EFFECTS OF ATTACHMENT SECURITY, THREAT, AND ATTACHMENT FIGURE PRIMES ON COGNITIVE ATTENTIONAL TASK PERFORMANCE

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ABSTRACT

EFFECTS OF ATTACHMENT SECURITY, THREAT, AND ATTACHMENT FIGURE PRIMES ON COGNITIVE ATTENTIONAL TASK PERFORMANCE

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The attachment system is activated when a threat is perceived in the environment. Attachment style differences moderate the levels of this activation. Whereas anxiously attached people are more hypervigilant to attachment-related stress, avoidant people have an ability to suppress their attachment related thoughts under stressful conditions. The aim of the present study was to

investigate whether the subliminal presentation of threat and attachment figure primes interfere with the cognitive task performance of participants with different attachment styles. It was hypothesized that anxious participants would perform worse than secure and avoidant participants under both conditions of attachment-related threat and attachment figure primes. Avoidant participants were expected to perform poorly only when a threat prime is followed by an attachment figure prime. The securely attached participants were expected to perform better than the other attachment groups. University students (N = 225) filled out a questionnaire package including the measures of attachment figure names (WHOTO), attachment anxiety and avoidance (The Experiences in Close Relationships, ECR); and they were administered computerized Signal Detection and Stroop tasks representing cognitive attentional performance in the laboratory. The results showed that attachment avoidance was a significant predictor of decreased cognitive performance, and attachment anxiety makes people vulnerable to cognitive performance decline only under certain circumstances of attachment system activation. Attachment security was identified to make individuals immune to the effects of threat or attachment figure availability priming on cognitive performance. The findings were discussed considering previous work and implications for cultural differences.

Key words: attachment styles, threat and attachment figure primes, cognitive performance, attachment system activation, Signal Detection and Stroop tasks

ÖZ

BAĞLANMA STİLLERİ, TEHDİT VE BAĞLANMA FİGÜRÜ ÇAĞIRIŞTIRICILARININ KOGNİTİF DİKKAT PERFORMASI ÜZERİNDE ETKİLERİ

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Bağlanma sistemi çevrede bir tehdit algılandığında aktive olur. Aktivasyon düzeyi bağlanma stilli farklılıkları ile ilişkilidir. Kaygılı bağlanan bireyler bağlanma ile ilgili tehditlere karşı aşırı tetikte iken, kaçınan bağlanma stiline sahip bireyler stresli koşullar altında bağlanma ile ilgili düşüncelerini bastırabilirler. Bu çalışmanın amacı tehdit ve bağlanma figürü çağırıştırıcılarının eşikaltı gösteriminin farklı bağlanma stillerine sahip katılımcıların bilişsel dikkat

performansı üzerinde bir etkisi olup olmadığını araştırmaktır. Kaygılı bağlananların tehdit ve bağlanma figürü çağırıştırıcısı koşulu altında da güvenli ve kaçınan bağlanma stiline sahip katılımcılardan daha kötü performans göstereceği öngörülmüştür. Kaçınan bağlanma stiline sahip katılımcıların sadece tehdit çağırıştırıcısı bağlanma figürü çağırıştırıcısı ile takip edildiğinde daha kötü performans göstermesi beklenmiştir. Güvenli bağlananların diğer bağlanma stiline sahip olanlardan her koşulda daha iyi performans göstermesi beklenmiştir. Üniversite öğrencileri (N = 225) bağlanma figürlerinin adlarını (WHOTO), ve bağlanma kaygısı ve kaçınmasını (Yakın İlişkilerde Yaşantılar Envanteri, YİYE) ölçen ölçeklerin bulunduğu bir anket bataryası doldurmuşlardır ve bilişsel dikkat performansını temsil eden Sinyal Tanıma (Signal Detection) ve Stroop görevlerini bilgisayar aracılığıyla laboratuarda tamamlamışlardır. Bulgular bağlanma kaçınmasının düşük bilişsel performansın anlamlı bir yordayıcısı olduğunu, bağlanma kaygısının ise sadece belirli bağlanma sistemi aktivasyonu koşulları altında bilişsel performans düşüşüne yol açtığını göstermiştir. Güvenli bağlanmanın kişileri tehdit veya bağlanma figürü erişilebilirliği çağırıştırıcılarının etkisine karşı bağışık hale getirdiği belirlenmiştir. Bulgular önceki çalışmalar ve kültürel farklılıklar dikkate alınarak tartışılmıştır.

Anahtar kelimeler: bağlanma stilleri, tehdit ve bağlanma figürü çağırıştırıcıları, bilişsel performans, bağlanma sistemi aktivasyonu, Signal Detection ve Stroop görevleri

To

My Mother Sevinç, My Father Bülent,

and My Grandmother Sevim

Thank you for being my safe haven…

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INTRODUCTION

1.1 General Introduction

Being loved, nurtured, protected and taken care of are arguably some of the most basic needs of human beings. Form birth on, it is evolutionarily adaptive to identify a person, or a few people, who can be trusted to turn to in times of danger and stress - who can protect, comfort and take care of us. Without these sanctuaries, life would be extremely stressful, difficult, dangerous, and possibly unbearable. The close ties, namely *attachment*, people have with these significant others have essential survival value, and they are investigated by the theory of attachment.

The security of attachment at the time of infancy does not only have survival value for the otherwise helpless tiny human offspring, but it is also suspected to shape the course of his future close relationships. Human attachment is not confined to infancy, but it characterizes the affectionate bonds people form with their romantic partners, friends and relatives throughout the course of the life span development. Having secure attachments seems to

enhance the life quality of individuals, make them happier, more satisfied with life, and even healthier (see Mikulincer & Shaver, 2007 for a review).

One of the most interesting tenets of attachment system is how it becomes active and how it influences the emotions, cognitions and behaviour of the individual. The humble aim of this thesis is to investigate the possible relationships between attachment system activation under conditions of threat and attachment figure availability and cognitive performance, in relation to different attachment styles. In the following sections, first a brief review of the theoretical framework and the activation of the attachment system will be introduced, then priming techniques utilized in this study will be explained, and finally the overview and hypotheses of the current study will be presented.

1.2 Attachment Theory: Theoretical Framework and the Activation of the Attachment System

1.2.1 Theoretical Background of Attachment Theory

Attachment Theory is one of the most influential theoretical frameworks in psychology, with its vast potential to explain and predict human behaviour based on early experiences with caregivers. John Bowlby (1973, 1980, 1982/1969) argued that attachment system is an inborn, evolutionarily adaptive regulatory device that adjusts the proximity of the infant with the attachment figure in order to ensure survival. Due to the immaturity of human infants at birth, they need an adult's protection and care for survival. As a result of natural selection pressures, infants evolve a set of behaviors that ensure proximity to

those adults who are willing to provide protection and care; such as smiling, babbling, crying, clinging and following. These behaviors start as early as the first week of life and continue until the end of the second year (Bowlby, 1973, 1980, 1982/1969). Borrowing form etiology, Bowlby (1982/1969) called this mechanism *attachment behavioral system.* Within this attachment behavioral system, the attachment figure - who is identified as the primary caregiver - is argued to serve as a physical and emotional *safe haven,* where the infant can turn to for support and comfort in times of distress; and a *secure base,* from which the infant can explore and learn about the world and develop his own personality. The attachment behavioral system is said to be activated when a physical, physiological, or psychological threat is perceived – a predator, hunger, illness, too much distance from the attachment figure, etc. This is a goal-corrected motivational system which drives the infant to *proximity seeking* to the attachment figure, i.e. perform attachment behaviour.

Attachment behavioral system also elicits *separation protest* in the infant when the attachment figure is not within comfortable reach. The attachment system and the exploration system work antagonistically. When there is a perceived threat in the environment, the attachment system is activated and the infant stops exploratory behaviour and seeks proximity, i.e. attachment behaviour. Once the attachment figure gives support and comfort to the infant, the attachment system seizes to be active, and the exploratory system becomes

active – the infant securely and freely explores the environment and engages is physical and cognitive activity (using the attachment figure as a secure base).

If the attachment figure is repeatedly and constantly sensitive and responsive to this *primary attachment strategy*, i.e. proximity seeking attempts, the infant's attachment behavior is reinforced and s/he experiences "felt security" (Sroufe & Waters, 1977). The repetition of this cycle aids in the development of a *secure* attachment style and a *positive internal working model* of the world – "Other people are dependable and trustworthy, and I can get help whenever I need it". On the other hand, if the attachment figure is not physically or emotionally available in times of need, the infant is forced to develop a *secondary attachment strategy* to ensure his/her survival, which leads to an *insecure* attachment and a *negative internal working model* of the world – "Other people are not dependable and trustworthy, and I cannot get help whenever I need it". If the attachment figure constantly denies proximity, the infant conceptualizes proximity seeking as a non-viable option and *deactivates* the attachment system, and tries to cope with problems on his/her own, what Bowlby (1982/1969) called "compulsive self-reliance"; which leads to the development of high attachment avoidance, hence an *avoidant* attachment style – "I am alone to solve my problems" (Shaver & Mikulincer, 2002). On the other hand, if the attachment figure provides inconsistent caregiving, i.e. if s/he satisfies proximity seeking attempts at some times, but fails to do so in other times, the infant regards proximity seeking as a still viable option and employs a

hyperactivation strategy whereby s/he intensifies the proximity seeking attempts in order to achieve the attachment figure's attention, this is what Bowlby (1982/1969) called "protest"; which leads to the development of high attachment anxiety, hence an *anxious* attachment style – "I have to act in clingy ways in order to get attention and help" (Shaver & Mikulincer, 2002).

These different patterns of the attachment behavioral system was first conceptualized as distinct *attachment styles* by Mary Ainsworth and her colleagues (Ainsworth, Blehar, Waters, & Wall, 1978) as the result of a series of laboratory studies, which employed the Strange Situation Protocol, a procedure devised by Ainsworth. In a typical Strange Situation procedure, a mother and her child (usually around the age of 12 months) are seated in an unfamiliar room containing toys. A series of eight episodes follow, entailing the infant exploring in an unfamiliar environment, interacting with a stranger, being separated from and then reunited with the primary caregiver (Ainsworth et al., 1978). The Strange Situation is argued to provide a life-like simulation of attachment behavioral system activation, and therefore a test of the system's nature, style and functioning. The infants' reaction to their mothers' return after the separation was seen as the main indicator of their different attachment styles. Ainsworth categorized these responses into three major attachment styles (Ainsworth et al., 1978): *Secure* - the child is distressed by the mother's departure but easily soothed by another adult, and is happy on the mother's return; *Avoidant* - the child is not distressed by the mother's departure and avoids

or turns away from her on her return; *Anxious* – the child is extremely distressed during separation and exhibits conflicted or ambivalent responses toward the mother during reunions (e.g. may cling one moment but angrily resist comforting the next). During home studies, mothers of securely attached infants were observed to be emotionally available in times of need and responsive to their children's proximity-seeking behavior, i.e. primary attachment strategy; whereas mothers of avoidant infants tended to be emotionally rigid, as well as angry at and rejecting of their infants' proximity-seeking efforts; and the interactions between anxious infants and their mothers were characterized by lack of harmony and lack of caregivers' consistent responsiveness (Ainsworth et al., 1978). Mothers of both avoidant and anxious infants seemed to be unresponsive to the infants' need of security attainment, thereby fostering their children's adoption of secondary attachment strategies. However, as stated above, whereas avoidant infants deactivate their attachment system in response to the unavailability of their attachment figures, anxious infants tend to hyperactivate the attachment system to gain a more reliable supportive reaction from their inconsistent caregivers (Main, 1990; Main, Kaplan, & Cassidy, 1985).

1.2.2 Adult Attachment

Bowlby (1973, 1982/1969) conceptualized attachment as a lifelong process that exists "form cradle to grave". The repeated reinforcement of the attachment style is argued to grow old with the individual and form the adult attachment style, which influences the prospective romantic relationships. It was

Hazan and Shaver (1987) who first conceptualized romantic love as an attachment process and argued for a pattern of adult attachment that is similar to infant-mother attachment configuration. In their influential study, where they asked their participants to rate themselves on three paragraphs describing different styles of attachment, Hazan and Shaver (1987) showed that just like infants (Ainsworth et al., 1978), adults could be categorized into three distinct attachment styles - *secure, avoidant,* and *anxious/ambivalent,* and that these styles are as common in adulthood as in infancy. Hazan and Shaver (1987) also argued that these different attachment styles would influence the romantic relationships of adults differently; more specifically they asserted that romantic experiences would be characterized by trust, friendship, and positive emotions for secure adults; fear of closeness and lack of trust for avoidant adults; and preoccupation with and desire to merge with the other person for the anxious/ambivalent adults.

Hazan and Shaver (1987, 1994) also linked adult attachment to Bowlby's (1973) internal working models, where secure attachment is associated with a general belief that other people are trustworthy and the self is likable; avoidant attachment is linked to a lack of belief of and need for romantic love; and anxious/ambivalent attachment is connected with clinginess to romantic partner and a low regard for the value of self. Moreover, the adult attachment styles were found to be linked to childhood experiences and memories (Hazan & Shaver, 1987), where secure adults recall their mothers as dependably

responsive and caring; avoidant adults as cold and rejecting; and anxious/ambivalent adults as a mixture of positive and negative characteristics.

Following Bowlby's (1973) internal working models and Hazan and Shaver's (1987) adult attachment categorization, Bartholomew and Horowitz (1991) proposed a new framework for determining attachment styles, where the model of self and model of others is crossed, yielding a four-category model. The *model of self* represents the individual's appraisal of himself as worthy of love and support or not, and reflects the extent to which the individual is worried about being rejected, abandoned and unloved by significant others, manifesting itself as *attachment anxiety*. The *model of others*, on the other hand, represents the individual's evaluation of other people as trustworthy, available, reliable and caring or not, and reflects the extent to which the individual is uncomfortable with intimacy and closeness, manifesting itself as *attachment avoidance* (Bartholomew & Horowitz, 1991). The possible combinations of these two dimensions yield four distinct attachment patterns: people who have a positive model of self (a sense of worthiness and lovability – low on anxiety) and a positive model of others (an expectation that other people are generally accepting and responsive – low on avoidance) are conceptualized as having a *secure* attachment style, and being comfortable with both intimacy and autonomy. People with a positive model of self (a sense of worthiness and lovability – low on anxiety) and a negative model of others (an expectation that other people are generally untrustworthy and rejecting – high on avoidance) are

conceptualized as having a *dismissing* attachment style, and protecting themselves against disappointment by avoiding close relationships and maintaining a sense of independence and invulnerability. People who have a negative model of self (a sense of unworthiness and unlovability – high on anxiety) and a positive model of others (an expectation that other people are generally accepting and responsive – low on avoidance) are conceptualized as having a *preoccupied* attachment style, and striving for self-acceptance by gaining the acceptance of valued others. Finally, people who have a negative model of self (a sense of unworthiness and unlovability – high on anxiety) and a negative model of others (an expectation that other people are generally untrustworthy and rejecting – high on avoidance) are conceptualized as having a *fearful* attachment style, and avoiding close involvement with others and fearing intimacy (Bartholomew & Horowitz, 1991).

As an alternative to conceptualizing attachment styles in categories, some researchers have advocated for the utilization of dimensional measures of attachment anxiety and avoidance. Arguably, investigating attachment styles both in terms of categories and dimensions would complement one another and provide richer information pertaining to the attachment patterns. High attachment anxiety corresponds to a negative view of self, characterized with a preoccupation with the need to be loved and enmeshed with the significant other, and fear of being rejected and abandoned. High attachment anxiety is typified with the employment of a *hyperactivation strategy*, where the person *fights* for

the attachments needs – s/he is hypervigilant to attachment threats, continuously worried about the presence and responsiveness of attachment figures, and clings to and depends on them too much (Mikulincer & Shaver, 2003, 2007). On the other hand, high attachment avoidance corresponds to a negative view of others characterized with compulsive self-reliance and discomfort and avoidance of closeness and intimacy. High attachment avoidance is characterized with the employment of a *deactivation strategy*, where the person *flights* from the attachments needs – s/he is dismissing of the need for attachment figure's presence and responsiveness, reduces display of intimacy and affection, and refuses comfort and support form significant others (Brennan, Clark, & Shaver, 1998; Mikulincer & Shaver, 2003, 2007).

