the intervention, intervention mothers were rated as more sensitive than control mothers and a larger number of intervention children appeared to be securely attached (in terms of the organized attachment strategies A, B, C) compared to the control children. In contrast, a positive effect on infant disorganization could not be traced, 4 intervention children (8%) and 6 control children (12%) were classified as disorganized.

Sajaniemi et al. (2001) studied the effects of an early occupational therapy intervention on cognitive development and the quality of attachment in extremely low birth-weight infants. The intervention aimed at supporting parent-child interaction by enhancing the parents' capacity to read their infants' cues and to respond adequately, thus focusing on the parent's sensitivity. The program was home based, with weekly sessions between the sixth and the twelfth month of the baby's age, and it involved 52 families with matched control families. The program was implemented by an occupational therapist experienced in treating infants, and the mean number of sessions was 20. According to the authors, the therapy helped to gather information on how the infant interacted with his/her environment and made it possible to adapt the environment to the infant's needs. As an example, an infant with tactile hypersensitivity could have problems with eating and holding. Parents were taught to adapt the environment to the baby's need by giving the right amount and combination of stimulation at the right time (Sajaniemi et al., 2001, p. 124). At the age of four years, 48 children (control group: $n = 25$; intervention group: $n = 23$) were assessed with the Preschool Assessment of Attachment (PAA; Crittenden, 1995); these were the children of the original sample who had not exceeded the pre-set age limit of four years for the use of the PAA system. The observed children had slightly higher risk scores than the children who were excluded from the attachment assessment (Sajaniemi et al., 2001). In the intervention group, more children were classified as securely attached than in the control group. Moreover, significantly less children in the intervention group had an atypical attachment pattern (considered to be comparable with disorganized infant attachment; Solomon & George, 1999; Teti, 1999) compared to the control group: 7 children (30%) in the intervention group versus 14 children (56%) in the control group.

Reviewing these studies in samples with at-risk children, the interventions appeared to be somewhat more successful in preventing disorganized attachment than interventions in the clinically referred groups. In particular, the sensitivity-focused intervention of Sajaniemi et al.

(2001) and the video-feedback intervention of Juffer et al. (2005b) managed to realize changes in disorganization.

Parents at risk. The last group of studies involves parents at risk. Egeland and Erickson (1993) evaluated a preventive intervention program for high-risk mothers and their infants (STEEP, Steps Toward Effective Enjoyable Parenting). The mothers were at risk because of poverty and associated risk factors such as lack of education, single status, and unstable life circumstances. The intervention combined individual home visits with group intervention for new parents in weekly sessions with alternating home visits and group meetings, starting in pregnancy and continuing during the first year after birth (30 sessions on average). The intervention was implemented by mothers who had some experience in working with low-income families. From the total sample of 154 mothers, 74 were randomly assigned to the STEEP program and 80 were assigned to the control group. STEEP mothers not only received practical support and advice, but also video feedback in order to increase sensitive parenting and help to examine and discuss their own childhood experiences. The STEEP program had a positive impact on a number of outcome measures, for example, the mother's sensitivity and her understanding of infant development, although no positive effects were found on attachment security (A, B, C). In addition, the intervention did not result in a smaller number of disorganized attached infants at 13 months ($n = 135$). In the intervention group, 26 infants were classified as disorganized infants (41%) and 14 infants were classified as disorganized in the control group (19%), so if anything, a negative effect seemed to have emerged.

Heinicke et al. (1999) examined a home-visiting, relationship-based intervention for mothers who were identified as at risk for inadequate parenting, mainly because of poverty and a lack of support. The first-time mothers were randomly assigned to an intervention ($n = 31$) or a control group ($n = 33$). The intervention started during pregnancy, and mothers were offered weekly home visits, as well as mother–infant group meetings during the first year postpartum (the intervention was continued after the posttests at 12 months). The mothers attended, on average, 17 group sessions, and they received, on average, 36 home visits during the first year. Home visits were carried out by mental health professionals. The primary goal of the intervention was to offer the mother a stable relationship that conveyed understanding of her situation, and that promoted her sense of self-efficacy through a variety of specific interventions (e.g., discussing alternate approaches to her relationship to her child) (Heinicke et al., 1999, p. 356). The intervention appeared to be effective with respect to all relevant outcome measures: maternal sensitivity, mother's respect for the child's autonomy, attachment (A, B, C), and disorganized infant attachment. More children were classified as disorganized in the control group (9 children, 27%) than in the intervention group (4 children, 13%).

