Developmental Psychology
2002, Vol. 38, No. 5, 806–821

0012-1649/02/$5.00 DOI: 10.1037//0012-1649.38.5.806

Maternal Sensitivity, Infant Attachment, and Temperament in Early Childhood Predict Adjustment in Middle Childhood: The Case of Adopted Children and Their Biologically Unrelated Parents

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In a longitudinal study, internationally adopted children ($N = 146$) placed before 6 months of age were followed from infancy to age 7. Results showed that girls were better adjusted than boys, except in cognitive development, and that easy temperament was associated with higher levels of social, cognitive, and personality development and fewer behavior problems. Higher quality of child–mother relationships, in terms of attachment security and maternal sensitivity, uniquely predicted better social and cognitive development. The combination of attachment disorganization and difficult temperament predicted less optimal ego-control and lower levels of cognitive development. It is concluded that even in adopted children, who are not biologically related to their adoptive parents, early mother–infant interactions and attachment relationships predict later socioemotional and cognitive development, beyond infant temperament and gender.

The goal of the present study was to investigate early precursors of adopted children's adjustment in middle childhood. The emphasis was on maternal sensitivity, infant attachment, and infant temperament as potentially important predictors of later adjustment. Previous longitudinal studies on biologically related parent–child dyads found evidence for the importance of parenting, attachment, and temperament in predicting later socioemotional and cognitive adjustment (e.g., Belsky, 1981, 1984; Sroufe, Carlson, & Shulman, 1993; Weinfield, Sroufe, & Egeland, 2000). The children who participated in the current study are biologically unrelated to their adoptive parents, however, and thus allow for more conclusive evidence of social-interactive influences on children's development—independent of genetic relationships (Rowe, 1993b). We explored the longitudinal and concurrent associations between maternal sensitive responsiveness, security of child–mother attachment relationships, the child's temperament, and later adjustment in terms of social development, personality development, cognitive development, and behavior problems.

Without adhering to a deterministic model, we suggest that the nature of the parent–child relationship during infancy and toddlerhood is an important factor in establishing coherence in individual development across time and situations and in facilitating adjustment in middle childhood, in particular under stable circumstances (Bowlby, 1988). In line with Block's (1993) and Sroufe's (1979, 1996) ideas, we believe that the study of coherence in individual development should focus on broad constructs that have meaning across different contexts and ages (see also Belsky, Rovine, & Taylor, 1984; Kochanska & Murray, 2000). In this perspective, coherence resides above all in the organization and meaning of different behaviors, cognitive processes, and particular emotions over time, manifested in various contexts (Beckwith, Rodning, & Cohen, 1992; Rutter, 1987; Sroufe, 1979; Sroufe et al., 1993). Individual differences in adaptation are not simply differences in temperament, nor do they only reflect environmental pressures and opportunities (Sroufe, 1979, p. 840). Coherence of individual development is based on the ideas that children actively adapt to changing life circumstances and developmental issues and that affect plays a key role in the coherent organization of behavioral propensities and functioning. An important role of caregivers is to help children cope with the stresses and strains of new situations and challenges and maintain organized behavior (Sroufe, 1979).

In addition to (more or less) constitutional factors such as gender or temperament, maternal sensitive responsiveness and infant–mother attachment security have been shown to be antecedents of children's adaptive functioning over time and to contribute to the coherence in individual development with respect to social development (e.g., Berlin, Cassidy, & Belsky, 1995; Fagot, 1997; Kerns, 1994), personality development (e.g., Sroufe et al., 1993; Urban, Carlson, Egeland, & Sroufe, 1991), cognitive development (e.g., Beckwith et al., 1992; Jacobsen & Hofmann, 1997; Van IJzendoorn, Dijkstra, & Bus, 1995), and the incidence of behavior problems (e.g., Carlson, 1998; Lyons-Ruth, Easterbrooks, & Cibelli, 1997; Rothbaum & Weisz, 1994). A major problem with most previous studies of the influence of parenting on children's adaptation is the confounding of genetic similarities

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We are grateful for the assistance of M. J. Bakermans-Kranenburg, R. A. C. Hoksbergen, E. Rigg-Jansen, H. K. Andriesse, M. P. de Graaf, C. M. de Haas, J. W. A. L. Heijmans, E. Hoogmoed, N. Jenner, E. Kornelis, S. Niemeijer, I. Nijhof, J. Rovers, J. S. van Dijk, M. J. van Vliet, M. H. C. Verkerk, R. Visser, and M. Zwaanswijk.

This study was supported by grants from the Netherlands Organization for Scientific Research (NWO, Grant 575–87–701 to R. A. C. Hoksbergen and Femmie Juffer).

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and parenting effects (Rowe, 1993a, 1993b). In studies on biologically related parents and children, associations between parental and child variables may always be due to their genetic connections instead of (nongenetically determined) experiential influence. In our investigation of adopted children and their biologically unrelated parents, however, we tested whether maternal sensitive responsiveness and attachment security make unique contributions to children's adjustment in the four developmental domains beyond those of genetic similarities and the contributions of temperament and gender. In the following paragraphs we discuss the theoretical and empirical work that guided our investigation in the domains of social, personality, and cognitive development and the development of behavior problems.

In the domain of *social development*, parent–child relationships have been studied from several theoretical orientations, including social interaction theory. Social interaction theory emphasizes that sensitive parents may serve as positive role models for their children's interaction with peers and are likely to teach their children social skills that may generalize to other relationships (Darling & Steinberg, 1993; Denham, Renwick, & Holt, 1991; Putallaz, 1987). In attachment theory, the concept of internal working models has received much attention in explaining the link between the quality of child–parent attachment relationships and later social development. Internal working models have been conceptualized as cognitive/affective mental structures that summarize past experiences in attachment relationships and shape expectations about future interactions with significant others (Bretherton, 1996). Children with secure attachments are supposed to develop working models of available care, self-worth, and having potency in the environment; children with insecure attachments are thought to develop working models of the self as unworthy and expectations of others as unresponsive and unavailable (Bretherton, 1991). It follows that secure children are expected to be more empathic and responsive to others, better at resolving conflicts, and more able to establish and maintain friendships than are insecure children (Sroufe et al., 1993). Furthermore, insecure children may tend to evoke more rejection and are likely to receive less support from peers or adults than are secure children (Kerns, 1994).

In the domain of *personality development*, sensitive parents are expected to have a positive influence on children's ego-control (i.e., the adaptive and flexible control of motivational and emotional impulses) and ego-resiliency (i.e., the dynamic capacity to respond flexibly and resourcefully to changing demands) (Block & Block, 1980; Sroufe, 1979). These predictions are based on studies which have shown that sensitively responding parents are likely to foster their children's feelings of control, self-efficacy, and competence (Beckwith & Cohen, 1989; Bornstein & Tamis-LeMonda, 1989; Egeland, Carlson, & Sroufe, 1993; Riksen-Walraven, 1978; Van Aken & Riksen-Walraven, 1992) and may enhance positive emotional regulation of arousal in their children (Barth & Parke, 1993; Ford & Thompson, 1985). Attachment theory assumes that secure children may possess a greater capacity for self-regulation than insecure children, because adequate fine-tuning of affect and arousal regulation as well as accurate processing of cognitively and emotionally based information are central to secure child–mother attachment relationships (Main, 1990; Sroufe et al., 1993; Verschueren, Marcoen, & Schoefs, 1996). This greater capacity for self-regulation could be reflected in higher levels of optimal ego-control and ego-resiliency.

