The Relative Effects of Maternal and Child Problems on the Quality of Attachment: A Meta-Analysis of Attachment in Clinical Samples

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van IJzendoorn, Marinus H.; Goldberg, Susan; Kroonenberg, Pieter M.; and Frenkel, Oded J. *The Relative Effects of Maternal and Child Problems on the Quality of Attachment: A Meta-Analysis of Attachment in Clinical Samples.* Child Development, 1992, **63**, 840–858. In this meta-analysis of 34 clinical studies on attachment the hypothesis is tested that maternal problems such as mental illness lead to more deviating attachment classification distributions than child problems such as deafness. A correspondence analysis on 21 North American studies with normal subjects produced a baseline against which the clinical samples could be evaluated. Separate analyses were carried out on studies containing the traditional A, B, C classifications and on studies that also included the recently discovered D or A/C category. Results show that groups with a primary identification of maternal problems show attachment classification distributions highly divergent from the normal distributions, whereas groups with a primary identification of child problems show distributions that are similar to the distributions of normal samples. The introduction of the D or A/C classifications (about 15% in normal samples) reveals an overrepresentation of D or A/C in the child problem groups, but the resulting distribution still is much closer to the normal distributions compared to the samples with maternal problems. In clinical samples, the mother appears to play a more important role than the child in shaping the quality of the infant-mother attachment relationship.

The Strange Situation and its associated classification scheme (Ainsworth, Blehar, Waters, & Wall, 1978; Ainsworth & Wittig, 1969) have been the basis of a major body of research on parent-infant relationships. While there are many approaches to the study of parent-infant relationships, the studies relevant for the present paper are those based on the attachment construct as described by Ainsworth (Ainsworth et al., 1978) and derived from Bowlby's more general concepts of attachment (Bowlby, 1971). A large number of studies of the antecedents and sequelae of attachment classified on the basis of behavior in the Strange Situation (see Bretherton, 1985, for a review) lend credibility to this procedure as a standardized validated paradigm for assessing infant-mother attachment in this conceptual framework.

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A natural offshoot of this work has been the use of the Strange Situation to assess infant-mother attachment in populations known to have problematic infant-mother relationships (e.g., maltreated infants) or thought to be vulnerable to problematic relationships (e.g., preterm infants). In general, investigators studying these populations have predicted a decrease in secure (or optimal) forms of attachment relative to that in low-risk comparison groups. In some cases, a low-risk comparison group was directly assessed; in others, investigators relied on published normative data (e.g., Ainsworth et al., 1978; van IJzendoorn & Kroonenberg, 1988) for comparison. In some of these studies, such comparisons were not made because the focus was on within-group comparisons. Additionally, some individual studies were limited by small samples, particularly when the risk group was defined by a condition of low frequency. Thus, the mixed findings of these studies are difficult to interpret. The purpose of the present paper is to use meta-analytic techniques to provide a systematic appraisal of the results from clinical studies and their significance for attachment theory.

Bowlby's formulation emphasized an evolutionary perspective and history which, he argued, served to select species-specific behaviors in infants that are effective in eliciting caregiver proximity and protection as well as reciprocal species-specific behaviors in adults. This formulation suggests that developing attachments can be disrupted by conditions that limit, impair, or distort the infant's behavior as well as conditions that interfere with adult responsiveness. For our present purposes, we refer to the first kind of condition as child problems and the second kind as maternal problems. The present analyses were designed to allow for quantitative assessment of the relative impact of child and maternal problems on quality of attachment.

In general, attachment theorists have argued that parental behavior plays a more powerful role than infant behavior in shaping the quality of attachment. In studies on normal groups, there are some data that support this assertion (e.g., Belsky, Rovine, & Taylor, 1984), while other findings contradict it (e.g., Lewis & Feiring, 1989). It is possible that normative studies sample only a narrow range of infant behavior. The inclusion in the present analyses of infants with developmental and physical problems may introduce sufficient variation in infant behavior to provide a better test of this assertion.

A second purpose of the present analyses was to determine whether specific clinical or risk conditions bias attachment toward particular patterns. Infant-mother attachment, as indexed by Strange Situation behavior, is conceptualized as representing four main patterns. The first three were described by Ainsworth and her colleagues (Ainsworth & Wittig, 1969; Ainsworth et al., 1978). The fourth was added more recently by Main and Solomon (1986, 1990) in an effort to take account of previously unclassifiable cases and cases where the Strange Situation classification seemed paradoxical in light of home observations. Each pattern is considered to represent a distinct developmental history of mother-infant interaction and to bias future development in distinct ways.

The Strange Situation entails a series of structured observations of mother, infant, and an unfamiliar female in a laboratory playroom. The central events include two mother-infant separations: during one the infant is with the stranger; during the second the infant is first alone and then briefly with the stranger before the mother's return.

Infants who are securely attached (pattern B) use the mother as a secure base from which to explore; they reduce their exploration and may be distressed in her absence, but greet her positively on her return and soon start to explore again. This is the pattern shown by two-thirds of infants in normal samples. It has been associated with responsive care in the home during the first year and advantages in subsequent development relative to the other patterns (see Bretherton, 1985, for a review).

Infants whose attachment pattern is insecure avoidant (A) explore with minimal reference to the mother, are minimally distressed by her departure, and seem to ignore or avoid her on return. In normative samples this pattern characterizes one in five infants. Prior maternal home behavior in this group has been described as intrusive (Belsky & Rovine, 1988) and reflecting discomfort with physical contact (Ainsworth et al., 1978). Theoretically, avoidant attachment in infancy is associated with later antisocial and aggressive behavior, and there are some data to support this (Cassidy & Kobak, 1988; Renken, Egeland, Marvinney, Mangelsdorf, & Sroufe, 1989), but there are other nonsupporting data (Bates & Bayles, 1988) and it remains controversial.

