What’s in a Name? Attachment-Related Attentional Bias

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Participants completed a dot probe task that presented pairs of first names: the participant’s own name and a neutral name (Experiments 1–4), the name of their attachment figure and a neutral name (Experiments 1–4), or the name of a known person and a neutral name (Experiments 2–4). A significant attentional bias effect was found for the attachment name in attachment-related contexts, whether they were threatening or positive. The results of Experiments 2 and 4 showed that the attentional bias effects for the attachment name were not driven by familiarity effects and could not be interpreted in terms of salience. Attachment anxiety was associated with hypervigilance toward the attachment name in threatening and positive attachment contexts. Attachment avoidance was unrelated to any attentional bias effects.

Keywords: attentional bias, selective attention, adult attachment style, dot probe, individual differences

Bowlby’s attachment theory (1969/1982) has a strong influence on our present understanding of early and adult attachment. Although this theory already postulated an information-processing model of attachment, experimental research into the mechanisms by which people process attachment-related material is still in its infancy. Specifically early information-processing mechanisms, such as attention, that are considered of key relevance in the regulation of the attachment system (Main, 1990) have not yet been studied systematically. Therefore, the present set of studies focused on a neglected aspect of attachment working models by investigating the effect of attachment representations on selective attention to attachment-related information in adults.

Cognitive View on Attachment

Central to Bowlby’s attachment theory is the concept of internal working models (IWMs) that evolve out of early attachment experiences with primary caregivers. These basic cognitive structures are assumed to enclose specific beliefs about the self and the attachment figure, as well as processes that influence the encoding of interpersonal information (Pietromonaco & Feldman Barrett, 2000). IWM processes are presumed to affect pathways from childhood to adulthood by shaping cognitive, emotional, and behavioral response patterns that provide guidelines for coping with distress. One particularly important mechanism that may mediate linkages between past and present attachment representations is the process of selective attention. The latter has been argued to be of key relevance in extracting motivationally relevant information from our environment and, hence, guides our perception of the world. Furthermore, the deployment of attention is believed to be a crucial mechanism through which one regulates thoughts, feelings, goals, and behaviors (see Lang, Bradley, & Cuthbert, 1997; Mogg & Bradley, 1998). Within the attachment domain, attentional factors have already been studied in relation to the processing of threatening information (Belsky, Spritz, & Ćrnic, 1996; Dewitte, Koster, De Houwer, & Buysse, 2007; Kirsh & Cassidy, 1997; Main, Kaplan, & Cassidy, 1985; Zeijlmans van Emmichoven, Van IJzendoorn, De Ruiter, & Brosschot, 2003). However, attention involves more than just the filtering of incoming information, which is just a first step in the activation of the attachment system. That is, attention allocation may also serve important functions for the regulation of the attachment system once it has been activated.

The Attachment Behavioral System

A central tenet of Bowlby’s attachment theory (1969/1982) is that children and adults have an innate attachment behavioral system that is organized around seeking proximity toward significant others in times of need. When there is no signal of threat or when the attachment figure is perceived as nearby and responsive to one’s needs, the attachment system remains quiescent and one feels safe and confident to engage in other behavioral activities (e.g., exploration and affiliation). Once a threat has been detected, however, the attachment system becomes automatically activated, resulting in feelings of insecurity. To deal with these distressing feelings, people seek proximity toward the attachment figure to get comfort and protection. When this attachment figure is perceived as available and thus willing to provide support, the individual regains a sense of “felt security,” ending the activation of the attachment system. Repeated interactions with an available attachment figure usually result in the development of positive expectations about the availability of others in times of need, which is characteristic of securely attached individuals. Conversely, when the attachment figure is appraised as being unavailable and unresponsive, feelings of insecurity remain active, which encourages the development of alternative strategies of affect regulation. The
latter coincide with the development of negative expectations about the self and/or the other, which is characteristic of anxiously and avoidantly attached individuals (Brennan, Clark, & Shaver, 1998). Although both anxious and avoidant attachment styles are commonly referred to as insecure attachment, each style is associated with a distinct way of coping with stress arousal. Anxiously attached individuals adopt hyperactivating strategies that are manifested in exaggerated threat appraisals, increased proximity-seeking behavior, and hypervigilance toward the attachment figure. Avoidantly attached individuals, on the other hand, avoid attention and proximity to the attachment figure by deactivating the attachment system and relying on themselves to cope with distress (Fraley & Shaver, 2000; Mikulincer & Shaver, 2003). This model clearly defines that proximity seeking is a central coping mechanism for dealing with distress and that individual differences in attachment representations contribute to distress regulation by relying on, intensifying, or inhibiting proximity seeking toward the attachment figure. Provided that the maintenance of proximity and the regulation of felt security is a central pursuit of IWM (Bretherton, 1985), it can be argued that IWM and their underlying processes are interdependent with and mutually related to the regulation of the attachment system.

The appealing nature of this model resides in the fact that it integrates a normative and intraindividual perspective on attachment while putting forward some clear and verifiable assumptions. First of all, the attachment system is activated only in threatening conditions. That is, attachment-related as well as attachment-unrelated threat cues trigger the operation of attachment processes to achieve the goal of proximity toward the attachment figure. This stress-attachment link has been well documented in the literature. Several studies among infants as well as adults have demonstrated that the encounter with stressful events such as separation (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Fraley & Shaver, 1998), thoughts about loss (e.g., Fraley & Shaver, 1997), interpersonal conflict (Noller, Feeney, Bonnell, & Callan, 1994; Pietromonaco & Feldman Barrett, 1997), distress (Mikulincer, 1998; Simpson, Rholes, & Nelligan, 1992), and attachment-related and -unrelated distressing words (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Gillath, & Shaver, 2002) increases proximity seeking at the behavioral as well as at the cognitive level. These studies have also revealed that individual differences in attachment representations affect the extent to which this attachment system activation is being experienced. Mikulincer and colleagues (2000) have provided interesting evidence on this behalf. In three experiments using a lexical-decision task on the priming of a stress or neutral word, they found that secure persons reacted to stress primes with heightened accessibility of proximity-related thoughts. For anxious people, both proximity-related thoughts and worries were highly accessible under either stress or nonstress contexts because of their chronically active attachment system. Avoidantly attached individuals reacted the same as secure persons, except that they displayed defensive suppression of proximity worries. Beyond these individual differences, the three attachment groups reacted to stress with heightened accessibility of proximity themes, which supports the normative component of the stress-attachment link. This indicates that, in a distressing context, everyone undergoes (preconscious) activation of the attachment system.