In the domain of *cognitive development*, it has been suggested that sensitively responding parents may stimulate cognitive development through offering children the opportunity to experience the effects of their own behavior by providing contingent social support (e.g., Beckwith & Cohen, 1989; Lewis & Goldberg, 1969; Riksen-Walraven, Meij, Hubbard, & Zevalkink, 1996; Riksen-Walraven & Van Aken, 1997), structuring learning activities through scaffolding (Rogoff, 1990), and joint problem solving (Gauvain & Rogoff, 1989; Schaffer, 1992). Some preliminary evidence for a relation between attachment and cognitive development has been summarized in a quantitative meta-analysis of 32 studies (Van IJzendoorn et al., 1995). Several mechanisms were suggested to explain a relation between secure child–parent attachment relationships and cognitive development. First, the teaching–learning process is expected to take place smoothly in secure child–parent relationships, because trustful and trusted parents are likely to facilitate learning (Bretherton, 1985) and because secure children may not be inclined to focus their attention on task-irrelevant, attachment-related aspects of the situation. Second, an optimal balance between attachment and exploration could promote higher levels of exploratory competence and thus greater cognitive development (the secure-base hypothesis; Waters, Posada, Crowell, & Lay, 1994). Third, the internal working model of a confident or brittle self may stimulate or hamper cognitive development depending on its motivational impact (Jacobsen & Hofmann, 1997).

In the domain of *behavior problems*, Rothbaum and Weisz (1994) conducted a meta-analysis of 47 studies dealing with the relation between parental caregiving and externalizing behavior in nonclinical samples. They concluded that a lack of parental acceptance–responsiveness may place children at increased risk for externalizing behavior. The influence of parental caregiving on internalizing behavior in nonclinical samples is equivocal. Different results may be obtained in clinical samples, especially if participants are at increased risk for internalizing disorders, for example, in children with chronic medical health problems (Lavinge & Faier-Routman, 1992) or in children who are reared by depressed mothers (e.g., Cummings & Davies, 1994). In studies of attachment, insecure and disorganized child–mother attachment relationships have been shown to be associated with higher levels of both internalizing and externalizing behavior, especially in high-risk samples (e.g., Greenberg, DeKlyen, Speltz, & Endriga, 1997; Lyons-Ruth et al., 1997; Sroufe et al., 1993) but also in nonclinical samples (e.g., Booth, Rose-Krasnor, McKinnon, & Rubin, 1994; Moss, Rousseau, Parent, St-Laurent, & Saintonge, 1998; Rothbaum, Schneider-Rosen, Pott, & Beatty, 1995). The mechanisms and processes that are thought to be responsible for the associations between attachment insecurity and behavior problems are far from clear, however, and still lack sufficient empirical evidence (Goldberg, 1997). Genetic factors may inflate the association between parenting and attachment on the one hand and behavior problems on the other hand. In adoptive samples, this alternative interpretation of a possible linkage has been ruled out in advance.

Along with maternal sensitive responsiveness and attachment security, infant temperament may prove to be predictive of the child's adjustment in middle childhood. The empirical evidence

for a relation between difficult temperament during early childhood and later behavior problems is growing, in particular in at-risk groups (e.g., Allen & Prior, 1995; Caspi, Henry, McGee, Moffit, & Silva, 1995; Guerin, Gottfried, & Thomas, 1997; Rende, 1993; Schwartz, Snidman, & Kagan, 1996). Also, several researchers have reported links between temperament and social development (e.g., Rothbart, Ahadi, & Hershey, 1994), personality development (Caspi & Silva, 1995; Rothbart & Ahadi, 1994), and cognitive development (Carey & McDevitt, 1995; Keogh, Bernheimer, & Guthrie, 1997; Martin, 1983, 1994).

Goodness of fit may be one of the mechanisms explaining these longitudinal associations (Keogh, 1986; Lerner, Nitz, Talwar, & Lerner, 1989), thus emphasizing the interaction between child and environment. In the context of school, for example, difficult temperament characteristics, such as high distractability and low task-persistence, have been found to affect the child's "teachability," school achievement, and intellectual development (Keogh, 1989; Matheney, 1989). In the present study, early difficult temperament may be associated with lower levels of social and cognitive development as well as with a higher incidence of externalizing and internalizing behavior. From the perspective of a cumulative risk model (Rutter, 1990), we argue that the combination of difficult temperament and a problematic, disorganized attachment relationship exacerbates adjustment problems in middle childhood. Disorganized attachment is the most powerful indicator of a disturbed attachment relationship (Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999) that may affect children's development, specifically when a difficult temperament causes a problematic fit between the child and the social environment (Mangelsdorf, Gunnar, Kestenbaum, Lang, & Andreas, 1990; Seifer, 2000). In the case of adoptive families, the risk of a problematic fit between the child and the adoptive parents may be elevated because of the lack of biological relatedness (Brodzinsky, 1987; Grotevant & McRoy, 1990). Also, in the current sample, the adopted children were neither selected by nor matched to the characteristics of their future adoptive parents. Placement of a particular child was contingent upon the prospective parents' place on the waiting list of an adoption organization.

The present study was carried out with a sample of 146 internationally adopted children, placed before the age of 6 months, whom we followed over the course of about 7 years with minimal attrition. Because our longitudinal study was basically observational, this sample size may be considered as rather large. This unique investigation of early-adopted children's adjustment in middle childhood may contribute to the disentanglement of genetic and social-interactive influences on child development. Furthermore, in our study, the confounding factors of extreme and prolonged deprivations before adoption may be less pertinent than in the case of the adoptees from Romanian orphanages (Rutter et al., 1998), although the possibility of physical and psychological suffering during the few months before adoption cannot be excluded. Another merit of our study is that adopted children's adjustment in middle childhood was examined from a broad longitudinal perspective with assessments in multiple contexts and with multiple indicators, focusing on four major areas of child development.

Recent empirical studies report that adopted children have elevated rates of behavior problems compared with their nonadopted peers and are overrepresented in mental health settings (Brodzinsky, Schechter, Braff, & Singer, 1984; Stams, Juffer, Rispens, & Hoksbergen, 2000; Verhulst, Althaus, & Versluis-den Bieman, 1990; for a meta-analysis, see Wierzbicki, 1993). Compared with their nonadopted counterparts, adopted children, and in particular boys, show relatively high rates of externalizing problems and attention difficulties (Stams et al., 2000; Verhulst et al., 1990). Brodzinsky (1987) has argued that adoption can be considered as a psychological stressor that may negatively affect a child's development. According to Brodzinsky (1987, 1990), the adopted child's experience of losing the biological parents and origins may lead to emotional and behavioral reactions in the child and in the adoptive family. Alternatively, risk factors experienced before the adoption placement—for example, the child's genetic disposition or nonoptimal prenatal and pre-adoption care—may explain emotional or behavioral difficulties in adopted children (O'Connor et al., 2000; Rutter et al., 1998).

From the theoretical framework of attachment theory, using a coherence model, we hypothesized that higher maternal sensitive responsiveness and secure child–mother attachment relationships in early childhood would each contribute to favorable adjustment of adopted children in middle childhood and set the stage for optimal performance in various developmental domains without fully determining individual differences in adaptation. In this model, child development remains sensitive to environmental changes and stressful life events (Waters, Hamilton, & Weinfield, 2000). We tested the hypothesis that sensitive responsiveness, secure attachment, and absence of attachment disorganization would be related to higher levels of social development, greater ego-resiliency, more optimal ego-control, higher levels of cognitive development, and less externalizing and internalizing behavior. We hypothesized that lower sensitive responsiveness, less secure attachment, and more disorganized attachment would increase the risk for less optimal adaptation or even behavioral maladjustment. From the perspective of a cumulative risk model (Rutter, 1990) we speculated that a combination of attachment disorganization (the most maladaptive attachment modality; see Lyons-Ruth & Jacobvitz, 1999; Main & Solomon, 1990; Van IJzendoorn et al., 1999) and difficult temperament would be especially predictive of less optimal adjustment in middle childhood. Finally, we predicted that female adopted children would be better adjusted than male adopted children. The favorable adjustment of adoptive girls during childhood has been documented extensively (e.g., Achenbach, Howell, Quay, & Conners, 1991; Earls, 1987; Howe, 1997; Rutter, 1990; Stams et al., 2000; Verhulst et al., 1990).We suggest that constitutional factors such as temperament and gender predict adjustment in a substantial way, and we tested whether the parent–child relationship would predict adjustment over and above the effects of gender and temperament.

