Child-Care and Family Predictors of Preschool Attachment and Stability From Infancy

NICHD Early Child Care Research Network

This study used multinomial logistic regression to examine relationships between child-care experience (in the context of overall family functioning) and preschool attachment. Attachment behavior was assessed at 36 months with the Strange Situation, and A, B, C, and D attachment classifications were assigned using the MacArthur coding system. Maternal sensitivity was the strongest predictor of preschool attachment classification. With respect to child-care effects, as at 15 months, no child-care factors (quantity, quality, or type) predicted, in and of themselves, attachment security at 36 months. However, 1 of 3 interactions involving child care that were detected at 15 months reemerged at 36 months: When maternal sensitivity was low, more hours per week in care somewhat increased the risk of the insecure–ambivalent (C) classification. There was significant but modest stability of attachment classifications from 15 to 36 months, especially for children with A and C classifications.

This article addresses two concerns regarding the relations between child-care experience and child–mother attachment at 36 months as assessed by the MacArthur coding system (Cassidy, Marvin, & the MacArthur Working Group on Attachment, 1992). First, in a large, normative sample of children, this study uses a comprehensive set of maternal, family, child, and child-care factors to predict attachment quality in preschool, with a particular

focus on the extent to which features of child care predict attachment classification after maternal, family, and child factors are controlled. Second, acknowledging differential measurement of child–mother attachment in infancy and preschool, the study analyzes associations of child-care predictors with patterns of stability and instability in attachment security from 15 to 36 months while controlling for mother, family, and child factors.

The majority of studies addressing child care and attachment have focused on the quality of attachment during infancy as measured with the Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978). Investigations published in the 1980s documented significant associations between early and extensive child care (defined as 20 or more hours per week of routine nonmaternal care in the 1st year of life) and elevated rates of insecure attachment between 12 and 18 months, especially insecure–avoidant attachment (Belsky & Rovine, 1988; Clarke-Stewart, 1989; Lamb & Sternberg, 1990). However, studies of infants entering child care in the 1990s failed to replicate the link between nonmaternal care, as a main effect, in the 1st year and attachment insecurity (e.g., Roggman, Langlois, Hubbs-Tait, & Rieser-Danner, 1994; Symons, 1998), including an earlier analysis of the current sample that used the Strange Situation at 15 months (NICHD Early Child Care Research Network, 1997).

The results of the NICHD Study of Early Child Care (NICHD Early Child Care Research Network, 1997) are important in this regard because the study is a large ($N = 1,364$), prospective, longitudinal investigation in which infants were identified at birth, which thus reduced selection bias. Analyses when the children were 15 months old revealed no significant main effects of child-care experience on either attachment security or avoidance of the mother in the Strange Situation. There were, however, significant interaction effects indicating that poorer child-care quality, more than minimal hours of care (more than 10 hours/week), or more than one child-care arrangement were each associated with increased insecurity under conditions of low maternal sensitivity and responsiveness (NICHD Early Child Care Research Network, 1997).

In a second report (NICHD Early Child Care Research Network, 1999), more hours per week in child care were found to be associated with lower maternal sensitivity and less positive engagement of the child with the mother over the first 3 years of life. Although higher quality child care was associated with more positive mother–child interaction, the negative relations between amount of child care and quality of the mother–child relationship from 15 to 36 months (NICHD Early Child Care Research Network, 1999) suggested that even though main-effect associations between child care and attachment security were not noted in this sample at 15 months, they might emerge by 36 months. In the present analysis of the data from the NICHD Study of Early Child Care, we ask if child-care experience (amount, number of arrangements, age of entry, and quality), alone or in combination with family, maternal, or child factors, is associated with attachment security at 36 months.

Twenty years ago, a number of studies used the Strange Situation with groups of preschoolers with varying amounts of child-care experience and compared the groups on ratings (not classifications) of attachment behaviors in the Strange Situation. These studies did not control for family factors that might have affected both the decision to use child care and attachment security. The results were mixed. Blehar (1974) reported that 2- and 3-year-olds with 5 months of child-care experience were more anxious than children with no child-care experience. Further, the 2-year-olds in child care showed more avoidance of the mother, and the 3-year-olds showed more ambivalence, compared with the children cared for at home by mothers. Later studies, however, failed to find differences when following Blehar's method closely (Moskowitz, Schwarz, & Corsini, 1977), when including groups that entered care in infancy (Portnoy & Simmons, 1978), or when assessing both groups prior to entry into child care and 3 months later (Roopnarine & Lamb, 1978).

It has been argued that hours away from the mother during the 1st year of life may adversely affect the proximal processes of mother–child interaction and ultimately the attachment relationship (Belsky, 1999; Jaeger & Weinraub, 1990; Owen & Cox, 1988), and this argument can also be used to hypothesize that more time in child care will be associated with insecurity after infancy. On the other hand, time away from the mother per se may not be associated with attachment insecurity in the preschool years: Rather, the quality of that experience away from the mother may be the feature of child care associated with security. Children in high-quality care could learn communication skills that could be used in shared plans with the mother, an essential component of secure interaction (goal-corrected partnership) in the preschool years (Marvin, 1977).

Given the longitudinal nature of the NICHD Study of Early Child Care and the repeated assessment of attachment at 15 and 36 months, the present study also presents an opportunity to examine not only the prediction of attachment at 36 months but also the extent and correlates of stability in attachment classification at 15 and 36 months. Meta-analytic studies of attachment across time support the notion of continuity from infancy through adolescence. Fraley's (1999) meta-analysis included 27 (N = 1474) published or in-press longitudinal studies in which attachment was assessed first in infancy using the Ainsworth Strange Situation and again at one of four later times: later in infancy (n = 905) using the Ainsworth Strange Situation, in preschool (n = 190) using the

MacArthur system (Cassidy et al., 1992) or the Waters and Deane (1985) Attachment Q-set, at age 6 (n = 131) using the 6-year procedure (Main & Cassidy, 1988), or in adolescence (n = 248) using the Adult Attachment Interview (George, Kaplan, & Main, 1995). The weighted r reflecting secure–insecure stability across all ages was .39, suggesting moderate stability in security overall. Fraley's meta-analysis included a single study that examined stability for 89 children from infancy to preschool using the MacArthur system (Howes & Hamilton, 1992), and in that study the r was .45.

Another recent meta-analysis (van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999) reported only on the stability of the disorganized type of attachment over time. The weighted r for 14 studies (N = 840) was .34. Again, only one study (Milentijevic, Altman, & Ward, 1995) examined stability from infancy to preschool using the MacArthur system, and it did not find significant stability (r = .16).

Whether stability in attachment from infancy to the preschool period will be observed is still open to question. Crittenden (2000) suggested that some instability during this time period is normative. In addition to the increase in experience in nonfamilial contexts and new threats to safety to which the preschooler is exposed, Crittenden proposed that developmental maturation itself may be a cause of instability during this time period. She argued that increasing cognitive and linguistic competence makes possible the expression of new, more complex attachment organizations in the preschool period. On the basis of her dynamic-maturational model of attachment, Crittenden (2000) specifically predicted an increase in the use of coercive (Type C) attachment patterns. In this pattern, aspects of the resistant behavior are organized into a strategy that compels the attachment figure to comply with the child's needs (Teti & Gelfand, 1997). Indeed, there is some empirical support for this hypothesis (Bohlin & Hagekull, 2000; Fagot & Pears, 1996; Teti, Gelfand, Messinger, & Isabella, 1995).

Instead of asking simply about the extent of attachment stability, we examined family, maternal, and child factors associated with continuity and discontinuity. From infancy to the preschool period in particular, such factors are likely to be related to changes in the quality of the parent–child relationship (Sroufe, Carlson, Levy, & Egeland, 1999). For example, Fagot and Pears (1996) found that a move from an infant secure classification at 18 months to a preschool coercive (C) classification at 30 months was associated with parental divorce or remarriage.

Several authors have reported links between early child-care experience and attachment stability from infancy to preschool. Although Howes and Hamilton (1992) found significant stability in attachment from infancy to the preschool period, they found instability to be associated with hours per week in child care, especially for children who began care after infancy. Children who entered part-time child care as infants (κ = .82) or 3-year-olds (κ = .27) had more stable maternal attachment classifications, regardless of quality of attachment, than children who entered full-time care as infants (κ = .30) or 3-year-olds (κ = .00). These results should be considered tentative. This sample was nearly 100% European American and middle class, and the most common child-care experience was to enter part-time care at age 3. Also, adjustments for factors associated with this and other child-care choices were not made, and sample sizes for some subgroups were small.

The stability described by Howes and Hamilton (1992) is interesting in light of a report by Egeland and Hiester (1995). In their high-risk sample from the 1970s, early and extensive child care beginning in the 1st year seemed to have a negative effect for children who were secure as infants but a positive effect for children who were insecure. Further, infant attachment security predicted later outcomes only for children who were not in early and extensive day care before 18 months of age. Egeland and Hiester speculated that these relations may be mediated by a change in attachment security from infancy to preschool for children in child care and greater stability of attachment for children who did not experience nonmaternal care. Egeland and Hiester did not, however, actually measure preschool security in their study.

Because attachment stability is usually summarized as the overall proportion of a sample that is stable, and because it combines secure and insecure classifications, findings relating child care and stability may actually be obscured in the aforementioned reports. It is important to examine the *direction* of change for unstable dyads, especially for studies of the effects of child care, in which child care is hypothesized to have either positive or negative effects. For instance, Egeland and Hiester (1995) suggested, "It may well be that many of the children in day-care who were classified as securely attached at 12 months of age will be insecurely attached by preschool age because of the inconsistency in care resulting from repeated separations" (p. 482). They also hypothesized, however, that for initially insecure pairs, early child care may support a shift toward security: "[E]arly day-care may provide some mothers, particularly those who are single heads of household, with the relief they need to cope better and provide better care" (p. 482). Thus, Egeland and Hiester articulated hypotheses that related amount and stability of child care in infancy to (a) a shift from security in infancy to insecurity in the preschool years and (b) a shift from insecurity in infancy to security in the preschool years for children being raised in single-parent, low-income families.

