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THE IMPACT OF ATTACHMENT ACTIVATION ON MEMORY IN WOMEN

By

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ABSTRACT

THE IMPACT OF ATTACHMENT ACTIVATION ON MEMORY IN WOMEN

By

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Priming associate cognitive networks and level of anxiety were examined as mechanisms underlying the impact of attachment activation on word list recall. A block random experiment was conducted with 323 female undergraduate students (mean age 20 years) with two independent factors: level of anxious attachment (high or low) and memory task outcomes after engaging in one of four conditions (Attachment-Death Story, Spider Story, Attachment-Embedded Story, and Neutral Story). It was hypothesized that different cognitive associative networks could be activated by using relevant primes, and that this would be seen via differential processing of word types in a recall task. Another hypothesis was that exposing persons with high vigilance to a specific domain/network to an intense activation of that domain would result in anxiety strong enough to disrupt memory processing. It was also posited that previous patterns of word recall found in the literature would be replicated or extended. Results did not support these hypotheses. Another postulation was that an overt and intense method of activating the attachment network would decrease memory performance for women when compared a covert and non-intense activation method. While a trend was noted in support of this hypothesis, the result was not significant. The implications of these findings are discussed.

Dedicated to my partner, Holly Oppenheimer, whose support, encouragement, and love sustained me throughout my graduate studies.

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INTRODUCTION

Attachment theory has generally been utilized by researchers examining relational and emotional responses. It has only been in recent years that interest has grown in the explanatory power of attachment theory as it interacts with cognitive processes. This area of research has mainly focused on those mental processes such as attention, reaction time (speed of processing), and memory (both episodic and semantic). A notable attribute of these studies is the utilization of cognitive theory (i.e., associative networks), to examine the influence of attachment on cognition. The theory of associative networks is based on the concept of a semantic mental network where associated ideas or concepts are linked together. When the network is primed or activated (by a word or phrase associated with the network), a spreading activation throughout the network occurs, and related components of that network are thought to be processed more quickly and efficiently (Solso, 1998). This concept has been applied to attachment as well, with exposure to relevant words, phrases, or other material priming an "attachment associative network." A variety of paradigms have been used to activate the attachment system, such as subliminal priming (Maier et al., 2004; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; Mikulincer, Gillath, & Shaver, 2002), overt priming with attachment-relevant sentences (Poole, 1998), writing about an attachment relationship (Rowe & Carnelley, 2003), conditioned pairing of rejection/acceptance with tones (Baldwin & Kay, 2003; Baldwin & Meunier, 1999), and reading attachment-relevant vignettes (Pereg & Mikulincer, 2004). Unfortunately, such paradigms are not consistent in format or application and researchers have not employed them to answer the

questions of 1) are core attachment elements specifically being activated, as predicted by theory, versus a general anxiety response? and 2) during attachment activation, how is the emotional aspect of attachment varying in intensity, and thus altering the cognitive outcome?

Theories of anxiety predict a cycle of physiological arousal and emotion that impacts cognitive processing (Eysenck, 1982; Eysenck, 1985; and Spence & Spence, 1966). Attachment theory is specific to intimate protective relationships, and also predicts an anxious response, one that may be expected to impact cognition, as well. The two theories do not contradict one another, but Eysenck's theory of anxiety is much broader and refers to physiological arousal generated by a wide variety of threats and negative anticipatory thoughts. The current literature on attachment and cognition has failed to examine the emotional response so important to attachment theory. One example of the importance of considering the emotional response (conceived of as an attachment-specific anxiety) concurrent with attachment activation is found in the literature on anxiety. It is a well-established fact that very high levels of anxiety consume cognitive resources, thus negatively impacting cognitive functioning (Eysenck, 1982). Research in attachment has found that different attachment groups respond with varying levels of psychological anxiety and cortisol secretion (Goldberg, 1995) in response to having the attachment system activated. Those persons who are anxiously attached may reach such high levels of anxiety when the attachment system is *intensely* activated. This is predicted to result in impaired cognitive processing of demanding tasks. This study thus attempts to refine the theoretical predictive power of attachment in cognitive studies.

Attachment

Bowlby identified attachment as a protective system developed in infancy as a survival mechanism (Ainsworth, Blehar, Waters, & Wall, 1978, and Bowlby, 1969, 1973, 1980). It is a dually informed system, with both infant and caregiver acting and reacting within the relationship, that revolves around the caregiver-infant bond in times of stress or threat (Ainsworth et al., 1978; George & Solomon, 1999; Goldberg, 1995). This perceived threat begins a cycle (or activation of the attachment system) whereby the child seeks contact with a primary caregiver or expresses distress, and a timely, sensitive response from the caregiver soothes the child (Ainsworth et al., 1978; Goldberg, 1995). Such comfort affirms for the child the sensitivity of the caregiver to such expressed needs, and a feeling of safety is therefore associated with proximity to this caregiver. It follows that the attachment behaviors of the child are no longer necessary when an appropriate response is provided; the attachment system shuts down, or deactivates, and the child's behavior and physiological arousal returns to a normal state (Fox & Card, 1999; Hofer, 1995).

Researchers have identified some typical patterns of response to the attachment system being activated. The optimal, or secure, response develops from caregiving interactions whereby the infant learns that his or her attachment bids will be met by a caregiver who is available and responsive in an appropriate and timely manner (Ainsworth et al., 1978; Goldberg, 1995). They engage in exploration in the mother's presence, maintain proximity checks, and show a variety of distress responses upon her leaving, yet her return allows these children to calm down relatively quickly and deactivate the attachment system.

Nonoptimal patterns of responding have been identified as well over the last three decades of attachment research. One of these patterns, the anxious-insecure style, develops in response to caregiving that is unpredictable, and at times, inappropriate (Ainsworth et al., 1978; Goldberg, 1995). Those in the anxious-insecure category tend to cling to the mother, avoiding exploration, and show great distress when the mother leaves and returns. Upon reunion, these children may show both angry and contact seeking behavior, and will take much longer to be comforted than secure children (Ainsworth et al., 1978; George & Solomon, 1999; Goldberg, 1995). Different terms have been used for such patterns of attachment responses, and the terms used for childhood have adult equivalents. This pattern has commonly been called ambivalent/resistant or anxious-ambivalent for infants and children, and anxious, preoccupied, or ambivalent for adults. Here it will be referred to as anxious attachment.

The attachment system is thought to extend into adulthood, functioning in a similar way as in childhood, but with some important differences. Attachment researchers have identified several criteria that differentiate adult attachment relationships from other social relationships: seeking contact with the attachment figure when contending with stress; decreased anxiety through use of the attachment figure as a haven of safety (either through contact or by use of mental representation); a substantial increase in anxiety and searching behavior if threatened by separation from the attachment figure; expectations that the relationship will last over time; and a reciprocity appropriate to adult relationships, based on a mutual sharing of comfort and protection (George et al., 1999; West, Sheldon, & Reiffer, 1987). Feeney (1999) described the events that

arouse the adult attachment system: "stressful conditions in the social or physical environment; conditions that appear to threaten the future of the attachment relationship; and conditions of the individual, such as ill health" (Feeney, 1999: p.371).

Secure adults give evidence of valuing attachment relationships while being able to appropriately resolve or down-regulate the attachment system (for example, seeking proximity to an attachment figure during a time of stress). Anxiously attached adults may present as angry, passive, or fearful in the face of an activated attachment system. Narrative research interviews reveal that while secure adults are coherent and consistent in discussing attachment relationships, the interviews of anxiously attached adults contain long, rambling sentences with repeated or excessive detail.

Relevant to the area of research on attachment and cognition is the concept of internal working models. Internal working models are mental representations of self and attachment figures that develop during childhood. Such representations of self may include a sense of being valued and deserving, as well as secure and confident in the attachment figure's responsivity. Representations of the attachment figure include the level of availability, responsiveness, and sensitivity regarding attachment needs (Bowlby, 1973). Bretherton and Munholland (1999) described internal working models as "a multiply connected schema network" (p. 98) in which repeated specific attachment-relevant incidents (e.g., "mom came home from work and comforted me when I hurt myself") inform the development of overall meaning constructs ("Mom makes herself available when I need her"). Such an information-

processing network provides a framework for understanding how attachment functions, especially in adults.

Theories of Anxiety and Cognition

Prior research has shown a curvilinear relationship between anxiety and resulting cognitive performance, with moderate anxiety producing increased effort on mental tasks (Spence & Spence, 1966), and higher levels of anxiety showing decrease in cognitive performance (Eysenck, 1982). Known as the Yerkes-Dodson theory, this indicates that arousal related to anxiety assists mental efforts, while high levels lower performance (Eysenck, 1985). More recent research suggests the existence of a "threshold effect," whereby deficits in cognitive processing occur as anxiety reaches clinically significant levels (Waldstein et al., 1997).

Eysenck and Calvo's (1992) processing efficiency theory adds the prospect of limited mental processing resources, with performance on mental tasks thought to be impacted by availability of such resources. Additionally, anxiety is postulated to decrease cognitive capacity as resources are diverted to threat-vigilance. This explains the phenomena of high anxiety/low performance via the increased level of intrusive worry which is thought to accompany higher levels of anxiety. This intrusive worry is thought to overwhelm cognitive processing by increasing task demands of the moment, while cognitive resources remain the same. In Barlow's (2000) discussion of this phenomenon, he concurs, stating that "[a]t sufficient intensity, this process results in disruption of concentration and performance."

The extant literature appears to provide mixed evidence linking anxiety to cognitive performance. Yovel and Mineka (2004) reported failing to find a link between anxiety and attentional bias for negative information. These findings, however, provide some support for a threshold effect: studies which examine nonpsychiatric populations have found little impact of anxiety on cognitive functioning (Hoffman & al'Absi, 2003; Palav et al. 2000; and Waldstein et al. 1997), while clinical subjects with anxiety disorders often perform worse on neuropsychological measures than nonclinical controls (Dibartolo, Brown, & Barlow, 1997; Kizilbash, Vanderploeg, & Curtiss, 2002; and Livingston, Stark, Haak, & Jennings, 1996). However, exceptions have been noted as well, with clinical populations not always showing such a performance (Zalewski, Thompson, & Gottesman, 1994). One reason that significant differences have not been consistently found might be due to not controlling for gender, which has been linked to both levels of anxiety and differential performance in certain neuropsychological domains.

