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Attachment working models as unconscious structures: An experimental test

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Internal working models of attachment (IWMs) are presumed to be largely *unconscious* representations of childhood attachment experiences. Several instruments have been developed to assess IWMs; some of them are based on self-report and others on narrative interview techniques. This study investigated the capacity of a self-report measure, the Inventory of Parent and Peer Attachment (IPPA; Arnsden & Greenberg, 1987), and of a narrative interview method, the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985), to measure unconscious attachment models. We compared scores on the two attachment instruments to response latencies in an attachment priming task. It was shown that attachment organisation assessed by the AAI correlates with priming effects, whereas the IPPA scales were inversely or not related to priming. The results are interpreted as support for the assumption that the AAI assesses, to a certain degree, unconscious working models of attachment.

Introduction

One of the most controversial assumptions of attachment theory is that internal working models of attachment are unconscious structures operating mainly outside the realm of conscious awareness. Although widely claimed (e.g., Bowlby, 1973; Bretherton & Munholland, 1999; Main, Kaplan, & Cassidy, 1985; Marvin & Brittner, 1999), this notion remains a largely speculative assumption. Attachment researchers proceeding from a social psychology tradition have done a great deal to investigate this and other core hypotheses of attachment theory through their use of experimental procedures in conjunction with self-reported attachment instruments (see Shaver & Mikulincer, 2002, for an overview). In contrast, attachment researchers from the developmental psychology tradition have thus far failed to use experimental procedures to test their highly ambitious claims. The present study is aimed at taking the developmental tradition of attachment research one step further into the experimental direction. We use an experimental priming design to investigate the levels of automaticity¹ characterising attachment models assessed by two widely-used types of adult attachment instruments: self-reports and interviews.

Assessing adult attachment

Internal working models of attachment are mental representations of childhood attachment experiences, which become increasingly crystallised into adolescence and early adulthood.

¹ The term automatic is used in the sense of Posner and Snyder (1975). Automatic processes are fast and effortless processes that are not guided voluntarily and that hardly need cognitive resources. They are not under a person's subjective control. We thus use the terms unconscious and automatic interchangeably.

Numerous attachment researchers have developed adult attachment measures based on their own conceptualisation of the nature and the expression of internal working models. A most puzzling aspect of research on attachment in adulthood is the lack of convergence between these attachment measures (Bartholomew & Shaver, 1998; Crowell & Treboux, 1996). One might argue that if attachment measures all tap internal working models, they should show moderate relations with each other. Why are the relations found thus far so small? In addition to the contribution of measurement error, we propose that the weak relations repeatedly found between attachment measures are partly a function of the varying degrees of automaticity of the internal working models that each assesses.

One of the most widely used adult attachment measures is the Adult Attachment Interview (AAI; George et al., 1985). Other popular instruments include measures of self-reported attachment styles (e.g., Hazan & Shaver, 1987, and subsequent adaptations) and measures of feelings of security in the current relationship with the parents (e.g., Arnsden & Greenberg, 1987). A recurrent issue pertains to the usefulness of each of these instruments, with proponents of the AAI claiming that this interview is the only available measure that taps into unconscious attachment models (e.g., Furman & Wehner, 1994; Main et al., 1985).

The empirical evidence, however, is mixed. On the one hand, several studies have linked automatic psychological processes to self-reported attachment styles (see Shaver & Mikulincer, 2002, for a comprehensive review), suggesting that attachment self-reports do measure unconscious attachment processes. On the other hand, studies have also found correspondence between scores on the AAI and skin conductance or facial emotional expression during the interview (Dozier & Kobak, 1992; Spangler & Zimmermann, 1999). Facial expression and psychophysiological reactivity can be

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interpreted as evidence for unconscious processes. A direct measure of unconscious cognitive processes related to the AAI is, however, still missing. It therefore appears that attachment research has yet to demonstrate the validity of the AAI proponents' claim that a unique and rich aspect of this interview is the unconscious nature of the attachment models tapped.

Nearly all previous studies using the AAI together with self-reports of attachment have used attachment styles to romantic partners as their self-reported measure. As outlined by Bartholomew and Shaver (1998), however, equating attachment models pertaining to different attachment figures represents a basic conceptual flaw. Meta-analytic work (Crowell, Fraley & Shaver, 1999) has confirmed that two sources of variation (type of instrument and target relational figure) are jointly responsible for the weak relations found between attachment measures. One must thus keep one of these two sources of variation constant in order to understand the meaning of any association or discrepancy between attachment instruments.

The present study will keep the "relational figure" variable constant by focusing on attachment models pertaining to the relationship with the parents. The AAI will be used as an interview measure, whereas the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987) will serve as the self-report. According to Bowlby (1973), several internal working models of attachment exist within the same individual and differ in their degree of automaticity, with models developed earlier being the most unconscious or automatic. We argue that the AAI, because of its strong focus on childhood experiences along with its coding system concentrating on discourse analysis, taps into attachment models that are somewhat primitive and not entirely accessible to the individual's conscious awareness.

