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Attachment (In)Security and Threat Priming Influence Signal Detection Performance

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Abstract

This study examined whether the subliminal priming of threat and attachment figure availability interfere with cognitive attentional performance in conditions of uncertainty among individuals with differing attachment orientations. University students ($N = 225$) first completed a scale to identify names of their significant attachment figures (WHOTO) and self-report measures of attachment anxiety and avoidance and were then administered a computerized signal detection task assessing their cognitive attentional performance under conditions of threat and attachment figure availability priming. Findings revealed that both attachment anxiety and avoidance posed risk factors for cognitive performance but in different patterns. While attachment avoidance made individuals more prone to errors in missing a signal that was present, attachment anxiety increased the error rate for false alarms. These findings are discussed in relation to previous work in the field and their implications for potential cultural differences.

Keywords

Attachment orientations, cognitive performance, signal detection task, threat and attachment figure primes

One of the most prominent tenets of attachment theory (Bowlby, 1973, 1980, 1982/1969) is that the attachment system is activated under conditions of both physical and psychological threat, eliciting proximity seeking to a protective attachment figure in order to

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increase the chances of survival of the young. However, this proximity-seeking behavior may not be a viable strategy when the attachment figure is absent or unavailable because of contextual and personal factors. In such cases, activation of the attachment system has an effect not only at the behavioral and emotional levels but also at the cognitive level (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer & Shaver, 2007). The present research aims to simulate the activation of the attachment system via attachment-related threat word primes and to investigate the effects of this activation on performance of a cognitive task vis-à-vis the subsequent perceived availability of attachment figures and chronic attachment orientations.

To better explain the activation of the attachment system, Mikulincer and Shaver (2003, 2007) conceptualized a dynamic model explaining primary (secure) and secondary (insecure) attachment strategies that function differently under an actual or imagined threat from the environment and (un)availability of the attachment figure. When the attachment behavioral system is activated in response to the perception of an internal (physiological or psychological) or external (physical) threat, the individual seeks physical or cognitive proximity to the attachment figure. If the attachment figure is consistently responsive to individual's needs for proximity and safety, she/he develops a sense of security and connectedness. However, if the attachment figure somehow fails to fulfill these basic attachment needs, the individual cannot feel the security she/he requires and resorts to using secondary attachment strategies. The resulting insecure attachment patterns in fact develop through two distinct mechanisms. On the one hand, when the attachment figure is constantly harsh, rejecting, and unwilling to provide warm care, the individual deactivates the attachment system and instead develops compulsive self-reliance in order to survive with minimal help from the unresponsive significant other and as a result cultivates attachment avoidance. On the other hand, when the attachment figure is inconsistent, insensitive, or intrusive in caregiving, the individual hyperactivates the attachment system and intensifies proximity-seeking attempts in order to maximize the chances of extracting more resources from the unpredictable attachment figure and consequently develops attachment anxiety.

A number of previous studies have tested the effects of subliminal or supraliminal attachment security and/or threat priming on emotions and behaviors using the framework of attachment system activation. The initial study by Mikulincer and his colleagues (2000) examined the effects of threat priming and attachment system activation and demonstrated that people react relatively faster to attachment-related words after they are primed with a stress word, and that this pattern of accessibility seems to be valid regardless of the person's attachment orientation, attachment relatedness of the stress word, and the type of priming conditions (subliminal or supraliminal). In a subsequent study, Mikulincer, Gillath, and Shaver (2002) showed that threat conditions activate mental representations of attachment figures. It was also found that a threat word prime leads to faster reaction times for the names of attachment figures than a neutral word prime but has no significant effect on the reaction times for the other persons' names. These studies provided empirical evidence for the threat-related activation mechanism of the attachment system.

Previous studies have also shown that the effects of heightened attachment system activation under stressful conditions vary according to individuals' attachment orientation. Mikulincer and his colleagues (2000) demonstrated that securely attached participants show a functional activation of the attachment system whereby they react with heightened accessibility to attachment-related thoughts to stress primes but not to neutral word primes. This indicates that secure individuals' cognitive system is not chronically occupied with attachment themes, and the attachment system is activated only when faced with a threat.

Several recent investigations have examined the activation of secondary attachment strategies (i.e., hyperactivation and deactivation) and their effects on attention and cognition as well. The studies examining secondary activation have consistently found that anxiously attached people tend to focus their attention more easily on and have greater difficulty drawing their attention away from attachment-related stimuli and information, evidencing their preoccupation with attachment-related thoughts. For instance, Mikulincer and his colleagues (2000) showed that anxiously attached participants react faster to attachment themes under both conditions of stress and neutral primes. Moreover, they show relatively high accessibility to thoughts about proximity-related worries when primed with words relating to proximity and love and display heightened activation of the representations of their attachment figures when they are primed with both neutral and threat words (Mikulincer et al., 2002). Similarly, Dewitte, Houwer, Buysse, and Koster (2008) demonstrated that attachment anxiety is related to heightened approach (vs. avoidance) responses toward the attachment figure under conditions of both threat and neutral word priming. Another study by Dewitte, Houwer, Koster, and Buysse (2007) showed that attachment anxiety is also related to attentional bias toward attachment figures in both threat and positive attachment contexts. When taken together, these results suggest that anxiously attached people exhibit chronic hyperactivation of the attachment system, which is easily triggered even when there is no apparent signal of threat.

This chronic preoccupation with the availability of attachment figures is argued to influence anxious people's cognitions as well. It has been demonstrated that attachment anxiety affects the ability to suppress attachment-related thoughts. One set of studies has shown that when anxiously attached individuals are asked to picture their romantic partner leaving them and then a few minutes later to stop thinking about it, they have difficulty forgetting the imagined scenario, and their skin conductance level and emotion-related brain activity remain high (Fraley & Shaver, 1997; Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005). Consistent with the premises of the attachment activation system, Siefert (2005) demonstrated that anxiously attached people have heightened access to negative childhood memories. Moreover, Mikulincer, Florian, Birnbaum, and Malishkevich (2002) showed that separation reminders increase the accessibility of death-related thoughts for anxious participants. Corroborating these results, Stanton and Campbell (2015) recently found that anxiously attached individuals experience cognitive load when they encounter relationship threats.

Avoidant attachment, however, seems to cause a very different pattern in the attachment system activation. Past studies have indicated that avoidant individuals find it relatively easy to shift their attention away from attachment-related threat words (Dewitte, Koster, De Houwer, & Buysse, 2007) or other stimuli that could activate or suggest attachment-related themes (Edelstein & Gillath, 2008; Kirsh & Cassidy, 1997). They easily suppress separation-related thoughts (Fraley & Shaver, 1997) and show low accessibility to attachment-related worries even when a prime word is semantically associated with these worries (Mikulincer et al., 2000). In addition, they take longer to identify attachment-related information, have decreased access to the names of their attachment figures in attachment-related threat conditions (Mikulincer et al., 2002), show a weaker tendency to approach the attachment figure (Dewitte et al., 2008), and report greater difficulty encoding and recalling attachment-related information (Fraley, Garner, & Shaver, 2000). They have also been found to recall fewer emotional childhood memories and take longer time to retrieve them (Mikulincer & Orbach, 1995). Furthermore, Dozier and Kobak (1992) and Roisman, Tsai, and Chiang (2004) found that avoidant people show increased electrodermal activity during the Adult Attachment Interview, especially during questions that ask them to consider real and imagined separations or rejections from their parents, as evidence of their effortful emotional suppression. Overall, these studies suggest that those with avoidant attachment regulate their cognitive resources so that they avoid attachment-related thoughts primarily via the mechanisms of attention and memory. The ability of avoidant individuals to block or disengage from such attachment-related information suggests the operation of a preattentive mechanism or cognitive-control strategy (Niedenthal, Brauer, Robin, & Innes-Ker, 2002). A recent study by Marks and Vicary (2016) contributed to these findings by showing that individuals high on attachment avoidance can manage to lower their access to attachment themes when they are consciously aware of the presence of an attachment threat.