Lyons-Ruth et al. (1990) examined a home-visit intervention for mothers and infants at high risk due to the combined effects of poverty, maternal depression, and caretaking inadequacy. The mean infant age at intake was 4.7 months. By 18 months of age, the intervention families had received weekly home-visiting service for 13.3 months on average (mean number of completed home visits was 46.7). The four goals of the intervention were: (1) providing a trustworthy relationship with the home visitor; (2) increasing the family's competence (including financial, health, and legal aspects); (3) modeling and reinforcing positive exchanges between mother and infant, with an emphasis on the mother's dual role as teacher and source of emotional security for her infant; and (4) decreasing social isolation (Lyons-Ruth et al., 1990, p. 87). The intervention was implemented by lay visitors in one part of the intervention group and by professional intervenors in another part of the group. Since no differences were observed between these two sub-groups, infants from both levels of treatment were analyzed as one single intervention group. Significant effects of intervention on maternal sensitivity could not

be traced in the intervention group. However, the intervention appeared to be effective with respect to the traditional secure (B), insecure-avoidant (A), and insecure-resistant (C) attachment classifications. Moreover, fewer intervention infants (15 of 28 children, 53%) than control infants (7 of 10 children, 70%) were classified as disorganized. Thus, the intervention appeared to have decreased the occurrence of disorganized attachment.

Bakermans-Kranenburg et al.'s (1998) intervention study involved primiparous low-SES mothers with an insecure mental representation of attachment (Main, Kaplan, & Cassidy, 1985), as assessed with the Adult Attachment Interview (AAI; Main & Goldwyn, in press). Two types of intervention were randomly provided: one intervention was directed at the behavioral level, promoting sensitivity, and the second intervention was also directed at the representational, mental level. In the first intervention group, the program aimed at enhancing maternal sensitive behavior through providing personal video feedback, Video Intervention to promote Positive Parenting (VIPP), combined with brochures on sensitive responding in daily situations. In the second intervention group, the program included additional discussions about past and present attachment relationships/experiences, aiming at affecting the mother's representation (R) of attachment (VIPP-R). Both types of intervention were short term: During four home visits between the seventh and tenth month after the baby's birth, the program was implemented by three female intervenors (one master's level and two PhD level). Results from a first sub-sample ($n = 30$, 10 control mothers, 10 VIPP mothers, and 10 VIPP-R mothers) were described by Bakermans-Kranenburg et al. (1998). The VIPP and VIPP-R intervention both resulted in increased maternal sensitivity at the posttest, but not in increased attachment security (A, B, C). The interventions were not effective with respect to attachment disorganization (40% and 30% D, respectively, in the intervention groups versus 20% D in the control group). The outcomes have to be considered as preliminary, as they were derived from a sub-sample, and the intervention groups had to be compared with a relatively small control group ($n = 10$). Results from the larger total sample ($n = 81$) must be awaited before firm conclusions can be drawn.

Intervention efforts in this last group of studies, with parents at risk, seem to present the most diverging results, with promising results found in the Heinicke et al. (1999) and Lyons-Ruth et al. (1990) studies, but less-positive outcomes in the STEEP project (Egeland & Erickson, 1993) and the study of Bakermans-Kranenburg et al. (1998). Noteworthy, it seems not to be the case that the largest effects were found in the group with the least problems: Mothers in the Bakermans-Kranenburg et al. (1998) had relatively stable and favorable life circumstances, compared to the other samples in this group of studies, but the interventions in this sample were not effective with respect to disorganization.

Coding System

A detailed coding system was used to rate every intervention study on design, sample, and intervention characteristics (see Table 2). As design characteristics, we coded sample size, randomization, and the study's attrition rate. For intervention characteristics, we coded aspects of the format of the intervention, that is, number of sessions, professional or non-professional intervenors, home based or center based, and the child's age at the start of the intervention. We also took into account whether the intervention aimed at enhancing parental sensitivity, affecting the parent's mental representation of attachment or providing support (or a combination of approaches). Moreover, we included the intervention's effectiveness on sensitivity, which we categorized into the following three categories: effect size less than or equal to 0.15, between 0.16 and 0.40, and greater than or equal to 0.41. Due to the small but significant