1.2.3 Activation of the Attachment System

The activation of the attachment system and subsequent employment of attachment strategies obviously have a cognitive component – the individual assesses the environment for threat-related cues and if any is perceived, the attachment system is activated and the individual is driven to maintain or restore proximity to attachment figures. However, this proximity seeking behaviour may not always be viable, due to the absence of attachment figures, or other contextual and personal factors. In such a case, the attachment system may not show any attachment behaviour manifestations; but it may be still active at a cognitive level, and thoughts about proximity may still influence cognition and therefore behavior. In social cognitive terms, exposure to threat and stress may

increase the accessibility of proximity and attachment- related thoughts even when proximity-seeking behaviors are inhibited (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000). A handsome amount of studies have been conducted on this cognitive component of attachment system activation. These studies on general, exposed participants to symbolic threat contexts and assessed the accessibility of attachment-related thoughts (see Mikulincer & Shaver, 2003 for a review). A brief review of these studies will be introduced next.

1.2.3.1 Stress - Attachment System Activation Link

One pioneering work in the area by Mikulincer, Birnbaum, Woddis, and Nachmias (2000) focused on the effects of threat priming and attachment system activation. In this study, first, participants were classified in terms of their attachment styles according to the Attachment Style Scale, and later they were asked to perform a computerized lexical decision task. In each trial, the participants were exposed to a word prime (either stress or neutral) and then to a target letter string, which was either a non-word or a word from one of the following categories: proximity-related words (closeness, love, hug), distance-related words (separation, rejection, abandonment), positively valued words (brightness, honesty, efficacy), negatively valued words (dullness, cheat, lazy), and neutral words (office, table, boat). Participants were asked to decide whether the target letter string was a word or not, and their reaction times were recorded. The results of the study clearly showed that people reacted relatively faster to attachment-related words that reflect proximity, closeness, and love, after they

were primed to a stress word (e.g., failure, death, illness); and that this pattern of accessibility seemed to be valid independently of the person's attachment style, attachment relatedness of the stress world, and different priming conditions (subliminal or supraliminal).

In another work, Mikulincer, Gillath, and Shaver (2002) showed that threat conditions activate the mental representations of attachment figures. In this study, the participants were first asked to provide the names of their attachment figures via the WHOTO scale, and names of other people they know and do not know personally via some name lists. Next they performed a computerized lexical decision task where they were asked to judge whether a target letter string was a word or non-word, and their reaction times were recorded. The participants were exposed to a prime word (either threat related - failure, separation; or neutral - hat) before they saw the target letter strings, which could be either a non-word or a word from one of the following categories: names of attachment figures, names of other close persons who were not attachment figures, names of persons whom the participant knew personally, and names of unknown persons. The results of the study showed that a threat word prime, either attachment related - separation, or unrelated - failure, led to faster reaction times for names of attachment figures than a neutral word prime, but had no significant effect on the reaction times for recognizing the names of other close persons, known persons, names of unknown persons, and non-words; which shows that any psychological threat perceived activates the attachment

system and heightens the cognitive accessibility of only the attachment figure but no one else, rejecting the possible explanation of familiarity.

A more recent study by Dewitte, Houwer, Buysse, and Koster (2008) examined the stress and attachment link via an approach-avoidance paradigm. In the study, the participants were primed with either a threat context (attachment related - separation or unrelated - failure) or a neutral context, and later they were asked to complete a stimulus response compatibility (SRC) task, where they were instructed to make a symbolic approach or avoidance response (move a figure on the computer screen towards or away from a target) depending on a certain feature of the presented stimuli (name of attachment figure or other known person). The results of the study indicated that the tendency to approach (versus avoid) the attachment figure (relative to a known person) is significantly stronger in a stressful context compared to a non-distressing context (Dewitte et al., 2008). This finding is in line with the basic premise of attachment theory that threat automatically activates a stronger proximity-seeking tendency towards the attachment figure (Bowlby, 1973). Moreover, this pattern of results was found regardless of the participants' attachment styles and attachment relevance of the threat prime.

Further evidence comes from a recent doctoral dissertation by Siefert (2005), where participants were primed with an attachment-related threat word (separation) and asked to recall childhood memories. The results of the study showed that exposure to the threat prime led to the recall of affectively different

memories compared to the control prime – the participants who were primed with the threat word reported more attachment-related childhood memories, both in number and in detail. This was interpreted as an indicator of the attachment system activation as the result of a stress induction (Siefert, 2005).

These findings clearly show that there is a strong link between stress and attachment, which leads people to seek proximity to attachment-related thoughts and attachment figures under stressful conditions. It is important that the source stress does not have to be an attachment-related one, any kind of threat can and does lead to proximity seeking behaviour.

1.2.3.2 Attachment Style Differences in the Attachment System Activation

As reviewed above, studies suggest that everybody, regardless of their attachment style, show heightened attachment system activation under stressful conditions; however a salient attachment style difference underlying the attachment system activation under different conditions has also been documented.

The study of Mikulincer and his friends (2000) indicated that securely attached participants were reported to react only to stress primes with heightened accessibility to attachment-related thoughts, but not to neutral word primes. This finding indicates that secure persons' cognitive system is not chronically occupied with attachment themes, but the attachment system is activated only when necessary, i.e. when the individual is faced with a threat - which is a

further evidence of the adaptive function of the secure attachment. This study further documented that securely attached people reacted to words conveying separation and rejection significantly slower, which shows that their internal working models are composed of positive views of the world, where they do not get rejected or left alone (Mikulincer et al., 2000). Hence, these findings for secure persons reflect a functional activation of the attachment system. The system seems to be mainly activated upon signals of threat for a person's well-being and this activation is confined to attachment themes that have positive affective connotations and may have beneficial consequences for a person's well-being. Arguably, in times of stressful events thinking about love and closeness to a significant other may lead to a state of anticipated relief and comfort and reduce the distress. Accordingly, this activation may underlie secure persons' optimistic and hopeful judgments and their tendency to seek support in times of need.

There also exist ample findings on the activation of secondary attachment strategies in adulthood and their effects on attention and cognition. The results of studies examining this activation have consistently found that anxiously attached people tend to focus their attention more easily on, and have difficulty taking away from, attachment-related stimuli and information (e.g., Mikulincer et al., 2000, 2002), which is a clear sign of their preoccupation with attachment-related thoughts. Mikulincer and his friends (2000) showed that anxiously attached participants reacted relatively faster to attachment themes under both stress and

non-stress primes. Moreover, they showed relatively high accessibility to thoughts about proximity-related worries along with words of proximity and love. Mikulincer and his friends (2002) also found that participants who scored high in attachment anxiety showed a heightened activation of attachment figures under both neutral and threat primes.

The study by Dewitte and his friends (2008) demonstrated a similar pattern, their results showed that attachment anxiety was related to heightened approach (versus avoidance) responses towards the attachment figure whether the participants were primed with a threat or neutral condition. Another study by Dewitte, Houwer, Koster, and Buysse (2007) also showed that attachment anxiety is related to attentional bias towards attachment figure in both threat and positive attachment contexts. For anxiously attached people, these results suggest a chronic, dysfunctional activation of the attachment system - characterized with heightened reactions to attachment related concepts and increased accessibility of representations of attachment figures - which is constantly triggered even when there is no signal of threat. These results further suggest that this constant preoccupation with rejection and separation may multiply the distress originally caused by the stressful event and may result in chronic distress and decreased well-being.

This chronic preoccupation is argued to influence anxious people's cognitions as well. It has been revealed that attachment anxiety affects the ability to suppress thoughts. A set of studies have shown that when anxious 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 stay high (Fraley & Shaver, 1997; Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005). Siefert's study (2005) also indicated that anxious people reported greater 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, which is well in line with Bowlby's (1982/1969) original idea that the primary function of the attachment system is to ensure the individual's survival.

On the other hand, avoidant attachment seems to cause a very different pattern in the attachment system activation. Studies indicate that avoidant individuals tend to easily shift their attention away from stimuli showing or suggesting attachment-related themes (Edelstein & Gillath, 2008; Kirsh & Cassidy, 1997) and attachment-related threat words (Dewitte et al., 2007), easily suppress separation-related thoughts (Fraley & Shaver, 1997), and show low accessibility to attachment-related worries even a word semantically associated with these worries is primed (Mikulincer et al., 2000). They also take longer time to identify attachment-related information and decrease access to the names of their attachment figures in an attachment-related threat condition (Mikulincer et al., 2002), show a weaker tendency to approach the attachment figure (Dewitte et al., 2008) and they report greater difficulty encoding and recalling

attachment-related information (Fraley, Garner, & Shaver, 2000). They are also reported to recall fewer emotional childhood memories and to take longer time to retrieve them (Mikulincer & Orbach, 1995); moreover they are shown to repress negative childhood memories and defensively focus their attention on memories colored by positive affect when primed with threat words (Siefert, 2005). Moreover, the doctoral dissertation study of Marks (2007), which employed a similar methodology to that of Mikulincer and his colleagues (2000) but manipulated the awareness of the threat prime as well, showed that avoidant individuals can block out unwanted attachment-related thoughts even better when they are aware of the attachment-related threat. In addition, neurological studies by Dozier and Kobak (1992) and Roisman, Tsai, and Chiang (2004) indicated that avoidant people show increased electrodermal activity during the Adult Attachment Interview, especially during questions that asked them to consider real and imagined separations or rejections from their parents, which is a sign of their effortful emotional suppression. These studies clearly show that people with avoidant attachment styles arrange their cognitive resources so that they avoid attachment-related thoughts, both via mechanisms of attention and memory.

One very interesting extension to this scheme is the finding showing that the ability of avoidant people to ignore attachment-relevant information diminishes when a cognitive or emotional "load" is inflicted (e.g., Berant, Mikulincer, & Shaver, 2008; Edelstein & Gillath, 2008; Mikulincer, Dolev, &

Shaver, 2004). This pattern verifies that the control of attention takes cognitive effort, and when another cognitive task is given, the individual experiences ego depletion which causes him/her to fail to avoid attachment-related information. Mikulincer and his friends' findings (2002), which showed that avoidant participants failed to show low accessibility to attachment related worries under cognitive load are also in line with this pattern. Marks' study (2007) also showed that avoidant individuals who were instructed to form sad facial expressions (a cognitive and emotional load) after being primed with an attachment-related threat word had difficulty suppressing thoughts of separation and loss in subsequent cognitive tasks and reported feeling more negative affect.

Recently, Gillath, Giesbrecht, and Shaver (2009) showed that avoidant individuals perform better than non-avoidant individuals on basic memory tasks, but their superior performance declines when they are reminded of a close relationship they fell insecure about. These findings indicate that avoidant people are also preoccupied with attachment related thoughts and emotions, but 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, via a process that utilizes cognitive effort and inevitably fails when some additional cognitive load is presented. This cognitive load could be inflicted via methods of priming conditions of attachment-related threat and attachment figure availability. The ability of avoidant individuals to block, or disengage from such attachment-related information clearly suggests the

operation of a pre-attentive mechanism or cognitive-control strategy (Niedenthal, Brauer, Robin, & Innes-Ker, 2002). Nonetheless, no studies have yet addressed whether the so-called superior performance of avoidant individuals would persist when the cognitive processes are assessed by decision making tasks which measure the ability to make correct decisions under conditions of uncertainty - this will be one of the aims of the present study.

Overall, a handsome amount of studies have examined the attachment system activation and the associated cognitive components, with respect to different attachment styles. The literature suggests that perceived threat is a strong activator of the attachment system. In addition, attachment anxiety is associated with a chronic preoccupation of the attachment system; whereas attachment avoidance is characterized by a strong suppression, which fails when an additional cognitive load is presented. As reviewed above, the experimental manipulations in most of these studies are done via the technique of priming, which will be discussed in detail next.

1.3 Priming

As reviewed above, a number of studies investigating the attachment system activation have employed priming procedures. Priming is defined as a process by which a given stimulus activates certain mental pathways, thereby enhancing the ability to process subsequent stimuli in relation to the priming stimulus. In other words, it is a pre-activation of certain mental representations (Bargh & Chartrand, 2000). The process results in a *priming effect*, which is the

condition where access to a particular item of information in memory is enhanced as a result of recent exposure to a related priming stimulus. Early priming studies in 1950s and 1960s showed that when participants are exposed to lists of words; those words are more likely to be recognized in subsequent free association tasks, even if participants fail to recall them after the initial exposure (Bargh & Chartrand, 2000). These studies were pioneering in the sense that they were first to suggest that early exposure to a certain stimulus can affect the later recognition of it, and that implicit measures of cognition and memory could be utilized instead of then-dominant methods of introspection and self report.

Priming studies also spread to the domain of social psychology with the ground-breaking priming study of Higgins, Rholes, and Jones (1977), which demonstrated that not only neutral words but also personality trait concepts could be primed. Higgins and his colleagues (1977) exposed their participants to synonyms of certain personality traits and then asked them to read about a target person and form impressions about him. The results of the study showed that the participants who had been exposed to positive personality trait words, such as "adventurous" and "independent" formed more positive impressions of the target person compared to the participants who had been previously exposed to relevant terms such positive personality trait words such as "reckless" and "aloof." The memory task performed before the impression formation showed that the participants could not remember the trait words they were primed with (Higgins et al., 1977). This study was pioneering in the sense that it showed the

influence of priming could go beyond simple recognition effects and interfere with social perception and impression formation.

Following the priming paradigm, subsequent studies showed that priming could influence affective responses (Murphy & Zajonc, 1993; Zajonc, 1980), self evaluations (Baldwin, Carrell, & Lopez, 1990), attitudes, stereotypes and prejudice (Greenwald & Banaji, 1995; Krosnick, Betz, Jussim, & Lynn, 1992; Payne, 2001), cortical activity (Williams et al., 2006), automaticity of social behaviour (Bargh, Chen, & Burrows, 1996), political opinion and voting behaviour (Hassin, Ferguson, Shidlovski, & Gross, 2007), and even academic performance (Lowery, Eisenberger, Hardin, & Sinclair, 2007).

1.3.1 Subliminal versus Supraliminal Priming

In priming tasks, the participant's level of awareness of the priming stimulus differs. In *supraliminal* or *"conscious" priming*, the participant is exposed to the priming stimulus as part of a conscious task, and is fully aware of the priming stimulus itself, but is not aware of the underlying pattern that aids in priming the construct (Bargh & Chartrand, 2000). Supraliminal priming can be achieved via having the participants read a vignette, solve scrambled sentences or look at a certain stimulus for more than 100 milliseconds (Greenwald, Draine, & Abrams, 1996).

On the other hand, with *subliminal priming*, the participants are not consciously aware of the priming stimulus they are exposed to, they have no recollection of seeing it, yet they are still under the influence of it in the

subsequent tasks. Subliminal priming is achieved by three principles: very brief presentation of the prime, immediate masking by another stimulus, and appropriate awareness checks (Bargh & Chartrand, 2000). Subliminal priming was first utilized in a social cognition experiment carried out by Bargh and Pietromonaco (1982) who used a subliminal presentation of stimuli to replicate the earlier trait concept priming studies of Higgins et al. (1977), which employed supraliminal priming. The key with subliminal priming is the duration of the stimulus, which still does not have one clear rule, given the individual differences in recognition thresholds. One of the most important factors in deciding on the duration of the stimulus is the place of presentation of the stimulus on the visual field (Crano & Brewer, 2002). Studies show that longer stimulus durations still function as subliminal priming when presented on the parafoveal visual field (about 2 to 6 degrees of visual angle from the focal point of attention) as compared to the foveal visual field (0 to 2 degrees of visual angle), since information presented on the parafoveal region does not reach conscious awareness even if it is processed subconsciously (Bargh & Chartrand, 2000).

1.4 The Present Study

Attachment theory is one of the most prominent perspectives on human development which aims at understanding the mechanisms behind the human being's most fundamental need to feel protected and secure. Attachment theory (Bowlby, 1973, 1980, 1982/1969) proposes that whenever a threat is perceived

by the organism, the attachment system becomes active, ensuring proximity to the attachment figure in search of comfort and security. The immediate processing of information in the environment and activation of the attachment system employs some cognitive mechanism and is most likely mediated by individual differences in the attachment style. As reviewed in section 1.2.3, there are ample studies investigating the relationship between different attachment styles and cognitive processes underlying the activation of the attachment system. However, to the best of the author's knowledge, no studies have yet combined the effects of attachment system activation with cognitive attentional task performance, which is an indispensible part of the cognitive system, with its vast influence on human functioning via being the key process in extracting motivationally relevant information from our environment, hence guiding our perception of the world and reacting to it accordingly. Moreover, no studies have yet manipulated the priming of both threat conditions and attachment figure availability to trigger attachment system activation, which would provide a closer replication of the real attachment situations. The present study aims at fulfilling these gaps by investigating specific attachment orientations which are more susceptible to cognitive performance decline as a function of attachment system activation and subsequent attachment figure availability, which will be manipulated by subliminal priming.