Method

Participants

For the purpose of this article, two intervention studies were combined. In these studies, a short-term early intervention was implemented in three sessions at home between 6 and 9 months in a randomly assigned experimental group. The families were randomly recruited through Dutch adoption organizations and were not selected on the basis of (future) problems. Also, to avoid selection, the parents were not aware of the intervention when they entered the study because they were requested to participate in a study examining the development of adopted children. The brief inter-

vention was not repeated during the following years. In one study, the intervention had been moderately successful in enhancing maternal sensitivity and infant attachment security in the short run (Juffer, Hoksbergen, Riksen-Walraven, & Kohnstamm, 1997), whereas in the second study the intervention proved to be moderately effective in reducing internalizing behavior problems at 7 years of age (Stams, Juffer, Van IJzendoorn, & Hoksbergen, 2001). In the predictions of the cognitive and socioemotional functioning of 7-year-old adopted children in the current study, we statistically controlled for the intervention effects in order to be able to describe the participants' socioemotional and cognitive development from the 1st to the 7th years of their lives.

The adoptive parents were Caucasian White, and in all families the adoptive mother was the primary caregiver. We assessed socioeconomic status at age 7. The families were predominantly from middle-class or upper middle-class backgrounds. At 7 years, participants were 146 families for whom longitudinal data were available (attrition rate of 9%). The children, 65 boys and 81 girls, were adopted from Sri Lanka ($n = 79$), South Korea ($n = 48$), and Colombia ($n = 19$). The adopted children were neither selected by nor matched to the characteristics of their future adoptive parents. Separate Bonferroni-corrected statistical tests, with the initial level of significance set at $p < .10$, confirmed the absence of selective attrition with respect to temperament, attachment, maternal sensitivity, and all background variables. Parents gave various reasons for not participating. The major reasons were disinterest or health problems of family members, and some parents had no time available because of their full-time employment outside the home. Four mothers had died of incurable illnesses.

Measures

Families were visited at home at 5, 6, 9, and 12 months. Mothers and children came to the laboratory at 12, 18, and 30 months. At age 7, families were visited at home to observe mother–child interaction, to interview the mother, and to administer questionnaires to her. The school was visited in order to interview classmates and to have questionnaires completed by the focal child's teacher. The statistics on the reliability and validity of measures were based on the total sample. Table 1 presents a summary of the assessments, together with the indicators for reliability.

Health condition on arrival. Health condition on arrival was an index of the infant's health condition from the time of birth until arrival. The information was gathered in the first interview with the parents at the child's age of 5 months. The health score was computed by a standardized summation of three variables: birth weight, incidence of prematurity, and health problems on arrival (reversed). Scores were keyed to a good standard of health. Principal-components analysis showed a one-dimensional solution with an explained variance of 54%. The standardized item reliability (α) was .60 ($N = 132$). The health condition score ranged from 0.00 to 0.68 ($M = 0.36$, $SD = 0.13$, $N = 188$).

Socioeconomic status. Socioeconomic status was a combination of the educational and vocational background of both parents and was computed on the basis of sample-specific factor loadings and standard deviations. Mean scores correspond to socioeconomic strata in the following way: 3 to 9, lower class; 9 to 12, middle class; and 12 to 16, upper class (Bernstein & Brandis, 1970). Principal-components analysis revealed a one-dimensional solution with an explained variance of 69%. The reliability of the scale (α) was .82. The mean score was 9.94 ($SD = 2.78$, $N = 176$, range = 2.86 to 14.73), which means that the sample can be considered as middle class.

Attachment security. Attachment assessments were conducted using Ainsworth's standardized Strange Situation laboratory procedure (Ainsworth, Blehar, Waters, & Wall, 1978). The attachment classifications at 12 months were distributed as follows: 22% avoidant ($n = 32$), 76% secure ($n = 110$), and 2% resistant ($n = 3$). We chose to devise a continuous scale for attachment security for two reasons: first, because there was an insufficient representation of ambivalent children among attachment classifications to conduct robust analyses, and second, in order to gain statistical power in regression analyses. Continuous scores for attachment security were computed by assigning numbers to Strange Situation subclassifications according to a rule that was derived from propositions by Main, Kaplan, and Cassidy (1985) and Van IJzendoorn, Sagi, and Lambermon (1992). The most insecure infants, with A1 and C2 classifications, were assigned the score of 1. The most secure infants, classified as B3, were assigned the score of 5. The A2 and C1 infants were assigned the score of 2, the B4 infants the score of 3, and the B1 and B2 infants the score of 4. Infants classified as B4 were assigned a lower security status than infants classified as B1 or B2 because of earlier research on this marginal group (Sagi et al., 1985; Van IJzendoorn, Van der Veer, & Van Vliet-Visser, 1987). Intercoder reliability for the resulting continuous scale, in terms of intraclass correlations (r), ranged from .81 to .95, using four pairs of raters. The mean score was 3.36 ($SD = 1.24$, $N = 159$). A high score on a scale for attachment security indicates that the infant is able to use the mother as a secure base when exploring the environment and is active in seeking contact with the mother if distressed. Interrater reliability for the main attachment classifications (Cohen's kappa) ranged from .80 to 1.0 ($N = 155$).

Table 1
Timetable for Assessments and Reliabilities

Age	Assessments	Reliabilities
5–30 months	Health condition on arrival	$\alpha = .60$
	Attachment security	$.81 < r^a < .95$, $.80 < \kappa < 1.0$
	Disorganization of attachment	$r = .86$, 85% agreement[b]
	Maternal sensitive responsiveness	$\alpha = .62$, $.90 < \kappa < .97$
	Perceived difficult temperament	$\alpha = .86$
5–7 years	Stressful life events	$\alpha = .68$
7 years	Socioeconomic status	$\alpha = .82$
	Maternal sensitive responsiveness	$\alpha = .81$, $\kappa = .87$
	Externalizing problem behavior	$\alpha = .93$
	Internalizing problem behavior	$\alpha = .86$
	Ego-resiliency	$\alpha = .83$
	Ego-control	$\alpha = .89$
	Social development	$\alpha = .90$
	Cognitive development	$\alpha = .87$

[a] Intraclass correlations. [b] Categorical classification.

The Strange Situation procedures were used at 12 months to assess disorganization of attachment (D). The Main and Solomon (1990) coding system was used by coders who were extensively trained by Mary Main (Marinus H. van IJzendoorn and Marian J. Bakermans-Kranenburg). Data were available for 143 cases. Because of technical problems, 3 cases could not be coded for disorganized attachment in an adequate manner. The classification of disorganized attachment as well as the coding of the continuous rating scale for intensity of disorganized behavior ($M = 2.90$, $SD = 1.91$; minimum = 1, maximum = 8) showed a satisfactory intercoder reliability on 20 cases (for the categorical D classification, 85% agreement; for the D continuous score, $r = .86$). In 25 adopted children we found sufficient signs of disorganized attachment behavior to classify these children as disorganized (18%).

Maternal sensitive responsiveness (12, 18, and 30 months and 7 years). At 12 months, maternal sensitive responsiveness consisted of seven variables. Sensitivity and cooperation (Ainsworth, Bell, & Stayton, 1974) were assessed during an 8-min free-play situation in the child's home, and emotional support, respect for the child's autonomy, structure and limit setting, hostility, and quality of instruction (Erickson, Sroufe, & Egeland, 1985) were assessed during a total time of 12.5 min in five short task situations (e.g., making a simple puzzle) at the laboratory. The averaged Cohen's kappa for agreements within one scale point was .91. Principal-components analysis revealed a one-dimensional solution with an explained variance of 44%. The internal consistency, in terms of Cronbach's standardized item alpha, was .77 ($N = 155$). The 12-months score for maternal sensitive responsiveness was the standardized summation of all seven variables divided by their number, and it ranged from −1.92 to 1.44 ($M = -0.01$, $SD = 0.67$, $N = 160$).

At 18 months, maternal sensitive responsiveness was assessed in the laboratory in three new task situations (e.g., building a tower of blocks) during a total time of 9 min, and it was measured with the same five Erickson scales as before (Erickson et al., 1985). The averaged Cohen's kappa for agreements within one scale point was .90. Principal-components analysis showed a one-dimensional solution with an explained variance of 59%. The internal consistency, in terms of Cronbach's standardized alpha, was .82 ($N = 151$). The 18-months score for maternal sensitive responsiveness was the summation of all five variables divided by their number. The scores ranged from −2.08 to 1.85 ($M = 0.00$, $SD = 0.77$, $N = 151$).