In contrast, the IPPA probes respondents about their *current* relationships with their parents, and assesses the participants' *explicit* evaluations of these relationships. One might thus argue that the IPPA taps solely into conscious attachment models. Based on previous research that uncovered relations between other attachment self-reports and automatic cognitive processes (see Shaver & Mikulincer, 2002), however, we rather argue that the AAI and the IPPA tap models of the attachment figures that differ in their *degree* of automaticity. The AAI, because of its focus on childhood experiences and its method of assessing the coherency of answers through discourse analysis, should assess the models characterised by the highest degree of automaticity.

Representational structure of internal working models

Bowlby (1973) proposed that internal working models of attachment consist of representations of the caregiver's availability, along with representations of oneself as deserving of the caregiver's affection, and representations of other individuals in the social environment. Because these representations are presumed to be closely interconnected (Bowlby, 1973), we propose that they can be mutually activated by spreading activation (Collins & Loftus, 1975). When the representation of the attachment figure is activated, activation automatically spreads to the related representations of the caregiver's availability, of oneself as worthy of love or not, and of others as benign or hostile. This process is very fast and hardly needs time and information-processing capacity or any

acts of voluntary will, running in a completely unconscious way (Bargh, 1994). In addition to this strongly automatic route of activation, evaluations can also be made more consciously. Such evaluations need more time and mental capacity than automatic ones, and will sometimes contradict them (Devine, 1989). Between fully automatic and fully conscious processes, a continuum of more or less automatic and conscious evaluative processes can be assumed.

A major assumption of this study is that attachment models assessed by the AAI are largely automatic. They are therefore constituted of automatic associations between the model of the caregiver and evaluative representations (of self, of caregivers and of others), whereas models assessed by a self-report questionnaire contain less automatic connections. In line with Banse (2003), we propose that priming methods offer an elegant access to unconscious processes and thus constitute a useful tool for investigating the unconscious nature of the attachment models derived from different instruments.

Measuring unconscious processes: The priming paradigm

Priming is an experimental technique that is used to activate specific mental representations and to assess the behavioural consequences of this activation. It has been used to investigate automatic affective evaluations (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986), relational schemata (e.g., Baldwin, 1992), and attachment styles (e.g., Mikulincer, Birnbaum, Woddis, & Nachmias, 2000). One of the most classic priming techniques is subliminal psychodynamic activation (SPA; Silverman & Silverman, 1964; see Slipp, 2000, for a review). Silverman and colleagues propose that the subliminal presentation of sentences allows for activation of unconscious processes and for observation of the behavioural consequences of such an activation (Geisler, 1986; Greenberg, 1992; Patton, 1992; Silverman, Bornstein, & Mendelsohn, 1976; Silverman, Ross, Adler, & Lustig, 1978). Several meta-analyses (Bornstein, 1990; Hardaway, 1990; Weinberger, 1992) have supported the validity of SPA, suggesting that it is an adequate tool for the investigation of unconscious processes in attachment research.

There is, however, scepticism against SPA research (Fudin, 1999, 2000). The two main concerns are as follows: (1) Interpretation of the observed effects requires psychoanalytical assumptions, which are too speculative to allow for convincing interpretations of experimental outcomes (Fudin, 1999). In our view, this argument questions the theoretical background of SPA rather than its empirical reliability. The theoretical foundation of this study is attachment theory (Bowlby, 1973, 1980, 1982), which is a well-formulated and widely accepted theory of human development. (2) Another criticism is that the encoding of whole sentences presented subliminally is questionable (Fudin, 1999, 2000). This concern, however, is based on two unpublished reports (Drain, 1997; Greenwald & Liu, 1985) whose results should be interpreted with caution, as they are in sharp contrast to meta-analytic data (Hardaway, 1990) and recent compelling findings (Shah & Kruglanski, 2002).

There is therefore evidence that subliminal sentence presentation is a promising method for the experimental activation of automatic attachment models. The purpose of this study is to investigate whether models of the attachment figures assessed by the AAI and those assessed by the IPPA are characterised by a certain degree of automaticity. A subliminal

sentence priming method will be used to activate automatic attachment models, followed by a sentence-answering task. The experimental data will then be examined in relation to the AAI and to the IPPA scores. The magnitude of the associations found will provide an index of the degree of automaticity of the attachment models assessed by each instrument.

The sentence "My mom rejects me" will be used as the subliminal prime. Because maternal rejection is conceptualised as a basic attachment threat, this sentence is expected to activate individuals' automatic representations of their attachment figures, as well as the related representations of self and others. Once activated, these unconscious models will affect the participants' responses (in this case, the reaction time) to the sentence-answering task used in the experiment.

Two experimental conditions will be used: a priming condition (described above) in which unconscious representations of the mother are activated, and a neutral condition in which no unconscious activation takes place. In both conditions, participants will then be asked to answer, as quickly as possible, "yes" or "no" to evaluative target sentences pertaining to six different domains (parents, self, self-efficacy, others, emotions and neutral). The reaction time difference between prime and control condition for the same target sentence will be used as an index of the priming effect.

