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Attachment, attention, and cognitive control: Attachment style and performance on general attention tasks

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ABSTRACT

Three studies examined the effects of attachment style on performance in non-attachment-related attention tasks; one study also assessed the effect of priming memories of experiences of attachment security or insecurity on attentional performance in a flanker task. In Study 1, participants performed a psychological refractory period (PRP) task assessing their ability to switch attention rapidly from one decision to another; in Studies 2 and 3 they performed a flanker task assessing their ability to resist distracters. Avoidant attachment predicted better performance on both tasks, and the effects remained even after controlling for neuroticism, general anxiety, and BIS/BAS scores. Study 3 showed that thinking in detail about a past experience of insecurity eliminated avoidant participants' superior performance. In sum, avoidant people are generally skilled at regulating their attention, even on non-attachment-related tasks, but their performance is hampered by reminders of experiences of insecurity.

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One of the unique features of Bowlby and Ainsworth's attachment theory when it was first proposed was its emphasis on cognitive processes not previously included in psychoanalytic theories (e.g., Bowlby, 1982). For example, Bowlby explained the lasting effects of early experiences with parents in terms of conscious and unconscious "internal working models" of self and relationship partners, an idea that has now been elaborated and extensively tested in many studies (e.g., Baldwin, Fehr, Keedian, Seidel, & Thompson, 1993; Bartholomew & Horowitz, 1991; see Mikulincer & Shaver, 2007, chap. 6, for a review, and Mikulincer, Shaver, Sapir-Lavid, & Avihou-Kanza, in press, for recent data). Bowlby (1980) also reconceptualized Freudian defense mechanisms in terms of "segregated" cognitive systems and defensive attentional strategies. These ideas have also been elaborated and tested in both interview studies (Hesse, 2008; Main, 1995) and laboratory experiments demonstrating attachment-style differences on attachment-related cognitive tasks (e.g., Edelstein et al., 2005; Fraley, Garner, & Shaver, 2000; Mikulincer, Dolev, & Shaver, 2004).

The observed differences in attention and memory might reflect selective processing, which could be either exclusive to attachment-related information or more general, involving pre-attentive mechanisms or information-processing strategies that can be applied to both attachment and non-attachment-related information. In the studies reported here, we examined the possibility that individual differences in attachment style might be associated with attentional abilities and strategies even in non-attachment-related situations and tasks, because attentional skills might be quite broad in application.

Mikulincer and Shaver (2007) proposed a dynamic model of the "attachment behavioral system" (the innate system proposed by Bowlby, 1982, based on work by ethologists). The model depicts what Main (1990) called the "primary attachment strategy" – seeking support from a trusted caregiver when one is upset or threatened, with the expectation that he or she will provide protection and assistance. The model also includes two "secondary attachment strategies" that reflect histories of troubled relationships with inadequately responsive or unsupportive attachment figures. One of these secondary strategies – "hyperactivation" of the attachment system, or "anxious" attachment – involves heightened vigilance regarding attachment figures' availability and responsiveness, and rapid escalation of emotions and help-seeking when threats are encountered. This strategy is thought to be learned early in life as a way of making certain that an inconsistent, distracted, or unreliable caregiver pays attention and provides adequate protection and support (Ainsworth, Blehar, Waters, & Wall, 1978).

The other secondary strategy – "deactivation" of the attachment system, or "avoidant" attachment – involves down-regulation or suppression of thoughts and emotions associated with personal vulnerability or dependency on attachment figures. The goal of this strategy is to maintain an extreme degree of independence, invul-

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nerability, and autonomy (which Bowlby, 1982, called "compulsive self-reliance"). This strategy is learned in the context of a caregiver who provides better care when one does not complain, make requests, or seem overly needy or whiny, and does not insist on close bodily contact (Ainsworth et al., 1978).

Studies focusing on these secondary strategies in adulthood and their effects on attention and cognition have found that people with an anxious attachment style tend to focus their attention on, and have difficulty disengaging from, attachment-related stimuli and information (e.g., Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Gillath, & Shaver, 2002). Anxious individuals also find it difficult to disengage from their own negative thoughts and memories (Mikulincer & Orbach, 1995). When asked to retrieve childhood memories of a particular negative emotion (e.g., fear, sadness, or anger), they quickly comply, and once one such memory is retrieved, a host of others arise uncontrollably. When asked to imagine their romantic partner leaving them and then, a few minutes later, to stop thinking about it, they have difficulty letting go of the imagined scenario, and their skin conductance level and emotion-related brain activity remain high (Fraley & Shaver, 1997; Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005).

