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Articles

Attachment, Intelligence, and Language: A Meta-analysis†

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Abstract

In attachment theory, several hypotheses about the association between attachment and cognitive development have been generated. In a series of meta-analyses on 32 studies, we tested whether the quality of attachment is related to intelligence (DQ or IQ) and to language competence. Attachment showed a weak association with DQ and IQ measures (combined r = *.09;* N = *1026). The combined effect size for the relation between attachment and language competence was* r = *.28 (*N = *303). We conclude, first, that differences in intelligence do not play a major role in shaping attachment relationships. Differences in quality of attachment are not confounded in any significant way with differences in intelligence. Second, secure children appeared to be more competent in the language domain than insecure children. Language development appears to be stimulated in the context of a secure attachment relationship because secure parents may be better 'teachers' and secure children may be better motivated 'students'.*

Keywords: Attachment; intelligence; language.

What do we know about the relation between socio-emotional and cognitive development? Are these central dimensions of human development orthogonal or intertwined, and if the latter is the case, how strong is the association between socio-emotional and cognitive functioning? In this paper we would like to address these questions in the context of attachment theory (Bowlby, 1969). It has been suggested that the first attachment relationship between infants and their parents is an important foundation for the children's development in other domains, such

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as the cognitive domain, and that it is a cause of individual differences in those domains (Bretherton, 1985).

In attachment theory human infants are thought to be endowed with an attachment behavioral system that ensures the proximity of primary caregivers or attachment figures. The attachment behavioral system is supposed to be evolutionarily adaptive because it has served to protect infants in a vulnerable stage of their lives from predators and other dangers in the so-called environment of evolutionary adaptedness (Bowlby, 1969; 1973). Bowlby (1973) also indicated that the attachment relationship between infants and their parents might facilitate the infants' acquisition of various skills necessary for survival, under the guidance of those attachment figures.

It is important to note that Ainsworth and her colleagues (Ainsworth, Blehar, Waters & Wall, 1978) coined the phrase 'secure base' to describe the role of attachment figures in stimulating children's exploration of the environment. In fact, the famous Strange Situation procedure is based on the idea that crucial individual differences in the quality of attachment relationships can be observed in a stressful situation in which a conflict arises between the children's inclination to explore new facets of their environment and their bias to keep close to the attachment figure. Securely attached children are able to strike a balance between attachment and exploration, whereas insecurely attached children stay focused on their attachment figures, either indirectly (the avoidantly attached children) or explicitly (the resistantly attached children) (Main, 1990). The insecurely attached children might be less able to derive knowledge and skills from their interaction with the environment because attachment-related concerns and anxieties dominate their thoughts and actions (De Ruiter & Van IJzendoorn, 1993; Grossmann & Grossmann, 1993).

From attachment theory, several hypotheses concerning the effects of infant-parent attachment on the child's cognitive development can be derived (Bretherton, Bates, Benigni, Camaioni & Volterra, 1979). The hypotheses are based on the presupposition that securely attached children will, in general, show a more optimal cognitive development than their insecurely attached peers.

First, the *attachment-teaching hypothesis* might be relevant in explaining the possible linkage between attachment and cognition (Bowlby, 1980). In secure dyads, parents might be better able to informally instruct and teach their children who are less distracted by task-irrelevant, attachment-related aspects of the situation. Any learning process has in, some ways, the demand characteristics of a stressful situation in that the fear of failure has to be kept under control and the child has to be guided into uncharted territories. Trustful and trusted caregivers might succeed better in this teaching-learning process than caregivers who have established an insecure bond with their child. The consistent responsiveness that promotes secure attachments may at the same time enhance the children's communicative behavior and linguistic abilities (Gersten, Coster, Schneider-Rosen, Carlson & Cicchetti, 1986).

Second, the *attachment-exploration hypothesis* emphasizes the children's own contribution to their cognitive development. Secure children might feel more free to explore the environment, even if it contains exciting but also somewhat threatening features. Insecurely attached children would be less able to derive insights and skills from new environments because they would be more focused on attachment-related characteristics. An optimal attachment-exploration balance is hypothesized to make it easier for children to explore longer and more thoroughly

on their own, and therefore to drive them to higher levels of cognitive competence (Bretherton *et al.*, 1979).

The third hypothesis takes the social nature of cognitive development into account, in particular the fact that many children have an extended network of social relationships outside their family. The *social-network hypothesis* suggests that beyond infancy children relate to peers and nonparental caregivers, and that their primary attachments may hamper or stimulate these relationships as a source of new insights and skills. Securely attached children are thought to have more harmonious relationships with their friends or peers and with their teachers (Sroufe, 1983). They would therefore be more able to derive cognitive stimulation from these relationships. Insecurely attached children might be too defensive or too ambivalent to use their partners' resources optimally.

