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The reciprocal relation between children's attachment representations and their cognitive ability

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Abstract

This study explores reciprocal relations between children's attachment representations and their cognitive ability. Previous literature has mainly focused on the prediction of cognitive abilities from attachment, rarely on the reverse prediction. This was explored in the current research. Attachment representations were assessed with the Attachment Story Completion Task (Bretherton, Ridgeway, & Cassidy, 1990); the IQ was measured with the WPPSI-III (Wechsler, 2004). Data were collected twice, at a two-year interval, from about 400 preschoolers. Reasoning IQ was found to influence the development of secure attachment representations, while attachment security and disorganization influenced later verbal IQ. The implications of the findings for both clinical and research purposes are discussed in the light of the interactions between cognitive abilities and attachment representations.

Keywords

attachment, IQ, longitudinal design

The relations between attachment security and children's socio-emotional and cognitive development have been documented in previous literature with both typically developing and atypical populations (e.g., Jacobsen & Hofmann, 1997; Moss, Cyr, & Dubois-Comtois, 2004; van Ijzendoorn et al., 2007). The conclusions have highlighted the predictive role of attachment to cognitive abilities, the hypothesis being that more securely-attached children develop higher levels of cognitive abilities. The reverse prediction, from cognitive abilities to attachment security, has, on the contrary, rarely been considered. This is somewhat surprising since current internal working models (IWMs)—key concepts in the attachment theory developed by Bowlby—are cognitive concepts, and their level of elaboration might well depend on children's cognitive capacities. Also, a few studies have concerned attachment insecurity or disorganization rather than security. The aim of the present study was to test a model where the relation between both security and organization of attachment representations and cognitive abilities (i.e., verbal and reasoning capacities) was hypothesized to be bidirectional. This model was tested with normally developing children and with children displaying externalizing behavior.

Previous research focusing on the relations between attachment and cognitive abilities considered attachment from two different perspectives (attachment behavior and attachment representations); cognitive variables were also considered from two different points of view (intelligence, i.e., the developmental [DQ] or intellectual [IQ] quotient, and academic achievement, i.e., the grade-point average).

Available results with children regarding the relations between attachment behavior and both DQ and IQ are somewhat inconsistent. The instrument most commonly used to measure attachment behavior was the Strange Situation Procedure (SSP; Ainsworth, Blehar, Waters, & Wall, 1978), which considers children's attachment behavior with their caregiver. Several studies failed to support the hypothesis of a relation between attachment and cognitive abilities. In a meta-analysis, van Ijzendoorn, Dijkstra, and Bus (1995) concluded that attachment quality was only weakly associated with DQ and IQ. Another, more recent study found no association between attachment behavioral patterns and IQ (Moss & St-Laurent, 2001). However, other studies have detected a significant relation between attachment behaviors and cognitive abilities. Indeed, attachment patterns have been found to predict DQ one and a half years later (Spieker, Nelson, Petras, Jolley, & Barnard, 2003) and IQ, especially verbal IQ, one year later (van Ijzendoorn & Van Vliet-Visser, 1988) and three years later (O'Connor & McCartney, 2007). Studies of academic achievement also concluded that attachment security predicted grade-point average (Jacobsen & Hofmann, 1997; Moss & St-Laurent, 2001). Contrarily, very few previous studies have considered children's attachment representations rather than attachment behavior in relation to cognitive variables. Jacobsen and his colleagues (1994; 1997), using the *Separation Anxiety Test* (SAT; Slough & Greenberg, 1990)) to assess children's attachment representations through the completion of stories presented by means of pictures, and dealing with several attachment-relevant themes, reported that the attachment groups differed significantly on IQ without specifying how the relations varied according to the attachment patterns (secure, avoidant or ambivalent).

Since no instrument was designed to assess adults' attachment behaviors, no study has dealt with the relations between adults'

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attachment behavior and cognitive abilities. Contrariwise, studies where adults' attachment representations were assessed with the *Adult Attachment Interview* (George, Kapan, & Main, 1985) failed to support the relation between attachment classifications and IQ (Bakermans-Kranenburg & van Ijzendoorn, 1993; Sagi et al., 1994).