Second, the attachment behavioral system is specifically oriented toward the attachment figure. That is, only proximity to or thoughts about the attachment figure can stop or prevent activation of the attachment system. Three features are critical in distinguishing attachment figures from nonattachment figures (Hazan & Shaver, 1994; Hazan & Zeifman, 1994). First, this person should be a target of proximity maintenance, meaning that one enjoys close contact with the attachment figure and gets upset when separated from him or her. Second, an attachment figure is used as a safe haven in times of distress, illness, or danger, meaning that this person provides support, protection, and advice when feeling sad or upset. Third, an attachment figure is relied on as a secure base from which one can explore the world, because this person promotes feelings of confidence and security. Provided that several persons can serve these attachment functions, it is generally believed that people can have more than one attachment figure (Collins & Read, 1990; Mikulincer & Arad, 1999; Ross & Spinner, 2001). In the present study, we are only interested in the primary attachment figure with whom one maintains a long-term and strong affective bond.

The third aspect of the attachment behavioral system that we want to emphasize is the most important one in terms of the present investigation. That is, adults, contrary to children, do not necessarily need the physical proximity of the attachment figure to obtain a sense of felt security. A mental representation of this person can suffice. Hence, threat automatically activates thoughts about the attachment figure, and these internal representations can become symbolic sources of protection (Mikulincer & Shaver, 2003). At the cognitive level, these mental representations may incline people to selectively attend to information related to the attachment figure. As such, it can be argued that attentional factors contribute to proximity maintenance and influence the regulation of the attachment system.

In summary, the attachment system (a) only gets activated on stress arousal, (b) is specifically oriented toward the attachment figure and, once activated, (c) elicits a mental representation of the attachment figure as a means to obtain a sense of psychological proximity (Mikulincer & Shaver, 2003). On the basis of these three assumptions of the attachment behavioral system, one can predict that, under conditions of threat, adults will selectively direct their attention to information related to their attachment figure(s), and this mechanism will be affected by individual differences in attachment representations. The present study was set up to test these hypotheses. There is one set of data that has some bearing on this research question. In three experiments, Mikulincer, Gillath, and Shaver (2002) primed their participants subliminally with (attachment-related as well as attachment-unrelated) threat words, followed by a lexical decision task in the first two studies and an emotional Stroop task in the third study. The target stimuli in these cognitive tasks were names of the attachment figure, close persons, known persons, and unknown persons. Their results showed that threat primes led to increased accessibility of attachment figure representations as indicated by faster reaction times on the lexical decision task and longer color-naming latencies on the emotional Stroop task. They also found that this effect was enhanced in persons who have a high level of attachment anxiety on the priming of both a stress and neutral word, but it was smaller (and even absent in an attachment-related stress context) in persons...
high in attachment avoidance, compared with those low in attachment avoidance.

Although these data clearly show that information regarding attachment figures is more accessible in a threatening context, they do not allow for the conclusion that people direct their attention to such information. In the present study, we are specifically interested in attentional processes because these are at the heart of attachment theory. That is, internal working models are conceived as providing rules for the direction and organization of attention (Main et al., 1985), which implies that attentional factors play an important role in the activation and functioning of the attachment system. In other words, we are not just interested in demonstrating that the attachment system gets activated on stress arousal by measuring cognitive accessibility; rather, we focus here on the effect of attention on the regulation of the attachment system, which takes the present research beyond the work of Mikulincer and colleagues (Mikulincer, Shaver, & Pereg, 2003). Moreover, the tasks used in previous research, namely the Stroop and lexical decision tasks, serve as measures of cognitive activation but have been criticized as measures of attention allocation. Researchers have suggested some interpretative difficulties with these tasks. It has been suggested that the Stroop effect does not reflect attention but arises from other factors such as interruption effects or task-irrelevant processes (e.g., de Ruiter & Brosschot, 1994). In the case of attachment, the latter could be positive or negative thoughts about the attachment figure or other attachment-related thoughts, which compete for attentional resources. Similar problems have been noted regarding lexical decision tasks (MacLeod, Mathews, & Tata, 1986). Even if the Stroop and lexical-decision tasks would capture a certain component of attention, it is certainly not the component of selective spatial attention that is in all likelihood crucial in the seeking for security and proximity from the attachment figure.

The Present Study

To investigate selective attention toward the attachment figure, we used a dot probe task (MacLeod et al., 1986), during which we presented pairs of first names. In the dot probe task, two stimuli, consisting of a critical stimulus and a neutral stimulus, are presented simultaneously at two different locations on the computer screen. After these stimuli have been removed from the screen, a small dot probe appears at the position of one of the two stimuli, and participants are asked to respond as quickly as possible to the location of the dot. When the dot replaces the critical stimulus, this is called a congruent trial and when the dot appears at the location of the neutral stimulus, this is called an incongruent trial. The idea behind the dot probe task is that reaction times are faster on congruent trials than on incongruent trials because attention is already allocated at the location where the probe appears. This is labeled as a congruency effect and indicates selective attention. Compared with other attentional bias tasks, the dot probe task is particularly suitable for measuring selective attention because the required response follows a double-stimulus presentation and thus implies the selection of one stimulus over another. Although the majority of the attentional bias studies apply a pictorial probe detection task, we preferred to use personally relevant names instead of pictures because physical appearance and other nonspécific factors could confound the results obtained with our dot probe task when using pictures of persons.