The fourth hypothesis is the *attachment-cooperation* hypothesis. Securely attached children are thought to be more likely to cooperate with a tester in a set of standardized tasks, and more likely to treat the test as a game played with the tester (Main, 1973). Their cognitive performance will therefore be better than the performance of insecurely attached children who might be more timid and anxious in the test situation (Gersten *et al.*, 1986). Insecure children may show stronger anxiety which may inhibit interactions that are necessary to perform well on a test (Lamb, Thompson, Gardner & Charnov, 1985). As a consequence, language tests, the Bayley scales, and other tests that are based on communication between child and tester, might be a better reflection of differences in socio-emotional than in cognitive functioning. In particular, insecurely attached children would perform less well than might be expected on the basis of their cognitive abilities whereas securely attached children would perform according to their abilities (Matas, Arend & Sroufe, 1978).

Another hypothesis concerns the development of a self-model parallel to the development of an internal working model of attachment (Bretherton, 1985), that may stimulate or delay cognitive development because of its motivational implications. Furthermore, an important hypothesis is the idea of attachment as a crucial developmental issue in infancy which provides the cornerstone for subsequent social and cognitive development, without necessarily being related to this further development in any direct, causal way (Sroufe, 1979). Lastly we should not exclude the possibility that cognitive development influences the development of attachment relationships. Bell (1970), for example, demonstrated how the development of the concept of person permanence and the growth of a unique bond between parent and infant are intertwined. Children who are cognitively more advanced, may be better able to convey their attachment needs and emotions to their parents who in turn respond more sensitively.

The hypotheses about the relation between attachment and cognition are not mutually exclusive, and an emphasis on the interplay between the different models may provide the most compelling interpretation of the association between attachment and cognition. Although it is difficult to test each of the separate hypotheses, they clearly imply the existence of a more or less strong linkage between attachment and cognitive development. In this meta-analysis we therefore want to bring together the results of studies pertinent to the general attachment-cognition hypothesis.

Several years ago, Bretherton and her colleagues (1979) took stock of the available evidence in a narrative review. They concluded that a substantial number of

investigators had discovered positive relations between attachment quality as assessed in the Strange Situation procedure and cognitive functioning defined in a broad way. There was, however, also a substantial number of studies in which the expected correlations were not found. Furthermore, they stated that relations between quality of attachment and language competence seemed to be weaker, with a higher proportion of studies finding no differences in language competence between securely and insecurely attached children.

There are at least two reasons to evaluate the current status of the literature on attachment and cognition again. During the last decade or so, several studies in this area have been carried out, and we may now have a somewhat firmer database from which to derive conclusions. Second, a narrative review has many advantages, for example, of producing in-depth evaluations of the strengths and weaknesses of individual studies, and of yielding new hypotheses and interpretations to be tested in subsequent research. If the results of many of the studies are not clear-cut, however, insignificant trends might accumulate to a significant outcome across studies which might not be uncovered in a narrative approach. A meta-analytic approach might be better suited to the task of describing trends in the material. If studies yield inconsistent results the advantages of a meta-analysis become even more pronounced. The meta-analytic approach provides rational criteria for the combination of those inconsistent results, and for replicable conclusions about divergent trends in the material (Rosenthal, 1991; Mullen, 1989).

In this paper we report on a quantitative meta-analysis that brings together the results of studies pertaining to the global hypothesis of an association between attachment and cognitive development. The meta-analysis is restricted to the broad secure *versus* insecure attachment dichotomy because pertinent data for the two insecure categories separately (insecure-avoidant and insecure-ambivalent infants) are lacking in most studies in this area. One of the reasons is the small number of ambivalently attached children (about 12% in nonclinical samples; Van IJzendoorn, Goldberg, Kroonenberg & Frenkel, 1992). Because the ambivalently attached infants, in particular, might be cognitively somewhat delayed (Ainsworth *et al.*, 1978), we will test whether samples with relatively many ambivalent infants show stronger associations between attachment security and cognitive development.

We have restricted the current meta-analytic review to two cognitive domains: Intelligence and language competence. Other aspects of cognitive development such as exploration and play will be scrutinized in another context (Van IJzendoorn, in prep.). Traditionally, intelligence measured as Developmental Quotient (DQ) or Intelligence Quotient (IQ), has been considered a core indicator of cognitive development, although questions have been raised as to the validity of these measures (Sternberg, 1985). In many studies on attachment, however, measures for DQ or IQ have been routinely included to control for potential cognitive differences. Therefore, data on the relation between attachment and intelligence have accumulated, but a quantitative integration of the available data is still lacking. Another core issue in cognitive development is, of course, the development of language abilities. Language becomes an important vehicle for communication between parents and children in their second year of life. It has been argued that irrespective of its biological origins, language competence can only be acquired through intensive social interaction with other human beings (Tomasello, 1992). Because of the social nature of language acquisition and its appearance in

infancy, the association with attachment seems to be evident, and contrary to Bretherton *et al.* (1979) we expect to find such an association through a meta-analytic combination of extant studies.