In a meta-analysis, van Ijzendoorn et al. (1995) suggested the reverse hypothesis that cognitive abilities could influence later attachment security. To the best of our knowledge, only two studies have dealt with this hypothesis with normally-developing children. Ziegenhain and Jacobsen (1999) concluded that DQ at 18 months was not linked to attachment representations at six years of age. Another recent study used the *Attachment Story Completion Task* (ASCT) to assess children's attachment representations through the completion of stories presented using figurines and dealing with several attachment-relevant themes. The authors found a significant effect of verbal—but not reasoning—IQ on attachment representations (Stievenart, Meunier, Van de Moortele, & Roskam, submitted). The authors suggested that verbal IQ could be seen as a resilient factor in the cognitive representation of attachment security as measured by ASCT, although the same did not apply to reasoning IQ. It could be that the higher the children's verbal ability, the better their reasoning about attachment relationships. High verbal ability could actually lead to more flexible and resilient IWMs, taking account of relational experiences with various caregivers in different settings. This reverse hypothesis has been more debated among children with atypical development. Several authors have found differences in attachment behavior according to children's DQ. Cross-sectional data on the attachment behaviors of children with Down syndrome (Atkinson et al., 1999), and longitudinal data on children with mental retardation (van Ijzendoorn et al., 2007), showed that they were more likely to be categorized as insecure than children with higher cognitive abilities.

The theoretical basis for the prediction of later attachment behaviors and representations from early cognitive abilities is based on a core concept in attachment theory, namely internal working models (IWMs). Bowlby (in Collins & Read, 1994, p. 55) defined IWMs as "the internal mental representations that individuals develop of the world and of significant people within it, including the self". IWMs are especially important for interpreting and predicting the behavior of attachment figures in order to plan immediate and further reactions. All researchers dealing with IWMs agree on the importance of their dynamic character. For instance, Atkinson (Atkinson et al., 1999, p. 46) defined IWMs as "active constructions that are restructured in response to environmental, affective and cognitive change" and Crittenden (1990) suggested that models could be said to be "open" if the subject could make new interpretations and predictions, whereas they are "closed" if all behaviors are interpreted in terms of existing models. On the other hand, "working" models allow cognitive manipulations, whereas "non-working" models do not.

Although they all recognized the dynamic properties of IWMs, only a few authors have dealt with the ways in which individual differences influence these properties. Atkinson (Atkinson et al., 1999) and Crittenden (1990) suggested that cognitive capacities played an instrumental role in these constructions and reconstructions. Such variations in the function and organization of IWMs may indeed be influenced, or even determined, by children's level of cognitive functioning, i.e., their intellectual capacities. It could concurrently be hypothesized that, among other variables, high cognitive abilities would actually favor open and working IWMs. Conversely, low cognitive abilities would favor closed and non-working IWMs. In line with these ideas and the suggestion made by Stievenart et al. (submitted), we hypothesized here that children's cognitive abilities interact with the development of IWMs, and so with attachment representations and behaviors. The present study specifically focused on attachment representations, considered as indicators of children's IWMs. So, the higher the children's cognitive ability, the better their reasoning about attachment relationships. High cognitive ability could actually lead to open and working IWMs, taking account of relational experiences with various caregivers in different settings, characterized by secure and low disorganized attachment representations.

Both studies measuring attachment behavior and those concerned with attachment representations have mainly focused on the security pattern. This means that there is a lack of evidence about the relations between the two insecure patterns (avoidant, ambivalent), disorganization, and cognitive variables. Such relations, especially those implying disorganized attachment, are nevertheless of great interest in the field of developmental psychopathology, since disorganized patterns are much more common in children referred for clinical assessment than for normally-developing children (Greenberg, Speltz, DeKlyen, & Endriga, 1992). Attachment disorganization has been seen as particularly relevant for clinical purposes, due to its relations with a risk of psychopathology in general and with externalizing behavior in particular (Green & Goldwyn, 2002). In line with such important results, there has been a recent "shift of emphasis away from the importance of the distinction between secure/insecure to that between organization/disorganization" (Green & Goldwyn, 2002, p. 840). To our knowledge, there is currently no research which has studied the relation between disorganized attachment and cognitive abilities, while there were many studies considering the relation between security and cognitive abilities.

In sum, the data on the relation between attachment and cognitive abilities is somewhat inconsistent for the security pattern, and almost non-existent for the disorganized pattern. Furthermore, it cannot clarify the question of the direction of potential causality between attachment and cognitive abilities, since most of the studies were cross-sectional and correlational in nature. The direction of relations between the two sets of variables needs to be explored further. First, the link from attachment security representations to higher cognitive ability has to be confirmed. Second, the reverse hypothesis that higher cognitive ability may impact on attachment security representations should be tested in a cross-lagged panel of data. Third, the relation between the disorganized pattern of representations which can be considered as particularly relevant for recent theoretical and clinical purposes, and cognitive development has to be explored. Fourth, cognitive abilities for reasoning and verbal IQs should be considered in order to explore their different and specific effects. Fifth, there could be some differences between normally-developing children and children who were referred for externalizing behaviors. These five points actually constitute the five objectives of the present study.