TABLE 2. *Coding System for the Individual Intervention Studies*

Design	
N	Note: If the control group is compared with two or more intervention groups, the control group is split up accordingly (e.g., Bakermans-Kranenburg et al., 1998; Cooper & Murray, 1997).
Random	0 = Subjects randomly assigned to intervention or control group 1 = Subjects not randomly assigned to intervention or control group, or no randomization reported
Attrition	Percentage of attrition: $100 \times [(original\ sample - sample\ size\ for\ which\ results\ are\ reported) / original\ sample]$
Intervention Sessions	Number of sessions (mean) <i>Note:</i> Interventions during one year, weekly: sessions = 40.
Intervenor	0 = Not in person (video tape, written information) 1 = Lay person (experienced mother) 2 = Professional or graduate student
Homebased	0 = Intervention not at home (e.g., health clinic, group meetings) 1 = Intervention at subject's home
Start	Age of child in months at start intervention <i>Note:</i> When intervention starts at birth, age start = 0, when intervention starts during pregnancy, a negative value is assigned, e.g., during third trimester of pregnancy (Heinicke et al., 1999), age start = -2, during second trimester of pregnancy (Egeland & Erickson, 1993), age start = -4.
Video	0 = No video feedback 1 = Video feedback used as intervention method (e.g., Bakermans-Kranenburg et al., 1998)
Focus	Focus of the intervention: 1 = Support (e.g., counselling regarding marital problems or financial difficulties) 2 = Sensitivity (e.g., information on infant development, modeling of touch and massage, video feedback aiming at promoting sensitive responsiveness) 3 = Representation (e.g., examination of internal working model of parent in relation to infant, re-experiencing of the past) 4 = Support + sensitivity 5 = Support + representation 6 = Sensitivity + representation 7 = Sensitivity + representation + support
Sample SES	0 = High/middle 1 = Low
Clinical	0 = Subjects not clinically referred 1 = Parents clinically referred; fulfilling DSM-III-R criteria (e.g., Cooper & Murray, 1997); or children clinically referred (e.g., Cohen et al., 1999)
Multirisk	0 = Sample not high-risk 1 = High-risk parents or infants (e.g., drug-dependent, impoverished, socially isolated, minority group, single parents, adopted infants, irritable infants)
Risk	1 = At-risk parents (e.g., impoverished, socially isolated, insecure) 2 = At-risk infants (e.g., adopted infants, irritable, premature)
D in control group	Percentage of disorganized infants in control group

association between parental (in)sensitivity and disorganization (Van IJzendoorn et al., 1999), interventions that were more effective in enhancing parental sensitivity might also be more effective in preventing disorganization. As sample characteristics, we coded features of both the involved parents (e.g., high or middle vs. low SES, clinical reference, or at high risk because of a combination of risk factors such as poverty, social isolation, and single parenthood) and their children (e.g., prematurity, irritability, international adoption). Moreover, the percentage of disorganized children in the control group was included. Four studies (Bakermans-Kranenburg et al., 1999; Cooper & Murray, 1997; Juffer et al., 2005a, 2005b) included more than one intervention, and separate effect sizes were computed for each of the interventions. Satisfactory intercoder reliabilities were established ($k = 10$; mean $r = 0.98$, range 0.90–1.00; mean $\kappa = 0.95$, range 0.78–1.00). Two coders (MHvIJ and MJBK) coded all studies independently. Disagreements were discussed and the final coding reflected the consensus of the two coders.

Data Analysis

The outcomes of all studies included in the meta-analysis were re-computed with Mullen's (1989) Advanced BASIC Meta-analysis program and transformed into Cohen's d . The resulting set of effect sizes were inserted into Borenstein, Rothstein, and Cohen's (2000) Comprehensive Meta-Analysis (CMA) program that computed fixed, as well as random effect, model parameters. CMA also computed confidence intervals around the point estimate of an effect size. Because all studies proposed directed hypotheses predicting that the intervention would have a positive effect, we present here the 90% confidence boundaries (with one-tailed α set at 0.05; see Table 2).

Significance tests and moderator analyses in fixed-effects models are based on the assumption that differences between studies leading to differences in effects are not random, and that, in principle, the set of study-effect sizes is homogeneous at the population level. Significance testing is based on the total number of subjects, but generalization is restricted to other participants that might have been included in the same studies of the meta-analysis (Rosenthal, 1995). Statistical inferences may be regarded as applying only to the specific set of studies at hand (Hedges, 1994). In random effects models, this assumption is not made (Hedges & Olkin, 1985) and they allow for the possibility that each separate study has its own population parameter. In random-effects models, significance testing is based only on the total number of studies and generalization is based on the population of studies from which the current set of studies was drawn (Rosenthal, 1995).