Rauh, Ziegenhain, Muller, and Wijnroks's (2000) study of German infants examined the impact of day-care experiences on the direction of change in attachment classifications. Specifically, they examined whether age at entry into child care (before or after 12 months) or mode of entry into child care (abrupt or a more gradual transition) related to changes in attachment status from 12 to 21 months. Abrupt transitions were characterized by many hours of attendance with little or no maternal company, whereas gradual transitions were characterized by few hours of attendance with long periods of being accompanied by the mother. Rauh et al. found that a change from a secure to an insecure pattern was associated with an abrupt entry into child care. All infants who moved from an insecure to a secure pattern had experienced a gradual transition to child care, even though they experienced insensitive mothering in early infancy. The majority of stable secure infants had sensitive mothers and lenient transitions into child care. Those infants who remained insecure had experienced early insensitive mothering, and day-care experience appeared unrelated to attachment. In addition, changes in attachment status during the child's 2nd year were related to changes in maternal sensitivity between 3 and 12 months.

Thus there is ample support for investigation into the role of child-care experience in predicting attachment security in preschool and the extent to which these features of care (amount, quality, age at entry, and number of arrangements) as well as child,

family, and demographic factors are related to stability in attachment over time. Of the available methods (the Attachment Q-Set [Waters & Deane, 1985], the Preschool Assessment of Attachment [PAA; Crittenden, 1992], and the coding scheme developed by the MacArthur Working Group on Attachment [the MacArthur system; Cassidy et al., 1992), we chose the MacArthur system to assess preschool attachment in the present study for several reasons. First, a principal goal in this study was to examine stability in attachment classifications from infancy to the preschool period. Of the three attachment assessments, the MacArthur system is the preschool coding system that most closely parallels the infant system.

Second, the sample investigated was predominantly low risk. The particular strength of the PAA is its ability to more clearly differentiate among the insecure attachment patterns (Rauh et al., 2000), and therefore its use would not confer any particular advantage over the MacArthur system in this study. (Nevertheless, in order to consider hypotheses that Crittenden [2000] proposed, we did consider insecure subgroups in our analyses.)

Third, there is a core set of investigations that demonstrates the validity of the MacArthur coding system in diverse populations. Children classified as secure by the MacArthur system have been shown to be more obedient, have more positive affect (Cassidy, Berlin, & Belsky, 1991), and have more positive emotional and social outcomes in middle childhood (Booth, Rose-Krasnor, McKinnon, & Rubin, 1994) than children classified as insecure. Similarly, mothers of children classified as secure have been shown to have more positive affect (DeMulder & Radke-Yarrow 1991) and to be more warm and accepting (Barnett, Kidwell, & Ho Leung, 1998) than mothers of children classified as insecure.

In short, the two aims of this investigation were (a) to examine child-care predictors of Strange Situation attachment at 36 months as classified by the MacArthur system, controlling for mother, family, and child factors that also may predict child attachment, and (b) to determine whether 15-month attachment classification improves the prediction of 36-month attachment classification and the extent to which stability in attachment is related to features of child care, controlling for selection, family, and child factors.

Method

Participants

Participants in the NICHD Study of Early Child Care were recruited from hospitals near the following locations throughout 1991: Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Pittsburgh, Pennsylvania; Charlottesville, Virginia; Morganton, North Carolina; Seattle, Washington; and Madison, Wisconsin. Potential participants were selected from among 8,986 mothers giving birth during selected 24-hour sampling periods who were screened to determine their eligibility for the study. Subjects were excluded from the sample if (a) the mother was under 18, (b) the mother was not conversant in English, (c) the family planned to move, (d) the child was hospitalized for more than 7 days following birth or had obvious disabilities, (e) the mother had a known or an acknowledged substance-abuse problem, or (f) the family lived at a considerable distance from the site or in a location that posed a danger to home visitors. Of those contacted in the initial sampling periods, 5,265 met the eligibility criteria for the study and agreed to be contacted after their return home from the hospital. A subset of this group was selected in accordance with a conditionally random sampling plan.

When the infants were 1 month old, a total of 1,364 families with healthy newborns were enrolled in the study. The recruited families came from a wide range of socioeconomic and sociocultural backgrounds and included 24% ethnic-minority children, 10% low-education mothers (less than a high school education), and 14% single-parent mothers. (Note that these percentages are not mutually exclusive.) The recruited families did not differ significantly on major demographic variables from other families eligible to participate except that the mothers in the study had a 4% higher rate of intention to be employed compared with the nonparticipating mothers. Actual percentages for mothers' employment plans at the end of recruitment reflected the following use of child care: 53% full time, 23% part time, and 24% no nonmaternal care.

The sample was not designed to be nationally representative. However, we compared the demographic characteristics of the sample with those of people living in the same census tracts and nationally. The sample was similar to families in the census tract records and in the nation as a whole on key demographic variables (household income and ethnicity).

Characteristics of the families included in the analyses examining child attachment outcomes at 36 months are provided in Table 1. Maternal educational levels ranged from less than a high school diploma to post-graduate work, with nearly 30% of the sample having 12 years of formal education (a high school diploma) or less. Approximately one fourth of the families had very low incomes, as indicated by an income-to-needs ratio ≤ 1.8. Most families had a male partner living in the home. Number of hours per week in child care ranged from 0 to more than 50. Among families whose child was in child care for at least 10 hours/week (74% of the study participants in the infant's 1st year), hours of child care per week averaged 24 from 0 to 6 months, 34 from 7 to 15 months, 34 from 16 to 24 months, and 33 from 25 to 36 months.

Child attachment security data at 15 and 36 months were available for 1,153 and 1,150 children, respectively, and 1,060 children provided attachment data at both time points. Compared with families that remained in the study through 36 months, families who did not contribute attachment data at 36 months were more likely to have mothers who were non-White

Table 1
Sample Characteristics of Participants Included in Multinomial Logistic Regression Analyses of 36-Month Attachment Security

Characteristic	Whole sample (1,140 families)		Observed sample (869 families)	
	n	%	n	%
Child gender				
Female	558	48.9	428	49.3
Male	582	51.1	441	50.7
Child ethnicity				
White	851	74.6	636	73.2
Black	157	13.8	119	13.7
Hispanic	74	6.5	65	7.5
Other	58	5.1	49	5.6
Maternal education				
Less than high school diploma	101	8.9	60	6.9
High school graduate	233	20.4	178	20.5
Some college	378	33.2	293	33.7
College graduate	252	22.1	192	22.1
Postgraduate work	176	15.4	146	16.8
Income-to-needs ratio				
0–1 (poverty)	172	15.1	102	11.8
>1–1.8 (near poverty)	152	11.7	114	13.1
>1.8 (nonpoor)	814	71.5	651	75.1
Average no. of hours per week in care	22.83	(16.02)	27.67	(14.04)

Note. Numbers in parentheses in last row are standard deviations.

or Hispanic (31.9% vs. 18.8%); mothers with less education (13.4 years vs. 14.3 years), more depressive symptoms (13.0 vs. 11.2), and more separation anxiety (72.8 vs. 70.0); and households with fewer two-parent families (73.1% vs. 86.4%) and lower income-to-needs ratios (2.1 vs. 2.8). All comparisons noted were significant at $p < .05$.

Overview of Data Collection

Visits to the families' homes occurred when the infants were 1, 6, 15, 24, and 36 months of age. Observations in child-care arrangements and of mother–child interaction during play were obtained at 6, 15, 24 and 36 months, and Strange Situation attachment assessments were conducted at 15 and 36 months. Telephone interviews to update maternal-employment and child-care information occurred at 3-month intervals between 3 and 36 months. At all home visits, mothers were interviewed regarding household composition, family income, and significant life events. In addition, mothers completed a number of questionnaires, including measures of depressive symptoms and attitudes toward separation from the child, that were used in the present report.

Measures

This presentation of measures is organized to reflect the way in which variables functioned in the analyses. We first present measures used as dependent variables in the substantive analyses of the effects of child care. Next we describe covariates in the analyses of child-care effects, and then we describe child-care measures. Composites were used to reduce both the number of variables and the complexity of the analyses being performed as well as to increase measurement reliability.

Attachment Measures

This report includes measures of child attachment security at 15 and 36 months. The Strange Situation (Ainsworth et al., 1978) was conducted during the 15-month laboratory visit (see NICHD Early Child Care Research Network, 1997, for a full description of the procedures at 15 months). At 36 months, a modified Strange Situation (Cassidy et al., 1992) was conducted during a laboratory visit.

15 months. The Strange Situation is a 25-min procedure containing brief episodes of increasing stress for the infant, including two mother–infant separations and reunions. It is designed to elicit and measure infant attachment behavior. Attachment behavior may be categorized as secure (B) or insecure (A, C, D, or U; Main & Solomon, 1990). When stressed, secure (B) infants seek comfort from their mothers, which is effective and permits them to return to play. Avoidant (A) infants tend to show little overt distress and turn away from or ignore the mother on reunion. Resistant (C) infants are distressed and angry but ambivalent about contact, which is not effective in helping them return to play. Examples of disorganized/disoriented (D) behaviors are prolonged "stilling" and severe distress followed by avoidance. A case that cannot be classified as A, B, C, or D is assigned the U, or unclassifiable, code. In this report, as in the previous one that focused only on infant attachment (NICHD Early Child Care Research Network, 1997), the 42 infants assigned a U classification were not included in the analyses.

The Strange Situation was administered according to standard procedures and coded independently by three highly trained coders. Coding disagreements were resolved by group consensus. Across coding pairs, before conferencing, agreement for the four-category ABCD system was 82% ($\kappa = .70$).

36 months. A modified Strange Situation procedure based on recommendations by Cassidy et al. (1992) was used to assess attachment security at 36 months. In this procedure, designed to be moderately stressful for the child, the mother and child were invited to make themselves comfortable in a room containing a basket of toys, a beanbag chair, a chair for the

mother, and a schoolhouse with small plastic figures. After 3 min, the mother was signaled to leave. The first separation lasted 3 min unless the child was distressed. After a 3-min reunion, the mother left again, and the second separation lasted for 5 min unless the child was distressed, in which case the mother returned to the room early. The assessment was terminated after 3 min of the second reunion. Research assistants at the 10 sites were trained and certified to conduct this modified Strange Situation according to standard procedures.