Interestingly, it has been shown that the ability of avoidant people to ignore attachment-relevant information in fact diminishes when a cognitive or emotional "load" is inflicted (e.g., Berant, Mikulincer, & Shaver, 2008; Edelstein & Gillath, 2008; Mikulincer, Dolev, & Shaver, 2004). This finding suggests that the control of attention takes cognitive effort, and when another cognitive task is given, the individual experiences ego depletion, which causes her/him to fail to avoid attachment-related information. Mikulincer and his colleagues' findings (2002), that avoidant participants failed to show low accessibility to attachment-related worries under cognitive load, are also in line with this pattern. Taken together, these findings indicate that avoidant people are also preoccupied with attachment-related thoughts and emotions. However, unlike anxiously attached people, they have learned that pursuing them is not a viable option, so they use their cognitive capacity to suppress these thoughts and emotions through a process that utilizes cognitive effort and inevitably fails when some additional cognitive load is presented.

Although many studies have examined attachment system activation vis-à-vis different attachment orientations, to date no studies have manipulated the priming of both threat conditions and attachment figure availability to provide a closer simulation of the attachment system activation and functioning model offered by Mikulincer and Shaver (2003, 2007). The first module of their model depicts the activation of the attachment system in response to signs of threat, and this has been replicated in many studies, as reviewed above. However, the second and third modules, depicting the differentiation between the availability and unavailability of the attachment figure, and the hyperactivating and deactivating strategies employed in cases of unavailability as a function of the viability of proximity-seeking options, have not yet been simulated in experimental settings. Arguably, this identifies an important gap in the investigation of the effects of attachment system activation on cognitive processes, since the entire system is not accurately simulated unless both threat and availability of the attachment figure are represented. The present study aims to fill this gap by creating a more real-life-like simulation of the attachment system activation by priming both threat and attachment figure availability conditions consecutively. For this purpose, threat priming is intended to serve as the attachment system activator, and attachment figure availability priming is intended to represent the viability of proximity-seeking options. By examining the effects of these primes vis-à-vis chronic attachment dispositions, we intend to deliver a better approximation of the attachment system activation and functioning that is arguably more compatible with the model offered by Mikulincer and Shaver (2003, 2007).

Moreover, although the relationships between attachment orientations and cognitive processes underlying the activation of the attachment system have been widely examined, to the best of our knowledge, the effects of attachment system activation on cognitive performance and attentional control have not been examined, with the exception of the study by Gillath, Giesbrecht, and Shaver (2009). These authors demonstrated that avoidant individuals perform better than non-avoidant individuals on basic attention tasks, but their superior performance declines when they are reminded of a close personal relationship they fell insecure about. However, it is still unknown how they would perform when presented with a subliminal reminder of their chronically unavailable attachment figure and/or when they perceive an attachment-related threat. It is reasonable to predict on the basis of previous studies that cognitive failure is likely to result from the distraction caused by the load inflicted by the hypervigilant strategy of people who are high on attachment anxiety. However, relatively little is known about the consequences of defensive suppression and deactivating strategies of people who are high on attachment avoidance when their performance is measured in subsequent tasks. In order to fill these gaps, the present study aims to measure the effects of attachment system activation by both threat and attachment figure primes on attentional control performance on a neutral cognitive task, which is independent of threat and attachment themes.

Furthermore, we do not know how cognitive attentional control is influenced when the individual is asked to perform under uncertainty while the attachment system is activated. Considering that attention capacity is a crucial component of the cognitive system, as the key tool for extracting motivationally relevant information from the environment and acting accordingly, attentional control merits more detailed investigation, especially under conditions of uncertainty – an unexplored angle. This investigation is crucial since the attachment behavioral system indeed has to function within uncertainty, where the individual has to constantly monitor the setting for signs of physical or psychological threat, and act accordingly by employing adaptive attachment behavior in order to survive amidst constant unknowns (Mikulincer & Shaver, 2007). This study aims to fill these gaps by utilizing a cognitive task that is tuned to measure attentional performance in face of ambiguous stimuli.

Considering this aim and the fact that previous studies have investigated the cognitive processes underlying the attachment system activation using rather straightforward assessments of mere inhibition of dominant response, such as Stroop, lexical decision, or dot-probe tasks, we employed another, and possibly more informative method, namely, the signal detection task, which is a technique based on the modeling of decision-making processes under conditions of uncertainty. The signal detection task involves presenting the participant with a set of stimuli for a very brief period of time and asking them to identify whether a certain stimulus is present within this set or not. The knowledge that the target stimulus is present in some cases but absent in others poses a degree of uncertainty for the performer. Hence, the task of correctly identifying the presence or the absence of this inconsistent stimulus mirrors the challenge of working under conditions of unpredictability. The signal detection task provides a unique opportunity to examine the behavior of an observer in the presence of ambiguous stimuli since the task of the observer is to discriminate the presence versus absence of a signal from the noise. The amount of ambiguity in the stimulus can be manipulated in the signal detection task to reveal how observer accuracy and/or bias change (e.g., Lerman et al., 2010). For this reason, we chose the signal detection task to assess objectively whether those with differing attachment orientations have varying accuracy (i.e., sensitivity) in detecting signals in ambiguous situations. We believe this framework of the signal detection task could be a fairly good approximation of the attachment system, as its working principle is based mainly on detecting whether cues of threat are present or absent.

The signal detection task has been utilized before in various research areas where information processing models are used, such as sensory psychophysics and decision-making (Tanner & Swets, 1954), attention (Sorkin, Pastore, & Pohlmann, 1972), memory (Banks, 1970), speech perception (Egan & Clarke, 1956), audiology (Campbell & Moulin, 1968), maternal sensitivity (Donovan, Leavitt, & Taylor, 2005), susceptibility to stress (Horowitz, Becker, & Malone, 1973), and psychological aging (Hertzog, 1980; Ratcliff, Thapar, & McKoon, 2001).

The signal detection paradigm has many advantages over other paradigms for the assessment of cognitive performance. It is a relatively simple task, which eliminates the possible confounding effects of intelligence and level of education. It is also representative of many other cognitive paradigms such as lexical decision-making, matching tasks, recognition memory, and semantic verification (Ratcliff, Zandt, & McKoon, 1999). Yet it is markedly different from these tasks – as an executive function test, the signal detection paradigm offers a unique method of modeling the decision-making process of someone who has to make decisions under conditions of uncertainty because the target stimulus to be processed and reacted to is sometimes present and sometimes absent in an unpredictable fashion. This framework provides the researcher with the opportunity to differentiate between the two distinct kinds of right (i.e., correctly identifying the presence or absence of a stimulus – a hit, or a correct rejection, respectively) and wrong decisions (i.e., judging the stimulus is there when in fact it is not – a false alarm, or failing to detect a stimulus that in fact is there – a miss); and hence to assess not only mere performance but also sensitivity and bias. This makes it a valuable method of measurement since it assumes that rather than being a passive receiver of information, the decision maker is active and makes difficult perceptual judgments under conditions of uncertainty (Swets et al., 1964). Finally, signal detection task has been considered to be an instrumental method for solving the problem of individual differences in decision processes since it explicitly delineates a subject's level of sensitivity to discriminate between competing stimulus alternatives and his or her decision processes in response giving rather than assessing congruence to response criteria only (Hertzog, 1980). Other cognitive tasks, such as the Stroop, lexical decision, or dot-probe tasks, are more straightforward assessments, where the participant only has to inhibit their dominant response, which does not give the researcher the opportunity to assess whether the participant is good at deciding when to act and when to withhold action in accordance with unpredictable conditions. All things considered, an application of the signal detection paradigm to attachment system activation and subsequent cognitive attentional task performance could arguably be beneficial, since this measure of higher order cognitive function of making decisions under conditions of uncertainty may reflect key underlying processes of the attachment behavioral system, which is essentially a go/no go decision-making mechanism that has to function also within uncertain environments, where the individual has to correctly identify the presence or absence of certain stimuli signaling physical or psychological threat. Success in the signal detection requires the person's full attention to correctly identify uncertain stimuli and thus may be a relatively good proxy to measure cognitive performance in the uncertain setting of attachment system activation in real life.