Individuals with insecure attachment models should be slower at giving a positive answer to target sentences like "My mom loves me" in the prime condition compared to the neutral condition, because it is expected that the prime will activate unconscious models of parental unavailability that will interfere with the conscious tendency to respond "yes". The same pattern is expected for both dismissing and preoccupied attachment models because these two insecure states of mind with respect to attachment share a core feature of unintegrated negative experiences with the parents (Main & Goldwyn, 1998). Hence, in both cases, activation of attachment models is expected to slow down the reaction time. In contrast, individuals with secure attachment models should be faster when activated compared to the neutral condition, because the prime will activate positive unconscious models of parental availability, which will facilitate the conscious desire to respond "yes". An underlying hypothesis is that the positive models of attachment figures held by these individuals are sufficiently deep-rooted not to be compromised by a prime of *maternal rejection*. The same pattern is expected for self- and other-related sentences, but not for emotion-related or neutral target sentences. The domains of self, self-efficacy, relationships to parents, and relationships to others were chosen because of Bowlby's (1973) suggestion that the two components of attachment working models are (1) the model of the attachment figure and (2) the model of the self as worthy of affection, which would gradually generalise to models of close others in general and of the self in general. Clear relations between priming effects and the AAI are expected. Smaller associations are expected with the IPPA.

Method

Participants

The participants were 38 of the original 49 participants (78%) of the Bielefeld Longitudinal Study (Grossmann & Grossmann, 1983). All (20 men and 18 women) were between the

ages of 21 and 22. They were invited to a laboratory at the University of Bielefeld. The priming experiment took 20 minutes and was interrupted halfway through by a 90-minute break. During this break, attachment models were assessed with the AAI and the IPPA. Each participant received 100 DM (\$45).

Measures

Self-reported attachment working models: Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987; German version, Zimmermann, 1992). The IPPA assesses attachment security to mother, father, and peers. Fifty items are used for each attachment figure. Only the mother and father scales are used in this study. According to Armsden and Greenberg, the items for each figure can be treated as a unifactorial measure assessing aspects of security-insecurity along a single dimension. These unifactorial scores present high internal consistency and test-retest reliability (Armsden & Greenberg, 1987). In this study, internal consistency coefficients were .89 and .85 for the mother and father scales, respectively.

Rated attachment working models: Adult Attachment Interview (AAI; George et al., 1985). The AAI is a semistructured interview focusing on childhood attachment experiences with one's parents and on the integration of these experiences into a coherent appraisal of the self, the parents, and attachment relationships. Participants are asked to describe their relationships with their parents when they were young, to instantiate descriptions with specific memories, to recall incidences of distress, and to conceptualise relationship influences. The AAI has been shown to have excellent test-retest reliability, discriminant validity, and predictive validity (Bakermans-Kranenburg & van IJzendoorn, 1993; Crowell et al., 1996; Sagi, Van IJzendoorn, Scharf, Karen-Karie, Joels, & Mayseless, 1994).

The transcribed interviews were rated using the German version (Zimmermann, 1994) of the revised Attachment Interview Q-sort (Kobak, 1993). The Q-sort consists of 100 items based on Main and Goldwyn's (1998) rating method, describing coherency of discourse, representations of relationships to the attachment figures, integration of experiences, valuing of attachment, and other aspects relevant to the assessment of attachment representations. Each transcript was rated by two independent raters trained in the Q-sort method. The two Q-sort ratings were combined by averaging the two raters' scores. The combined ratings were correlated with prototype expert ideal-score ratings for each of the AAI classifications: secure, dismissing, and preoccupied attachment representations. This resulted in continuous scores for the secure, dismissing, and preoccupied dimensions for each participant. Mean composite reliability was .82 (range .66 through .95). For the secure dimension the reliability score was .89, for dismissing .90, and for preoccupied .76 (Spearman-Brown). The reliability scores reported here are thus very similar to those obtained in the Regensburg Longitudinal Study (Zimmermann & Becker-Stoll, 2002). The dimensional scores will be used in the following analyses.

Procedure

Upon their arrival at the laboratory, the participants were told that a number of experiments would be run on a personal

computer, assessing their attention processes and reaction speed. The experiment was divided into two conditions: a neutral control condition, in which an artificial letter combination was used as a prime, and a priming condition with an attachment-relevant stimulus as the prime. In each condition, the prime (neutral or maternal rejection) was first presented subliminally 16 consecutive times on the screen. Participants were informed that it was an attention experiment, and they were instructed to react as quickly as possible to the flashes presented on the screen by pressing a key.

Following this block of prime presentations, 32 one-line target sentences appeared on the monitor in a fixed order. The participants responded with *Yes* or *No* as quickly as possible by pressing one of two buttons. They did not know that there was a relation between prime and target sentences. This second portion (presentation of target sentences) was explained as an investigation of their present feelings and thoughts about themselves and their current life. It was repeated in each condition (priming and neutral).

To control for order effects, the neutral condition was presented first for half of the sample, followed by the priming condition after a 1.5-hour delay. The order of experimental conditions was reversed for the other half. The AAI and the IPPA were conducted between the two priming conditions. AAI and IPPA scores did not vary across order conditions.

Materials

Neutral condition. The priming stimulus consisted of an anagram of all letters of the sentence serving as the prime in the other experimental condition. It was a letter combination without semantic meaning ("Imene Amam theln hicm ba").

