Attachment-related information processing: exploring the effect of attachment organization on cognitive regulation in adults
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Chapter 3

Effects of attachment representation and anxiety disorder on attention to and memory for threatening information

To investigate the effect of the mental representation of attachment on information processing, 32 anxiety disorder outpatients, as diagnosed by the ADIS-R, were administered the Adult Attachment Interview, the Symptom Check List-90, and the State-Trait Anxiety Inventory. They were subjected to an emotional Stroop task with subliminal and supraliminal exposure conditions, a free recall memory task, and a recognition test. All tasks contained threatening, neutral and positively valenced stimuli. Results on the Stroop task showed color-naming interference for threatening words in the supraliminal condition only: both dismissing and preoccupied participants reacted faster than autonomous participants did. On the free recall task, both insecurely attached groups showed inferior recall of threatening words, compared to autonomous participants. Results on the recognition task showed no differences between attachment groups. The findings are interpreted in light of Williams et al.’s (1997) model of selective information processing. It is concluded that attachment insecurity, but not the type of insecurity, is a decisive factor in attention and memory processes.

Thanks are due to Dr. Arend Veenings and his co-workers of the APZ De Grote Rivieren for recruiting the patients who participated in this study.
Chapter 3

Introduction

The concept of the internal working model of attachment plays a key role in attachment theory and in attachment-related research (Bowlby, 1973; Bretherton & Munholland, 1999). From the moment of birth on, human beings learn to organize the otherwise fragmentary information about themselves and their social environment in a mental framework emerging from their relationships with attachment figures (Bowlby, 1973). Without this organization of information, one would never learn what can be expected from others and what is expected by others. The layout of the mental representations of attachment is strongly influenced by what one has experienced. Securely attached children have the experience that their caregivers are responsive and reliable and that they themselves are worthy of attention and love. Insecurely attached children have the opposite experience with irresponsible or unreliable caregivers, leaving them with low self-esteem and a feeling of unworthiness or ineffectiveness (Bretherton & Munholland, 1999). Whatever their experiences, all children develop a mental representation that enables them to anticipate their caregivers' behavior, to interpret it and to adapt their own behavior to that of their caregivers. This internal working model of attachment is defined as "... a set of conscious and/or unconscious rules for the organization of information relevant to attachment and for obtaining or limiting access to (...) information regarding attachment-related experiences, feelings and ideations" (Main, Kaplan, & Cassidy, 1985, pp. 66-67).

With attachment theory, Bowlby combined psychodynamic, ethological and cognitive aspects of development with an information-processing model of cognition. In the past decades, cognitive psychologists have developed different models to explain the ways in which human beings process specific kinds of information. The idea that incoming information is mentally organized into cognitive representations is widely accepted, even though the exact nature of these mental models is an issue of continuing debate (see Williams, Watts, MacLeod, & Mathews, 1997). Cognitive scientists study the basic rules and basic mechanisms of cognitive organization. Also, information-processing paradigms have been applied to different clinical disorders, investigating whether specific dysfunctions in information processing go together with specific emotional symptoms or syndromes (for a review, see Mathews & MacLeod, 1994).

Mental representations of attachment are thought to direct not only feeling and behavior, but also cognitive processes related to attachment, such as attention and memory. Bowlby (1980) extrapolated on the idea that human beings selectively attend to sensory information to escape from information overload. Due to the filtering of incoming information by the tacit organizational rules of the internal working model, attention is directed towards what fits the representation. Attachment-related information that, as a result of its (affective) content, does not fit the expectancies is defensively excluded. Consequently, the original representations of attachment are confirmed and rigidly established. The memory system is subject to the same kinds of biases at the levels of encoding and retrieving information. Information that smoothly fits the existing representations is easily stored and easily reproduced (see Williams et al., 1997).

On a cognitive level, autonomous or secure attachment is reflected by open, non-defensive mental operations regarding attachment-related experiences, as shown in the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985; Main, 1990). When
interviewed about their childhood memories, autonomous respondents give a balanced view of their past experiences and talk about their history in a clear and coherent way. **Dismissing** attachment is revealed in the AAI by a claim for limited access to memories related to attachment. These respondents show restricted feelings regarding attachment experiences and often contradict themselves when presenting a general idealizing view of their attachment figures that cannot be corroborated by positive episodic memories. **Preoccupied** attachment is revealed in the AAI by ambivalence about attachment experiences. These respondents often talk in a very incoherent way about their past and show confusion about or continuing anger with their major attachment figures. There is a fourth classification for an **unresolved** state of mind with respect to loss or trauma; this is coded when respondents show signs of disorganization or disorientation during discussions of potentially traumatic events. The indices for the unresolved attachment category in the AAI are not representative of the overall state of mind with regard to attachment, and consequently individuals classified as unresolved receive a best-fitting alternate classification as autonomous, dismissing or preoccupied. Dozier and Kobak (1992) have shown that the cognitive representational organizations are associated with specific strategies for either deactivation (in case of dismissing attachment) or hyperactivation (in case of preoccupied attachment) of the attachment system. A most striking finding is the heightened autonomous physiological arousal their respondents showed when using a deactivating strategy, for example when playing down the importance of negative childhood experiences with separation, rejection or threat by the parents.