The third major pattern is described as insecure-ambivalent/resistant (C). It is marked by minimal exploration reflecting inability to move away from the mother. These infants are highly distressed by separations and are difficult to settle on reunions. In normal samples, approximately one of seven babies shows this resistant pattern. This pattern is considered to reflect a history of inconsistent maternal responsiveness and subsequent social development vulnerable to social withdrawal. Since this is the least frequent pattern, it has not been possible to provide strong empirical tests of these propositions. In general, because the number of infants showing specific forms of insecurity (avoidance or resistance) is relatively small, most investigators combine them into a single insecure group for analysis, and the distinct patterns of prior and subsequent behavior associated with avoidance and resistance in the Strange Situation are not yet documented satisfactorily.

The bulk of studies included in the present analyses used only these three classifications. A smaller group of more recently completed studies also use the fourth pattern, known as insecure-disorganized (D). The development of this category was precipitated by the observations that (1) a small number of cases did not fit into the A, B, C scheme; (2) maltreated children were being classified as secure, which did not make theoretical sense; and (3) in some clinical samples, infants were showing features of both avoidant and ambivalent attachment. A substantial number of these cases are now described as insecure-disorganized; in other studies (e.g., Crittenden, 1985), these cases are described as A/C because they display avoidant as well as resistant behavior. We consider these two descriptions as overlapping (Carlson, Cicchetti, Barnett, & Braunwold, 1990) and will use the term "disorganized" (D) for both categories (Main, 1990). The salient feature of this pattern is that in contrast to the previous three patterns, which are marked by a coherent strategy for managing arousal in the Strange Situation, insecure-disorganized infants lack a coherent strategy. In addition, they engage in odd behaviors that are inexplicable except in the context of fear or confusion in the presence of the mother. Early indications are that this pattern occurs with high frequency in maltreated infants (Carlson, Cicchetti, Barnett, & Braunwold, 1989; Crittenden, 1985; Lyons-Ruth, Connell, Zoll, & Stahl, 1987; Spieker & Booth, 1988) as well as infants of depressed mothers (Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985), suggesting that it is a very insecure pattern. In normal samples, infant disorganization has been associated with the mother's traumatic and unresolved loss of an attachment figure (Main & Hesse, 1990). The sequelae of disorganized attachment in infants have not yet been well studied. Thus, the validity of the D category is not yet well established.

The disorganized classification may be of special interest in clinical samples. However, because of its recent development, it has not yet been widely used in either normal or clinical samples. Analyses in the present study were therefore done separately for studies using only the A, B, C system and those using all four classifications. The few studies available thus far that included D classifications emphasize the association of disorganization with what we have labeled maternal problems. However, it is possible that organic deficits on the part of the child also contribute to disorganization in attachment either by limiting the child's ability to develop a coherent attachment strategy or by disrupting parental behavior. Furthermore, since a substantial number of D cases were previously considered secure (Goldberg, Fischer-Fay, Simmons, Fowler, & Levison, 1989; Main & Solomon, 1986, 1990), earlier studies that did not use the D classification may well have underestimated the extent of insecure attachment in both child and maternal problem samples.

The following hypotheses were tested: (1) Both maternal and child problems will decrease the incidence of secure attachment. (2) Both maternal and child problems will increase the incidence of disorganized attachment. (3) Maternal problems will have stronger effects than child problems in decreasing secure attachment. (4) Maternal problems will have stronger effects than child problems in increasing disorganized attachment. (5) The effects of both maternal and child problems on attachment quality will be more evident when the D classification has been used.

Method

Data base.—Pertinent studies were selected through PsychLit; the keyword "attachment" was used to identify the studies. The following criteria were applied in selecting the data base for the current analyses:

1. Only studies of infant-mother attachment using the classical Strange Situation procedure or slightly modified separation-reunion procedures and reporting the distribution of A, B, C (or A, B, C, D or A/C) classifications were considered. Studies involving other caregivers and studies in which all insecure classifications were combined were excluded.

2. Since the majority of clinical samples were of North American origin, selection was restricted to North American studies for both clinical and normative samples. The purpose of this restriction was to avoid confounding cultural and clinical factors in the analyses.

3. In studies that involved repeated measures of infant-mother attachment (e.g., Gaensbauer, Harmon, Cytryn, & McKnew, 1984), only the first assessment was included. This was to rule out multiple assessments of attachment in the same dyads. In these cases, the first assessment was chosen because it was less likely to be influenced by a previous measure.

4. Insofar as possible, where more than one report emanated from the same laboratory, we attempted to confirm and exclude overlapping samples. There were three such cases of overlap with prior reports (Belsky & Rovine, 1988; Carlson et al., 1989; Goldberg et al., 1989). In the latter two examples, the more recent report represented a reclassification of earlier data with the addition of the D classification and therefore did not enter into the same analyses as the earlier reported data.

5. A minimal sample size was not one of the criteria since some of the clinical samples were expected to be small and the majority of the analyses are performed on data aggregated over samples.

These criteria resulted in selection of 34 clinical samples representing 1,624 Strange Situation classifications. These were divided into three categories: (1) those drawn from populations identified by the child's diagnosis (e.g., deafness, Down syndrome) were considered to reflect child problems; (2) those drawn from populations identified by a maternal condition (e.g., psychiatric diagnosis, maltreatment) were considered to reflect maternal problems; (3) those that were difficult to classify into the two previous categories were considered other. In making these assignments, we recognized that there is some propensity for an association between child and maternal problems (Sameroff & Chandler, 1975). Problems existing in one member of the dyad tend to increase problems in the other, and diagnoses might therefore not be independent. Thus, a physically impaired child may be perceived differently by parents, may alter the parents' behavior, and may increase their feelings of stress, anxiety, and even depression. Similarly, a mother with a psychiatric problem may have affected her child prenatally, or through genetic transmission of some deviance. However, without detailed documentation of specific child and maternal "problems" in each specific sample, our question could best be answered by entering each sample into the category that represented its primary identification.