The child's behavior during the assessment was classified according to the system developed by the MacArthur Working Group on Attachment (the MacArthur system; Cassidy et al., 1992). Videotapes were shipped to a central location and rated by a team of three coders who were blind to child-care status, maternal sensitivity ratings, and previous attachment classification. The three coders were trained and certified by Jude Cassidy to code using the MacArthur system. All coders had passed the minimum 75% agreement at the level of ABCD classifications with Jude Cassidy on a set of 21 test tapes.

The MacArthur coding system classifies preschoolers as secure (B) or insecure (A, C, and D). Secure (B) children are able to resolve the stress of the separation and resume calm, comfortable interaction with the parent. Insecure-avoidant (A) children maintain extreme neutrality toward the parent and even after reunion rarely express either positive or negative emotion toward the parent. Insecure-ambivalent (C) children show fussy, helpless, whiny, and/or resistant behavior toward the parent. They may seek contact but find it unsatisfactory. Insecure-controlling/insecure-other (D) children are either controlling or show combinations of strategies, such as avoidance and ambivalence or avoidance and controlling behavior, during the reunions. Controlling children take charge of the reunion, usually in either a caregiving (role reversal) or punitive manner. A child showing more than one type of controlling behavior is classified as controlling-general. Coders also make a global 9-point security rating. A team of three coders conducted the coding. Reliability was calculated based on 867 randomly paired cases. Disagreements were discussed, and a consensus code was assigned. Intercoder agreement (before conferencing) on the four-category ABCD classifications was 75.7% (κ = .58). The average correlation between paired coders on the 9-point security rating was .73. An examination of the 4 × 4 reliability contingency table revealed that coders were less likely to confuse B with A, B with C, B with D, and A with C (ps < .002) and more likely to confuse A with D (p < .06) and C with D (p < .15). Thus, distinguishing among the insecure groups (A, C, and D) in these analyses was supported.

Mother/Family/Child Measures

Demographic variables. The *income-to-needs* ratio was computed from maternal interview items collected at each home visit. Family income, excluding Aid to Families With Dependent Children, was divided by the appropriate poverty threshold, which was determined by the year in which the income was earned and household size. This variable was averaged across 0–36 months to create an average income-to-needs ratio. Higher income-to-needs ratios were associated with greater security at 36 months, more cumulative child-care hours, and greater child-care quality. *Maternal education* was represented by five levels determined when the child was 1 month old: 1 = less than high school, 2 = high school graduate, 3 = some college, 4 = college graduate, and 5 = graduate education. More education was associated with higher security scores, more child-care hours, and greater child-care quality at 36 months. *Two-parent status* (either married or partnered) was determined from interviews at 1, 3, 6, 15, 24, and 36 months. The cumulative variables used in the analyses had three levels: 0 = never lived in a two-parent household, 1 = sometimes lived in a two-parent household, and 2 = always lived in a two-parent household. Seventy percent of the children consistently lived in a two-parent household through 36 months.

Maternal well-being. Maternal *psychological functioning* was a composite formed by averaging the standardized scores of depressive symp-

toms (reverse scored) at 1, 6, 15, 24, and 36 months on the Center for Epidemiologic Studies Depression Scale (CES–D; Radloff, 1977) and at 6 months on three scales of the NEO Personality Inventory (Costa & Mc-Crae, 1985): Neuroticism (reverse scored), Extraversion, and Agreeableness. Cronbach's alpha was .80. *Maternal depressive symptoms* was computed from the 1–36-month scores on the CES–D, which were standardized and then averaged across time. Cronbach's alphas for the CES–D across the five data collection points ranged from .88 to .91. The depression scores were moderately stable over time (rs ranged from .46 to .58).

Parenting behavior. Four observational measures of parenting included the ratings from both concurrent (36 months) and 6–36-month averages of *maternal sensitivity* (described below) and *responsiveness in the home* as measured by the Infant/Toddler Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) at 6 and 15 months and the Preschool HOME at 36 months. The Positive Involvement factor score and the Lack of Negativity factor score were summed and then standardized and averaged across age.

Mother-child interaction was videotaped in semistructured 15-min observations at each age. The observation task at 6 months had two components. In the first 7 min, mothers were asked to play using any toy or object available in the home or none at all; for the remaining 8 min, mothers were given a standard set of toys they could use in play with their infants. At 15, 24, and 36 months, the observation procedures followed a "three boxes" procedure in which mothers were asked to show their children age-appropriate toys in three containers in a set order (see Vandell, 1979). The mother was instructed to have her child play with the toys in each of the three containers and to do so in the order specified.

At each age, a *maternal sensitivity* composite based on three of the ratings was constructed. At 6, 15, and 24 months, it comprised the sum of three 4-point ratings, sensitivity to nondistress, positive regard, and intrusiveness (reverse scored). At 36 months, three 7-point ratings formed the composite: supportive presence, respect for autonomy, and hostility (reverse scored). Intercoder reliability on the composite was .87 at 6 months, .83 at 15 months, .85 at 24 months, and .84 at 36 months. Internal consistencies were .75, .70, .79, and .78, respectively. The composite scores were moderately stable across time (rs ranged from .39 to .48). Composites across age periods (from 6 to 36 months and from 24 to 36 months) were computed by standardizing the scores at each age and averaging them across time.

Parenting attitudes. Mothers reported about their *authoritarian beliefs* about child rearing at 1 month on the Modernity Scale (Schaefer & Edgerton, 1985). Higher scores indicated more traditional beliefs. Cronbach's alpha was .90. *Maternal attitudes toward separation* were also measured at 1 month using the 21 items from subscale I, Maternal Separation Anxiety, of the Separation Anxiety Scale (Hock, Gneżda, & McBride, 1983). A high score on this scale indicates that a mother experiences worry, sadness, and guilt when separated from her child. It also reflects adherence to beliefs about the value of exclusive maternal care. Internal consistency exceeded .90.

Child measures. *Child positive engagement of mother* was the average of composites of child behavior from the 15-, 24-, and 36-month mother-child interaction observations. At 15 and 24 months, positive engagement was the sum of 4-point ratings of child engagement of mother and positive mood; at 36 months, positive engagement was formed from the sum of 7-point ratings of child affection toward mother and negativity (reverse scored). Cronbach's alphas for the positive engagement composites were .58, .74, and .78. Intercoder reliabilities of the composite ratings computed according to Winer (1971) were .74, .70, and .77 at 15, 24, and 36 months, respectively. The scores at each age were standardized and averaged across time.

Child compliance, reflecting compliance and cooperation with the mother and the absence of assertive and passive noncompliance, was rated at 36 months from videotaped observations in the laboratory of the child's response to the mother's request to have her child pick up toys following

a 15-min toy-play period. Five-point ratings of compliance, assertive noncompliance, passive noncompliance, and dyadic cooperation were completed by centralized coders who were unaware of other information on the children. Reliabilities of the ratings according to Winer's (1971) procedure ranged from .79 to .93 (see NICHD Early Child Care Research Network, 1998). These ratings were standardized and combined to create the final composite.

Mother-reported behavior problems were measured with the 99-item Child Behavior Checklist-2/3 (Achenbach, 1992). Mothers rated how characteristic each behavior was of the child over the last 2 months (0 = *not true*, 1 = *sometimes true*, 2 = *very true*). The two broadband factors, Externalizing (aggressive and destructive behavior problems) and Internalizing (social withdrawal and depression), were standardized and summed (see NICHD Early Child Care Research Network, 1998).

Child social competence at 36 months was assessed with the Adaptive Social Behavior Inventory (Hogan, Scott, & Bauer, 1992). Mothers respond to the scale's 30 items in terms of frequency of occurrence (1 = *rare*, 2 = *sometimes*, 3 = *almost always*). The Express scale (13 items) taps sociability and empathy; the Comply scale (10 items) measures prosocial engagement and cooperation. Coefficient alphas for the Express and Comply scales were .76 and .82. These two subscales were standardized and summed (see NICHD Early Child Care Research Network, 1998).

Child-Care Variables

At 3-month intervals, starting when the infants were 3 months old, mothers were telephoned and asked about their current child-care arrangements, from which information was obtained about amount of care, number of arrangements, type of care, and age at entry. *Amount of care* was the average of the weekly hours in care from 0 to 36 months. Children who received no nonmaternal care were assigned scores of 0. *Number of arrangements*, a measure of stability of care, was a count of the number of times the mother reported that the child started a new child-care arrangement, cumulated from 0 to 36 months. Because of a few extreme scores, this variable was truncated at the 95th percentile. Children who received no nonmaternal care received scores of 0.

Mothers' telephone reports were also used to create three classifications for *type of care* at 36 months. The six-category classification consisted of mother care (i.e., those children not in any regular child care), father care, other relative care, in-home nonrelative care, child care in another home, and care at a child-care center. These six types were regrouped into mother care versus all others and relative care versus all others.

Analysis of covariance was conducted to determine if concurrent type of care at age of outcome was associated with attachment security. The 36-month security rating was compared across different categorizations of type of care, with the selection and mother/family/child variables as covariates. There were no differences in security ratings across any of the three categorizations for type of care (mother, father, other relative, in-home nonrelative, child-care home, and child-care center; mother care vs. all others; and relative care vs. all others), and no further type-of-care analyses were conducted.

Age at entry into child care was trichotomized. The age at which the child began averaging at least 10 hours/week of child care was categorized into one of three categories: before 15 months, between 16 and 35 months, and never.

A measure of *child-care quality* was obtained from observations of the child-care settings at 6, 15, 24, and 36 months for children spending at least 10 hours/week in a regular nonmaternal care arrangement. Observations of the sensitivity, involvement, and stimulation provided by caregivers in the child-care arrangement were conducted on 2 half-days during a 2-week interval. The Observational Record of the Caregiving Environment (ORCE; see NICHD Early Child Care Research Network, 1996) was used during these visits. Because the ORCE assesses the quality of caregiving for an individual child rather than at the level of caregivers or classrooms,

it is an instrument that can be used in home and center settings alike and is sensitive to variation in the child's proximal experience of the setting.