Moreover, previous studies have investigated the cognitive processes underlying the attachment system activation by rather straightforward

assessments such as Stroop, lexical decision, or dot-probe tasks; this study aims at utilizing another, possibility more informative method - the Signal Detection task, which is a technique based on the modeling of decision making processes under conditions of uncertainty. Arguably, this higher order cognitive function of making decisions under conditions of uncertainty may reflect certain underlying processes of attachment system activation, yet this angle has not been studied by previous work.

The overarching hypothesis 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 (decision making latency and accuracy) of people in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent availability of their attachment figures.

In this view, the absence of a threat prime is not expected to activate the attachment system of the people who have secure or dismissing attachment styles, and hence not influence their cognitive performance - even when their attachment figure is primed subsequently. On the other hand, since preoccupied attachment is characterized by a chronic occupation with attachment related thoughts and worries, regardless of the presence of an actual threat in the environment, people with preoccupied attachment style are expected to be distracted by the priming of their attachment figures, and perform worse - even when there is no real perceived threat.

Moreover, it is conceived that the priming of an attachment related threat would activate the attachment system of the securely attached people and if there is a subsequent unavailability of attachment figures, this combination would deteriorate their attention, causing them to perform poorly on the cognitive task. On the other hand, in such a case, dismissing people is anticipated to suppress their proximity seeking behaviour and still be able to concentrate on the task at hand, due to their deactivation system.

In a similar vein, when an attachment-related threat prime is followed by the subliminal presentation of the attachment figure, the exploration system of securely attached people is conceived to become fully operating due to the fulfillment of the attachment needs (perceiving the attachment figure) following an attachment system activation (threat prime). Once the exploration system becomes fully operant in the safe presence of the attachment figure, the securely attached participants are expected to excel at the cognitive task, via using the attachment figure as a secure base. On the other hand, this condition is expected to be unfavorable for dismissing people - the pairing of a threat prime with the subliminal presentation of the attachment figure, who has chronically been unavailable to them, is conceived to exhaust their suppression skills and make them vulnerable to attachment related worries and hence use up the cognitive capacity and subsequently cause them to perform poorly. In addition, threat primes are expected to deteriorate the task performance of preoccupied participants even further than the no-threat, attachment-figure case, since the

perception of a real threat in the environment would amplify their hypervigilance, further depleting cognitive resources from the task.

1.4.1 Overview of the Study and the Definitions of the Major Study Variables

As stated above, the present study aims to investigate the performance of participants with different attachment styles on a series of cognitive tasks under different subliminal priming conditions of threat and attachment figure availability. Hence, the first experimental condition will be manipulated by the presence of a threat prime, which will serve as the activator of the attachment system, and will consist of the subliminal presentation of either an attachment-related threat word, or a neutral word (i.e. the first independent variable: *threat condition*). The second experimental condition will be manipulated by the presence of an attachment figure name prime, which will serve as the attachment figure distractor and will consist of the subliminal presentation of the name of either an attachment figure name or a neutral name (i.e. the second independent variable: *attachment figure availability condition*). So the experimental design of the present study is planned to be a 2 x 2 between subjects factorial design, defined by first prime (attachment-related threat word, neutral word) x second prime (name of attachment figure, neutral name). Moreover, the different priming conditions will be examined vis-à-vis the attachment styles of the participants (i.e. the third independent variable: *attachment style*). So the analyses of the study will be conducted via a 2 x 2 x 4 design defined by first

prime (attachment-related threat word, neutral word) x second prime (name of attachment figure, neutral name) x attachment style (secure, dismissing, preoccupied, fearful). The no-threat, non-attachment figure prime pair will serve as the neutral condition. The main dependent variable of the present study is defined as the *cognitive attentional performance,* and this variable will be measured extensively via a series of detailed measures, namely precision and response time in a Signal Detection and a Stroop task. These tasks and their related measures will be further explained in the method section.

1.4.2 Experimental Conditions and Hypotheses of the Study

The most general prediction of the present study is that the priming of an attachment related threat word will activate the attachment system and this activation will affect the performance of the participants in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent attachment figure name primes. More specific hypotheses will be stated in terms of both attachment styles differences and experimental conditions.

Hypothesis 1: Under the neutral condition, where no threat word and no attachment figure name will be primed, the task performances are not expected to differ with respect to attachment styles; and the performances of the participants in this condition will also serve as an index for future comparisons.

Hypothesis 2: In the second experimental condition, where a neutral, no threat word prime is followed by an attachment figure name prime, the cognitive performance of the participants who score low on both attachment avoidance

and anxiety (i.e. secure attachment style) and the participants who score high on avoidance and low on anxiety (i.e. dismissing attachment style) is expected to be better than those of the participants who score low on avoidance and high on anxiety (i.e. preoccupied attachment style) as compared to the neutral word-neutral name condition. Briefly, in this condition, preoccupied participants are expected to perform worse than both secure and dismissing participants - whose performances are not predicted to be different from each other.

Hypothesis 3: In the third experimental condition, where an attachment-related threat word prime is followed by a neutral name prime, securely attached participants' cognitive performance is expected to deteriorate, and they are expected to perform worse than dismissing ones, whose performance is not anticipated to change. Preoccupied participants' performance is anticipated to deteriorate even further than the neutral word-attachment figure name condition, and they are expected to perform worse than both secure and dismissing participants.

Hypothesis 4: In the forth experimental condition, where an attachment-related threat word prime is followed by the subliminal presentation of an attachment figure name, the task performance of secure participants is expected to enhance, and they are anticipated to perform better than dismissing participants, whose task performance is predicted to decline in this condition. The task performance of preoccupied participants is anticipated to further deteriorate and be lower than both secure and dismissing participants.

Hypothesis 5: No gender-related performance differences are expected in any of the experimental conditions.

Since participants with fearful attachment have a model of self that is similar to preoccupied attachment and a model of others reminiscent of dismissing attachment, no separate predictions are made with respect to this group. Under circumstances of high anxiety (threat condition) a similar pattern to those of participants with preoccupied attachment is predicted due to their similar mental models.

CHAPTER 2

METHOD

2.1 Participants

The participants were undergraduates from the Middle East Technical University. The participants were recruited from introductory psychology courses and they were rewarded with extra course credit for their participation. The original ad-hoc sample of the study consisted of 227 adult participants, who first filled a survey package and then completed a series of computerized cognitive tasks. Only two participants failed to participate in the experiment, one due to her nightblindness which made it impossible for her to use the computer screen, and the other due to the fact that he dropped the introductory psychology course. No participants were removed from the sample during the data cleaning process, leaving 225 participants for the further analyses.

As summarized in Table 2.1, the sample was consisted of 166 female (73.8%) and 59 male participants (26.2%). The age range of participants varied from 18 to 48 with a mean of 20.65 (*SD* = 2.70). All of the participants were students of the Middle East Technical University, with 104 participants (46.2%)

from the Department of Psychology, 48 participants (21.3%) from the Faculty of Administrative Sciences, 30 participants (13.3%) from the Faculty of Engineering, 29 participants (12.9%) from the Faculty of Education, 13 participants (5.8%) from the Faculty of Arts and Sciences, and 1 participant (0.4%) from the Department of Mathematics. The sample was consisted of 100 (44.4%) freshmen, 80 (35.6) sophomore, 8 (3.6%) junior, 33 (14.7%) senior and 3 (1.3%) graduate students. A total of 129 (57.3%) participants reported that they spent most of their lives in a metropolitan city, 53 (23.6%) in a province, 38 (16.9%) in a county, and 4 (1.8%) in a town. Of the participants, 22 (9.8%) reported their family income as high, 184 (81.8%) as medium, and 18 (8%) as low.

Table 2.1 Demographic Characteristics of the Sample

		Frequency	Percentage	Mean	SD	Range
Age				20.65	2.70	18-48
Sex						
	Female	166	73.78			
	Male	59	26.22			
Department						
	Psychology	104	46.22			
	Administrative Sciences	48	21.33			
	Engineering	30	13.33			
	Education	29	12.89			
	Arts and Sciences	13	5.78			
	Mathematics	1	.44			
Class						
	Freshmen	100	44.44			
	Sophomore	80	35.56			
	Junior	8	100.00			
	Senior	33	14.67			
	Graduate	3	1.33			
Place lived longest						
	Metropolitan City	129	57.33			
	Province	53	23.56			
	County	38	16.89			
	Town	4	1.78			
Income						
	High	22	9.78			
	Medium	184	81.78			
	Low	18	8.00			

2.2 Instruments

Before the experimental sessions, the participants received a survey package consisting of informed consent form, demographic information form, Experiences in Close Relationships Inventory, WHOTO, and a list of Turkish names (see Appendix A).

2.2.1 Experiences in Close Relationships Inventory (ECR)

In order to measure the participants' attachment styles, i.e. their 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 - namely, their levels of attachment anxiety and avoidance, the participants were asked to fill the Experiences in Close Relationships inventory (ECR; Brennan, Clark, & Shaver, 1998). This self-report measure of attachment styles comprises two highly reliable 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. Sample items include "I don't feel comfortable opening up to others", "Just when someone starts to get close to me I find myself pulling away", "I try to avoid getting too close to others" (avoidance) and "I worry about being rejected or abandoned", "I worry that others won't care about me as much as I care about them", "I find that my partners don't want to get as close as I would like" (anxiety). Participants were

asked to rate the extent to which they agree with each statement using a Likert-type scale ranging from 1 (disagree strongly) to 7 (agree strongly). The ECR has been adapted to Turkish, examined in terms of its factor structure in Turkish samples, shown to have good construct validity (Sümer, 2006). Both subscales of the ECR were found to be reliable, the Cronbach's alpha was calculated to be .86 for the anxiety subscale, and .90 for the avoidance subscale. According to principal component analysis, the scale explained 38% of the total variance in a Turkish sample (Sümer, 2006). Also in this study both subscales were found to be internally consistent, the Cronbach's alpha was calculated as .85 for the anxiety subscale, and .92 for the avoidance subscale. According to principal component analysis, the two factor solution of the scale was valid and the factors explained 37.86% of the total variance in the current sample.

2.2.2 WHOTO

The six-item WHOTO scale, developed by Fraley and Davis (1997), was administered in order to determine the attachment figures of the participants, i.e. the people to whom the participants seek proximity, those whom the participants use as a safe haven, and those whom the participants use as a secure base. In the WHOTO scale, two items tap the proximity-seeking function, ("Who is the person you most like to spend time with?", "Who is the person you don't like to be away from?"), two items tap the safe-haven function ("Who is the person you want to be with when you are feeling upset or down?", "Who is the person you would count on for advice?"), and two items tap the secure-base function ("Who

is the person you would want to tell first if you achieved something good?", "Who is the person you can always count on?). 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 the most in these six questions. The WHOTO has been translated and adapted to Turkish by Gündoğdu Aktürk (2010) and it has been shown to have good construct validity.

2.2.3 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 names of persons whom 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 since it was recognized by the least number of participants and it is used both as a male and a female name in the Turkish language; therefore it was identified as the closest choice to a neutral name which would not elicit any feelings in the participants.

2.2.4 Signal Detection Task

In signal detection tasks, the participants are presented with a series of trials in which a particular stimulus signal is either present or absent. The participant may 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) (Swets et al., 1964; Green & Swets, 1966).

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) is present in a string of letters X or not by pressing the appropriate keys on the keyboard (http://psych.hanover.edu/javatest/Media/Chapter2/MedFig.SignalDetection.html). In each trial, the participants were presented with a string of 15 letter Xs for 500 ms, then the string disappeared and the participants were asked "Did you see the Y?" The participants were instructed to press either the key "E" for yes (evet), or the key "H" for no (hayır). The number of correct hits, correct rejections, false alarms, and misses; and the reactions times associated with those answers were recorded.

The cognitive attentional performance (the main dependent variable) of the participants in the Signal Detection task was measured via two estimates - precision and response time. In more detail, 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 - which is 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 detecting signals, and hence better cognitive attentional performance (Tanner & Swets, 1954; Swets, Tanner,

Birdsall, 1964). The *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.

The signal detection paradigm has many advantages for cognitive performance assessment. First of all, it is a relatively simple task, which eliminates the possible confounding effects of different levels of intelligence and education. Also the signal detection task is representative of many other cognitive paradigms such as lexical decision, matching tasks, recognition memory, and semantic verification (Ratcliff, Zandt, & McKoon, 1999). Moreover, being 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, it provides the researcher with the opportunity to differentiate between the two distinct kinds of right (a hit, or a correct rejection) and wrong decisions (a false alarm, or a miss); and hence to assess both sensitivity and bias. It is also a valuable method of measurement since it assumes that the decision maker is not a passive receiver of information, but an active decision-maker who makes difficult perceptual judgments under conditions of uncertainty (Swets et al., 1964).

2.2.5 Stroop Task

The participants also performed a computerized Stroop task (Stroop, 1935) in which they were asked to name the color in which a target word (which was either the name of same color or the name of another color) was written on

the monitor by pressing the appropriate keys on the keyboard. In each trial, the target word written in either one of four colors – red, blue, black and green - was presented on a white background in the middle of the screen and the participants tried to name as quickly as possible the color of the target word by pressing the appropriately labeled key on the keyboard – the first letter of the color, the key "K" for red (kırmızı), "M" for blue (mavi), "S" for black (siyah), and "Y" for green (yeşil). In some trials, the name of the color and color of the ink were the same (congruent trials) and they were different in others (incongruent trials). The number of correct and incorrect answers and the response times associated with congruent and incongruent trials were measured and reported.

The Stroop task is mainly an inhibition task, measuring higher order frontal cortex activity; and it is considered to measure selective attention, cognitive flexibility, working memory capacity, ability to suppress dominant response, and processing speed and it is used as a tool in the evaluation of executive functions (MacLeod, 1991, 1992; Kane & Engle, 2003). Research indicates that the activation of a specific mental representation increases attention to representation congruent elements (the word itself), thus leading to a slowing of color naming of the words in the Stroop task, otherwise known as the Stroop Effect (Stroop, 1935). Since lower levels of Stroop Effect indicates a lower level of interference resulting from a superior ability to suppress the dominant response, or in order words an efficient selective attention operation (MacLeod, 1991), it can be considered as a measure of higher cognitive

performance. The Stroop Effect is calculated as the difference between the reaction times in incongruent and congruent trials.

The results of the initial statistical analyses of the present study indicated to a quite unexpected and uncommon pattern in the Stroop Effect of the current sample. Although the reaction times for the congruent trials were found to be significantly faster compared to the reaction times for the incongruent trials in the overall sample, indicating a significant Stroop Effect (t (222) = 83.68, p < .001); it was depicted that 58 participants (26%) reacted to the incongruent trials of the Stroop task faster than they reacted to the congruent trials. Since such a large incidence of a reverse Stroop Effect is not reported in the literature, this subsample was investigated for significant differences from the majority of the sample. The analyses showed that this group did not significantly differ from the rest of the sample on any of the demographic or study variables, or the experimental manipulations. Hence it was inferred that the situation could stem from a measurement error, and the reliability of the reaction measures of the congruent and incongruent trials were investigated. The reaction times in the incongruent trials were found to be unusually dispersed. Hence it was concluded that the reaction time measure of the incongruent trials was unreliable, so the reaction time in the congruent trials of the Stroop task was used as a measure of the cognitive performance; with shorter reaction times indicating to higher performance.

There is also evidence in the literature that advocates for the use of the reaction times in the congruent trials of the Stroop task as a measure of cognitive performance. MacLeod's (1998; MacLeod & MacDonald, 2000) "inadvertent reading" hypothesis argues that in the congruent trials of the Stroop task, where the word and the color are consistent, it is impossible for the researcher to depict the possible reading errors of the participants, which is rather easy to do in the incongruent trials. MacDonald (1998) goes on to argue that since "incorrect" word naming and "correct" color naming cannot be discriminated on congruent trials, these undetected reading errors are inherently reflected in the response latencies of the congruent trials. Hence one can argue that the reaction times in the congruent trials of the Stroop task, which intrinsically bear these reading errors of the participants, could be utilized as a measure of cognitive attentional performance: participants with higher attentional performance would make fewer inadvertent reading errors, and hence report a shorter reaction time in the congruent trials of the task - an effect that cannot be observed in the incongruent trials.

2.3 Procedure

The ethics committee approval was taken from the METU UEAM (Human Participants Ethics Committee) before starting the data collection process.

Prior to the experiment, the survey package consisting of informed consent form, demographic information form, Experiences in Close

Relationships Inventory, WHOTO, and a list of Turkish names was administered to the participants in the introductory psychology courses. They were explained that the study consisted of a survey and a computerized experiment, and they were also asked to make an appointment for the experiment on the time-table distributed in the class after completing the survey package.