Individuals with an avoidant attachment style tend to shift their attention away from stimuli depicting or evoking attachment-related themes (e.g., pictures of one's mother, pictures of people separating; Kirsh & Cassidy, 1997; Main, Kaplan, & Cassidy, 1985), to take longer to identify attachment-related information under certain conditions (Mikulincer et al., 2002), and to have greater difficulty encoding or recalling such information (Edelstein et al., 2005; Fraley et al., 2000; Mikulincer & Orbach, 1995). The ability of avoidant people to ignore such information disappears, however, when a cognitive or emotional "load" is imposed (e.g., Berant, Mikulincer, & Shaver, 2008; Mikulincer et al., 2004), suggesting that the control of attention takes cognitive effort, even though avoidant people have presumably practiced defensive attentional control for years. Theoretically this is thought to be the case because the underlying attachment needs are never really extinguished, so the defenses against them require constant cognitive effort, unlike more emotionally neutral forms of practiced cognitive skills.

The ability of avoidant individuals to block, or disengage from, attachment-related information (including their own thoughts and feelings, if these threaten a compulsively self-reliant stance), clearly suggests the operation of a pre-attentive mechanism or cognitive-control strategy (Niedenthal, Brauer, Robin, & Innes-Ker, 2002), but so far it has remained unclear whether this strategic use of attention is limited to attachment-related material or is more general, as might be the case if it has been extensively practiced for years or was rooted in a temperament that made avoidance a viable strategy from early on. We were therefore motivated to examine the association between avoidant attachment and performance on standard content-neutral attention tasks.

The studies reported here are based on attention tasks – the psychological refractory period (PRP) paradigm (e.g., Miller & Alderton, 2006; Pashler, 1994) and the flanker task (Eriksen & Eriksen, 1974; Uwe, 2005) – that have been extensively studied by cognitive researchers with no special interest in attachment theory. These attention tasks assess a person's ability to make two consecutive judgments quickly without losing track of either one (the PRP task, as described further below) and to focus attention on task-relevant information while resisting distracters (the flanker task, as also described below). If more avoidant individuals perform better than their less avoidant peers on these tasks, it suggests that their attentional skills are fairly general.

We used two such tasks while also measuring participants' dispositional tendencies to use either hyperactivating (i.e., anxious) or deactivating (i.e., avoidant) strategies in regulating their emotions and behavior in close interpersonal relationships. These tendencies were assessed with a two-dimensional measure of attachment style, the Experiences in Close Relationships inventory (ECR; Brennan, Clark, & Shaver, 1998). This self-report measure comprises two highly reliable 18 item scales, one measuring attachment anxiety and the other measuring avoidant attachment. The ECR has high construct validity, being able to predict theoretically expected outcomes in hundreds of published studies (see Mikulincer & Shaver, 2007, for a review). In general, we expected avoidance to be associated with more effective and faster allocation of attention (Hypothesis 1), because this association has been obtained in studies of non-attachment-related words and fairly general facial expressions (e.g., Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006; Niedenthal et al., 2002). We also explored the possibility (Hypothesis 2) that this skill might be disrupted or diminished in the presence of reminders of past experiences of insecurity. If true, this would support the theoretical assumption that attentional skill is part of a defensive strategy that can be undermined or interfered with by a cognitive or emotional load (e.g., Mikulincer et al., 2004). We advanced no specific predictions about attachment anxiety, because studies related to this dimension have generally focused on attachment-related stimuli, to which anxious people seem to gravitate uncontrollably. Nothing is known about whether this tendency toward fixation and rumination extends to neutral attention tasks. Finally, we included several control measures of individual differences that might provide alternative interpretations of our results.

Study 1

In Study 1, we examined associations between the two attachment dimensions – anxiety and avoidance – and performance in the well-studied psychological refractory period (PRP) task (e.g., Miller & Alderton, 2006; Pashler, 1994). In this task, participants are presented with two simple stimuli separated by a variable but brief stimulus onset asynchrony (SOA). They are instructed to make a speeded decision about each stimulus (e.g., first between two possible colors of a square and then between two letters of the alphabet). By pressing one of two keys in each case (four keys in all), participants indicate which stimulus appeared in each of two temporal 'slots' or positions (the first and the second). For example, either a yellow or a blue square might appear in the first temporal slot and either an X or an O in the second slot. The participant would attempt to press, as fast as possible, one of two keys just after the first stimulus appeared to indicate whether it was the yellow or the blue square, and then push one of the remaining two keys just after the second stimulus, to indicate whether it was an X or an O.