Within each broad grouping, samples were further divided into subgroups that shared the same identifying characteristic (e.g., prematurity). This allowed us to not only identify the primary locus of problems but to see whether child or maternal effects could be accounted for by specific subgroups within the broader category and to see whether particular populations deviate from the pattern of the broader category represented.

The samples available for analysis are not necessarily representative of the range of clinical populations that could be studied or would be of interest. Among child problems, prematurity has been most intensively studied with respect to all aspects of development, including attachment. Similarly, among the maternal problems, studies of maltreatment are the most common in our selected samples. Most of the other subgroups we have formed are either small or more heterogeneous. For example, the studies listed under the heading of "physical problems" include a group with cystic fibrosis and one with congenital heart disease, both from the same hospital (Goldberg et al., 1989; Goldberg, Simmons, Neuman, Campbell, & Fowler, in press), and a group with a mixture of physical disabilities (Wasserman, Lennon, Allen, & Shilansky, 1986). There were very few studies of children with sensory impairments, Down syndrome, and autism, and the samples we have grouped as "other delays" are heterogeneous, not only across samples, but often within samples.

In examining maternal problems, parent mental illness is largely represented by parents with schizophrenia or affective disorders. Other diagnoses have not been studied for their impact on child rearing and attachment. Teen mothers were included in only two studies (Frodi, Grolnick, Bridges, & Berko, 1990; Lamb, Hopps, & Elster, 1987), although they are considered a high-risk group. Many young- and/or single-mother families are included in studies of attachment in socially disadvantaged families. We did not include such samples in the present analyses since these are not clinically identified populations.

The comparison normative data come from 21 samples representing 1,584 Strange Situation classifications selected by the same criteria as the clinical samples. The age of children in the normative samples ranged from 12 to 24 months; that in the clinical groups ranged from 12 to 50 months. In many cases, children in the clinical samples were known or expected to be delayed in some aspect(s) of development. In each study, however, investigators provided reasonable justification for using this procedure with children beyond the age usually considered appropriate for the Strange Situation.

Data analysis.—The samples were cast in a contingency table with the normal comparison samples (N) as one of the two marginal distributions and frequencies of A, B, C classifications (see Table 1) or A, B, C, D classifications (see Table 2) over the "normal" samples as the other. Two types of analyses were conducted. In the first, standardized residuals for each cell of Tables 1 and 2 were computed. The sum of the squared standardized residuals is equal to the standard Pearson's χ^2 (or chi-squared statistic), and in large samples the standardized residuals are asymptotically distributed as z scores. These standardized residuals indicate the direction and size of the deviation of the observed frequencies from those expected from the marginal distribution of the total normal sample. A positive deviation means that the sample has a higher proportion of cases in that category than the total normal sample; a negative deviation means that the sample has a lower proportion in that category than the total normal sample. Since a large number of tests on the size of the standardized residuals were done simultaneously, protection from capitalizing on chance significance was assured by Bonferroni-like corrections of the standard alpha level of .05, which was divided by 21 (samples) $\times$ 3 (categories), and a two-tailed Bonferroni level of .0008 was adopted (z = 3.35). For the clinical ABC samples, .05 was divided by 31 (clinical samples) $\times$ 3 (categories), and the critical level of .0005 was adopted (z = 3.47). For the normal ABCD samples, .05 was divided by 4 (samples) $\times$ 4 (categories), giving a critical level of .003 (z = 2.96). For the clinical ABCD samples, .05 was divided by 12 (clinical samples) $\times$ 4 (categories), providing a critical level of .001 (z = 3.26). Each clinical sample was tested with a chi-square goodness-of-fit test against the distribution of the normal samples (see Table 1).

Following our earlier paper (van IJzendoorn & Kroonenberg, 1988), a second type of analysis, correspondence analysis, was used to investigate similarities and differences in sample distributions or profiles (Benzécri, 1976; Greenacre, 1985; Nishisato, 1980). The method was applied on the "normal" samples and permits simultaneous analysis of both sample and category profiles; its solution is obtained through singular value decomposition of the standardized residuals and a weighting of the singular vectors by the square root of the singular values multiplied by the inverse square root of N subjects in a sample. In the graphical representation of the results of a correspondence analysis, the origin represents the marginal distribution of both categories and samples. The maximum number of independent dimensions of such graphical representations is equal to the minimum of the number of row and column categories minus one. Thus the standardized residuals for the ABC distributions can be perfectly represented in two dimensions, and those for the ABCD distributions in three dimensions. The representation shows which samples have similar distributions over categories and which categories have similar distributions over samples, as well as which categories and which samples deviate markedly from their "global" distribution. The clinical samples (and their combinations) have been projected into the graphical representation of the normal samples by using regression-type procedures with the clinical sample coordinates or those of the combinations as the criteria and the category coordinates as regression weights for the frequencies of the clinical samples (Greenacre, 1985; for an application in a similar situation, see van IJzendoorn & Kroonenberg, 1988).

The real advantage of the correspondence analysis plot is that the *patterns* of standardized residuals are investigated and compared rather than the *separate* standardized residuals. The plot provides a complete overview of the similarities and differences between the distributions of the samples and between the samples and the total normal distribution. Samples with similar patterns will lie together in the same part of the graph, and samples with reversed patterns will lie on the opposite side of the origin. Furthermore, a new sample can easily be compared at once with all other samples by calculating its location in the plot.

First all samples with A, B, and C frequency distributions were analyzed. A parallel analysis was then conducted for the ABCD samples.

Results

Relative effects of child and maternal problems on attachment.—Table 1 lists each of the samples for the A, B, C analysis, grouped by identifying characteristics. The left-hand side of the table indicates the reported frequency of patterns of attachment; the right-hand side provides the standardized residuals. Figures in bold represent significant deviations from the total normal sample. Table 2 provides similar data for samples that reported A, B, C, D frequencies. Here the normative data are very limited as the D classification has not been used extensively. In Tables 1 and 2 the "comparison groups" are the nonclinical comparison groups used in the clinical studies.