Some validity data on the Erickson scales (Erickson et al., 1985) used in infancy have been reported in previous studies on parts of the sample. For example, the mother's (summed) scores on the Erickson scales measured at 12 months predicted the child's persistence and enthusiasm in solving a task at 18 months: $r = .41$, $p < .05$ and $r = .37$, $p < .05$, respectively ($N = 28$, control group; Juffer, 1993). Also, the mother's (summed) scores on the Erickson scales at 12 months predicted the child's compliance and affective sharing in a task situation at 18 months: $r = .33$, $p < .05$ and $r = .38$, $p < .05$, respectively ($N = 28$, control group; Juffer, 1993). The stability of the (summed) scores on the Erickson scales between 12 and 18 months was considerable: $r = .60$, $p < .01$ ($N = 26$, control group; Juffer, 1993). Meij (1992) found a correlation of .52 ($p < .01$, $N = 75$) between (nonadoptive) mothers' summed scores on the Erickson scales measured at 12 months and their scores on Ainsworth et al.'s (1974) sensitivity scales.

At 30 months, maternal sensitive responsiveness was assessed in the laboratory in a free-play situation and in a task situation and consisted of seven variables. In the free-play situation (8 min), we used the Ainsworth scales (Ainsworth et al., 1974). In the three task situations (e.g., playing an adapted game of table football; total time = 15 min), we used the 1990 revision of the Erickson scales: emotional support, intrusiveness, sensitivity and timing, hostility, and clarity of instruction (Egeland, Erickson, Clemenhagen-Moon, Hiester, & Korfmacher, 1990; Erickson et al., 1985). The averaged Cohen's kappa was .97 (agreements within one scale point). Principal-components analysis revealed a one-dimensional solution and an explained variance of 49%. Cronbach's standardized item alpha was .81 ($N = 139$). The overall score for maternal sensitive responsiveness was based on all seven variables and ranged from −1.95 to 1.61 ($M = 0.00$, $SD = 0.70$, $N = 159$).

Principal-components analysis was performed on the three scores for maternal sensitive responsiveness at 12, 18, and 30 months, which resulted in a one-dimensional solution. The explained variance was 58%. Cronbach's standardized item alpha was satisfactory ($\alpha = .62$, $N = 137$). The three scores for maternal sensitive responsiveness were combined into one overall score, which ranged from −2.03 to 1.42 ($M = 0.00$, $SD = 0.76$, $N = 146$). This aggregated early childhood sensitivity measure was one of our central predictors for children's functioning at 7 years. Because the two dimensions of warmth and nonpunitive control are combined in one aggregate score, the measure showed some similarity to Baumrind's (1971) conceptualization of authoritative parenting.

At 7 years, we videotaped two episodes of 8 min each at the child's home. In the first and second episodes, the mother was asked, respectively, to assist her child in solving a difficult puzzle and to make a drawing together with her child on the same sheet of paper. The first and second episodes were scored using all five Egeland/Erickson scales (Egeland et al., 1990; Erickson et al., 1985), and the second episode was additionally scored with three scales used to assess maternal emotional availability, namely, sensitivity, structuring/intrusiveness, and hostility (Emotional Availability Scales, Middle Childhood Version; Biringen & Robinson, 1991; Biringen, Robinson, & Emde, 1993). Whereas the Egeland/Erickson scales emphasize the cognitive side of maternal sensitive responsiveness, focusing on the mother in a teacher-like role, the Emotional Availability Scales emphasize the affective side of maternal sensitive responsiveness.

Although the Egeland/Erickson scales (Egeland et al., 1990; Erickson et al., 1985) were developed for rating maternal sensitive responsiveness in early childhood, we used these scales in middle childhood. We took into account the more frequent verbal interaction between mother and child at this age compared with the more frequent physical contact of the mother–child dyad in early childhood. For example, the mother's greater verbal support (combined with positive affect), expressed as positive comments, praise, and encouragement of the child's efforts, could result in a higher score on emotional support at age 7. In early childhood, higher scores were characterized by a combination of positive verbal and physical support, such as praising the child while touching or stroking him or her. In the same vein, the mother's instructive behavior relied relatively often on verbal explanation at age 7. In contrast, in early childhood, the mother showed and manipulated the play material relatively more often, and verbal explanation played a less dominant role in her instructive behavior. Also, in scoring the Egeland/Erickson scales in middle childhood, we chose age-adequate tasks. Furthermore, we found a correlation of .30 ($p < .01$, $N = 166$) between the total scores on the Egeland/Erickson scales and those on the Emotional Availability Scales (Stams et al., 2001), indicating some convergent validity. Finally, the Egeland/Erickson scales were found to be test–retest reliable at 7 years (see below).

The Egeland/Erickson scales and the Emotional Availability Scales were scored by different raters, who were trained by Femmie Juffer. Intercoder reliability, in terms of Cohen's kappa, was established on 60 tapes and was computed for agreements within one scale point. The averaged kappas were as follows for the Egeland/Erickson scales: emotional support, .92; hostility, .97; intrusiveness, .94; clarity of instruction, .96; and sensitivity and timing, .92. Averaged kappas for the Emotional Availability Scales were as follows: hostility, .91; structuring/intrusiveness, .83; and sensitivity, .78. Test–retest reliability, implying stability of maternal sensitive-responsive behavior within a time period of 9 to 12 months after the initial assessment, was established on 20 randomly selected mother–child dyads. The same dyads obtained scores from different observers. The scales proved reliable, because a series of paired t tests revealed no significant differences between the initial test and the posttest. The correlations ranged from .56 (sensitivity and timing) to .84 (intrusiveness), $p < .01$ (one-tailed). Principal-components analysis showed a one-dimensional solution.

The explained variance was 44%. Cronbach's alpha was .81 ($N = 166$). The overall score for maternal sensitive responsiveness was based on eight standardized variables and ranged from −1.73 to 1.59 ($M = 0.00$, $SD = 0.65$, $N = 166$).

Perceived temperament (12, 18, and 30 months). Temperament was measured with the Dutch Temperament Questionnaire (Kohnstamm, 1984), which is an adaptation of the Infant Characteristics Questionnaire (Bates, Freeland, & Lounsbury, 1979; Bates, 1980, 1987). Mothers rated their child's behavior on nineteen 7-point scales. Cronbach's alpha was .78 at 12 months, .85 at 18 months, and .84 at 30 months. Principal-components analysis revealed a one-dimensional solution with an explained variance of 78%. Cronbach's alpha was .86 ($N = 146$). The overall score ranged from −2.78 to 2.12 ($M = 0.00$, $SD = 0.88$, $N = 146$). A high score on the early childhood temperament scale indicates that the mother perceived her child as relatively difficult on aspects such as sociability, persistence, mood, and adaptability.

Sociometric status (7 years). Sociometric data were gathered by means of interviews at school with all classmates. Being unaware of the child we were focusing on, each child could name three classmates as most liked and three classmates as most disliked. The total number of times a child was rated as liked or disliked formed the raw "like" and "dislike" scores, respectively. The standard preference score, that is, the standardized difference of the standardized like score and the standardized dislike score, was considered as indicative of the child's sociometric status or peer group popularity (Cillessen & Ten Brink, 1991). The preference score ranged from −2.74 to 2.63 ($M = 0.32$, $SD = 0.99$, $N = 144$).

Child Behavior Check List/Teacher's Report Form (7 years). The Child Behavior Check List (CBCL) and the Teacher's Report Form (TRF) both contain 118 problem items that are scored on similar 3-point scales (Achenbach, 1991a, 1991b, 1991c; Verhulst, Van der Ende, & Koot, 1996, 1997). Mothers and teachers indicated whether behavioral descriptions were *not at all true* (0), *somewhat true* (1), or *very true* (2) of their child. Scores were thus obtained on eight syndromes: withdrawn, somatic complaints, anxious/depressed, delinquency, aggression, social problems, thought problems, and attention problems. Cronbach's alpha ranged from .59 (withdrawn, CBCL) to .94 (aggression, TRF). Furthermore, overall scores were obtained for externalizing behavior (CBCL, $\alpha = 91$; TRF, $\alpha = .95$) and internalizing behavior (CBCL, $\alpha = .84$; TRF, $\alpha = .88$). The mother–teacher agreements were moderate, varying between .24 ($p < .01$, $N = 149$) for withdrawn and .55 ($p < .01$, $N = 148$) for attention problems (one-tailed significance). Agreement was higher for externalizing behavior, $r(149) = .55$, $p < .01$, than for internalizing behavior, $r(148) = .31$, $p < .01$ (one-tailed).