During completion of the ORCE, observers recorded the occurrence of specific categories of behavior and made qualitative ratings of the observed caregiving environment. At each age, the ORCE consisted of four 44-min observation cycles spread over 2 days. Each 44-min cycle consisted of four 10-min observation periods. Three of these periods were dedicated to coding of discrete caregiver and child behaviors in ten 30-s observe/30-s record intervals and a brief period of note taking for making qualitative ratings. In addition, each cycle contained a 10-min period for extended observation and note taking for qualitative ratings. Qualitative ratings of caregiver behavior were made by observers at the end of each 44-min cycle for the following seven 4-point scales: Sensitivity to Nondistress, Stimulation of Cognitive Development, Positive Regard, Detachment (reverse scored), and Flatness of Affect (reverse scored), with Fostering Exploration and Intrusiveness (reverse scored) added at 36 months. At each age, these ratings were averaged across cycles to yield a single set of ratings reflecting qualities of the caregiving environment at that period. A second stage of compositing summed across these ratings (with reverse scoring as noted above) at a given age to yield a total quality composite score.

Observers received extensive written and videotaped training, and all participated in a central training session. Following training, all observers were administered a videotaped reliability test. All observers met criteria for reliability prior to undertaking field observations. All qualitative scales had adequate intercoder agreement with these "gold standard" videotapes (.94, .86, .81, and .80 at 6, 15, 24, and 36 months, respectively). In addition, observers were required to perform live reliability visits with on-site partners, and interobserver live agreement for the qualitative scales was high (.90, .89, .89, and .90). With regard to the internal consistency of the quality composites formed at each age from the different qualitative scales, Cronbach's alphas for the child-care quality composites were .89, .88, .86, and .82 at 6, 15, 24, and 36 months, respectively. Finally, in order to create a cumulative index of child-care quality, the child-care quality composites from each age (6, 15, 24, and 36 months) were standardized and averaged over time to yield a single index.

Results

Preliminary Analyses: Validity of the MacArthur Strange Situation Classifications

MacArthur preschool attachment classifications (Cassidy et al., 1992) are based on the children's Strange Situation separation and reunion behavior at 36 months. We sought to determine whether the classifications in this sample, in which the majority of the children had child-care experience and thus were routinely separated from their mothers, had construct validity. Validation involved determining that child attachment classification was associated with non-child-care measures in a manner consistent with past work in attachment research and attachment theory. However, the present study was not an attachment study per se, and the selection of validation variables was limited to those that had been collected for other study purposes. Six validating variables were measures of maternal functioning: maternal psychological functioning from 1 to 36 months, maternal authoritarian beliefs about child rearing, maternal sensitivity during mother–child interaction, composited from 1 to 36 months and at 36 months only, and maternal responsiveness in the home, composited from 1 to 36 months and at 36 months only. Four validating variables were measures of child functioning: child positive engagement of the mother from 15 through 36 months, child compliance at 36 months, mother-reported behavior problems at 36 months, and mother-reported social competence at 36 months.

We expected secure children (coded as B) to have mothers with greater psychological adjustment, greater sensitivity in play and home observations, and fewer authoritarian child-rearing attitudes. We expected secure children to be more positive in interactions with their mothers, to be more compliant during the laboratory toy cleanup, and to have fewer mother-reported behavior problems and more mother-reported social competence. We expected children coded as D to have the most problematic scores on these measures. To test these propositions, we computed one-way analyses of variance (ANOVAs). All of the tests of association were significant, although the indices of association were modest. All post hoc significant differences were found for secure versus various insecure groups (two for B vs. A, six for B vs. C, and nine for B vs. D). None of the comparisons between the insecure groups reached significance. Thus, for secure versus insecure, at least, attachment classifications from the MacArthur coding scheme for preschool Strange Situation assessments are related to maternal and family antecedents and concurrent child outcomes in a manner consistent with previous research and attachment theory. In support of the hypothesis that the D group would be the most extreme, the greatest number of differences was found between the B and D groups. (A table is available upon request.)

Relations of Family and Child Covariates With Attachment

Results of child-care studies are often difficult to interpret because they fail to take into account the fact that child-care experience is related to family characteristics. Because families choose child care, child-care experience cannot be presumed to be independent of family characteristics, which must be controlled before the effects of child care can be determined. Two forms of covariates were examined.

Selection (Control) Variables

A set of covariates referred to as selection variables was first identified in order to control for bias in child-care usage. Unless these selection variables were controlled, effects could be attributed to child-care variables that were really associated with factors that affected both child-care usage and child attachment outcomes. On the basis of previous analyses with this sample, several potential selection factors were identified. Three of these variables met the criterion for selection variables for the 36-month attachment outcomes; that is, they were associated with both child care and attachment, and they tapped both family resource and maternal attitude domains. The selection variables were income-to-needs ratio, maternal education, and maternal attitudes toward separation. Families with more maternal education and higher income-to-needs ratios had children who began child care at younger ages and for more hours. They chose higher quality care. More of their children were securely attached, compared with children from families with lower maternal education and lower income-to-needs ratios. Families with mothers who reported more separation anxiety had children who started child care at older ages and for fewer hours. They chose lower quality care. More of the children of mothers with higher separation anxiety scores were insecurely attached. Correlations between the selection covariates, child-care

variables at 36 months, and the binary secure–insecure attachment outcome variable are reported in Table 2.

Mother/Family/Child Covariates

In addition to controlling for selection effects, we controlled for other maternal and child factors that have been shown to be associated with child attachment security. The effects of these variables on attachment were controlled before we examined the effects of child-care variables on child attachment. The mother and family variables included maternal depressive symptoms, maternal sensitivity, and two-parent status. Mothers who reported more depressive symptoms had more children who were insecurely attached, compared with mothers who reported fewer depressive symptoms. More children of sensitive mothers were securely attached, compared with children of less sensitive mothers. Finally, more children of two-parent families were securely attached, compared with children of single-parent families. We also included child gender as a covariate because there is a theoretical reason to believe that gender differences in preschool attachment may exist (Crittenden, 1997), and we found it to be a moderator of child-care effects on attachment at 15 months (NICHD Early Child Care Research Network, 1997). Although it showed no relations with the dichotomous secure–insecure variable at 36 months, it was associated with the four-way ABCD variable. Correlations among the mother/family/child covariates, the child-care variables at 36 months, and the binary secure–insecure attachment outcome variable are reported in Table 2. Tables showing these associations with the ABCD categorical variable are available upon request.

Examining Relations Between Child-Care Experience and Attachment

Two sets of analyses were performed. The first set of analyses tested the associations of cumulative child-care experience with preschool attachment classification, controlling for selection and mother/family/child variables. The second set of analyses focused on the relations of child care with stability of attachment from 15 to 36 months.

Relations Between Child Care and Attachment Classification at 36 Months

Multinomial logistic regression (Hosmer & Lemeshow, 1989) was used to examine the associations between child care and the preschool Strange Situation attachment classification. The categorical dependent variable (A, B, C, or D) was predicted from control variables reflective of selection effects (income-to-needs ratio, maternal education, and maternal attitudes toward separation), mother/family/child characteristics (maternal sensitivity, maternal depressive symptoms, family status, child gender), and four child-care variables (hours per week, number of arrangements, age at entry, and quality). All predictors were entered into the analyses at the same time. Table 3 presents unadjusted descriptive statistics for predictor variables by attachment classification (A, B, C, or D) at 36 months.

Multinomial logistic regression is similar to logistic regression but is more general because the dependent variable is not restricted to two categories. Predictor variables may be continuous or categorical. The

Table 2
Zero-Order Correlations Among Selection, Predictor, and Dependent Variables, and Descriptive Statistics, 36-Month Multinomial Logistic Regression

Variable	1	2	3	4	5	6	7	8	9	10	11	12
					Intercorrelations							
Selection												
1. Income-to-needs ratio												
2. Maternal education	.55***											
3. Maternal separation anxiety	−.30***	−.35***										
Mother/family/child												
4. Maternal depression	−.29***	−.31***	−.24***									
5. Maternal sensitivity	.44***	.51***	−.30***	−.34***								
6. Two-parent status	.37***	.32***	−.18***	−.27***	.36***							
7. Child gender[a]	.04	.04	.02	.02	.09**	−.01						
Child care												
8. Hours per week	.17***	.12***	−.12***	−.09**	.01	−.07*	.03					
9. No. of arrangements	.03	.04	−.05	.01	.01	−.07*	−.02	.33***				
10. Age at entry	−.15*	−.13*	.08*	.05	−.06	−.01	.05	−.60***	−.46***			
11. Quality	.24***	.23***	−.09*	−.14***	.28***	.20***	.03	−.11**	.01	−.01		
12. Secure–insecure attachment	.07*	.13***	−.08**	−.09**	.18***	.12***	−.06	.04	−.00	−.02	.05	
					Descriptive statistics							
n	1,138	1,140	1,129	1,140	1,140	1,140	1,140	1,140	1,140	1,068	869	1,140
M	3.40	14.37	69.79	−0.02	−0.00	70.3[b]	48.9[c]	22.83	5.05	1.27[d]	0.02	61.5[e]
SD	2.73	2.48	13.26	0.76	0.75			16.02	3.36	0.61	0.81	

[a] 1 = boys; 2 = girls. [b] Percentage who always had two parents. [c] Percentage of girls. [d] 1 = entry at <15 months; 2 = entry at 16–35 months; 3 = never. [e] Percentage who were secure.
*$p < .05$. **$p < .01$. ***$p < .001$.

odds ratio is expressed as a probability ratio with respect to the referent category (i.e., the closer to 1.00, the smaller the effect).

It was impossible to include all participants in a single analysis because some of the child-care variables (hours per week, number of arrangements, and age at entry) involved the total sample, whereas child-care quality was available only for those children

observed in child care. Thus, the multinomial logistic regressions were conducted twice, once for the total sample and once for the sample observed in care.