Method

Sample

This study was part of the longitudinal "H2M children" research program attempting to identify early predictors of externalizing behavior problems in children. The research was conducted by the Educational and Development Psychology Unit at the Université Catholique de Louvain (UCL) in Belgium, with the collaboration of the St Luc University Clinic in Brussels. It covered preschoolers displaying externalizing behavior who had been referred to clinicians, and non-referred preschoolers (see http://www.uclouvain.be/h2m-children.html, for more details of the H2M children research program).

Data was collected from a good-sized sample of 399 Belgian preschoolers (58.4% boys), referred and non-referred, and their parents. The non-referred cohort ($N = 283$) were recruited when the children were three to five years old, in the first to third kindergarten sections in several elementary schools in the French-speaking part of Belgium. The referred group ($N = 116$) were recruited from pediatric units in Belgian hospitals where they had been referred for externalizing behavior problems (arousal, opposition, agitation, aggressiveness, non-compliance) by parents and/or teachers who considered them "hard to manage". The criterion for being included in the clinical group was not based on instrumental assessment, but only on parents' claims. Children displaying substantial language delays or developmental disorders were excluded from the sample.

The data used here came from two waves of assessment: at the outset of the research program (T1), and at the 24-month follow-up (T2). At the time of recruitment, the mean age of the children was 54.93 months ($SD = 11.16$) (boys: 50.01 months, $SD = 11.01$; girls: 54.15 months, $SD = 12.43$). The educational level of the parents was measured by the total number of years of schooling successfully completed. The mean educational level of the parents was 14.33 years ($SD = 2.95$) for the mothers, and 14.76 years ($SD = 2.47$) for the fathers. Most of the parents lived together (87%), but 13% were separated or divorced. The two groups did not differ on these variables.

Three research assistants (all professional clinicians) were involved in collecting data from the referred children. All of the children were examined by one of the research assistants in a quiet room, and were also visited at school. Data on non-referred children was collected in the three kindergarten sections of randomly selected schools within the French-speaking part of Belgium. Twelve fourth-year masters students in the Department of Psychology and Education at UCL, who had been intensively trained in sampling and data collection procedures, undertook the data collection. The children were each examined by a master's student in a quiet room. A covering letter assured the parents that the data would remain confidential.

At T1, each child had to complete the ASCT and the Block Design and Information subtests of the WIPPSI-III. The same procedure was used 24 months later (T2).

Measures

Attachment Story Completion Task (ACST).

Les Histoires à compléter, the French version of the *Attachment Story Completion Task* (ASCT) (Bretherton et al., 1990), was used by the clinicians to assess the children's attachment patterns. The administration of the task was video-recorded. The stories involved handling materials, and covered themes such as transgression, fear, separation from and reunion with parents, and the loss of a dog. The narratives were coded by the clinician research assistants using the Q-set procedure which was developed by Pierrehumbert (Miljkovitch, Pierrehumbert, Karmaniola, & Halfon, 2003). This resulted in continuous scores, which were obtained by comparing the children's individual Q-sort description with the criterion sort provided by experts for a prototypical child using Main and Cassidy's four patterns (secure, avoidant, ambivalent and disorganized) (Miljkovitch et al., 2003).

In both referred and non-referred groups, 20% of the first wave video-recorded ASCT were coded separately by two independent coders. The agreement between the two coders for the four continuous scores of attachment patterns was computed with intraclass correlations. It was moderate to high and significant: secure: $\alpha = .80$, $p < .01$, avoidant: $\alpha = .75$, $p < .01$, ambivalent: $\alpha = .66$, $p < .01$ and disorganized: $\alpha = .86$, $p < .01$. They were considered good although higher intraclass correlations between coders have previously been reported with ASCT ($\alpha = .94$, $\alpha = .94$, $\alpha = .85$ and $\alpha = .90$ respectively) (Miljkovitch, Pierrehumbert, Bretherton, & Halfon, 2004; Miljkovitch, Pierrehumbert, & Halfon, 2007). They were similar to those that were recently reported with ASCT in a Swiss and a Spanish sample of respectively 68 and 30 cases randomly selected with a total of 10 judges. Intraclass coefficients for the four Q-scores were for the Swiss sample, .94, .94, .85, .90, and for the Spanish sample, .81, .74, .69, .81 and .76 for the four Q-scores (Pierrehumbert et al., 2009). In our study, a K-Cohen coefficient for the coding of attachment patterns was also computed. This ranged from .62 to 1.00 with a mean of 0.78 ($SD = .10$).