Priming condition. The sentence "My mom rejects me" [*Meine Mama lehnt mich ab*] was used as the priming stimulus.

The duration of each priming stimulus presentation was 30 ms, in order to keep it subliminal. Immediately after each stimulus presentation (0 ms delay), a mask consisting of random small black-and-white rectangles appeared for 100 ms in the same field on the screen. The participants were instructed to react as quickly as possible to the masking stimulus by pressing a button. Each priming stimulus with its mask was presented 16 consecutive times, with an interstimulus interval of 3 s. After this block of prime presentations, 32 target sentences had to be answered.

Thirty-two one-line statements were used as target sentences. The same list was used in both experimental conditions. The content of the sentences was predominantly attachment-relevant and pertained to the parental relationship (six sentences: e.g., "My mom loves me"), self-esteem (five sentences, e.g., "I am lovable"), self-efficacy (five sentences: e.g., "I am successful"), relationship to others (five sentences: e.g., "I trust my friends"), emotions (six sentences: e.g., "I am angry"), and neutral information (five sentences: e.g., "I can write") (see Appendix A for the complete list). The statements were presented in a thematically mixed but fixed order, in the same screen position as the priming stimuli. All stimuli (primes and targets) were presented in black type using an Arial type font within a white 50 mm × 250 mm rectangle. Its midpoint was exactly in the middle of the monitor. The distance between the participant's eyes and the monitor was 70 cm. The participant was instructed to respond with *Yes* or *No* to each statement as accurately and as quickly as possible. *Yes* was

indicated by pressing the right cursor button on the keyboard, using the right index finger, and *No* by pressing the left cursor button using the left index finger. The type of response (*Yes* or *No*) and the reaction time were assessed by the computer.

For all sentences except the neutral ones, a specific response was required for the answer to be considered "positive". For example, "I am lovable" had to be answered with *Yes*, and "My mom hates me" with *No*. In this task, similar to the "speed-accuracy trade-off" (Dennis & Evans, 1996; Wickelgren, 1977), the priming effects among individuals with insecure attachment models could take two distinct forms: a delayed response time for positive answers, or a tendency toward negative answers. This could mask attachment differences in priming effects. To ensure that only one pattern of priming effect would arise, target sentences with thematically obvious content were developed in order to invite a positive response pattern. As expected, this manipulation caused a ceiling effect: Only 5.5% of all answers were negative. The priming effect could thus only take the form of a modified reaction time. All negative answers and a few positive answers with more than 3000 ms latency were excluded from the data analyses.

In each experimental condition, the mean answer latencies were computed separately for each domain: parental relationship, self, self-efficacy, relationship to others, emotions, and neutral. A difference score for each target domain was calculated by subtracting the mean response latency for a specific domain under neutral condition from the mean response latency of the same domain under priming condition. We thus obtained priming effects for each domain. Positive scores indicate a longer response latency in the priming condition compared to the neutral condition, whereas negative scores indicate accelerated reaction time under priming condition compared to the neutral condition.

Apparatus. The experiment was run on a PC Pentium II 266 MHz with an EIZO 15" high screen monitor. The refresh rate of the monitor was 75 Hz. The PXL-Collection of Psychological Experiments (Irtel, 1995) was used to present prime and target sentences.

Awareness measures. To test the subliminality of the primes, the participants were asked whether they had noticed anything during the "attention experiment". Only two individuals reported that they had seen letters on the screen, but they were unable to name any word. One man indicated that he had seen the word "Mom" on the screen, but had not recognised other words. Moreover, when asked, none of the participants thought that there was a relation between prime and target tasks. Thus, the Bargh's (1994) criteria for subliminality of primes were met.

Results

Preliminary analyses

The mean scores of the three AAI dimensions (secure, dismissing, and preoccupied) were respectively 0.09 ($SD = .54$), 0.02 ($SD = .52$), and -0.14 ($SD = .25$) on a scale ranging from -1 to 1 . Means and standard deviations of the IPPA mother and father scales were 3.88 (0.62) and 3.56 (0.75) on a 5-point Likert scale. Mean reaction time to the priming stimuli

Table 1

Pearson correlations between attachment security to mother/father assessed by IPPA and priming effects for different target domains (N = 38)

IPPA	Priming effect					
	Relations to parents	Self	Self-efficacy	Relations to others	Emotional states	Neutral
Security _{mother}	.32*	-.02	-.15	-.12	-.04	.19
Security _{father}	.09	.01	-.23	-.04	-.03	-.05

* $p < .05$.

ranged from 1050 ms to 1170 ms, with standard deviations from 100 ms to 175 ms. The reaction time variables did not differ between the two experimental conditions (main effect prime), all t s < 1.5 . The relations between the IPPA scales and the AAI attachment dimensions in this sample were examined in a previous study. Strasser (2003) reports correlations of .35 ($p < .05$), $-.28$, ($p < .10$), and $-.46$ ($p < .01$) between attachment security to mother assessed through the IPPA and the AAI secure, dismissing and preoccupied dimensions, respectively. No significant correlation was found between the AAI and the father scale of the IPPA.