Hypotheses

As described earlier, the search for symbolic or psychological proximity is a cognitive process that is part of the primary attachment strategy and can thus be regarded as a normative process. This means that everyone is assumed to display an attentional bias effect toward the attachment figure. However, on the basis of attachment theory and the aforementioned research, we also predicted that individual differences in attachment style will modulate this attentional bias effect. Taking into account that anxiously attached individuals are characterized by a hyperactive attachment system (Mikulincer & Shaver, 2003; Mikulincer et al., 2003), we hypothesized that the attentional bias toward the name of the attachment figure would become more pronounced as attachment anxiety increases. Attachment avoidance, on the other hand, was expected to be negatively associated with the attentional bias for the attachment figure, because individuals who score high on the avoidance dimension tend to deactivate their attachment system when confronted with attachment-related threats (Mikulincer et al., 2002).

To investigate these hypotheses, we conducted four experiments. In Experiment 1, we explored whether an attentional bias effect toward the attachment figure’s name can indeed be found. In Experiment 2, we examined whether this bias is specific to the attachment figure or driven by familiarity effects. Through systematic variation of the priming context, distressing (Experiment 1) versus positive (Experiment 3), we also investigated whether this effect is unique to a stress-eliciting context, as is postulated by attachment theory. Experiment 4 was designed to exclude the interpretation that the attentional bias effect for the attachment name was caused by potentially confounding factors such as salience.

Experiment 1

The main goal of Experiment 1 was to examine selective attention toward the name of the attachment figure in an attachment-related stress context. Stress was induced by a procedure in which participants were asked to imagine their attachment figure going abroad for a long period of time. In this respect, it has been demonstrated that asking people to imagine their attachment figure leaving them for a while, generates an amount of distressing feelings (Fraley & Shaver, 1997). Consequently, being physically separated from their attachment figure makes people appeal to psychological sources of proximity. Then, we administered a dot probe task to the participants, with both stimulus pairs consisting of the first name of the attachment figure (i.e., attachment name) and a neutral name and pairs consisting of the participant’s first name (i.e., own name) and a neutral name. Faster responding to congruent trials (dot appears at the location of the attachment or own name) than to incongruent trials (dot appears at the opposite location of the attachment or own name) indicates an attentional bias effect (MacLeod et al., 1986). On the basis of attachment theory, we predicted an overall attentional bias effect toward the name of the attachment figure. In addition, we expected this effect to be particularly pronounced in anxiously attached participants,
whereas attachment avoidance should be negatively associated with the attentional bias effect toward the attachment figure’s name. By including trials with the name of the participants, we could verify whether the relation between bias effects and attachment style is specific to attachment names.

**Method**

**Participants.** Our sample consisted of 59 participants. Of those, 25 were visiting students from high school (mean age = 17 years) who volunteered to participate. The remaining 34 were first-year psychology students at Ghent University, Ghent, Belgium (mean age = 18 years) who participated in return for course credit.

**Materials.** As stimulus material we selected single words: the name of the attachment figure, the participant’s own first name, and neutral first names. We created three types of stimulus pairs in our dot probe task: pairs in which the name of the attachment figure was combined with a neutral name, pairs in which the participant’s own name was combined with a neutral name, and filler pairs that consisted of two neutral names (to avoid habituation effects). We assured that each of the critical stimuli was assigned to one of the four neutral stimuli. Each name was presented equally often during the task. The names were presented in black uppercase letters (Arial Black, font size 38), at a distance of 5 cm above and below the center of the screen. The probe detection task was programmed and presented with the INQUISIT 2.01 Millisecond software package (Millisecond Software, Seattle, WA) on a Pentium II computer with a 15-inch (38.1-cm) color monitor. Participants responded by pressing the q or m key of an AZERTY keyboard.

We used the revised Experiences in Close Relationships Scale (ECR; Fraley, Waller, & Brennan, 2000) to capture the two attachment dimensions, Anxiety and Avoidance. The Anxiety scale (18 items) taps fears of abandonment and strong desires of interpersonal merger, whereas the Avoidance scale (18 items) assesses discomfort with closeness, dependence, and intimate self-disclosure. This questionnaire has proven to be internally consistent and adequate in terms of construct validity (Brennan, Clark, & Shaver, 1998). In this sample, Cronbach’s alphas were high for the Anxiety subscale (0.89), as well as for the Avoidance subscale (0.92). By asking our participants to complete the questionnaires with their attachment figure in mind, we narrowed the target to one particular person to avoid social desirability effects (Stein et al., 2002).

**Procedure.** The experiment was conducted in groups of 4 participants. After signing an informed consent form, participants completed six questions referring to the three critical features that distinguish attachment figures from nonattachment figures (see introduction). Once their primary attachment figure was identified, participants were asked to imagine this person going abroad for 1 to 2 years. This separation story served primarily as a means to activate the attachment system (see Fraley & Shaver, 1998). Then, they were instructed to select four neutral names from a name list of 50 male and 50 female names. A neutral name was defined as a name that did not represent anyone they knew. The neutral names that were presented were relatively “common” names, ranging from short names to longer names. To match for word length, participants were urged to choose names with approximately the same number of letters as the name of their attachment figure. Next, participants performed the dot probe task followed by the ECR.