Overview of the Present Study and Hypotheses

This study aims to simulate the attachment system activation and functioning by subliminally priming conditions of threat and attachment figure availability and investigate the subsequent effects of this activation vis-à-vis the two fundamental attachment orientations, attachment anxiety, and attachment avoidance, on a series of attention tasks. The experimental design of the present study is a 2×2 between-subject factorial design, defined by first prime (attachment-related threat word vs. neutral word) $\times$ second prime (name of attachment figure vs. neutral name), where each experimental condition is examined for additional moderation of the primes by the two attachment dimensions. Cognitive attentional performance is measured via precision and response time in the signal detection task.

The overarching expectation of the present study is that the priming of an attachment-related threat would activate the attachment system, and this activation would affect the attentional performance in the signal detection task (through different forms of decision-making accuracy and latency) as a function of the interaction of the attachment orientations and subsequent availability of the attachment figures. Both attachment anxiety and attachment avoidance are expected to predict cognitive performance in the signal detection task, but in different ways due to the different defensive secondary attachment strategies they entail.

Specifically1

Hypothesis 1. Under the experimental condition where the attachment system is activated with a threat word, followed by the priming of the attachment figure name, attachment anxiety is conceived to be associated with lower performance in the subsequent cognitive task—in terms of reporting more false alarms (making false positive judgments).

This condition, where the attachment figure is mentally available, is thought to be a fairly close replication of the attachment system of individuals high on attachment anxiety, for whom seeking proximity to attachment figures is a viable option when the attachment system is activated upon threat. The suboptimal attentional performance is regarded to be due to the chronic hypervigilance to threat stimuli resulting from the hyperactivation strategy (see Mikulincer et al., 2000; Mikulincer et al., 2002).

Hypothesis 2. Under the experimental condition where the attachment system is activated with a threat word, followed by the priming of a neutral name, attachment avoidance is conceived to be associated with lower performance in the subsequent cognitive task—in terms of reporting more misses (making false negative judgments). This condition, where the attachment figure is unavailable, is thought to be a reasonably close replication of the attachment system of individuals high on attachment avoidance, who are accustomed to the chronic unavailability of their attachment figures. This suboptimal attentional performance is regarded to be due to the effortful suppression of the attachment system caused by the deactivation strategy (see Berant, Mikulincer, & Shaver, 2008; Edelstein & Gillath, 2008; Mikulincer, Dolev, & Shaver, 2004 and Mikulincer et al., 2002).

Method

Participants

A total of 227 undergraduates at the Middle East Technical University in Ankara (73.77% female) participated in the study for extra course credit. One participant was excluded since she had night blindness which made it impossible for her to use the computer screen, and another one dropped the course and did not participate in the experimental session, leaving 225 participants for further analyses. The mean age of participants was 20.65 ($SD = 2.70$).

Instruments

Participants completed the following measures one week before the beginning of the experimental sessions:

Experiences in Close Relationships Inventory (ECR). Attachment orientations were measured with the ECR (Brennan, Clark, & Shaver, 1998), which is composed of two 18-item scales, one measuring attachment anxiety and the other measuring attachment avoidance. The ECR attachment avoidance subscale reflects an individual's discomfort with closeness, and the attachment anxiety subscale reflects an individual's concern about abandonment. The ECR has been translated and adapted into Turkish and shown to have high reliability and good construct validity (Sümer, 2006). Both subscales had high Cronbach's α reliability coefficients; .85 for the anxiety and .92 for the avoidance subscale in the current study.

WHOTO. The 6-item WHOTO scale, developed by Fraley and Davis (1997), was administered in order to determine the names of the attachment figures of the participants. Each of the three attachment functions, namely, proximity seeking, safe haven, and secure base, was assessed with 2 items. For each item, participants were instructed to write the first name of the person who best serves the targeted attachment-related function and to label that person's relational role (e.g., mother, father, friend, romantic partner). For each participant, the attachment figure was identified as the name that appeared most frequently in answers to these six questions. The WHOTO has been previously translated and adapted into Turkish by Gündoğdu Aktürk (2010) and has been shown to have good construct validity.

List of Turkish First Names. In order to create an alternative neutral name to the names of attachment figures, the participants received a list of Turkish first names and were asked to mark the ones that were names of people that they knew personally. The name list consisted of some common and uncommon names in Turkish language, and at the end of the data inspection, the name "Güner" was selected as the neutral name prime since it was recognized by the least number of participants, is a unisex name in the Turkish language, and was not expected to elicit participants' feelings in relation to an attachment figure.

One week after the pre-experimental session, the participants completed the following measure in the experimental sessions.

The Signal Detection Task. In the experimental sessions, the participants were presented with a series of trials in which a particular stimulus signal was either present or absent. The participant could correctly identify the presence or absence of a signal (a hit, or a correct rejection); or incorrectly identify a signal when in fact it was absent (a false alarm), or miss the presence of a signal (a miss) (Green & Swets, 1966; Swets et al., 1964).

The signal detection task in this study was a series of computerized tasks where the participants were asked to determine if the letter Y (signal) was present or not in a string of letter X, by pressing the appropriate keys on the keyboard. The number of correct hits, correct rejections, false alarms, and misses, and the reaction times associated with those answers were recorded.

Cognitive attentional performance of the participants in the signal detection task was measured via two estimates, precision and response time. The precision of the participants in the signal detection task was measured via the *d prime (d')*—the most commonly used measure of sensitivity in signal detection tasks, defined as the standardized difference between the means of the false positive (false alarms) and true positive (hits) responses; with higher levels of d' indicating a higher sensitivity in correctly detected signals, and hence better cognitive attentional performance (Swets, Tanner, & Birdsall, 1964; Tanner & Swets, 1954). The numbers of hits, correct rejections, false alarms, and misses were also taken into account as measures of cognitive performance, with a higher number of hits and correct rejections indicating better performance, and a higher number of false alarms and misses signaling poorer performance. *Response time* in all signal detection tasks of participants was also calculated as an indicator of performance, with shorter reaction times associated with higher cognitive performance.

Procedure

One week prior to the beginning of experimental sessions, the survey package consisting of an informed consent form, a demographic information form, ECR, WHOTO, and a list of Turkish names was administered to the participants in the introductory psychology courses.

Before the participants were invited to the laboratory for the experiment, they were randomly assigned to one of the four conditions of the 2 × 2 factorial design. The first experimental condition included the manipulation of the presence of a threat prime, which served as the activator of the attachment system. In this condition, participants were exposed to the subliminal presentation of either an attachment-related threat word or a neutral word. In the second experimental condition, the presence/absence of an attachment figure name prime was manipulated and thus served as the attachment figure availability. In this condition, the participants were exposed to the subliminal presentation of either the name of their attachment figure or a neutral name (Güner). In sum, all participants were equally assigned to one of the four conditions: (1) neutral word–neutral name, (2) neutral word–attachment figure name, (3) threat word–neutral name, and (4) threat word–attachment figure name, without knowing their attachment orientations.

After approximately one week following the administration of self-reported scales in classrooms, the experiment sessions were started and took about a month to complete. Each participant was admitted to the laboratory individually and it was explained that they would participate in an experiment on social cognition in which they would complete a series of computerized tasks.