The overall multinomial logistic regression model for the full sample was significant, χ^2 (36, $N = 854$) = 75.1, $p < .001$, and likelihood ratio tests on the individual variables (see Table 4) T4

Table 3
Descriptive Statistics for Selection, Mother/Family/Child, and Child-Care Variables by ABCD Classification at 36 Months

	Attachment classification											
	A			B			C			D		
Predictor	*n*	*M* or %	*SD*	*n*	*M* or %	*SD*	*n*	*M* or %	*SD*	*n*	*M* or %	*SD*
					Selection variables							
Income-to-needs ratio	55	2.87	2.70	701	3.55	2.72	196	3.18	2.34	186	3.21	3.13
Maternal education (years)	55	13.71	2.39	701	14.62	2.41	197	14.03	2.50	187	13.96	2.65
Maternal separation anxiety	55	69.05	13.51	693	68.90	13.14	196	71.24	13.16	185	71.81	13.49
					Mother/family/child variables							
Maternal depression	55	−0.12	0.71	701	−0.08	0.72	197	−0.01	0.73	187	0.18	0.88
Maternal sensitivity	55	−0.08	0.78	701	0.11	0.67	197	−0.09	0.77	187	−0.29	0.92
Always two parents (%)	55	65.45		701	74.47		197	67.51		187	58.82	
Child gender (% girls)	55	33.18		701	46.79		197	50.25		187	58.82	
					Child-care variables							
Hours per week	55	20.35	15.69	701	23.32	16.19	197	22.09	16.32	187	22.52	15.14
No. of arrangements	55	5.51	3.41	701	5.04	3.50	197	4.99	3.52	187	4.99	3.25
Entry into 10 hours/week by 36 months (%)	52	90.38		658	91.34		184	87.50		174	93.68	
Quality	40	0.20	0.76	540	0.05	0.81	148	−0.09	0.80	141	−0.04	0.83

Note. A = insecure–avoidant; B = secure; C = insecure–ambivalent; D = insecure–controlling/insecure–other.

Table 4

Likelihood Ratio Tests on Individual Variables of Multinomial Logistic Regression Model Relating Child Care to ABCD Attachment at 36 Months

Variable	χ^2	df	N
Income-to-needs ratio	8.4*	3	854
Maternal education	3.4	3	854
Maternal separation anxiety	1.7	3	854
Maternal depression	6.8	3	854
Maternal sensitivity	15.8***	3	854
Two-parent status	5.7	6	854
Child gender	11.4**	3	854
Hours per week	2.1	3	854
No. of arrangements	2.2	3	854
Age at entry	1.9	6	854
Quality (observed-in-care sample)	3.5	3	643

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

revealed that one selection and two mother/family/child variables were significant predictors of attachment classification: income, maternal sensitivity, and child gender. None of the three child-care predictors available for the whole sample significantly predicted any attachment classification. That is, variations in the amount of care, the frequency of care arrangements, or the age at entry did not increase or decrease a child's chances of being in a particular attachment classification after we controlled for all selection and mother/family/child variables.

The parameter estimates for each of the significant contrasts are presented in Table 5. To make the table easier to read, we have listed parameters only for the variables that were significant across contrasts. The Wald chi-square indicates the effect of adding a particular variable after entry of all the other variables. Comparisons with other than the referent category (e.g., between A and D)

are also depicted. These can be computed because all information is incorporated in the model.

Mothers who exhibited more sensitivity and responsiveness across the play assessments between 6 and 36 months were more likely to have children classified as B than as D and marginally more likely to have children classified as A than D, C than D, and B than C. Boys were less likely than girls to be classified as D rather than B or A. Children were more likely to be classified as A or B rather than D when the income-to-needs ratio was lower (when effects of all other variables were controlled). When the analysis was performed on the sample of children observed in child care, the results were essentially the same, $\chi^2(39, N = 643) = 70.1$, $p < .01$. The three significant predictors were income, maternal sensitivity, and child sex, and child-care quality had no effect on attachment classification.

Previous analyses with this sample at 15 months (NICHD Early Child Care Research Network, 1997) revealed that the associations between certain child-care variables and attachment security were moderated by mother or child factors. Specifically, significant interactions revealed that infants were less likely to be classified as secure when low maternal sensitivity was combined with poor-quality child care, more than minimal hours of care (10+ hours/ week), or more care arrangements (> 1). Boys experiencing many hours of care (30+ hours/week) and girls experiencing minimal amounts of care (< 10 hours/week) were somewhat less likely to be securely attached. Therefore, instead of testing all possible mother/family/child by child care interactions, in the present study these four interactions (Maternal Sensitivity × Quality; Maternal Sensitivity × Hours per Week; Maternal Sensitivity × Number of Arrangements; and Hours per Week × Child Gender) were tested, one at a time, in the multinomial logistic regression models.

Only one interaction, Maternal Sensitivity × Hours per Week, added significantly to the models, χ^2 (3, N = 854) = 8.3, $p < .05$. Pairwise comparisons revealed that the significant Maternal Sen-

Table 5

Parameter Estimates for Multinomial Logistic Regression Model Relating Child Care to ABCD Attachment at 36 Months (ABCD36), Full Sample Only

Significant contrast	Wald χ^2	B	SE	Odds ratio	Confidence interval
ABCD36: A vs. D					
Income-to-needs ratio	4.29*	−0.22	0.11	0.80	0.65–0.99
Maternal sensitivity	2.77†	0.50	0.30	1.64	0.92–2.94
Child gender = boy	6.01*	0.91	0.38	2.49	1.20–5.16
ABCD36: C vs. D					
Income-to-needs ratio	ns				
Maternal sensitivity	3.61†	0.36	0.19	1.44	0.99–2.09
Child gender = boy	ns				
ABCD36: C vs. B					
Income-to-needs ratio	ns				
Maternal sensitivity	2.76†	−0.26	0.16	0.77	0.57–1.05
Child gender = boy	ns				
ABCD36: D vs. B					
Income-to-needs ratio	7.04**	0.12	0.05	1.13	1.03–1.23
Maternal sensitivity	15.30***	−0.62	0.16	0.54	0.39–0.73
Child gender = boy	8.85**	−0.61	0.21	0.52	0.36–0.81

Note. A = insecure–avoidant; B = secure; C = insecure–ambivalent; D = insecure–controlling/insecure–other.

$†p < .10.$ $*p < .05.$ $**p < .01.$ $***p < .001.$

sitivity × Hours per Week interaction was due to differences in the prediction of C versus B classifications and C versus D classifications. Because C versus D classifications were not reliably coded, we followed up only on the C versus B prediction. After we adjusted for all other variables, and when number of hours of care was at the sample grand mean ($M = 22.8$, $SD = 16.0$), children in the C category were less likely to have sensitive parents than were children in the B category (B = .74). As the number of hours in child care increased, maternal sensitivity was somewhat more related to the odds of a child's being given a B rather than a C classification. For example, for children with 20 hours more care than the sample mean, B = .78, and for children with 40 more hours of care than the sample mean, B = .82. Thus, as hours in care increased, children with more sensitive parents were more likely to be classified as B, and children with less sensitive parents were more likely to be classified as C.

Relations Between Child Care and Stability of 15-Month Attachment Classification

We examined prediction from, and the stability of, Strange Situation ABCD classifications at 15 months in several ways. First, using a binomial test, we determined whether the proportions of children in the A, B, C, and D categories differed significantly between 15 and 36 months. There were no differences in the proportions of B ($p > .45$) and D ($p > .15$) classifications at the two ages. However, at 36 months there were significantly fewer A classifications ($p < .001$) and significantly more C classifications ($p < .001$) than there were at 15 months.

Second, the categorical ABCD variable at 15 months (ABCD15) was included in a multinomial logistic regression model that was identical to the one described for the child-care analyses above except that the mother/family/child and child-care variables were composited only for the time period between the two attachment assessments. This procedure allowed us to test whether the 15-month attachment classification accounted for any variance when the 16–34-month predictors of 36-month attachment were also included in the model. The results of this model are reported in Tables 6 and 7. ABCD15 also accounted for significant variance, $\chi^2(9, N = 650) = 21.2$, $p < .05$, when mother/family/child factors measured between the two assessments were controlled. The individual parameter estimates (Table 7) indicated that attachment classification at 15 months accounted for variance in four of the six attachment category contrasts at 36 months when all other predictors were controlled. Children in the B or C categories at 15 months were more likely to be in the B category at 36 months than the A category, and children in the C category at 15 months were less likely to be classified as D at 36 months than to be classified as B. Children classified as C at 15 months were more likely to remain classified as C at 36 months than to be classified as D or A. The same effect of ABCD15 was found when child-care quality was included in the model with ABCD15, χ^2 (9, $N = 515$) = 21.1, $p < .05$.

Third, to clarify these stability findings, we analyzed the contingency table of the ABCD classifications at the two ages (see Table 8) with the diagonal cells highlighted. The tablewise kappa statistic, which corrects for base rates of the ABCD distributions at both ages and thus for stability due to chance, was .057 ($p < .01$). Thus, overall stability between 15 and 36 months was significant

Table 6
Likelihood Ratio Tests on Individual Variables of Multinomial Logistic Regression Model Relating Child Care to ABCD Attachment at 36 Months With ABCD Attachment at 15 Months Included

Variable	χ^2	df	N
Income-to-needs ratio	6.4	3	650
Maternal education	2.1	3	650
Maternal separation anxiety	.6	3	650
Maternal depression	5.2	3	650
Maternal sensitivity	20.1***	3	650
Two-parent status	10.1	6	650
Child gender	10.9*	3	650
Hours per week	2.2	3	650
No. of arrangements	4.1	3	650
Age at entry	6.0	6	650
ABCD attachment at 15 months	21.2*	9	650
Quality (observed-in-care sample)	1.0	3	515

$* p < .05.$ $*** p < .001.$

but modest. We analyzed individual cells using EXACON (Bergman & El-Khouri, 1987, 1998); binomial probabilities are listed at the bottom of each cell in Table 8. These results indicate that there was significant stability in the A and C categories from 15 to 36 months and that it was significantly unlikely that a child classified in the C category at 15 months would be classified in the A category at 36 months.

Finally, to examine whether child-care variables were related to the attachment instability for the secure–insecure dichotomies observed at 15 and 36 months, we used logistic regression to predict security or insecurity at 36 months within both the initially secure and initially insecure groups. By proceeding in this manner we were in a position to determine, on the one hand, why some children who were initially secure remained that way over time whereas others did not, and, on the other hand, why some children who were initially insecure remained that way whereas others did not. We chose this method over a series of multinomial logistic regressions (one each for A, B, C, and D at 15 months predicting to A, B, C, and D at 36 months) because both the validation analyses and the multinomial analyses thus far indicated consistent differentiation between the secure category and the various insecure categories but not within all of the insecure categories.