Participants were seated behind the computer at a distance of approximately 60 cm from the screen to perform the dot probe task. Our version of the task consisted of an instruction screen, 4 practice trials, and 160 test trials. Participants were instructed to respond to a small dot that would appear at the upper or lower location of the screen. Furthermore, they were instructed to respond as quickly and accurately as possible. All trials were presented in a random order. Each trial started with a fixation cross that was presented in the center of the screen for 1,000 ms. Then a name pair appeared with one name presented in the upper spatial location and the other name presented in the lower spatial location of the computer monitor. After 500 ms, these names disappeared and one of them was replaced by a small dot probe (5 mm in diameter). When the probe was presented at the upper location, participants pressed the q key with the left hand; when the probe was presented at the lower location, they pressed the m key with the right hand. The names and dot probes were presented equally often at the upper or lower position of the screen. The 160 test trials were divided in two blocks (without pause in between) of 80 trials consisting of 32 own name–neutral pairs, 32 attachment name–neutral pairs, and 16 neutral–neutral pairs.

**Data analysis.** Reaction times were subjected to a Name (own name, attachment name) × Congruence (congruent, incongruent) analysis of variance (ANOVA), with both variables treated as within-subject factors. Furthermore, attentional bias scores were calculated and then correlated with attachment anxiety and avoidance. To retain the full range of scores on the subscales of the ECR and in line with the dimensional view on attachment (Fraley et al., 2000), we preferred correlational analyses to intergroup analyses. The attentional bias indices were formed by subtracting the average detection time on congruent trials from the average detection time on incongruent trials. A positive bias score indicates vigilance (shorter reaction times on congruent trials than on incongruent trials), whereas a negative bias score indicates avoidance (shorter reaction times on incongruent trials than on congruent trials) (see Mogg, Millar, & Bradley, 2000).

**Results**

Latencies from trials with errors were removed (less than 3% in each condition), as well as reaction times shorter than 200 ms or longer than 2,000 ms, which were treated as outliers (Koster, Crombez, Verschuere, & De Houwer, 2003). Probe detection latencies that were 3 standard deviations above the individual mean were considered as additional outliers and excluded from statistical analyses.

Table 1 presents the mean response latencies for each trial type. The repeated measures ANOVA revealed a significant main effect of congruence, $F(1, 58) = 13.65, p < .001$, showing that participants responded faster on congruent trials ($M = 371$ ms, $SD = 48$ ms) than on incongruent trials ($M = 384$ ms, $SD = 54$ ms). Neither the main effect of name, nor the interaction effect between name and congruency were significant (all $Fs < 1$).

Both the attentional bias indices for the attachment name, $t(58) = 2.36, p < .05$, as well as for the own name, $t(58) = 3.04, p < .01$, differed significantly from zero. In addition, we investi-
ATTACHMENT-RELATED ATTENTIONAL BIAS

Table 1
Mean Reaction Times (and Standard Deviations) of Target Responses in the Dot Probe Task as a Function of Trial Type and Congruency in Experiment 1

<table>
<thead>
<tr>
<th>Trial type</th>
<th>Congruency</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own name–neutral name</td>
<td>Congruent</td>
<td>371 (50)</td>
</tr>
<tr>
<td>Attachment name–neutral name</td>
<td>Congruent</td>
<td>371 (49)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>387 (63)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>382 (52)</td>
</tr>
</tbody>
</table>

Note. Reaction times are given in milliseconds.

gated the correlations between anxious and avoidant attachment styles and the attentional bias scores toward the attachment name. These correlations are presented in Table 2. A significant positive correlation emerged between anxious attachment and the attentional bias index for attachment name. Neither the attentional bias for one’s own name nor the attentional bias for the attachment name correlated significantly with avoidant attachment.

Discussion

The most important finding of Experiment 1 was the significant attentional bias effect for the attachment name. This result is in line with the hypothesis that attachment system activation influences cognitive processing, causing selective attention to the name of the attachment figure. Note that an attentional bias effect toward the own name emerged as well. Although of secondary importance, this result is interesting because previous studies have suggested that an attentional bias toward one’s own name is not a robust and stable phenomenon (Bundesen, Kyllingsbaek, Houmann, & Jensen, 1997; Gronau, Cohen, & Ben-Shakhar, 2003; Harris & Pashler, 2004; Harris, Pashler, & Coburn, 2004).

In this respect, one could argue that the attentional bias effect for the attachment name says little about attachment processes because a similar bias effect was observed for the name of the participant. In other words, the bias effects may have been driven by general factors such as familiarity or personal relevance. However, the fact that only the attentional bias effect for the attachment name was related to attachment style, as measured by the ECR, suggests that the effect was indeed driven by attachment-related processes. More specifically, as predicted, the attentional bias effect for the attachment name was stronger for participants who had high scores on attachment anxiety. It should be noted, however, that attachment avoidance did not correlate with any of the attentional bias effects. We return to this finding in the General Discussion.

Experiment 2

To test an alternative explanation in terms of familiarity, we conducted a second experiment in which the name of a known person was paired with a neutral name. The absence of an attentional bias toward the name of a known person with whom one meets regularly, but who does not serve attachment functions, would then argue against an interpretation in terms of familiarity and would provide additional evidence for the specificity of the attentional bias effect.

Method

Participants. Forty-five psychology students from Ghent University participated in the study in return for course credit. Additionally, another 14 students from various faculties at Ghent University were paid 5 € for their participation in this study, resulting in a total sample of 59 participants. None of them had participated in the first experiment.