The cognitive tasks were programmed using the DirectRT research software (Jarvis, 2006) and were run on two Hewlett Packard 7540 CRT color monitors with refresh rates of 85 Hz. All the stimuli were displayed in black lettering on a white background and were located in the middle of the screen. The participants received all the instructions on the computer screen and were allowed to stop and ask questions to the experimenter at any point, and they worked at their own pace throughout the experiment.

After the instructions, the participants were presented with the first trial of the experiment. Each trial of the task began with a "+" in the middle of the screen followed by a 20-ms subliminal presentation of the first prime word in black lettering. Next, an XXX pattern, which served as a backward mask, was presented for 500 ms. The first prime word was either an attachment-related threat word in Turkish (sad, fear, loss, unhappy, alone, separation) or a neutral word (jacket, hat, book, shirt, notebook, chair) according to the experimental condition. The prime words were presented in a randomized order. Threat words were selected from previous literature (Mikulincer et al., 2000; Mikulincer, Gillath, & Shaver, 2002) and translated into Turkish. Neutral words were selected on the basis that they did not carry any emotion-laden meanings, and that their number of letters matched the number of letters in the threat words.

When the backward mask following the first prime word disappeared from the screen, another "+" appeared in the middle of the screen and was followed by a 20-ms subliminal presentation of the second prime word in black lettering. Then an XXX pattern, which served as a backward mask, was presented for 500 ms. The second prime word was either the name of the attachment figure of the participant, which was previously assessed via the WHOTO scale, or the neutral name (Güner), again according to the experimental condition.

Immediately following the last backward mask, the first trial of the signal detection task began. The participants were presented with a string of 15 letter Xs for 500 ms. At half of the trials the letter Y was embedded in this string of Xs, while there was no Y in the other half of the strings. Immediately after the string disappeared, the participants were asked "Did you see the Y?" Participants were instructed to press either the key "E" for yes ("Evet" – the word for yes in Turkish) or the key "H" for no ("Hayır" – the word for no in Turkish). The appropriate response keys were reassigned on the keyboard so that the letters associated with yes/no were next to one another for ease of the answering process, and the positions of the response keys were counterbalanced within the two computers.

Once each trial of the signal detection task was over, the participants were again presented with the same sequence of primes, and the next trial of the task began. Participants were given 10 practice trials at the beginning and then 60 experimental trials, only the responses in the experimental trials were recorded and analyzed. The entire task took approximately half an hour in total.

After the completion of the experiment, the participants were thanked and they were fully debriefed via e-mail once all of the experimental sessions and data collection were finished.

Results

Participants reported significantly higher levels of attachment anxiety ($M = 4.00$, $SD = .93$) than attachment avoidance ($M = 3.08$, $SD = 1.11$), $t(224) = 64.83$, $p < .001$. The average percentage of hits was 39.38% ($M = 23.63$, $SD = 3.30$), correct rejections was 41.48% ($M = 24.89$, $SD = 4.03$), false alarms was 8.03% ($M = 4.82$, $SD = 4.02$), and misses was 10.18% ($M = 6.11$, $SD = 3.26$) in a total of 60 trials (see Table 1). Mean standardized signal detection sensitivity (d') was 1.98 ($SD = .66$). Mean reaction time was 578.76 ms ($SD = 176.56$) for hits, 433.33 ms ($SD = 162.20$) for correct rejections, 660.30 ms ($SD = 200.04$) for false alarms, and 761.42 ms ($SD = 346.18$) for misses. Average reaction time in all signal detection tasks was 751.47 ms ($SD = 299.66$).

As seen in Table 1, attachment avoidance was negatively correlated with the number of hits ($r = -.16, p = .019$) and signal detection sensitivity (d') ($r = -.18, p = .006$), and positively correlated with the number of misses ($r = .15, p = .026$) and reaction time for hits ($r = .17, p = .011$), correct rejections ($r = .19, p = .004$), false alarms ($r = .14, p = .033$), and average reaction time for the signal detection task ($r = .20, p = .003$); whereas attachment anxiety was not significantly correlated with any of the study variables. As would be expected, sensitivity in signal detection tasks (d') was negatively correlated with average reaction time in responding the signal detection items ($r = -.21, p = .002$).

Table 1. Descriptive statistics and bivariate correlations of the major study variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. ECR avoidance												
2. ECR anxiety	.02											
3. Number of hits	−.16*	.05										
4. Number of correct rejections	−.12	.00	−.05									
5. Number of false alarms	.12	.01	.06	−.99***								
6. Number of misses	.15*	−.05	−.99***	.05	−.05							
7. *d′*	−.18**	.01	.56***	.76***	−.76***	−.55***						
8. RT hits	.17*	−.01	−.20**	−.05	.04	.22**	−.14*					
9. RT correct rejections	.19**	.04	−.05	−.25***	.25***	.07	−.21**	.73***				
10. RT false alarms	.14*	−.02	−.05	.09	−.09	.06	.06	.44***	.49***			
11. RT misses	.11	.01	.10	−.09	.10	−.09	.02	.59***	.77***	.55***		
12. RT average	.20**	.02	−.18**	−.13	.13	.20**	−.21**	.89***	.93***	.58***	.78***	
Mean	3,08	4.00	23.63	24.89	4.82	6.11	1.98	578.76	433.33	660.30	761.42	751.47
SD	11.11	.93	3.30	4.03	4.02	3.26	.66	176.56	162.20	200.04	346.18	299.66
Frequency			39.38%	41.48%	8.03%	10.18%						

Note. d′ = sensitivity, i.e., the standardized difference between the means of false positive (false alarms) and true positive (hits) responses in signal detection task. RT = reaction time; ECR = Experiences in Close Relationships Inventory.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Considering that using the two attachment dimensions as continuous variables, rather than forced categories, potentially explains larger variance on the outcome variables and is deemed to be a better fit for measuring individual differences in attachment (see Brennan, Clark, & Shaver, 1998; Sümer, 2006; Fraley, Hudson, Heffernan, & Segal, 2015), we conducted a series of hierarchical regression analyses, where attachment anxiety and avoidance, dummy-coded experimental conditions, and their interactions were the predictors of cognitive performance. In these regression analyses, following the procedures described by Aiken and West (1991), first the variables were mean centered and two- and three-way interaction terms were computed by multiplying all centered variables with each other. Attachment anxiety and avoidance, and prime word and name were entered in the first step; then the two- and three-way interaction terms of these variables were entered in the second and last steps, respectively. The four-way interaction term of all variables was not entered in the analysis due to inadequate power. Finally, in order to depict the significance, simple slope tests were employed and significant interactions between the variables were plotted by generating simple regression equations of a given dependent variable at low (i.e., one *SD* below the mean) versus high (i.e., one *SD* above the mean) levels of the independent variable, following the methods of Aiken and West (1991). The standardized regression coefficients (β) explained variance of each step (R^2 *change*), and total explained variances (*adjusted* R^2) are presented in Table 2.

The regression analyses revealed a similar pattern of results for number of hits and number of misses. Attachment avoidance significantly predicted both the number of hits ($\beta = -.14, p = .035$) and misses ($\beta = .13, p = .047$) in the signal detection task (see Table 2). Moreover, three-way interaction effects of attachment avoidance, prime word, and prime name on both number of hits and number of misses were significant ($\beta = .14$, $p = .036$; $\beta = -.14, p = .039$). In order to depict the significance and patterns of these interactions, simple slope tests were employed and the interactions were plotted. Supporting Hypothesis 2, the simple slope tests revealed that when the participants were primed with a threat word followed by a neutral name, as the level of attachment avoidance increased, the number of hits decreased, $t(217) = -2.63, p = .009$, and the number of misses increased, $t(217) = 2.66$, $p = .008$ (see Figures 1(a) and 2(a)). No significant interaction effects were found under the neutral word prime for either the number of hits or the number of misses (see Figures 1(b) and 2(b)).