Hypothesis 1 predicted that both maternal and child problems would decrease the incidence of secure attachment. The first notable feature of Table 1 is that neither the total child problem sample, the subgroup samples, nor any of the individual child problem samples show any standardized residuals in bold. That is, none of the standardized residuals are significant deviations from those expected on the basis of our normative comparison data. However, the total maternal problem sample does show a significant decrease in secure (B) attachment (−4.86) and an increase in insecure ambivalent (C) attachment (+7.06). Further examination of the subgroups indicates that each of the main subgroups deviates from the total normal sample. The maltreatment and mental illness groups show a significant increase in insecure ambivalent (C) attachment. Both show a decrease in secure attachment, although the decrease is significant only in the maltreatment group (maltreatment −4.41; mental illness −2.54). The teen mother group also shows some decrease in secure attachment (−1.66) but a significant increase in insecure avoidant (A) attachment (+3.68). These data so far are consistent with hypothesis 3, that maternal problems would have a stronger effect on attachment than child problems.

Further investigation relevant to hypothesis 1 entails examination of similar analyses for samples that included the D classification. This also provides an opportunity to test hypothesis 2, which predicted that both maternal and child problems would have the effect of increasing disorganization in attachment. Table 2 summarizes these data. In this case, the total child problem sample does not show a significant decrease in secure attachment (B), but does show a significant increase in disorganized attachment (D +6.34). However, further examination shows this pattern only in the single sample of children with Down syndrome. Since the number of samples in this analysis is relatively small, it appears that this single sample may be unduly influencing the aggregated child problem. Examination of the total maternal problem sample shows a significant decrease in secure (B) attachment (−6.04) along with an increase in disorganized (D) attachment (+9.60). This pattern is replicated in the total maltreatment sample (−6.61 B, +10.15 D). The alcohol abuse sample shows a similar pattern, although only the increase in disorganization is significant (−1.30 B, +4.14 D). Although the number of samples is small and the standardized residuals are not always significant, the maternal problem samples generally show a decrease in B and an increase in D attachment. As with the A, B, C analyses, the general pattern of findings supports hypothesis 3, that the effects of maternal problems on attachment classification distributions are greater than those of child problems.

Similarities and differences in A, B, C profiles.—The standardized residuals show only how much separate categories in separate samples deviate from what is to be expected in normal samples. Correspondence analysis permits simultaneous analysis of the distributions of the samples over the categories and the distributions of the categories over samples. Correspondence analysis does not focus on *separate* standardized residuals but allows for comparisons between *patterns* of standardized residuals for (combinations of) samples. A correspondence analysis on the normal samples was carried

TABLE 1

DISTRIBUTIONS OF A, B, C CLASSIFICATIONS IN NORMAL AND CLINICAL SAMPLES

	DISTRIBUTION				STANDARDIZED RESIDUALS[a]		
STUDY	A	B	C	N	A	B	C
N—Normal U.S. samples:							
N1—Ainsworth et al. (1978)	22	70	13	105	.10	−.05	−.02
N2—Antonucci & Levitt (1984)	17	28	2	47	2.37	−.63	−1.59
N3—Bates, Maslin, & Frankel (1985)	9	45	11	65	−1.19	.21	1.02
N4—Belsky & Rovine (1988)	24	102	23	149	−1.19	.21	1.04
N5—Benn (1985)	11	29	1	41	.89	.29	−1.82
N6—Connell (1977)	31	61	9	101	2.26	−.82	−1.01
N7—Crockenberg (1981)	5	34	9	48	−1.55	.32	1.24
N8—Easterbrooks & Lamb (1979)	3	62	1	66	−2.86	2.67	−2.52
N9—Vaughn et al. (1989)	24	74	21	119	−.08	−.65	1.61
N10—Smith & Pederson (1988)	12	27	8	47	.76	−.80	.89
N11—Fagot & Kavanagh (1990)	33	60	9	102	2.64	−1.01	−1.04
N12—Main (1983)	11	25	4	40	.97	−.35	−.44
N13—Moss (1979)	7	25	7	39	−.35	−.32	.98
N14—Owen et al. (1984)	4	50	5	59	−2.33	1.66	−.86
N15—Gunnar et al. (1989)	10	37	16	63	−.81	−.81	2.92
N16—Thompson & Lamb (1983)	7	30	6	43	−.61	.22	.28
N17—Waters (1978)	10	30	10	50	−.08	−.61	1.52
N18—Main (personal communication, 1990)	41	82	16	139	2.34	−1.16	−.31
N19—Teti & Ablard (1989)	8	33	6	47	−.53	.26	.06
N20—Donovan & Leavitt (1989)	6	33	1	40	−.77	1.10	−1.78
N21—Lewis & Feiring (1989)	30	125	19	174	−.95	.77	−.57
Total normal	325	1062	197	1,584			
Child problems:							
P—Prematurity:							
P1—Rode et al. (1981)	3	17	4	24	−.87	.23	.59
P2—Plunkett et al. (1986)	10	32	14	56	−.44	−.91	2.66
P3—Goldberg et al. (1989)	11	49	4	64	−.59	.93	−1.40
P4—Frodi & Thompson (1985)	3	15	2	20	−.54	.43	−.31
P5—Brown & Bakeman (1980)	7	13	6	26	.72	−1.06	1.54
P6—Rodning, Beckwith, & Howard (1989)	2	30	7	39	−2.12	.75	.98
Total prematurity	36	156	37	229	−1.60	.20	1.59