Materials and procedure. Here, we describe only the differences with Experiment 1. Participants were asked to identify not only their attachment figure but also a known person. They were told that a known person is someone they meet and speak to regularly but with whom they do not have a special, close relationship. Hence, the dot probe task in Experiment 2 consisted of three critical trial types: own name–neutral name, attachment name–neutral name, and known name–neutral name. Again, neutral–neutral trials were included as filler trials. To obtain a complete randomized combination of critical names with neutral names, we urged the participants to choose five instead of four neutral names from the name list. In this study, the 160 test trials were divided in two blocks of 80 trials consisting of 20 own name–neutral pairs, 20 attachment name–neutral pairs, 20 known name–neutral pairs and 20 neutral–neutral pairs.

Two self-report questionnaires followed the dot probe task, the ECR (Fraley et al., 2000) and the 10 items of the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). The latter was added to explore the relationship between selective attention for the participant’s own name, found in the first study, and participant self-esteem. In this sample, Cronbach’s alphas were high for both questionnaires (α = 0.89 for the ECR Anxiety subscale, α = 0.85 for the ECR Avoidance subscale, and α = 0.87 for the RSES).

Table 2
Correlations Between Individual Differences in Attachment Style as Measured by the ECR and Global Self-Esteem as Measured by the RSES Versus the Attentional Bias Scores for the Different Trial Types, Throughout the Four Experiments

<table>
<thead>
<tr>
<th>Attentional Bias Index</th>
<th>Attachment avoidance</th>
<th>Global self-esteem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attachment name</td>
<td>.01 , .08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.2**</td>
<td></td>
</tr>
<tr>
<td>Experiment 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own name</td>
<td>−.03 , −.01</td>
<td>−.11</td>
</tr>
<tr>
<td>Attachment name</td>
<td>.23* , −.01</td>
<td>−.27**</td>
</tr>
<tr>
<td>Known name</td>
<td>.02</td>
<td>.10 , .14</td>
</tr>
<tr>
<td>Experiment 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own name</td>
<td>.15 , −.07</td>
<td>−.04</td>
</tr>
<tr>
<td>Attachment name</td>
<td>.28** , −.08</td>
<td>−.11</td>
</tr>
<tr>
<td>Known name</td>
<td>.08 , −.16</td>
<td>.21</td>
</tr>
<tr>
<td>Experiment 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own name</td>
<td>−.16</td>
<td>.01 , −.02</td>
</tr>
<tr>
<td>Attachment name</td>
<td>−.21 , −.04</td>
<td>−.02</td>
</tr>
<tr>
<td>Known name</td>
<td>.20 , .19</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. ECR = Experiences in Close Relationships Scale (Fraley, Waller, & Brennan, 2000); RSES = Rosenberg Self-Esteem Scale (Rosenberg, 1965).

*p < .10. **p ≤ .05.
Results

Table 3 presents the mean reaction times for each trial type. We conducted a $3 \times 2$ ANOVA with name (own name, attachment name, known name) and congruency (congruent, incongruent) as within-subjects factors. The main effect of congruency was marginally significant, $F(1, 58) = 3.76, p = .06$, indicating that the participants tended to be faster on congruent trials ($M = 381$ ms, $SD = 37$ ms) than on incongruent trials ($M = 386$ ms, $SD = 39$ ms). Furthermore, the interaction effect between name and congruency was significant, $F(1, 57) = 3.39, p < .05$. Again, the main effect of name was not significant, $F(1, 57) = 1.35, p > .10$. With a priori $t$ tests, we found that only the attentional bias score for the attachment name differed significantly from zero, $t(58) = 3.16$, $p < .01$. The bias score for the own name and the known name did not differ from zero, $t < 1$.

Unlike what was found in Experiment 1, the correlation between anxious attachment and the bias score for the attachment name was not statistically significant, yet it approached statistical significance, $p = .08$ (see Table 2). Furthermore, a significant negative correlation was found between self-esteem, as measured by the RSES, and the attentional bias for the attachment name. Again, no significant correlations were found between the attentional bias indices and avoidant attachment.

Discussion

Most important to note, participants were faster in responding to congruent trials than to incongruent trials, and this selective attention effect was more pronounced in trials with the attachment name than in other trials. Contrary to the previous study, this attentional bias effect was specific to the attachment name; neither the attentional bias effect for the own name, nor the attentional bias effect for the known person's name was significant. This indicates that, in threatening conditions, only the names of persons who serve attachment functions grab attention, which is in line with attachment theory. These results also support the claim that the findings of Experiment 1 could not be accounted for by familiarity effects.

Again, meaningful correlations emerged between the attentional bias effect for the attachment name and individual differences. The attentional bias index for the attachment name was marginally significantly and positively related to attachment anxiety and a significant negative correlation was found with self-esteem. The latter indicates that people with low self-esteem display an enhanced attentional bias effect toward the attachment name. Provided that anxiously attached individuals are characterized by negative self-esteem (Bysma, Cozarelli, & Summer, 1997; note that, in our study, anxious attachment was also significantly correlated with global self-esteem, $r = -.36, p < .001$), this result may be regarded as indirect, and additional evidence for our hypothesis concerning attachment anxiety. Again, attachment avoidance was not significantly associated with any of the attentional biases.

Experiment 3

Experiments 1 and 2 showed that a threatening situation such as separation of the attachment figure triggers the operation of the attachment system, which inclines people to direct attention toward attachment figure-related cues. In Experiment 3, we added a control condition to substantiate this stress–attachment hypothesis (Bowlby, 1969/1982). Because previous research has primarily included a neutral context as a control condition, we decided to examine the effects of a positive priming context on the process of selective attention. According to the stress–attachment hypothesis, the attentional bias toward the name of the attachment figure should be evident only when people imagine a threatening event involving the attachment figure but not when imagining a benign event. In addition to this normative activation of the attachment system, it is assumed that individual differences in attachment influence the extent to which one will engage in attachment behavior, even at the cognitive level (Mikulincer et al., 2000). Hence, it is possible that anxious people’s chronically active attachment system and excessive preoccupation with attachment themes will influence attention allocation, even in a positive context. To test the stress–attachment link in relation to attention, we conducted a third experiment that was identical to the second one, except that in this experiment we asked the participants to imagine spending an enjoyable evening or day out with their attachment figure and to write about related thoughts, feelings, and behaviors. Provided that no stress-eliciting context is presented, the coping mechanism of seeking proximity should not be relevant; hence, no attentional bias effects should be found, except perhaps for anxiously attached individuals who may experience attachment system activation in the absence of actual signs of threat.