Gender is a notable factor in examining the effects of anxiety and cognitive testing. Women are more likely to be diagnosed with anxiety disorders than men, as well as showing significantly higher levels of anxiety on self-report measures (Barlow, 2000). Furthermore, gender effects in neuropsychological functioning have been found, with female subjects performing better on verbal memory and word fluency tasks (Orsini et al., 1982) and male subjects showing higher results on motor and visuospatial tasks (Buckelew & Hannay, 1986). In Martin and Franzen's (1989) nonclinical student sample, cognitive performance varied by gender, with males doing more poorly on memory and executive

functioning tasks with mild levels of anxiety and females improving or staying stable. These findings indicate the need to control for gender by cognitive domain in anxiety studies.

Using this knowledge of the impact of anxiety on cognition enhances our understanding of those studies that have endeavored to measure the effect of attachment on cognitive processes.

Impact of Attachment on Cognitive Processes

Over the past decade, a small body of research has been developed examining the impact of attachment styles on cognitive processes. Early reports in this area focused on a potential relationship between attachment and general intelligence. More recently, researchers have employed experimental methodology to test the effect of attachment on attention and memory; some studies have made use of overt or unconscious activation of attachment, while others have simply measured attachment styles without attempts at activation prior to the cognitive tests. Researchers using the priming paradigms are utilizing the concept of associative networks. Once a semantic or conceptual associative network is primed, a spreading activation throughout the network begins, and related items from that network should be processed more quickly and efficiently (Solso, 1998). In using the attachment system in this manner, the different attachment styles predict differential processing of attachment information. For example, anxious attachment is related to hypervigilance for rejection once the system is activated, and thus leads to a prediction that attachment primes will facilitate the processing of threatening attachment information. Other researchers in this area have either employed different

theoretical conceptualizations (such as cognitive schemas) or have examined a different cognitive process (such as memory). The extant research has been critically examined in the following sections, which are grouped by outcome variables or cognitive theory employed.

Attachment and Intelligence

Research on attachment and intelligence in children has provided inconsistent results. A meta-analysis by van IJzendoorn and colleagues (1995) reported a weak pooled effect size for attachment and various cognitive tests. However, 20 out of the 25 studies examined reported nonsignificant results. Indeed, the authors concluded "for all practical purposes the association between attachment and DQ/IQ is too weak to recommend the routine inclusion of IQ [Intelligence Quotient] or DQ [Developmental Quotient] tests in order to control for this type of cognitive difference" (p. 125).

Adult attachment and cognitive measures have been examined together mainly in the context of a potential confound in narrative measures, but have not shown a significant relationship between attachment and intelligence (Abraham et al. 1995, and Bakermans-Kranenberg et al. 1993).

The van IJzendoorn and colleagues' meta-analysis (1995) reported a salient result: a larger proportion of anxious/ambivalent individuals per study was related to increased effect size for the attachment-intelligence relationship. The authors explained this by noting that ambivalent children tend to be "upset in any strange environment and by any stranger who is trying to interact, for example, in the context of testing cognitive abilities." The clear implication here is that

activation of the attachment system is interfering with cognitive processing for ambivalent children. Since the attachment system is not always activated, this may be a transient effect, thus depressing IQ scores only due to state anxiety. However, this has never been tested. Regarding the adult research, adults have a higher threshold for activation of attachment; in the two studies cited previously, the AAI was given 2 and 3 months prior to cognitive testing (Bakermans-Kranenberg et al., 1993; Abraham et al., 1995). It may be that a different set of results would have been reported had the cognitive tests directly followed a task intense enough to activate the attachment system.

It is important to note here that IQ tests measure a range of cognitive processes, from crystallized semantic knowledge to higher-level visual abstraction, and of course encompassing such discrete processes as attention and working memory. However, when considering such a vast array of abilities, the theoretical basis tends to be less integrated, with the result that predictive power declines. The following sections examine more discrete processes and theories.

Attachment Priming and Reaction Time Studies

Measuring reaction time examines the ability to attend to information and the speed of mental processing during tasks. Common outcome measures in this research have been Stroop tests and lexical-decision making tasks. In these studies, researchers have employed either subliminal priming of attachment or conditioned pairing of attachment-relevant information with tones as ways to activate the attachment system.

Subliminal priming paradigms of threat versus neutral words have been used in two published articles covering several studies (Mikulincer et al., 2000; Mikulincer et al., 2002). Mikulincer et al. (2000) used a lexical decision making task in which a threat or a neutral word prime was subliminally presented directly before a word or nonword target (some of which were attachment-relevant). Subjects were instructed to quickly determine whether the targets were words or nonwords, with the outcome measure being their reaction time. The results suggested that secure subjects experience attachment system activation via threat primes (but not neutral primes) and tend to respond to this activation with associations to positive relationship traits, such as love and companionship. Additionally, subjects with high levels of anxious attachment were more likely to be hypervigilant with respect to threat cues or other signals that initiate attachment activation, and such vigilance regarding attachment appeared to be actively present even in non-threat conditions. These responses suggest that secure individuals may be differentiated from those who are anxiously attached via their expectations regarding attachment figures: the secure person expects to be comforted and protected, and the anxiously attached individual carries expectations of uncertainty or rejection. Mikulincer and colleagues (2002) employed a similar priming paradigm, but used a lexical decision task with five different kinds of names or nonwords as targets; and, in a separate analysis, substituted a Stroop task, but used the same target variables. Subjects were asked to rapidly judge whether these targets were words or nonwords. The results suggested that quicker accessibility to names of attachment figures was related to having high levels of anxious attachment, or when threat cues were

presented. Again, this is indicative of a link between anxious attachment and some degree of vigilancy for attachment information even in non-threat conditions.

What is problematic with these two studies is that threat primes are employed and the distinction is not discussed between activating a specific attachment associative network, as opposed to one composed of general threat. As will be seen, this is a major criticism of many of the studies in the literature. If one is not determining differences between the two networks, then questions are left unanswered as to whether one is activating general threat or attachment. This same criticism applies to the failure of Mikulincer et al. (2000) to use target words that are generally positive or negative in tone, but not specific to attachment. When the dependent variables are indistinguishable in terms of concept, it is difficult to determine whether broad negative and positive biases are being utilized or whether associative networks are indeed being activated.

Maier and colleagues (2004) also made use of a subliminal priming paradigm in their study. They used a neutral prime versus a maternal rejection prime ("my mom rejects me"). Their outcome measure was a series of self-evaluative sentences to which subjects were told to answer "yes" or "no" as quickly as possible. Two examples of the sentences used are "my mom loves me," and "I am lovable." This material was developed to encourage a bias towards positive responses and mean reaction times were recorded. Results showed secure subjects with significantly faster reactions to positive self-statements and self-efficacy in the maternal rejection priming condition, but not with the neutral prime. This finding is consistent with Mikulincer et al.'s (2000)

conclusion that attachment security is related to positive attachment expectations or beliefs in the face of threat. Maier and colleagues did not find significant results for the anxious-preoccupied dimension, explaining that the variance of the dimension may have been too low. However, theory predicts that anxious-preoccupied subjects have a high vigilance for negative attachment threats, thus faster reaction times for that material. Therefore, the attachment target content used by the authors may not have been negatively charged enough to see an effect.

Baldwin and his colleagues (Baldwin & Kay, 2003; Baldwin & Meunier, 1999) reported on the use of conditioning attachment-relevant material with tones as a priming paradigm. Baldwin and Kay (2003) conditioned specific tones to either social acceptance or social rejection, and presented the tones before a lexical decision task. Subjects were asked to rapidly determine whether the targets (including various words associated with either attachment or affect) were words or nonwords. Low levels of anxious attachment were related to slower reactions to rejection targets, when primed with either acceptance or rejection tones. It is possible that this outcome reflects an information-inhibition strategy used in the face of rejection cues by either securely or avoidantly attached individuals (those attachment styles that correspond to low levels of anxious attachment) in order to maintain positive expectations of attachment figures (secure) or to deactivate attachment (avoidant).

In an earlier study, Baldwin and Meunier (1999) asked subjects to identify and then visualize either an unconditionally accepting or conditionally accepting person known to them. This visualization was then paired with tones in a

conditioning exercise, and a lexical decision task similar to that used by Baldwin and Kay (2003) was employed, with the addition of word primes (success, failure, or neutral categories) before targets were presented. Higher levels of security meant that subjects were more likely to associate to positive expectations of attachment responses, with preoccupied attachment tending to predict vigilance for rejection. These findings provided evidence consistent with the previous research discussed, predicting differential expectations when attachment is aroused for secure versus anxiously attached individuals.

These two latter studies (Baldwin & Kay, 2003; and Baldwin & Meunier, 1999) provide more specific evidence for the predictive power of attachment theory in relation to cognition. This is due to employing attachment-relevant primes or outcome measures. However, since the same lab reported these results, it invites replication by others for confirmation.

Attachment as a Cognitive Schema

Some researchers using experimental methods to examine attachment and cognition have not relied explicitly on use of primes leading to a spreading activation within an associative network. Instead, mental representations associated with the attachment system, or internal working models, have been conceptualized as cognitive schemas that guide the mental processing of attachment-relevant information (Miller, 1999; van Emmichoven, van IJzendoorn, De Ruiter, & Brosschot, 2003). Thus, the processing of attachment words has been predicted to vary by attachment group or dimension, as regulated by internal working models. For example, a Stroop task was employed by van Emmichoven and colleagues (2003) in a study using both clinically anxious and

nonclinical control groups. The authors postulated that the Stroop task responses would slow when words were "associated with participants' concerns and thus distract[ing] them from their task" (p. 221), but that when material did not fit attachment working model expectancies, defensive exclusion of the information would occur. Target word groups in the Stroop task consisted of positive, neutral or threatening categories. A pattern emerged, with the secure-clinical and insecure-nonclinical groups processing threatening words more slowly, thus showing better schema processing, and quicker responses by the secure-nonclinical and insecure-clinical groups. These findings are supportive of an overall effect of anxiety on performance. Furthermore, quicker reaction times of the insecure-clinical group to this task can be explained by insecure deactivating strategies, while the faster reaction time speed of the secure-non-clinical may be explained by defensive exclusion of negative and threatening attachment material in the face of expecting positive information. In a separate memory task, van Emmichoven et al. (2003) found that insecure clinical subjects performed more poorly on recall of threat related words compared to secure subjects. This is in contrast to the previous research cited in the area, and may be due to the authors combining the (not comparable) groups of dismissing and anxious-preoccupied subjects for analyses. Unfortunately, the grouping of insecure versus secure may create a heterogeneous attachment group made up of members who react to attachment stimuli in widely varying ways, or, the grouping may be more heavily slated towards certain subclassifications. Avoidant subjects are more prevalent in the population, and are known for using such deactivating strategies, as opposed to anxiously attached subjects. Also,

as mentioned above, the use of general threats as targets does not allow the researchers to make claims based on cognitive schemas specific to attachment. Again, this brings into question whether broad negative schemas or affect are being tapped here.