Matching results were obtained for the number of correct rejections and number of false alarms. Attachment avoidance marginally but significantly predicted both the number of correct rejections ($\beta = -.12, p = .068$) and false alarms ($\beta = .13, p = .063$) (see Table 2). Moreover, three-way interaction effects of attachment anxiety, prime word, and prime name on both the number of correct rejections and number of false alarms were found to be significant ($\beta = -.20, p = .003$; $\beta = .20, p = .004$). In support of Hypothesis 1, the simple slope tests revealed that when the participants were primed with a threat word followed by an attachment figure name, as the level of attachment anxiety increased, the number of correct rejections decreased, $t(217) = -2.47, p = .014$, and the number of false alarms increased, $t(217) = 2.55, p = .012$ (see Figures 3(a) and 4(a)). No significant interaction effects were found under the neutral word prime for either the number of correct rejections or the number of false alarms (see Figures 3(b) and 4(b)).

Table 2. Attachment anxiety and avoidance, prime word and prime name regressed on measures of cognitive performance.

	Number of+hits	Number of correct rejections	Number of false alarms	Number of misses	Sensitivity in signal detection tasks (d')	Reaction time for hits	Reaction time for correct rejections	Reaction time for false alarms	Reaction time for misses	Reaction time in all signal detection task
Variables	β	β	β	β	β	β	β	β	β	β
Anx	.03	−.05	.05	−.02	−.04	.01	.07	−.01	.01	.05
Avo	−.14*	−.12†	.13†	.13*	−.18**	.18**	.20**	.13†	.11	.22**
Prime word	.08	−.08	.07	−.08	−.01	.08	.06	−.01	.04	.06
Prime name	.08	−.10	.09	−.07	−.02	.01	.08	−.13†	.00	.02
Anx × Prime Word	−.10	−.05	.06	.09	−.11	.01	−.03	.04	.00	−.01
Anx × Prime Name	−.07	−.08	.08	.10	−.09	.09	.11†	.12†	.06	.13†
Avo × Prime Word	−.03	−.07	.05	.04	−.04	−.07	−.05	−.07	−.04	−.10
Avo × Prime Name	.03	.03	−.03	−.04	.04	.00	.00	−.02	.07	.00
Anx × Prime Word × Prime Name	−.06	−.20**	.20**	.08	−.20**	−.01	.06	−.07	−.02	.01
Avo × Prime Word × Prime Name	.14*	.02	−.02	−.14*	.12	−.10	−.06	.01	.05	−.07
R^2 change	.03	.05	.05	.04	.06	.02	.02	.02	.01	.03
Adjusted R^2	.03	.04	.03	.03	.04	.02	.03	.02	.02	.01

Note. Variables: attachment anxiety, attachment avoidance, type of primed word, type of primed name. β values were taken from the last step.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$

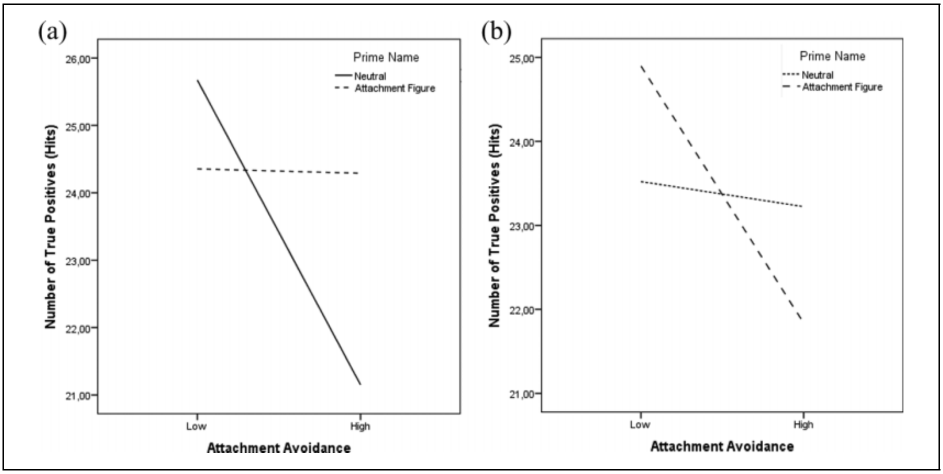

Figure 1. a. Three-way interaction effect of attachment avoidance and prime name on number of hits under threat word prime. b. Three-way interaction effect of attachment avoidance and prime name on number of hits under neutral word prime.

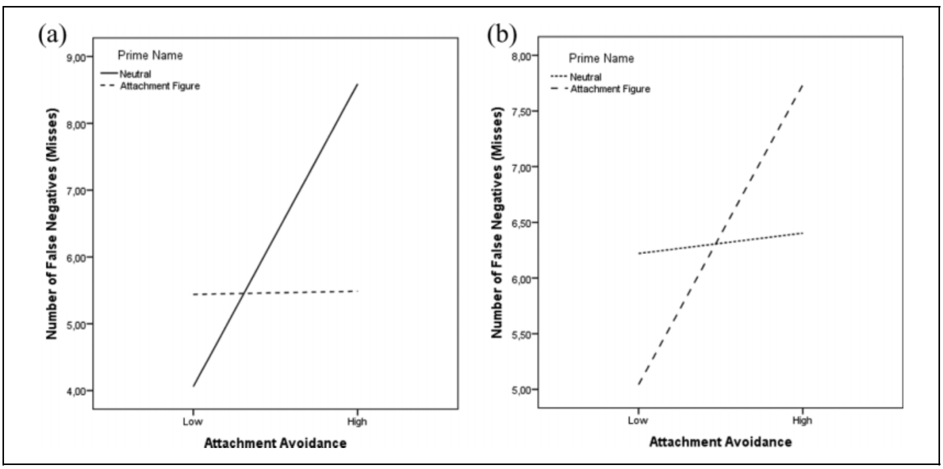

Figure 2. a. Three-way interaction effect of attachment avoidance and prime name on number of misses under threat word prime. 2b. Three-way interaction effect of attachment avoidance and prime name on number of misses under neutral word prime.

With regard to standardized sensitivity in the signal detection task (d'), analyses revealed that attachment avoidance was again a significant predictor ($\beta = -.18$, $p =$ .009), indicating that as attachment avoidance increased, signal detection accuracy performance deteriorated (see Table 2). The three-way interaction effect of attachment anxiety, prime word and prime name also significantly predicted d' ($\beta = -.20$, $p =$ .004). The significant simple slope $t(217) = -2.76$, $p = .006$ for the threat word-attachment figure name condition suggested that participants with high attachment

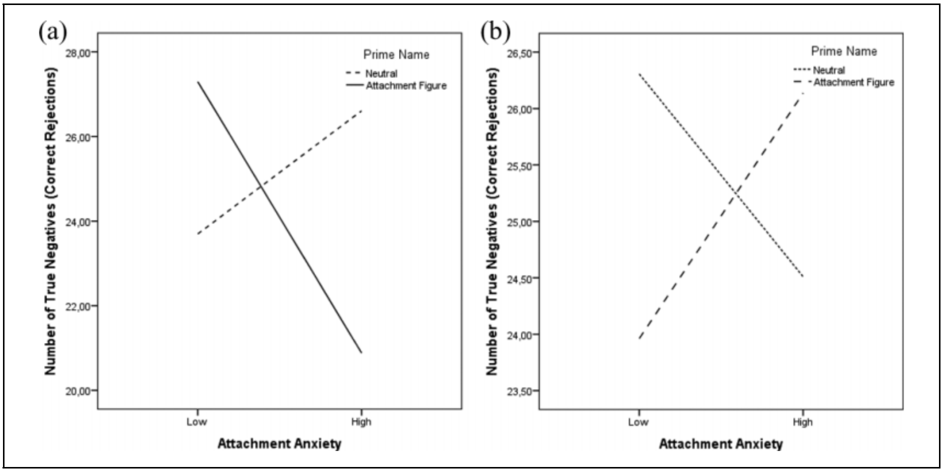

Figure 3. a. Three-way interaction effect of attachment anxiety and prime name on number of correct rejections under threat word prime. b. Three-way interaction effect of attachment anxiety and prime name on number of correct rejections under neutral word prime.