Method

Participants. Fifty-four psychology students from Ghent University participated in the study in return for course credit. None of them had participated in the previous experiments.

Materials and procedure. The only difference between the present study and Experiment 2 concerned the nature of the priming task. Instead of imagining their attachment figure going abroad, participants were asked to think and write about spending an enjoyable evening or day out with their attachment figure. Both the ECR (α = 0.91 for the ECR Anxiety subscale and α = 0.90 for the ECR Avoidance subscale) and the RSES (α = 0.81) were highly internally consistent.

Results

Table 4 presents the mean reaction times for each trial type. A $3 \times 2$ ANOVA, with name (own name, attachment name, known
Table 4

Mean Reaction Times (and Standard Deviations) of Target Responses in the Dot Probe Task as a Function of Trial Type and Congruency in Experiment 3

<table>
<thead>
<tr>
<th>Trial type</th>
<th>Congruency</th>
<th>M (and SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own name–neutral name</td>
<td>Congruent</td>
<td>388 (52)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>388 (47)</td>
</tr>
<tr>
<td>Attachment name–neutral name</td>
<td>Congruent</td>
<td>379 (51)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>389 (49)</td>
</tr>
<tr>
<td>Known name–neutral name</td>
<td>Congruent</td>
<td>384 (50)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>396 (51)</td>
</tr>
</tbody>
</table>

Note. Reaction times are given in milliseconds.

Established attentional effects are indeed driven by attachment processes. Nevertheless, an alternative interpretation for the obtained findings is still plausible. It has to be considered that our results simply reflect the fact that, just before completing the dot probe task, participants were asked to think about their attachment figure. This mental focus on the attachment figure may have been sufficient to temporarily increase the salience of information related to the attachment figure and, hence, may have induced the attentional bias effect for the name of the attachment figure.

Experiment 4

To test this alternative explanation, we conducted a fourth experiment that was identical to Experiments 2 and 3, except that in Experiment 4 we created an attachment-irrelevant context by asking our participants to imagine the known person, and not the attachment figure, going abroad for a certain period of time. This allowed us to investigate whether merely thinking about the attachment figure has induced the attentional bias effects in the previous experiments. According to the alternative explanation in terms of salience effects, this priming task should lead to an attentional bias effect for the known name rather than for the attachment name. Finding no attentional bias effect in this experiment would thus strengthen the idea that the attentional bias effects in the previous experiments were specifically related to attachment processes. As such, we hoped to find no attentional bias effects, not even for the attachment name.

Method

Participants. Sixty-two first-year psychology students participated in the experiment as a part of their course requirements. None of them had participated in the previous experiments.

Materials and procedure. These were the same as in the previous two experiments, except for the nature of the priming task. This time, participants were asked to think and write about the known person going abroad for a certain period of time. Similar to the previous three experiments, both the ECR and the RSES displayed high Cronbach’s alphas (ECR Anxiety subscale, $\alpha = 0.87$; ECR Avoidance subscale, $\alpha = 0.90$; and RSES, $\alpha = 0.91$).

Results

Table 5 presents the mean response latencies for each trial type.

Table 5

Mean Reaction Times (and Standard Deviations) of Target Responses in the Dot Probe Task as a Function of Trial Type and Congruency in Experiment 4

<table>
<thead>
<tr>
<th>Trial type</th>
<th>Congruency</th>
<th>M (and SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own name–neutral name</td>
<td>Congruent</td>
<td>376 (57)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>379 (49)</td>
</tr>
<tr>
<td>Attachment name–neutral name</td>
<td>Congruent</td>
<td>377 (58)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>380 (56)</td>
</tr>
<tr>
<td>Known name–neutral name</td>
<td>Congruent</td>
<td>381 (52)</td>
</tr>
<tr>
<td></td>
<td>Incongruent</td>
<td>382 (51)</td>
</tr>
</tbody>
</table>

Note. Reaction times are given in milliseconds.
We analyzed these reaction times using a 3 (name: own name, attachment name, known name) × 2 (congruence: congruent, incongruent) repeated measures ANOVA. As expected, neither the main effect of congruence nor the interaction was significant, both Fs < 1. Also the main effect of name did not reach significance, F(1, 60) = 1.72, p > .10.

None of the attentional bias scores differed significantly from zero (all ts < 1) and none of them correlated significantly either with individual differences in attachment or with global self-esteem (see Table 2).

Discussion

In line with our predictions, no significant attentional bias effects emerged for the known name after an imagination procedure involving the known person. This finding indicates that the attentional bias effects for the attachment name that were present in the previous experiments were not simply due to the stress-induction procedure functioning as a prime and increasing attention for the attachment stimulus. Furthermore, the absence of a bias effect for the attachment name is in line with attachment theory, because separation from a known person appears to be a nontreatening and attachment-irrelevant situation that is not supposed to activate the attachment system (see Mikulincer & Shaver, 2003). The fact that anxiously attached individuals did not react with vigilance toward the attachment figure also seems plausible, considering that the content of the priming was not relevant in terms of attachment needs. To ascertain that the absence of a bias effect was genuine, we calculated the statistical power of the crucial test. Starting from the mean effect size of the attentional bias scores for the attachment name estimated from Experiments 1 and 2 (mean d = .35), this study, with 62 participants, had a power of .77 to detect an effect of that magnitude at the (two-tailed) α = 0.05 level. Hence, our study had enough power to detect an effect if any should appear, but still we failed to find one. This indicates that the lack of an attentional bias effect for the attachment name was not the result of a lack of power.