The theory of internal working models of attachment shows similarity to Beck’s schema model of cognitive processing in psychopathology (Beck, 1976; Beck & Emery, 1985). In Beck’s view, cognitive schemata result from experience and guide new information along the processing lines that experience has formed. Biases in information processing result from systematic distortions in cognitive schemata that have been strengthened by perceptual sensitivity and memory biases for information congruous with the schema. For anxiety disorder patients, Beck’s model predicts hypervigilance in the processing of threatening information. Beck’s model was refined by Williams et al. (1997), who make a distinction between passive-automatic and active-strategic processing of information. They show that these are two independent cognitive processes that may explain dissociations in the performance of anxious and depressed patients on cognitive tasks. Referring to the distinction made by Graf and Mandler (1984), they distinguish two processes that operate on mental representations. **Priming** is a relatively automatic process where exposure to a stimulus activates an associated schema; **elaboration** is a more strategic process where associations between related representations are formed as a result of the activation of one representation. Findings from a number of experimental studies on anxiety and depression show that anxiety-related information-processing biases are associated with differences in priming processes, and depression-related biases are associated with differences in elaboration processes (Williams et al., 1997).

In a previous study, we reported provisional evidence for a general response inhibition in insecurely attached nonclinical adults, as shown in two experiments using a modified Stroop task (Zeijlmans van Emmichoven, de Ruiter, & Brosschot, 2000). Selectivity in information processing as a result of insecure attachment representations may be more pronounced in clinically disordered groups. Although the relations between insecure
attachment and psychopathology are neither linear nor exclusive, insecure attachment representations are expected to make individuals more vulnerable to develop psychopathology (Bowlby, 1988; Guidano & Liotti, 1983; Main, 1996). Various studies have provided empirical evidence for the co-occurrence of insecure adult attachment representations with psychopathology (for a review, see Dozier, Stovall, & Albus, 1999) but longitudinal investigations will have to provide information about causality. Affective disorders per se have been subject of a huge amount of cognitive research (see Williams et al., 1997). In the present study, we will experimentally investigate whether information-processing biases in anxiety disorder patients specifically relate to the different qualities of attachment representations.

Information processing in anxiety seems to be largely characterized by hypervigilance for relevant threat cues. The priming process can be experimentally modelled using the emotional Stroop task. In this task, participants are asked to name the color in which words of different emotional value are printed. Response latencies indicate interference of the word content with the primary task: color-naming reaction times slow down when the word is associated with participants concerns and thus distracts them from their task. In a recent review, Williams, Mathews, & MacLeod (1996) showed that in many Stroop studies, anxious participants have let the content of the stimuli interfere with their task of naming the color in which the stimulus words were printed, especially when the emotional valence of the stimulus material was threatening and of personal relevance. Even at a pre-attentive level, with stimuli presented subliminally, this attentional bias has been shown to be active (MacLeod & Hagan, 1992; MacLeod & Rutherford, 1992; Mogg, Bradley, Williams, & Mathews, 1993; Mogg, Kentish, & Bradley, 1993; van den Hout, Tenney, Huygens, Merckelbach, & Kindt, 1995). From this experimental research it is safe to conclude that patients suffering from anxiety disorders are characterized by an (automatic) attentional bias for threat stimuli.

The elaboration process can be experimentally modelled in memory tests. Memory researchers distinguish explicit memory, which concerns conscious recollection, from implicit memory, which involves nonconscious effects of past experiences on subsequent information processing. Explicit memory depends on the extent to which the activated schema, at the time of encoding, is related to other associated representations that are used as retrieval cues. In a free recall test, explicit memory is activated by specifically asking participants to consciously retrieve previously processed material. Poor memory performance on a free recall test is supposed to indicate poor elaboration of the stimuli offered. Recognition performance is expected to be superior to recall performance, because it is easier to recognize previously processed stimuli than to recall them. Cloitre and Liebowitz (1991) refer to a free recall task as measuring semantic memory whereas a recognition task concerns perceptual memory. Evidence for a memory bias in anxiety disorders is equivocal and results even contradict each other (for an overview, see Mineka & Nugent, 1995): few studies have provided empirical evidence for an explicit memory bias in anxiety patients; some studies have reported an implicit memory bias related to clinical anxiety. The studies of memory biases in anxiety disorders are not only inconsistent in their results, but also in the applied paradigms (Eysenck & Mogg, 1992). In view of the controversial findings in anxiety disorder samples, McNally (1994) suggests that researchers concentrate on involuntary explicit memory paradigms to specify the effects of anxiety disorders on memory.
performance. Involuntary explicit memory is like explicit memory in that it involves conscious recollection, but like implicit memory in that it involves no strategic effort. According to McNally, in anxiety disorder patients threatening information just "pops" into mind without deliberate search, and therefore involuntary explicit memory processes should be studied in these samples.

Departing from the fact that there is substantial evidence for the existence of an (automatic) attentional bias in clinical anxiety, we investigated whether this bias would function the same way for all anxiety disorder patients, or whether a differentiation within the patient sample based on their attachment representations would explain the differences between research results. A large part of the research on information processing in anxiety disorders has been inspired by the cognitive-psychophysiological model for the etiology and maintenance of panic disorder and agoraphobia (for a review, see McNally, 1990). In short, this model holds that agoraphobia is caused by a specific sensitivity for somatic sensations that are interpreted by agoraphobic patients as signals of impending catastrophes and causes them to react fearfully. This fear reaction intensifies the somatic sensations and brings them into a vicious cycle of fear and flight, which is maintained by their excessive attention to threat cues. Some authors have pointed to the importance of developmental antecedents in the etiological model of agoraphobia and of anxiety in general (Goldstein, 1982; Kolk, 1989). Their view has been supported by review studies (Jacobson, Wilson & Tupper, 1988; Roy-Byrne & Cowley, 1995; see also Roth & Fonagy, 1996) that show that the therapeutic techniques based on the cognitive-psychophysiological model only cause clinically significant recovery in about one-third of the agoraphobia patients. Patients with little avoidance behavior (so-called 'panic disorder patients') seem to benefit more from this therapeutic angle than proper agoraphobics.