It has been argued that random-effects models more adequately mirror the heterogeneity in behavioral studies and use non-inflated α levels when the requirement of homogeneity has not been met (Hunter & Schmidt, 2000). We present the combined effect sizes and their confidence intervals in the context of fixed- or random-effects models, depending on the homogeneity of the specific set of effect sizes. The Q -statistics are presented to test this homogeneity of the specific set of effect sizes, and also to test the significance of moderators (Borenstein et al., 2000; Mullen, 1989; Rosenthal, 1995). In our series of meta-analyses, some data sets were heterogeneous. In those cases, the random-effects model parameters (significance, confidence intervals) are presented; they are somewhat more conservative than the fixed-effects parameters. The moderator tests (based on the fixed effects) should be considered to be descriptive of the specific set of studies at hand (Rosenthal, 1995). In order to avoid conclusions based on small sample sizes, we excluded analyses for moderators with one or more cells containing fewer than four studies. In Table 3, asterisks for d indicate significant combined effect sizes. Asterisks for Q indicate heterogeneity of the specific set of effect sizes.

TABLE 3. Meta-Analytic Results of Intervention Effects on Disorganized Attachment ($k = 15$ Study Outcomes)

	k	N	d	90% CI	Q	p
Total set	15	842	0.05	(-0.07 ~ 0.17)	21.41	
Design						
Random/control					0.72 ¹	0.39
Yes	11	677	0.05	(-0.15 ~ 0.25)	20.45*	
No	4	165	0.20	(-0.12 ~ 0.53)	0.23	
Attrition ²					0.13 ¹	0.72
0%	5	196	0.06	(-0.22 ~ 0.33)	1.32	
1-20%	8	537	0.04	(-0.20 ~ 0.28)	16.62*	
>20%	2	109	0.33*	(0.01 ~ 0.64)	.92	
Intervention						
Age start					5.74 ¹	0.02
<6 months	6	409	-0.13	(-0.30 ~ 0.05)	10.37	
>6 months	9	433	0.23*	(0.05 ~ 0.40)	5.29	
Intervenor						
Not in person	1	48	0.05	(-0.45 ~ 0.55)		
Lay person	2	173	-0.35	(-0.61 ~ 0.09)	3.74	
Professional	12	621	0.17*	(0.03 ~ 0.37)	9.10	
Focus					5.11 ¹	0.03
Sensitivity	5	291	0.26*	(0.07 ~ 0.46)	4.35	
other	10	551	-0.08	(-0.24 ~ 0.07)	11.95	
Video						
No	12	612	0.13	(-0.01 ~ 0.28)	6.63	
Yes	3	230	-0.06	(-0.69 ~ 0.58)	11.93**	
Sessions					1.78 ¹	0.41
<5	5	258	0.18	(-0.03 ~ 0.39)	3.85	
5-16	5	238	-0.06	(-0.33 ~ 0.20)	1.13	
>16	5	346	0.14	(-0.22 ~ 0.50)	14.65**	
Home-based						
Yes	13	776	0.07	(-0.10 ~ 0.24)	21.19*	
No	2	66	0.19	(-0.67 ~ 1.05)	0.14	
Sensitivity effect size ³					1.49 ¹	0.47
lowest-0.15	5	271	0.03	(-0.19 ~ 0.24)	2.01	
0.16-0.40	4	297	0.05	(-0.44 ~ 0.53)	12.66**	
0.41-highest	5	226	0.14	(-0.09 ~ 0.38)	2.25	
Sample						
SES					2.97 ¹	0.08
Middle/high	9	475	0.17*	(0.00 ~ 0.34)	7.02	
Low	6	367	-0.03	(-0.33 ~ 0.27)	11.42*	
Multi-risk					0.01 ¹	0.91
Yes	6	465	0.12	(-0.17 ~ 0.41)	15.86**	
No	9	377	0.06	(-0.13 ~ 0.25)	5.53	
Clinical					0.19 ¹	0.67
Yes	6	299	0.00	(-0.22 ~ 0.23)	1.68	
No	9	543	0.12	(-0.13 ~ 0.36)	19.54*	
Risk ⁴					6.56 ¹	0.01
Parent	9	500	-0.10	(-0.25 ~ 0.06)	11.84	
Child	4	276	0.29	(0.09 ~ 0.50)	2.78	
Percentage of disorganization in control group ³					10.99 ¹	<0.001
<21%	6	422	-0.18	(-0.35 ~ -0.02)	6.88	
≥21%	7	354	0.31**	(0.13 ~ 0.49)	3.32	

* $p < 0.05$, ** $p < 0.01$.