To measure adaptive functioning at school, teachers indicated on 7-point scales the degree to which children worked hard, behaved appropriately, showed progress in learning, and displayed a happy mood (TRF). A score for academic performance was obtained by averaging teacher ratings for six academic subjects. School performance was assessed with the CBCL and consisted of four variables: learning problems, repeated grades, type of school (in terms of special education for poorly functioning children), and academic performance. The reliabilities (Cronbach's alphas) for adaptive functioning at school, academic performance, and school performance were .74, .92, and .57, respectively.

California Child Q-set (7 years). The California Child Q-set (CCQ) consists of 100 items, printed on individual cards, providing descriptions of behavioral, affective, and cognitive characteristics of children (Block & Block, 1980; Van Lier, Haselager, Hoeben, & Van Lieshout, 1992; Van Lieshout et al., 1986). Mothers and teachers were asked to sort the items into a forced, quasi-normal, nine-category distribution that ranged from *extremely uncharacteristic* (1) to *extremely characteristic* (9) of the child being described. Two types of scores were derived from the Q-sort: profile scores and scale scores (Van Lier et al., 1992; Van Lieshout et al., 1986). Profile scores, which were obtained by correlating the actual Q-sort with expert profiles for each construct, were calculated for adult or peer acceptance and rejection, ego-control (i.e., the disposition to express impulses and emotions), and field independence (i.e., a cognitive style that implies relative absence of distraction by irrelevant features of the problem situation). Together with the 4 profile scores, we calculated 11 scale scores, namely, for ego-resiliency, ego-brittleness, ego-overcontrol, ego-undercontrol, creativity, prosocial competence, antisocial competence, depression, self-esteem, social esteem, and vitality. Internal consistencies, in terms of Cronbach's alpha, ranged from .52 (social esteem) to .87 (prosocial competence). The agreement between mother and teacher varied between .19 ($p < .05$, $N = 144$) for creativity and .54 ($p < .05$, $N = 144$) for vitality (one-tailed).

School Behavior Assessment List (SCHOAL; 7 years). Teachers completed the School Behavior Assessment List (Bleichrodt, Resing, & Zaal, 1993), a measure that was used to assess the socioemotional behavior of children at school. The items, which were measured on 6-point scales, included pairwise comparisons of opposite adjectives describing personality characteristics. For the purpose of this study, three scales were used: attitude to work ($\alpha = .93$), agreeableness ($\alpha = .86$), and emotional stability ($\alpha = .79$).

Intelligence (7 years). Intelligence was assessed by a trained researcher during a home visit, using the abbreviated Revised Amsterdam Child Intelligence Test (RACIT; Bleichrodt, Drenth, Zaal, & Resing, 1987). Bleichrodt et al. (1987) found empirical evidence for convergent validity, because the RACIT appeared to correlate ($r = .86$) with the Wechsler Intelligence Scale for Children—Revised. The RACIT consists of the following tests: Flexibility of Closure (Cronbach's $\alpha = .84$), Paired Associates (split half reliability, $\alpha = .77$), Perceptual Reasoning (split half reliability, $\alpha = .73$), Vocabulary (Cronbach's $\alpha = .74$), Inductive Reasoning (Cronbach's $\alpha = .86$), and Ideational Fluency (Cronbach's $\alpha = .81$). The reliability of the abbreviated RACIT was .91 ($N = 163$), and was estimated on the basis of the number of subtests, the reliabilities of the subtests, and the correlations between the subtests. The score for IQ ranged from 77 to 145 ($M = 107.45$, $SD = 14.60$, $N = 162$).

Composites. We focused on obtaining general scores rather than situation-specific ones in order to minimize subject loss and sources of error, to ensure high-quality data, and to reduce the number of dependent variables, thereby preventing chance capitalization. For this purpose, the information derived from multiple sources (teachers, mothers, and peers) and from different measures (questionnaires, Q-sorts, personal interviews, and observational instruments) was averaged within categories after standardization (see Belsky et al., 1984, and Kochanska & Murray, 2000, for a similar approach). Thus, composite scores were derived for personality development (i.e., ego-resiliency and ego-control), social development, cognitive development, and behavior problems (i.e., internalizing and externalizing) (for details, see Stams, 1998; Stams et al., 2001).

Personality development: Ego-resiliency and ego-control (7 years). Ego-resiliency refers to the dynamic capacity to respond flexibly to changing situational demands, in particular to stressful encounters, and to the ability to modulate the level of ego-control in situationally appropriate ways. The composite measure for ego-resiliency consisted of nine variables. Ego-resiliency, ego-brittleness (reversed), depression (reversed), creativity, self-esteem, and vitality were derived from the CCQ, the scores of mother and teacher having been averaged. Emotional stability and attitude to work were derived from the SCHOAL, and adaptive functioning at school was derived from the TRF. Principal-components analysis revealed a one-dimensional solution with an explained variance of 44% and factor loadings ranging from .37 (vitality) to .87 (ego-resiliency). Cronbach's standardized item alpha was .83. The composite ego-resiliency score was the standardized summation of all nine variables divided by their number, and ranged from −1.83, indicating high ego-brittleness, to 1.24, indicating high ego-resiliency ($M = 0.00$, $SD = 0.67$, $N = 175$).

The ego-control dimension was based on Block and Block's (1980) empirically derived personality typology of ego-control, that is, the tendency to contain emotional and motivational impulses. Ego-control con-

sisted of four CCQ scale scores and two CCQ profile scores dealing with ego-undercontrol and ego-overcontrol as reported by the mother and the teacher of the target child. Principal-components analysis revealed a one-dimensional solution with an explained variance of 66% and factor loadings ranging from .74 (scale score, ego-undercontrol, mother: reversed) to .86 (profile score, ego-overcontrol, teacher). The ego-control score was the standardized summation of all six variables divided by their number. The standardized item alpha was .89. The ego-control score ranged from −2.21, indicating undercontrol, to 2.07, indicating overcontrol ($M = 0.02$, $SD = 0.86$, $N = 175$).

Only moderate scores of ego-control should be regarded as optimal (Arend, Gove, & Sroufe, 1979; Van IJzendoorn & Van Vliet-Visser, 1986). Inspecting the curves of the quadratic relations between ego-control on the one hand and both internalizing behavior and the composite measure for ego-resiliency on the other hand, we decided that scores around the mean could be regarded as optimal. On this basis we computed scores for optimal ego-control by setting the mean to zero and treating all values as absolute. The scores were subtracted from a constant (maximum score + .01) in order to key the control variable to optimal ego-control. The scores for optimal ego-control ranged from 0.01 to 2.18 ($M = 1.49$, $SD = 0.51$, $N = 175$).

Social development (7 years). Social development consisted of nine variables. Rejection (reversed), acceptance, prosocial competence, antisocial competence (reversed), and social esteem were derived from the CCQ, the mother and teacher scores having been averaged. Social problems (reversed) and appropriate school behavior were derived from the CBCL and the TRF. Agreeable behavior at school was derived from the SCHOAL, and the child's peer group popularity was derived from the sociometric measure. Principal-components analysis revealed a one-dimensional solution. The explained variance was 59%, and the factor loadings ranged from .55 (appropriate school behavior) to .96 (rejection, reversed). Cronbach's standardized item alpha was .90. The social development score was calculated via a standardized summation of all variables divided by their number and was transformed to normal by means of a quadratic transformation (Tabachnick & Fidell, 1996). The transformed social development score ranged from 0.00 to 1.33 ($M = 0.81$, $SD = 0.25$, $N = 175$) and correlated .99 with the initial social development score.