Typically, the response time to the first discrimination (in the first time slot, hereafter called Task 1) is unaffected by the SOA between the two tasks, whereas the response time to the second discrimination task (Task 2) is systematically related to the SOA. That is, at short SOAs, the response time is long, and as the SOA increases the response time to Task 2 decreases. This systematic slowing, referred to as the psychological refractory period (PRP) effect, is thought to reflect a capacity limitation of the attentional system when a person is choosing a response (Pashler, 1994).

Based on previous attachment research it seemed likely that more avoidant individuals would be better able to quickly allocate or shift attention at will in the PRP task. If this is indeed the case, more avoidant participants should exhibit a smaller PRP effect (Hypothesis 1). Because we are generally interested in both kinds

of attachment insecurity – anxiety and avoidance – we also measured attachment anxiety, but without making specific predictions about it. And we included several individual-difference measures that might provide alternative explanations of our findings.

Method

Participants

Eighty-three undergraduates (64 women and 19 men, ranging in age from 18 to 28 years, *Mdn* = 19), all with either naturally or medically corrected 20–20 vision, participated in the study. Thirty-four percent described themselves as Caucasian, 33% as Asian, 7% as Hispanic, 5% as Pacific Islanders, 1% (one person) as African–American, and 20% as "mixed" or "other." All participants received credit in an introductory psychology course for completing the study.

Materials and procedure

Participants were tested individually in a 30-min experiment described as a study of attention and personality. After receiving preliminary instructions and signing an informed consent agreement, participants received specific instructions about the PRP task and completed 30 training trials. They then began the actual task, which was based on a paradigm used by Luck (1998) and consisted of two stimuli separated by a variable SOA. The first stimulus (S1) was a blue or a yellow square, presented just above a central fixation point. The second stimulus (S2) was an X or an O presented just below that point. The distance between the two stimuli was 6 cm and the viewing distance was 60 cm. The two stimuli were separated by one of four possible SOAs (50, 150, 250, and 350 ms), which were randomly intermixed within a block of 64 trials. There were three blocks (thus 192 trials) altogether. Responses were made with the index finger of each hand, one of which fingers was assigned to, say, the blue square and the letter O, and the other finger was assigned to the yellow square and the letter X. (These assignments were counterbalanced across participants.)

Participants received the following instructions: "In this experiment, you will be asked to quickly identify two objects. First, you will be asked to identify the color of a square. Then, you will be asked to identify a letter. If the square is yellow, press the S key, if it is blue, press the D key. If the letter is "X", press K, if it is "O", press L. The letter will remain on the screen until you make a response. Respond as quickly as possible while remaining accurate".

Each trial began with a fixation stimulus – a cross – in the center of the screen. When the participant decided to initiate the task, he or she pressed the space bar. After a brief delay, the fixation cross disappeared and was replaced by S1, which was presented for 50 ms; then, following a variable SOA, S2 was presented for 50 ms. The fixation cross then reappeared. When ready, the participant pressed the space bar to trigger the next trial. He or she was instructed to respond as quickly as possible, not to wait until both stimuli had been presented, and not to make anticipatory responses (e.g., guessing what would appear next and pressing the corresponding key in advance). The computer used for this task (and the subsequent experiments) was a standard personal computer, with a Pentium processor and a 15-in. (38.10-cm) VGA monitor, running a Windows-based experimental software program, Presentation, Version 8.01. The participant was seated so that the distance of his or her eyes' from the computer screen was approximately 60 cm.

Upon completion of the PRP task, participants received a computerized battery of questionnaires which included scales assessing attachment style (attachment-related avoidance and anxiety), neuroticism, approach and avoidance tendencies as measured by the BIS/BAS scales described below, and general trait anxiety. The order of the questionnaires was randomly varied across participants.

As mentioned, attachment orientation – anxiety and avoidance – was assessed with the Experiences in Close Relationships inventory (ECR; Brennan et al., 1998). Participants were asked to think about their experiences and feelings in close relationships, without focusing on a specific one, and rate the extent to which each item accurately described them using a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Eighteen items assessed attachment anxiety (e.g., "I worry about being abandoned," "I worry a lot about my relationships") and 18 items assessed avoidant attachment (e.g., "I prefer not to show a partner how I feel deep down," "I get uncomfortable when a romantic partner wants to be very close"). In the present study, Cronbach alphas were high for both the attachment anxiety scale (.92) and the avoidance scale (.94). Two scores were computed by averaging items on each subscale after appropriately reverse-scoring some of the items.