IQ

A brief evaluation of IQ was carried out using two subtests of the WPPSI-III (Wechsler, 2004): the block design subtest (for reasoning IQ) and the information subtest (for verbal IQ). These subtests have been found to correlate highly with the full-scale IQ (Anastasi & Urbina, 1997). The standardized scores of the two subtests of the WIPPSI-III were used in the analyses.

Statistical analyses

The main statistical analyses were carried out using the SEM software AMOS 16.0 (Arbuckle, 2007). Although partially controlled, problems with shared-method variance were inevitable because of the longitudinal design. Since the data had been gathered at two points in time with the same method, covariations between the same construct may reflect both the substantive relations of interest and some degree of shared-method variance (Cole & Maxwell, 2003).

The data were checked for normality, which is a critical assumption underlying the maximum-likelihood procedure used in this study. The results indicated univariate normality for all the variables. Finally, children with missing data were removed from the sample in order to avoid biasing the results by using estimations. The final sample consisted of 196 normally-developing children and 75 children displaying externalizing behaviors.

Evaluation of the fit of the model was carried out on the basis of inferential goodness-of-fit statistics (χ^2) and a number of other indices. A significant χ^2 indicates that a significant proportion of the variance is not explained by the model. However, the use of χ^2 may be problematic since in large samples its excessive power tends to lead to the rejection of models that actually manifest an acceptable fit (Hayduk, 1996). Therefore, we decided to use three measures recommended by several authors in conjunction with the χ^2 statistic: the comparative fit index (CFI) (Marsh, Balla, & McDonald, 1988), the Tucker–Lewis Index (TLI) (Tucker & Lewis, 1973), and the root-mean-square error of approximation (RMSEA) (Cole & Maxwell, 2003). Values close to or greater than .90 are

Table 1. Descriptive statistics for the variables included in the measurement model at Time 1 and Time 2

			Mean	*SD*
Time 1	Security	Normally developing children	.32	.29
		Referred children	.31	.27
		Total	.32	.28
	Disorganization	Normally developing children	–.43	.24
		Referred children	–.34	.21
		Total	–.40	.24
	Verbal IQ (information subtest)	Normally developing children	9.62	2.98
		Referred children	9.31	2.83
		Total	9.53	2.94
	Reasoning IQ (block design subtest)	Normally developing children	9.92	3.17
		Referred children	9.63	2.32
		Total	9.84	2.96
Time 2	Security	Normally developing children	.42	.24
		Referred children	.35	.24
		Total	.40	.24
	Disorganization	Normally developing children	–.47	.18
		Referred children	–.39	.19
		Total	–.45	.19
	Verbal IQ (information subtest)	Normally developing children	10.17	3.18
		Referred children	9.81	2.90
		Total	10.07	3.11
	Reasoning IQ (block design subtest)	Normally developing children	9.48	3.63
		Referred children	9.40	2.62
		Total	9.46	3.38

Table 2. Bivariate correlations among the variables at Times 1 and 2

	T1				T2			
	1	2	3	4	5	6	7	8
1. Security T1		–.70**	.16**	.05	.27**	–.09	.22**	.02
2. Disorganization T1			–.17**	–.12(*)	–.18**	.20**	–.07	–.05
3. Verbal IQ T1				.41**	.07**	–.04	.42**	.20**
4. Reasoning IQ T1					.17**	–.10(*)	.28**	.25**
5. Security T2						–.61**	.12**	.16**
6. Disorganization T2							–.07	–.15**
7. Verbal IQ T2								.35**
8. Reasoning IQ T2								

Note. (*)p < .10 ; **p < .05 ; ***p < .01.

desirable on the CFI and the TLI, while the RMSEA should preferably be less than or equal to .06 (Hu & Bentler, 1999).

Results

Before discussing these analyses, we will present the variables included in the model. Security and Disorganization were used as measures of attachment. Measures of avoidance and ambivalence were removed due to high collinearity with security. For cognitive abilities, the observed variables were Verbal and Reasoning IQ, since only one subtest of the WIPPSI-III was used.