Method

Data base

In collecting our data we used several different strategies to trace the pertinent literature, and we searched for published as well as unpublished papers (Mullen, 1989). PsychLit, Eric, and Dissertation Abstracts were used with combinations of several key-words, including attachment, cognition, intelligence, and language. Earlier review papers (e.g. Bretherton *et al.*, 1979) and books (Lamb *et al.*, 1985), and the references of the systematically collected papers served as the other source of data. We found 25 studies on the association between attachment and IQ or DQ, and seven studies on language competence. We restricted the search to studies involving established measures of attachment based on attachment theory, in particular the Strange Situation and related procedures.

Meta-analytic procedures

In primary-level studies the unit of analysis is the subject; in a meta-analysis of several primary-level studies the unit of analysis is the outcome of those studies. Because of the difference in units of analysis, the meta-analytic approach has to be based on a different set of statistical techniques. These techniques should, for example, take into account the fact that data in meta-analysis are usually based on different sample sizes and therefore lack the homogeneity of variance required for conventional statistics (Mullen, 1989; Rosenthal, 1991). In the present meta-analysis the statistical tests associated with the pertinent studies were transformed into a few common metrics for effect size: the correlation coefficient (r), the standardized difference between the mean of two groups (d), and Fisher's Z.

The following meta-analytic procedures were applied to these common metrics (Mullen, 1989):

1) to combine effect sizes according to the weighted Stouffer method, we used the following formula:

$$Fisher\,Z = \frac{\Sigma w_j\, Fisher\,Z}{\Sigma w_j}$$

where: w_j = sample sizes of the studies.

Fisher Z = Fisher Z associated with the effect sizes of the studies

2) we used tests for homogeneity of study results to indicate whether study results were sampled from different populations.

The formula for the test for homogeneity of effect sizes is:

$$x^2_{(k-1)} = \Sigma\,(N_j - 3)\,(Fisher\ Z - Fisher\ Z)^{\bar{2}}$$

where: k = number of studies included in the meta-analysis.

Furthermore, a disjoint cluster analysis of effect sizes (Hedges & Olkin, 1985) was carried out, based on the following statistic:

$$U = \left(\Sigma \frac{\sqrt{N_j - 3}}{k} \right) Fisher Z_j$$

The differences between rank-ordered and adjacently ranked *U*s were then tested against a preset significance level (in our case $a = .10$), and it was tested whether the set of studies could be divided into significantly different subsets.

3) to estimate the probability that the variability of the effect sizes of the included studies in question could be significantly explained by the predictor variables, we used the following formula:

$$Z = \frac{\Sigma \lambda_j \, Fisher Z_j}{\sqrt{\Sigma \frac{(\lambda_j^2)}{(N_j - 3)}}}$$

In order to explain systematic variations between the effect sizes of different clusters of studies, we included the following predictor or moderator variables in our meta-analyses: (1) publication year; (2) sample size; (3) socio-economic status of the sample (lower class, middle class, or upper class); (4) race; (5) nationality (whether the study was carried out in the USA or in another country); (6) clinical status; (7) attachment measurement (Strange Situation or a different measure); (8) age of the children during attachment measurement; (9) age of the children during the cognitive measurement; (10) difference between these two ages; (11) percentage of anxious-ambivalently attached infants in each sample. These predictors were hypothesized to explain some of the variability in effect sizes between the studies.

For a number of studies, exact probability levels were not available. It was only reported whether or not the hypothesis test was significant. We decided to make conservative estimates of study outcomes. According to Mullen (1989) descriptions of 'no significant effect' in the absence of pertinent statistics can be conservatively estimated as $p = .50$; descriptions of 'a significant effect' in the absence of statistics can be conservatively estimated as $p = .05$. Mullen (1989, p.49) argues that although these estimates are likely to be patently false in any given instance, they are the most defensible (and the most conventional) approximations. Other and more sophisticated approaches to estimate incomplete study outcomes have been developed (e.g., regression-type methods) but they appear to converge with the conventional approach (Shadish, 1992) or do not seem to be entirely convincing even to professional statisticians (Cook, Cooper, Cordray, Hartmann, Hedges, Light, Louis & Mosteller, 1992, p.331).

Results and Discussion

Attachment and intelligence

In the 25 attachment studies in which an IQ or DQ measure has been included, the Bayley Scales of Infant Mental and Motor Development seem to be most popular. In 11 out of 13 studies using the Bayley, the Mental Development Index was selected as the measure for Developmental Quotient. In Lewis, Brooks-Gunn & Jaskir, (1985) and White (1991) it is unclear whether the combined index for mental and motor development was used, or only the mental index. Because a substantial number of studies included the Bayley mental assessment, we analysed the homogeneous set of the Bayley data separately (see Table 1).