Miller (1999) examined attachment and cognition, using the same framework of attachment as a cognitive schema. Using story recall, the author reported that both secure and fearful classifications were related to memory for negative friendship stories, with secure persons recalling friends' joint activities and fearful individuals remembering details of activities engaged in separately for the friends. (The fearful dimension is another insecure attachment construct, that while not equivalent to anxious-preoccupied attachment, it does provide relevant information pertaining to attachment-related anxiety.) The author concluded that attachment-schematic processing occurred despite nonactivation of the attachment system. An alternative explanation, however, is that these negative stories naturally elicited some activation of the attachment system due to the component of a relationship threat. Indeed, other researchers have found that merely presenting subjects with an attachment-relevant word (such as separation) provides enough activation of the attachment system to see differences in accessibility of names of attachment figures (Mikulincer et al., 2002) and recall of attachment-relevant words (Rowe & Carnelley, 2003).

In an unpublished dissertation, Poole (1998) also employed the concept of attachment as a cognitive schema and presented subjects with a recall task for sentences describing attachment-relevant and –irrelevant events. Poole reported "schema-consistent processing" for both high security (a significantly

higher recall of happy attachment sentence events), and fearful attachment (significantly lower recall for happy attachment events). Inconsistent with other studies, anxious-preoccupied attachment was significantly related to poor recall of high anxiety attachment events. Along with this inconsistency with other studies, the relationship between fearful subjects and poorer recall for happy events does not speak to a level of vigilance for negative or threatening attachment stimuli that is predicted by theory.

Attachment Priming and Memory

Studies employing memory outcomes also test the strength of associative networks with priming paradigms. The work in this area has shown that attachment style influences the ability to recall attachment-related information (Hahn, 1995; Pereg & Mikulincer, 2004; and Rowe & Carnelley, 2003).

Pereg and Mikulincer (2004) studied the effect of attachment style on recall of type of information. This study employed an affect-induction task where subjects were assigned to one of two conditions: reading an article about kites or reading an article about a car accident that led to a child's death. Although this task was used with the intention of examining the effects of a neutral versus a negative emotion induction, the nature of the latter article works as a device to activate the attachment system, and thus the study may be considered to have employed an overt priming paradigm. After the presentation of the article, subjects read several headlines (positive, neutral, or negative), which they were later asked to recall. Subjects with high levels of secure attachment recalled significantly more positive headlines and fewer negative headlines; the inverse was found for participants high in anxious attachment (lower recall of positive

headlines and higher recall of negative ones). Again, these results are consistent with research finding different expectations by secure and anxious groups when presented with attachment events. Pereg and Mikulincer also noted that the headlines were not specific to attachment, and that this study contributed the knowledge that attachment associations could impact memory processing of non-attachment information. However, such induction of negative emotion and the resulting outcomes may be due to higher levels of depression that have been noted in insecure attachment groups. Again, this brings to question whether a negative bias is the actual mechanism underlying the pattern of recall, or if it is attachment.

In a different study of attachment and memory, Rowe and Carnelley (2003) primed subjects with different attachment style schemas. These schemas represented actual relationships reported for subjects, but were not always congruent with subjects' overall or global attachment style. Subjects then engaged in a recall task for a word list which contained positive and negative attachment and non-attachment words. Participants primed with a secure schema showed significantly higher recall of positive attachment words, and those primed with an anxious attachment schema had significantly lower recall of both positive attachment and positive non-attachment words. The relationship previously seen between anxious attachment and a strong recall or association to negative attachment information did not appear here. One explanation for this could be based on the fact that the attachment schemas primed were not always the global attachment orientation for subjects.

An unpublished dissertation also reported findings on attachment and memory. Hahn (1995) investigated both actual childhood memories and word list recall. Using a priming paradigm with both positive and negative attachment words, Hahn employed two tasks: one measuring the speed of retrieval of both negative and positive memories of childhood and parents, and another requiring free recall of a word list describing positive, negative, and neutral relationships with mothers and fathers. Anxious-preoccupied attachment was significantly related to quicker recall of negative childhood and parental memories. Secure attachment was associated with both significantly higher recall of the positive maternal descriptors and lower recall of the negative maternal descriptors, when compared to the anxious-preoccupied group.

In sum, the limited research on attachment and cognitive processes provides relatively consistent results. Experiments on attachment and reaction times or mental processing speed have shown high levels of anxious attachment associated with quicker responses to attachment words after both threat and neutral primes (Mikulincer et al., 2000; Mikulincer et al., 2002) and rapid identification of rejection targets with dual primes of failure and conditional acceptance (Baldwin & Meunier, 1999), and low levels of anxious attachment related to slower reaction times to rejection targets when primed with acceptance or rejection contexts (Baldwin & Kay, 2003) and when primed dually with failure and unconditional acceptance (Baldwin & Meunier, 1999). Secure attachment has been found significantly related to rapid responses to positive attachment words when primed with a threat word (Mikulincer et al., 2000), faster reaction times to positive statements about the self and self-efficacy when primed with

maternal rejection (Maier et al., 2004), and quicker recognition of acceptance targets when dually primed with conditional acceptance and a success context (Baldwin & Meunier, 1999).

Studies examining attachment and memory have shown insecure and/or highly anxiously attached subjects with significantly better recall of negative headlines (Pereg & Mikulincer 2004), negative stories (Miller, 1999), negative memories of childhood and parents (Hahn, 1995), and negative attachment-related words (Rowe & Carnelley, 2003) when primed with negative affect, attachment schemas, attachment-relevant words, or negative friendship stories. Secure subjects have also been shown to have a better recall of happy attachment events (Poole, 1998), positive maternal descriptors from a word list (Hahn, 1995), and positive attachment words (Rowe & Carnelley, 2003). In addition, Hahn (1995) also found that secure individuals tend to have a significantly lower recall of negative maternal descriptors when compared to anxious-preoccupied persons. These findings suggest that secure and anxiously attached persons have different expectations when faced with attachment events or information. Secure persons appear to expect a positive and nurturing response from an attachment figure and anxiously attached individuals are either uncertain or expecting rejection. Anxiously attached persons may also experience a lower threshold for activation of the attachment system. Thus, there appears to be vulnerability for individuals with high levels of anxious attachment, due to these negative expectations. The literature on attachment also notes a link between anxiously attached individuals and varying degrees of anxiety and depression with the potential for clinical diagnoses (Dozier, Stovall, &

Albus, 1999). Therefore, this study focuses on this subgroup of attachment in order to better understand the mechanisms which may be a part of such vulnerability.

Synthesizing Predictions of Cognition and Emotion

Researchers employing cognitive paradigms with attachment are relying on theories of either associative networks or cognitive schemas to explain the underlying mechanisms. However, both research and theory support predictions that both cognition and emotion are significant aspects of the functioning of the attachment system. Here it is hypothesized that associative networks function clearly at low levels of attachment anxiety. That is, priming with attachment-relevant words will activate a mental network or schema devoted to the attachment system; this, in turn, allows subjects to process attachment-relevant material more quickly and deeply. However, it is also predicted that associative networks play a less straightforward role when very high levels of anxiety are reached. Two factors play into this: first, when the intensity of the attachment activation is increased; and secondly, when the level of anxious attachment predisposes a person to reach that threshold of anxiety much more quickly than those low in anxious attachment. When such an effect is achieved and high levels of anxiety are broached, it is predicted that cognitive resources are overloaded and processing of information will slow; also, that vigilance to all threat cues increases (as opposed to a domain specific vigilance for attachment-relevant threat). The literature also reveals relationships between subgroups of attachment and the tendency to process attachment content differently when attachment is activated. For example, anxiously attached individuals tend to

show an increase in vigilance for negative attachment information, resulting in more efficient processing of and memory for such stimuli. This is not to say that anxious attachment increases cognitive capacity overall, but that mental resources appear to be concentrated on particular subsets of information within the environment.

A variety of methods have been used to prime or activate attachment in order to measure cognitive outcomes. These range from subliminal priming to extended immersion in attachment related narratives (Mikulincer et al., 2000; Mikulincer, Gillath et al., 2001; Mikulincer, Gillath, & Shaver, 2002; Mikulincer, Hirschberger, Nachmias, & Gillath, 2001; Pereg & Mikulincer, 2004). While these studies have uncovered, for example, that activation of attachment impacts the cognitive processing of differently valenced emotional content (Pereg & Mikulincer, 2004), they have not differentiated whether they were activating attachment-relevant anxiety, another specific anxiety, or broad negative affect.

Another relevant concern in making claims regarding discriminant validity is a choice of dependent variables which further affirm that the concept of attachment is being tapped into. An example would be asking subjects to recall words related to attachment (comforting, rejecting) as opposed to words related more to a general sense of threat (failure). It is reasonable to postulate that a more general threat cue would be "picked up" by the selective attentional sweep of an activated attachment system, the theory of associative mental networks predicts that attachment-coded material will be processed more quickly and efficiently. However, prior research has allowed overlap between attachment-

relevant stimuli and general threat stimuli in dependent measures. Therefore, it is important to choose dependent measures which are clearly related to either attachment or general threat.

Attachment and general threat material may be difficult to differentiate, given that threats of many types will activate the attachment system, and that once the attachment system is activated, there is evidence of psychological and physiological processes closely related to anxiety (Hofer, 1995). Comparison with other situation-specific anxieties is one way to begin differentiating attachment processes from other anxiety processes, however. One such situation-specific anxiety is spider anxiety. Some level of anxious reaction to spiders is common; researchers have found that even non-phobic subjects respond to spiders with significant levels of distress (Vernon & Berenbaum, 2002). Although induction of spider fear naturally leads to some level of threat, a reaction to such a natural phenomena is not as closely imbued with attachment-relevant traits such as an embedded association with relationships. Spider anxiety induction has also been differentiated from a more general anxious arousal. When cued, both phobic and non-phobic subjects show a selective attention for spider-relevant information versus a general bias toward any information containing an element of threat (Kindt & Brosschot, 1998). Use of a spider-anxiety paradigm as a comparison condition (with both attachment-relevant and spider-relevant information as outcome measures) is thus predicted to confirm the discriminant validity of attachment paradigms.