D—Deafness:							
D1—Lederberg & Mobley (1990)	9	23	9	41	.20	−.86	1.73
PH—Physical problems:							
PH1—Goldberg et al. (1989)[b]	14	25	3	42	1.83	−.60	−.97
PH2—Goldberg et al. (in press)[c]	15	27	2	44	1.99	−.46	−1.48
PH3—Wasserman et al. (1987)	8	25	3	36	.23	.18	−.70
Total physical problems	37	77	8	122	2.39	−.53	−1.84
DO—Down syndrome:							
DO1—Goldberg (1988)	6	30	1	37	−.58	1.04	−1.68
DO2—Vaughn (personal communication, 1990)	0	20	1	21	−2.08	1.58	.00
Total Down	6	50	2	58	−1.71	1.78	−1.94
A—Autism:							
A1—Shapiro et al. (1987)	5	8	2	15	1.10	−.65	.10
OD—Other delays:							
OD1—Shapiro et al. (1987)[d]	4	1	3	8	1.84	−1.88	2.01
OD2—Shapiro et al. (1987)[e]	1	1	1	3	.49	−.71	1.03
OD3—Shapiro et al. (1987)[f]	4	5	1	10	1.36	−.66	−.22
OD4—Goldberg (1988)[g]	7	15	2	24	.94	−.27	−.57
OD5—Goldberg (1988)[h]	7	23	3	33	−.09	.19	−.55
Total other delays	23	45	10	78	1.75	−1.01	.10
Total child problems	116	359	68	543	.43	−.27	.05
Maternal problems:							
M—Maltreatment:							
M1—Schneider-Rosen et al. (1985)	5	5	7	17	.81	−1.90	3.36
M2—Lyons-Ruth et al. (1987)	5	4	1	10	2.06	−1.04	−.22
M3—Lamb et al. (1985)	17	11	4	32	**4.07**	−2.26	.01
M4—Egeland & Sroufe (1981)	7	11	11	29	.43	−1.92	**3.89**
M5—Carlson et al. (1989)	10	9	3	22	2.58	−1.50	.16
M6—Crittenden (1985)	8	6	6	20	1.92	−2.02	2.23
Total maltreatment	52	46	32	130	**4.90**	**−4.41**	**3.94**

TABLE 1 (Continued)

Study	Distribution A	Distribution B	Distribution C	*N*	Standardized Residuals[a] A	Standardized Residuals[a] B	Standardized Residuals[a] C
MI—Mental illness							
MI1—Gaensbauer et al (1984)	2	5	0	7	47	14	− 93
MI2—Naslund et al (1984)	3	33	10	46	−2 10	39	1 79
MI3—Sameroff et al (1982)[i]	47	118	67	232	− 09	−3 01	**7.10**
Total mental illness	52	156	77	285	− 85	−2 54	**6.98**
T—Teen mothers							
T1—Lamb et al (1987)	19	19	1	39	**3.89**	−1 40	−1 75
T2—Frodi et al (1990)	9	16	5	30	1 15	− 92	66
Total teen mothers	28	35	6	69	**3.68**	−1 66	− 88
Total maternal problems	132	237	115	484	3 28	**−4.86**	**7.06**
Other							
DE—Drug-exposed							
DE1—Rodning et al (1989)	9	7	2	18	2 76	−1 46	− 16
AD—Adoption							
AD1—Singer et al (1985)	13	24	9	46	1 16	−1 23	1 37
CO—Comparison groups	96	395	51	542	−1 44	1 66	−2 00

[a] Residuals reaching statistical significance are printed in bold
[b] Cystic fibrosis
[c] Congenital heart disease
[d] Developmental language delays
[e] Mental retardation
[f] Pervasive developmental delays
[g] Neurological problems
[h] Developmental delays
[i] Overrepresentation of mentally ill subjects

TABLE 2

DISTRIBUTIONS OF A, B, C, D CLASSIFICATIONS IN NORMAL AND CLINICAL SAMPLES

	DISTRIBUTION					STANDARDIZED RESIDUALS[a]			
STUDY	A	B	C	D	*N*	A	B	C	D
N—Normal samples:									
N1—Main (personal communication, 1990)	38	71	9	23	141	1.01	−.73	−.49	.50
N2—Physical problems[b]	3	30	2	10	45	−2.27	1.07	−.75	1.31
N3—Mental illness[c]	3	14	1	5	23	−.99	.39	−.55	.88
N4—Maltreatment[d]	26	53	11	7	97	.81	−.03	1.37	−1.92
Total normal	70	168	23	45	306				
Child problems:									
P—Prematurity:									
P1—Goldberg et al. (1989)	7	40	2	15	64	−2.00	.82	−1.28	1.82
P2—Rodning et al. (1989)	2	24	3	12	41	−2.42	.31	−.05	2.43
Total prematurity	9	64	5	27	105	−3.08	.84	−1.03	2.94
Ph—Physical problems:									
PH1—Goldberg et al. (1989)	9	19	2	12	42	−.20	−.85	−.65	2.34
PH2—Goldberg et al. (1989)	13	22	0	11	46	.76	−.65	−1.86	1.63
PH3—Sierra (1989)	11	11	2	5	29	1.69	−1.23	−.12	.36
Total physical problems	33	52	4	28	117	1.20	−1.53	−1.62	2.60
DO—Down syndrome:									
DO1—Vaughn (personal communication, 1990)	0	20	1	24	45	−3.21	−.95	−1.30	**6.76**
Total child problems	42	136	10	79	267	−2.47	−.87	−2.25	**6.34**

TABLE 2 (Continued)

Study	Distribution				*N*	Standardized Residuals[a]			
	A	B	C	D		A	B	C	D
Maternal problems									
M—Maltreatment									
M1—Carlson et al (1989)	1	3	0	18	22	−1 05	−1 40	− 95	**4.69**
M2—Crittenden (1985)	7	0	5	9	21	1 00	**−3.40**	2 72	**3.36**
M3—Crittenden (1989)	25	7	7	31	70	2 14	**−5.07**	76	**6.45**
Total maltreatment	33	10	12	58	113	1 41	**−6.61**	1 20	**10.15**
MI—Mental illness									
MI1—Radke-Yarrow et al (1985)	18	25	2	10	55	1 53	− 95	−1 05	67
AA—Alcohol abuse									
AA1—O'Connor et al (1987)[e]	3	8	1	11	23	− 99	−1 30	− 55	**4.14**
Total mother problems	54	43	15	79	191	1 56	**−6.04**	17	**9.60**
Other									
DE—Drug-exposed									
DE1—Rodning et al (1989)	3	7	1	7	18	− 56	− 92	− 30	2 67

[a] Residuals reaching statistical significance are printed in bold
[b] Comparison groups from Goldberg et al (1989)
[c] Comparison group from O Connor et al (1987)
[d] Comparison groups from Carlson et al (1989) and Crittenden (1985, 1989)
[e] Heavy alcohol consumption group

out to get an overview of the similarities and differences between profiles of individual samples and to create a baseline against which the clinical samples are evaluated (see Fig. 1).