Table 1. Meta-analytic data on the relation between attachment and Bayley DQ

Studies	Year	*n*	SES	Age (months) Assessment		% Ambivalent	Combined effect size	
				SSP	*DQ*		*r*	*d*
Bell	1978	33	low	11	24	12	.00	.00
Gersten *et al.*	1986	40	low	24	25	23	.25	.52
Grossmann, Grossmann	1986	49	middle	12	24	12	.00	.00
Lewis *et al.*	1985	37	middle	12†	?	9	.00	.00
Main	1983	40	middle	12	21	10	.49**	1.12
Matas *et al.*	1978	37	middle	18	23	27	.27*	.57
Morisset *et al.*	1990	72	low	13	24	15	.07	.14
O'Connor *et al.*	1987	46	low	12	12	11	.00	.00
Pastor	1981	62	low	18	24	24	.00	.00
Rode *et al.*	1981	24	middle	14	14	17	.00	.00
Slade	1987	15	middle	17	17	7	−.11	−.23
Waters *et al.*	1979	32	middle	15†	14	?	.00	.00
White	1991	60	?	16	?	?	.00	.00
Total		577					.08	.17

Note: * = $p \leq .05$; ** = $p \leq .01$; † modified Strange Situation procedure

In Table 1, the 13 studies on the quality of the attachment relationship between infants and mothers, and the Bayley outcome have been listed. Year of publication, sample size, socio-economic status of the sample, percentage of ambivalently attached children, and the children's age at which the Bayley and the Strange Situation procedure were applied are presented as well. Nine out of 13 studies assessed DQ at a later age than quality of attachment. Rode *et al.* (1981) measured both DQ and attachment at the same time, whereas Waters *et al.* (1979) and O'Connor *et al.* (1987) assessed the quality of attachment some weeks later than DQ. For the study of White (1991) it was unknown whether DQ was measured before the attachment assessment or at the same time. Most studies applied the Strange Situation procedure during the second year of life.

According to Cohen's (1988) criteria, the combined effect size for the association between attachment and the Bayley outcome is quite small: $d = .17$ which is comparable to a combined $r = .08$. Only two studies have found a significant association (Main, 1983; Matas *et al.*, 1978), but the majority did not find any relation at all. This picture was confirmed in the studies using other cognitive measures than the Bayley, such as the Stanford-Binet, the Cattell, or the Wechsler IQ tests (see Table 2).

From Table 2, it can be derived that the 12 pertinent studies yielded a small combined effect size of $d = .17$, which is comparable to a correlation of $r = .09$. Most of the studies did not find any association, with only three exceptions showing significant effect sizes (Goldberg *et al.*, 1989; Taylor, 1989; Oppenheim, Sagi & Lamb, 1988). The study results appeared to be very homogeneous, and the test for the diffuse comparison of effect sizes confirmed this: X^2 ($df = 22$) = 20.09; $p = .58$. Eleven out of 12 studies included attachment assessments at an earlier age than the IQ assessments. Only the Rodning *et al.* (1989) study assessed quality of attachment 6 months later than the IQ measure.

Table 2. Meta-analytic data on the relation between attachment and intelligence

Studies	Publ. year	*n*	SES	Measure	Age (month) assessm. *SSP*	*IQ*	% ambivalent	Combined effect size *r*	*d*
Bell	1978	33	low	Griffith	11	15	12	.24	.49
				Stanford-Binet	11	30			
				Stanford-Binet	11	36			
Connell[1]	1974	30	middle	Stanford-Binet	12	30	?	.00	.00
Connell	1976	52	middle	Cattel	12	14	0	.00	.00
Goldberg *et al.*	1989	50	?	Stanford-Binet	12	48	?	.27*	.56
Jacobson, Wilson	1986	23	middle	PPVT[3]	18	36	17	.02	.03
Rodning *et al.*	1989	18	low	Gesell	19	13	11	.00	.00
Taylor	1989	37	?	McCarthy	12	42	?	.28*	.56
Urban *et al.*	1992	47	low	Wechsler	12	120	21	.00	.00
Van IJzendoorn *et al.*	1988	65	high	LDT[4]	24	64	6	−.03	−.05
Van IJzendoorn *et al.*[2]	1992	68	middle	McCarthy	12	42	9	−.03	−.06
Oppenheim *et al.*	1988	59	middle	WPSSI	12	60	39	.26*	.54
Waters *et al.*	1979	32	middle	Stanford-Binet	15[5]	36	?	.00	.00
Total		514						.09	.17

Notes: * = $p \leq .05$
1. original sample *n*=46 (Connell, 1974)
2. Dutch sample
3. Peabody Picture Vocabulary Test
4. Leiden Diagnostic Test
5. Modified Strange Situation procedure

Because the effect sizes of the different studies were quite similar, it was expected that the variation between effect sizes would not be predictable on the basis of study characteristics. In Table 3, the relevant predictors have been listed, as well as the *p*-values pertaining to the relation between predictor and effect sizes. Only the percentage of anxious-ambivalently attached infants in each sample could explain a significant part of the variation in effect sizes ($p = .04$): Higher percentages of ambivalently attached infants were associated with larger effect sizes (cf. Ainsworth *et al.*, 1978). The other predictors were insignificant and we therefore conclude that the variation of effect sizes around the combined effect size is relatively small, and that it cannot be explained with most of our predictors. The outcome of this part of our meta-analysis is based on about 1000 dyads; the overall effect size for all studies involved is: $d = .18$; comparable to $r = .09$. In this large set of studies, this outcome is, of course, small (combined $p = .006$), but nevertheless significant.