Before the participants were invited to the laboratory, they were randomly assigned to one of the four conditions of the experiment. Then, the participants were categorized into the four attachment groups (secure, dismissing, preoccupied, and fearful) using K means cluster analysis on the two dimensions of the ECR, namely attachment avoidance and anxiety. The resulting sample size characteristics of each experimental condition with respect to different attachment styles and gender are summarized in Table 2.2.

After approximately one week the experiment sessions were started. The participants were individually admitted to the Middle East Technical University Department of Psychology Experimentation and Observation Laboratory and 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 Hertz. All the stimuli (except for colors in the Stroop task) 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 two cognitive tasks - signal detection and Stroop in a counterbalanced order. The participants were first given 10 practice trials and then 60 experimental trials with each task. Each trial of the tasks began with a + in the middle of the screen followed by a 20 ms subliminal presentation of the first prime word in black lettering, and then by an XXX pattern, which was presented for 500 ms and served as a backward mask. The first prime word was either an attachment-related threat word (sad - üzgün, fear - korku, loss - kayıp, unhappy - mutsuz, alone - yalnız, separation - ayrılık) or a neutral word (jacket - ceket, hat - şapka, book - kitap, shirt - gömlek, notebook - defter, chair - tabure), according to the experimental condition, and was used to create the condition of attachment system activation.

The threat words were selected according to previous literature (Mikulincer, et. al, 2000; Mikulincer, Gillath, & Shaver, 2002) and conjecture with the concern of keeping the words as short as possible. The neutral words were selected such that they both did not carry any emotion-laden meanings and that their number of letters matched the number of letters in the threat words. After the mask, another + in the middle of the screen followed by a 20 ms subliminal presentation of the second prime word in black lettering appeared,

and then again the backward mask XXX pattern was shown. The second prime word was either the name of the attachment figure of the participant that was assessed via WHOTO scale, or the neutral name (Güner), again according to the experimental condition, and served as the distractor to the following cognitive task. Immediately following the last mask, the trial of the cognitive task began. Once each trial was over, the participants were again presented with the same series of primes, and the next trial of the task began, and so forth. Each cognitive task took approximately five minutes in total. For both tasks, the appropriate response keys were reassigned on the keyboard so that the letters associated with yes/no and the color names were next to one another for easing the answering process. The positions of the response keys were also counterbalanced within the two computers.

After the completion of the computerized tasks, the participants were asked to fill out a brief form for awareness check for subliminal priming (see Appendix B). Following Bargh and Chartrand's (2000) Funneled Debriefing Technique, the participants were first asked some general questions about the experiment, e.g. "Do you think the instructions in this experiment were easy to follow?", "Have you ever participated in a similar experiment?", "Could rate the level of difficulty of this experiment on a scale from 1 to 7?", and then they received a more specific question pertaining to the awareness check of the subliminal primes: "During the experiment did you see any words or symbols other than the X letter series and the color names? If yes, could you please write

them down?". The answers given to this question were recorded, the participants were labeled as "identified the prime" if they could correctly report any prime words. Finally the participants were thanked for their contributions and they were fully debriefed via e-mail once all the experiments were over.

Table 2.2 Outlook of the Experimental Conditions

Attachment Style	Neutral Word		Threat Word		
	Neutral Name	**Attachment Figure**	**Neutral Name**	**Attachment Figure**	
Secure	$n = 15$ ($n_{Female} = 13$ $n_{Male} = 2$)	$n = 16$ ($n_{Female} = 10$ $n_{Male} = 6$)	$n = 16$ ($n_{Female} = 13$ $n_{Male} = 3$)	$n = 15$ ($n_{Female} = 12$ $n_{Male} = 3$)	$\Sigma = 62$
Dismissing	$n = 13$ ($n_{Female} = 10$ $n_{Male} = 3$)	$n = 12$ ($n_{Female} = 10$ $n_{Male} = 2$)	$n = 13$ ($n_{Female} = 11$ $n_{Male} = 2$)	$n = 12$ ($n_{Female} = 10$ $n_{Male} = 2$)	$\Sigma = 50$
Preoccupied	$n = 13$ ($n_{Female} = 8$ $n_{Male} = 5$)	$n = 14$ ($n_{Female} = 9$ $n_{Male} = 5$)	$n = 14$ ($n_{Female} = 8$ $n_{Male} = 6$)	$n = 14$ ($n_{Female} = 9$ $n_{Male} = 5$)	$\Sigma = 55$
Fearful	$n = 15$ ($n_{Female} = 10$ $n_{Male} = 5$)	$n = 14$ ($n_{Female} = 12$ $n_{Male} = 2$)	$n = 14$ ($n_{Female} = 10$ $n_{Male} = 4$)	$n = 15$ ($n_{Female} = 11$ $n_{Male} = 4$)	$\Sigma = 58$
	$\Sigma = 56$	$\Sigma = 56$	$\Sigma = 57$	$\Sigma = 56$	$\Sigma = 225$

CHAPTER 3

RESULTS

Prior to data analysis via statistical analysis software SPSS 15.1, the data set was screened and cleaned. First of all, the accuracy of data was inspected via examining descriptive statistics. Means, standard deviations, minimum and maximum values of the variables were checked to make sure that data were entered accurately. Second, the missing data in the data set were inspected for any systematic patterns and it was discovered that the data set did not contain any missing values. Hence the data set was found to be suitable for further statistical analyses.

Following conventional methodology for preparing response time data (Bargh & Chartrand, 2000), latencies from trials with errors were removed in the Stroop task (less than 5% in each condition) in addition to the reaction times (RTs) that were shorter than 200 ms or longer than 2000 ms, which were considered to be outliers. Additionally, both Stroop and Signal Detection latencies that were three and a half standard deviations above or below the individual mean were also considered to be outliers and excluded from statistical

analyses. The number of these excluded cases exceeded a 5% limit for only four participants, and the maximum response time for each individual was replaced for these outlier latencies.

The results of the present study will be presented next. First general descriptive statistics of the major study variables will be presented, then hypotheses will be tested via inferential statistics, and finally manipulation and awareness checks for the experimental manipulations will be given.

3.1 Descriptive Statistics of the Major Study Variables

3.1.1 Overview of the Sample

First the sample was investigated for attachment related variables. The analyses revealed that the WHOTO scale was able to determine the primary attachment figure of 175 participants (77.8%); more than one name emerged for the rest of the sample. The most frequently named attachment figure emerged as mothers in the sample (29.3%), romantic partners were second most common attachment figures (18.2%), friends, other family members, and fathers followed with frequencies of 8.9%, 8.95, and 7.1% respectively. Considering the attachment anxiety and avoidance subscales derived from the ECR, it was found that participants reported a significantly higher level of attachment anxiety (M = 3.99) than attachment avoidance (M = 3.66) (t (224) = 64.83, $p < .001$). Participants were categorized into the four attachment groups using K means cluster analysis on the two dimensions of the ECR. As a result of this examination, 62 participants (27.5%) were identified as having a secure

attachment style, 50 (22.2%) as dismissing, 55 (24.4%) as preoccupied, and 58 (25.7%) as fearful.

Next the sample was investigated in terms of dependent variables. As seen in Table 3.1, *d'* (d prime), which is the measure of sensitivity in signal detection task and defined as the standardized difference between the means of the false positive (false alarms) and true positive (hits) responses, had a mean of 1.98 (*SD* = .66); the average reaction time for the signal detection task was identified as 578.76 ms (*SD* = 176.56); and finally the mean reaction times for congruent trials in the Stroop task was calculated as 924.06 ms (*SD* = 182.87)

3.1.2 Gender and Group Differences on the Major Study Variables

A series of one-way analyses of variances (ANOVAs) was conducted in order to depict possible gender differences in the major study variables. As seen in Table 3.2, confirming Hypothesis 5, no significant gender differences were depicted in any of the study variables. Gender was also found to be unrelated to attachment anxiety or avoidance.

In addition, the possible differences in the study variables in terms of the groups which were formed by the random experimental assignment were investigated via a series of analyses of covariance (ANCOVAs). Gender and age were entered as covariates in the analyses and their effects were statistically controlled. As seen in Table 3.3, the analyses failed to reveal any statistically significant differences between experimental groups in terms of any of the study variables.

Table 3.1 Descriptive Statistics of the Major Study Variables

Variables	Mean	SD	Range
d prime	1.98	.66	3.57
RT Signal	578.76	176.56	934.90
RT Cong	924.06	182.87	974.00

Variables: d prime = sensitivity, i.e. the standardized difference between the means of false positive (false alarms) and true positive (hits) responses in signal detection task, RT Signal = the reaction time in all signal detection tasks, RT Cong = the reaction time in congruent trials of the Stroop task

Table 3.2 Gender Differences on the Major Study Variables

	Male		Female		
Variables	**M**	**SD**	**M**	**SD**	**F**
d prime	2.02	.71	1.97	.64	.34
RT Signal	590.49	193.36	574.59	170.62	.35
RT Cong	933.45	171.06	920.73	187.28	.21

*$p < .05$, **$p < .01$

Variables: d prime = sensitivity, i.e. the standardized difference between the means of false positive (false alarms) and true positive (hits) responses in signal detection task, RT Signal = the reaction time in all signal detection tasks, RT Cong = the reaction time in congruent trials of the Stroop task

Table 3.3 Group Differences on the Major Study Variables

	Neutral Word Neutral Name (n = 56)		Neutral Word Attachment Name (n = 56)		Threat Word Neutral Name (n = 57)		Threat Word Attachment Name (n = 56)		
Variables	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**F**
d prime	1.99	.66	1.99	.71	1.99	.62	1.95	.65	.06
RT Signal	570.60	169.16	565.52	194.66	590.74	177.12	587.96	167.44	.28
RT Cong	930.40	173.68	925.60	186.40	928.15	177.06	912.63	197.95	.10

*$p < .05$, **$p < .01$

Variables: d prime = sensitivity, i.e. the standardized difference between the means of false positive (false alarms) and true positive (hits) responses in signal detection task, RT Signal = the reaction time in all signal detection tasks, RT Cong = the reaction time in congruent trials of the Stroop task

3.1.3 Bivariate Correlations between the Major Study Variables

In order to depict possible patterns and strength of associations between the study variables, a series of Pearson's two- tailed correlation analyses was conducted. The results of these bivariate correlations are presented in Table 3.3., and the significant associations will be reported next.

Attachment avoidance was found to be negatively correlated with sensitivity in signal detection tasks (*d'*) (r = -.18, p < .01), positively correlated with reaction time in signal detection tasks (r = .20, p < .01), and positively correlated with reaction time in congruent trials of the Stroop task (r = .14, p < .05). On the other hand, attachment avoidance was not significantly associated with attachment anxiety. Attachment anxiety was not found to be significantly correlated with any other study variable.

The analyses also revealed that sensitivity in signal detection tasks (*d'*) was negatively correlated with reaction time in signal detection tasks (r = -.21, p < .01), as expected. The reaction time in signal detection tasks was also found to be positively correlated with reaction time in congruent trials of the Stroop task (r = .47, p < .01).

Table 3.4 Bivariate Correlations between the Major Study Variables

	1	2	3	4	5
1.ECR Avoidance					
2. ECR Anxiety	.02				
3. d prime	-.18**	.01			
4. RT Signal	.20**	.02	-.21**		
5. RT Cong	.14*	.08	-.11	.47**	

* Correlation is significant at the .05 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed)

1: attachment avoidance, 2: attachment anxiety, 3: sensitivity – i.e. the standardized difference between the means of false positive (false alarms) and true positive (hits) responses in signal detection task, 4: the reaction time in all signal detection tasks, 5: the reaction time in congruent trials of the Stroop task

3.2 Hypothesis Testing

In order to test the main hypotheses of the present study pertaining to the subliminal threat and attachment figure name priming on cognitive attentional performance as a function of attachment styles, a series of inferential statistics were employed. First a series of analyses of covariance (ANCOVA) were conducted in order to depict any cognitive performance differences between the experimental group vis-à-vis the attachment styles; where sex was entered as a covariate to control for its effects. Next, as a complementary method, a series of hierarchical regression analyses were conducted since attachment anxiety and avoidance are frequently measured as continuous variables in the literature. In the following section, first each individual hypothesis will be tested via a series of analyses of covariance (ANCOVA), and then the complementary results of regression analyses will be presented.

3.2.1 Categorical Measures: Analyses of Covariance (ANCOVA)

First of all, three separate analyses of covariance (ANCOVA) were carried out for each major study variable (sensitivity in determining the presence of the signal - the *d'*, reaction time in all signal detection tasks, and reaction time in congruent trials of the Stroop task) by entering attachment styles, threat condition and attachment figure name condition as the independent variables, and sex as the covariate. The detailed statistics regarding these analyses can be found in Appendix C. Next the significant results yielded by these analyses will be presented.

3.2.1.1 General Predictions

The most general prediction of the present study was that the priming of an attachment related threat word would activate the attachment system and this activation would affect the performance of the participants in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent attachment figure primes. In support of this prediction, the ANCOVAs did not revealed any significant main effects for any of the independent variables (threat prime, attachment figure prime, attachment style) on any of the dependent variables (sensitivity in determining the presence of the signal - the *d'*, reaction time in all signal detection tasks, reaction time in congruent trials of the Stroop task). Only a marginally significant main effect for attachment style emerged in the signal detection task (F (3, 208) = 2.12, $p < .10$, partial $\eta^2 = .03$), where securely attached participants reported marginally significantly higher levels of *d'* (M = 2.10) as compared to dismissing participants (M = 1.81), which points to a superior cognitive performance of secure participants. On the other hand, significant two and three-way interactions were depicted. In particular, in the signal detection task, a significant three-way interaction of prime word, prime name and attachment style on the sensitivity of the participants in determining the presence of the signal, (the *d'*) was significant (F (3, 208) = 5.34, $p < .001$, partial $\eta^2 = .07$). Moreover, in the Stroop task a significant two-way interaction of prime name and attachment style on the reaction times of participants in congruent trials was found (F (3, 208) = 3.34, $p < .05$, partial $\eta^2 = .05$). This

absence of significant main effects and presence of significant two and three-way interaction effects suggest that neither of the independent variables is strong enough to influence the cognitive performance of the participants on its own; but an influence on the cognitive performance is only achieved as a result of the unique combinations of these three independent variables. The post-hoc analyses of the significant two and three-way interactions on *d'* and the reaction time in congruent trials of the Stroop task will be presented next in line with the hypotheses of the study.

3.2.1.2 The Neutral Condition: Neutral Word Prime followed by Neutral Name Prime (Hypothesis 1)

It was hypothesized that under the neutral condition, where no threat word and no attachment figure name were primed, the task performances would not differ with respect to attachment styles. In support of this hypothesis, no significant differences were depicted in the cognitive performance of the participants in the neutral condition as a function of their attachment styles, as seen in Tables 3.5 and 3.6.

3.2.1.3 The Second Experimental Condition: Neutral Word Prime followed by Attachment Figure Name Prime (Hypothesis 2)

It was hypothesized that when a neutral, no-threat prime word is followed by an attachment figure name prime, preoccupied participants' performance would deteriorate and they would perform worse than the secure and dismissing participants, whose cognitive performances were anticipated to

remain uninfluenced. In partial support of Hypothesis 2, both preoccupied and fearful participants performed worse than secure participants under the attachment figure name condition; as seen in Table 3.6, they reacted significantly slower (M = 969.37, and M = 969.99, respectively) in the congruent trials of the Stroop task compared to the secure participants (M = 856.52). On the other hand, as illustrated in Table 3.5, no significant difference in *d'* was depicted for the preoccupied and secure participants; the performance of preoccupied participants in the signal detection task under this condition did not significantly decline as compared to the neutral condition either. Moreover, contrary to the expectations, preoccupied participants (M = 2.33) performed better than dismissing participants (M = 1.71) on the signal detection task. In support of the hypothesis, the cognitive performance of secure and dismissing participants did not show a significant change compared to the neutral condition, as illustrated in Table 3.5.

3.2.1.4 The Third Experimental Condition: Threat Word Prime followed by Neutral Name Prime (Hypothesis 3)

It was hypothesized that an attachment-related threat word prime followed by a neutral name prime would deteriorate the performance of securely attached participants and they would perform worse than dismissing participants whose performance was not anticipated to change. In addition, the preoccupied participants' performance was anticipated to deteriorate even further than the neutral word-attachment figure name condition, and they were expected to

perform worse than both secure and dismissing participants. The results did not entirely support Hypothesis 3, showing that securely attached participants' performance did not differ from the performance of dismissing participants, or the neutral condition (see Table 3.5). On the other hand, in partial support of the hypothesis; as seen in Table 3.5, the results showed that dismissing participants' performance did not deviate from the neutral condition when a threat word was followed by a neutral name. One unexpected finding emerged in this condition: preoccupied participants (M = 2.35) performed better than dismissing participants (M = 1.72) on the signal detection task, but their performance was not significantly different than those of securely attached participants or the neutral name-attachment figure name condition.