Using only North American samples, Ainsworth et al.'s (1978) "standard sample" (*N*1) again is projected very near to the origin (cf. van IJzendoorn & Kroonenberg, 1988). Although Gunnar, Mangelsdorf, Larson, and Hertsgaard's (1989) sample (N15) is a middle-class sample without special characteristics, it contains an overrepresentation of C type classifications. However, no study of normal mother-child pairs differed significantly from the total normal distribution.

The first dimension (*X*-axis) has a singular value of .19449 (percentage explained: 58%) and shows an overrepresentation of A classifications on the left and an overrepresentation of B classifications on the right. The formula for calculating the *X*-coordinate from the frequencies of the A group (f_A), the B group (f_B), and the C group (f_C) is: $X = (-.856\, f_A + .256\, f_B + .035\, f_C) / (.19449 \times N)$, where $N = f_A + f_B + f_C$. The second dimension (*Y*-axis) has a singular value of .16477 (percentage explained: 42%) and shows an overrepresentation of C classifications on the top. The formula for calculating the *Y*-coordinate is: $Y = (-.130\, f_A - .160\, f_B + 1.077 f_C)/(.16477 \times N)$.

Projecting clinical samples into the correspondence analysis plot using the two formulas shows that the maternal problems groups (e.g., depression, maltreatment, psychosis, teenage) deviate more from the normal distribution than the child problems groups (e.g., autism, prematurity, physical abnormalities, Down) (see Fig. 2).

The maltreatment group shows an overrepresentation of C and A classifications, whereas the mental illness group shows an extraordinary number of C relationships. Teenage mothers appear to have a surplus of A type relationships. Quite near to the origin are the samples with premature, autistic, developmentally delayed, and physically malformed children. Deaf children show an overrepresentation of C classifications, whereas Down syndrome children appear to be more often securely attached to their mothers. The point for all maternal problems combined clearly is farther away from the origin than the point for all child problems combined, which is projected very near to the origin. Drug-exposed mother-child dyads show more often an A type relationship, whereas in adoptive families both C and A classifications are slightly overrepresented. Surprisingly, the centroid for the comparison groups shows an overrepresentation of secure attachment classifications compared to the normal samples. In clinical studies, comparison groups seem to be too carefully selected in terms of undisturbed mother-child relationship characteristics. Differences between clinical and normal subjects may, therefore, be somewhat exaggerated.

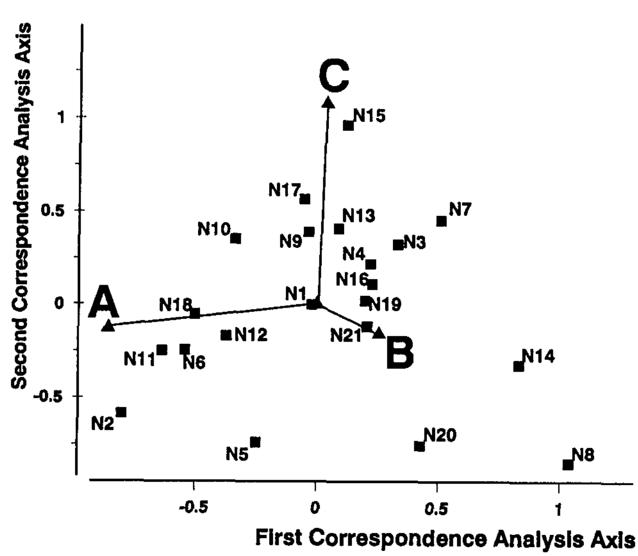

FIG. 1.—Correspondence analysis solution of sample-by-classification table for normal samples

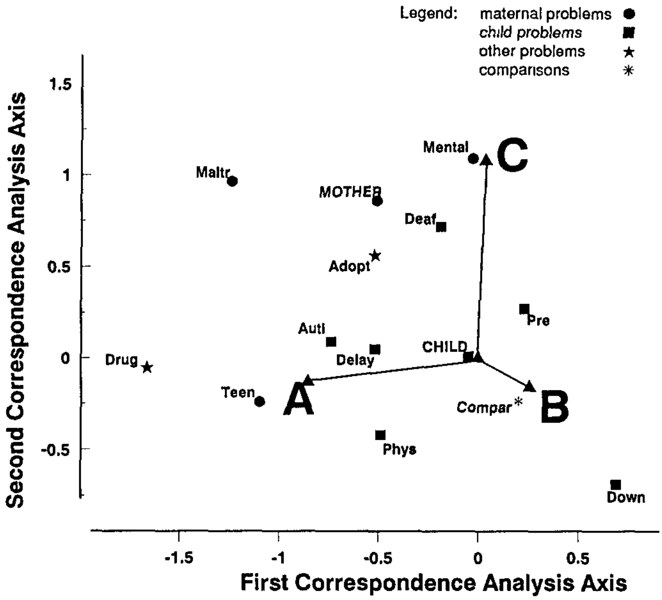

FIG. 2.—Projection of clinical samples on the correspondence analysis plot of the normal samples

Similarities and differences of ABCD profiles.—A second correspondence analysis on the normal samples that include D or A/C classifications was performed to create a baseline for the clinical samples with information about D or A/C classifications. For this analysis, comparison groups of some clinical samples were included to reach a satisfactory number of normal samples (see Fig. 3).