Cognitive development (7 years). Cognitive competence consisted of six variables: intelligence (RACIT), academic performance (TRF), learning progress (TRF), attention problems (reversed, CBCL and TRF), school performance (CBCL), and field independence (CCQ). Principal-components analysis revealed a one-dimensional solution with an explained variance of 61% and factor loadings ranging from .65 (intelligence) to .85 (academic performance). Cronbach's standardized item alpha was .87. The cognitive development score was computed by means of a standardized summation of all variables divided by their number and ranged from −2.54 to 1.59 ($M = -0.04$, $SD = 0.81$, $N = 175$).

Behavior problems (7 years). The scores for externalizing and internalizing behavior on the CBCL and TRF were combined into overall scores for externalizing and internalizing behavior and transformed to normal by a logarithmic and a quadratic transformation, respectively (Tabachnick & Fidell, 1996). The transformed score for internalizing behavior ranged from 1.00 to 2.46 ($M = 1.50$, $SD = 0.31$, $N = 176$) and correlated .99 with the initial score for internalizing behavior. The transformed score for externalizing behavior ranged from 0.00 to 0.83 ($M = 0.30$, $SD = 0.17$, $N = 176$) and correlated .97 with the initial score for externalizing behavior.

Stressful life events (5 to 7 years). The stressful life events scale was developed to assess the degree to which the family experienced stress during the last 2 years and was completed by the mother during the home visit at age 7. Stressful life events were measured with nine 4-point scales: financial problems; marital problems; problems at work; conflict with relatives, neighbors, or neighborhood; physical health problems of relatives; mental health problems of relatives; bereavement; unemployment; and divorce. Cronbach's alpha was .68 ($N = 118$). The items were standardized, summed, divided by their number (9), and transformed to normal by an inverse method (Tabachnick & Fidell, 1996). The scores for life stress ranged from 0.00 to 0.77 ($M = 0.20$, $SD = .19$, $N = 172$).

Results

The results are reported in two sections and are based on all participants for whom longitudinal data were available ($N = 146$). In the first section, we test for the bivariate associations between independent and dependent variables. In the second section, we test for the multivariate longitudinal effects of maternal sensitive responsiveness, infant temperament, and infant attachment on social development, personality development, cognitive development, and behavior problems at 7 years by conducting a series of hierarchical multiple regression analyses.

Bivariate Associations Between Predictor and Outcome Variables at 7 Years

Table 2 presents the means and standard deviations for all predictor variables and the correlations between the predictor

Table 2
Means and Standard Deviations of Predictors and Correlations Between Predictors and Age 7 Outcome Variables

				Outcome variables					
Predictor	*M*	*SD*	*N*	Social development	Ego-resiliency	Ego-control	Cognitive development	Externalizing behavior	Internalizing behavior
Health condition on arrival	0.37	0.13	144	.05	.12	−.18*	.15	.00	−.13
Sex of the child	1.55	0.50	146	.24**	.01	.19*	.02	−.41***	−.15
Socioeconomic status	9.90	2.84	146	.08	.06	−.02	.08	−.04	.07
Experimental vs. control	1.51	0.50	146	.04	.10	−.11	−.07	.04	.02
Attachment security	3.34	1.24	145	.22**	.13	.09	.14	−.15	−.06
Disorganization of attachment	3.79	2.00	143	−.18*	−.05	−.15	−.23**	.13	−.02
Early sensitive responsiveness	0.00	0.76	146	.22**	.19*	.12	.33**	−.10	.05
Difficult temperament in early childhood	0.00	0.88	146	−.20**	−.17*	−.10	−.21**	.22**	.24**
Stressful life events at 5–7 years	0.20	0.20	142	.06	.01	.09	.05	.04	.00
Sensitive responsiveness at 7 years	−0.02	0.68	136	.23**	.08	−.02	.14	−.09	.04

* $p < .05$. ** $p < .01$ (two-tailed).

variables and the outcome variables at 7 years, that is, social development, ego-resiliency, optimal ego-control, cognitive development, and externalizing and internalizing behavior.

Health condition on arrival, sex of the child, attachment security, disorganization of attachment, early and later maternal sensitive responsiveness, and difficult temperament were all significantly associated with one or more outcome variables. The following predictors did not significantly correlate with any of the outcome variables: socioeconomic status, experimental condition, and stressful life events. Therefore, we excluded these nonsignificant predictors from further multivariate analyses.

In Table 3 the correlations between the predictor variables are presented. It should be noted that only three correlations were significant. These significant correlations ranged from −.28 to .24. Multicollinearity problems were not supposed to emerge from these modest associations between the predictors. The correlation between attachment security and attachment disorganization was nonsignificant ($r = -.06$), which converges with previous meta-analytic outcomes (Van IJzendoorn et al., 1999). Attachment disorganization can be observed in infants who show an underlying insecure or secure attachment strategy (Main & Solomon, 1990) and thus is expected to be orthogonal to the security dimension of the Strange Situation classifications.

Multivariate Longitudinal Effects of Maternal Sensitive Responsiveness, Infant Temperament, and Attachment

To explore the longitudinal effects of maternal sensitive responsiveness, infant temperament, and attachment on the main outcome variables, we performed hierarchical multiple regression analyses on 7-year outcome variables, with forced entry of predictors within the hierarchical steps. In accordance with our hypotheses, the interaction between attachment disorganization and infant temperament was included in the regression equation. For all analyses, $N = 146$. To reduce subject loss, missing values were replaced with the variable mean. Other methods of treating missing data, that is, pairwise or listwise deletion of cases with missing values, yielded comparable results.

The predictor variables were entered in five hierarchical steps, beginning with child background variables (sex of child and infant health status, Step 1) followed by concurrent maternal sensitive responsiveness (Step 2), difficult temperament (Step 3), early parent–child relationships (early maternal sensitive responsiveness, attachment security, and attachment disorganization, Step 4), and the interaction between attachment disorganization and temperament (Step 5).

The final regressions involved eight predictors and were thus based on a ratio of predictors to participants of 1:18. In Table 4 the results of the regressions are presented. The (cumulative) regular and adjusted R^2 indicate the total amount of variance accounted for by the variables in the equation. The adjusted R^2change (ΔR^2) indicates the increment in the amount of variance accounted for. Finally, the beta coefficients (standardized estimates) show the association of each variable with the dependent variables, controlling for the previous predictors.

We found significant regression equations for social development, $F(8, 137) = 5.74$, $p < .01$, optimal ego-control, $F(8, 137) = 3.05$, $p < .01$, cognitive development, $F(8, 137) = 5.06$, $p < .01$, externalizing behavior, $F(8, 137) = 6.11$, $p < .01$, and internalizing behavior, $F(1, 144) = 2.09$, $p < .05$. The regression equation for ego-resiliency was not significant, $F(8, 137) = 1.93$, *ns*.

The total amount of variance accounted for in *social development* was 21% (adjusted R^2s are reported). The significant predictors were child background variables, accounting for 4% of the variance, concurrent maternal sensitive responsiveness, adding 5% to the variance accounted for, difficult temperament, adding 4%, and early parent–child relationships, adding another 7%. Girls scored higher on social development than boys. Next, concurrent maternal sensitive responsiveness predicted higher levels of social development, and children perceived as difficult in early childhood scored lower on social development. Finally, more secure child–mother attachment relationships were associated with favorable social development.

The total amount of variance accounted for in *optimal ego-control* was 10% (adjusted R^2). Child background variables and the disorganization by temperament interaction significantly predicted optimal ego-control, accounting for 6% and 2% of the variance, respectively. Girls were more optimally controlled than boys, and a better standard of health was related to less optimal ego-control. We explored the attachment disorganization by temperament interaction by means of a one-way analysis of variance, comparing children's ego-control scores in four groups with different combinations of high and low disorganization and easy and difficult temperament, based on median splits of the continuous variables. In accordance with the cumulative risk model, the a priori contrast between the combination of high disorganization and difficult temperament and the other combinations was tested.