3.2.1.5 The Fourth Experimental Condition: Threat Word Prime followed by Attachment Figure Name Prime (Hypothesis 4)

It was predicted that an attachment-related threat word prime followed by the subliminal presentation of the attachment figure name would enhance the task performance of securely attached participants and they would perform better than dismissing participants, whose task performance was predicted to decline in this condition. In addition, the task performance of preoccupied participants was anticipated to be lower than secure and dismissing participants, and both preceding conditions. The results disconfirmed the first part of the hypothesis; the task performances of secure and dismissing participants did not significantly differ neither from each other nor the neutral condition. On the

other hand, in support of the hypothesis, secure participants (*M* = 2.31) performed better compared to the preoccupied participants (*M* = 1.61) on the signal detection task under this condition. Moreover, preoccupied participants performed worse under this condition (*M* = 1.61) compared to both the neutral word-attachment figure name (*M* = 2.33) and the threat word-neutral name conditions (*M* = 2.35) on the signal detection task (see Figure 3.1). Moreover, in partial support of the hypothesis, both preoccupied and fearful participants performed worse than the securely attached participants under the attachment figure name condition; as seen in Table 3.6, they reacted significantly slower (*M* = 969.37, and *M* = 969.99, respectively) in the congruent trials of the Stroop task compared to the secure participants (*M* = 856.52).

In line with the general predictions, preoccupied and fearful participants did not show any significant performance differences throughout the study. On the other hand, an unexpected finding emerged: as seen in Table 3.6, dismissing participants performed significantly better on the Stroop task with lower reaction times on the congruent trials under the attachment name condition (*M* = 878.47) as compared to the neutral name condition (*M* = 979.25).

Table 3.5 Signal Detection Sensitivity (*d'*) with respect to Attachment Style, Prime Word, and Prime Name

	Neutral Word		Threat Word	
Attachment Style	**Neutral Name**	**Attachment Figure**	**Neutral Name**	**Attachment Figure**
Secure	(*n* = 15)	(*n* = 16)	(*n* = 16)	(*n* = 15)
M	2.22_{a}	1.92_{ab}	1.97_{ab}	2.31_{a}
SD	.56	.81	.72	.51
Dismissing	(*n* = 13)	(*n* = 12)	(*n* = 13)	(*n* = 12)
M	1.82_{a}	1.71_{a}	1.72_{a}	2.00_{ac}
SD	.74	.30	.54	.31
Preoccupied	(*n* = 13)	(*n* = 14)	(*n* = 14)	(*n* = 14)
M	1.91_{abc}	2.33_{b}	2.35_{b}	1.61_{c}
SD	.67	.75	.54	.60
Fearful	(*n* = 15)	(*n* = 14)	(*n* = 14)	(*n* = 15)
M	1.97_{a}	1.99_{ab}	1.91_{ab}	1.86_{ac}
SD	.67	.74	.54	.86

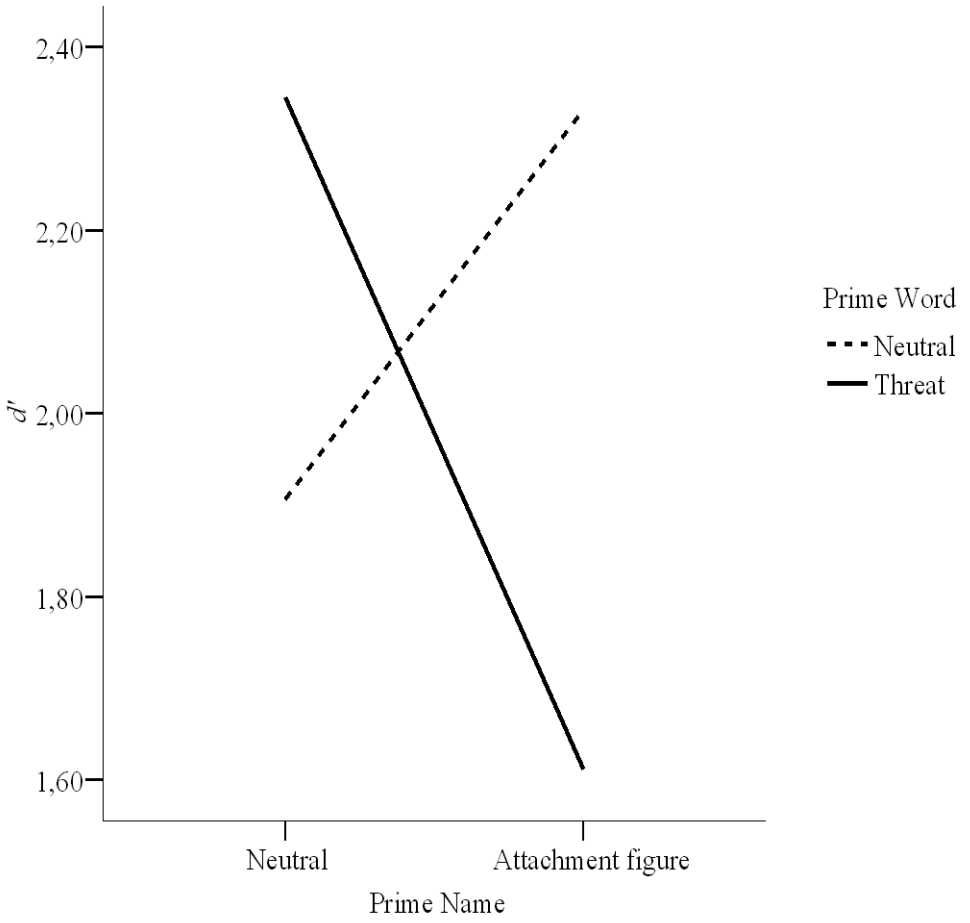
Means which do not share any subscripts are significantly different at $p < .05$

Table 3.6 Reaction Time in the Congruent Trials of the Stroop Task with respect to Attachment Style and Prime Name

Attachment Style	**Neutral Name**	**Attachment Figure**
Secure	(*n* = 31)	(*n* = 31)
M	931.62_{a}	856.52_{ab}
SD	168.15	175.60
Dismissing	(*n* = 26)	(*n* = 24)
M	979.25_{a}	878.47_{bc}
SD	214.18	199.61
Preoccupied	(*n* = 27)	(*n* = 28)
M	885.48_{ac}	969.37_{c}
SD	139.94	156.16
Fearful	(*n* = 29)	(*n* = 29)
M	922.70_{ac}	969.99_{c}
SD	168.24	212.43

Means with different subscripts are significantly different at $p < .05$

Figure 3.1 Interaction Effect of Prime Word and Prime Name on Signal Detection Sensitivity (*d'*) for Preoccupied Participants



3.2.2 Continuous Measures: Hierarchical Regression Analyses

Following the series of analyses of covariance (ANCOVA) that depicted the cognitive performance differences between the experimental groups vis-à-vis the attachment styles, a series of hierarchical regression analyses were conducted to investigate the effects of attachment dimensions as continuous measures. Since categorical analyses may result in the shrinkage of variance, and thus, decrease the power of analyses, main hypotheses were also tested via continuous measures using hierarchical moderated regression analyses. In these 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 via multiplying all centered variables with each other. Sex was entered to the hierarchical regression analyses in the first step to control for its effect; attachment anxiety and avoidance, and prime word and name were entered in the second step; and finally the two and three-way interaction terms of the variables of the second step were entered in the third step. And finally in order to depict the significance and patterns of interactions, simple slope tests were employed and interactions between the variables were plotted by generating simple regression equations of a given dependent variable at low (i.e. one standard deviation below the mean) versus high (i.e. one standard deviation 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 3.7.

In the first group of regression analyses, the sensitivity in the signal detection task (*d'*) was investigated as the criterion variable. As illustrated in Table 3.7, attachment avoidance was found to be significantly related to sensitivity in signal detection task in the final step (β = -.18, $p < .01$), with a negative effect on the performance of participants in the task.

The three-way interaction effect of attachment anxiety, prime word and prime name on sensitivity in the signal detection task (*d'*) was also found to be significant (β = -.20, $p < .01$). In order to depict the significance and patterns of this interaction, two simple slope tests were employed and the interactions were plotted. The first simple slope test revealed that being primed with a neutral word did not significantly affect sensitivity in the signal detection task with respect to the attachment anxiety under neither neutral (t (217) = -.31) nor attachment name prime conditions (t (217) = 1.27). The second simple slope test indicated that a threat word prime followed by a neutral name prime did not significantly influence performance with respect to attachment anxiety either (t (217) = 1.43). On the other hand, the significant simple slope (t (217) = -2.76, $p < .01$) for the threat word-attachment figure name condition suggested that participants with high attachment anxiety performed worse in the signal detection task with lower levels of *d'*, compared to participants with low attachment anxiety, who reported higher levels of *d'* (Figure 3.2). These results

support Hypothesis 4 which predicted that preoccupied participants would perform the worst when they are primed by an attachment figure name, after being primed by an attachment-related threat.

In addition to sensitivity, reaction time in the signal detection task also emerged as a significant determinant of cognitive performance in the second group of hierarchical regressions. As illustrated in Table 3.7, attachment avoidance was also significantly related to reaction time in signal detection task in the final step ($\beta = .22$, $p < .01$), with a positive effect on the reaction time, and hence again a negative effect on the cognitive performance.

The two-way interaction effect of attachment anxiety and prime name on performance was also found to be marginally significant ($\beta = .13$, $p < .10$). In order to depict the significance and patterns of this interaction, a simple slope test was employed and the interaction was plotted. The simple slope test revealed that being primed with a neutral name did not significantly affect reaction time in the signal detection task with respect to the attachment anxiety (t (221) = -.87). On the other hand, the marginally significant simple slope (t (221) = 1.53, $p < .10$) for the attachment figure name condition suggested that participants with high attachment anxiety performed worse in the signal detection task with a higher reaction time, compared to participants with low attachment anxiety, who reported lower reaction times (Figure 3.3). These results support Hypotheses 2 and 4 which predicted that preoccupied participants

would perform worse when primed by an attachment figure name, whether an attachment related threat did or did not precede.

Another dependent variable that revealed significant results in the categorical measures, the reaction time in the congruent trials of the Stroop Effect, also generated significant models in the regression analyses. As Table 3.7 shows, attachment avoidance again emerged as a significantly related variable to reaction time in the final step ($\beta = .15$, $p < .05$), with a positive effect on the reaction time, and hence again a negative effect on the cognitive performance. In the Stroop task, attachment anxiety also emerged as significant variable in the final step ($\beta = .14$, $p < .05$), with a positive effect on the reaction time, and hence a negative effect on the cognitive performance.

In addition, the two-way interaction effect of attachment anxiety and prime word on reaction time in the congruent trials of the Stroop task was found to be significant ($\beta = -.14$, $p < .05$). The simple slope analysis yielded a significant ($t\ (221) = 2.68$, $p < .01$) difference in the case of neural word priming. As seen in Figure 3.4, when primed with a neutral word, participants with high attachment anxiety performed significantly worse on the Stroop task compared to the participants with low anxiety. These findings support Hypothesis 2, which asserted that the chronic preoccupation of anxiously attached people would cause them to perform worse even when there is no objective threat in the environment. Moreover, no significant performance change emerged with respect to attachment anxiety when a threat word was

primed (t (221) = -.98), which supports the general prediction of threat would affect the performance regardless of attachment styles.

And finally, the two-way interaction effect of attachment anxiety and prime name on performance in the congruent trials of the Stroop task was again found to be significant (β = .22, p < .001). Similar to the results of the signal detection task, the simple slope test revealed that being primed with a neutral name did not significantly affect reaction time in the congruent trials of the Stroop task with respect to the attachment anxiety (t (221) = -1.15). On the other hand, the significant simple slope (t (221) = 3.30, p < .001) for attachment figure name condition pointed that participants with high attachment anxiety performed worse in the Stroop task with a higher reaction time, compared to participants with low attachment anxiety (Figure 3.5). These results also support Hypotheses 2 and 4 which argued that participants with high attachment anxiety would perform worse when primed by an attachment figure name, regardless of the preceding prime word.

Table 3.7 Sex, Attachment Anxiety and Avoidance, Prime Word, and Prime Name Regressed on Measures of Cognitive Performance

	Sensitivity in Signal Detection Tasks (d')	Reaction Time in all Signal Detection Task	Reaction Time in Congruent Trials of the Stroop Task
Variables	β	β	β
Sex	.04	.04	.03
F	.34	.35	.21
R^2 Change	.00	.00	.00
Adjusted R^2	.00	.00	.00
Sex	.03	.05	.03
Anxiety	.01	.01	.07
Avoidance	-.19**	.21**	.14*
Prime Word	-.02	.07	-.01
Prime Name	-.04	.01	-.01
F	1.66	2.17*	1.14
R^2 Change	.04	.05	.02
Adjusted R^2	.01	.03	.00
Sex	.04	.07	.07
Anxiety	-.04	.05	.14*
Avoidance	-.18**	.22**	.15*
Prime Word	-.01	.06	-.03
Prime Name	-.02	.02	-.01
Anx X Avo	-.02	.05	.10
Anx X Prime Word	-.11	-.01	-.14*
Anx X Prime Name	-.09	.13†	.22***
Avo X Prime Word	-.04	-.10	.02
Avo X Prime Name	.04	.00	-.03
Prime Word X Prime Name	-.01	-.02	-.03
Anx X Avo X Prime Word	.02	-.05	.05
Anx X Avo X Prime Name	-.01	.03	.03
Anx X Prime Word X Prime Name	-.20**	.01	.04
Anx X Prime Word X Prime Name	.12	-.07	-.08
F	1.55†	1.20	1.91*
R^2 Change	.06	.03	.10
Adjusted R^2	.04	.01	.06

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

Variables: sex, attachment anxiety, attachment avoidance, type of primed word, type of primed name

Figure 3.2 Interaction Effect of Attachment Anxiety and Prime Name on Signal Detection Sensitivity (*d'*) under Threat Word Prime

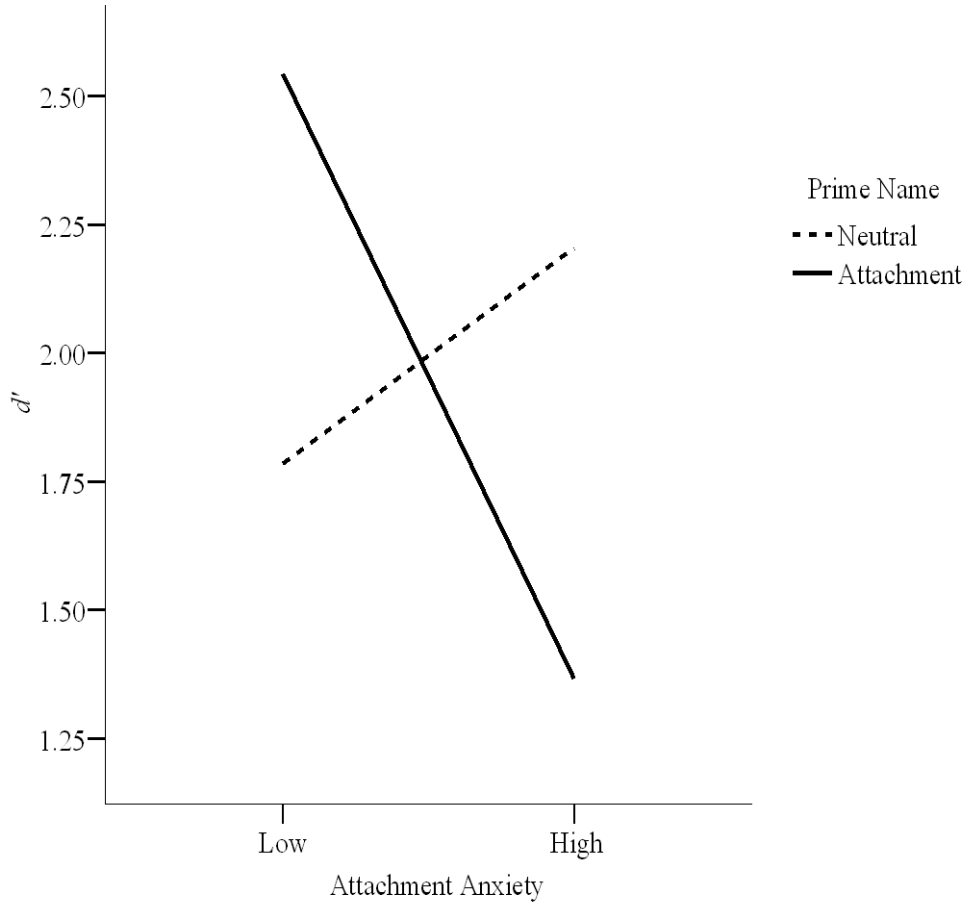


Figure 3.3 Interaction Effect of Attachment Anxiety and Prime Name on Reaction Time in Signal Detection Task