The graphical representation of the correspondence analysis solution is contained in Figure 3: the samples N1, N2, N3, and N4 constitute the basis for the solution, and all are reasonably near to the origin. In principle, three dimensions can be relevant in describing four categories (A, B, C, D), but in our case only two dimensions contribute to the inertia (Greenacre, 1985). The first dimension (*X*-axis) has a singular value of .22360 (percentage explained: 80%) and shows an overrepresentation of A and C classifications on the left side and an overrepresentation of D classification on the right side. The formula for calculating the *X*-coordinate is: $X = (-.652f_A + .165f_B - .655f_C + .734f_D) / (.22360 \times N)$. The second dimension (*Y*-axis) has a singular value of .11122 (percentage explained: 20%) and shows an overrepresentation of A and D classifications at the top and an overrepresentation of C and, to a lesser extent, B classifications at the bottom of Figure 3. The formula for calculating the *Y*-coordinate is: $Y = (.387f_A - .206f_B - .557f_C + .454f_D)/(.11122 \times N)$. The third dimension has a singular value of .00034, and it can therefore be safely ignored.

The plot for the A, B, C, D vectors shows that the D vector is almost orthogonal to the B vector, but is nearly an extension of the A, and especially the C vector. This means that normal samples containing an overrepresentation of D classifications tend to have less C classifications and A classifications than normal samples in which the D category is underrepresented. The B classifications seem to be nearly independent from the D classifications. In other words, D classifications mainly appear to be "recruited" from A or C classifications and to a much lesser extent from secure attachment classifications.

Projecting the clinical samples with A, B, C, D distributions into the correspondence analysis plot using the two formulas shows that the maltreatment, alcohol abuse, and Down syndrome samples most strongly deviate from the origin. These samples contain an overrepresentation of D and A type classifications. The samples with premature children and children with physical problems do not deviate as strongly from the origin compared to the three samples mentioned before. The same holds true for the mental illness sample of Radke-Yarrow et al.

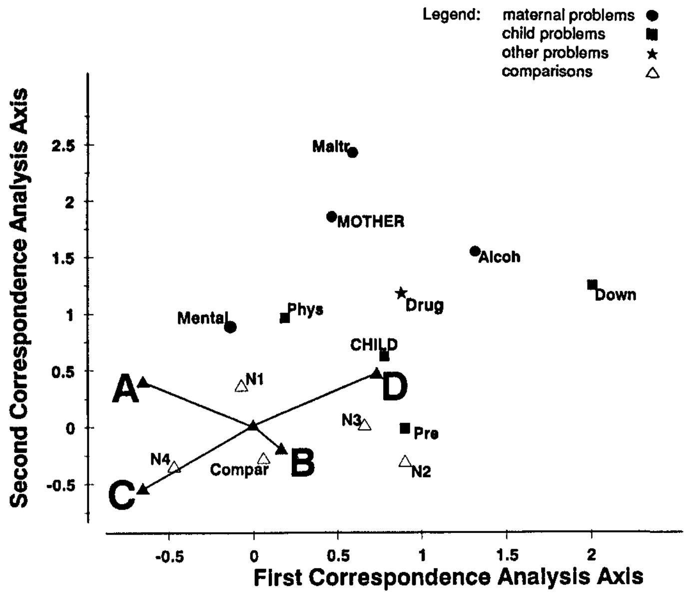

FIG. 3.—Correspondence analysis solution of ABCD samples-by-classification and projection of clinical samples and their aggregates.

(1985). It may be doubted that in this latter case the D or A/C classificatory system has consistently been applied. The study was one of the first to discover problems with applying the traditional A, B, C system, but an alternative system was not yet available. Combining the samples with maternal problems and those with child problems, it is clear that the maternal problem group deviates more strongly from the origin (A and D overrepresentation) than the child problem group (mainly a D overrepresentation). The latter deviation is mainly caused by the outlying position of the Down sample with a high number of unclassifiable, D-like relationships. It is possible that limited behavioral and cognitive abilities in the Down syndrome group preclude accurate use of the classification scheme. This is an issue that can be raised with respect to some of the other child problem samples (Vaughn, personal communication, November 1990). Without the Down group, the centroid for the child problems is somewhat closer to the origin (X-coordinate: .41; Y-coordinate: .63), but the D classifications still tend to be overrepresented in the child problem samples compared to the normal samples. To test whether the cluster of maternal problems significantly differs from the cluster of child problems, a (2 × 4) type of problem × classification category table was constructed. The resulting χ^2 (N = 458; df = 3) = 39.289, $p < .0001$.

Discussion and Conclusions

All analyses show that the effect of maternal problems was to increase insecure attachment as measured through the Strange Situation procedure. This was the case for both the earlier studies with only A, B, C distributions and the more recent studies that have included the D classification. Furthermore, this was true not only for the aggregated maternal problem sample but for subgroup aggregated samples as well as many individual samples. In contrast, there were few demonstrated effects of child problems on the attachment distribution, whether in samples with A, B, C classifications only or those including D classifications. While there appeared to be an effect of child problems in increasing disorganized attachment for the total aggregated child problem sample, and all the child problem samples showed an increase in D classifications, it was only in the Down sample (Vaughn, personal communication, November 1990) that disorganized attachments were significantly overrepresented. In the child problem samples, D classifications seem to have been mainly recruited from the A and C classifications; in the maternal problems group, D classifications appear to be primarily derived from the B classifications. It may be hypothesized that child problems do not necessarily compromise the ability to be secure in the attachment relationship—which maternal problems in fact do—but affect the way in which the insecurity is expressed.