The predictor variables in these logistic regression analyses were the same selection, mother/family/child, and child-care variables used in the first analyses except that they were averaged over the interval of interest, from 16 to 36 months, rather than over the lifetime of the child. The age-at-entry variable was dichotomized to reflect those who entered an average of 10 hours/week of child care between 16 and 35 months and those who did not (either because they entered care earlier or not at all). Thus, we were capturing change in status with this variable. In these analyses, as before, all mother/family/child variables and child-care variables were included in the analyses, which were conducted on both the total sample and the observed-in-care sample, with the four interaction terms entered one at a time.

Initially secure. The results, for the whole sample, for the children who were classified as secure at 15 months ($n = 480$) are presented in Table 9. Sixty-five percent were classified as secure

Table 7

Parameter Estimates for Multinomial Logistic Regression Model Relating Child Care to ABCD Attachment at 36 Months (ABCD36), With ABCD Attachment at 15 Months (ABCD15) Included, Full Sample Only

Significant contrast	Wald χ^2	B	SE	Odds ratio	Confidence intervals
ABCD36: A vs. B					
Maternal sensitivity	ns				
Child gender = boy	ns				
ABCD15 = B	4.10*	−0.88	0.43	0.42	0.18–0.97
ABCD15 = C	3.99*	−2.70	1.40	0.01	0.00–0.95
ABCD36: C vs. B					
Maternal sensitivity	6.75**	−0.39	0.15	0.68	0.51–0.91
Child gender = boy	6.30*	−0.55	0.22	0.58	0.38–0.89
ABCD15	ns				
ABCD36: D vs. B					
Maternal sensitivity	17.62***	−0.65	0.15	0.53	0.39–0.71
Child gender = boy	5.17*	−0.53	0.23	0.59	0.37–0.93
ABCD15 = C	4.55*	−1.17	0.55	0.31	0.11–0.91
ABCD36: A vs. D					
Maternal sensitivity	ns				
Child gender = boy	3.53†	0.74	0.40	2.1	0.97–4.55
ABCD15	ns				
ABCD36: C vs. D					
Maternal sensitivity	ns				
Child gender = boy	ns				
ABCD15 = C	8.15**	1.75	0.61	5.74	1.73–19.04
ABCD36: A vs. C					
Maternal sensitivity	ns				
Child gender = boy	3.83*	0.76	0.39	2.14	1.00–4.58
ABCD15 = B	3.78†	−0.98	0.50	0.38	0.14–1.01
ABCD15 = C	5.62*	−3.28	1.38	0.00	0.00–0.57

Note. A = insecure–avoidant; B = secure; C = insecure–ambivalent; D = insecure–controlling/insecure–other.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

at 36 months. Children who changed from a secure classification at 15 months to an insecure classification at 36 months had families with higher income-to-needs ratios and mothers with less education and lower sensitivity at 24–36 months (whole sample only). Girls were more likely than boys to change from secure to insecure from 15 to 36 months (40% vs. 31% for girls and boys, respectively; whole sample). Starting at least 10 hours/week of care between 16 and 36 months was associated with changing from secure to insecure, a finding that was significant for the observed-in-care sample ($p < .05$). Of the 38 secure children who were observed in care at 36 months and who had begun care sometime between 15 and 35 months, 50% became insecure, compared with 34% of secure children who had entered care before 15 months or not at all. Using the effect size formula recommended by Rosnow and Rosenthal (1988), we computed the effect size, r_ϕ, to be .09. None of the interactions involving child-care variables was significant.

Initially insecure. The results, for the whole sample, for the children who were classified as insecure at 15 months ($n = 307$) are presented in Table 10. Forty-one percent were classified as insecure at 36 months. The shift to security was associated with greater maternal sensitivity in both the whole and observed-in-care samples. Child-care factors did not account for change from insecure to secure attachment. None of the interaction terms was significant.

Discussion

This study involving participants in the NICHD Study of Early Child Care addressed two research questions. The first was the extent to which cumulative child-care experience was related to preschool attachment classification when selection and mother/family/child factors were statistically controlled. The second question focused on whether maternal, family, child, and child-care factors related to stability of attachment security from 15 to 36 months.

Relations Between Child Care and Attachment Classification at 36 Months

Features of child care were not associated with attachment classification at 36 months as main effects. As at 15 months, the amount of, type of, number of arrangements for, age at entry into, and quality of child care experienced by children in this sample were not associated with attachment classification at 36 months as measured by the MacArthur coding system. These results are consistent with more recent work on child care and infant and toddler attachment (e.g., Roggman et al., 1994; Symons, 1998) and with an older body of research on preschool-age children (Moskowitz et al., 1977; Portnoy & Simmons, 1978; Roopnarine & Lamb, 1978).

Table 8
15-Month ABCD by 36-Month ABCD Contingency Table

15-month classification	36-month classification				15-month total	
	A	B	C	D	n	%
A						
Count	**15**	82	24	23	144	13.6
Expected count	**7.3**	89.8	24.2	22.7		
Row %	**10.4**	57.0	16.7	16.0		
Column %	**27.8**	12.4	13.5	13.8		
Binomial *p*	**.01**	.21	.54	.50		
B						
Count	27	**419**	105	103	654	61.7
Expected count	33.3	**407.8**	109.8	103.0		
Row %	4.1	**64.1**	16.1	15.8		
Column %	50.0	**63.4**	59.0	61.7		
Binomial *p*	.15	**.25**	.34	.52		
C						
Count	1	63	**25**	8	97	9.2
Expected count	4.9	60.5	**16.3**	15.3		
Row %	1.0	65.0	**25.8**	8.3		
Column %	1.9	9.5	**14.0**	4.8		
Binomial *p*	.04	.39	**.03**	.03		
D						
Count	11	97	24	**33**	165	15.6
Expected count	8.4	102.9	27.7	**26.0**		
Row %	6.7	58.8	14.6	**20.0**		
Column %	20.4	14.7	13.5	**19.8**		
Binomial *p*	.23	.29	.27	**.10**		
36-month total						
n	54	661	178	167	1,060	
%	5.1	62.4	16.8	15.8		

Note. Binomial probabilities are one-tailed. χ^2 (9, N = 1,060) = 25.3, p < .01. κ = .06, p < .01. Boldface diagonal values indicate stable classifications. A = insecure–avoidant; B = secure; C = insecure–ambivalent; D = insecure–controlling/insecure–other.

However, across the two reports on child care and attachment produced by the NICHD Study of Early Child Care, associations between child care and attachment did occur under conditions of insensitive mothering. The present analyses extend the earlier finding (at 15 months) that more hours per week in care, when combined with less sensitive and responsive mothering, were associated with insecurity (NICHD Early Child Care Research Network, 1997). In the present report, the association is specifically for the group with Type C attachment, children who have ambivalent relationships with their parent. Our finding is that less sensitive mothering in combination with a high lifetime weekly average of hours in care is associated with a slightly greater probability of being classified as insecure–ambivalent rather than secure. This result is consistent with theoretical and empirical findings that caregivers of children classified as ambivalent are, relative to caregivers of secure children, less consistently available (Cassidy & Berlin, 1994) but not with findings that time in child care per se contributes to the perceived unavailability of the parent by the child. Rather, having more lifetime hours in child care is an additional risk factor for children already experiencing relatively less maternal sensitivity and responsiveness. Future research will determine how this group of children fares in the later preschool years and the transition to elementary school.

Relations Between Child Care and Stability of 15-Month Attachment Classification

We found modest stability for ABCD attachment classification from 15 to 36 months, in contrast to the overall stabilities reported in Fraley's (1999) and van IJzendoorn et al.'s (1999) recent meta-analyses. Recall, however, that these meta-analyses included a number of studies that examined stability of attachment within infancy or from infancy to later ages but only a single study in each that examined stability from infancy to preschool using the MacArthur system. The results of these two studies were equivocal; one found significant stability, r = .45 (Howes & Hamilton,

Table 9
Determinants of 36-Month Insecurity for 15-Month Secure Infants

Variable	Wald χ^2	B	SE	Adjusted odds ratio	Confidence interval
Selection					
Income-to-needs ratio[a]	3.85*	0.09	0.05	1.10	1.00–1.21
Maternal education	4.27*	−0.11	0.06	0.89	0.80–0.99
Maternal separation anxiety	0.00	0.00	0.01	1.00	0.98–1.02
Mother/family/child					
Maternal depression, 24–36 months	0.05	−0.03	0.12	0.97	0.76–1.24
Maternal sensitivity, 24–36 months	4.82*	−0.32	0.15	0.72	0.54–0.97
Two-parent status, 24–36 months	1.02	−0.17	0.17	0.84	0.60–1.18
Child gender (2 = female)	9.21**	−0.61	0.20	0.54	0.37–0.81
Child care					
Hours per week, 16–34 months	0.05	−0.00	0.01	1.00	0.99–1.01
No. of arrangements, 16–34 months	0.00	0.00	0.05	1.00	0.91–1.10
Age at entry, 16–34 months	3.60†	−0.60	0.32	0.55	0.30–1.02
Quality, 24–36 months[b]	0.76	−0.12	0.13	0.89	0.69–1.16

[a] Whole sample: n = 311 stay secure; n = 169 become insecure. [b] Observed sample: n = 241 stay secure; n = 132 become insecure.
† p < .10. * p < .05. ** p < .01.