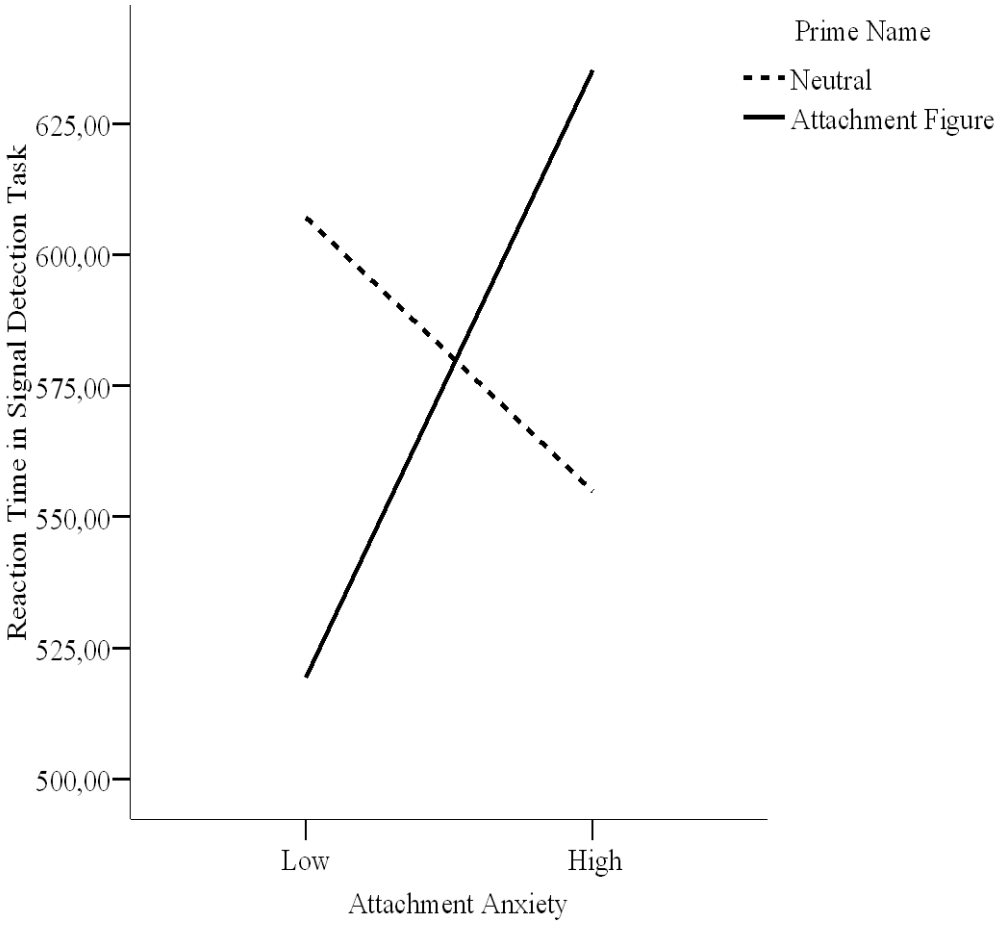


Figure 3.4 Interaction Effect of Attachment Anxiety and Prime Word on Reaction Time in Congruent Trials of the Stroop Task

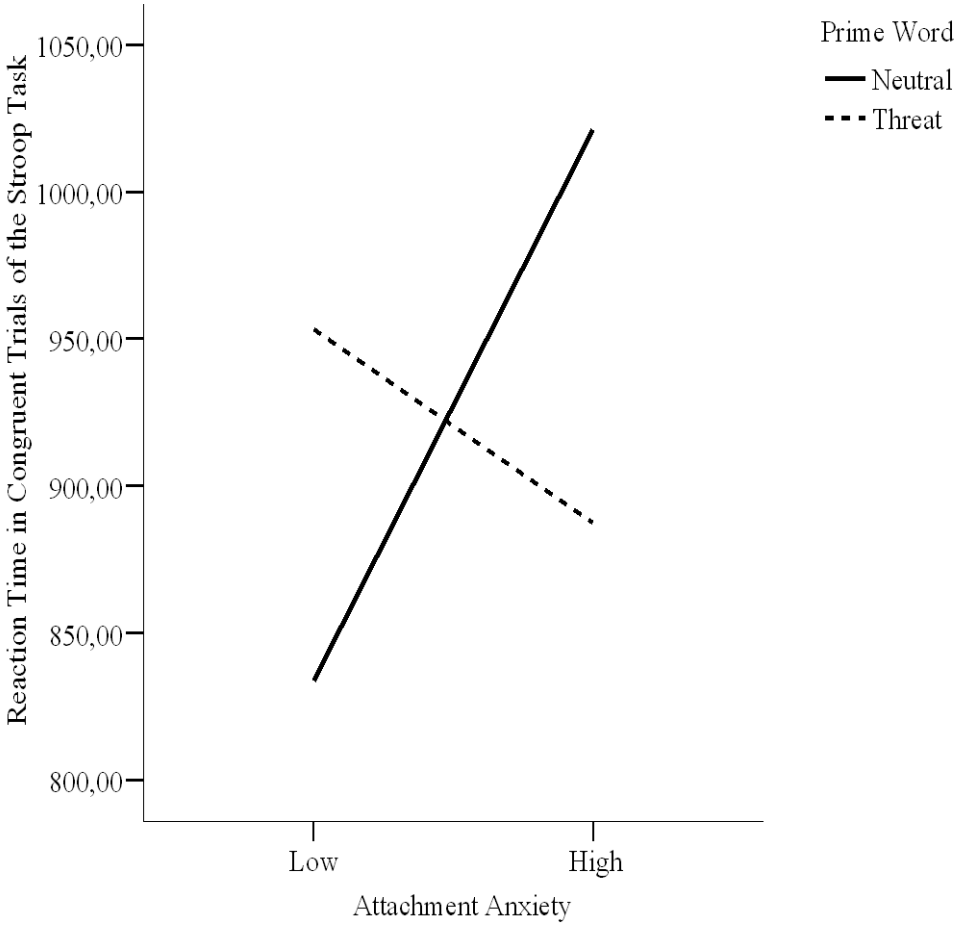
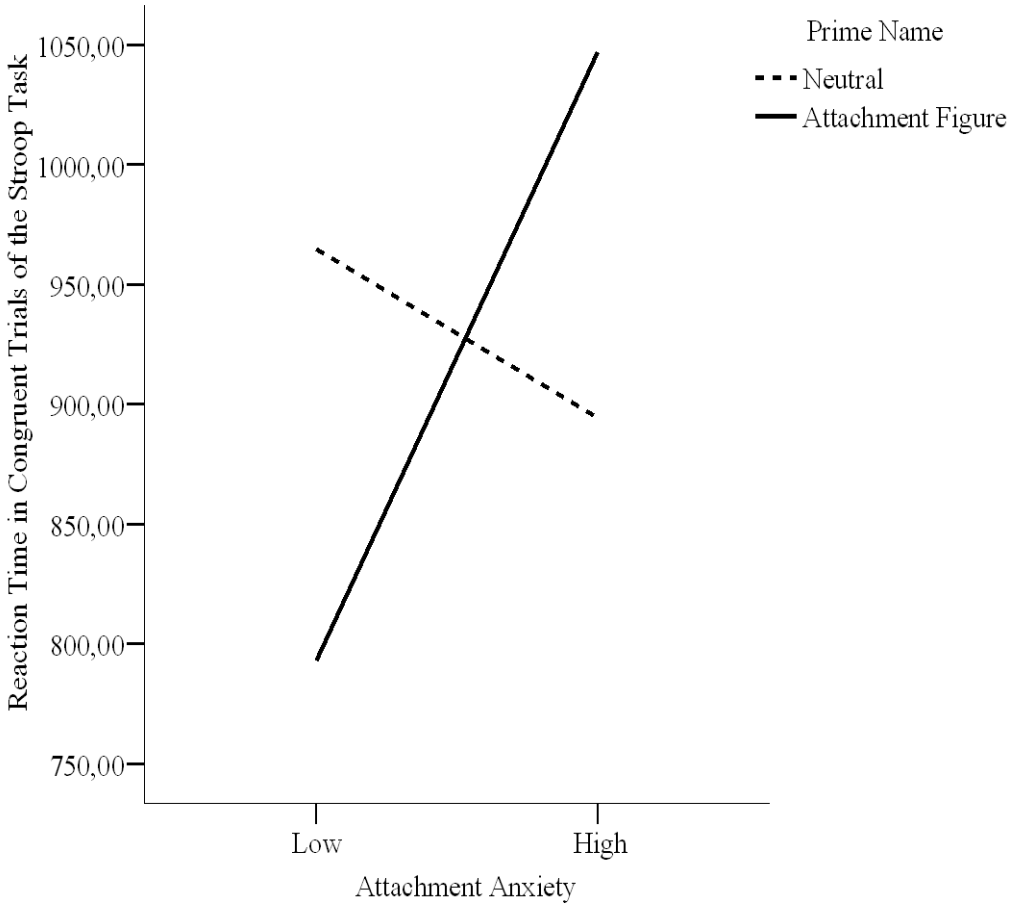


Figure 3.5 Interaction Effect of Attachment Anxiety and Prime Name on Reaction Time in Congruent Trials of the Stroop Task



3.3 Manipulation and Awareness Checks

The effects of the two experimental manipulations, namely threat and attachment figure conditions were examined via a series of analyses of covariance (ANCOVAs). Gender and age were entered as covariates in the analyses and their effects were statistically controlled. The analyses failed to reveal any statistically significant main effects of the experimental manipulations on any of the major study variables. On the other hand, the plausible and expected correlations between the study variables suggest that experimental manipulations worked in the anticipated directions.

In addition, awareness check for the subliminal primes in the experiment was investigated. Following the completion of the computerized tasks, the participants were asked to fill out a brief form for awareness check for subliminal priming, prepared in line with Bargh and Chartrand's (2000) Funneled Debriefing Technique. This awareness check revealed that 38 (16.9%) participants correctly identified one or more of the prime words during the experiment. Since identifying the primes could potentially interfere with the experimental process, the participants who could and could not identify the primes were compared in terms of all the study variables, and the analyses revealed no significant difference between these two groups, suggesting no impact of identifying subliminal primes.

3.4 Overview of Results

To sum up, the results of this study provided considerable support for the general assertion that the priming of an attachment related threat word activates the attachment system and this activation affects the performance of the participants in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent attachment figure primes. The results suggest that both attachment anxiety and avoidance are risk factors for cognitive performance. Attachment avoidance emerged as a main factor for decreased cognitive performance in this study; and attachment anxiety seemed to make people vulnerable, causing them to perform worse, only under certain circumstances of attachment system activation. On the other hand, attachment security seemed to be immune to the effects of threat or attachment figure availability priming on cognitive performance, supporting the protective function of a positive model of self and others. Next, these results will be further elaborated and associated to the literature.

CHAPTER 4

DISCUSSION

The main objective of this thesis was to investigate the possible relationships between attachment system activation and cognitive performance, with respect to different attachment styles. The present study aimed at simultaneously manipulating the conditions of threat and attachment figure availability via subliminally priming threat or neutral words, and attachment figure or neutral names; and hence to see the effects of attachment system activation on cognitive attentional performance. The main expectation of the present study was that the priming of an attachment-related threat would activate the attachment system, and this activation would affect the attentional performance of people in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent availability of their attachment figures.

In the following sections, first findings on the general descriptive characteristics of the major study variables will be elaborated, next the main findings of the study will be discussed, then the limitations of the study will be

discussed and finally the contributions and implications of the study will be addressed.

4.1 Descriptive Statistics of the Major Study Variables

4.1.1 Overview of the Sample

In the present study the most frequent attachment figures emerged as mothers and romantic partners. This prevalence of mothers and romantic partners as attachment figures could be argued to reflect the typical attachment pattern of emerging adults – they are in a transition from childhood attachment to adult romantic attachment, which is well in line with Feeney's (2004) assertion that romantic partners gradually take place of the parents who served as fundamental attachment figures during the early years of human lifespan development.

The present sample revealed a higher level of attachment anxiety than attachment avoidance, which is not common in the Western samples, but rather typical of Turkish samples (Sümer, 2008). Schmitt's review (2010) has also identified Turkey as a culture where attachment avoidance is quite low compared to other nations. Other studies have also documented that preoccupied attachment is more prevalent in societies with high rates of collectivism (Hofstede, 2001).

The sample was characterized by a quite balanced distribution of attachment styles, a feature not frequently mirrored in the literature, which reflects a dominant prevalence of secure attachment accompanied by a fairly

even distribution of other insecure attachment styles (Ainsworth et al., 1978; Bartholomew & Horowitz, 1991; Hazan & Shaver, 1987). This discrepancy could be related to categorized attachment groups on the basis of K-clustering of the two attachment dimensions: avoidance and anxiety.

4.1.2 Gender and Group Differences on the Major Study Variables

In the current sample, gender was found to be unrelated to the participants' performance in the cognitive tasks, which is consistent with literature that shows no gender differences in the attentional tasks utilized by this study (MacLeod, 1991). The sample also did not differentiate on attachment styles with respect to gender, a finding not reflected in previous studies which showed that males report significantly higher attachment avoidance and lower attachment anxiety than females (see Del Guidice, 2011 for a review).

The analyses of the present study failed to depict any statistically significant differences in the cognitive performance of different experimental groups, which contradicts the previous findings of attachment system activation studies which consistently found differences between the scores of experimental groups that were primed with neutral and threat words (Dewitte et al., 2008; Mikulincer et al., 2000, 2002). This discrepancy maybe attributed to the fact that the measures of these studies were not cognitive performance but solely indicators of attachment system activation.

In addition, no significant difference on any of the variables was found for participants who could and could not identify the subliminal primes. This

finding is very much in line with Mikulincer and his colleagues' study (2000), which showed that attachment system activation is not affected by types of priming – subliminal or supraliminal; and that identifying the subliminal primes does not impact the consequences of priming.

4.1.3 Bivariate Correlations between the Major Study Variables

Correlations between the major variables revealed a significant negative relationship between attachment avoidance and sensitivity in signal detection tasks (*d'*) - an indicator of superior cognitive performance. In addition, a positive association was found between attachment avoidance and reaction times in both signal detection tasks and congruent trials of the Stroop task, both of which point to a poor performance. These findings suggest that attachment avoidance could be associated with decreased precision and increased response times, and hence it could be argued to be a risk factor in cognitive attentional performance. This inference is also supported by the findings of Mikulincer (1997) which indicated that avoidant individuals have a lower tendency to show curiosity for exploring novel stimuli and cognitive openness, which could be considered to be precursors of cognitive performance.

Other bivariate correlations suggested that the two measures of this study, the signal detection and Stroop tasks, were both internally consistent and reliable in successfully measuring the same constructs with the same pattern. For example, the negative relation found between *d'* and reaction time in signal detection tasks confirms the antagonistic nature of these two measures - while

higher levels of *d'* signals superior cognitive performance, longer reaction times indicate poorer performance. Moreover, reaction time in signal detection tasks was found to be positively related with reaction time in congruent trials of the Stroop task which suggests both tasks successfully measure the same construct, with longer reaction times pointing to a poorer cognitive performance.

4.2 Main Findings of the Study

4.2.1 Categorical Measures: Analyses of Covariance (ANCOVA)

The most general prediction of the present study was that the priming of an attachment related threat word would activate the attachment system and this activation would affect the performance of the participants in the cognitive tasks, as a function of the interaction of their attachment style and the subsequent attachment figure primes. In support of this prediction, no significant main effects for any of the independent variables - threat prime, attachment figure prime, attachment style was found; nonetheless significant two and three-way interactions were depicted. It can be argued that these findings indicate that neither different primes nor attachment disposition is strong enough to influence the cognitive performance of the participants on its own; but an influence on the cognitive performance is only achieved as a result of the unique combinations of the threat in the environment, availability of attachment figures and chronic attachment styles, which is arguably a more realistic depiction of real attachment behavioral system. In line with this general picture, the results of the present study also showed that when the attachment system is not activated, cognitive

performance does not vary with respect to different attachment styles. This finding suggests that under normal circumstances, level of cognitive excellence is an inherent characteristic of individuals, independent of the security of their significant relationships.