Comparisons between groups (ANOVAS) revealed significant differences between normally-developing children and those displaying externalizing behaviors on Disorganization at Time 1 (F[269] = 8.40, $p < .01$) and Time 2 (F[269] = 11.31, $p < .01$) and on Security at Time 2 (F[269] = 3.58, $p < .10$). Table 1 gives the descriptive statistics for each group.

The results of the bivariate correlations at Times 1 and 2 are presented in Table 2. The correlations show that Security at Time 1 was related to Verbal IQ at Times 1 and 2, whereas Security at Time 2 was related to Verbal IQ at Time 2 and to Reasoning IQ at Times 1 and 2. Disorganization at Time 1 was solely related to Verbal IQ at Time 1, whereas disorganization at Time 2 was related to Reasoning IQ at Time 2.

Cross-lagged panel models

As suggested by Cole and Maxwell (2003), a set of nested-model comparisons were followed in a series of three steps in order to test the cross-temporal relations between Security, Disorganization,

Table 3. Fit statistics and model comparisons for the cross-lagged panel models

	SEM analyses			Difference test of relative fit				Absolute fit statistics		
Models	*df*	χ^2	*p*	Comp.	$\Delta\chi^2$	Δdf	*P*	RMSEA	CFI	TLI
1	12	41.58	< .01					.096	.943	.867
3	7	7.25	< .01					.011	1.000	.998
				3 vs. 1	34.33	5	< .05			
Unconstrained model (4)	16	17.79	< .01					.020	.997	.988
Model with metric invariance (5)	24	24.37	< .01					.008	.999	.998
				5 vs. 4	6.58	8	> .05			

Reasoning IQ and Verbal IQ. Step 1 tested the baseline model in which: (1) the baseline latent variables (Security T1, Disorganization T1, Verbal IQ T1, Reasoning IQ T1) and the disturbance terms associated with these latent variables at T2 (Security T2, Disorganization T2, Verbal IQ T2, Reasoning IQ T2) were allowed to correlate; (2) autoregressive paths were drawn providing information about the relative stability of the construct at the two time points; and (3) the disturbances of the measures at the two time points were allowed to correlate to control for longitudinal shared-method variance (Cole & Maxwell, 2003). In fact, both the assessment of attachment representations and that of cognitive abilities involved the use of language (comprehension and production). In order to control for this shared-method variance, correlations between all the variables at Times 1 and 2 were allowed. In Step 2, the full cross-lagged model, all the cross-sectional predictions were added to the baseline model and tested. Finally, Step 3 tested the alternative reduced cross-lagged model in which the path coefficients which were not statistically significant in Step 2 were constrained to zero. If doing this did not worsen the fit of the model to the data, and if the alternative model performed better than the baseline model, it was preferred to the full cross-lagged model.

Comparisons between the models were made by using the difference in the χ^2 statistics ($\Delta\chi^2$) between two concurrent models. Considering levels of parsimony, Step 2 was compared to Step 1, and Step 3 was compared to Step 1 and Step 2. Table 3 shows the relative and absolute model fits for the set of nested model comparisons.

The baseline model had a good fit to the data. The significant autoregressive coefficients (between .20 and .39, $p < .01$) corroborated previous findings that attachment (Security and Disorganization) and IQ (Verbal and Reasoning) tend to be relatively stable across time (Grégoire, 2006, p. 25; Moss, Cyr, Bureau, Tarabulsy, & Dubois-Comtois, 2005). Moreover, the cross-sectional covariances displayed the expected patterns of relations between Security, Disorganization, Reasoning and Verbal IQ, both at Time 1 and at Time 2. Note that, at Time 1, only one correlation was not significant, between Security and Reasoning IQ. At Time 2, Verbal IQ was not correlated with Security and Disorganization.

As expected, the full cross-lagged panel model fitted the data much better than the baseline model ($\Delta\chi^2$ [12] = 41.58, $p < .01$) (Table 3). Five cross-sectional path coefficients were significant: those from Reasoning IQ T1 to Security T2 ($\beta = .11$, $p < .05$) and Verbal IQ T2 ($\beta = .15$, $p < .05$), from Security T1 and Disorganization T1 to Verbal IQ T2 ($\beta = .32$, $p < .001$; $\beta = .20$, $p < .01$), and from Verbal IQ T1 to Reasoning IQ T2 ($\beta = .12$, $p < .05$). These results suggest a complementary influence between cognitive abilities and attachment security. While Reasoning IQ predicted Security at a later date, Security and Disorganization predicted Verbal IQ (but not Reasoning IQ) later on. However, the relation between Disorganization and Verbal IQ was not in the expected direction, as the more disorganized the child, the better his or her verbal abilities.