Attachment and language competence

The association between the quality of attachment and language competence has been studied infrequently, even if we define the concept of language competence

Table 3. The influence of the predictors on the effect sizes

Predictor	IQ/DQ *p*	Language *p*
Publication (year)	.43	.02
Size	.46	.03
SES	.43	.09
Age Strange Situation	.31	.32
Age competence	.31	.32
Age difference	.11	.10
Race	.25	.08
Nationality	.30	.11
Clinical	.41	.04
Strange Situation	.24	.37
Percentage ambivalent	.04	*

Note: diffuse comparisons: $X^2(22) = 20.23$ ($p = .57$); $X^2(6) = 6.73$ ($p = .35$)
* too many missing data

in a broad way, and also include (emergent) literacy abilities. Only seven studies were found, which are listed in Table 4.

The seven studies included different language measures such as number of words the infants seemed to understand (Bretherton *et al.*, 1979), the mean length of utterances (Gersten *et al.*, 1986), comprehension tests (Pentz, 1975; Connell, 1976), and emergent literacy tests (Bus & Van IJzendoorn, 1988). There was also some variation in time of measurement and the studies covered the first three years of life. It is important to note that the meta-analytic combination of this small and somewhat heterogeneous set of studies can only be considered provisional and exploratory.

According to Cohen's (1988) criteria, the combined effect size of the studies on attachment and language competence was quite substantial, and amounted to more than half of a standard deviation difference between the means: $d = .59$, which is comparable to $r = .28$. Four of the seven studies showed significant effect sizes, and the overall probability of the combined effect size is $p < .0001$. Although the diffuse comparison of effect sizes did not reveal a significant heterogeneity ($X^2(df = 6) = 6.73$; $p = .35$), the small number of studies allows for exploration of the variation in effect sizes (Mullen, 1989). Larger samples and more recent studies appeared to yield larger effect sizes. Studies in which clinical subjects were involved appeared to yield somewhat larger effect sizes (Gersten *et al.*, 1986; Morisset *et al.*, 1990). Because of missing data we were not able to test the effect of percentage of insecure-ambivalently attached children in a sample.

Conclusions

We may derive the following conclusions from the meta-analysis. First, the quality of attachment between infant and parent is quite strongly associated with the infant's language development. Second, the quality of attachment between infant and parent is significantly associated with cognitive development as assessed by DQ and IQ measures. In particular in samples with relatively many insecure-ambivalently attached

Table 4. Meta-analytic data on the relation between attachment and language

Studies	Publ. year	*n*	SES	Measure	Age (months) assessment		Combined effect size	
					SSP	*LA*	*r*	*d*
Bretherton *et al.*	1979	25	middle	no. of words	12	11	.00	.00
Bus, Van IJzendoorn	1988	43	upper	story exploration	42[3]	42	.25	.51
				proto-reading	42[3]	42		
Connell	1976	52	middle	no. different words	12	18	.26*	.55
				imitation words	12	18		
				comprehension	12	18		
Gersten *et al.*	1986	40	low	MLU[1]	24	25	.41**	.89
Main	1983	40	middle	utterances in words	12	21	.41**	.89
				no. different words	12	21		
				morphemes	12	21		
Morisset *et al.*	1990	72	low	PLS[2]	13	36	.40**	.87
Pentz	1975	31	?	interaction-language	28	32	.00	.00
				comprehension	28	36		
Total		303					.28	.59

Note: * = $p \leq .05$; ** = $p \leq .001$
1. Mean length of utterance
2. Preschool Language Scale
3. Modified Strange Situation

infants, insecure attachments appear to be related to a lower level of cognitive performance. Third, the association between attachment and DQ/IQ is much weaker than the association between attachment and language competence; this is contrary to Bretherton *et al.*'s (1979) conclusions. Fourth, the current meta-analysis provides some support for the hypothesis of a causal influence of attachment on language and cognitive development. Most studies assessed quality of attachment before assessing competence. However, it is logically impossible to exclude the reverse influence. The two interpretations are not incompatible (Ainsworth *et al.*, 1978), and future investigations should focus on the interlocking of socio-emotional and cognitive/language development.