Table 3
Correlations Between Predictor Variables

Variable	1	2	3	4	5	6	7	8
1. Sex of the child	1.00							
2. Health condition on arrival	.10	1.00						
3. Sensitive responsiveness at 7 years	−.05	−.19*	1.00					
4. Early difficult temperament	−.05	−.06	.11	1.00				
5. Early sensitive responsiveness	.03	.05	.24**	−.10	1.00			
6. Attachment security	−.01	−.05	−.09	.07	.13	1.00		
7. Disorganization of attachment	−.01	−.05	−.10	.14	−.28**	−.06	1.00	
8. Temperament × Disorganization	−.00	.02	−.09	−.05	−.07	−.05	.15	1.00

Note. $133 < N = 146$.
* $p < .05$. ** $p < .01$.

Table 4
Hierarchical Multiple Regression Analyses on Child Outcome Variables at Age 7

	Personality development																Behavior problems							
	Social development				Ego-resiliency				Ego-control				Cognitive development				Externalizing				Internalizing			
Predictor	R^2	Adj R^2	ΔR^2	β	R^2	Adj R^2	ΔR^2	β	R^2	Adj R^2	ΔR^2	β	R^2	Adj R^2	ΔR^2	β	R^2	Adj R^2	ΔR^2	β	R^2	Adj R^2	ΔR^2	β
1. Child background	.06	.04	.04*		.02	.00	.00		.07	.06	.06**		.02	.01	.01		.17	.16	.16**		.04	.02	.02	
Sex of the child				.24**				.00				.21*				.01				−.41**				.14
Health condition				.03				.12				−.20*				.15				.04				−.12
2. Sensitivity at 7 years	.11	.09	.05**	.23**	.02	.00	.00	.10	.08	.06	.00	−.05	.05	.03	.02	.16	.18	.16	.00	−.10	.04	.02	.00	.01
3. Difficult temperament	.16	.13	.04**	−.21**	.05	.03	.03*	−.17*	.09	.06	.00	−.10	.09	.07	.04**	−.21**	.23	.20	.04**	.22**	.09	.06	.04*	.22**
4. Early parent–child relationships	.24	.20	.07**		.09	.05	.02		.12	.08	.02		.19	.15	.08**		.26	.22	.02		.10	.06	.00	
Sensitivity				.07				.13				.10				.23**				.01				.09
Attachment security				.25**				.14				.06				.13				−.17*				−.10
Disorganization				−.08				.03				−.13				−.11				.08				−.05
5. Temperament × Disorganization	.25	.21	.01	−.11	.10	.05	.00	−.10	.15	.10	.02*	−.17*	.23	.18	.03**	−.20**	.26	.22	.00	.05	.11	.06	.00	.07

Note. $N = 146$. Adj R^2 = adjusted R^2.
* $p < .05$. ** $p < .01$.

The a priori contrast between the group of children with more difficult temperament and higher attachment disorganization versus the other groups was significant, $t(54.90) = -1.81$, $p < .05$ (one-tailed significance, unequal variances), whereas the differences between the other groups were not significant at $p < .05$ (see Table 5).

The total amount of variance accounted for in *cognitive development* was 18% (adjusted R^2). The following predictors contributed significantly to the variance accounted for: difficult temperament, adding 4%; early parent–child relationships, adding 8%; and the interaction between attachment disorganization and temperament, adding 3%. Children perceived as difficult during early childhood showed lower levels of cognitive development. Higher early maternal sensitive responsiveness was associated with better cognitive development. We explored the interaction between attachment disorganization and temperament after dichotomizing both predictors by using the median split. The a priori contrast revealed that children with a difficult temperament who scored high on disorganization had lower scores on cognitive development than did children from the remaining three groups, $t(138) = -4.12$, $p < .01$ (one-tailed significance), which were not different from each other at $p < .05$ (see Table 5).

The total amount of variance accounted for in *externalizing behavior* was 22% (adjusted R^2). Child background variables and temperament proved to be significant predictors, accounting for 16% and 4% of the variance, respectively. Girls scored lower on externalizing behavior than boys. Children perceived as difficult in early childhood scored higher on externalizing behavior in middle childhood.

The total amount of variance accounted for in *internalizing behavior* was 6% (adjusted R^2). Only temperament proved to significantly contribute to the total amount of variance, that is, 4%. Children perceived as difficult in early childhood showed relatively high levels of internalizing behavior in middle childhood.

Discussion

Continuity of children's development across time may be attributed to earlier and concurrent child-rearing circumstances and other contextual and constitutional factors as well as to genetic similarities between parents and their children. The present longitudinal investigation controlled for concurrent contextual (parenting) and constitutional (gender, health condition) factors in testing the influences of early parenting and temperament on later adjustment. Furthermore, the unique nature of the adoption sample excluded the influence of shared genetic factors between parents and children in enhancing the continuity of development. Even in a biologically unrelated group of parents and their adopted children from different cultures and ethnic backgrounds, early child–parent relationship characteristics played a significant role in shaping children's adjustment in middle childhood. From Rosenthal's (1995) perspective, the predicted variance in adjustment on the basis of earlier contextual factors was not only significant but also substantial: We found 21% and 18% of predicted variance in social and cognitive development, respectively, half of which could be attributed to parenting and relationship variables. It should be noted that we included only part of the potentially important environmental factors in the current investigation.

Table 5
Means and Standard Deviations of Optimal Ego-Control and Cognitive Development in Adopted Children With Low and High Attachment Disorganization and With Easy or Difficult Temperament

	Low disorganization				High disorganization				
	Easy temperament (n = 36)		Difficult temperament (n = 31)		Easy temperament (n = 36)		Difficult temperament (n = 39)		
Outcome	*M*	*S*	*DM*	*S*	*DM*	*S*	*D M*	*S*	*D*
Optimal ego-control	1.54_a	0.46	1.56_a	0.50	1.57_a	0.44	1.36_b	0.63	
Cognitive development	0.20_a	0.65	0.21_a	0.74	0.08_a	0.87	-0.46_b	0.93	

Note. Different subscripts indicate a priori contrasts significant at $p < .05$.

In our longitudinal study, we examined early-adopted children's adjustment in middle childhood from a broad, cross-context, cross-time perspective, using different measures (observations, questionnaires, Q-sorts, and sociometric data) and multiple sources of information (mothers, teachers, and classmates). Relevant environmental factors were directly measured instead of estimated from similarity coefficients in a behavior genetic design. A large group of 146 internationally adopted children, placed before 6 months of age, was followed from infancy to age 7.

We found that maternal sensitive responsiveness in early and middle childhood, as well as infant attachment security, attachment disorganization, and temperament each significantly predicted children's subsequent adjustment in middle childhood. Female adopted children were better adjusted than male adopted children, in particular in the social domain and the domains of impulse control (ego-control) and externalizing behavior problems. The favorable adjustment of girls during childhood has been documented extensively (e.g., Achenbach et al., 1991; Earls, 1987; Eme, 1979; Howe, 1997; Maccoby, 1998). Moreover, a more difficult temperament in early childhood predicted lower adjustment at age 7 in the domains of social and cognitive development and externalizing and internalizing behavior problems. Higher early and later maternal sensitivity and more secure infant attachment predicted better social and cognitive development. Furthermore, the interaction between temperament and attachment disorganization was significant. The combination of two risk factors—namely, attachment disorganization and difficult temperament—predicted lower levels of cognitive development and less optimal ego-control. In light of McCartney and Rosenthal's (2000; Rosenthal, 1995) interpretation of the meaning of effect sizes, we found excitingly robust predictability of later adjustment on the basis of early characteristics of the child and the parent–child relationship in this sample of genetically unrelated parents and adopted children.

The relations between early attachment security and quality of mother–infant interactions on the one hand and later child adjustment on the other hand may be indicative of coherence in individual development. From the perspective of attachment theory, coherence in individual development is a function of both past and concurrent child and environmental influences (Sroufe, 1997). In previous reviews of attachment theory, the coherence of individual development reflecting environmental stability has been emphasized (Lamb, Thompson, Gardner, Charnov, & Connell, 1985). Consistency in parental behavior over time, however, has been shown to be only moderate (Dunn, Plomin, & Daniels, 1986), or even low, because of changes in social support, stressful life events, and the developmental phase of the child (Pianta, Sroufe, & Egeland, 1989). In the current study, the association between maternal sensitivity in early childhood and at age 7 was modest (r = .24). Furthermore, environmental stability may reflect continuity in children's interactive behaviors, evoking consistently high-quality or low-quality parental support, stimulation, and control (Ge et al., 1996; Olson, Bates, & Kaskie, 1992). As Sroufe (1979) suggested, to understand the coherence of individual adaptation, one should view children as active participants in their own experience.