Attachment theory has offered the hypothesis that agoraphobia is at least partially caused by anxious mental representations of attachment relationships, rooted in early interaction with primary caregivers. Bowlby (1973) hypothesized that an anxious-ambivalent internal working model of attachment plays a key role in the etiology of agoraphobia. He considered the fear of leaving home (separation anxiety) as the central symptom of this condition. A meta-analysis by de Ruiter and van IJzendoorn (1992) revealed that agoraphobics indeed report significantly more childhood separation anxiety and parental overprotection than panic disorder patients without agoraphobia and normal controls. The authors suggest that anxious-ambivalent attachment is one of the risk factors for the development of agoraphobia. Shear (1996) too notes that attachment-theoretical ideas may be of great relevance for understanding clinical anxiety disorders and she specifically points out the possibility that disturbed attachment relationships play a role in the etiology and pathogenesis of panic disorder with agoraphobia.

The current experiment was designed to study the relationship between the state of mind with regard to attachment, as measured with the AAI, and cognitive processes, in particular attention and memory, in an anxiety disorder sample. Attention was assessed with the modified Stroop task in both an unmasked (supraliminal) and a masked (subliminal) version. To be able to differentiate for emotional valence, positive, neutral and threatening stimuli were offered. Memory was assessed by means of a free-recall and a recognition task, also with positive, neutral and threatening stimuli. Two questionnaires were administered to...
be able to control for self-reported anxiety level and self-reported psychopathology symptoms.

We expected to find differences between autonomous and insecurely attached participants in the processing of threatening information because of regulatory differences in their respective attachment schemata. Specific hypotheses about the two insecure groups were inferred from the ways dismissing and preoccupied respondents diverge on the AAI.

In the unmasked version of the modified Stroop task, a preoccupied attachment representation was expected to slow down reaction times to threatening stimuli, because preoccupied individuals are known to become enmeshed and unable to fend off what is threatening to them. Participants with a dismissing attachment representation, on the other hand, were expected to show shorter response latencies to threatening stimuli, because these individuals are known to show strong cognitive defense to threatening information. Autonomously attached individuals were expected to have reaction times in between the two insecure groups. In the subliminal (masked) version of the Stroop task, we expected both insecurely attached groups to react slower to threatening stimuli, because they cannot use their defense strategies at an automatic level, while autonomously attached individuals were expected to react faster to threatening stimuli than the two insecure groups, as a result of an absence of interference.

On the free recall task, dismissing participants were expected to reveal the poorest memory for threatening stimuli as they are thought to elaborate threatening material less well because of defensive processing. Preoccupied participants were expected to show superior recall for threatening words because of excessive elaboration. Autonomously attached individuals were supposed to score in-between the two insecure groups. Inspection of incorrectly remembered words may reveal the accessibility of the cognitive schema for that category at the time of recall. On the recognition task, differences between attachment groups were expected to be absent, because recognition concerns perceptual memory and is less dependent on cognitive elaboration and on the strength of associations between representations.

Method

Participants and Procedure
Thirty-two individuals voluntarily participated in this study. The sample consisted of 17 men and 15 women with a mean age of 33.7 (SD = 10.8, range 19-67 years). They were all anxiety disorder outpatients referred for treatment to a regional psychiatric hospital. The interviewing and testing took place in the period between the intake procedure and the start of cognitive-behavioral therapy. Participants were tested individually at the hospital. Participation consisted of five 1.5-hour sessions, in which the ADIS-R, the AAI, the Stroop task, two memory tests, a perception task not reported on here, and several questionnaires (among them the STAI and the SCL-90) were administered. Nineteen of the participants received medication at the time of testing: 9 were using an antidepressant, 4 were using a benzodiazepine and 6 were using both an antidepressant and a benzodiazepine.

Data were lost in four instances. One participant dropped out of the study after two sessions because of a crisis and thus did not complete the questionnaires, the Stroop task and
the memory tests. Two participants did not understand the instructions for the Stroop task and made over 25% mistakes, which made their results unfit for further analyses. One participant was colorblind and thus could not conduct the Stroop task. Attachment classifications and diagnoses of these four individuals did not differ significantly from the other participants.

**Measures**

**Anxiety Disorders Interview Schedule-Revised.** The ADIS-R (Dutch version by de Ruiter, Bouman, & Hoogduin, 1993) is a semi-structured interview schedule, which provides a differential diagnosis for the DSM-III-R categories anxiety disorders, mood disorders, somatoform disorders and substance abuse. The ADIS-R also globally screens for psychotic episodes. Respondents are questioned about medication use and medical history.

The diagnostic interviews in this study were conducted by three clinical psychology interns who were trained in the use of the ADIS-R and in adjustments of the interview to DSM-IV criteria (APA, 1994). All participants met DSM-IV criteria for an anxiety disorder as a primary diagnosis (panic disorder with agoraphobia, n = 21; panic disorder without agoraphobia, n = 6; social phobia, n = 3; generalized anxiety disorder, n = 2). All diagnoses were checked afterwards against the psychiatric assessments from the outpatient clinic; there were no disagreements.