Table 10
Determinants of 36-Month Security for 15-Month Insecure Infants

Variable	Wald χ^2	B	SE	Adjusted odds ratio	Confidence intervals
Selection					
Income-to-needs ratio[a]	0.01	−0.00	0.06	1.00	0.89–1.12
Maternal education	0.11	0.02	0.07	1.02	0.90–1.16
Maternal separation anxiety	0.59	−0.01	0.01	0.99	0.97–1.10
Mother/family/child					
Maternal depression, 24–36 months	0.82	0.14	0.15	1.15	0.85–1.56
Maternal sensitivity, 24–36 months	11.86***	0.57	0.16	1.76	1.28–2.43
Two-parent status, 24–36 months	1.34	0.21	0.18	1.23	0.87–1.76
Child gender (2 = female)	0.00	−0.00	0.25	1.00	0.61–1.63
Child care					
Hours per week, 16–34 months	0.42	0.01	0.01	1.01	0.99–1.02
No. of arrangements, 16–34 months	1.69	−0.07	0.06	0.93	0.83–1.04
Age at entry, 16–24 months	0.25	−0.21	0.41	0.81	0.36–1.83
Quality, 24–36 months[b]	0.02	0.20	1.64	1.22	0.71–1.39

[a] Whole sample: $n = 125$ stay insecure; $n = 182$ become secure. [b] Observed sample: $n = 83$ stay insecure; $n = 154$ become secure.
*** $p < .001$.

1992), and the other did not, $r = .16$ (Milentijevic et al., 1995). Both of these studies also examined the stability of dichotomous classifications: secure–insecure and D–not-D, respectively. In our study, the four-category ABCD classification revealed a bit of lawful association between the two time points ($\kappa = .057$). This lawfulness appeared to be due to a higher number of cases than expected in the A to A and C to C cells and fewer cases than expected in the C to A and C to D cells, associations that would be obscured if the analysis included only the secure–insecure dichotomy. That the association between 15- and 36-month attachment classifications was to some extent lawful was also supported by the significant contribution made by the 15-month ABCD classification to the multinomial regression model predicting 36-month ABCD. When the effects of maternal sensitivity were statistically controlled, infants with a C classification were unlikely to become preschoolers with an A or D classification; rather, they were more likely to remain classified as C. Infants classified as B were unlikely to become preschoolers classified as A and were more likely to remain classified as B. Although the most "stable" group was secure infants who remained secure (64%), in fact this proportion was about what would be expected by chance, because rates of security at both ages were about 62%. Overall, at 36 months the likelihood of being classified a C increased and the likelihood of being classified an A decreased, although the overall likelihood of being secure remained constant. This move to C was predicted by Crittenden (2000), although for a different preschool coding system. Our findings are consistent with her speculation that preschoolers will tend to use the more coercive strategies that are available to them.

If, on the basis of existing evidence, both the infant and the MacArthur preschool attachment assessments are presumed to be valid, it is necessary to theoretically and empirically account for low rates of stability in attachment classification. Attachment theory explains instability as a response to changes in the relationship with attachment figures (Bretherton, 1985) or a consequence of developmental changes in the child that, for whatever reason, are not met with corresponding changes in responses from attach-

ment figures (Crittenden, 1992; Fagot & Pears, 1996). In the NICHD study, if secure–insecure changes were not due to chance, we would expect to find some associations between change and maternal sensitivity. The associations with maternal sensitivity were, in general, as predicted, with low or decreased sensitivity from 24 to 36 months predicting the change from security to insecurity, and higher sensitivity from 24 to 36 months predicting the change from insecurity to security. These results are compatible with the interpretation that a decline in maternal sensitivity in the 3rd year of life, or the lack of appropriate maternal adjustment to the changing demands of parenting a preschooler, could contribute to a shift from security to insecurity between 15 and 36 months. Frodi, Grolnick, and Bridges (1985) reported a similar finding in their study on stability of attachment within infancy: Mothers of stable secure and insecure-to-secure children had higher sensitivity scores at 12 months than did mothers of secure-to-insecure and stable insecure children. So there is evidence in this and other studies that aspects of the caregiving environment may be associated with a failure to find the expected stability in attachment security. The apparent role of maternal sensitivity in the *change* from insecure to secure attachment is evidence for the influence of maternal sensitivity on secure child–mother attachment.

In our study, in accordance with the predictions articulated in Egeland and Hiester's (1995) report, a particular feature of child care was associated with a particular pattern of instability. Children who moved from security to insecurity were more likely to have entered into at least 10 hours per week of child care during the interval between 15 and 35 months than were children who remained secure. The effect was not strong, but it did suggest that some children respond to entry into nonmaternal care in the toddler and preschool years with behaviors indicative of insecurity. Whether the insecurity exhibited by this group is as predictive as the insecurity exhibited by the rest of the sample can be examined in future analyses.

The same analysis revealed an unexpected effect of income. The families of those children who moved from secure to insecure had

higher income-to-need ratios than did the families of those who stayed secure. It could be that the higher income in the secure-to-insecure group was associated with the parent returning to work between 15 and 36 months as well as with entry into 10 or more hours of child care a week for the children.

Validity of the MacArthur Strange Situation

Currently, there are three commonly used procedures for assessing attachment quality in preschoolers, each with its particular strengths. These include the Attachment Q-Set (Waters & Deane, 1985), the Preschool Assessment of Attachment (PAA; Crittenden, 1992) and the coding scheme developed by the MacArthur Working Group on Attachment (the MacArthur system; Cassidy et al., 1992). The Attachment Q-Set assesses attachment quality with the mother from behavior in the home and has also been used to assess teacher–child attachment in preschool classrooms (Howes & Hamilton, 1992; Howes & Ritchie, 1999). The other coding schemes assess attachment from behavior in the Strange Situation. Despite using the same procedure to observe attachment behavior and the infant coding system as a basis for the development of a preschool classification system, the MacArthur system and the PAA differ in some important respects. The MacArthur system was developed to closely mirror the original infant coding scheme. Although new subcategories are added in the MacArthur system, they relate primarily to the infant disorganized attachment (D) classification (i.e., controlling–caregiving, controlling–punitive). Furthermore, children not clearly displaying any particular pattern or displaying contradictory patterns are assigned to an insecure-other group, which is included in the D category. In contrast, the PAA includes a greater differentiation of the avoidant and resistant categories than does the infant system (Crittenden, 1992), and children displaying contradictory patterns of attachment are usually assigned to a defined subcategory (Teti, 1999).

This study reports some evidence of the validity of the MacArthur coding system of preschool attachment. There were modest but consistent associations between maternal sensitivity averaged across the first 3 years and attachment security at 36 months. The strength of these associations is similar to that reported in a meta-analysis across a variety of types of assessment of attachment security (the 15-month NICHD study was included in that meta-analysis), including the Strange Situation, the Q-Sort, and other methods (De Wolff & van IJzendoorn, 1997), using Pearson's product–moment correlation coefficients (r) as the effect size estimate. In the NICHD Study of Early Child Care, the simple correlation between maternal sensitivity, averaged across 6, 15, 24, and 36 months, and the 36-month 9-point security rating was .24 (n = 1,140). This moderate correlation is quite similar to the combined effect size found for the 16 studies in the meta-analysis that focused on children older than 1 year (r = .25). Because the NICHD Study of Early Child Care sample is large and diverse, this effect size can be considered to be robust and, like the De Wolff and van IJzendoorn (1997) meta-analyses, to confirm the important but not exclusive role of maternal sensitivity in the development of attachment security. We also report consistent, theoretically predicted, but modest associations between attachment security and concurrent measures of observed child positivity (r = .24) and compliance (r = .14) and mother-reported social competence (r = .17) and problem behavior (r = −.12).

Although all possible comparisons among the ABCD attachment classifications were examined for the validation variables, there were consistent differences only between the secure (B) and the insecure (A, C, and D) categories, with the majority of these differences being accounted for by the B versus D comparison, the two groups considered to be at the extremes of a continuum of security.

Although this study was not designed, nor were hypotheses specified, to differentiate among insecure groups, this inability, combined with the findings of modest stability and unusual sex differences in the distribution of attachment, may be considered by some to diminish the validity of the MacArthur system. However, some of the lack of stability—specifically, an increase in Type C attachment, has been predicted theoretically (Crittenden, 2000). With regard to the findings of sex differences, boys were more likely than girls to be classified as B rather than D and to be classified as A rather than C. This finding is contrary to van IJzendoorn et al.'s (1999) meta-analysis, which across 11 infant studies found no effect of child sex. However, none of the studies in that meta-analysis involved preschool-age children, and just this type of sex difference was predicted by Crittenden (1997).

The issues of validity and stability can be addressed by future research, particularly that comparing the MacArthur system with the alternative preschool coding system, the PAA. The PAA differentiates more within insecure groups and may be particularly sensitive to developmental changes and sex differences in the preschool years (Crittenden, 1994). In sum, the present study was only incidentally about the validity of the MacArthur system, and doubts about the use of the Strange Situation for assessing attachment in the preschool years, and/or about the MacArthur system as a classification system, necessarily remain. Future research needs to determine whether the MacArthur system can differentiate among insecure subgroups to the same extent that the Ainsworth infant attachment system can.

Certain additional limitations of this study must also be taken into consideration. The NICHD sample excluded adolescent mothers and infants with serious health problems. We were less likely to obtain access to child-care arrangements that were of probable lower quality, and attrition was higher in low-income and minority families. Thus, extreme conditions were not represented in this sample in large numbers. Mindful of these qualifications, we tentatively conclude that the results to date of the NICHD Study of Early Child Care indicate that family factors exert far more influence than child-care factors on the mother–child relationship. However, long daily separations from mother for children whose interactions with their mothers are already distressed exacerbate risks. Future analyses with this sample must address the processes by which children with poor interactions with their mothers are put at increased risk from extensive day care and whether these risks are displayed later in school or with peers.

References

Achenbach, T. M. (1992). Manual for the Child Behavior Checklist/2-3 and 1992 profile. Burlington: University of Vermont, Department of Psychiatry.

Ainsworth, M., Blehar, M., Waters, E., & Wall, S. (1978). Patterns of attachment: A psychological study of the Strange Situation. Hillsdale, NJ: Erlbaum.

Barnett, D., Kidwell, S. L., & Ho Leung, K. (1998). Parenting and pre-schooler attachment among low-income urban African American fami-lies. *Child Development, 69,* 1657–1671.

Belksy, J. (1999). Quantity of nonmaternal care and boys' problem behav-ior/adjustment at 3 and 5: Exploring the mediating role of parenting. *Psychiatry: Interpersonal and Biological Processes, 62,* 1–21.

Belsky, J., & Rovine, M. (1988). Nonmaternal care in the first year of life and the security of infant–parent attachment. *Child Development, 59,* 157–167.