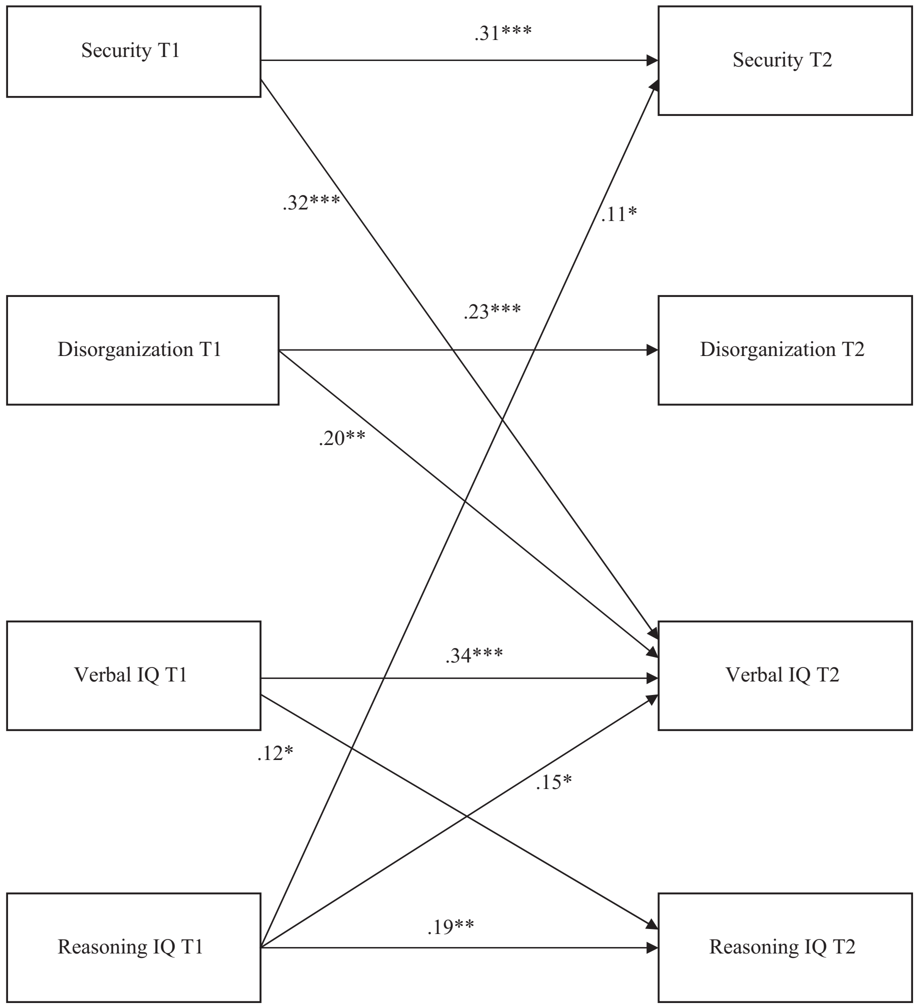
Finally, by constraining the non-significant path coefficients to zero, a more parsimonious model was retained which did not significantly worsen the fit to the data, compared to the full model ($\Delta\chi^2[7] = 7.25$, $p > .05$) but fitted better than the baseline model ($\Delta\chi^2[5] = 34.33$, $p < .01$). Table 3 shows the relative and absolute model fits for the set of nested model comparisons. The final, most parsimonious, model is presented in Figure 1.

Multi-group analysis

Having established an acceptable measurement model, a multi-group structural equation modeling was used to examine whether the hypothesized structural relations were invariant across groups. The first step was to determine a baseline model in which all regression paths across groups were freely estimated; this involved testing the more parsimonious model using the entire "pooled" sample (i.e., both the referred and non-referred children). The model showed an acceptable fit: $\chi^2(16) = 17.79$ ($\chi^2/df = 1.11$), a CFI of .997, and an RMSEA value of .020. The second step was to test for metric invariance to ensure that different groups responded to the model in the same way so that the model would be reliable (Steenkamp & Baumgartner, 1998). In practice, metric invariance allows researchers to compare the strength of the relations between constructs in different groups. At this stage, the model with metric invariance was more restrictive than the baseline model. The test of metric invariance was conducted by constraining the factor pattern coefficients (loadings) to be equal across groups. These constraints increased the χ^2 value from 17.79 to 24.37, gaining eight degrees of freedom. Because the metric invariance model was nested within the baseline model, a χ^2 difference test was performed. Given that the χ^2 difference of 6.58 with eight degrees of freedom was not statistically significant at $\alpha = .05$, metric invariance was supported. We thus concluded that there was no significant difference between the groups in our parsimonious model.