The results of the current study showed that the cognitive performance of people who have a secure attachment remains uninfluenced by the effects of threat and attachment figure availability. This finding confirms the protective nature of secure attachment – having a stable positive view of self and others protects the cognitive resources from being distracted by threats in the environment or the manipulation of attachment figure availability, hence facilitates concentration and maintenance of the attention on the task at hand. This finding is also supported by early studies showing that cognitive structures derive benefit from secure attachment, for example, two aspects of information processing - information search and integration of new information within cognitive structures have been shown to be positively related to a secure attachment working model (Mikulincer, 1997). Another study by Mikulincer and Arad (1999) has shown that people with secure attachment style have a higher level of cognitive openness, they are better at recalling expectation-incongruent information and integrating that new information into their existing schemas. Secure attachment has also been linked to enhanced interest in exploration, which is tightly related to cognitive openness (Green & Campbell, 2000).

Attachment security has also been linked to enhanced cognitive functioning in Turkish samples: individuals who score high on both of the complementary dimensions of relatedness and individuation, i.e. individuals with secure attachment, tend to report higher levels of need for cognition, conceivably due to their ability to use their secure attachment and high interpersonal relatedness as a secure base to foster a higher need for cognition, explore their environment, and develop an integrated and balanced individuation (İmamoğlu, 2003, İmamoğlu & İmamoğlu, 2007, 2010). All of these findings support Bowlby (1973) and Ainsworth (1991)'s assumption that attachment security would enhance curiosity, encourage relaxed exploration of new information and phenomena, and favor the formation of open and flexible cognitive structures, all of which are closely linked to cognitive performance.

Previous studies (Mikulincer et al., 2000) have shown that secure people's cognitive system is not chronically occupied with attachment themes, but the attachment system is activated only when necessary, i.e. when the individual is faced with a threat; and the findings of the current study builds on them by showing that even when the attachment system is activated by a threat in the environment, secure attachment acts as a protective mechanism for the cognitive system and prevents possible cognitive resource depletion and distraction from the task. Such an inference is also in line with the findings of Mikulincer (1997) which showed that the secure attachment working model manifests itself in a sense of confidence in dealing with social and informational

threats; and Mikulincer and Florian's study (1998) which also reported that securely attached individuals are confident in their ability to deal with distress.

Previous findings have shown that securely attached people believe that their attachment figures would not abandon them and that these figures would help them in cases of danger (e.g., Mikulincer & Shaver, 2007). The current study builds on these findings by showing that the manipulation of attachment figure availability does not influence secure participants' cognitive performance; presumably because the positive self and other models of securely attached people, which has been historically reinforced with the constant availability of attachment figures who have been responsive to their primary attachment strategies, makes them confident that their attachment figures will always be available and responsive to them, even if they are absent physically (attachment figure unavailability prime). This confidence arguably enables them to use their cognitive resources on the task at hand rather than depleting them on attachment related worries.

Unlike the majority of the previous studies which have argued that individuals who score high on attachment avoidance arrange and utilize their cognitive resources so that they can deactivate their attachment systems, suppress attachment needs and remain concentrated even under conditions of threat (Dewitte et al., 2007; Edelstein & Gillath, 2008; Fraley & Shaver, 1997; Kirsh & Cassidy, 1997; Mikulincer et al., 2000), the findings of the present study showed that dismissing attachment does not provide the individual with a

protective shield against attachment-related stress and worries. To the contrary, the current results indicated that when the attachment system of dismissing individuals is activated via the subliminal presentation of either an attachment-related threat word or the name of their chronically unavailable attachment figure, they perform significantly worse than preoccupied participants on the signal detection task and they also show an inferior trend than secure ones, although not statistically significant. Previous studies have suggested attachment avoidance as a risk factor for well-being (Fraley & Brumbaugh, 2007), relationship satisfaction (Friedman et al., 2010), and self-image (Mikulincer et al., 2004); and the findings of the present study suggest that avoidance could make people vulnerable to the depletion of cognitive resources. This negative influence of attachment avoidance on cognitive performance was also evident in the bivariate correlations (see section 4.1.3) and it will be further discussed under the continuous measures (see section 4.2.2).

Nonetheless, an unexpected, yet very interesting finding emerged with the performance of dismissing participants on the other cognitive measure - the Stroop task. Dismissing participants performed significantly better on the Stroop task with lower reaction times on the congruent trials when they were primed with an attachment figure name as compared to the case when they were subliminally exposed to a neutral name. To the best of the author's knowledge such a finding is unprecedented in the literature, with the exception of Hick's doctoral dissertation study (2007), which showed that being subliminally primed

with the name of the romantic partner leads to more positive appraisals of task performance (amount of control over own task performance and level of personal ability to accomplish the task) among high avoidant participants. This enhancement in cognitive performance when primed with the attachment figure documented in the current study could suggest that even chronically unavailable and dismissing, attachment figures may still offer a secure base for exploration and better cognitive functioning. Conceivably, individuals who report high attachment avoidance could derive some benefit from proximity to their attachment figures; nonetheless probably only when they are not consciously aware of receiving this proximity, so that their characteristic strategy of directing their attention away from emotional and attachment-related needs is not activated.

The findings showed that the cognitive performance of preoccupied individuals is deteriorated when they are reminded of their attachment figures. These results are arguably consistent with the findings of the previous studies which indicated that anxiously attached people show a heightened activation of attachment figures (Mikulincer et al., 2002), heightened approach responses towards attachment figures (Dewitte et al., 2008), and attentional bias towards attachment figures (Dewitte et al., 2007). The results of the present study build on these findings that anxiously attached people show an increased accessibility of representations of attachment figures, and indicate that this hypervigilance interferes with higher order cognitive processes and uses up the cognitive

resources and depleting them which results in a poorer performance on subsequent cognitive tasks.

Moreover, the hypervigilance of preoccupied people about attachment related threats is also reflected in the results of the present study - their cognitive performance declined even further when their fixation on the chronically inconsistent attachment figures was paired with the presence of a real threat in the environment. These results are consistent with the findings of McGowan (2002) which showed that under a stressful situation, thinking about a significant other leads to greater distress than thinking about an acquaintance for individuals with negative self-models (i.e. anxious attachment). The findings of the present study also point to a similar direction - when preoccupied participants were primed with their attachment figures' names under the threat condition, this combination yielded the worst outcome in their cognitive attentional performance, conceivably due to the fact that their cognitive system became too overwhelmed when the thought of their attachment figure - with whom they were already chronically preoccupied with, was induced under a stress condition - which they were already chronically hypervigilant about. Arguably, such an extensive preoccupation with attachment diminished available resources, leaving the individual weak in the face of subsequent cognitive demands.

4.2.2 Continuous Measures: Hierarchical Regression Analyses

In the current study, a further investigation of the possible relationships between attachment system activation and cognitive performance was also

conducted via examining attachment anxiety and avoidance as continuous measures. These analyses indicated that attachment avoidance predicted cognitive performance negatively in both tasks - higher attachment avoidance predicted lower sensitivity in signal detection task, and longer response latencies in both signal detection and Stroop tasks. This pattern indicates that attachment avoidance leads people to more instinctual responses, which are not only slow but also inaccurate; conceivable due to the high stress elicited by the activation of the attachment system. Building on the findings of both bivariate correlations and the categorical analyses, these results suggest that high levels of attachment avoidance, but not attachment anxiety, could pose a risk factor for optimal cognitive functioning, which is well in line with the previous findings indicating attachment avoidance is negatively related to cognitive openness, curiosity and the need for cognition and exploration - which could be considered to be the precursors of cognitive performance. For instance, adult attachment studies have consistently documented that avoidant people score lower on self-report measures of novelty seeking (Chotai, Jonasson, Hagglof, & Adolfsson, 2005), trait curiosity (Mikulincer, 1997), and desire to explore (Green & Campbell, 2000); they also engage in exploratory behaviors less (Aspelmeier & Kerns, 2003) and they have more negative attitudes toward curiosity (Mikulincer, 1997).

These results of the present study are also valuable in terms of confirming the previous findings which suggested that high attachment

avoidance is a greater main risk factor than high attachment anxiety for the collectivist Turkish culture (Sümer & Kağıtçıbaşı, 2010). Different cultural, ecological, political, and socioeconomic contexts may foster different attachment styles as functional characteristics; and even if the attachment styles are universal, the underlying regulation mechanisms could be different (Schmitt et al., 2004). For example, numerous studies have shown that in several African and South Asian cultures, where the environment is high in pathogens, stress and mortality rates, dismissing attachment style and short-term mating strategies are more prevalent and normative, because they are more adaptive in adjusting the organism to the insecurities present in the environment; moreover collectivistic cultures are also shown to foster preoccupied attachment as a functional form of romantic involvement, because the cultural norms value relatedness and enmeshedness (see Schmitt, 2010 for a review). The same cultural functionality pattern could be true for exploration and related cognitive functioning. For example, in more individualistic cultures, attachment avoidance could be associated with higher exploration and hence not pose a risk factor for cognitive development. On the other hand, in highly relational contexts, a certain amount of relatedness is necessary for the individual to be able to explore the environment. So, high attachment avoidance could pose a risk factor in these societies where a relational context is prevalent. Future studies could investigate this possible cultural difference.

Friedman et al. (2010) have also documented that attachment avoidance poses a greater risk factor for heightened relationship conflict, less perceived relationship support and investment, and poorer relationship satisfaction in collectivist cultures, as opposed to individualist cultures. Attachment anxiety, however is not associated with any relationship problems, possibly due to the fact that attachment anxiety demands closeness, which fits better in collectivist cultures. The results of the current study builds on these findings of the previous work by suggesting that attachment avoidance could also be a risk factor for decreased cognitive attentional performance in a sample from a collectivistic and relational culture (see Sümer & Kağıtçıbaşı, 2010).

Although attachment anxiety did not have a main effect, its interactions with certain experimental conditions were predictive of cognitive performance, which suggests that attachment anxiety does not pose a risk factor of poor cognitive functioning on its own, but it makes people vulnerable only under certain circumstances of attachment system activation. The results showed that participants with higher levels attachment anxiety performed worse on the cognitive tasks even when they were primed with a neutral word. This finding suggests that attachment anxiety causes a chronic preoccupation with attachment related threats and this fixation depletes cognitive resources, causing poorer functioning, even when there is no real threat in the environment. This result is consistent with the previous findings which indicated that anxiously attached people possess a chronic, dysfunctional activation of the attachment system -

characterized with a hypervigilance to attachment related concepts even under conditions of no threat (Dewitte et al., 2007, 2008; Mikulincer et al., 2000, 2002), and a hypervigilance with respect to threat-related cues and mental rumination on distress-related material (Mikulincer & Florian, 1998). The results of the present study build on these findings in showing that this chronic hyperactivation of the attachment system interferes with higher order cognitive processes and depletes the cognitive resources with attachment- related worries, leaving the subject weak on the face of subsequent cognitive demands.

Attachment anxiety was also associated with diminished cognitive performance when paired with attachment figure exposure. Confirming the findings of the categorical analyses, this result suggests that being reminded of their inconsistent attachment figures, with whom they have been chronically preoccupied with, depletes the cognitive resources of individuals of high attachment anxiety and causes them to perform poorly on subsequent attentional tasks (see section 4.2.1). 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 they withdraw from information search when they think it competes with social contacts. Being exposed to the names of their attachment figures may have produced a similar result for the anxious participants of the

present study as well, they may have deactivate their exploratory system in favor of social contact and hence performed worse on the subsequent cognitive tasks.

Finally, attachment anxiety was also associated with diminished cognitive performance when paired with attachment-related threat and attachment figure name exposure. Confirming the findings of the categorical analyses, this result suggests that the cognitive performance of participants with high attachment anxiety declines even further when their fixation on the chronically inconsistent attachment figures is paired with the presence of a real threat in the environment (see section 4.2.1). Conceivably, people with high attachment anxiety can handle only attachment-related stress or only the presence of their attachment figures, with whom they are chronically preoccupied with, to a certain level; but they find the combination of these two stressors unbearable and their cognitive functions decline in the face of this overload. These results suggest that attachment anxiety is not a default risk factor for cognitive performance, but it is problem only under some circumstances, where the attachment system is activated via attachment-related threats and chronically inconsistent attachment figures' availability.

4.3 Limitations of the Study and Suggestions for Future Studies

The limitations of the current study should be considered in interpreting the reported findings above. The first limitation of this study stems from sample selection. As mentioned in the Chapter 2, the participants of the current study were recruited via convenience sampling and they are exclusively university

students; hence the sample is neither random nor representative in terms of many important demographic characteristics such as age, education, income, etc. Moreover, even if no gender-related differences were found in any of the study variables throughout the analyses, the fact that the overwhelming majority of the sample consisted of female participants should be considered as a limitation of the sample. Therefore the findings of this study should be replicated with more representative and randomly selected samples for purposes of external validity and generalizability.

Furthermore, the current study has considerable limitations that arise from its methodology. Although subliminal priming and response time measurements have been shown to be quite effective instruments for implicit assessment; they remain vulnerable to methodological errors that stem from the possible shortcomings of the technological equipments and computer programs, such as the refresh rates of computer screens or the sensitivity of reaction time recordings. In this particular study, unfortunately there wasn't any opportunity to check whether the primes where indeed presented for the exact amount of milliseconds specified, or whether the participant's recorded reaction times were indeed the exact amount of time it took them to respond. Therefore it is vital that the results of this study are replicated by future studies employing more advanced soft and hardware equipment. In addition, even if further analyses showed that it did not cause any significant differences in the results, the fact that a handsome number of participants were able to correctly identify the

subliminal primes could be considered as a shortcoming of the study. Future studies could use longer masks to avoid this interference. Moreover, one can argue that the threat and attachment figure availability contexts were rather mildly constructed via the mere exposure of words. In addition, more sophisticated measures of attention and other executive functions could be employed by future studies for better assessment of cognitive performance.

Finally, 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. Future studies recruiting Turkish samples should also aim at replicating the culturally relevant findings of this study, especially pertaining to the possible negative effects of attachment avoidance.

4.4 Contributions and Implications of the Study

As reviewed in Chapter 1, there exists a vast literature on the mechanisms of attachment system activation and its consequences on various cognitive phenomena pertaining to attachment-related information, such as attachment figure recognition; memory, attention, and thought suppression about attachment themes. However, to the best of the author's knowledge, no studies have yet linked the attachment system activation and cognitive performance on attachment-unrelated attention tasks. The humble aim of this study was to take a first step in depicting any possible attachment style related differences in cognitive performance as a function of being subliminally exposed to

attachment-related threats and attachment figures as distractors. Moreover, the design of this study was planned in a hope to offer the benefit of investigating the joint effect of attachment system activation and attachment figure availability, hence providing a close replication of the real attachment situations. In addition, with the employment of two distinct cognitive attentional tasks - one selective attention and the other dominant response suppression, it was intended to offer a fairly comprehensive assessment of cognitive performance. While the signal detection task evaluates the basic executive functions, the Stroop task is an inhibition task assessing the higher order frontal cortex functions of the brain; so these two tasks provide two distinct perspectives of cognitive functioning, and the fact that the major findings of the present study is replicated in both of these tasks provides a strong evidence for the presence of the depicted effects of attachment style and attachment system activation on cognitive performance. The fact that this study utilized both self report and experimental methodologies could also be considered as a point of strength, with the opportunity to infer causality in the obtained findings. The sample size of the study is quite larger compared to most experimental studies, which offers greater effect sizes and higher reliability of the results. Finally, the procedure of this study was designed such a way that the self report measures were collected in a separate session one week before the experimental sessions, which helped solve the previous problem of attachment style measures and attachment-related primes interfering with each others' effects (Mikulincer et al., 2002).

The present study could also bear some notable implications. One such implication takes its roots from the concept of "broaden-and-build" cycle of attachment security by Mikulincer and Shaver (2003). This concept follows the footsteps of Fredrickson's (2001) Broaden-and-Build Theory of Positive Emotions, which suggests that positive emotions, such as enjoyment, happiness, and joy, broaden one's awareness and encourage novel, varied, and exploratory thoughts and actions; and over time this broadened behavioral repertoire builds skills and resources. Mikulincer and Shaver's (2003) "broaden-and-build" cycle of attachment security follows a similar reasoning and argues that attachment security enhances a person's resources for maintaining coping flexibility and emotional stability in times of stress and broadens the person's perspectives and capacities, maximizes personal adjustment and development, and optimizes human functioning.