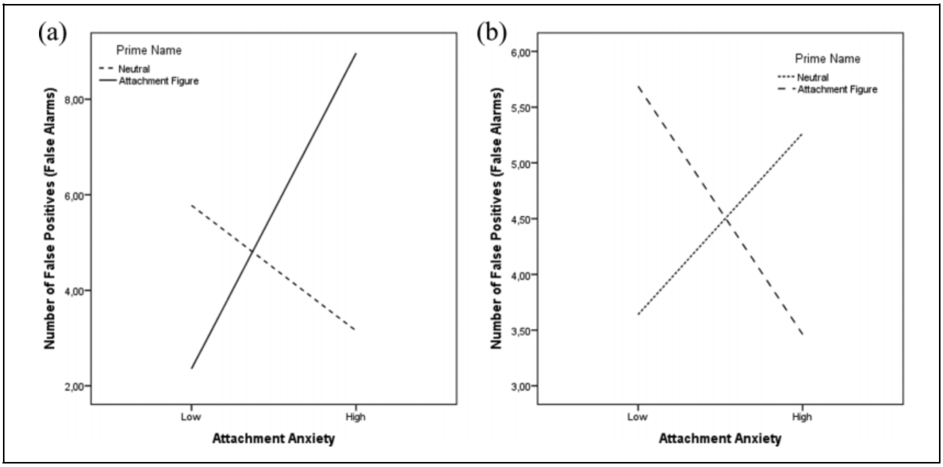

Figure 4. a. Three-way interaction effect of attachment anxiety and prime name on number of false alarms under threat word prime. b. Three-way interaction effect of attachment anxiety and prime name on number of false alarms under neutral word prime.

anxiety performed worse on the signal detection task by scoring significantly lower on d' as compared to the participants with low attachment anxiety under this condition (see Figure 5(a)). No significant interaction effects were found under the neutral word prime (see Figure 5(b)).

In addition to sensitivity, reaction time in the signal detection task was also investigated as an indicator of cognitive performance. Results of the regression analyses revealed that attachment avoidance positively predicted reaction time for hits

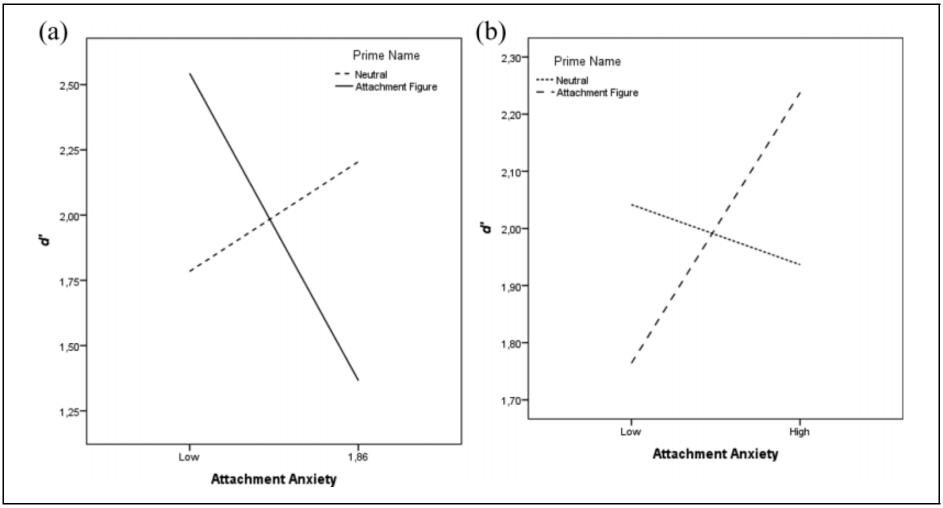

Figure 5. a. Three-way interaction effect of attachment anxiety and prime name on signal detection sensitivity (d') under threat word prime. b. Three-way interaction effect of attachment anxiety and prime name on signal detection sensitivity (d') under neutral word prime.

($\beta = .18, p = .009$), correct rejections ($\beta = .20, p = .003$), and false alarms ($\beta = .13$, $p = .052$), as well as for all signal detection tasks ($\beta = .22, p = .002$), suggesting that those with high attachment avoidance performed worse in the task. Marginally significant two-way interaction effects of attachment anxiety and prime name on reaction time for correct rejections, false alarms, and all signal detection tasks also emerged ($\beta = .11, p = .098$; $\beta = .12, p = .095$; $\beta = .13, p = .064$). Simple slope tests failed to reveal any significant slopes for reaction time for correct rejections and false alarms; yet a marginally significant simple slope emerged for reaction time in all signal detection tasks $t(221) = 1.53$, $p = .071$, for the attachment figure name condition, showing that participants with high attachment anxiety performed worse in the signal detection task with higher reaction times, as compared to participants with low attachment anxiety, who reported lower reaction times (see Figure 6).

Discussion

The overarching aim of the present study was to simulate the attachment system activation by experimentally manipulating attachment-related threat presence and attachment figure availability via subliminal priming in an effort to explore if this activation affected cognitive attentional performance with respect to attachment tendencies. As anticipated, the overall results pointed to a differentiated effect, where attachment anxiety emerged as associated with deteriorated attentional performance under attachment system activation in terms of making more false alarms, while attachment avoidance emerged as associated with missing the signals that are actually there.

The main expectation of the present research was supported, which was that the activation of the attachment system would affect attentional performance in the signal

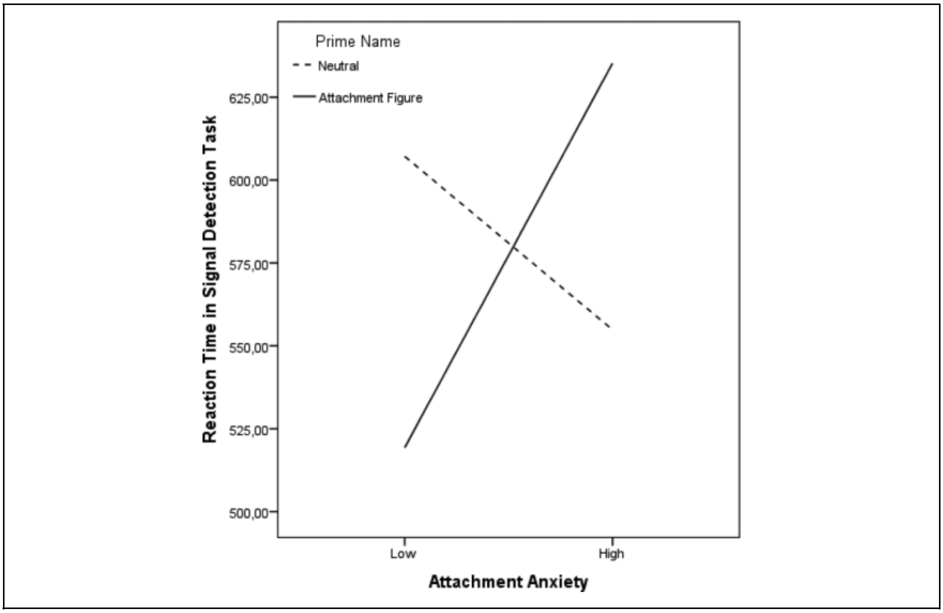

Figure 6. Two-way interaction effect of attachment anxiety and prime name on reaction time in all signal detection tasks.

detection task as a function of the interaction of the attachment orientations and the subsequent availability of the attachment figures. As expected, both attachment avoidance and anxiety emerged as negatively related to cognitive performance, but in distinct patterns.