To be sure that any effects we obtained were specifically related to attachment and not to more general personality traits, we included a number of additional questionnaire measures. Because attachment anxiety and avoidance, especially anxiety, are often associated with the general trait of neuroticism (Noftle & Shaver, 2006), we included the neuroticism subscale of the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). The BFI comprises 44 items measuring five global traits: Extraversion (8 items), Agreeableness (9 items), Conscientiousness (9 items), Neuroticism (8 items), and Openness (10 items). All items consist of short phrases (e.g., is talkative; is depressed, blue; tends to be lazy) related to each trait construct (John & Srivastava, 1999). Each phrase is rated on a 5-point scale (1 = *disagree strongly*, 5 = *agree strongly*). Subscale scores are created by reverse-scoring certain items, summing the ratings for the items on each subscale, and dividing by the total number of items to obtain a mean score. John and Srivastava reported alpha reliabilities ranging from .75 to .80 for the different subscales. In the present study, the alpha for the neuroticism scale (the only one we will use here) was .84.

We also included another measure of general anxiety. The Trait Anxiety Subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a 20-item scale that asks respondents to rate each item on a 1 (*not at all*) to 4 (*very much*) scale. The Trait Anxiety Subscale has been shown to have adequate internal consistency reliability, and in the present study its alpha coefficient was .85.

Finally, we included a common general measure of approach and avoidance tendencies, the BIS/BAS Inventory (Carver & White, 1994). This 20-item measure, which has been shown in previous studies to be somewhat related to the ECR attachment-style dimensions (e.g., Meyer, Olivier, & Roth, 2005), yields one Behavioral Inhibition System (BIS) score and three Behavioral Activation System (BAS) scores: Drive, Fun Seeking, and Reward Responsiveness. Each item is rated on a 1 (*strongly disagree*) to 4 (*strongly agree*) scale. The BIS/BAS scales have adequate internal consistency reliability (alphas ranging from .65 to .80) and temporal stability (*r*s ranging from .59 to .69 across an 8-week period; Jorm et al., 1999). Convergent validity has also been established (Carver & White, 1994). In our sample, alphas for the scales ranged from .66 to .86. Four scores were computed by averaging items on each subscale after appropriately reverse-scoring some of the items.

Results and discussion

Preliminary analyzes

Before examining associations between the attachment-style dimensions and the PRP effect, we examined the response patterns of each participant and excluded four participants who grouped their S1 and S2 responses together, contrary to instructions. We

then tested for the standard PRP effect and found that, as in previous studies (e.g., Luck, 1998), the Task 2 response time (RT) was slowest at the short Task 1–Task 2 SOA (524 ms) and decreased to 448 ms at the longest SOA, yielding an overall F value (3,246) of 62.81, $p < .001$. Accuracy for both tasks was high (Task 1 mean = 94.4% correct; Task 2 = 90.4% correct) and was unrelated to either attachment dimension ($rs < .15$, $ps > .18$).

To create a single performance score to use as a dependent variable in regression analyses, we quantified the PRP effect (i.e., the slowing of Task 2 responses due to performing Task 1) by computing the percentage increase in Task 2 RTs relative to Task 1 RTs across all SOAs. (The different SOAs were used in the present study simply to make the task less predictable and to allow us to assess whether the usual PRP change as a result of SOA was occurring.) The mean PRP score was 1.16 (SEM = 0.11), meaning that, on average, the Task 2 RTs were 116% longer than task 1 RTs.

Attachment style

To test our prediction (Hypothesis 1) regarding the association between avoidant attachment and PRP performance, we conducted a hierarchical regression analysis. In the first step of the analysis, gender, age, neuroticism and general anxiety scores, and scores on the four BIS/BAS scales were introduced as controls. In the second step, the two attachment variables (anxiety and avoidance) were introduced to examine their main effects. In the third step the 2-way interaction (the product term) between attachment anxiety and avoidance was introduced.

There was a main effect of avoidant attachment, such that more avoidant participants yielded smaller PRP effects, $\beta = -34$, $t(65) = -2.83$, $p = .006$. No other main effects or interactions were significant. When the analysis was rerun without the control variables, the results were essentially the same. Thus, avoidant attachment, unlike all of the other predictor variables tested, was associated with an ability to shift attention quickly and effectively from one task to another. To test the generality of this ability or skill, in Study 2 we examined a different task, with a new participant sample – the well-researched flanker task (Eriksen & Eriksen, 1974).