Attachment theory (Bowlby, 1973, 1980, 1982/1969) argues that attachment security fosters as a result of long and intricate interactions with constantly available and responsive attachment figures, yet contemporary research has shown that temporarily activating the mental representations of attachment security themes (via words, pictures, or scenarios), namely "security priming", can make attachment figures symbolically available, and hence augment a person's sense of felt security, and thus can set in motion the "broaden-and-build" cycle of secure attachment (see Gillath, Selcuk, & Shaver, 2008 for a review). These studies which primed participants with secure

attachment has indicated that security priming can generate empathetic responses (Mikulincer et al., 2001), more positive attitudes toward novel stimuli (Mikulincer, Hirschberger, Nachmias, & Gillath, 2001), less negative evaluative reactions toward out-group members (Mikulincer & Shaver, 2001); can promote mental health, prosocial values, and inter-group tolerance (Mikulincer & Shaver, 2007b), compassion and altruism (Mikulincer, Shaver, Gillath, & Nitzberg, 2005), self-transcendence values (Mikulincer et al., 2003), creative problem solving (Mikulincer, Shaver, & Rom, 2011), and authenticity and honesty (Gillath, Sesko, Shaver, & Chun, 2010). The effects of these security priming studies were recorded to be rather short-lived; yet other studies have been able to record more long-tem results. For example, Carnelley and Rowe (2007) has shown that repetitive priming of attachment security leads to more positive relationship expectations, more positive self-views, higher felt-security, and less attachment anxiety even 10 days after the priming. Gillath and Shaver have also shown that repeated subliminal security priming has beneficial effects on mood, and on the functioning of caregiving and exploration systems, even one week after the priming sessions (as cited in Gillath et al., 2008, p. 1658).

Building on these finding, the results of the current study also point to the protective functioning of attachment security by showing that attachment security protects cognitive resources and aids in enhanced cognitive attentional performance even under conditions of attachment-related threat and attachment figure unavailability; whereas attachment insecurity is associated with declined

performance under specific conditions of attachment system activation. These results provide further evidence for implementing the aforementioned studies on security priming and suggest that such attachment security induction can also protect insecurely attached individuals' cognitive performance even under conditions of attachment-related threat and attachment figure unavailability. Such implementations could obviously benefit counseling and clinical psychology and be utilized in therapy settings (Mikulincer & Shaver, 2009). In a similar vein, the results of this study could also have implications on predicting and enhancing academic performance in learning settings, and work performance in organizational settings.

The immense literature in attachment theory research has already associated different attachment styles with various aspects of human life, such as relationship quality (Hazan & Shaver, 1987), mental health and coping with stress (Mikulincer, Florian, & Weller, 1993), cognitive openness and curiosity (Mikulincer, 1997), information processing (Vermigli & Toni, 2004), self appraisals (Mikulincer, 1995), and death anxiety (Mikulincer, Florian, Birnbaum, & Malishkevich, 2002). This thesis humbly aimed at relating attachment style and attachment system activation to another very crucial human quality, cognitive performance; and it is hoped to provide some new insights to the matter.

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APPENDIX A

The Questionnaire Package

Gönüllü Katılım ve Bilgilendirme Formu

Sayın katılımcı,

Bu araştırma Orta Doğu Teknik Üniversitesi, Psikoloji Bölümü, Sosyal Psikoloji yüksek lisans programına bağlı olarak Prof. Dr. Nebi Sümer'in danışmanlığında yürütülen, Ezgi Sakman'ın yüksek lisans tez çalışmasıdır. Bu çalışma iki bölümden oluşmaktadır. İlk bölümde yakın ilişkilere ilişkin tutum ve davranışlar ele alınmakta, ikinci çalışmada ise deneysel bir ortamda dikkat ele alınmakta ve ilk çalışmayla ilişkisi incelenmektedir. Bu anketteki sorulara vereceğiniz yanıtlar son derece önemli olduğundan, lütfen her soruyu dikkatle okuyup sizi en iyi yansıtan cevabı anket içindeki yönergeleri dikkate alarak veriniz. Ankette yer alan soruların doğru veya yanlış cevabı yoktur ve sizden kimliğinizle ilgili hiçbir bilgi istenmemektedir. Vereceğiniz bilgiler kimlik bilgileriniz alınmadan tamamıyla gizli tutularak, yalnızca araştırmacılar tarafından, grup düzeyinde değerlendirilecektir. Çalışmadan elde edilecek sonuçlar sadece bilimsel amaçlı olarak kullanılacaktır. Ankete katılım tamamen gönüllülük esasına dayanmaktadır. Çalışmada sizi rahatsız eden herhangi bir soruyla karşılaşırsanız ya da ankete devam etmek istemezseniz bu durumda anketi yarıda bırakabilirsiniz. Veri toplama ve analiz sürecinin sonunda elde edilen bulgularla ilgili tüm sorularınız cevaplandırılacaktır.

Yardımlarınız ve katılımınız için teşekkür ederiz.

Çalışma hakkında daha fazla bilgi almak için; Sosyal Psikoloji yüksek lisans öğrencilerinden Ezgi Sakman (Tel: 0536 349 12 86; E-posta: esakman1986@yahoo.com) ile iletişim kurabilirsiniz.

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Verdiğim bilgilerin bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum. (Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

Tarih	Ad-Soyad	Araştırmacının imzası
----/----/-----	İmza	

DEMOGRAFİK BİLGİ FORMU

Yaşınız: ____

Cinsiyetiniz: __Erkek __ Kadın

Okumakta olduğunuz Üniversite: _____
Bölüm: _____
Kaçıncı sınıftasınız? _____

Üniversiteye başlayana kadar yaşamınızın en uzun süresini geçirdiğiniz yeri işaretleyiniz:
__Büyükşehir __İl __İlçe __Kasaba

Ailenizin gelir düzeyi: __Yüksek __Orta __Düşük

Lütfen aşağıdaki cümleleri aklınıza ilk gelen kişinin <u>adını</u> yazarak doldurunuz. Söz konusu kişiyle olan yakınlığınızı (anne, baba, sevgili, arkadaş, vb.) ise parantez içinde belirtiniz.

1. Birlikte vakit geçirmekten en çok hoşlandığım kişi
   …….dir.

2. Ayrı kalmaktan hiç hoşlanmadığım kişi
   …….dir.

3. Kendimi üzgün veya kötü hissettiğimde yanında olmayı en çok isteyeceğim kişi
   …….dir.

4. Tavsiyelerine en çok güvendiğim kişi
   …….dir.

5. Başarılı olduğum bir konuyu ilk paylaşmak isteyeceğim kişi
   …….dir.

6. Her zaman güvendiğim kişi
   …….dir.

Aşağıdaki maddeler romantik ilişkilerinizde hissettiğiniz duygularla ilintilidir. Bu araştırmada sizin ilişkinizde yalnızca şu anda değil genel olarak neler olduğuyla ya da neler yaşadığınızla ilgilenmekteyiz. Maddelerde sözü geçen "birlikte olduğum kişi" ifadesi ile romantik ilişkide bulunduğunuz kişi kastedilmektedir. Eğer halihazırda bir romantik ilişki içerisinde değilseniz, aşağıdaki maddeleri bir ilişki içinde olduğunuzu varsayarak cevaplandırınız. Lütfen her bir maddenin ilişkilerinizdeki duygu ve düşüncelerinizi ne oranda yansıttığını karşılarındaki 7 aralıklı ölçek üzerinde, ilgili rakam üzerine çarpı (X) koyarak gösteriniz.

1----------2----------3----------4----------5----------6----------7

Hiç katılmıyorum — Kararsızım/ fikrim yok — Tamamen katılıyorum

1. Gerçekte ne hissettiğimi birlikte olduğum kişiye göstermemeyi tercih ederim	1	2	3	4	5	6	7
2. Terk edilmekten korkarım	1	2	3	4	5	6	7
3. Romantik ilişkide olduğum kişilere yakın olmak konusunda çok rahatımdır	1	2	3	4	5	6	7
4. İlişkilerim konusunda çok kaygılıyım	1	2	3	4	5	6	7
5. Birlikte olduğum kişi bana yakınlaşmaya başlar başlamaz kendimi geri çekiyorum	1	2	3	4	5	6	7
6. Romantik ilişkide olduğum kişilerin beni, benim onları umursadığım kadar umursamayacaklarından endişelenirim	1	2	3	4	5	6	7
7. Romantik ilişkide olduğum kişi çok yakın olmak istediğinde rahatsızlık duyarım	1	2	3	4	5	6	7
8. Birlikte olduğum kişiyi kaybedeceğim diye çok kaygılanırım	1	2	3	4	5	6	7
9. Birlikte olduğum kişilere açılma konusunda kendimi rahat hissetmem	1	2	3	4	5	6	7
10. Genellikle, birlikte olduğum kişinin benim için hissettiklerinin, benim onun için hissettiklerim kadar güçlü olmasını arzu ederim	1	2	3	4	5	6	7
11. Birlikte olduğum kişiye yakın olmak isterim, ama sürekli kendimi geri çekerim	1	2	3	4	5	6	7
12. Genellikle birlikte olduğum kişiyle tamamen bütünleşmek isterim ve bu bazen onları korkutup benden uzaklaştırır	1	2	3	4	5	6	7
13. Birlikte olduğum kişilerin benimle çok yakınlaşması beni gerginleştirir	1	2	3	4	5	6	7
14. Yalnız kalmaktan endişelenirim	1	2	3	4	5	6	7
15. Özel duygu ve düşüncelerimi birlikte olduğum kişiyle paylaşmak konusunda oldukça rahatımdır	1	2	3	4	5	6	7
16. Çok yakın olma arzum bazen insanları korkutup uzaklaştırır	1	2	3	4	5	6	7

1----------2----------3----------4----------5----------6----------7

Hiç katılmıyorum — Kararsızım/ fikrim yok — Tamamen katılıyorum

17. Birlikte olduğum kişiyle çok yakınlaşmaktan kaçınmaya çalışırım	1	2	3	4	5	6	7
18. Gerçekte ne hissettiğimi birlikte olduğum kişiye göstermemeyi tercih ederim	1	2	3	4	5	6	7
19. Terk edilmekten korkarım	1	2	3	4	5	6	7
20. Romantik ilişkide olduğum kişilere yakın olmak konusunda çok rahatımdır	1	2	3	4	5	6	7
21. İlişkilerim konusunda çok kaygılıyım	1	2	3	4	5	6	7
22. Birlikte olduğum kişi bana yakınlaşmaya başlar başlamaz kendimi geri çekiyorum	1	2	3	4	5	6	7
23. Romantik ilişkide olduğum kişilerin beni, benim onları umursadığım kadar umursamayacaklarından endişelenirim	1	2	3	4	5	6	7
24. Romantik ilişkide olduğum kişi çok yakın olmak istediğinde rahatsızlık duyarım	1	2	3	4	5	6	7
25. Birlikte olduğum kişiyi kaybedeceğim diye çok kaygılanırım	1	2	3	4	5	6	7
26. Birlikte olduğum kişilere açılma konusunda kendimi rahat hissetmem	1	2	3	4	5	6	7
27. Genellikle, birlikte olduğum kişinin benim için hissettiklerinin, benim onun için hissettiklerim kadar güçlü olmasını arzu ederim	1	2	3	4	5	6	7
28. Birlikte olduğum kişiye yakın olmak isterim, ama sürekli kendimi geri çekerim	1	2	3	4	5	6	7
29. Genellikle birlikte olduğum kişiyle tamamen bütünleşmek isterim ve bu bazen onları korkutup benden uzaklaştırır	1	2	3	4	5	6	7
30. Birlikte olduğum kişilerin benimle çok yakınlaşması beni gerginleştirir	1	2	3	4	5	6	7
31. Yalnız kalmaktan endişelenirim	1	2	3	4	5	6	7
32. Özel duygu ve düşüncelerimi birlikte olduğum kişiyle paylaşmak konusunda oldukça rahatımdır	1	2	3	4	5	6	7
33. Çok yakın olma arzum bazen insanları korkutup uzaklaştırır	1	2	3	4	5	6	7
34. Birlikte olduğum kişiyle çok yakınlaşmaktan kaçınmaya çalışırım	1	2	3	4	5	6	7

Aşağıda bir isim listesi verilmiştir. Lütfen bu listede <u>şahsen tanığınız kişilerin</u> (ünlü kişiler ya da medyada tanınan vb. isimler dışındaki) isimlerinin yanına bir çarpı (X) işareti koyunuz.

Abdullah	
Ahmet	
Ali	
Alper	
Asiye	
Aslı	
Arda	
Arzu	
Ayça	
Ayşe	
Bahadır	
Bahar	
Barış	
Barlas	
Başak	
Batu	
Begüm	
Berk	
Bumin	
Burak	
Burcu	
Bülent	
Büşra	
Can	
Cansu	
Cem	
Ceren	
Ceyla	
Cihan	
Deniz	
Duygu	
Ece	
Eda	
Efe	
Elcin	
Elif	
Emine	

Emirhan	
Emre	
Eray	
Esra	
Ezgi	
Fatih	
Fatma	
Fevzi	
Feyza	
Furkan	
Gencer	
Giray	
Gizem	
Gönenç	
Gözde	
Güner	
Güngör	
Gürel	
Hasan	
Hanife	
Hatice	
Hüseyin	
İbrahim	
İpek	
İrem	
İsmail	
Kaan	
Kemal	
Kerem	
Levent	
Leyla	
Mehmet	
Melda	
Melike	
Melis	
Mert	
Merve	

Murat	
Mustafa	
Müge	
Naime	
Nazlı	
Nedim	
Nesibe	
Onur	
Orçun	
Osman	
Ozan	
Ömer	
Özlem	
Öztunç	
Pelin	
Pınar	
Refik	
Saffet	
Sefa	
Selin	
Semih	
Songül	
Şerife	
Tolga	
Tuğba	
Tuğçe	
Uğur	
Volkan	
Yağız	
Yağmur	
Yiğit	
Yusuf	
Zehra	
Zeliha	
Zeynep	
Zülal	

APPENDIX B

Awareness Check for Subliminal Priming

Değerli Katılımcı,

Deneye katıldığınız için çok teşekkür ederiz. İleride bu deneyi daha iyi planlayabilmek için aşağıdaki soruları kısaca cevaplarsanız çok seviniriz.

1. Bu deneyde verilen yönergeler ve görevler kolay anlaşılıyor mu?

   Evet □ Hayır □

   Eğer cevabınız Hayır ise hangi aşamalarda zorlandınız? Lütfen kısaca yazınız.

2. Daha önce benzer bir deneye katıldınız mı?

   Evet □ Hayır □

3. Sizce burada yapılan testlerin zorluk derecesi nedir?

   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5 ---------- 6 ---------- 7

Hiç zor değildi	Ne zor ne de kolaydı	Çok zordu

4. Deney sırasında ekranda X harfi serileri ve renk isimleri dışında herhangi bir sözcük ya da işaret gördünüz mü?

   Evet □ Hayır □

   Eğer cevabınız Evet ise lütfen gördüğünüz sözcük ya da işaretleri aşağı yazınız.

5. Eğer deney ile ilgili başka görüşleriniz varsa lütfen aşağı yazınız.

APPENDIX C

Summary Tables for ANCOVA

Table 1. ANCOVA for Sensitivity in Signal Detection Tasks *(d')*

Source	Sum of Squares	df	Mean Square	F
Between				
Attachment Style	2.65	3	.88	2.12†
Prime Word	.01	1	.01	.03
Prime Name	.02	1	.02	.04
Attachment Style*Prime Word	.60	3	.20	.48
Attachment Style*Prime Name	.39	3	.13	.31
Prime Word*Prime Name	.03	1	.03	.08
Attachment Style*Prime Word*Prime Name	6.67	3	2.22	5.34***
Within	86.61	208	.42	
Total	979.41	225		

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

Table 2. ANCOVA for Reaction Time in All Signal Detection Tasks

Source	Sum of Squares	df	Mean Square	F
Between				
Attachment Style	150,091.21	3	50,030.40	1.57
Prime Word	23,860.03	1	23,860.03	.75
Prime Name	536.56	1	536.56	.02
Attachment Style*Prime Word	63,286.84	3	21,095.61	.66
Attachment Style*Prime Name	29,951.06	3	9,983.69	.31
Prime Word*Prime Name	49.35	1	49.35	.00
Attachment Style*Prime Word*Prime Name	52,333.79	3	17,444.60	.55
Within	6,659,428.04	209	31,863.29	
Total	82,348,749.22	225		

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

Table 3. ANCOVA for Reaction Time in Congruent Trials of the Stroop Task

Source	Sum of Squares	df	Mean Square	F
Between				
Attachment Style	86,348.77	3	28,782.92	.87
Prime Word	4,371.48	1	4,371.48	.13
Prime Name	6,776.19	1	6,776.19	.20
Attachment Style*Prime Word	58,334.54	3	19,444.85	.58
Attachment Style*Prime Name	333,705.43	3	111,235.14	3.34*
Prime Word*Prime Name	2,956.28	1	2,956.28	.09
Attachment Style*Prime Word*Prime Name	42,839.25	3	14,279.75	.43
Within	6,952,263.40	209	33,264.42	
Total	199,617,193.64	225		

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$