Main analyses

Table 1 shows the correlations between the IPPA scores for mother and for father and the priming effects for each target domain. Only 1 of the 10 correlations between attachment security and the priming effects produced by the experimental manipulation was significant: that between security to mother and priming effect for the relationship to parents. The direction of this effect was somewhat unexpected, however. Subjects with higher self-rated security to mother needed more time to answer sentences like "My mother/father loves me" with *Yes* or sentences like "My mother/father hates me" with *No*, when primed with maternal rejection compared to the neutral condition. The reversed data pattern was expected. No significant relations were found with other target domains, or with the father security scale.

Table 2 presents the correlations between the three AAI dimensions (secure, dismissing, and preoccupied) and the priming effect for each domain. Several significant effects were obtained with the secure dimension, which was significantly or marginally correlated with the priming effects for sentences concerning the self, self-efficacy, and relationship to others. As expected, the lower an individual's security score in the AAI, the higher the priming effects. Thus, activation of the representation of the mother caused individuals with low security scores in the AAI to need more time to give positive evaluations of themselves and their self-efficacy. A similar trend was found with the relationship to others. In contrast, the higher an individual's security score, the faster he or she gave positive evaluations after being primed with the maternal figure compared to the neutral condition.

Corresponding results were obtained with the dismissing dimension. As expected, the correlations between this dimension and the priming effects for self, self-efficacy, and relationship to others were positive. No significant correlations were found between the preoccupied dimension and response latency, nor between any AAI dimension and response latency

to parental relationships, emotion-related², or neutral sentences.

Order effects. The design counterbalanced the order of experimental conditions, with half of the subjects going through the priming condition first and the neutral condition second, and vice-versa for the other half. As the AAI and the IPPA were conducted in the mean time between conditions, there could be some carryover effect of these measures on reaction times to attachment target sentences. To test for order effects, we ran hierarchical regression analyses with the variables on which we found significant attachment effects. The first regression equation tested interaction effects between experimental order and the IPPA_{mother} scale (multiplicative product) on the priming effect of sentences concerning the relationship to parents. The interaction term IPPA_{mother} × Experimental Order was entered in the regression analysis after the main effects IPPA_{mother} and Experimental Order. The interactive term was not significant ($t < 1$), indicating that the relations between the IPPA_{mother} scale and the priming effect was not moderated by the order of experimental conditions.

The same analysis was run with the AAI dimensions. An interaction term Security × Experimental Order was entered after the main effects Security and Experimental Order. None of the interaction terms was found significant with the sentences concerning the self, self-efficacy, and relationship to others (all t s < -1.62). A similar pattern was found with the dismissing dimension. Two of the three interaction terms Dismissing × Experimental Order yielded no significant effect ($t < -1.43$). However, for the priming effect of sentences concerning self-efficacy, the interactive term was significant, $\beta = .89$, $t = 2.11$, $p < .05$. We further investigated the significant interaction by analysing the priming effects obtained before and after the AAI/IPPA separately. Because of the small sample size, we used a more lenient significance level ($p < .20$) for these post hoc analyses. The priming effect was related to the dismissing dimension when the priming condition was run before the AAI/IPPA ($p < .20$), whereas no relation was found between the dismissing dimension and the priming

² As the priming effect for emotion sentences was computed by using the mean score obtained with emotion sentences referring to qualitatively different emotions (fear, anger, hope, etc.), we also ran separate analyses for the single sentences. The only significant correlations found were between the secure and dismissing dimensions on the one hand and, on the other hand, the priming effect for the sentence "I am hopeful". As expected, individuals with higher security scores were quicker in indicating to be hopeful when primed with maternal rejection compared to the neutral condition ($r = -.38$, $p < .05$). Correspondingly, higher scores on the dismissing dimension were positively related to this priming effect ($r = .37$, $p < .05$). No further effect was significant (all p s $> .42$).

Table 2

Pearson correlations between the secure, dismissing and preoccupied dimensions of the AAI and priming effects for different target domains (N = 38)

AAI	Priming effect					
	Relations to parents	Self	Self-efficacy	Relations to others	Emotional states	Neutral
Secure	.05	-.38*	-.35*	-.28 [†]	-.11	-.12
Dismissing	.00	.36*	.32*	.32*	.10	.08
Preoccupied	-.24	.26	.24	.05	.10	.08

* $p < .05$; [†] $p < .10$.

effect when the priming condition was run after the AAI/IPPA ($p > .20$).

Overall, then, the order analyses revealed that the significant correlations between attachment variables and priming effects reported in Table 1 and 2 were not moderated by the order of experimental conditions. The only exception revealed a stronger relation between attachment organisation and priming effect in the condition conducted before (rather than following) the AAI/IPPA, thus ruling out the hypothesis of carryover effects being responsible for the findings.