Study 2

The flanker task was designed to assess "executive control" (i.e., inhibition of undesired responses and facilitation of desired responses). It involves presenting a simple "target" (e.g., an arrowhead like this: <) in the context of congruent (<), incongruent (>), or neutral (–) flankers arranged in a particular configuration, such as > > < > > or < < < < <. A research participant's assignment is to indicate by pressing one of two computer keys whether the target symbol points one way or the other. The task is considerably more difficult when the flankers are incongruent with the target than when they are congruent or neutral, and it is considerably easier when the flankers are congruent with the target rather than incongruent or neutral (Fan, McCandliss, Sommer, Raz, & Posner, 2002; Uwe, 2005). As in Study 1, we predicted that more avoidant individuals would perform better on this task, by being better able to ignore the flankers. We also assessed attachment anxiety and the previously used control variables: neuroticism, general anxiety, and constructs measured by the BIS/BAS scales.

Method

Participants

The participants were 101 undergraduates (67 women, 34 men; *Mdn* age = 20 years) with naturally or medically corrected 20–20 vision. Fifty-one percent classified themselves as Asian; 19% as Caucasian; 15% as Hispanic; 4% as African–American; and 11% as "mixed" or "other." They received credit in an introductory psychology course for participating.

Materials and procedure

Participants were individually tested in a 30-min experiment presented as a study of attention and personality. After receiving general instructions and signing an informed consent agreement, the flanker task was explained and they completed 10 training trials. The stimuli consisted of a target (< or >) flanked by congruent or incongruent pairs of arrowheads. Each of the flankers was an arrowhead .6 cm long, pointing right or left, or a (neutral) hyphen of the same length. The target arrowhead was presented directly above a central fixation point. The nearest flankers were presented at roughly .6° of visual angle to each side of the target, and the outer flankers were presented at roughly 1.2°.

The timing of the various parts of the presentation was as follows: Each trial began with a fixation point, followed 750 ms later by the target and flankers, which were shown for 250 ms. Participants were instructed to respond to each target with a key press. A target pointing to the right required depression of the right-pointing arrowhead on the keyboard; a target pointing left required depression of the left-pointing arrowhead (participants used the right index finger for pressing the left arrow key [←] and the right ring finger for pressing the right arrow key [→]). (Only responses with RTs between 100 and 750 ms post-target were included in the analyses.)

Participants received the following instructions: "In this experiment, each trial will start with a fixation cross followed by a brief display of arrows that will look something like this: > > < > >. Please indicate the direction in which the CENTER arrow (the one pointing left in the example) is pointing. During the task, please do as follows: Make sure you fixate the cross. Then respond both quickly and accurately when the arrowhead pattern appears. If the central arrow is pointing left, press the left arrow key with your right index finger. If it is pointing right, press the right arrow key with your right ring finger. The screen will remain blank until you respond, but when you do respond the experiment will advance to the next trial. When you have read the above instructions, please press the space bar to begin".

There were three congruency conditions (congruent, incongruent, and neutral), which were presented in a random order within each block. Every block consisted of 120 trials (40 repetitions of each condition). An experimental session contained four blocks, so each of the conditions was presented 160 times, with there being 480 trials altogether. Upon completing the flanker task, participants received a computerized battery of questionnaires. In this study, the alphas for the attachment scales were high (avoidance, .92; anxiety, .91), and the alphas were adequate for neuroticism (.87), trait anxiety (.88), and the BIS/BAS scales (alphas ranged from .70 to .87). The order of the questionnaires was randomized across participants.

Results and discussion

As in Study 1, there was no significant correlation between either attachment dimension and accuracy in any of the experimental conditions (congruent, incongruent, or neutral); rs ranging from .03 to .34 and ps ranging from .88 to .11. (The accuracy ranged from .86 to .98, making it difficult for anything to correlate with accuracy.) Compatible with previous studies in the literature, we found a congruency effect, $F(2,99) = 273.25$, $p < .001$, such that reactions to congruent trials were faster than reactions to incongruent trials (average RTs: incongruent $M = 551.26$; congruent $M = 451.97$; and neutral $M = 459.81$). The general congruency effect is often divided into two separate effects (e.g., Posner & Cohen, 1984) – a facilitation

effect (congruent faster than neutral) and an interference effect (incongruent slower than neutral). We computed these two scores and conducted three multiple regression analyses, one for the overall congruency (or flanker) effect, one for facilitation, and one for interference. As in Study 1, in the first step of each analysis we entered gender, neuroticism, trait anxiety, and the BIS/BAS scores as controls. In the second step we entered the attachment anxiety and avoidance scores. In the third step we entered the 2-way interaction of attachment anxiety and avoidance.