**Adult Attachment Interview.** The AAI is a semi-structured interview with 21 questions and standardized probes. Respondents are asked for descriptions of their childhood relationships with their parents in general, and in specific situations like illness, distress and separation. Furthermore, they are asked about memories of rejection and threat by the parents, and about abuse by and loss of important figures. Respondents are also asked how they think their childhood experiences have influenced their personality and (if relevant) their behavior towards their own children, and they are asked about their current relationship with their parents. The coding system of the AAI does not depend on what respondents say they remember, but on how they speak about their experiences in terms of coherence. Adult attachment classifications show a reasonable test-retest reliability over 2-month and 12-month periods, and are independent of IQ, autobiographical memory, verbal ability, social desirability, interviewer and coder (Bakermans-Kranenburg & van Ijzendoorn, 1993; Sagi et al., 1994; Benoit & Parker, 1994).

Twenty of the AAI’s were coded according to the manual (Main & Goldwyn, 1994) by Dr. C. de Ruiter, who was trained in Charlottesville, U.S.A., in 1990 and has 85% intercoder reliability with Dr. M. Main. Ten of these interviews (50%) were double-coded by I.A. Zeijlmans van Emmichoven, who was trained by M. Main and E. Hesse in Leiden, the Netherlands, in 1995, and has an intercoder reliability over 83% with Dr. M. Main. Percentage of agreement on these 10 cases was 100% for the 3-way classification and 90% (kappa = .80) for the 4-way classification. The other twelve AAI’s in this study were coded by I.A. Zeijlmans van Emmichoven. Five of these AAI’s (17%) were double-coded by Dr. M.H. van IJzendoorn, who was trained in Charlottesville, U.S.A., in 1988 and in Leiden, the Netherlands, in 1991 and 1995. Across these five interviews, agreement was 100% for the 3-category classification and 90% (kappa = .55) for the 4-category classification. Disagreements were solved through discussion.
\textbf{Emotional Stroop task.} Stimulus words: The 3x24 stimulus words were chosen from a list of 2250 words that had been rated by independent raters as belonging to one of 5 categories (ter Laak, 1992). For our study, words were selected from the categories \textit{positive}, such as "optimism," "happiness"; \textit{neutral}, such as "practical," "short"; and \textit{threatening}, such as "murder," "fatal". All words had been matched for length (number of letters as well as number of syllables), and for the degree to which the raters had judged the word as typical for the category. The latter judgment is thought to be highly associated with frequency in daily use.

Hardware: The words were presented on a high resolution VGA color monitor that was connected to a 386 microcomputer. The response time was recorded in milliseconds by a voice key (100-3000 Hz) that was connected to the computer. The experimenter recorded the color named by pushing a button on a response panel.

Software: Before the Stroop words appeared in the center of the screen, a fixation square was presented for 500 milliseconds. The stimuli appeared in 6-mm capital letters in one of four colors (red, yellow, blue or green). Participants were instructed to ignore the word meaning and name the color as fast as possible. They started out with 18 practice trials, after which all stimulus words were presented twice in the subliminal (masked) and twice in the supraliminal (unmasked) condition, resulting in a total of 72 x 2 x 2 = 288 trials, which were divided into 8 blocks of 36 trials. Words, masking condition and word color were randomly mixed, with the constraints that each color appeared in 25\% of the trials, each word was presented once in each of the colors, both the same color and the same stimulus category could not appear in successive trials, and for each participant the task was newly randomized.

In the supraliminal condition, the word remained on the screen until the participant named the color. In the subliminal condition, the word was replaced by a mask (a row of ###) of the same length and in the same color after 14.3 milliseconds (i.e., one VDU raster scan). The masking procedure was designed to prevent conscious awareness of the words, without preventing semantic processing (cf., Marcel, 1983; MacLeod & Hagan, 1992).

\textbf{Awareness check.} To make sure the participants had been unable to consciously perceive the stimuli in the masked presentation condition, a forced-choice word discrimination task was presented. This task consisted of 96 trials, divided into 8 blocks of 12 trials each. After each Stroop block, an awareness block was presented. Half of the time a word was presented for 14.3 milliseconds, while during the other half a random letter string of the same length was presented. Both were immediately followed by a mask of equivalent length. Participants were instructed to decide whether the letter string appearing before the mask was a word or not, and indicate their decision by pressing a button on a response box. Participants were expected to show only chance levels of performance on this task if our assumptions about the subliminal presentation were correct.

\textbf{Memory tasks.} The stimulus set consisted of 12 positively valenced, 12 neutral and 12 threatening words. The words were matched for length and number of syllables; each word in each category was matched with a word in each other category with respect to frequency in daily use (ter Laak, 1992). The words were shown on a computer screen for one second, and every 2 seconds a new word was shown. The presentation was in random
order (see Watts & Coyle, 1993). Participants were instructed to pay close attention to the words, but no suggestion of a memory task was given. After a 30-minute distracter task (completing questionnaires) participants did a free recall and a recognition task. For the free recall task, participants were instructed to write down as many words as they could remember from the previous word presentation. When they indicated they had finished, they were encouraged once to try to remember more words. For the forced-choice recognition test, participants were shown all 36 words from the original target word list and 36 filler words, matched for emotional valence, length and frequency, and again shown in random order. Participants were instructed to decide whether they had seen the word before in the word list by pressing a button on the response box.