In order to test the idea of continuity as a reflection of a stable environment, we performed the hierarchical multiple regression analyses with concurrent maternal sensitivity included before the early childhood predictors. In this way, we examined the unique association of early parent–child relationships with individual development, controlling for concurrent circumstances and environmental stability (Sroufe, Egeland, & Kreutzer, 1990). Although concurrent sensitive responsiveness was included only in the prediction of social development, early parent–child relationships remained predictive of social and cognitive development in middle childhood.

Along with maternal sensitive responsiveness and child–mother attachment relationships, infant temperament proved to be remarkably predictive of the child's adjustment in middle childhood. In the present study, early difficult temperament was associated with lower levels of social development and cognitive development as well as with a higher incidence of externalizing and internalizing behavior problems. In the case of adoptive families, the negative effects of a difficult temperament on the child's later adjustment are relatively large and pervasive. In biological families, genetic relatedness may dampen the effects of children's temperament, because shared genes might make it easier to stimulate the goodness of fit between parent and offspring. The current study emphasizes the importance of difficult temperament for later adjustment in families where temperamental commonalities between parents and children are contingent instead of genetically based.

It should be noted that the least favorable type of attachment, that is, attachment disorganization, did not uniquely predict

(mal-)adaptation in middle childhood. In the current investigation, attachment disorganization only predicted later adjustment in interaction with difficult temperament. The combination of two risk factors was associated with less optimal ego-control and lower levels of cognitive development in middle childhood, beyond the main effect for temperament. Attachment disorganization has been found to be associated in particular with externalizing behavior problems (Lyons-Ruth & Jacobvitz, 1999; Van IJzendoorn et al., 1999), but in the present investigation it was related to less optimal ego-control and lower levels of cognitive development (cf. Jacobsen, Edelstein, & Hofmann, 1994; Moss et al., 1998), both in combination with difficult temperament. Further research on the relative contributions of attachment disorganization and difficult temperament to the emergence of externalizing behavior problems is necessary. The current investigation shows that attachment disorganization per se is an insufficient condition for the development of adjustment problems. It is the concurrence of a constitutional factor (i.e., difficult temperament) and a relational factor (i.e., a disorganized attachment relationship) that causes less optimal adjustment in the realm of ego-control and cognitive development.

Studies of the interface between nature and nurture, employing adoption or twin designs, have supported theoretical models that account for the interaction between genes and environment (Ge et al., 1996; Losoya, Callor, Rowe, & Goldsmith, 1997; Rutter et al., 1997) and have demonstrated that social development (Plomin, 1994), personality development (Bouchard, 1994; Loehlin, 1992), cognitive development (Boomsma & Vanbaal, 1997; Plomin, Fulker, Corley, & DeFries, 1997), as well as internalizing and externalizing behavior have moderate to strong genetic bases in largely homogeneous environments (Eaves et al., 1997; Kovacs & Devlin, 1998; Van den Oord, Boomsma, & Verhulst, 1994). Ge et al. (1996) found that children's heritable characteristics affected their caregivers' behavior and led to reciprocal behavioral sequences.

Behavior genetics research has sometimes been translated into a rejection of the nurture assumption and has led some scholars to believe that the home environment has no predictable effects on children's personality, social, and cognitive development (Harris, 1998, pp. 354–355). Stated differently, Rowe (1993a, p. 184) doubted whether differences between parents and families in their display of warmth and affection influenced their children's personality development. He argued that much of the evidence relating parenting to child outcome measures was confounded with the biological relation between parents and children (Rowe, 1993b). In a provocative article, Scarr and McCartney (1983) proposed that "genes drive experience" (p. 425) because the genotype determines the ways in which the individual experiences the environment. Our investigation of adopted children's development as related to their early childhood experiences of parenting and attachment shows that parents make a difference even when genetic commonalities have been excluded. Of course, it may be argued that our results show the importance of gene–environment correlations (Scarr & McCartney, 1983) and the powerful influence of temperament and gender on the nature of the environment. Even when we control for differences in temperament and gender by entering these variables into the regression equation before parenting and attachment, however, we find that early environmental factors predict adopted children's adjustment in middle childhood.

Plomin et al. (1997) found that genetic influences increased from infancy to adolescence, especially for general cognitive and verbal ability. During childhood and adolescence, adopted children became increasingly more similar to their biological parents and increasingly less similar to their adoptive parents. These findings do not imply that parents cannot influence their children's cognitive development, as Plomin et al. correctly stated; rather, they imply that environmental factors associated with parents' cognitive abilities have increasingly less effect on the cognitive competence of children. The influence of peers and schools may become larger. It has also been suggested that other dimensions of parenting may increasingly influence cognitive development, such as parental warmth and support instead of parental cognitive abilities. Indeed, in a longitudinal study carried out by Estrada, Arsenio, Hess, and Holloway (1987), affective mother–child relationships in early childhood were shown to influence children's cognitive functioning in middle childhood positively, beyond contributions made by maternal intelligence and socioeconomic status. In the same vein, in the present study, higher maternal sensitive responsiveness in infancy substantially predicted children's favorable cognitive development in middle childhood. It will be exciting to see whether similar predictions can be confirmed for cognitive development in adolescence or whether genetic determinants will gain influence with growing age. We are planning to follow up this sample in adolescence in order to test this possibility.

Some limitations of the current study should be mentioned. A first limitation is the lack of a rational or empirical explanation for the absence of prediction of ego-resiliency and behavior problems on the basis of early child–parent relationships. For example, we expected to find a significant association between (disorganized) attachment and externalizing problem behavior. Apart from the high percentage of securely attached children—which may be considered as one explanation for the absence of connections between infant attachment security and child adjustment in the domains of personality development, cognitive development, and behavior problems—it remains unclear how this lack of significant predictions should be interpreted. Maybe the rather small percentage of disorganized attachments (18%, which is about the regular percentage in nonclinical samples; Van IJzendoorn et al., 1999) precluded the finding of strong evidence in favor of the expected association. Furthermore, we cannot rule out the possibility that the lack of predictability is (partly) due to the nature of this sample: parents and children without genetic commonalities. It remains to be seen whether ego-resilience and behavior problems are more strongly genetically based than the other domains in this investigation.

A second limitation involves the lack of resistant (C) children in the insecure category, which precluded analyses by type of insecurity. A third limitation involves the assessment of temperament through questionnaires, using only maternal ratings of the child's behavior. Such ratings may be biased (Mednick, Hocevar, Baker, & Schulsinger, 1996) or reflect mainly maternal evaluation of the child–mother relationship (Shaw & Vondra, 1995; Vaughn et al., 1992). Moreover, because both temperament and behavior problems were assessed with questionnaires, the associations found between these assessments may have been inflated, even more so because of partly overlapping item content (Sanson, Prior, & Kyrios, 1990).

However, Lengua, West, and Sandler (1998) found that associations between temperament and behavior problems remained significant and interpretable after decontamination of measures. In our study, contamination was restricted because temperament was assessed in early childhood only up to 30 months, whereas behavior problems were assessed at age 7 years. Other limitations pertain to the neglect of father–child relationships in these adoptive families with highly traditional role division and the absence of valid measures for directly assessing child–mother attachment relationships in middle childhood. In future studies, temperament should be rated by independent observers, concurrent as well as early attachment security should be assessed, and both fathers' and mothers' interactions and relationships with their children should be investigated. Finally, to be able to fully appreciate the relevance and implications of our findings, it is imperative that we follow the focal children into early and late adolescence, when genetic influences may weaken the adoptive parents' impact on their children and new developmental challenges become salient.

In sum, we conclude that even in adopted children, who are not biologically related to their adoptive parents, the early mother–infant relationship predicts socioemotional and cognitive adjustment in middle childhood, beyond the effects of infant temperament and gender and parents' socioeconomic status.

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Received February 13, 2001
Revision received April 15, 2002
Accepted April 15, 2002 ■

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