The regression conducted for the flanker effect (incongruent RT mean minus congruent RT mean) yielded no significant main effects or interactions. The regression analysis for the facilitation effect (being helped by congruent flankers – neutral RT mean minus congruent RT mean) also revealed no significant main effects or interactions.

The regression conducted for the interference effect (being hindered by the incongruent flankers, which is indicated by a large RT difference between the incongruent and neutral flanker conditions) revealed a main effect for avoidance, $\beta = -.36$, $t(84) = -3.06$, $p < .01$, and a significant interaction between attachment anxiety and avoidance, $\beta = -.38$, $t(83) = -3.29$, $p = .001$.

To examine the source of the 2-way interaction, we followed Aiken and West (1991) procedure and calculated two regression lines for predicting the interference effect from avoidant attachment: one line when attachment anxiety was one standard deviation above the mean and a second line when attachment anxiety was one standard deviation below the mean. The results indicated that avoidance had a significant effect on interference only when attachment anxiety was one standard deviation above the mean, $b = -23.79$, $t(83) = -3.56$, $p = .0006$, but not when it was one standard deviation below the mean, $b = -3.23$, $t(83) = -.52$, ns. Thus, avoidance reduced interference only among participants who were relatively high on attachment anxiety (see Fig. 1).

The main effect of avoidant attachment on interference suggests that more avoidant people are better able to ignore flankers. The interaction between anxiety and avoidance suggests that anxious individuals can control their attention only to the extent that they have mastered the skills associated with avoidance. The effects of the attachment dimensions were found even when controlling for several other individual-difference scores, none of which were significantly associated with the attention variables.

Study 3

In Study 3, we again tested participants' performance on the Eriksen flanker task. This time, however, we exposed them to an attachment-related prime before they began the flanker task. Priming, either subliminally or supraliminally, with attachment-related stimuli or scenarios has been found in previous studies to affect people's feelings, attitudes, and goals (e.g., Baldwin et al., 1993; Gillath & Shaver, 2007; Mikulincer, Shaver, Gillath, & Nitzberg, 2005). For example, asking people to think about a relationship in which they felt secure causes them to be less defensive and more compassionate and willing to help other people (e.g., Mikulincer et al., 2005). In the present study we wished to determine whether reminding a person of times when they had felt either secure or insecure in a relationship would affect performance on the flanker task. We therefore asked study participants, before undertaking the flanker task, to think about a past close relationship in which they felt relatively secure, relatively anxious, or relatively avoidant (although we did not use those abstract psychological terms).

As in Studies 1 and 2, we predicted (Hypothesis 1) that more avoidant individuals would perform better on the task than less avoidant individuals, because they would be able to ignore the incongruent flankers. But we expected this ability to be reduced when participants had just been thinking about a time when they felt insecure. Because avoidant people presumably do not wish to recollect such experiences, being forced to do so and then having to suppress the recalled memories might detract from their usual superiority on a neutral attention task. This would indicate, in line with previous studies, that avoidant people's regulation of attention is not immune to effects of cognitive or emotional load. As before, we also measured dispositional attachment anxiety and the previously used control variables: neuroticism, general anxiety, and the BIS/BAS constructs.

Method

Participants

The participants were 116 undergraduates (87 women, 29 men; *Mdn* age = 19 years) with naturally or medically corrected 20–20 vision. Forty-five percent were Asian; 27%, Caucasian; 10%, His-