RATIONALE AND HYPOTHESES

Attachment theory has been employed to explain and predict behavioral and emotional responses. In order to explain and predict mental processes as well during attachment activation, the theory must be further refined. Prior research suggests that the attachment system can also be conceptualized as a unique semantic associative network. By using the commonly employed cognitive method of priming, it is predicted that the attachment associative network will be activated, and thus that attachment relevant material will be more quickly and efficiently processed. Use of mixed stimuli (a list of words containing both attachment and spider concepts) can help to understand if this extension of attachment theory is useful and has predictive power.

Related to this are questions of methodology. Different methods of activation of attachment may tap such emotional intensity, as mentioned above. If the level of resulting anxiety varies widely among methods, this may help explain inconsistencies in the literature. Over the past decade, the attention of attachment researchers has turned increasingly towards the use of priming and activating methods or paradigms to examine the effects of attachment on cognitive processes. These studies have provided an important move forward in the field of attachment research. Currently, there exists a lack of discriminant validity regarding the methods used to stimulate and measure attachment activation. As a result, we do not know that such paradigms are limited to tapping attachment-relevant working models. Theories of attachment predict that upon activation of the system, not only are cognitive associative networks initiated, but also attachment-relevant anxiety. Thus, there is a need to

determine to what extent such paradigms are indeed activating the attachment system in particular, or whether these conditions are the result of a general arousal of anxiety or negative affect. A parallel concern here is regarding the use of dependent variables in which an attachment-relevant bias is assumed, but which may be better understood as inducing broad negative affect instead. Thus, two issues which need to be concurrently addressed in order to begin establishing discriminant validity for attachment-activation paradigms are: 1) use of comparison conditions to test and confirm that attachment paradigms may be distinguished from methods which activate other specific anxieties, and 2) the use of dependent variables which specifically tap into the attachment system.

In sum, for cognitive research relying on attachment activation, the choice of both paradigms and dependent variables is relevant when making claims based on attachment dimensions. If we are, in fact, are only arousing a general anxiety or eliciting a recall/reaction bias based on general anxiety or negative affect, there is little that may be stated unequivocally about the function of the attachment system.

The following hypotheses are based on the use of four experimental conditions with equal numbers of subjects of either high or low anxious attachment assigned to each (see Table 1):

1. Spider Story (to activate a spider associative network)
2. Attachment-Death Story (to overtly activate attachment associative network)
3. Attachment-Embedded Story (to covertly activate attachment associative network)
4. Neutral Story (control group condition)

Table 1
Group By Experimental Condition With Projected Sample Size

	Spider	Death	Embedded	Control
High Anxious Attachment	40	40	40	40
Low Anxious Attachment	40	40	40	40

Based on the extant research, four overall hypotheses are projected here to guide the specific hypotheses:

Differentiating Attachment System Activation

It is predicted that attachment system arousal can be differentiated from the activation of other domains, and that cognitive functioning during suchactivation can be predicted by the use of semantic associative networks. The theory of associative networks assumes that particular words or phrases tap into specific networks and activate them; other words/concepts within that network should subsequently be easier to process and remember. Therefore, attachment cues should activate an attachment associative network and spider cues should activate a spider associative network. If groups are cued with different stories, yet all are given both attachment- and spider-associated words in a memory task, we should see differences between groups on recall.

Hypothesis 1: Subjects in the two attachment-relevant conditions will show a significantly higher recall of attachment words than subjects in the other two conditions.

Hypothesis 2: Subjects in the spider-relevant condition will have significantly higher recall of the spider words than subjects in the other conditions.

Anxiety Effect

Another extension of theory in exploring cognitive processes post-activation of attachment is to examine how the emotional response interacts with cognitive performance. It has been shown that high levels of anxiety related to a particular domain leads to a higher bias to seeking out information in that area. For example, the ambivalent attachment group has been shown to be more highly vigilant for attachment information in the environment. These high levels of situation-specific anxiety may be thought of as traits delineating groups vulnerable to a particular domain, or network of stimulus cues. An additional hypothesis is that an intensity of activation will prove to be more important to these vulnerable groups than to nonvulnerable groups; after all, one might expect that a spider-phobic is more emotional and fearful at the sight of many large spiders than a nonphobic. It is predicted that for such a vulnerable group, a more emotionally "intense" activation of that domain or information will result in very high levels of anxiety. In accordance with well-established theories of anxiety and cognition, we then expect that such high anxiety will interfere with cognitive performance on resource-heavy tasks.

The activation of both attachment and spider associative networks stimulates not only cognitive associations, but anxiety specific to each domain, as well. An effect of anxiety on the relationship between anxious-attachment and cognitive performance will occur when two factors are present together: (1) persons with high vigilance to a particular domain are (2) exposed to intense

activations of that domain. When these two factors are present together this will result in very high levels of anxiety, increased to the point of interfering in cognitive processing for these subjects. Therefore, the presence of high vigilance to either attachment threat cues (high levels of Anxious Attachment) or spider cues (high levels of Spider Fear) combined with the intense activation of the respective domains (the Attachment-Death Story or Spider Story) should result in high anxiety levels. In turn, these particularly high levels of anxiety will decrease cognitive functions. Thus, when both factors are present, anxiety will mediate the relationship between the cued domain and memory functioning. If either of these factors (high vigilance or intense activation) is not present, then anxiety will not reach this threshold.

It is also predicted that subjects with high attachment vigilance assigned to the Attachment-Death Story condition will show high levels of anxiety, which will in turn significantly disrupt their cognitive performance compared to other subjects. This disruption is expected to extend beyond attachment-relevant information.

> **Hypothesis 3:** High Anxious Attachment subjects in the Death Story condition will have a significant relationship between post-experimental anxiety and both working memory and memory tasks (Letter-Number Sequencing and total words recalled on the Word List). The higher the level of anxiety, the poorer the cognitive functioning will be.
>
> **Hypothesis 4:** High Spider Fear subjects in the Spider Story condition will have a significant relationship between post-experimental anxiety and both working memory and memory tasks (Letter-Number Sequencing and total words recalled on the Word List). The higher the level of anxiety, the poorer the cognitive functioning will be.
>
> **Hypothesis 5:** High Anxious Attachment subjects in the Attachment-Death Story (high intensity) condition will perform significantly more poorly

on non-attachment-relevant information processing (Letter-Number Sequencing) than under the other conditions.

Differentiating Methods of Activating Attachment

Activating the attachment system at different intensities will result in different outcomes on memory tasks. It is predicted that more intense activations of attachment will also access enough attachment-relevant anxiety that subjects in this group will have a lower overall performance on memory recall than subjects in the less intense attachment activation condition.

Hypothesis 6: Subjects in the condition which intensely activates the attachment system (Attachment-Death Story) will have a significantly lower overall recall on the word list task than those in the less intensely activated condition (Attachment-Embedded Story).

Replication of Patterns of Word Recall

Patterns of recall for the Attachment-Death Story and Attachment-Embedded Story conditions will be replicated or extended (same patterns seen for memory tasks as seen in prior research for reaction time tasks and memory research). Prior research has shown particular patterns for subjects with high levels of anxious attachment with a variety of paradigms and outcome measures. However, most priming studies have used reaction time outcomes. The memory recall studies use the same general theories, show some of the same patterns consistently, and thus we predict that the use of priming should show similar results.

Hypothesis 7: All subjects in the two attachment-relevant conditions will recall significantly more attachment words than non-attachment-related words (that is, spider words).

Hypothesis 8: High and Low levels of Anxious Attachment will differentially impact word recall for negative and positive attachment words for those subjects exposed to attachment cues in the experimental condition. Specifically, High Anxious Attachment subjects in the two attachment-relevant experimental conditions are expected to show a significantly higher recall of negative attachment words than all other subjects, including the Neutral Story and Spider Story conditions. Low Anxious Attachment subjects in the two attachment-relevant experimental conditions are expected to have a significantly higher recall of positive attachment words than all other subjects, including the Control and Spider Anxiety conditions.

METHOD

Participants

Three hundred and twenty-three female undergraduate subjects were recruited using the MSU psychology subject pool. Gender differences have been established for both tests of verbal memory (Orsini et al., 1982) and levels of anxiety (Barlow, year), indicating the need to control for gender with these variables. Martin and Franzen's (1989) findings conclude that male performance on memory tasks is more sensitive to mild levels of anxiety. These results indicate that using a female sample is a more rigorous test of the anxiety effect hypothesis, and at the very least, if using both male and female subjects, comparisons by gender are necessary. In the interest of controlling the sample size, a female undergraduate sample of participants was examined for this study.

Subjects ranged in age from 18 to 56 years ($\underline{M}$ = 19.67, $\underline{SD}$ =2.73). Ethnicity of subjects was mainly Caucasian (79%), with a minority identifying as African American (9%), Asian American (7%), other ethnic group (4%), or Hispanic (1%). All subjects were undergraduates, reporting their grade level as freshman (45%), sophomore (25%), junior (21%) or senior (9%). Median annual household income reported was $80,000 to $89,999.

Attentional processes have been found to be significantly related to memory tasks as an initial processing system which discriminates essential from inessential information as a precursor to encoding it in memory; thus, memory processes rely on attentional ability (Lezak, 1995). The Trails A task, a measure of simple attention, was added to the design as a covariate. Depression has also

been found to decrease memory (Lezak, 1995), and subjects with significant depression have been shown to have decreased volume of the hippocampus, a brain structure localized as an important memory processing area (Chronister & Hardy, 2002).. The Beck Depression Inventory (BDI; Beck, 1987) was added to use as an additional covariate in case the groups differed significantly for level of depression.

Upon recruitment via the online surveys, subjects were placed into High Anxious Attachment or Low Anxious Attachment groups based on their score from the Reciprocal Attachment Questionnaire (see below). They were then assigned to one of four experimental conditions. In a 2 (group) X 4 (condition) design, forty subjects were projected to be assigned to each cell; due to uneven recruitment, the actual number of subjects per cell varied slightly, with 40 subjects in all cells, except for Low Anxious X Death Story, which ended up with 43 total subjects.