In explaining the association between attachment and language competence several hypotheses are relevant. Securely attached children may be more willing to interact and communicate with their attachment figures, and therefore they may be more motivated to explore language (attachment-exploration hypothesis). Insecurely attached children may not engage in prolonged verbal exchanges with their parents. This in turn may lead to less exposure to adult language competence. Because of the insecure children's poorer relationships with peers and non-parental adults, they might provoke a less rich language environment, not only within but also outside the family (the social-network hypothesis). Furthermore, parents of avoidantly or ambivalently attached children may be less willing and able to contingently respond to verbalizations of their children, and therefore contribute to the cycle of poor motivation and poor competence in language (the attachment-teaching hypothesis). Lastly, when language competence is measured in the context of parent-child interaction, the children's poor socio-emotional

functioning might feedback to their verbal communication in general, and to the insecure children's language performance in particular (Gersten *et al.*, 1986). In fact, this is a variation of the attachment-cooperation hypothesis: because of the disharmonious relationship between parent and child, the child's performance within the context of this relationship will be below the level of its competence.

On the basis of the available data it is not possible to exclude any of the hypothetical interpretations of the mechanism which leads to the association between attachment and language competence. The studies fail to describe the process of parent-child interaction in enough detail to establish how important each of the hypothetical factors are, and how they interplay. Because DQ/IQ is only weakly related to attachment, we might exclude the interpretation that language competence is associated with attachment solely through a third factor: DQ/IQ. Language competence is, of course, related to DQ/IQ simply because most cognitive tests also contain some language components. Because the relation between DQ/IQ and attachment is weak, however, the relation between language and attachment cannot be completely determined by DQ/IQ differences.

It is surprising that cognitive competence as measured by DQ/IQ tests is only weakly associated with attachment quality. The total effect size for the association between IQ/DQ and attachment is only $r = .09$, that is less than one fifth of a standard deviation ($d = .17$), and this figure is quite reliable because it is based on more than 1000 subjects. The outcome is, of course, statistically significant but the question is whether it is also theoretically and practically significant. According to Cohen's (1988) criteria for a weak ($d = .20$), medium ($d = .50$), and strong ($d = .80$) effect size, our finding is clearly within the range of weak effects. Rosenthal (1991), however, considers 'weak' effect sizes of potentially great importance. He argues that the so-called Binomial Effect Size Display (BESD) presents a much better picture of the relevance of small effect sizes. A 'weak' effect of a medical treatment would, for example, mean that the treatment was successful for 10% of the patients – which is considerable if hundreds of lives are at stake (Rosenthal, 1991).

Although it seems difficult to find generally accepted criteria for effect sizes, we would like to suggest here that for all practical purposes the association between attachment and DQ/IQ is too weak to recommend the routine inclusion of IQ or DQ tests in order to control for this type of cognitive difference. At the level of individual studies with average sample sizes the relation between DQ/IQ and attachment will probably be insignificant. The time and resources of both subjects and researchers may therefore be better used for more substantial purposes. Theoretically, however, the outcome of our meta-analysis may not be insignificant. First, because we have had to insert conservative estimates for study results that were only reported on the level of 'significant' or 'not significant', the combined effect size may easily be a conservative estimate of the real association. Second, we found that the association between attachment and IQ/DQ is stronger in samples with relatively many insecure-ambivalently attached children. This result indicates that had we been able to perform a meta-analysis on the three main attachment categories – avoidant, secure, ambivalent – we might have found a rather strong effect for the split between ambivalently attached children and the others (Main, 1973). Especially the ambivalently attached children are upset in any strange environment and by any stranger who is trying to interact, for example in the context of testing cognitive abilities (the attachment-cooperation hypothesis).

Why is attachment more strongly related to language competence than to IQ or DQ? First, most studies on attachment and DQ/IQ have been carried out in relatively stable, lower-to-upper middle class families from non-risk populations. Secure attachment might only be a protective factor in the context of high-risk childrearing settings, because only in that type of environment could it play its role as a buffer against adverse circumstance (Morisset *et al.*, 1990). We did indeed find somewhat larger effect sizes for the relation between attachment and language in clinical groups. Second, DQ and IQ tests for infants and toddlers might be somewhat less valid than language competence measures because they claim to assess a broad-band, general cognitive competence (Morisset *et al.*, 1990; Cicchetti & Wagner, 1990). Third, the number of language studies is quite small, and the meta-analytic outcome is still provisory. In the set of studies on attachment and IQ/DQ, we have had to impute conservative estimates which might have led to underestimating the 'real' combined effect size.

In sum, insecure attachment appears to be associated with a lower level of cognitive functioning and language competence. The meta-analysis demonstrated that research on the process through which the quality of attachment affects cognitive and language development is badly needed to explain the quite strong association between attachment and language, and the quite weak relation between attachment and DQ/IQ.

References

Ainsworth, M.D.S., Blehar, M.C., Waters, E. & Wall, S. (1978). *Patterns of attachment.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Bell, S.M. (1970). The development of the concept of object as related to infant-mother attachment. *Child Development, 41,* 291–311.