Discussion

The central assumption of this study was that there are different types of internal working models, which differ in their degree of automaticity. Working models developed earlier in life are assumed to be more unconscious and automatic than those developed more recently (Bowlby, 1973). Several types of adult attachment measures, such as self-reports (Shaver & Mikulincer, 2002) and narrative interview techniques (Main et al., 1985), are presumed to assess unconscious working models. The main goal of this study was to investigate the levels of association between automatic cognitive evaluation processes and two measures tapping working models of the relationship with the parents, one self-report (the IPPA) and one interview (the AAI). A secondary aim was to explore the associative structure underlying internal working models; more precisely, the relations between the model of the attachment figure and the models of self and of others (see Bowlby, 1973).

The main finding of this study is that despite being moderately related to each other, the IPPA and the AAI present very different patterns of associations with automatic processes. Two of the three dimensions of the AAI were associated with automatic evaluations of sentences related to self, self-efficacy, and relationship to others (trend only for the secure dimension), whereas there was no convincing evidence that automatic evaluations pertaining to any domain were related to attachment security derived from the IPPA.

In fact, self-reported attachment security to mother was associated with automatic evaluations of the parents in a counterintuitive manner. If the IPPA tapped into representations of the parents that were congruent with their unconscious counterparts, higher security should have facilitated and thus accelerated the tendency to respond positively to questions about the relationship with one's parents. Instead, we found that higher security scores on the IPPA were associated with more time being needed to answer such questions affirmatively when primed with maternal rejection, compared to the neutral condition. The delayed response time suggests that the unconscious parental model activated by the prime was

negative (despite the self-report of high attachment security), thus interfering with the voluntary desire to respond positively. It therefore appears that the IPPA might in part be subject to idealisation of the relationship with the parents.³ This positive self-report, however, is fragile to the threat posed by priming of maternal rejection.

Besides this counterintuitive finding, no association was found between self-reported attachment security and priming effect for any domain. A first explanation for the null findings pertains to the age of the participants. The IPPA was originally validated with late adolescents aged between 16 and 20 years (Armsden & Greenberg, 1987), whereas our sample was slightly older (between 21 and 22 years). Perhaps the IPPA is not an adequate measure of attachment security in early adulthood. More relevant instruments might be self-reported questionnaires of attachment style to a romantic partner (e.g., Brennan, Clark, & Shaver, 1998). This is supported by studies with adult samples in which attachment style to partners assessed by such self-reports was found to relate to automatic (subliminal) priming effects (e.g., Mikulincer et al., 2000; Mikulincer, Gillath, & Shaver, 2002; Mikulincer, Hirschberger, Nachmias, & Gillath, 2001). These results suggest that attachment styles assessed by such questionnaires are related to an unconscious attachment organisation.

The seeming differences between Mikulincer and colleagues' results and ours concerning the relation between self-reported questionnaires of attachment and priming effects could also be attributed to differences in the priming tasks used. Whereas Mikulincer and colleagues mainly used a single-word priming technique (see Neely, 1991), we preferred a sentence-priming design. One advantage of the single-word priming technique is that several different priming stimuli can be presented and varied within subjects, leading to a broader range of possible priming effects. It might thus be that the design of this study did not allow us to find the appropriate stimuli to activate attachment security assessed by the IPPA.

Another hypothesis pertains to the different developmental periods that are the focus of the AAI and the IPPA. The AAI concentrates mostly on childhood experiences, whereas the IPPA focuses on the current relationship with the parents. The subliminal activation technique was designed to activate a critical childhood experience. This prime might have activated models developed earlier rather than current models assessed by the IPPA. Thus, the failure to find relations between priming effects and the IPPA could be a reflection of the

³ Such an idealisation can only be expected when secure individuals in the AAI rate their parents as less available in a questionnaire than do insecure dismissing participants. This is a sensible hypothesis though, as secure individuals often have a more critical and balanced view of their relationship with their parents than dismissing individuals do (Main et al., 1985).

instrument's focus on current relationships rather than an indication that it does not provide a window into unconscious processes. Finally, the null pattern of findings may also be an accurate reflection of reality. Perhaps attachment security as assessed by the IPPA is fully under the individual's conscious awareness. It could, actually, be subject to social desirability confounds, and thus not correspond to the individual's "real" representations of parental availability and supportiveness.

In contrast to the pattern of findings with the IPPA, several theoretically consistent associations were found between priming effects and the Secure and Dismissing AAI dimensions. These relations were found with the domains of self-representations, self-efficacy, and representations of others (excluding the parents). Although the AAI data were not analysed categorically, for simplicity purposes the findings can be approximated as follows. Individuals with secure attachment working models were faster at giving positive evaluations of themselves, of their self-efficacy and (marginally) of others after their maternal model had been subliminally activated than in a neutral condition, whereas individuals with dismissing working models were slower at appraising themselves and others positively when their model of their mother had been activated, compared to the neutral condition.

This delayed response time in the priming condition suggests that the higher an individual's dismissing score is, the more likely it is that his or her unconscious representations of self and others are inconsistent with their conscious counterparts. They therefore interfere with the conscious desire to appraise and present oneself in a positive light and to view the social environment as nonthreatening. In contrast, the accelerated response time under priming condition suggests that the higher an individual's security score is, the more congruent his or her conscious and unconscious representations of self and others are. Further, these individuals' positive evaluations of self and others appear robust to the priming of maternal *unavailability*. This is consistent with secure individuals' discourse in the AAI, which shows an ability to realistically recognise parental flaws along with a general positive evaluation of one's self-worth and of the value of interpersonal relationships.