Note. k = number of studies; N = number of subjects; d = effect size; CI = confidence interval of the effect size; Q = homogeneity/comparison. Asterisks for d indicate significant combined effect sizes. Asterisks for Q indicate heterogeneity of the specific set of effect sizes.

¹ Q for the comparison.

² Contrast was tested without subgroup with $k < 4$ studies.

³ Contrast was tested without missing data.

⁴ Contrast was tested without mixed sample (Cohen et al., 1999).

RESULTS

In the meta-analytic part of this review, we tried to test in a more systematic and quantitative way whether attachment-based interventions managed to prevent or decrease disorganization of attachment and which intervention or sample characteristics were associated with significant differences among effect sizes.

Early interventions showed diverging outcomes on disorganized attachment, ranging from negative to positive effects. In five studies, positive effects were established (see Table 1): the WWW intervention of Cohen et al. (1999), Gelfand et al. (1996), Heinicke et al. (1999); the video-feedback intervention of Juffer et al. (2005b), Lyons-Ruth et al. (1990), Sajaniemi et al. (2001), with effect sizes ranging from small ($d = 0.16$) to medium ($d = 0.53$) (Cohen, 1988). However, several other interventions were not successful in preventing or changing disorganization [Bakermans-Kranenburg et al. (1998); the PTT intervention of Cohen et al. (1999); Cooper & Murray (1997); Egeland & Erickson (1993); the book-only intervention of Juffer et al. (2005b); Van den Boom (1994)]. The overall combined effect was not significant ($k = 15$, $N = 842$, $d = 0.05$; homogeneous set, Table 3). The interventions did not significantly prevent or change infant disorganized attachment.

We found no significant difference in effect size between random studies and studies without a control group or without random assignment. Attrition was not associated with a significant difference in effect size either. The age of the children at the start of the intervention was significantly associated with effect size. Interventions starting later ($d = 0.23$) were more effective than interventions starting prenatally or in the first 6 months of the infant's life [$d = -0.13$; Q (for the comparison) = 5.74, $p = .02$]. Interventions that used professional intervenors as compared to those that used lay persons (e.g., experienced mothers) or written material as a means of intervening were the only interventions that showed a significant effect size ($d = 0.17$). However, the other subgroups were small, so the contrast could not be tested. The contrast between the studies that focused on sensitivity only and studies with combined efforts (e.g., sensitivity and support) appeared to be significant ($Q = 5.11$, $p = 0.03$). The five interventions focusing on sensitivity only were significantly more effective in reducing attachment disorganization ($d = 0.26$) than interventions with combined efforts ($d = -0.08$). Contrasting other intervention characteristics (the use of video feedback, the number of sessions, and where the interventions took place) did not yield significant results, or subsets of studies were too small to warrant testing the significance of the moderator. Because interventions that focused on sensitivity only were more successful in reducing attachment disorganization than broader interventions, we also tested whether interventions that were effective in enhancing maternal sensitivity (categorized into three categories, effect size ≤ 0.15 , between 0.16 and 0.40, and ≥ 0.41) were more effective in reducing infant disorganization as well. The contrast was not significant ($Q = 1.49$, $p = 0.47$). Differences in intervention effects on sensitivity were not associated with differences in effectiveness on attachment disorganization.

The sample characteristics SES, the presence of multiple risk factors, and clinical referrals were not significant moderators and were not associated with differences in effect sizes among the studies (see Table 3). Inclusion of the Lyons-Ruth et al. (1990) study, which involved a substantial number of depressed mothers, in the subset of clinical samples did not change these outcomes. Interventions that were implemented in groups with the risk primarily located in the child (prematurity, irritability, or international adoption) were more effective ($d = 0.29$) than interventions with parents at risk (because of depression, maternal attachment insecurity, or poverty, social isolation, and single parenthood) ($d = -0.10$). The Cohen et al. (1999) study could not be included in this analysis because, in some cases, problems were manifested as infant problems, for example, sleeping or behavior problems, whereas in other cases, referrals

were made due to maternal depression and feelings of failure in bonding or attachment (Cohen et al., 1999, p. 436). The contrast was significant ($Q = 6.56, p = 0.01$). Moreover, studies with higher percentages of disorganized attachment in the control groups (i.e., more than 20%, which was the median for all studies with reported percentages of disorganization in the control group) were more effective ($d = 0.31$) than studies with lower percentages of disorganized children in the control group ($d = -0.18; Q = 10.99, p < 0.001$).