Our data suggest that if mothers suffer from mental illness or engage in disturbed caregiving behavior (e.g., maltreatment) their children cannot compensate for the resulting lack of maternal responsiveness and are vulnerable to insecure forms of attachment. However, when children are impaired (physically or mentally in various degrees), their mothers are generally capable of compensating for this potential handicap in the dyadic relationship; child problems do not lead to significant decreases of secure attachments compared to the normal population. Even with a more detailed classification system (i.e., including the D option), the differences between the effects of maternal and child problems remain. Thus, although it has been speculated that failure to find effects of child problems on attachment might reflect mistaken classification of disorganized attachment (Goldberg, 1988), the present data indicate that at least on the level of secure versus insecure attachment this may not be the case.

However, a few caveats must be taken into account. First, clinical samples tend to be small and selected in a nonrandom way. Individual studies therefore can yield quite diverging attachment classification distributions, even if they belong to the same cluster. This may, on the one hand, restrict the generalizability of the results. On the other hand, the present analyses minimize sampling errors by aggregating over individual samples and combining them in relatively large and more representative groups. The present findings should, therefore, be more stable and less influenced by outlying cases (or outlying individual samples) than the original separate studies and therefore more replicable than the individual studies on which they are based.

A further advantage of this aggregating technique and the need to make comparisons with norms is highlighted by our finding that the normal comparison groups in the clinical studies show an unusually high proportion of secure attachment. Thus, differences between the clinical and comparison groups in individual studies may be attributable to a high proportion of B cases in the comparison group, a decreased proportion of B cases in the clinical group, or a combination of both.[1]

Nevertheless, we should be especially cautious about the generalizability of the findings for the A, B, C, D analyses. Because the D and A/C classifications have not been widely used, the number of studies in these analyses is relatively small. This is true for both the normative and clinical samples. It may also be the case that the earlier A/C classifications used by Crittenden (1985) and Radke-Yarrow and her colleagues (Radke-Yarrow et al., 1985) are not isomorphic with the formalized D criteria, and the two should not be combined. Furthermore, since the D category has not been widely validated against home behavior, its meaning is not yet fully clear.

A second consideration is whether the Strange Situation, designed and validated with normal, healthy, middle-class infants, can be considered valid for clinical samples. While extensive data now exist that demonstrate the validity of the Strange Situation and the associated classification schemes for healthy infants (see Bretherton, 1985; Lamb, Gaensbauer, Malkin, & Schultz, 1985; Sroufe, 1988, for reviews), validity data for clinical samples are meager. A number of studies of clinical populations have reported associations between parental measures of responsiveness and support and security of attachment similar to those found in normative samples (Egeland & Sroufe, 1981; Goldberg, Perrotta, Minde, & Corter, 1986; Goldberg et al., 1989; Lederberg & Mobley, 1990; Lyons-Ruth et al., 1987; Sierra, 1989; Wasserman et al., 1987). Nevertheless, since these data are limited and may not be generalizable to other clinical populations, our findings should be treated with caution.

Third, although our descriptive meta-analysis shows a relation between quality of attachment and locus of impairment, we refrain from drawing conclusions concerning causality, at least in the case of maternal problems. An alternative interpretation of the present data may emphasize the disturbing effect of an anxious attachment relationship on mothers' mental health or caregiving behavior. Since in some cases there is also evidence of an increase in child risk

[1] A recent case in point is a study by Wille (1991) comparing preterm and full-term infants where the percent of B cases is decreased in the preterm groups (44%) but the percent of B cases is also increased in the full-term group (83%). Unfortunately, these data did not become available after the analyses had all been done.

factors in clinical groups with antecedent maternal problems (e.g., Sameroff, Seifer, & Zax, 1982), child problems may also make a contribution (though not well measured) in the maternal problem groups. In some cases (e.g., Crittenden, 1985; O'Connor, Sigman, & Brill, 1987), direct assessments of infants show no clear evidence of abnormalities. However, in many of the maternal problem samples, confounding infant problems cannot be ruled out. It is less plausible, however, to suggest that child problems such as deafness or cerebral palsy can be considered a consequence of insecure attachment.

Last, the division of clinical problems into maternal problems and child problems may be considered arbitrary. Of course, child problems such as preterm births may in some cases be a consequence of maternal experiences such as stress. Maternal problems such as depression may in some cases be transmitted genetically and cause certain child problems to develop. Because we did not have access to detailed diagnostic information for individual subjects, we divided the samples according to their primary identification. This may have caused unwarranted attribution of problem type in some cases. Such errors would create more overlap and smaller differences between the two groups. Thus, our procedure may actually underestimate the differences. Nevertheless, the data clearly show that problems primarily attributed to the mother are related to an increase in insecure and disorganized attachments, while those primarily attributable to the child have less clear-cut effects.

These meta-analyses are consistent with the position advanced by attachment theorists (e.g., Ainsworth et al., 1978; Sroufe, 1985) that the mother plays a more important role than the child in shaping the quality of relationships. Logically, the mother's more mature capacities allow her to be guided by infant needs, while infants are not capable of comparable adaptation. Indeed, the aspects of maternal behavior that are shown to shape the relationship are precisely those that are geared to the needs and behaviors of the infant (i.e., sensitivity and responsiveness). Thus, in individual studies that show an association between maternal behavior and attachment, the measures of maternal behavior typically "take account" of infant behavior. The present findings suggest that it may be this ability to take account of infant behavior that is disrupted in the maternal problem samples but not in the child problem samples. The processes that enable mothers to adapt to biological impairments in the child problem samples may not be the same as those that enable mothers to adjust to normal variation in infant behavior. Therefore, we would be cautious about making inferences about the relative effects of child and maternal characteristics on the quality of attachment relationships in healthy samples (Sroufe, 1985) from these data.

The emphasis on maternal capacities, however, is further underlined in recent studies on adult attachment (Main & Goldwyn, in press). In about 80% of cases thus far studied, infant-mother attachment can be predicted on the basis of mothers' internal working model of attachment (see van IJzendoorn, in press, for a review). Studies of adult attachment in clinical groups, particularly those that link caretaking styles to adult working models of attachment, promise to reveal the mechanisms by which maternal problems—but not child problems—shape infant-mother attachment.

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