Discussion

The effect of attachment security on cognitive ability has been explored in previous studies (van Ijzendoorn & Van Vliet-Visser, 1988). The main purpose of the current research was to confirm this effect with attachment representations, rather than attachment behaviors. We also aimed to be innovative in three ways. First, the reverse hypothesis that cognitive ability could affect attachment representations was studied. Second, the relation between the disorganized pattern and cognitive abilities was especially explored. Third, reasoning IQ was distinguished from verbal IQ in order to



Note.$^{(*)}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$.

Figure 1. Standardized path coefficients for cross-lagged panel models.

analyze their particular influences on attachment representations. All these innovations were conducted in the context of multi-group analysis (comparisons between normally developing and referred children).

Contrary to what might have been predicted from previous findings that verbal IQ influences the security of attachment representations (Stievenart et al., submitted), our results suggest that reasoning capacity influences security attachment representations at a later date. However, attachment security and disorganization influenced verbal ability. These results for attachment security are similar to those of van Ijzendoorn and Van Vliet-Visser (1988) and O'Connor and McCartney (2007) (although their results were obtained with attachment behaviors). However, our results on disorganization are surprising, as we expected disorganization to influence verbal ability in a negative way. Furthermore, no difference between groups was observed: interactions between attachment representations and cognitive abilities occurred in the same way in the two groups.

Considering these observations from a developmental perspective, we might suggest that, in early childhood, the children's reasoning IQ plays a more important role than their verbal IQ in the development of secure attachment representations, and that the security of the attachment representations contributes to higher verbal IQ later on. These observations are important for clinical purposes. Children with low cognitive abilities could be seen as being at risk of developing insecure attachment representations due to their low reasoning ability, while less secure and disorganized attachment could lead in turn to low verbal ability. Since attachment insecurity and disorganization have been demonstrated to be related to socio-emotional and behavioral problems (Greenberg, Cassidy, & Shaver, 1999; Lyons-Ruth, Easterbrooks, & Cibelli, 1997), this assumption suggests that early intervention programs should focus on the prevention of deleterious developmental cascades between cognitive and affective development. Children whose cognitive ability is enhanced in this way would be more likely to develop secure and low disorganized attachment representations, which in turn may serve as a protective factor for their cognitive and socio-emotional development (Goodman, 1995). Such hypothetical developmental cascades have of course still to be confirmed in longitudinal research involving more than two waves.

The results of the present study also highlighted the relevance of the distinction between the security and disorganization of attachment representations (Green & Goldwyn, 2002). Indeed, the two aspects seemed to be relatively independent. Although some significant correlations were displayed between Security and Disorganization at Times 1 and 2, there were no cross-temporal relations between them. This suggests that these two aspects developed independently of each other. In addition, Security appeared to be more stable than Disorganization, and the impact of cognitive ability on these two aspects was different. Further empirical results should therefore continue with this distinction between security and disorganization of children's attachment representations in order to highlight their conceptual properties. Clinically, the independence of the two aspects means that both security and disorganization of attachment representations have to be assessed in children. Some of them may be securely attached but high disorganized, while others may be insecurely attached but low disorganized. From a clinical point of view, improving organization should enhance the coherence of the attachment strategies displayed by the subject, whereas improving security should enhance the subject's ability to regulate the expression of negative emotions. Since Security appeared to be more stable than Disorganization in the results, improving organization could be easier than improving security in the clinical context.

With respect to cognitive abilities, similar conclusions can be drawn about the relevance of the distinction between reasoning and verbal abilities. In previous studies, cognitive abilities have mostly been studied without taking account of these two dimensions; in the present study, the relations between verbal and reasoning abilities and attachment representations were distinguished. Previous results have highlighted significant influences of attachment behavior on intelligence without specifying the effect on reasoning or verbal capacities. The exception is van Ijzendoorn and Van Vliet-Visser (1988), who demonstrated that security in attachment behaviors influenced Verbal IQ. Our results confirmed the relation between representations of attachment security and verbal IQ, but also showed a link between disorganization and verbal IQ. In the present research, verbal IQ was assessed with the Information subtest that evaluates the child's capacity to gain, retain and retrieve general knowledge (Wechsler, 2004). As mentioned by O'Connor and McCartney (2007), secure children are more likely to explore their environment, and so to learn something, since they have already acquired security with their attachment figures. Inversely, less secure children are less able to profit from environmental resources because they are more concerned about the reactions and/or the attitudes of their attachment figures.