General Discussion

Although Bowlby specified the centrality of internal working models as an organizing force in guiding attention, to date little is known about the relationship between intentional processing and the regulation of the attachment system. Therefore, we argued that research into the information-processing mechanisms associated with activation of the attachment system is pivotal. In attachment theory, it has been postulated that the confrontation with or the imagination of a distressing situation activates the attachment system and the primary goal of proximity maintenance (Mikulincer & Shaver, 2003). The studies reported in this article linked this key assumption to the process of selective attention, considering it as a relevant mechanism for explaining the regulatory mechanisms underlying attachment system activation. The most important finding throughout the four experiments was that we consistently found an attentional bias effect for the attachment name in attachment-related contexts, regardless of whether the context was positive or negative. Attention allocation was also shown to be modulated by individual differences in attachment style. More specifically, we found that anxious attachment was related to increased attention toward the attachment figure’s name in both threatening and positive attachment contexts. We briefly summarize the experimental findings that led to these conclusions and relate these main findings to a cognitive–motivational view on adult attachment.

The first two experiments supported the central claim that, after exposure to an attachment-related threat prime, attention was selectively directed toward attachment-related information. Several sources of evidence point to the reliability and strength of these findings: First, selective attention toward the name of the identified attachment figure was found in Experiment 1 and replicated in Experiment 2. Second, the attachment name was the only stimulus name that yielded a robust attentional bias effect. In Experiments 1 and 3, attentional bias effects for the own name and known name were found as well, but these effects could not be replicated in the other experiments, which is consistent with other studies that investigated attention toward personally relevant stimuli (Bundesen et al., 1997; Gronau et al., 2003; Harris & Pashler, 2004; Harris, Pashler, & Coburn, 2004). Most of this research has shown that an attentional bias effect toward emotional words and names is actually not a robust and stable phenomenon. Therefore, we want to stress the importance of the fact that we did find a consistent attentional bias effect toward the name of a significant other. Third, this effect was found in nonselected individuals in the dot probe task, although it has been reported that attentional bias effects in a nonselected, nonclinical sample are usually not very robust and actually not easily found at all (Mogg & Bradley, 2005).

The present findings also revealed that attention was selectively and specifically directed toward the name of the attachment figure. Throughout the experiments, some direct and indirect evidence was obtained that support this idea: First, as described earlier, selective attention effects were most consistently found for the attachment name, which is fully in line with attachment theory. Second, in Experiments 2 and 4, alternative explanations (familiarity, salience) for the attentional effects could be excluded. Third, in Experiments 1, 2, and 3, only selective attention toward the attachment name was meaningfully related to individual differences that have theoretically been proposed to modulate the effect of threat on the attachment system.

One particular finding, however, seems rather inconsistent with attachment theory. According to the stress–attachment link, only events that are perceived by a person as threatening should activate the attachment system (Mikulincer & Shaver, 2003); yet in Experiment 3, we found that thoughts about spending an enjoyable day out with the attachment figure induced selective attention toward the name of the attachment figure as well. This suggests that attentional processing was not uniquely activated by stress-eliciting stimuli. Although this finding seems at odds with the normative component of attachment system activation, an explanation in terms of individual differences in attachment is still plausible. Selective attention toward the attachment figure’s name was specifically and exclusively related to attachment anxiety, indicating that the more anxious a person is, the more he or she will attend to attachment figure-related cues, even in a positive priming context. This fits with anxious individuals’ chronic hyperactivation of the attachment system, an assumption already demonstrated in previous research. For example, Mikulincer and colleagues (2000, 2003) found that anxious individuals have ac-
cess to attachment themes in either stress or nonstress contexts, suggesting that their attachment system is chronically activated even when there is no signal of threat and no demand for coping actions. This conclusion has been substantiated by using a neutral priming context as a control condition, leaving unexplored how the attachment system cognitively reactivates to an attachment-related positive context. In this respect, the present data suggest that, even in an attachment-related positive context, anxiously attached individuals rely on their hyperactivating strategies. We return to this finding in the following paragraph, in which we elaborate on the relation between individual differences in attachment and attentional processing.

The findings of our studies showed that anxious persons reacted with increased attention toward the attachment figure’s name in either a threatening or a positive attachment context, providing additional evidence for their hyperactive attachment system. Experiments 1 and 2 demonstrated anxious participants’ hypervigilance on stress arousal, whereas Experiment 3 revealed the same attentional pattern in a positive attachment context. With regard to the first two experiments, only the first one revealed a clearly significant correlation between attachment anxiety and selective attention toward the attachment figure’s name. In Experiment 2, this correlation was marginally significant, but we found additional evidence for the association between attachment anxiety and vigilance toward the attachment figure by means of the negative correlation between self-esteem and selective attention for the attachment name. The relation between self-esteem and the attentional bias for the attachment name was, however, absent in the other experiments. One possible reason for the fact that the pattern of findings on individual differences was somewhat dissimilar in Experiments 1 and 2 is variation in the mean and range of attachment anxiety, avoidance, and self-esteem scores across experiments. However, post hoc analyses revealed no indication of such differences. Also note that the observed correlations with attachment anxiety may have been weakened by the limited range of attachment anxiety scores in our samples, which may be the result of the fact that our participants were not preselected on the basis of their attachment style. Provided that anxious attachment styles represent rather small portions of the population (Hazan & Shaver, 1987), our sample did probably not exclude extremely high-anxious persons. In fact, securely attached individuals (low anxiety and avoidance scores) formed the majority in our samples. Another plausible reason for the inconsistencies in the correlational results may be the low reliability of interindividual differences in dot probe effects (see Schmulke, 2005). For instance, in the present set of data, the mean split-half reliabilities of the attentional bias effects for the attachment name were .41 in Experiment 1, .23 in Experiment 2, .26 in Experiment 3, and .38 in Experiment 4. Considering that sufficient reliability of a measure is a prerequisite for research on interindividual differences, the low reliabilities of these dot probe tasks seriously limit the strength of the correlations one can expect to observe. In fact, given these low reliabilities, it is striking that we did find meaningful correlations in three consecutive experiments.