DISCUSSION

We reviewed ten studies with 15 preventive interventions that included disorganized attachment as an outcome measure, and we combined the results of these interventions in a series of meta-analyses. The meta-analysis showed that the effects of the 15 interventions ranged from negative ($d = -0.49$) to positive ($d = 0.53$), with a non-significant combined effect size ($d = 0.05$). The 90% confidence interval was small (-0.07 to 0.17) due to the homogeneity of the set of outcomes. The heterogeneity in the studies regarding aims, methods, and sample characteristics did not result in a similar heterogeneity in the set of outcomes. This implies that the chances are small that a substantial, or even a significant, combined effect size would result from a much larger set of similar intervention studies.

Four important contrasts were found: effective interventions started after six months of the infant's age rather than before six months; sensitivity-focused interventions appeared to be more effective than interventions with a broader focus; interventions in samples with children at risk were more effective than interventions in samples with at-risk parents; and in samples with a higher percentage of disorganization in the control group, the interventions were more successful in preventing disorganization. All four moderators led to homogeneous sub-sets of studies; thus, they can be considered important factors explaining the diversity of effect sizes.

First, effective interventions started after six months of the infant's age. Although some clinical writings suggest that the parent-child system around birth is characterized by openness to support, advice, and intervention (Crnic & Greenberg, 1987; Olds, Henderson, Chamberlin, & Tatelbaum, 1986), the meta-analytic results do not confirm this impression. It might be the case that the period immediately after birth (when parents are in the process of adapting to the new family situation and the demands of caregiving are high) is also a very demanding period for parents, during which it is difficult for parents to be open to intervention. The clinical dilemma is, however, that some groups need supportive intervention in the first few months after the birth of a baby, as in the case of postpartum depression (Cooper & Murray, 1997); or even prenatally, in order to be well prepared for the birth of the baby (Egeland & Erickson, 1993; Heinicke et al., 1999). Our findings do not imply that these groups do not need early intervention, or that the interventions do not bring about any change. In fact, these families may profit from early interventions in several areas that were not included in the current analyses. The meta-analytic results, however, show that, unfortunately, interventions that started before six months after the birth of the child were generally not effective in preventing disorganized attachment. It can be noted that most interventions with positive effects started at or shortly after six months. This might imply that interventions have the most impact when they are implemented in the period of the formation of a selective attachment relationship between the infant and the parent (Bowlby, 1969/1984). However, all but one intervention (Cooper & Murray, 1997) that started early continued into the second half year of the infant's age, and thus covered this period of the attachment relationship formation.

Secondly, sensitivity-focused interventions appeared to be more effective than interventions with a broader focus. In fact, only sensitivity-focused interventions produced a significant (combined) effect size. Sensitivity-focused interventions may have been successful in reducing

frightening or extremely intrusive or unresponsive parental behavior, but it should be noted that differences in intervention effects on sensitivity were not associated with differences in effectiveness on attachment disorganization. However, effects on sensitivity were based on assessments with Ainsworth's sensitivity scale and similar rating scales for sensitive behavior (e.g., Erickson, Sroufe, & Egeland, 1985), and they may be not sufficiently differentiated to detect effects on extremely negative parental behavior, as Lyons-Ruth and Jacobvitz (1999) suggested. Why were sensitivity-focused interventions more effective than interventions that also involved support and/or efforts to affect maternal representations? First, sensitivity-focused interventions are characterized by well-defined and relatively modest aims. In broadband approaches with multiple goals, it may be more difficult to bring about a significant effect on one of the many aspects that are included in the intervention. Long-term and broadly focused support of multi-problem families in coping with their daily hassles may, however, be needed in order to enable them to subsequently focus on sensitivity and representations (Bakermans-Kranenburg et al., 2003). Moreover, broadband interventions may have been effective on other outcome measures [e.g., parental satisfaction, quality of the marital relationship, or even on parenting and child behavior such as maternal sensitivity and infant-presenting problems, e.g., Cohen et al. (1999); Egeland & Erickson (1993)] that are beyond the scope of the current analyses. Second, sensitivity-focused interventions may be easier to implement for the "average" intervenor, and thus capitalize on the intervenor's expertise (Van IJzendoorn & Bakermans-Kranenburg, 2003b). Interventions with broader aims and methods [including the type of "psychotherapy in the kitchen" described by Fraiberg et al. (1975)] need highly qualified all-round intervenors, and these may be scarce. In the same vein, treatment adherence may be divergent for the two types of interventions. Whereas it appears quite possible for intervenors to stick to the protocol of a sensitivity-focused program, it may be much more difficult to implement a long-term broadband intervention in a "standard" way; as a result, positive outcomes of a potentially effective multifaceted intervention program may be obscured. A recent example is the attachment-based intervention study of Spieker and her colleagues in the context of Early Head Start (Spieker, 2003). They showed that over a two-year intervention period staff-turnover can seriously damage the implementation of a broad-based intervention effort.