Unexpectedly, no significant relations were found between the AAI dimensions and the priming effect for parent-relationship sentences. The correlations were, in fact, extremely low. Although the prime "My mom rejects me" successfully activated the participants' attachment models, as shown by the theoretically consistent results discussed above, no attachment effects were found for those target sentences that were semantically closest to the priming sentence. We had expected that the semantic proximity between the priming sentence and parent-relationship target sentences would yield clear relations between priming effect and attachment working models. One possible explanation for the null results is that the *specific content* of the priming sentence, namely maternal rejection, briefly overrode positive evaluations of maternal availability in individuals with high security scores, because of the semantic closeness between prime content and mother representations. This could have reduced the priming effect for this specific domain, and thus made it difficult to detect attachment effects. This hypothesis can easily be tested in future studies by using priming sentences of neutral, negative, and positive valence.

A second possibility is that information about parental availability is especially prone to defensive processing. Insecure

(and especially dismissing) attachment working models go hand in hand with a high motivation to suppress negative thoughts about parental unavailability (Dozier & Kobak, 1992; Main et al., 1985). This defensive processing, which happens on an automatic level, might have been powerful enough to suppress any activation effect. In priming research, there is some evidence that accuracy motivation can considerably reduce priming effects (Dijksterhuis, Spears, & Lépinasse, 2001, Exp. 3). It is thus conceivable that defensive processing levelled attachment differences.

With regard to the secondary aim of the study, the findings allow us to draw conclusions about the associative structure of working models derived from the AAI. The findings showed that activating the representation of the mother led to a successive activation of self-representations and representations of others, the valence of which varied according to the participants' AAI scores. This suggests that the working model assessed in the AAI is not solely a representation of the parents but a general appraisal of the parents, the self, and others. This is in line with Bowlby's (1973) proposition that the model of the caregiver's availability gives rise to related models of self and others in the social environment. In keeping with network theories of memory (Collins & Quillian, 1969), our findings suggest that representations of the caregiver's availability and of oneself and others are associatively connected. The activation of representations of the attachment figures causes, via spreading activation, a heightened availability of self- and other-representations.

No correlations between priming effects and the preoccupied dimension were found to be significant. Most of the correlation coefficients went in the expected direction, but failed to reach statistical significance. One reason might be that the variance of this dimension is considerably lower compared to the other two AAI dimensions. There may not have been sufficient variability on the preoccupied dimension to detect meaningful attachment-related differences in priming effects. Finally, and as predicted, no significant correlation was found between any attachment score and the priming effects for emotional or neutral sentences. All significant effects reported in this study pertain to representations of self and others, which offers some evidence for the discriminant validity of the AAI.

Although the differential priming effects found in this study were predicted *a priori*, they do not quite replicate data patterns reported in recent attachment priming research. As mentioned above, Mikulincer and colleagues (e.g., Mikulincer et al., 2000, 2002; Mikulincer & Shaver, 2001) have done extensive work relating priming effects to self-reported inventories of attachment. In contrast to the findings of the present study, those studies found normative attachment priming effects that were more clear-cut than differential attachment-style priming effects. One explanation for the seemingly different results pertains to the content of the prime stimuli used. In Mikulincer et al.'s studies, either the attachment system is activated with threat-related words like "death" (Mikulincer et al., 2000), or general safe haven representations are activated with words like "support" or "love" (Mikulincer & Shaver, 2001). Thus, the attachment system in general, rather than one relationship-specific internal working model (e.g., partner or mother), can be presumed to be activated. As attachment theory assumes that all individuals, regardless of their attachment pattern, have a basic need for a safe haven when threatened, it could be that when this basic need is activated, normative attachment effects are found across attachment patterns.

In contrast, attachment differences in behavioural strategies (e.g., avoidance) and cognitive processes (e.g., deactivation) are presumed to be person-specific (Collins & Read, 1994; Shaver, Collins, & Clark, 1996). Individual differences should thus mainly appear when one relationship-specific model has been primed. In this study, the activation of one relationship-specific attachment model, namely the internal working model of the mother, was the main focus of interest. This led to the expected relationship-specific cognitive appraisal processes. At this point we can only speculate whether the sole presentation of, e.g., “I am rejected” would have led to normative priming effects replicating Mikulincer and colleagues’ results. In future studies, systematic variation of the prime stimuli will shed light on the mechanisms leading to the different results reported in different priming studies.

The priming paradigm: A useful method for attachment research?

Social psychologists have a solid tradition of using experimental procedures in conjunction with self-reports of attachment style (see Shaver & Mikulincer, 2002). To our knowledge, however, and despite strong theoretical claims as to its capacity to tap into unconscious structures, the AAI has not been subjected to similar procedures. The findings of this study add to those of the classic Dozier and Kobak (1992) study in supporting the widely claimed assumption that the AAI taps into attachment models operating mostly outside the realm of conscious awareness.