Unlike the majority of the previous studies which have argued that individuals who score high on attachment avoidance are able to arrange and utilize their cognitive resources so that they can deactivate their attachment systems, suppress attachment needs, and remain focused even under conditions of threat (Dewitte, Koster, et al., 2007; Edelstein & Gillath, 2008; Fraley & Shaver, 1997; Kirsh & Cassidy, 1997; Mikulincer et al., 2000), the findings of the present study showed that high attachment avoidance does not provide the individual with a protective shield when it comes to cognitive attentional performance under attachment-related threat. To the contrary, the current results indicated that, irrespective of priming conditions, attachment avoidance emerges as a predictor of suboptimal cognitive functioning, evident in its significant negative relationship with signal detection sensitivity, and positive relationship with reaction time in the signal detection task, which indicate lower accuracy and longer response latencies, hence poorer performance. This pattern indicates that attachment avoidance is associated with more instinctual responses, which are not only slow but also inaccurate. These results are well in line with previous findings indicating attachment avoidance is negatively related to cognitive openness, curiosity, novelty seeking, and the need for cognition and exploration (Aspelmeier & Kerns, 2003; Chotai, Jonasson, Hagglof, & Adolfsson, 2005; Green & Campbell, 2000; Mikulincer, 1997), which could be considered as precursors of optimal cognitive performance. Much like the way they minimize their dependence on attachment figures, circumvent social interaction, and suppress their attachment needs (Bowlby, 1988; Shaver & Hazan, 1993), individuals high on attachment avoidance also dismiss the importance of new information, avoid exploration, and suppress curiosity (Mikulincer, 1997). The underlying mechanism is the same: They do not have the secure base they need for exploration and the safe haven in case things go wrong, so they cope with this insecurity by distancing themselves from potential sources of threat, which translates to a deactivated system, and lowered curiosity, exploration, and information seeking. The signal detection task employed in this study is an effective tool for measuring how the individual handles novel information at an automatic level, as it taps into how the person receives novel information, evaluates it against a certain rule, and makes a judgment in a very limited amount of time. Hence, the poor overall performance of individuals high on attachment avoidance on this task provides valuable evidence that attachment insecurity might pose as one potential risk factor for optimal information processing in face of novel stimuli.

In addition to this generalized relationship with deteriorated cognitive performance, attachment avoidance also emerged as specifically related to poorer accuracy in detecting signals when they are there. In support of the second hypothesis, the results showed that when participants are primed with a threat word that is followed by a neutral name, high attachment avoidance is significantly related to lower number of hits and higher number of misses. This experimental condition is thought to reflect the attachment system activation of individuals high on attachment avoidance fairly realistically—the system is activated by a threat but the attachment figure is unavailable, as she/he chronically is. Under this real-life-like situation, individuals high on attachment avoidance are prone to missing the signals that are present in the environment, perhaps due to the cognitive load they are experiencing while deactivating their attachment system, since proximity seeking is not a viable option for them. This effortful suppression depletes their cognitive resources (see Berant, Mikulincer, & Shaver, 2008; Edelstein & Gillath, 2008; Mikulincer, Dolev, & Shaver, 2004) and subsequently is associated with making more mistakes. The fact that these mistakes are limited to failing to detect cues in the environment (making misses in the signal detection task) is an interesting finding. The deactivated attachment system seems to be related with individuals high on attachment avoidance missing what is “out there” in the environment. They fail at the “go” part of the go/no go decision-making mechanism of the attachment system, where the individual needs to correctly identify the presence of stimuli signaling physical or psychological threat in the uncertain environment, in order to react in time and preserve the self in face of these dangers.

Interestingly, when the threat prime was followed by an attachment figure name prime, there were no performance differences among individuals with low and high avoidance. This finding may signal a potential protective effect of attachment figure priming for individuals high on attachment avoidance. Even if the significant other is chronically nonresponsive, being mentally reminded of them under attachment-related threat may still benefit the individuals with high avoidance and cause them to perform at least as good as their counterparts who are low on avoidance.

Although attachment anxiety did not directly predict the indicators of attentional performance in the signal detection task irrespective of priming conditions, its interaction with some combinations of threat and attachment priming showed that it indeed is related to diminished performance under certain conditions. Specifically, in support of the first hypothesis, the results showed that when participants are primed with a threat word that is followed by the attachment figure name, high attachment anxiety is significantly related to lower numbers of correct rejections and higher numbers of false alarms. This experimental condition best reflects the attachment system activation of individuals high on attachment anxiety—the system is activated by a threat and the attachment figure is there, reflecting the proximity seeking as a viable option. Building on previous studies using the WHOTO to elicit names of attachment figure, it is conceivable that these attachment figure primes worked to remind the participants high on attachment anxiety of the chronically insecure relationships they have with their significant others (e.g., Dewitte & De Houwer, 2011; Fraley & Davis, 1997; Milyavskaya & Lydon, 2013). Since the history of these relationships is most likely characterized by an inconsistent pattern (where proximity seeking is a viable but not always dependable option), being reminded of these approachable but unpredictable caregivers arguably resulted in the hyperactivation of the attachment system in an effort to maximize resource extraction (Mikulincer & Shaver, 2007). Our findings suggest that these individuals high on attachment anxiety are prone to judging signals as present even though they are absent, probably due to the hypervigilance they are experiencing as a result of this hyperactivation of their attachment system. The fact that these mistakes are limited to failing to say no when the anticipated signal is absent (false alarms in the signal detection task) is an interesting finding. The hyperactivated attachment system seems to be related with individuals high on attachment anxiety overreacting and seeing things that are in fact not there. These results are in line with the previous findings showing that the attachment system of the individuals high on attachment anxiety is chronically hyperactivated and makes them react even if there are no real signs (see Mikulincer et al., 2000; Mikulincer et al., 2002). They seem to be more prone to errors at the "no go" part of the go/no go decision-making mechanism of the attachment system, where it is more adaptive for the individual to correctly identify the absence of stimuli signaling physical or psychological threat in the uncertain environment, which is arguably a more beneficial strategy enabling scarce resources to be conserved for moments of actual need by using them sparingly.

The overall performance in the signal detection task, as measured by sensitivity (d'), also emerged as significantly related to attachment anxiety under this experimental condition. Results showed that when participants were primed with a threat word that was followed by the attachment figure name, high attachment anxiety was significantly related to lower d' scores. This result suggests that the overall cognitive performance of participants with high attachment anxiety declines when their fixation on the chronically inconsistent attachment figures is paired with the presence of a real threat in the environment.

Response time in the signal detection task was also associated with attachment anxiety. The results showed that when the participants are primed with the attachment figure name, high attachment anxiety is significantly related to higher reaction time in all signal detection tasks, indicating poor performance. In line with previous findings showing that anxious participants react to attachment-related primes whether a threat or neutral stimuli is presented first (see Dewitte et al., 2008; Mikulincer et al., 2000; Mikulincer et al., 2002), these results showed that individuals high on attachment anxiety experience performance decline when primed by an attachment figure name, whether or not an attachment-related threat preceded. Being reminded of their inconsistent attachment figures, with whom they have been chronically preoccupied, seems to deplete the cognitive resources of individuals high on attachment anxiety and be related with poor performance on subsequent attentional tasks. Another possible explanation for the decreased cognitive performance of participants who score high on attachment anxiety when exposed to attachment figures could be linked to the study by Mikulincer (1997) which indicated that individuals with anxious attachment style report a desire to explore the world, describe themselves as curious, and engage in information search, yet withdraw from information search when they think it competes with social contacts. Being exposed to only the names of their attachment figures (but not a threat word) may have produced a similar result for the participants with high attachment anxiety of the present study as well, they may have deactivated their exploratory system in favor of social contact and hence performed worse on the subsequent cognitive task.