Bell, S.M. (1978). Cognitive development and mother-child interaction in the first three years of life. Cited in M.D.S. Ainsworth, M.C. Blehar, E. Waters & S. Wall (1978). *Patterns of attachment.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Bowlby, J. (1969). *Attachment and loss, Vol. 1: Attachment.* New York: Basic.

Bowlby, J. (1973). *Attachment and loss, Vol 2: Separation: Anxiety and anger.* New York: Basic Books.

Bretherton, I. (1985). Attachment theory: Retrospect and prospect. In I. Bretherton & E. Waters (Eds.), Growing points of attachment theory and research. *Monographs of the Society for Research in Child Development, 50,* (1–2, Serial No. 209), 3–37.

Bretherton, I., Bates, E., Benigni, L., Camaioni, L. & Volterra, V. (1979). Relationships between cognition, communication, and quality of attachment. In E. Bates (Ed.), *The emergence of symbols. Cognition and communication in infancy* (pp.223–269). New York: Academic Press.

Bus, A.G. & Van IJzendoorn, M.H. (1988). Mother-child interactions, attachment, and emergent literacy: A cross-sectional study. *Child Development, 59,* 1262–1272.

Bus, A.G. & Van IJzendoorn, M.H. (1993). *The reading of a new story to three-year-olds by their mothers: Validity of a social construction orientation.* Leiden: Center for Child and Family Studies.

Cicchetti, D. & Wagner, S. (1990). Alternative assessment strategies for the evaluation of infants and toddlers: An organizational perspective. In S.J. Meisels & J.P. Shonkoff. *Handbook of early intervention,* (pp.246–278). Cambridge: Cambridge University Press.

Connell, D. (1974). *Individual differences in infant attachment related to habituation to a redundant stimulus.* Unpublished master's thesis, Syracuse University.

Connell, D. (1976). *Individual differences in attachment behavior: Long term stability and relation to language development.* Unpublished doctoral dissertation. Syracuse University.

Cook, T.D., Cooper, H., Cordray, D.S., Hartman, H., Hedges, L.V., Light, R.J., Louis, T.A. & Mosteller, F. (1992). *Meta-analysis for explanation. A casebook.* New York: Russell Sage Foundation.

De Ruiter, C. & Van IJzendoorn, M.H. (1993). Attachment and cognition: A review of the literature. *International Journal of Educational Research, 19,* 5–20.

Gersten, M., Coster, W., Schneider-Rosen, K., Carlson, V. & Cicchetti, D. (1986). The socio-emotional bases of communicative functioning: quality of attachment, language development, and early maltreatment. In M. Lamb, A.L. Brown & B. Rogoff (Eds.), *Advances in developmental psychology, 4,* 105–151. Hillsdale NJ: Lawrence Erlbaum Associates.

Goldberg, S., Lojkasek, M., Gartner, G., Corter, C. (1989). Maternal responsiveness and social development in preterm infants. *New Directions for Child Development, 43,* 89–101.

Grossmann, K.E. & Grossmann, K. (1986). Phylogenetische und ontogenetische Aspekte der Entwicklung der Eltern-Kind-Bindung und der kindlichen Sachkompetenz. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 4,* 287–315.

Grossmann, K.E. & Grossmann, K. (1993). Emotional organization and concentration on reality from an attachment theory perspective. *International Journal of Educational Research, 19,* 541–554.

Hedges, L.V. & Olkin, I. (1985). *Statistical methods for meta-analysis.* San Diego: Academic Press.

Jacobson, J.L. & Wille, D.E. (1986). The influence of attachment pattern on developmental changes in peer interaction from the toddler to the preschool period. *Child Development, 57,* 338–347.

Lamb, M.E., Thompson, R.A., Gardner, W. & Charnov, E. (1985). *Infant-mother attachment: The origins and developmental significance of individual differences in Strange Situation behavior.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Lewis, M., Brooks-Gunn, J. & Jaskir, J. (1985). Individual differences in visual self-recognition as a function of mother-infant attachment relationship. *Developmental Psychology, 21,* 1181–1187.

Main, M. (1973). *Exploration, play, and cognitive functioning as related to child-mother attachment.* Unpublished doctoral dissertation, John Hopkins University.

Main, M. (1983). Exploration, play, and cognitive functioning as related to infant-mother attachment. *Infant Behavior and Development, 6,* 167–174.

Main, M. (1990). Cross-cultural studies of attachment organization: Recent studies, changing methodologies, and the concept of conditional strategies. *Human Development, 33,* 48–61.

Matas, L., Arend, R.A. & Sroufe, L.A. (1978). Continuity of adaptation in the second year: The relationship between quality of attachment and later competence. *Child Development, 49,* 547–556.