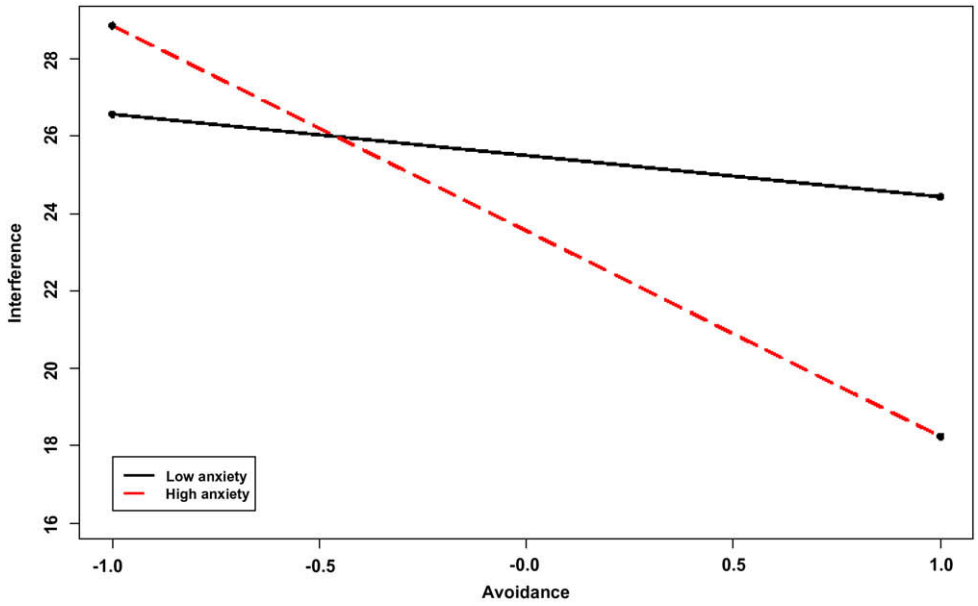

Fig. 1. The 2-way interaction between anxiety and avoidance as predictors of the flanker interference effect in Study 2.

panic; 2%, African–American; and 16% "mixed" or "other." They received credit in an introductory psychology course for participating.

Materials and procedure

Participants were individually tested in a 35-min experiment presented as a study of attention and personality. After receiving general instructions and signing an informed consent agreement, they were then randomly assigned to one of three priming conditions and were asked to remember a relationship in which they felt relatively secure ($n = 42$), anxious ($n = 37$), or avoidant ($n = 37$). They were asked to write a description of that relationship. For example, the instructions in the secure prime condition were: "Try to remember a close relationship in which you felt that the goal of getting close to your partner was achieved with relative ease, a relationship in which you felt comfortable being dependent on your partner or comfortable with your partner being dependent upon you, a relationship in which you did not worry that you would be abandoned or that your partner would get too close to you. Describe this relationship in detail. (You may refer to external events, behaviors of the people involved, and your own thoughts, emotions, desires, and the like.)"

Upon completing the priming task, participants received instructions for the flanker task and completed 10 training trials and 480 experimental trials, as in Study 2. Following the flanker task, participants received a computerized series of questionnaires. In this study, the alphas for the attachment scales were again high (avoidance, .93, anxiety, .93), and they were adequate for neuroticism (.86), trait anxiety (.87), and the BIS/BAS scales (alphas ranged from .61 to .79). The order of the questionnaire measures was randomized across participants.

Results and discussion

As in Studies 1 and 2, there was no significant correlation between either attachment dimension and accuracy in any of the experimental conditions (congruent, incongruent, or neutral); *r*s ranging from .00 to .13 and *p*s ranging from .99 to .16. (The accuracy ranged from .88 to .98, making it difficult for anything to correlate with accuracy.) There was also not a significant effect of prime condition on accuracy; all *F*s < 1. Compatible with previously published studies and our own Study 2, we found a congruency effect, $F(2,112) = 312.66$, $p < .001$, such that reactions to congruent trials were faster than reactions to incongruent trials (average RTs: incongruent $M = 547.23$; congruent $M = 461.32$; and neutral $M = 464.02$).

To examine our hypotheses regarding the effects of avoidant attachment (Hypothesis 1) and the attachment-related primes (Hypothesis 2) on performance in the flanker task, we computed two dummy variables: a secure vs. insecure prime variable (based on a contrast between the secure-relationship prime condition, weighted 2, and the two insecure prime conditions, both weighted −1) and an avoidant vs. anxious prime variable (based on the contrast between the avoidant-relationship prime condition, weighted 1, and the anxious-relationship prime condition, weighted −1, with the secure prime condition having a weight of 0).

Next, we computed three hierarchical regression analyzes, one each for the flanker, facilitation, and interference effects. The regression analyzes were similar to those used in Study 2, but this time we included in the second step not only the two attachment scores (anxiety and avoidance) but also the secure vs. insecure prime variable and the avoidant vs. anxious prime variable as predictors. In the third step, we included the 2-way interactions between the attachment and priming variables, and in the fourth step we included the two 3-way interactions among attachment anxiety, avoidance, and the two prime variables.

The regression analysis for the flanker effect revealed a 2-way interaction between avoidant attachment and the secure vs. insecure prime variable, $\beta = -.29$, $t(96) = -2.82$, $p < .01$. No other main effects or interactions were significant (indicating that the two kinds of insecurity priming had similar effects). To examine the nature of the interaction, we divided the file by prime condition and ran the regression analysis again, once for each prime condition. In the secure prime condition the beneficial effect of avoidance on the flanker effect was significant, $\beta = -.43$, $t(30) = -2.19$, $p < .05$; but in the insecure prime conditions the effect was reversed and approached significance, $\beta = .22$, $t(62) = 1.69$, $p < .10$. In other words, avoidant individuals' previously observed attentional advantage seemed to be eliminated when they had been forced to think about a past insecure relationship.