One possible explanation of the surprising result on disorganization is that it is a methodological artifact. Indeed, both normally-developing and referred children displayed low levels of disorganization: the correlations between their profiles and those of the prototypical disorganized child (as provided by the ASCT) are moderately negative (Table 2). They can thus not be considered as representative of disorganization at all. Further analyses with children displaying representative levels of disorganization are thus needed to confirm the present results.

The distinction we made between the Verbal and Reasoning IQ showed that only the Reasoning IQ influenced the development of the security of attachment representations. In this research, Reasoning IQ was measured by the Block-Design subtest that involves the capacity to analyze and synthesize visual abstract stimuli as well as to create non-verbal concepts (Wechsler, 2004). It may be that such cognitive abilities are an important step in the development of IWMs. The capacities acquired to synthesize and create non-verbal concepts can be very helpful for the two main functions of IWMs, i.e., the interpretation and the prediction of external events and others' behavior (Crittenden, 1990). A child displaying good reasoning abilities would therefore be more likely to create and refer to secure IWMs.

In line with the importance of the distinction between verbal and reasoning IQs, several recommendations can be made for studying the development of attachment representations in future research. For instance, it would be interesting to analyze the role played by cognitive abilities in the stability of the attachment representations. One hypothesis is that higher cognitive abilities are a protective factor for some significant life events. The literature shows that several life events (death of a parent, divorce or separation, etc.) can modify attachment representations (Bar-Haim, Sutton, & Fox, 2000). So it can be hypothesized that children with high cognitive abilities, maybe especially the reasoning ones, are more likely to maintain their secure previous attachment representations—based on working and open IWMs (Crittenden, 1990)—in the face of threatening life events because of their ability to cope with such new relational and social information. Conversely, children with low cognitive abilities are likely to have their IWMs more disturbed by negative and harsh life events because of their inability to integrate the new social and relational information without a radical transformation of their closed and non-working IWMs (Crittenden, 1990). Another example of further analysis is to consider the impact of cognitive abilities on the intergenerational transmission of attachment patterns (Miljkovitch et al., 2004). Children with higher cognitive abilities may be more independent of their parents' attachment representations. They could be better able to think about and to stand back from their attachment figures. They could also use other attachment relationships (with grandparents, uncles, aunts, peers, etc.) to model their IWMs. Children with lower cognitive abilities could be more dependent on their parents' IWMs because of their inability to elaborate IWMs different from those of their attachment figures.

In sum, this article has demonstrated a bidirectional relation between attachment representations and cognitive abilities. This relation differed for reasoning and verbal abilities, and for the security and disorganization of attachment representations. It would be interesting to replicate these results in future research with other clinical samples, e.g., with children with intellectual deficiencies, in different cultures and at several developmental stages. Furthermore, our results have to be considered with caution since the procedure of the story completion task by itself implies cognitive abilities in children. It may be that the significant associations between IQ and attachment representations, as measured with the ASCT, were due to the tasks' procedure. It would be interesting to replicate our method and analyses using other procedures for the assessment of attachment behaviors and representations in order to confirm the results.

The present study also suffers from another limitation, since we only considered the direct paths between attachment representations and cognitive abilities without mentioning any kind of mediators or moderators, leading to a lack of control for possible covariates. We are aware that several variables (e.g., personality, parenting behaviors) could mediate/moderate these relations. However, our purpose was simply to take the first step in studying the patterns of relations between attachment representations and cognitive abilities in two different groups of children. Furthermore, it could be that a third variable, e.g., socio-economic status of the family, would explain both the variance in IQ and the variance in attachment representations among children.

Also, our results did not provide any information about two patterns of insecurity: avoidance and ambivalence. We were therefore unable to be more precise about the relations between avoidant or ambivalent attachment representations and cognitive capacities. Finally, the findings concerning verbal and reasoning IQs were only computed with one subtest of the WPPSI-III. They should be replicated in future studies with a more complete evaluation of verbal and reasoning IQs.

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