Overall, in support of the general expectation, the results of the present study point to a key difference between how attachment tendencies are related to information processing and subsequent cognitive performance when the attachment system is activated. On the one hand, the chronic hypervigilance associated with attachment anxiety seems to be related to individuals reacting indiscriminately to stimuli and inevitably making false alarms. On the other hand, the chronic deactivation associated with attachment avoidance seems to be related to individuals withholding action and missing the signals that are there.

These overall results indicate that high attachment avoidance and anxiety are associated with suboptimal cognitive performance under conditions of attachment-related threat. When taken together, these findings suggest that low attachment avoidance and low attachment anxiety, corresponding to secure attachment, may emerge as a potential protective factor for optimal cognitive functioning. Previous studies (e.g., Mikulincer et al., 2000) have shown that the cognitive system of securely attached people is not chronically occupied with attachment themes, hence the attachment system is activated only when necessary (i.e., when the individual is faced with a threat). Moreover, securely attached people believe that their attachment figures would not abandon them but would be available to provide help in situations of danger (e.g., Mikulincer & Shaver, 2007). The findings of the current study also provide concurring evidence that secure attachment may potentially protect and conserve scarce cognitive attentional resources, supporting findings from earlier studies which reported that cognitive structures derive benefits from secure attachment (Green & Campbell, 2000; Mikulincer, 1997; Mikulincer & Arad, 1999).

Contributions and Implications of the Study

Despite the vast literature on the mechanisms of attachment system activation and its consequences on various cognitive phenomena pertaining to attachment-related information, no studies have yet linked the attachment system activation and cognitive performance under uncertainty on an attachment-unrelated attention task, such as signal detection. This study fills this gap and also takes a first step in investigating the joint effect of attachment-related threat presence and attachment figure availability, hence providing a closer simulation of the attachment system activation and functioning model offered by Mikulincer and Shaver (2003, 2007). In addition, with the employment of the signal detection task, which evaluates higher order decision-making processes under conditions of uncertainty, this study offers the unique advantage of providing a distinct and unprecedented assessment of cognitive functioning.

The present study has some notable implications. As proposed in the "broaden-and-build" cycle of attachment security, temporarily activating the mental representations of attachment security themes (via words, pictures, or scenarios) can augment a person's sense of felt security. This security priming has been shown to enhance a person's resources for maintaining coping, flexibility, and emotional stability in times of stress (see Gillath, Selcuk, & Shaver, 2008, for a review). Building on these findings, the results of the current study also point to the possible protective functioning of attachment security by showing that low attachment avoidance and low attachment anxiety are associated with higher attentional performance in face of attachment-related threat. These results provide preliminary evidence that attachment security induction can also protect insecurely attached individuals' cognitive performance and have broad implications in real-life settings.

The results of the present study show that while individuals high on anxiety are worse at making the "no-go" decision under uncertainty and have more false alarms, individuals high on avoidance are worse at making the "go" decision under uncertainty and make more misses. This finding may have important implications in real life. On the one hand, individuals high on attachment anxiety seem to be at high risk of depleting their cognitive (if not other) resources unnecessarily due to their chronic hypervigilance. This could put them at a disadvantage because they may find themselves without these limited resources when they actually need them. Moreover, this proneness to false alarms may harm the social relationships of individuals high on attachment anxiety. They may see rejection cues that are in fact not there and react adversely, jeopardizing their relationships by unnecessary outbursts. On the other hand, individuals high on attachment avoidance seem to be at risk of failing to detect vital cues in the environment due to their suppressed information-seeking. This could put them at a disadvantage because they may fail to detect cues of threat so may not react in time to protect themselves. The inclination of individuals high on attachment avoidance to fail to see the signs that are there may harm their close relationships as well. They could be less likely to detect covert signals of distress from their partners and hence fail to respond accordingly in a supportive role. This may deprive them of the chance of taking preemptive action in thwarting relationship conflict and possibly lead to future problems. The inclination to overlook signals may be costly for people with high attachment avoidance also in terms of missing the potential for social rewards. Recent work by Spielmann, Maxwell, MacDonald, and Baratta (2013) has shown that attachment avoidance is related to distorted perceptions of lower intimacy potential, which in turn translates into less romantic approach motivation even when the potential partner is responsive. Individuals high on avoidance seem to miss out on rewarding social experiences, perhaps because they are too afraid to be hurt.

Limitations of the Study and Suggestions for Future Studies

The potential contributions of the present study notwithstanding, the results should be approached with caution due to certain limitations. Although signal detection is a reliable measure of cognitive (attentional) performance, more diverse measures of attention and other executive functions could be employed in future studies for a more diversified assessment of cognitive performance. Furthermore, the employment of signal detection task as a new measure of cognitive attentional task performance should be replicated in future studies, especially in Western samples, in order to compare the results with the present findings from the Turkish sample. Moreover, one can argue that the simulated threat and attachment figure availability contexts were fairly mild stimuli consisting of mere exposure of words and names rather than actual threats. Future studies should devise closer replications of real-life attachment system activation conditions to reach more solid conclusions about the effects of such activation on cognitive performance. All in all, this being a single study not entailing a priori hypotheses, the results should be approached with caution, and should be replicated – an important direction for future research.

The present study produced an interesting finding, which could potentially lead to a new avenue for future research. While attachment avoidance emerged as generalized risk factor for cognitive performance, attachment anxiety appeared to make people vulnerable to making mistakes only under certain circumstances of attachment system activation. Considering that although attachment security is almost a universal norm, patterns of adult insecure attachment vary greatly across cultures (Schmitt, 2010; van IJzendoorn & Bakermans-Kranenburg, 2010), and the *cultural-fit hypothesis* argues that the less prevalent form of attachment insecurity poses higher risks for optimal functioning (Friedman et al., 2010), these results suggest that attachment anxiety and avoidance may have different implications on attachment system activation and cognitive performance in different cultural settings. Probably because of its culturally adaptive value, attachment anxiety is relatively more common in collectivist cultures compared to individualist cultures (see Schmitt, 2010). The level of attachment anxiety is also higher in comparison to attachment avoidance within collectivist cultures (Hofstede, 2001; Schmitt, 2010), and this was supported in the present study, along with other studies conducted with Turkish samples (Sümer, 2012). In keeping with the cultural-fit hypothesis (Friedman et al., 2010), many studies conducted with Turkish samples consistently revealed that attachment avoidance, but not attachment anxiety, negatively predicts a number of key outcome variables such as maternal sensitivity (Selcuk et al., 2010), secure attachment to parents (Sümer & Kağıtçıbaşı, 2010), marital satisfaction (Harma & Sümer, 2016), and friendship quality in middle childhood (Sümer, 2015); hence, avoidance poses a specific risk factor in collectivist and relational cultures, such as Turkey. The findings of the present study showing that attachment avoidance, but not attachment anxiety emerges as a generalized risk factor for cognitive functioning, irrespective of priming conditions, may suggest a similar pattern: Due to its higher dysfunctionality, attachment avoidance may be more distracting in a collectivist setting, causing poorer overall performance, while attachment anxiety may not be a generalized risk factor as it is congruent with the cultural atmosphere. Although cultural conclusions cannot be drawn solely from the results of the present study, as it employed participants from Turkey only, this interesting finding may lead the way to further cross-cultural research. Future studies using cross-cultural comparisons to investigate whether individuals high on attachment avoidance in individualistic cultures would perform better than those in collectivist cultures, while individuals high on attachment anxiety in collectivist cultures would perform better than those in individualistic cultures on signal detection task could be quite fruitful in establishing whether attachment anxiety and avoidance has different implications on attachment system activation and cognitive performance in different cultural settings.

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