The third significant moderator concerned the type of risk of the involved families. Interventions that were implemented in groups where it was the infants rather than the parents who were considered to be at risk (due to prematurity, irritability, or international adoption) were more effective than interventions with parents at risk. It might be easier to prevent or change disorganized attachment when the parent is relatively well-functioning and free of psychopathology. This finding converges with the clinical experience that in such cases the parent becomes a powerful ally in the treatment of the child instead of a co-client with multiple problems concerning herself. It should be noted that the two moderators—focus of the intervention and location of the primary risk—are not completely independent (the four studies with infants at risk were all sensitivity-focused, and four out of five sensitivity-focused interventions concerned samples with infants at risk), complicating the question whether the effectiveness of these studies should be ascribed to either the focus of the intervention, the type of risk of the sample, or the interaction between these two moderators. With multivariate analyses, we might detect the answer to this question, but the number of studies is definitely too small to warrant such analyses. More studies are needed to disentangle the contamination of these intervention and risk effects.

The fourth significant moderator was the percentage of disorganization in the control group. In samples with a higher percentage of disorganization in the control group, the interventions were more successful in preventing disorganization. The latter finding suggests that there is more room for improvement when the base-rate of disorganization is higher than is

usually found in normal, non-clinical groups (15%, Van IJzendoorn et al., 1999). A relatively high percentage of disorganization in the control group may make it easier for the intervention group to outperform the control group as it prevents a “floor” effect from dampening the intervention effectiveness. Alternatively or additionally, intervention effects may be larger in groups that are most at risk for disorganization. In a similar vein, in Olds et al.’s (1997) large-scale intervention study, most of the positive results were concentrated among mothers who were unmarried and from low-SES households (but see Kitzman et al., 2000, for contrastive evidence). Contrasting other design, sample, or intervention characteristics did not result in significant outcomes. Professional intervenors were effective, whereas lay persons and written material were not, but additional data is needed before the significance of this difference can be tested. It should be noted that the suggestion following from the narrative review that interventions might be less effective in preventing or reducing disorganization in clinically referred samples than in samples that were at risk was not substantiated by the meta-analytic results. Meta-analysis turns out to be an essential tool for detecting the study characteristics that distinguished more-effective studies (in terms of decreasing disorganization) from less-effective studies. We conclude that interventions may be most effective in decreasing disorganization in samples with high levels of disorganization when they start after six months of the infant’s age, when it is the infant who is primarily at-risk, and when a sensitivity-focused approach is used. The two interventions with significant positive effects on disorganization (Juffer et al., 2005b; Sajaniemi et al., 2001) have these four characteristics in common. This does not imply, however, that all studies with these characteristics should be effective—the power of meta-analysis lies exactly in detecting trends in effect sizes, going beyond the results of individual studies.

None of the studies designed an intervention that exclusively aimed at preventing disorganized infant attachment or focused on the reduction of frightening/frightened parental behaviors. In fact, the effects of the interventions on disorganized attachment behavior were not tested in the majority of the studies, and for these studies, it is the first time that the effectiveness of the interventions with regard to disorganized attachment was made explicit. Most studies yielded nonsignificant results, whether positive or negative (see Table 1). Two studies yielded significant positive effects on disorganization (Juffer et al., 2005b; Sajaniemi et al., 2001), and in only one study was the effect significantly negative (Egeland & Erickson, 1993). The negative effect of this intervention on disorganized behavior might raise concern, but it should be weighed against the positive effects that the intervention also realized (e.g., on maternal depression, sensitivity, understanding of infant development, and providing a stimulating and organized home environment).

It may be not surprising that only few studies yielded significant effects: All studies aimed at promoting sensitivity and infant–parent attachment security, including the disorganized classification, but without specifying distinct goals for enhancing “traditional” attachment security (A, B, C) and preventing disorganized attachment, respectively. Some of the studies were conducted even before much was known about the etiology of disorganized attachment. From the perspective of gaining more insight in the processes and mechanisms that underly the development of disorganized attachment, however, it is a significant limitation that no attachment-based intervention study published so far was designed as an intervention that explicitly aimed at preventing or reducing attachment disorganization. Such intervention studies are urgent from a clinical point of view as well, as “traditional” attachment security and infant disorganization may be considered as relatively independent orthogonal dimensions of attachment, and as maternal sensitivity is only weakly associated with disorganization (Van IJzendoorn et al., 1999). The recently augmented understanding of the particular interactive correlates of disorganization (such as frightening/frightened parental behavior) gives a new impetus

for intervention studies and points to the importance of including these other dimensions of parenting behavior in intervention studies.