With regard to the results of Experiment 3, which demonstrated anxious persons’ hypervigilance in a positive attachment context, it is important to note that an interpretation in terms of distress arousal is still plausible. We refer to the study by Mikulincer and Shaver (2000), which showed that anxious individuals reacted with impaired cognitive processing after a positive affect induction. According to their ad hoc explanation, anxious persons endorse a negative interpretation of positive affect because of their attempts to deny the cognitive relaxation that follows the recognition of a safe environment, and this cognitive loosening may be perceived as a danger cue. Moreover, it is likely that, through semantic priming mechanisms, positive thoughts about the attachment figure automatically spread into memories of negative attachment experiences that are overrepresented in the associative network of the anxious person’s mind (Mikulincer & Shaver, 2003).

In general, the results with regard to attachment anxiety are in line with attachment theory. However, in the case of attachment avoidance, the results did not conform to theoretical expectations. Provided that avoidantly attached individuals tend to deactivate their attachment system as a means to cope with insecurity and hence inhibit the proximity-seeking mechanism (Mikulincer & Shaver, 2003), we assumed that in distressing situations (or even in a positive attachment context) there would be a negative relation between the attachment bias score for the attachment figure’s name and avoidant attachment. None of our experiments confirmed this finding. However, this lack of results could be attributed to the priming context that was used in the present study; that is, separation from an attachment figure could be regarded as a particularly salient threat for anxiously attached individuals but not for avoidant individuals, who are assumed to inhibit emotional and cognitive reactions to distressing events (Fraley, Garner, & Shaver, 2000; Fraley & Shaver, 1997; Mikulincer & Shaver, 2003). This would imply that the separation prime did not activate their attachment system and, in that case, the attentional bias mechanism would not be relevant. Unfortunately, no manipulation check was performed to examine the effectiveness of our threat induction in the avoidant individuals. Future research should incorporate manipulation checks of threat induction or could rely on subliminal priming procedures (see Mikulincer et al., 2002) that may reduce strategic avoidance strategies. In addition to this, future work is needed to investigate whether the attentional bias effects for the attachment name depend on specific threat contexts. Considering previous research demonstrating that avoidant people react differently to attachment-related versus attachment-unrelated threatening contexts (Mikulincer et al., 2002), it could be interesting to precede our dot probe task with attachment-irrelevant stress stimuli (e.g., failure) so we can examine more accurately the effects of threat on the process of selective attention.

Throughout the General Discussion, we have already mentioned some limitations of the present study and made suggestions for future research. However, there is still another issue that remains to be discussed: The dot probe tasks in the present study yielded rather small differences in reaction times, which could indicate that the attentional bias effects varied over the course of the experiment. Therefore, we calculated attentional bias effects on the first and second halves of the dot probe tasks to determine whether the obtained attentional biases reflect a stable effect or a momentary response that habituates quickly (see Harris & Pashler, 2004). Throughout the four experiments, these analyses revealed no significant differences between the attentional bias effects calculated on the first and second halves of the task, which suggests that selective attention toward the attachment name is a real and consistent phenomenon that is not just an artifact of averaging reaction times over numerous trials.
In closing, the present study was among the first to assess the attentional correlates of the attachment system and, as such, provide evidence that activation of the attachment system indeed causes selective attention toward the attachment figure. We are convinced that this series of studies opens a wide range of possibilities with regard to the study of attentional processes in the adult attachment domain. Our studies also have broader implications for the conceptualization of the attachment system. We think that they point to the importance of incorporating information-processing mechanisms and attention in particular into the conceptualization of the attachment system. That is, selective attention has been related to perceptual, appraisal, and memory processes (see Mogg & Bradley, 1998), which are all relevant in the regulation of the attachment system. Furthermore, it is known that attentive processing of motivationally relevant information is modulated by personality factors (e.g., Eysenck, 1992) and learning experiences (e.g., Koster, Crombez, Van Damme, Verschueren, & De Houwer, 2004). Consequently, it seems reasonable to assume that, once attention is guided by established working models, this may influence and magnify the effects of previous experiences on ongoing attachment-related cognition, affect, and behavior and could therefore play an important role in transferring “early” attachment experiences into working models (Bowlby, 1969/1982), which are the cornerstones of the attachment system. Exploring the proposed dynamic relationships between early experiences, the attachment system, information processing, and attachment behavior is pivotal in deepening our understanding of adult attachment and social behavior.

References
Bylsma, W. H., Cozzarelli, C., & Sumer, N. (1997). Relation between adult attachment-related cognition, affect, and behavior and could therefore play an important role in transferring “early” attachment experiences into working models (Bowlby, 1969/1982), which are the cornerstones of the attachment system. Exploring the proposed dynamic relationships between early experiences, the attachment system, information processing, and attachment behavior is pivotal in deepening our understanding of adult attachment and social behavior.


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ATTACHMENT-RELATED ATTENTIONAL BIAS

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