Measures

Demographics. Subjects completed a demographics questionnaire gathering information pertaining to age, ethnicity/race, family income level, and years of education completed. See Appendix B.

Attachment. The Reciprocal Attachment Questionnaire (RAQ; West et al., 1987) measures nine subscales tapping into attachment dimensions (use of the attachment figure, angry withdrawal, proximity seeking, compulsive care-giving, availability of the attachment figure, separation protest, feared loss, compulsive self-reliance, and compulsive care-seeking). A dimension of anxious attachment

is obtained by summing the scores of three of these subscales: Separation Protest, Proximity Seeking and Feared Loss (West et al., 1987). Subjects start the questionnaire by identifying an attachment figure (defined as "the person you have been most likely to turn to or depend on for comfort or help when facing stress") and are directed to refer to this person while answering the 43 relationship items (e.g., "I feel it is best not to depend on my attachment figure") using a 5-point Likert scale (1=strongly agree to 5=strongly disagree). The three subscales used to measure anxious attachment have shown good internal consistency (Proximity Seeking: α=.74; Separation Protest: α=.89; and Feared Loss: α=.86). The items from these three subscales were combined to form an Anxious Attachment scale. In the current study, the internal consistency score for this Anxious Attachment scale was good: α=0.83. Scores ranged from 9 to 39, with higher scores indicating higher levels of anxious attachment (M=18.73, SD=5.38). See Appendix C.

Anxiety and depression. Depression has been found to significantly impact attention and memory task performance (Kizilbash et al., 2002; Palav et al., 2000). Thus, it was measured in subjects to be used as a covariate in the analyses. Level of depression was measured using the BDI (Beck, 1987), a 21-item self-report questionnaire. Respondents were instructed to choose one of four self-evaluative statements presented for each item that best reflects how they had been feeling over the past week. Examples of statements presented for a single item include "I do not feel sad," "I feel sad," "I am sad all the time and can't snap out of it," or "I am so sad or unhappy that I can't stand it." The BDI's

test-retest reliability has been reported ranging from 0.74 to 0.93, with validity coefficients of 0.66 against clinical ratings of depression (Lezak, 1995). In the current study, internal consistency was high (Cronbach's alpha=0.89). Scores ranged from 0 to 36 (M=7.53, SD=6.99), with a higher score indicating higher levels of depression. See Appendix D.

Anxiety was measured using the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The STAI contains 20 items regarding state anxiety and 20 items pertaining to trait anxiety. These self-evaluative statements are answered using a 1-4 Likert-type scale, ranging from 1, not at all, to 4, very much so. Examples of items include "I feel jittery" and "I am relaxed." State anxiety tends to fluctuate according to circumstance, and trait anxiety is considered a stable characteristic or dimension of personality. Finney (1985) reports that test-retest reliability is high for the trait anxiety scale (ranging from .73 to .86), but low for state anxiety (0.16 to 0.54), which corresponds to the expectations based on the given definitions. In the current study, Cronbach's alpha was strong for Trait Anxiety (α=0.94), as well as for the State Anxiety scale employed during the experiment (α=0.92). Scores for Trait Anxiety ranged from 20 to 73 ($\underline{M}$=39.27, $\underline{SD}$=11.06), and scores for the post-experimental State Anxiety ranged from 20 to 69 (M=34.24, SD=9.24). See Appendix E.

Attention and concentration. The Trailmaking Test-Part A from the Halstead-Reitan Neuropsychological Battery (Reitan & Wolfson, 1985) was used as a baseline measure of attention and concentration before giving the experimental condition tasks; this baseline was used as a covariate in the

analyses. Good test-retest reliability has been reported for this test (α=0.79; Dikmen, Heaton, Grant, & Temkin, 1999). This task requires the subject to scan a sheet of paper and connect dots in a numerical order, from 1 to 25. Subjects are instructed to perform this test as quickly as possible, and are asked to stop and correct any mistakes made during the course of testing. Time to completion in seconds is used as the measure, then converted into a standard T-Score norm (controlling for gender, age and education of the subject). In this study, T-Scores on the Trails A task ranged from 25 (0.6th percentile) to 84 (<99.9th percentile), with a median score of 55 (69th percentile). See Appendix F.

Memory. Letter-Number Sequencing, a measure of working memory, was employed to test the hypothesis that strong activation of the attachment system would significantly impact tasks which increase cognitive demand for subjects with high levels of anxious attachment (Hypothesis 2b). This task is a population-normed subtest of the Wechsler Memory Scale-Third Edition (Wechsler, 1997). It is a task of mental manipulation and alternate sequencing of numbers and letters during immediate recall. Subjects are verbally presented with a series of increasingly longer strings of mixed letters and numbers which they are instructed to repeat back to the examiner, presenting first the numbers (in numerical order) and then the letters (in alphabetical order). Subjects are given 1 point for every trial repeated in the correct sequence. Administration is discontinued when subjects make mistakes on all 3 trials within one block, or at the end of the last block. Test-retest reliability for this measure is good (alpha=.82) (Wechsler, 1997). Scores are the sum of all correct trials, which are

then converted into a normative scaled score (controlling for gender, age and education level). For this study, the scaled scores ranged from 5 (4^{th} percentile) to 18 (99.6^{th} percentile), with a median score of 9 (37^{th} percentile). See Appendix K.

A list of positive and negative attachment words was used to measure differential attachment-related memory processing. The original list, containing 30 positive and 30 negative attachment words, was developed by Rowe and Carnelley (2003). For this study, the list was modified and decreased to 10 positive and 10 negative words. A list of 20 spider-relevant words was administered interspersed throughout the attachment word list. This set of words was adapted from Kindt and Brosschot (1998b). This list was employed to test whether the Spider Story condition could be differentiated from the two attachment conditions. All subjects received the attachment and spider-relevant combined list (total of 40 words) as presented in Appendix L. Subjects were presented with the word list from an audio recording, in order to control for examiner bias. The subjects were instructed by the examiner to listen carefully, and told they would be asked to recall the word list after hearing it. Immediately after the administration, the subject was asked to recall as many of the words from the list as she could recall, and the examiner marked the recalled items on a checklist. Scores were derived based on the total number of all words recalled, total number of all attachment words, total number of spider words, total number of positive attachment words and total number of negative attachment words.

Spider fear. Level of spider fear was measured using The Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995), an 18-item measure of pre-existing spider fear. It employs a seven point Likert scale (ranging from 1, "not at all like you," to 7, "definitely like you") to rate items such as "Spiders are one of my worst fears," and "I would feel very nervous if I saw a spider now." Test-retest reliability has been reported ranging from 0.63 to 0.97, and good internal consistency for the scale has been determined (α=0.92; Szymanski & O'Donohue, 1995). In the current study, internal consistency of this scale was high (Cronbach's alpha=0.96). Scores are a sum of all item ratings. Scores for this study ranged from 18 to 126 (M=45.11, SD=26.13). See Appendix M.

Procedure

Participants were recruited using the MSU psychology subject pool, and received course credit for their participation. Subjects participated in two separate phases of data collection, an initial online phase of answering self-report questionnaires, and an in-person interview in which the experimental conditions were employed and the dependent variables measured. The initial online data collection consisted of submitting the consent form (see Appendix A) and completing five questionnaires in this order: a demographics questionnaire (see Appendix B), an attachment questionnaire (Reciprocal Attachment Questionnaire, RAQ; see Appendix C), measures of depression and anxiety (Beck Depression Inventory, BDI; State-Trait Anxiety Inventory, STAI; see Appendices D and E), and a spider fear questionnaire (Fear of Spiders Questionnaire, FSQ; see Appendix M). Subjects then signed up for a time to be

interviewed in person on the university campus. The online segment of the study lasted approximately 30 minutes.

Before the in-person interview, RAQ anxious attachment scores were calculated. The mean score of 18.5 reported by West and colleagues (1999) with undergraduate females was used as a high/low cutoff and each participant was assigned to either the 'High Anxious Attachment' (scores 19 and above) or 'Low Anxious Attachment' group (scores 18 and below) based on her score. The current study's mean score of 18.7 on the anxious attachment scale was not significantly different from West et al.'s (1999) mean [$t(322)=.78$, $p>.05$)]. Subjects were then randomly assigned to one of four experimental conditions (Attachment-Death Story, Attachment-Embedded Story, Spider Story, or Neutral Story; see Appendices G, H, I, and J), using random block design.

The in-person interview was conducted administering these tasks in this order: a measure of attention (Trailmaking Test Part A; see Appendix F), the experimental condition (one of four vignettes will be read and questions answered; see Appendices G, H, I, and J), a measure of state anxiety (the State Anxiety items from the STAI; see Appendix E), a working memory task (Letter-Number Sequencing; see Appendix K), and the word list recall task (a combined list of 20 attachment words and 20 spider-related words; see Appendix L). At the end of the interview, participants were thanked for their time, and read a debriefing statement about the nature of the experiment (see Appendix N).

During the in-person interview, subjects were first given the Trailmaking Test Part A, in order to measure a baseline of attentional processing as a covariate for the statistical analyses. The experimenter read the instructions of

this task to the subject, then told her when to begin; the task was timed using a stopwatch. Subjects were then presented with the task corresponding to the experimental condition they were assigned to. Each condition consisted of a vignette of comparable length, which subjects were asked to read. The four vignettes each related an experience of a college-age woman. For the Attachment-Death Story condition, subjects read about the woman finding out about the death of her mother and her subsequent grief; for the Spider Story condition, the vignette recounted the woman's nightmares about spiders; for the Neutral Story condition, the vignette was about shopping for a new computer; for the Attachment-Embedded Story condition, the vignette was the same as the Neutral Story condition, except that attachment-relevant words (such as "divorced" and "death") were embedded in the narrative. These attachment-relevant words were inserted throughout the vignette using alternative, non-attachment-related meanings. For example, in the Neutral Story condition vignette, the sentence "Shayla heard the prices Jared quoted and thought he must be out of contact with reality," was changed in the Attachment-Embedded Story condition to "Shayla heard the prices Jared quoted and thought he must be completely divorced from reality." This is intended to act as a non-conscious priming of attachment. Subjects were then asked to write answers to eight questions about the vignette, which ask the subject to imagine herself experiencing what the main character in the reading did.