This should be stressed even more so in view of the absence of a “dose–response” relation between change of sensitivity and decrease of disorganization. In a previous meta-analysis, we found such a dose–response relation between enhancement of sensitivity and elevated levels of attachment security; with only the most effective sensitivity interventions showing a significant effect size on attachment security (Bakermans-Kranenburg et al., 2003). This illustrates the causal role of sensitivity in the development of the organized (A, B, C) attachment patterns. Although sensitivity-focused interventions appear more effective in preventing disorganized attachment as well, this finding does not necessarily imply a similar causal relation between sensitivity and disorganized attachment.

Sensitivity-focused interventions may trigger change in parental behavior that is not fully identified with the usual sensitivity measures and that nevertheless affects infant attachment disorganization. Specific types of insensitive parental behavior might be linked to disorganization (see also Lyons-Ruth & Jacobvitz, 1999). Parental intrusiveness and interfering, disruptive behavior, as well as parental frightened/withdrawing behavior as particular types of insensitivity, may be unpredictable and/or frightening in the infant’s experience, and thus provoke disorganization (Main & Hesse, 1990). Intruding babies’ personal space or taking away their toys unexpectedly may have frightening and/or unpredictable qualities, and the same is true of sudden or persistent withdrawal from the interaction. To test this hypothesis, interventions aimed at reducing parental intrusiveness and withdrawal and enhancing parental cooperation and respect for the child’s autonomy should not only result in a change of these parenting behaviors, but also in a reduction of infant-attachment disorganization.

Moreover, effective sensitivity-focused interventions may have successfully affected parents’ *attention* processes, directing and focusing the parent’s attention to observations of the child in the here-and-now. Schuengel and his colleagues (Schuengel et al., 1999) documented the protective role of mothers’ secure mental representations of attachment in the development of infant disorganization. Mothers with unresolved loss, but otherwise secure mental representations of attachment, displayed very low levels of frightening, frightened, and dissociative behavior, and secure mothers’ unresolved loss did not predict infant disorganization. They speculated that secure mothers may monitor their infants more closely than insecure mothers, thereby preventing intrusions of thoughts related to unresolved loss. An infant may be a more salient focus of attention for secure mothers than for insecure mothers (Schuengel et al., 1999). In the same vein, an infant may be a more salient focus of attention for sensitive mothers than for insensitive mothers. Research on information processing shows that when the emphasis is on attention to a particular signal, it always occurs at the “cost” of attention to other signals (Posner & Snyder, 1975; Schuengel et al., 1999; Van der Heijden, 1992). This means that close monitoring of infants leaves little room for signals and thoughts from other sources. Sensitive mothers may monitor their infants more closely and thus may experience fewer moments of absorption (Hesse & Van IJzendoorn, 1998) or intrusions of distracting thoughts. As we have suggested elsewhere (Juffer et al., 2005b), interventions that teach parents to follow their child’s lead (WWW, Cohen et al., 1999), or to observe their child on videotape (Juffer et al., 2005b), focus parents’ attention on the child’s behavior. Even if parents’ general attention processes are not changed by this type of intervention, they may become more focused in the interaction with their child, monitoring the child’s behavior (as was practised in the intervention), and thereby diminishing dissociative processes in the presence of the child (Schuengel et al., 1999).

The current review and meta-analysis of intervention studies show that attachment disorganization can be prevented or changed, and it presents some suggestions about which pro-

cesses may be involved. New intervention studies should address the important question whether infant attachment disorganization can be prevented effectively through interventions explicitly aimed at decreasing parental non-involved or intrusive behavior (Lyons-Ruth et al., 1999), and/or parental frightened, frightening, or dissociative behavior (Main & Hesse, 1990; Schuengel et al., 1999). Ultimately, this may lead to the construction of programs that specifically aim at preventing attachment disorganization, as well as to some building blocks for curative therapeutic approaches. On the basis of the current meta-analytic results, we expect that at least one building block—sensitivity-focused feedback—will be an essential part of successful interventions for disorganized attachment in the future. Because infant disorganized attachment predicts later developmental psychopathology, it is of great clinical importance to design and test such intervention programs.

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¹Publications preceded by an asterisk indicate studies included in the meta-analysis.

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