The regression analysis for the facilitation effect (being helped by congruent flankers – i.e., mean congruent RT minus mean neutral RT) yielded no significant main effects or interactions. The regression conducted for the interference effect (being hindered by the incongruent flankers) revealed a 2-way interaction between avoidance and the secure vs. insecure prime condition, $\beta = -.28$, $t(96) = -2.72$, $p < .01$. (There was also a main effect of the BAS fun factor, $\beta = .24$, $t(105) = 2.11$, $p < .05$, but this is not of interest in the present study; the fun factor was included only as a control variable.) No other main effects or interactions were significant.

To examine the 2-way interaction, we divided the file by prime condition (secure condition compared with the two insecure conditions) and ran two regression analyses, one for the secure prime condition and one for the two insecure conditions combined. In the secure prime condition, avoidance was associated with a smaller interference effect, $\beta = -.40$, $t(30) = -2.11$, $p < .05$; in the combined insecure prime conditions the effect was reversed and approached significance, $\beta = .22$, $t(62) = 1.76$, $p = .08$. In other words, avoidant individuals' attentional advantage was eliminated when they had been thinking about an experience of insecurity. As in Studies 1 and 2, the association between avoidance and better attentional performance occurred even with several potential confounds controlled, and none of the confounds were significantly associated with attention except the BAS fun factor, which is not relevant to present concerns.

General discussion

Previous studies of attachment style and attention have found that avoidant individuals seem to have special abilities to regulate their attention in ways that often allow them not to experience negative attachment-related emotions (e.g., Edelstein & Gillath, 2008). One interpretation of these findings is that avoidant people use pre-attentive mechanisms or cognitive-control strategies to inhibit or disattend threatening thoughts and feelings (e.g., Niedenthal et al., 2002). The nature of this ability – general or attachment-specific – has been unclear. The present studies were aimed at determining whether avoidant individuals perform better than non-avoidant ones on the kinds of attentional tasks used in general cognitive research on attention, and if so, in what ways.

All three studies supported our first hypothesis, which was that avoidant people would perform better than non-avoidant ones on basic attention tasks. In Study 1, they were better able to make two perceptual judgments in rapid succession (on the PRP task). In Studies 2 and 3 they were better able to perform a flanker task. In both studies, avoidance was associated with a reduced interference effect, and in Study 3 it was also associated with the overall flanker effect. The results suggest that avoidant individuals' ability to regulate their attention is due mainly to ignoring or suppressing perceptions of potential distracters, an ability that Posner and Petersen (1990) interpreted as "executive control." By including

several control variables associated with possible alternative explanations (neuroticism, general anxiety, general approach or avoidance tendencies), we confirmed that the association between avoidant attachment and attentional performance is not due simply to non-attachment-specific personality traits.

Avoidant individuals' superiority disappeared, however, when they had been instructed to think about a prior relationship in which they felt insecure (supporting Hypothesis 2). Previous studies, especially the ones by Mikulincer et al. (2004), suggest that avoidant people have difficulty suppressing thoughts about rejection and loss, once activated, if they also have to perform another cognitively demanding task. In our Study 3, the avoidant participants had trouble excelling on the flanker task, either because they needed some of the same cognitive resources to suppress memories of insecurity and perform the flanker task simultaneously or because the negative memories that were insufficiently suppressed (because, unlike the Mikulincer et al., 2004, studies, we did not instruct participants to suppress thoughts of insecurity and did not provide time for them deliberately to do that) directly interfered with focusing on the flanker task. Disentangling these possibilities will require additional research.

Although the present studies show very clearly that avoidant individuals have general attention skills, not just ones used to block out threatening or undesirable attachment-related stimuli, we still do not know the precise nature of their skills or the developmental history behind their acquisition. Attachment theory suggests that experiences in early relationships rewards some children (those with avoidance-inducing parents) for acquiring attachment-related attention skills that then generalize to non-attachment domains. It is also logically possible, however, that innate temperamental factors predispose some children to have special attentional skills, and this makes these children more likely to acquire avoidant defenses when treated non-optimally by parents. To date, temperament theorists have not been very successful in explaining childhood attachment phenomena by temperamental factors (see Vaughn & Bost, 1999; Vaughn, Bost, & van IJzendoorn, 2008, for reviews), but the existing studies have not focused specifically on attention. This is another topic that deserves further research.

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