Morisset, C.E., Barnard, K.E., Greenberg, M.T., Booth, C.L. & Spieker, S.J. (1990). Environmental influences on early language development: the context of social risk. *Development and Psychopathology, 2,* 127–149.

Mullen, B. (1989). *BASIC meta-analysis: procedures and programs.* Hillsdale, NJ: Lawrence Erlbaum Associates.

O'Connor, M.J., Sigman, M. & Brill, N. (1987). Disorganization of attachment in relation to maternal alcohol consumption. *Journal of Consulting and Clinical Psychology, 55,* 831–836.

Oppenheim, D., Sagi, A. & Lamb, M.E. (1988). Infant-adult attachments on the kibbutz and their relation to socioemotional development 4 years later. *Developmental Psychology, 24,* 427–433.

Pastor, D.L. (1981). The quality of mother-infant attachment and its relationship to toddlers' initial sociability with peers. *Developmental Psychology, 17,* 326–335.

Pentz, T. (1975). *Facilitation of language acquisition: the role of the mother.* Unpublished doctoral dissertation, John Hopkins University.

Rode, S.S., Chang, P.N., Fisch, R.O. & Sroufe, L.A. (1981). Attachment patterns of infants separated at birth. *Developmental Psychology, 17,* 188–191.

Rodning, C., Beckwith, L. & Howard, J. (1989). Characteristics of attachment organization and play organization in prenatally drug-exposed toddlers. *Development and Psychopathology, 1,* 277–289.

Rosenthal, R. (1991). *Meta-analytic procedures for social research. Revised edition.* Newbury Park, CA: Sage.

Shadish, W.R. (1992). Do family and marital psychotherapies change what people do? A meta-analysis of behavioral outcomes. In T.D. Cook, H. Cooper, D.S. Cordray, H. Hartman, L.V. Hedges, R.J. Light, T.A. Louis & F. Mosteller (Eds.). *Meta-analysis for explanation. A casebook* (pp.129–208). New York: Russell Sage Foundation.

Slade, A. (1987). Quality of attachment and early symbolic play. *Developmental Psychology, 23*, 78–85.

Sroufe, L.A. (1979). The coherence of individual development: early care, attachment, and subsequent developmental issues. *American Psychologist, 34*, 834–841.

Sroufe, L.A. (1983). Infant-caregiver attachment and patterns of adaptation in the preschool: The roots of competence and maladaptation. In M. Perlmutter (Ed.), *Minnesota Symposia in Child Psychology Vol. 16*, (pp.41–83). Hillsdale, NJ: Lawrence Erlbaum Associates.

Sternberg, R.J. (1985). *Beyond IQ: A triarchic theory of human intelligence.* New York: Cambridge University Press.

Taylor, D.G. (1989). *Coherence in individual development: early attachment, intervening experience, and attachment, exploration, and cognition in 3 1/2 year olds.* Unpublished doctoral dissertation, Pennsylvania State University.

Tomasello, M. (1992). The social bases of language in acquisition. *Social Development, 1*, 67–87.

Urban, J., Carlson, E., Egeland, B. & Sroufe, L.A. (1991). Patterns of individual adaptation across childhood. *Development and Psychopathology, 3*, 445–460.

Van IJzendoorn, M.H. (1992). Intergenerational transmission of parenting: A review of studies in nonclinical populations. *Developmental Review, 12*, 76–99.

Van IJzendoorn, M.H. (in prep.). *Attachment, exploration, and play.*

Van IJzendoorn, M.H. & Van Vliet-Visser, S. (1988). The relationship between quality of attachment in infancy and IQ in kindergarten. *The Journal of Genetic Psychology, 149*, 23–28.

Van IJzendoorn, M.H., Sagi, A. & Lambermon, M.W.E. (1992). The multiple caregiver paradox. Some Dutch and Israeli data. In R.C. Pianta (Ed.), Beyond the parent: The role of other adults in children's lives. *New Directions for Child Development, 57*, 5–25.

Van IJzendoorn, M.H., Goldberg, S., Kroonenberg, P.M. & Frenkel, O. (1992). The relative effects of maternal and child problems on quality of attachment: A meta-analysis of attachment in clinical samples. *Child Development, 63*, 840–858.

Vaughn, B., Egeland, B., Sroufe, L.A. & Waters, E. (1979). Individual differences in infant-mother attachment at twelve and eighteen months: stability and change in families under stress. *Child Development, 50*, 971–975.

Waters, E., Wippman, J. & Sroufe, L.A. (1979). Attachment, positive affect, and competence in the peer group: two studies in construct validation. *Child Development, 50*, 821–829.

White, J.J. (1991). *Antecedents of maternal-infant attachment: A longitudinal study.* Unpublished doctoral dissertation.

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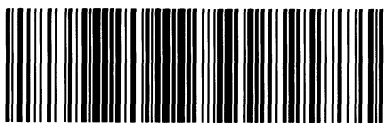

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