Questionnaires. The State-Trait Anxiety Inventory (STAI; Dutch version: van der Ploeg, Defares, & Spielberger, 1979) contains 20 statements about trait anxiety and 20 statements about state anxiety. Participants indicate on a four-point scale how strongly the statements apply to them. Internal consistency (alpha) in this study was .94 for trait anxiety and .93 for state anxiety. The psychometric qualities of the STAI have been found satisfactory, and the manual provides normscores.

The Symptom Check List (SCL-90-R; Dutch version: Arrindell & Ettema, 1986) contains 90 items about psychological dysfunctioning. The SCL-90 has 8 subscales (anxiety, agoraphobia, depression, somatization, interpersonal sensitivity, cognitive-performance difficulty, hostility and sleep problems) and one overall score for psychoneuroticism. Internal consistency (alpha) in this study was .98 for all 90 items together. Internal consistency of the subscales ranged between .85 and .94, with the exception of the subscale 'sleep problems' which had an alpha of .59. The psychometric qualities of the SCL-90 have been found satisfactory, and the manual provides normscores.

Results

Adult Attachment Interview
Nine participants (28.1%) were classified as autonomous, 15 (46.9%) as dismissing and 8 (25%) as preoccupied. Three respondents (one dismissing, two preoccupied) received a primary classification as unresolved with respect to loss or trauma. The distribution of the AAI classifications is shown in Table 1. The AAI distribution in our sample was compared to a standard probability distribution based on clinical samples with adult psychiatric patients (see van IJzendoorn & Bakermans-Kranenburg, 1996). The distributions were compared with Multinom (Kroonenberg, 1998). The 3-way AAI distribution (dismissing, autonomous and preoccupied) differed significantly from the standard probability distribution: there were more autonomous participants in our sample ($\chi^2 (2) = 10.94, p < .01$). The 4-way AAI distribution (with separate classification of the "unresolved" category) also differed significantly from the standard probability distribution: there were significantly more autonomous participants and less unresolved participants in our sample ($\chi^2 (3) = 40.13, p < .01$).
Chapter 3

There were no differences between the AAI categories for age, sex, relationship status, or medication use. There was no significant relation between attachment status and DSM-IV diagnosis (see Table 1).

<table>
<thead>
<tr>
<th></th>
<th>Dismissing</th>
<th>Autonomous</th>
<th>Preoccupied</th>
<th>Unresolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants</td>
<td>15 (14)</td>
<td>9 (9)</td>
<td>8 (6)</td>
<td>0 (3)</td>
</tr>
<tr>
<td>Panic disorder with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>agoraphobia</td>
<td>9 (8)</td>
<td>8 (8)</td>
<td>4 (3)</td>
<td>0 (2)</td>
</tr>
<tr>
<td>Panic disorder</td>
<td>3 (3)</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Social phobia</td>
<td>2 (2)</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>0 (1)</td>
</tr>
<tr>
<td>Generalized anxiety disorder</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Table 1. Distribution of attachment classifications and DSM-IV diagnoses (4-way AAI distribution in brackets).

Analyses of the Stroop response latencies and the memory tasks were performed both for 3-way and 4-way AAI classifications; there were no differences in the results. The results reported here are based on 3-way AAI classifications with the three unresolved participants classified according to their secondary (or ‘forced’) attachment classification.

**STAI**
The mean score for state anxiety was 51.8 ($SD = 12.9$). This is slightly higher than the normative scores for psychiatric outpatients (6th decile). The mean score for trait anxiety was 56.2 ($SD = 10.3$). This is somewhat higher than the normative scores for trait anxiety in outpatient samples (7th decile). The correlation between the two STAI scales was significant ($r = .58$, $p < .01$, 2-tailed). There was no significant relation between both STAI scores and the AAI classifications, or between both STAI scores and DSM-IV diagnoses. There was no relation between the STAI scores and the results on both memory tasks. There was no significant relation between the trait anxiety scores and scores on the Stroop task. The state anxiety scores correlated positively with all of the Stroop response latencies (Spearman’s $r$ ranged between .46 and .62, $p < .01$, 1-tailed). For this reason, state anxiety was added as a covariate in all Stroop analyses.

**SCL-90**
The SCL-90 scale scores ranged closely around the norm scores for outpatient samples. There were no significant relations between the SCL-90 scores and the ADIS-R diagnoses. Two SCL-90 scales were related to the AAI classifications: dismissing participants scored significantly lower than autonomous and preoccupied participants on the depression subscale ($F(2,30) = 5.00$, $p < .01$, Student-Newman-Keuls multiple comparisons) and dismissing participants scored lower than autonomous ones on the agoraphobia scale ($F(2,30) = 3.84$, $p < .05$, Student-Newman-Keuls multiple comparisons). There was no significant relation between the SCL-90 scores and scores on the Stroop task. All SCL-90 scales correlated positively with the score for incorrectly recalled threatening words on the free recall task.
Overall, there was a significant correlation between the psychoneuroticism scale and the score for incorrectly recalled threatening words \( (r = .49, p < .01, \text{ 2-tailed}) \). There were no significant relations between the SCL-90 scales and the recognition task.