Subjects then completed the State Anxiety section of the STAI as a measure of their immediate post-experiment anxiety. Next, subjects were given the Letter-Number Sequencing task, requiring them to hold an increasingly

longer set of items in working memory while repeating numbers and letters separately, in sequential order, to the examiner. This task was immediately followed by the word list recall task consisting of both attachment words and spider-relevant words. This word list was presented in an audio recording (to avoid examiner bias) to the subject, who was asked to recall as many of the words as possible. At the end of the presentation of the word list, the examiner marked the words recalled by the participant on a checklist. A short debriefing concerning the nature of the experiment was then conducted (see Appendix N for the script). The entire in-person interview took approximately 20-30 minutes.

Four undergraduate student volunteers and the graduate student investigator conducted the interviews. Training on the interview protocol consisted of two weeks of supervised practice administration, including meetings devoted to issues such as interviewer bias and standardized test administration. Interviewers then administered the protocol with an 85% accuracy rate or better on two practice and two supervised interviews, consisting of accuracy on these items: timing the Trails A task; scoring on the LNS and Word List Recall tasks; and reading all directions correctly. Subjective feedback about overall interview administration, including handling questions from subjects, was provided as well. Weekly meetings and feedback continued throughout the interviewing process. Furthermore, after interviewers had completed five interviews on their own, they were observed again, with each earning an 85% accuracy rate or better on interview administration.

RESULTS

Missing Data, Kurtosis and Skew, and Covariates

Interviews were conducted with 323 subjects, with each experimental cell having 40 participants, with the exception of the Low Anxious Attachment X Attachment-Death Story group, which had 43. All subjects interviewed were included in the data analyses. Missing data points were found for four different participants on four different items: question #27 on the RAQ, question #21 on the BDI, question #11 on the SFQ, and the demographic item on income. Missing data was estimated by substituting sample means for each of the items. Kurtosis and skewness were examined for all study variables. Significant kurtosis and/or skew were found on two variables, level of Spider Fear and Depression. A square root transformation was performed on these two variables, which brought them into an acceptable range for kurtosis and skewness (see Table 2).

Table 2
Skew and Kurtosis Values for Transformed Variables

Variable	Pre-Transformation		Post-Transformation	
	Skew (SE)	Kurtosis (SE)	Skew (SE)	Kurtosis (SE)
Depression	1.37(.14)	1.67(.27)	.17(.14)	-.30(.27)
Spider Fear	1.01(.14)	.05(.27)	.65(.14)	-.68(.27)

In assigning subjects to conditions, only high/low anxious attachment status was controlled. An initial 2 (High/Low Anxious Attachment) X 4 (Experimental condition) ANOVA was thus used to determine whether there would be significantly different levels of Spider Fear among the eight cells.

Although the analysis showed that the overall model was not significant, $F(7, 315)=1.87$, $p>.05$, post hoc pairwise comparisons indicated that subjects in the Spider Condition had higher levels of Spider Fear than those in the Attachment-Death Story Condition [$t(161)=2.01$, $p<.05$] as well as subjects in the Attachment-Embedded Story Condition [$t(158)=2.65$, $p<.01$]. Although the experimental conditions were randomly assigned to subjects, these differences indicate that the level of Spider Fear was unevenly distributed across experimental condition groups. This difference in initial levels of Spider Fear was a potentially confounding influence on subjects' recall of spider words. Therefore, the level of Spider Fear was accounted for in the univariate and multivariate analyses by using it as a covariate. Other covariates used were depression (BDI) and attentional ability (Trails A). The empirical relevance of using these two variables as covariates is noted in the Hypotheses section. See Table 3 for means and standard deviations of the three covariates. Table 4 presents the means and standard deviations for all of the dependent variables by experimental condition and level of Anxious Attachment. See Table 5 for means and standard deviations for independent variables and covariates by experimental condition and level of Anxious Attachment.

Table 3
Descriptive Statistics for Analysis Covariates

Variable	Mean	SD	Range	Possible Range
Trails A	55.11	10.77	25-84	0-100
Depression	7.53	6.99	0-36	0-63
Spider Fear	45.11	26.13	18-126	18-126

Note: Score given for Trails A is a T-score

Power Analysis

A power analysis was conducted using the Power and Precision program (Borenstein, Rothstein, Cohen, Schoenfeld, & Berlin, 2000), based on the sample

size, an effect size drawn from previous research, and an alpha of 0.05. An effect size estimate of 0.19 (approximately a medium effect size) was employed based on Mikulincer et al.'s (2002) effect size found for the main effect of priming for the anxious attachment group (eta-squared=0.19). The use of covariates is one way to increase power without increasing sample size, thus three appropriate covariates (depression, attention, and spider fear) were added as part of the study design and as parameters in the power analysis. The expected power of 0.80 was yielded based on a final sample size of 323 as well as the statistical analysis that was employed which demands the most power (2 X 4 ANCOVA).

Tests of Hypotheses

Differentiating Attachment System Activation

For Hypothesis 1, a one-way ANCOVA was used to test the prediction that the two attachment-relevant experimental conditions (Attachment-Death Story and Attachment-Embedded Story) would show a significantly higher mean score on the total attachment word list than the other two groups (Spider Story and Neutral Story groups). A main effect was not found for experimental condition [$F(3, 316)=1.17$, $p>.05$]. See Tables 6 and 7.

For Hypothesis 2, a one-way ANCOVA was used to test the hypothesis that subjects in the Spider Story experimental condition would have a significantly higher mean score on spider-relevant words when compared to each of the other three groups. There was no main effect found for condition [$F(3, 316)=1.12$, $p>.05$]. See Tables 8 and 9.

Table 4

Means and Standard Deviations for Dependent Variables by Experimental Condition and Level of Anxious Attachment

Experimental Condition	Variable						
	Anxious Attachment	Total Words	Positive Attachment Words	Negative Attachment Words	Total Attachment Words	Spider Words	LNS
Spider Story	High	10.18(2.4)	2.55(1.2)	1.75(1.0)	4.30(1.4)	5.88(2.2)	9.43(2.2)
	Low	10.38(3.1)	2.20(1.3)	1.98(1.4)	4.18(2.0)	6.20(2.1)	10.03(1.8)
Attachment-Death Story	High	9.63(2.5)	2.23(1.1)	1.50(1.1)	3.73(1.5)	5.90(1.8)	9.85(2.8)
	Low	10.30(3.2)	2.23(1.4)	1.77(1.1)	4.00(1.9)	6.30(2.0)	9.44(2.2)
Attachment-Embedded Story	High	10.80(2.7)	2.28(1.0)	2.13(1.0)	4.40(1.3)	6.40(2.3)	9.98(2.2)
	Low	10.88(2.8)	2.10(1.3)	2.12(1.1)	4.23(1.8)	6.65(2.2)	9.93(2.4)
Neutral Story	High	10.60(2.9)	2.23(1.2)	2.18(1.1)	4.40(1.8)	6.23(2.2)	9.63(1.9)
	Low	10.08(2.5)	2.15(1.7)	1.80(1.5)	3.95(1.7)	6.13(1.9)	10.30(2.0)

Note: Score given for LNS is a standard score for WAIS-3

Table 5

Means and Standard Deviations for Independent Variables and Covariates by Experimental Condition and Level of Anxious Attachment

Experimental Condition	Variable					
	Anxious Attachment	Anxious Attachment score	Post-story Anxiety	Depression[a]	Spider Fear	Attention[b]
Spider Story	High	22.95(4.6)	37.63(9.2)	9.28(8.5)	54.60(26.4)	54.23(10.4)
	Low	14.60(2.5)	34.18(9.4)	6.35(5.9)	47.33(24.5)	57.25(10.9)
Attachment-Death Story	High	22.73(4.4)	38.36(10.2)	8.80(6.5)	48.50(31.0)	54.68(10.8)
	Low	14.79(2.5)	34.35(11.9)	4.02(3.6)	39.12(24.9)	55.23(10.4)
Attachment-Embedded Story	High	23.38(4.5)	33.60(7.7)	10.03(7.3)	40.65(25.6)	52.03(9.9)
	Low	14.63(2.6)	31.28(6.8)	7.98(8.7)	41.50(22.1)	56.13(11.3)
Neutral Story	High	22.50(3.4)	34.98(8.0)	7.98(7.0)	48.65(28.4)	55.38(10.3)
	Low	14.60(2.7)	29.55(6.5)	6.08(5.7)	40.98(23.3)	55.93(12.1)

Note: a=Depression clinical cut-offs for BDI-2 are: 0-13 (minimal), 14-19 (mild), 20-28 (moderate), and 29-63 (severe)

Table 6
Summary of One-way ANCOVA Testing Hypothesis 1

	F Values	*df*	*p*	$\eta 2$	Power
Experimental Condition	1.17	3	.32	.01	.31
Trails A (C)	1.39	1	.24	<.01	.22
Depression (C)	.03	1	.87	<.01	.05
Spider Fear (C)	4.20	1	.04	.01	.53
Corrected Model					.57

Note. C = Covariate

Table 7
Estimated Marginal Means and Standard Errors Tested in Hypothesis 1

Experimental Condition	Variable
	Total Attachment Word List Recall
Spider Story	4.28 (.19)
Attachment-Death Story	3.86 (.19)
Attachment-Embedded Story	4.29 (.19)
Neutral Story	4.17 (.19)

Table 8

Summary of One-way ANCOVA Testing Hypothesis 2

	F Values	*df*	*p*	$\eta 2$	Power
Experimental Condition	1.11	3	.34	.01	.30
Trails A (C)	2.26	1	.13	<.01	.32
Depression (C)	.64	1	.42	<.01	.13
Spider Fear (C)	.31	1	.58	<.01	.09
Corrected Model					.39

Note. C = Covariate

Table 9

Estimated Marginal Means and Standard Errors Tested in Hypothesis 2

Experimental Condition	Variable
	Spider Word Recall
Spider Story	6.01 (.23)
Attachment-Death Story	6.10 (.23)
Attachment-Embedded Story	6.57 (.23)
Neutral Story	6.16 (.23)

Anxiety Effect

For Hypothesis 3, Pearson correlations were used to test whether post-experimental State Anxiety impacted performance on memory and working memory tasks (the total number of words recalled on the Word List Recall Task and the Letter-Number Sequencing task) for High Anxious Attachment subjects in the Attachment-Death Story condition. There was no significant relationship between level of state anxiety and cognitive measures for these subjects (see Table 10).