Bergman, L. R., & El-Khouri, B. (1987). EXACON: A Fortran 77 program for the exact analysis of single cells in a contingency table. *Educational and Psychological Measurement, 47,* 155–161.

Bergman, L. R., & El-Khouri, B. M. (1998). *SLEIPNER: A statistical package for pattern-oriented analyses, V 2.0.* Stockholm, Sweden: Stockholm University, Department of Psychology.

Blehar, M. C. (1974). Anxious attachment and defensive reactions associ-ated with day care. *Child Development, 45,* 686–692.

Bohlin, G., & Hagekull, B. (2000). Behavior problems in Swedish four-year olds: The importance of maternal sensitivity and social context. In P. M. Crittenden & A. H. Claussen (Eds.), *The organization of attach-ment relationships: Maturation, culture, and context* (pp. 75–96). New York: Cambridge University Press.

Booth, C. L., Rose-Krasnor, L., McKinnon, J. A., & Rubin, K. H. (1994). Predicting social adjustment in middle childhood: The role of preschool attachment security and maternal style. *Social Development, 3,* 189–204.

Bretherton, I. (1985). Attachment theory: Retrospect and prospect. In I. Bretherton & E. Waters (Eds.), Growing points of attachment theory and research (pp. 3–35). *Monographs of the Society for Research in Child Development, 50*(1–2, Serial No. 209).

Caldwell, B. M., & Bradley, R. H. (1984). *Home Observation for Mea-surement of the Environment.* Little Rock: University of Arkansas.

Cassidy, J., & Berlin, L. (1994). The insecure/ambivalent pattern of at-tachment: Theory and research. *Child Development, 65,* 971–981.

Cassidy, J., Berlin, L., & Belsky, J. (1991, April). *Attachment organization at age 3: Antecedent and concurrent correlates.* Paper presented at the biennial meeting of the Society for Research in Child Development, Seattle, WA.

Cassidy, J., Marvin, R. S., & The MacArthur Working Group on Attach-ment of the John D. and Catherine T. MacArthur Foundation Network on the Transition From Infancy to Early Childhood (1992). *Attachment organization in preschool children: Procedures and coding manual.* Unpublished coding manual, The Pennsylvania State University.

Clarke-Stewart, K. A. (1989). Infant day-care: Maligned or malignant? *American Psychologist, 44,* 266–273.

Costa, P., & McCrae, R. (1985). *The NEO Personality Inventory manual.* Odessa, FL: Psychological Assessment Resources, Inc.

Crittenden, P. M. (1992). Quality of attachment in the preschool years. *Development and Psychopathology, 4,* 209–241.

Crittenden, P. M. (1994). *The Preschool Assessment of Attachment coding manual.* Miami, FL.: Family Relations Institute.

Crittenden, P. M. (1997). Patterns of attachment and sexuality: Risk of dysfunction versus opportunity for creative integration. In L. Atkinson & K. J. Zuckerman (Eds.), *Attachment and psychopathology* (pp. 47–93). New York: Guilford Press.

Crittenden, P. M. (2000). A dynamic-maturational approach to continuity and change in pattern of attachment. In P. M. Crittenden & A. H. Claussen (Eds.), *The organization of attachment relationships: Matura-tion, culture, and context* (pp. 343–357). New York: Cambridge Uni-versity Press.

DeMulder, E. K., & Radke-Yarrow, M. (1991). Attachment with affec-tively ill and well mothers: Concurrent behavioral correlates. *Develop-ment and Psychopathology, 3,* 227–242.

De Wolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attach-ment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68,* 571–591.

Egeland, B., & Hiester, M. (1995). The long-term consequences of infant day-care and mother–infant attachment. *Child Development, 66,* 474–485.

Fagot, B. I., & Pears, K. C. (1996). Changes in attachment during the third year: Consequences and predictions. *Development and Psychopathol-ogy, 8,* 325–344.

Fraley, R. C. (1999). *Attachment continuity from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms.* Unpublished doctoral dissertation, University of California, Davis.

Frodi, A., Grolnick, W., & Bridges, L. (1985). Maternal correlates of stability and change in infant–mother attachment. *Infant Mental Health Journal, 6,* 60–67.

George, C., Kaplan, N., & Main, M. (1995). *The Berkeley Adult Attach-ment Interview.* Unpublished protocol, University of California, Berke-ley, Department of Psychology.

Hock, E., Gnezda, M. T., & McBride, S. (1983, April). *The measurement of maternal separation anxiety.* Paper presented at the biennial meeting of the Society for Research in Child Development, Detroit, MI.

Hogan, A. E., Scott, K. G., & Bauer, C. R. (1992). The Adaptive Social Behavior Inventory (ASBI): A new assessment of social competence in high-risk three-year-olds. *Journal of Psychoeducational Assessment, 10,* 230–239.

Hosmer, D. W., & Lemeshow, S. (1989). *Applied logistic regression.* New York: Wiley.

Howes, C., & Hamilton, C. E. (1992). Children's relationships with child care teachers: Stability and concordance with parental attachments. *Child Development, 63,* 867–878.

Howes, C., & Ritchie, S. (1999). Attachment organizations in children with difficult life circumstances. *Development and Psychopathology, 11,* 251–268.

Jaeger, E., & Weinraub, M. (1990). Early maternal care and infant attach-ment: In search of process. In K. McCartney (Ed.), *Child care and maternal employment: A social ecology approach* (pp. 71–90). San Francisco: Jossey-Bass.

Lamb, M., & Sternberg, K. (1990). Do we really know how day-care affects children? *Journal of Applied Developmental Psychology, 11,* 351–379.

Main, M., & Cassidy, J. (1988). Categories of response to reunion with the parent at age 6: Predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology, 24,* 415–426.

Main, M., & Solomon, M. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years* (pp. 121–160). Chicago: University of Chicago Press.

Marvin, R. S. (1977). An ethological-cognitive model for the attenuation of mother–child attachment behavior. In T. M. Alloway, L. Krames, & P. Piner (Eds.), *Advances in the study of communication and affect: Vol. 3. The development of social attachments* (pp. 25–60). New York: Plenum Press.

Milentijevic, I., Altman, S., & Ward, M. J. (1995, April). *Adolescent mothers and their children: Stability of attachment organization from 1 to 3.5 years.* Paper presented at the biennial meeting of the Society for Research in Child Development, Indianapolis, IN.

Moskowitz, D. S., Schwarz, J. C., & Corsini, D. A. (1977). Initiating day care at three years of age: Effects on attachment. *Child Development, 48,* 1271–1276.

NICHD Early Child Care Research Network. (1996). Characteristics of infant child care: Factors contributing to positive caregiving. *Early Childhood Research Quarterly, 11,* 269–306.

NICHD Early Child Care Research Network. (1997). The effects of infant

child care on infant–mother attachment security: Results of the NICHD Study of Early Child Care. *Child Development, 68,* 860–879.

NICHD Early Child Care Research Network. (1998). Early child care and self-control, compliance, and problem behavior at twenty-four and thirty-six months. *Child Development, 69,* 1145–1170.

NICHD Early Child Care Research Network. (1999). Child care and mother–child interaction in the first 3 years of life. *Developmental Psychology, 35,* 1399–1413.

Owen, M. T., & Cox, M. J. (1988). Maternal employment and the transition to parenthood: Family functioning and child development. In A. E. Gottfried & A. W. Gottfried (Eds.), *Maternal employment and children's development: Longitudinal research* (pp. 85–119). New York: Plenum Press.

Portnoy, F. C., & Simmons, C. H. (1978). Day care and attachment. *Child Development, 49,* 239–242.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385–401.

Rauh, H., Ziegenhain, U., Muller, B., & Wijnroks, L. (2000). Stability and change in infant–mother attachment in the second year of life: Relations to parenting quality and varying degrees of day care experience. In P. M. Crittenden & A. H. Claussen (Eds.), *The organization of attachment relationships: Maturation, culture, and context* (pp. 251–276). New York: Cambridge University Press.

Roggman, L., Langlois, J., Hubbs-Tait, L., & Rieser-Danner, L. (1994). Infant day-care, attachment, and the "file drawer problem." *Child Development, 65,* 1429–1443.

Roopnarine, J. L., & Lamb, M. E. (1978). The effects of day care on attachment and exploratory behavior in a strange situation. *Merrill-Palmer Quarterly, 24,* 85–95.

Rosnow, R. L., & Rosenthal, R. (1988). Focused tests of significance and effect size estimation in counseling psychology. *Journal of Counseling Psychology, 35,* 203–208.

Schaefer, E. S., & Edgerton, M. (1985). Parent and child correlates of parental modernity. In I. E. Siegel (Ed.), *Parental belief systems* (pp. 287–318). Hillsdale, NJ: Erlbaum.

Sroufe, A. L., Carlson, E. A., Levy, A. K., & Egeland, B. (1999). Implications of attachment theory for developmental psychopathology. *Development and Psychopathology, 11,* 1–13.

Symons, D. K. (1998). Post-partum employment patterns, family-based care arrangements, and the mother–infant relationship at age two. *Canadian Journal of Behavioral Science, 30,* 121–131.

Teti, D. (1999). Conceptualizations in the preschool years: An integration. In J. Solomon & C. George (Eds.), *Attachment disorganization* (pp. 213–242). New York: Guilford Press.

Teti, D. M., & Gelfand, D. M. (1997). The Preschool Assessment of Attachment: Construct validity in a sample of depressed and nondepressed families. *Development and Psychopathology, 9,* 517–536.

Teti, D. M., Gelfand, D. M., Messinger, D. S., & Isabella, R. (1995). Maternal depression and the quality of early attachment: An examination of infants, preschoolers, and their mothers. *Developmental Psychology, 31,* 364–376.

Vandell, D. L. (1979). Effects of a playgroup experience on mother–son and father–son interaction. *Developmental Psychology, 15,* 379–385.

van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11,* 225–250.

Waters, E., & Deane, K. (1985). Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. In ‚. Bretherton & E. Waters (Eds.), Growing points of attachment theory and research (pp. 41–65). *Monographs of the Society for Research in Child Development, 50*(1–2, Serial No. 209).

Winer, B. J. (1971). *Statistical principles in experimental design* (2nd ed.). New York: McGraw-Hill.