**Stroop task**

A repeated-measures analysis of variance (ANOVA) was conducted with attachment group as between-subjects factor, masking condition and word valence as within-subject factors and state anxiety as a covariate. There was a significant three-way interaction effect between attachment classification, masking condition and word valence \( (F(4,56) = 2.62, p < .05) \). Underlying were significant interaction effects between word valence and attachment classification \( (F(4,56) = 4.22, p < .01) \), and between masking condition and attachment classification \( (F(2,28) = 7.25, p < .01) \). Furthermore, there was a significant interaction effect between word valence and masking condition \( (F(2,56) = 12.68, p < .01) \). This interaction effect was underlined by main effects for word valence \( (F(2,56) = 22.26, p < .01) \) and for masking condition \( (F(1,28) = 142.61, p < .01) \). Table 2 shows the mean response latencies on threatening, neutral and positive words in the masked and the unmasked condition for dismissing, autonomous and preoccupied participants.

<table>
<thead>
<tr>
<th></th>
<th>Dismissing ((n = 12))</th>
<th>Autonomous ((n = 8))</th>
<th>Preoccupied ((n = 8))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Masked presentation:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatening</td>
<td>678 (79)</td>
<td>725 (92)</td>
<td>705 (127)</td>
</tr>
<tr>
<td>Neutral</td>
<td>685 (63)</td>
<td>720 (100)</td>
<td>701 (120)</td>
</tr>
<tr>
<td>Positive</td>
<td>676 (69)</td>
<td>720 (97)</td>
<td>688 (121)</td>
</tr>
<tr>
<td><strong>Unmasked presentation:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatening</td>
<td>761 (76)</td>
<td>911 (157)</td>
<td>791 (147)</td>
</tr>
<tr>
<td>Neutral</td>
<td>732 (84)</td>
<td>814 (107)</td>
<td>767 (162)</td>
</tr>
<tr>
<td>Positive</td>
<td>736 (77)</td>
<td>828 (127)</td>
<td>775 (176)</td>
</tr>
</tbody>
</table>

Table 2. Mean Stroop response latencies in msecs (SD’s in brackets) for the 3 types of stimuli in 2 masking conditions

Post-hoc analyses of the interaction effects between attachment classification, word valence and masking condition (Student-Newman-Keuls tests for multiple comparisons) revealed that dismissing and preoccupied participants reacted significantly faster to the unmasked threatening words than the autonomous group \( (F(2,27) = 4.82, p < .05) \).

Post-hoc \( t \)-tests of the dependent variables revealed that all participants reacted slower to the unmasked than to the masked stimuli \( (p < .001) \). With unmasked presentation, all participants reacted slower to the threatening words than to the neutral and positive words.

Next, Stroop reaction times were subjected to another repeated-measures analysis of variance (ANOVA) with agoraphobia diagnosis added as second between-subject factor. This analysis yielded no results different from the ones reported above.
Chapter 3

Awareness checks
On the awareness checks, our participants’ performance did not differ significantly from chance, indicating they had not been able to consciously recognize the stimulus words in the masked condition ($t(27) = .04, ns$).

Free recall task
The average numbers of correctly recalled words from the three categories are presented in Table 3. One-way ANOVA’s (Kruskall-Wallis) revealed a significant difference between the AAI classifications on the number of threatening words recalled ($\chi^2 (2) = 6.17, p < .05$). Post-hoc analyses (Mann-Whitney one-tailed paired analyses with Bonferroni correction) showed that the dismissing participants recalled significantly less threatening words than the autonomous group ($p < .02$). Also, the preoccupied participants remembered significantly less threatening words than the autonomous ones ($p < .02$). Paired analyses of the word valence categories (Wilcoxon) revealed that all participants recalled more threatening than positive words ($p < .01$).

Analyses of the incorrectly recalled words (see Table 4) revealed no differences between attachment groups. Paired analyses of the incorrectly recalled words revealed that more threatening than neutral words were incorrectly recalled ($p < .01$) and more threatening than positive words were incorrectly recalled ($p < .05$).

Agoraphobics did not differ from non-agoraphobic anxiety patients on any of the variables in the free recall task.

Recognition task
The average numbers of correctly recognized target words are presented in Table 3. Recognition data were analyzed for percentage correctly recognized target words and for percentage correctly recognized filler words. Two repeated-measures analyses of variance (ANOVA) were conducted with attachment group as between-subjects factor and word valence as within-subject factor. There were no interaction effects between attachment classification and word valence. Also, there were no main effects for attachment classification. In both analyses, a main effect for word valence was found. Post-hoc $t$-tests (with Bonferroni correction) were conducted for the dependent variables. The one main effect for word valence ($F(2,62) = 5.48, p < .01$) was caused by threatening targets being better recognized than neutral targets ($t(30) = 4.73, p < .001$). The other main effect for word valence ($F(2,62) = 32.64, p < .001$) was caused by threatening fillers being better recognized than positive fillers ($t(30) = 6.52, p < .001$) and neutral fillers being better recognized than positive fillers ($t(30) = 8.28, p < .001$).

Analysis of the incorrectly recognized filler words (see Table 4) revealed a single main effect for word valence ($F(2,62) = 32.64, p < .001$). Post-hoc analyses showed that positive filler words were more often incorrectly recognized than threatening filler words ($t(30) = 7.52, p < .001$) and also more often than neutral filler words ($t(30) = 7.06, p < .001$).