For Hypothesis 4, Pearson correlations were used to test whether post-experimental State Anxiety impacted performance on memory and working memory tasks (the total number of words recalled on the Word List Recall Task and the Letter-Number Sequencing task) for High Spider Fear subjects in the Spider Story condition. A median split on the variable level of Spider Fear was used to create High and Low Spider Fear groups for the analyses. There was no significant relationship between level of state anxiety and cognitive measures for these subjects (see Table 11).

Table 10
Hypothesis 3: Pearson Correlations Between Post-Story Anxiety and Cognitive Variables for High-Anxious Attachment Subjects in Death Story Condition

	LNS	Total Words Recalled
Post-Story Anxiety	.04	-.19

Table 11
Hypothesis 4: Pearson Correlations Between Post-Story Anxiety and Cognitive Variables for High-Spider Fear Subjects in Spider Story Condition

	LNS	Total Words Recalled
Post-Story Anxiety	-.05	.10

For Hypothesis 5, highly anxiously attached subjects in the Attachment-Death Story condition were expected to perform significantly more poorly on the Letter-Number Sequencing task than all other subjects. A 2 X 4 ANCOVA was used to test this hypothesis. The results of the analysis did not support the hypothesis. The interaction between High/Low Anxious Attachment and Experimental Condition was not significant [$F(3, 312)=1.08$, $p>.05$] nor were main effects found for condition [$F(3,312)=.38$, $p>.05$] or level of anxious attachment [$F(1,312)=.33$, $p>.05$]. See Tables 12 and 13.

Table 12
Summary of Two-way ANCOVA Testing Hypothesis 5

Factors	*F* Values	*df*	*p*	$\eta 2$	Power
Experimental Condition (EC)	.38	3	.77	<.01	.13
Anxious Attachment (AA)	.33	1	.57	<.01	.09
EC*AA	1.08	3	.36	.01	.29
Trails A (C)	9.06	1	<.01	.03	.85
Depression (C)	.42	1	.52	<.01	.10
Spider Fear (C)	1.08	1	.30	<.01	.18
Corrected Model					.77

Note. C = Covariate

Table 13
Estimated Marginal Means and Standard Errors Tested in Hypothesis 5

Experimental Condition	Variable	
	Anxious Attachment	Letter-Number Sequencing
Spider Story	High	9.49(.35)
	Low	9.98(.35)
Attachment-Death Story	High	9.86(.35)
	Low	9.45(.34)
Attachment-Embedded Story	High	10.02(.35)
	Low	9.87(.35)
Neutral Story	High	9.62(.35)
	Low	10.27(.35)

Supplemental analyses. In order to further address the question of whether an anxiety threshold effect exists, additional analyses were conducted. Reported levels of post-experimental anxiety and amount of change from baseline levels were examined. When experimental conditions were grouped according to "intense activation" (spider and death stories) or "non-intense activation" (embedded attachment words and neutral computer stories), significant group differences were found for both reported levels of post experimental anxiety [$t(321)=3.05$, $p<.01$)], and the amount of change in anxiety from baseline [$t(321)=4.99$, $p<.001$)]. Intense condition groups reported comparatively higher anxiety after reading the stories. Both groups showed a drop in anxiety from pre- to post-test, with the nonintense group showing a significantly greater decline. In examining the group means by condition separately, only the High Anxious Attachment subjects in the Attachment-Death Story condition showed a mean increase in reported anxiety. Effects of vulnerability impacted anxiety reports, as well. For subjects in the Attachment-Death Story condition, High Anxious Attachment persons reported significantly higher levels of anxiety than the Low Anxious Attachment group [$t(81)=-2.30$, $p<.05$)]. Interestingly, the effect of vulnerability was not observed for High/Low Spider Fear groups in the Spider Story condition [$t(78)=-.40$, $p>.05$)].

Another aspect of an anxiety threshold effect is the degree to which heightened anxiety impacts cognitive functioning. Correlations did not reveal a significant relationship between either post-experimental anxiety and total word recall scores ($r=.04$, $p>.05$) or the amount of change in anxiety and total word

recall (r=.07, p>.05). A final observation about levels of anxiety is that the group with the highest reported post-experimental anxiety, the High Anxious Attachment group given the Attachment-Death Story condition, had a mean percentile of 58.9, normed by age and gender against a general population. This percentile rank falls within normal limits, with only scores at the 93rd percentile or higher generally considered abnormally high.

Differentiating Methods of Activating Attachment

For Hypothesis 6, an independent samples t-test was used to test the mean score of the total number of words recalled on the Word List Recall Task for subjects in the Attachment-Death Story condition compared to those in the Attachment-Embedded Story condition. Subjects in the Attachment-Death Story condition were predicted to have a significantly lower mean score recall of all words when compared to the Attachment-Embedded Story group. The difference between group means was not significant, although it approached significance [t(161)= -1.96, p=.052], in the direction predicted. See Table 14.

Table 14
Total Word Recall List Scores for the Attachment Conditions

Condition	Mean	SD
Attachment-Death Story	9.98	2.86
Attachment-Embedded Story	10.84	2.74

Replication of Patterns of Word Recall

For Hypothesis 7, it was predicted that subjects in the two attachment-related experimental conditions would recall significantly more attachment words than non-attachment words. Subjects in these two experimental conditions were combined into one group, and a t-test was used to compare Total Attachment Word Recall scores versus Spider Word Recall scores. Results of the t-test were significant [$t(162)=11.76$, $p<.001$], but did not support the hypothesis. Contrary to the hypothesis, subjects in the two attachment relevant conditions remembered significantly more spider-related words than attachment-related words (see Table 15). Indeed, a paired-samples t-test follow-up analysis to this showed that all subjects recalled more spider words than attachment words [$t(322)=14.47$, $p<.001$]. See Table 16.

Table 15
Mean Word Recall for Combined Attachment Conditions

Word group	Mean	SD
Total Attachment words	4.09	1.64
Spider words	6.31	2.06

Table 16
Mean Word Recall for All Subjects

Word group	Mean	SD
Total Attachment words	4.15	1.69
Spider words	6.21	2.06

Hypothesis 8 predicted that the Attachment-Embedded Story and Attachment-Death Story groups were expected to replicate two patterns of response in recall found previously in the literature: (1) High Anxious Attachment subjects in the attachment-relevant experimental conditions were expected to show a significantly higher recall of negative attachment words than all other subjects, including those in the Neutral Story and Spider Story conditions, and (2) Low Anxious Attachment subjects in the attachment-relevant experimental conditions were expected to have a significantly higher recall of positive attachment words than all other subjects, including those in the Neutral Story and Spider Story conditions. These predictions were tested by conducting two analyses, using a 2 (High/Low Anxious Attachment group) by 4 (Experimental Condition) ANCOVA for each test. The first ANCOVA was run using positive attachment words as the dependent variable, and the second with negative attachment words as the dependent variable. The results of the analysis did not support the hypotheses. The interaction between High/Low Anxious Attachment and Experimental Condition was not significant for Positive Attachment words [$F(3, 312)=.37$, $p>.05$], nor for Negative Attachment words [$F(3, 312)=1.16$, $p>.05$]. Main effects were not found for condition or level of anxious attachment in either of the analyses (see Tables 17, 18, 19, and 20).

Supplemental Analyses

Given the nonsignificant results using the Anxious Attachment subscale of the RAQ, the nine individual scales were examined in relation to the dependent variables. Significant results were found for only one of the scales, which are

Table 17

Summary of Two-way ANCOVA Testing Hypothesis 8: Positive Attachment Words

Factors	*F* Values	*df*	*p*	$\eta 2$	Power
Experimental Condition (EC)	.64	3	.59	<.01	.18
Anxious Attachment (AA)	1.53	1	.22	<.01	.23
EC*AA	.37	3	.77	<.01	.12
Trails A (C)	1.56	1	.21	<.01	.24
Depression (C)	.41	1	.52	<.01	.10
Spider Fear (C)	3.85	1	.05	.01	.50
Corrected Model					.48

Note. C = Covariate

Table 18

Estimated Marginal Means and Standard Errors Tested in Hypothesis 8

Experimental Condition	Variable	
	Anxious Attachment	Positive Attachment Words
Spider Story	High	2.60(.19)
	Low	2.21(.19)
Attachment-Death Story	High	2.23(.19)
	Low	2.22(.19)
Attachment-Embedded Story	High	2.26(.19)
	Low	2.08(.19)
Neutral Story	High	2.24(.19)
	Low	2.13(.19)

Table 19

Summary of Two-way ANCOVA Testing Hypothesis 8: Negative Attachment Words

Factors	*F* Values	*df*	*p*	$\eta 2$	Power
Experimental Condition (EC)	2.53	3	.06	.02	.62
Anxious Attachment (AA)	<.01	1	.96	<.01	.05
EC*AA	1.16	3	.33	.01	.31
Trails A (C)	.28	1	.60	<.01	.08
Depression (C)	.28	1	.60	<.01	.08
Spider Fear (C)	.96	1	.33	<.01	.17
Corrected Model					.66

Note. C = Covariate

Table 20

Estimated Marginal Means and Standard Errors Tested in Hypothesis 8

Experimental Condition	Variable	
	Anxious Attachment	Negative Attachment Words
Spider Story	High	1.78(.19)
	Low	1.97(.19)
Attachment-Death Story	High	1.52(.19)
	Low	1.73(.19)
Attachment-Embedded Story	High	2.14(.19)
	Low	2.11(.19)
Neutral Story	High	2.19(.19)
	Low	1.78(.19)

presented here. These further analyses were conducted substituting the Compulsive Care-Seeking scale for the Anxious Attachment variable. As the assignment to experimental conditions was originally dependent on use of the High/Low Anxious Attachment variable, these post-hoc analyses resulted in uneven group numbers (see Table 21).