We were specifically interested in the activation of childhood attachment experiences, internalised many years earlier. We therefore used a priming stimulus describing maternal caregiving behaviour. In order to examine the phenomenon of spreading activation, we focused the primed activation on a specific point in the cognitive network of attachment representations, namely maternal rejection. The sentence priming technique borrowed from SPA seemed an ideal tool to meet these requirements. One shortcoming of this technique, however, was that the activation of maternal rejection did not appear to spread and activate other, presumably close, parent-related representations. Although we have already discussed several possible reasons for this null result, the unclear processes underlying priming effects in SPA research make it a challenge to interpret such findings at this point (see, e.g., Fudin, 1999, 2000; Greenwald, 1992).

The goal of this study was not to test the validity of the SPA technique, but rather to activate two different aspects of attachment working models, namely “mother” and “rejection”. Priming effects have been found in studies in which two-word subliminal prime sentences were presented (Shah & Kruglanski, 2002), suggesting that subliminal sentence presentation might be a promising tool for activating unconscious processes. However, whether our findings were caused by the additive effect of the presentation of “mom” and “rejects” (see Greenwald & Liu, 1985) or by a “real” sentence-level priming effect remains speculative. The use of alternative priming methods will be an invaluable tool to address some of the questions that remain open at the end of this study.

Future directions

The findings of this study are generally consistent with the view that the AAI taps into attachment working models operating

mostly automatically, outside the realm of conscious awareness. Although further studies are needed to clarify and extend this first piece of evidence, our findings point to an inconsistency between automatic and conscious attachment models among individuals showing high dismissing tendencies, and a general consistency between these two levels of representations among secure individuals. What remains unclear, however, is the level of automaticity vs. consciousness of self-reported attachment models. This study has failed to uncover any fact supporting the notion that the IPPA taps working models characterised by a certain level of automaticity, with the exception of one counterintuitive finding that actually suggests that this instrument may be subject to idealisation of the relationship with the parents. An elegant way to investigate this matter further will be to contrast automatic evaluations of the attachment figures (e.g., by examining reaction time to positive and negative stimuli after subliminal presentations of words such as father, mother, dad, mom, etc.) with AAI and IPPA scores. If the IPPA is subject to parental idealisation, one can expect that automatic evaluations will be mostly negative among dismissing individuals reporting high levels of security in the IPPA.

Although the IPPA remains the closest self-reported approximation of the AAI in terms of focus (representations of the relationship with the *parents*), it was developed prior to major breakthroughs in the study of self-reported attachment and has often been criticised for being vulnerable to social desirability confounds, which may have contributed to the weak findings with the IPPA in this study. Extensive psychometric work (e.g., Brennan et al., 1998; Fraley & Waller, 1998) has led to the development of self-reports of attachment whose underlying dimensions are much better understood than those of the IPPA. Furthermore, there is compelling evidence that these instruments relate to automatic psychological processes (see Shaver & Mikulincer, 2002, for a review). Still missing, however, are studies using a design similar to that of the present study, systematically contrasting interviews and self-reports of attachment within the same sample. Such studies will provide invaluable insight into the varying degrees of automaticity characterising working models assessed by different instruments, into the mechanisms linking different attachment instruments to automatic processes, and into the specific domains of automatic processing (e.g., social cognition, emotion regulation, etc.) associated with each type of adult attachment measure.

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Appendix A

List of target sentences used in the priming experiment (Response format: Yes / No)

Relations to parents

Meine Mama haßt mich. (My mom hates me.)
 Meine Eltern lieben mich. (My parents love me.)
 Meine Mama mag mich. (My mom likes me.)
 Mein Papa haßt mich. (My dad hates me.)
 Ich liebe meine Eltern. (I love my parents.)
 Mein Papa mag mich. (My dad likes me.)

Self

Ich bin liebenswert. (I am lovable.)
 Ich bin nichts wert. (I am worthless.)
 Ich bin häßlich. (I am ugly.)
 Ich bin ein wunderbarer Mensch. (I am a wonderful person.)

Self-efficacy

Ich traue mir etwas zu. (I am resourceful.)
 Ich bin ein Versager. (I am a failure.)
 Ich mache alles falsch. (Everything I do is wrong.)
 Ich bin erfolgreich. (I am successful.)
 Ich mache vieles richtig. (I usually do things right.)

Relations to others

Andere mögen mich. (Other people like me.)
 Andere hassen mich. (Other people hate me.)
 Ich vertraue meinen Freunden. (I trust my friends.)
 Ich fühle mich geborgen. (I feel safe.)
 Ich bin einsam. (I am lonely.)

Emotional states

Ich bin zornig. (I am angry.)
 Ich habe Hoffnung. (I am hopeful.)
 Ich habe Angst. (I am afraid.)
 Ich schäme mich oft. (I am often ashamed of myself.)
 Ich bin zufrieden. (I am content.)
 Ich bin traurig. (I am sad.)

Neutral sentences

Ich kann schreiben. (I can write.)
 Ich bin Student. (I am a student.)
 Ich liebe Kunst. (I love art.)
 Mein Zimmer ist schön. (My room is pretty.)
 Mir ist oft langweilig. (I am often bored.)