Agoraphobics did not differ from non-agoraphobic anxiety patients on any of the variables in the recognition task.
Attachment, anxiety disorder and information processing

<table>
<thead>
<tr>
<th></th>
<th>Dismissing (n = 14)</th>
<th>Autonomous (n = 9)</th>
<th>Preoccupied (n = 8)</th>
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</thead>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
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<td>Positive</td>
<td>7.6 (2.2)</td>
<td>8.3 (2.2)</td>
<td>8.0 (2.8)</td>
</tr>
</tbody>
</table>

Table 3. Average number of correctly recalled and recognized words (SD's in brackets) for the 3 types of stimuli

<table>
<thead>
<tr>
<th></th>
<th>Dismissing (n = 14)</th>
<th>Autonomous (n = 9)</th>
<th>Preoccupied (n = 8)</th>
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</thead>
<tbody>
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<td><strong>Recalled:</strong></td>
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<td></td>
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<tr>
<td>Threatening</td>
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<td>1.8 (1.3)</td>
<td>2.5 (3.5)</td>
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<tr>
<td>Neutral</td>
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<td>1.0 (1.3)</td>
<td>0.8 (0.9)</td>
</tr>
<tr>
<td>Positive</td>
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<td>1.6 (1.9)</td>
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</tr>
<tr>
<td><strong>Recognized:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatening</td>
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<td>2.3 (2.8)</td>
<td>1.8 (1.4)</td>
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<tr>
<td>Neutral</td>
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<tr>
<td>Positive</td>
<td>4.4 (1.9)</td>
<td>4.0 (1.9)</td>
<td>5.0 (1.8)</td>
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</table>

Table 4. Average number of incorrectly recalled and recognized words (SD's in brackets) for the 3 types of stimuli

**Discussion**

The present study concerned the effect of the mental representation of attachment on information processing in anxiety disorder patients. Using different experimental tasks, we distinguished early (pre-attentional and attentional) from later (elaboration and recognition) stages of information processing. Results on the Stroop task showed color-naming interference for threatening words in the supraliminal condition: both insecure groups reacted faster than autonomous participants did. On the free recall task, both insecurely attached groups showed inferior recall of threatening words. We will discuss the findings and limitations of our experiment and formulate recommendations for future studies.

**Stroop task**

For the Stroop task with subliminal stimulus presentation, we predicted that both dismissing and preoccupied participants would show longer response latencies to threatening stimuli than autonomous participants, because at an automatic level defensive strategies cannot be
used. However, we found no differences between attachment groups on the masked Stroop presentation. The stimulus onset asynchrony (SOA) was put at a level that other studies (e.g., Mogg, Bradley, et al., 1993; Mogg, Kentish, et al., 1993) have reported to allow cognitive processing without conscious awareness. Results from the awareness checks indicated that participants indeed were unaware of the presence of stimulus words in the subliminal condition. However, finding no differences between attachment groups in the subliminal condition leaves us at a guess whether the word content was processed and just did not interfere, or whether nothing was processed at all. This question can be resolved by using individually determined masking thresholds (see Merikle, 1992) instead of so-called objective thresholds (see Holender, 1986). Note, however, that a number of studies have found interference effects of subliminally presented material with the same masking threshold as the one used in our study (e.g., Mogg, Bradley, et al., 1993; Mogg, Kentish, et al., 1993; Bradley, Mogg, Millar, & White, 1995; Mogg, Bradley, & Williams, 1995).

In the supraliminal Stroop condition, we expected dismissing participants to show shorter response latencies and preoccupied participants to show longer response latencies to threatening stimuli, both compared to the autonomous group. We found significant differences between autonomous and insecurely attached participants: the dismissing and the preoccupied group both showed significantly shorter response latencies to the unmasked threatening stimuli than the autonomous group. For the dismissing group, this finding is consistent with the idea that they show cognitive defense towards processing threatening information. For the preoccupied group, this finding is contrary to our prediction. An explanation may be that attachment insecurity, but not the type of insecurity, is a decisive factor in the early stages of information processing. Both insecure groups are known to avoid confrontation with painful experiences in the AAI but to this end use different strategies. We propose that at the level of early information processing, the insecure groups cannot apply their respective strategies and so both dismissing and preoccupied attachment representations lead to cognitive defense against threat.

An additional explanation for our Stroop results may lie in the fact that the stimuli offered did not concern attachment-related threatening information. In a future study, it would be useful to investigate whether there is a difference between insecurely attached groups in what is experienced as threatening. This could be done by offering stimuli related specifically to attachment threat besides generally threatening stimuli. It has been shown in patient samples that both the relevance of stimuli to the cognitive schema and the negativity of the material is of influence on the degree of Stroop interference (Williams et al., 1996).

State anxiety scores correlated positively with all dependent variables of the Stroop task. Controlling for the effect of state anxiety on response latency still left significant interaction effects of attachment classification, word valence and masking condition. Mathews and MacLeod (1994) have suggested that state anxiety only elicits selective attention to threatening stimuli in high trait anxious individuals. Checking our data for the influence of the combined state and trait anxiety levels on the Stroop response latencies, we found that participants scoring above the median on both trait and state anxiety had significantly longer reaction times on the unmasked threatening stimuli than participants scoring below the median on both state and trait anxiety ($F(3,27) = 3.16, p < .05$, Student-Newman-Keuls multiple comparisons). However, the combined state and trait anxiety scores were not significantly related to attachment classification.
Free recall task

In view of the equivocal results from previous studies concerning memory biases in anxiety disorder patients, we investigated whether differences in attachment representations might explain some of the different findings in previous research. On the free recall task, both dismissing and preoccupied participants showed inferior recall for threatening words compared to autonomous participants. For the dismissing group, this fits our hypothesis that these individuals elaborate threatening information less well, as is also suggested by the AAI where they tend to claim a bad memory. It has been shown that dismissing individuals perform well on memory tests as long as the stimuli do not concern attachment experiences (Bakermans-Kranenburg & van IJzendoorn, 1993; Sagi et al., 1994). Apparently, even generally threatening information is defended against by the dismissing group. We expected preoccupied respondents to show superior recall for threatening material, in line with their excessive preoccupation with negative attachment experiences in the AAI. Surprisingly, they too recalled significantly less threatening words than autonomous participants did. Again, we suggest that both insecurely attached groups react defensively at this level of information processing, contrary to the AAI where they are discriminated by their verbal strategy. An additional explanation may be that the stimuli offered in the memory test did not concern attachment-related threatening information.

Overall, all participants recalled significantly more threatening than positive stimulus words, which provides support for the idea that an activated threat schema produces a memory bias (Eysenck & Mogg, 1992). This is also consistent with studies that showed that anxiety disorder patients show superior recall of threat words compared to non-threatening information (Cloitre & Liebowitz, 1991; Becker, Rinck, & Margraf, 1994; Cloitre, Shear, Cancienne, & Zeitlin, 1994).

The occurrence of semantic intrusions of threatening material in the free recall task in all participants possibly indicates a general response bias in anxiety disordered patients, independent of state or trait anxiety levels and independent of attachment status (see Mogg & Mathews, 1990). The threat schema may be strongly activated by the memory induction and may result in general selective memory for threatening material. The free recall task is a conceptually driven paradigm that taps into the meaning of the offered words. The anxiety disorder patients in this study showed high accessibility of their threat schemata. We may have categorized the threat stimuli too broadly, causing cue-overload (Williams et al., 1997). Our finding that high scores on all SCL-90 scales were positively correlated with the amount of incorrectly remembered threatening words on the free recall task shows that people who report higher levels of symptomatology also seem to suffer more semantic intrusions of threatening information. Apparently, cognitive schemata for threatening information are more accessible in individuals with high self-rated symptomatology.

Recognition task

As expected, there were no differences between attachment groups on the forced-choice recognition task. Overall, all participants were better at correctly recognizing threatening target words than neutral target words. Also, all participants were better at correctly recognizing threatening and neutral filler words than positive filler words. Again, we may see this as evidence for better elaboration of threatening material in anxiety disorder patients.
Sample characteristics

Compared to other samples with psychiatrically disturbed adults, our sample included more autonomous and fewer unresolved participants. This may be because of self-selection: since participation in this study was voluntary, it is possible that autonomous individuals are more, and unresolved individuals are less willing to expose themselves to intensive interviewing and testing.

The results on the SCL-90 in relation to attachment classification can be interpreted in light of previous findings on the relation between self-reported level of symptomatology, expert-rated level of symptomatology and attachment representations. It has been shown that patients with dismissing attachment representations underreport the severity of their symptoms, suppress anxiety and emotional expression, and endorse strong and independent self-descriptions (Dozier & Lee, 1995; Pianta, Egeland, & Adam, 1996). Our finding that dismissing participants scored significantly lower on the SCL-90 depression and agoraphobia subscales, while there was no significant relation between the ADIS-R diagnoses and the attachment classifications, corroborates the evidence for a tendency to deny distress in individuals with a dismissing state of mind with regard to attachment.

Co-occurrence of anxiety and depression could not be completely controlled for in this study. By using the ADIS-R for diagnosing, depression as a primary diagnosis was ruled out. However, this does not mean that the anxiety disorder patients did not experience any depressive symptoms, as it is a well-established fact that comorbidity of anxiety and depressive symptoms is high. The Williams et al. (1997) model for selective information processing predicts explicit differences in the nature of cognitive biases in anxiety and depression. In a future study of the effect of attachment insecurity on information processing in clinical disorders, this should be accounted for by using more specific diagnostic instruments that allow control of the level of symptomatology.

In conclusion, we suggest that our study provides provisional evidence for one of the most basic assumptions of attachment theory: that the state of mind with regard to attachment influences information processing, particularly attention and memory. Differential effects for dismissing and preoccupied attachment representations could not be shown: both insecure groups revealed cognitive defense against threatening stimuli on the Stroop task and on the memory task. We propose that dismissing and preoccupied individuals do not differ in their basic cognitive schema (as can be inferred from our attention and memory results) and suggest that they only differ in their response strategies, for example in the AAI. Put otherwise, there may be two different insecure strategies to handle threat based on one insecure attachment schema.

We recommend that future investigations into attachment-related information processing compare different kinds of threatening material (general, disorder-specific and attachment-specific) and refine experimental conditions with individually determined thresholds for pre-attentive information processing. Furthermore, it will be interesting to compare information processing and response selection tasks to investigate similarities and differences in the nature of the insecure mental representations of attachment.
Because of the small sample and because the data did not completely fulfil the assumptions of normality and homogeneity as required for parametric statistical techniques, reaction times were first analyzed with Kruskall-Wallis one-way analyses of variance by rank. Between-group differences were further analyzed with the multiple comparisons inequality (Siegel & Castellan, 1988). These statistical tests led to the same conclusions as the ones reported.