The analyses related to these hypotheses were re-run, using the substitute attachment variable: Hypotheses 3, 4, and 8. The analysis for Hypothesis 8 had promising results with stronger power, but the other two sets

Table 21
Sample Size per Cell Using High/Low Compulsive Care-Seeking

Experimental Condition	Compulsive Care-Seeking	
	High	Low
Spider Story	47	33
Attachment-Death Story	40	43
Attachment-Embedded Story	43	37
Neutral Story	43	37
Total	173	150

of analyses were not significant. Again, Hypothesis 8 predicted these two patterns: (1) High (Attachment dimension) subjects in the attachment-relevant experimental conditions were expected to show a significantly higher recall of negative attachment words than all subjects in the Neutral Story and Spider Story conditions, and (2) Low (Attachment dimension) subjects in the attachment-

relevant experimental conditions were expected to have a significantly higher recall of positive attachment words than all subjects in the Neutral Story and Spider Story conditions. The 2 (High/Low Compulsive Care Seeking) X 4 (Experimental Condition) ANCOVA using Negative Attachment Words as the dependent variable was not significant for the interaction [$F(3,312)=.51$, $p>.05$)]. However, when using Positive Attachment Words as the dependent variable, the interaction between Compulsive Care Seeking and Experimental Condition was significant [$F(3,312)=4.50$, $p<.01$)]. Main effects were not found for either condition [$F(3,312)=.31$, $p>.05$)] or High/Low Compulsive Care-Seeking [$F(1,312)=.04$, $p>.05$)]. The assumption regarding the equality of error variances was not violated (Levene's $F(7,315)=1.01$, $p>.05$)]. The effect size of the interaction was eta-squared=.04. Cohen's guidelines for interpreting eta-squared effect sizes are as follows: small=.01, medium=.06, and large=.14. See Tables 22 and 23.

This outcome only partially supported the hypothesis. Subjects in the Low Compulsive Care-Seeking group/Attachment-relevant experimental conditions had mean scores on Positive Attachment Words second only to High Compulsive Care-Seeking subjects in the Spider Condition (see Table 23), but post-hoc t-test analyses revealed that they did not differ significantly from other subject groups. There were only significant group differences involving the High Compulsive Care-Seeking/Spider Story group, who scored higher than four other groups (See Table 23). These post-hoc analyses need to be interpreted with caution, however, as the chance of a Type I error increases when multiple tests are conducted separately and not controlled for using ANOVA or other similar

statistical analyses. When the two attachment-relevant conditions were combined, significant within-group differences were found between Low and High Compulsive Care-Seeking groups for recall of positive attachment words [$t(161)=2.15$, $p<.05$)]. The difference was found in the direction expected, with the group low in Compulsive Care-Seeking having a higher recall score.

Table 22
Summary of Two-way ANCOVA Testing Hypothesis 8 using Compulsive Care-Seeking: Positive Attachment Words

Factors	*F* Values	*df*	*p*	$\eta 2$	Power
Experimental Condition (EC)	.31	3	.82	<.01	.11
Compulsive Care-Seeking (CC)	.04	1	.84	<.01	.06
EC*CC	4.50	3	<.01	.04	.88
Trails A (C)	1.21	1	.27	<.01	.20
Depression (C)	.52	1	.47	<.01	.11
Spider Fear (C)	4.77	1	.03	.02	.59
Corrected Model					.88

Note. C = Covariate

Table 23

Estimated Marginal Means and Standard Errors Tested in Hypothesis 8

Experimental Condition	Variable	
	Compulsive Care-Seeking	Positive Attachment Words
Spider Story	$High_a$ $Low_{b,c}$	2.73(.18) 1.94(.21)
Attachment-Death Story	$High_b$ $Low_{a,b}$	2.07(.19) 2.37(.18)
Attachment-Embedded Story	$High_{b,c}$ $Low_{a,b}$	1.93(.18) 2.43(.20)
Neutral Story	$High_{a,b}$ Low_b	2.24(.18) 2.12(.20)

Note. Different subcript letters indicate significant mean differences: b: $p<.05$, c: $p<.01$

DISCUSSION

The goal of the current study was to refine the predictive power of attachment theory regarding cognition. The route used to do so was investigating mechanisms underlying the activation of attachment in cognitive research. Four main areas of examination regarding concepts and paradigms were: the differentiation of attachment from other anxiety-related constructs, whether an anxiety effect might exist, differentiating between methods employed to activate attachment, and the replication and extension of patterns of word recall found previously in the literature. In order to achieve this goal, a block random experiment was conducted with 323 female subjects with two independent factors: level of anxious attachment (high or low) and memory task outcomes after one of four conditions (Spider Story, Attachment-Death Story, Attachment-Embedded Story, and Neutral Story).

Discussion of Results

Differentiating Attachment System Activation

It was hypothesized that activating the attachment system accesses a cognitive associative network which is specific to attachment. Prior research in this area has proceeded with this concept as an implicit basis, but this has not previously been explicitly tested. The first specific experimental prediction was that subjects who were primed by reading one of the attachment-relevant stories (a story about death or a story with attachment words embedded in the narrative) would remember more attachment words from the memory recall list than subjects in the other two conditions (Spider Story or Neutral Story). This was

employed to test whether activation of an associative network dedicated to the attachment system would occur.

In order to test the discrimination of network activation, a comparative condition was applied. A narrative created to stimulate the associative network related to spiders was used. "Priming" of spiders was used, in part, because attachment activation also induces attachment-related anxiety; the spider task provided a comparable condition thought to activate both an associative network and related anxiety which would not overlap with relationship or attachment themes. This was employed to test whether priming of attachment activated attachment only and could be differentiated from the activation of other systems.

The second specific prediction was that subjects exposed to the Spider Story would recall more spider words from the memory recall task than the subjects in the three other conditions. Unexpectedly, there were no significant group differences shown in the tests of either of the specific hypotheses. The failure of the attachment-exposed subjects to show a higher recall for attachment words diverges from prior studies using a neutral comparison condition of initial priming (Mikulincer et al., 2000, Mikulincer et al., 2002, and Pereg & Mikulincer, 2004). These studies concluded that subjects primed with attachment cues showed quicker reaction times to subsequent attachment stimuli. However, one relevant difference may be in the target words used: Mikulincer and colleagues (2002) employed names of persons known or not known to the subjects, as well as non-words, and asked their subjects to identify whether the items were words or non-words. The authors report that high anxious attachment subjects had fast processing times for names of attachment figures, in both the neutral and

attachment priming conditions. This suggests that high anxious attachment persons are more readily able to access and process references to their attachment figures. It is important here to point out a potential bias in choice of target words. Target words belonging to groups such as people we know or which link to personal memories are categorized differently in terms of memory processing than words which fall within our knowledge base of general concepts; the former is considered episodic memory, the latter, semantic memory. The two categories of memory have been found to be processed in different areas of the brain (Solso, 1998). It is also known from past studies in cognitive psychology that specific kinds of information result in better memory recall. Two such kinds of information which are relevant to both "names of attachment figures" and "names of close persons" are (1) deeply processed information and (2) information which refers to ourselves (Solso, 1998). Thus, names of attachment figures and other close persons may be processed differently anatomically, more deeply (set into a previously created, deep associative network, as opposed to a neutral word like "hat"), and may access self-referential cognition. A high level of anxious attachment is also related to preoccupation with attachment themes or events. It could be that Mikulincer and colleagues' (2002) results are a reflection of a combination of high initial preoccupation with attachment and target words that are susceptible to better recall (compared to general concepts of attachment), as opposed to having activated the attachment system and impacting word recall. Considering further that the kind of prime was irrelevant to the outcome provides support for this idea.

Mikulincer and colleagues (2002) also present a second (similar) study in the same paper, indicating the same quick reaction to attachment figure names will occur under two events measured by the study: high anxious attachment, or the presence of threat cues. Thus, only secure subjects were shown to have responded differentially to the threat. This may further suggest that increased vigilance may be induced in secure persons, but can tell us no further about activation of attachment. Maier and colleagues (2004) also reported on a study featuring a neutral versus attachment prime. They only report significant differences for secure subjects, who reacted more quickly to two kinds of positive statements about the self, when exposed to the attachment prime. Although this is promising, it should be noted that these subjects did not show significant differences for attachment statements, and thus, the results only provide information about a tendency of secure persons to process positive information more quickly when an attachment cue is used. Again, evidence targeting whether attachment systems are stimulated may only be inferred and not firmly concluded from this study. Also, the current study differs in that our measure focused on high or low anxious attachment, and low levels of anxious attachment cannot be equated with having a secure attachment classification. Mikulincer and colleagues (2000) reported on a study whereby 'stress word' priming did result in fast processing of attachment words (semantic category); however, the same issue of problematic differentiation of what is being primed existed in this study as well, with high anxious attachment subjects providing quick reaction times to attachment words, regardless of prime (and secure subjects only responding thus to the stress word prime).

Therefore, while our finding that attachment priming did not result in significant differences in recall of attachment words is one that diverges from these studies, it also starts to provide an answer to a question the other three studies were not designed to address. First of all, it was not shown that initiating attachment activation (by two methods) clearly related to processing attachment information more quickly. Given the additional information that one prior study showed a processing preference for positive information beyond attachment, and that another showed preferential processing for attachment words when primed by a 'stress word,' a tentative explanation may be that a cognitive network associated with attachment is not activated in these studies, but rather a broader concept, such as negative or positive affect.

It was further found that activating a spider associative network resulted in no significant differences for those subjects and recall of spider words. This, too, differs from past research which found that spider priming is related to selective attention to spider-related information across subjects with varying levels of spider phobia (Kindt & Brosschot, 1998). It may be that combining the attachment and spider sets of words together resulted in processing interference. Subjects in the current study listened to the list being read, which taps into auditory short-term memory. However, the spider words in the list were more concrete (e.g., spider, web, hairy) and thus easier to form a visual mental image of than the more abstract attachment words (e.g., caring, supportive, rejecting). One hypothesis is that easily formed mental images from spoken words may utilize visual-spatial short-term memory, as well as auditory short-term memory. Auditory working memory is processed along the phonological loop, and visual-

spatial information is processed in short-term memory along a different cortical circuit, the visual spatial sketchpad (Kalat, 1998; Kolb & Whishaw, 2000). These have been shown to be different anatomical circuits in the brain, and that activating both at the same time results in more cerebral blood flow in the cortex than activating either circuit alone (Kalat, 1998). Therefore, one alternative explanation for our results is that having one set of words (spider) which may use both circuits, and thus accessing more mental resources, would result in higher recall than a set which relies primarily on just one circuit. Indeed, additional analyses showed that all subjects recalled significantly more spider words than attachment words.

Anxiety Effect

The second set of hypotheses predicted that exposing persons with high vigilance to a specific domain to an intense activation of that domain would result in anxiety strong enough to disrupt memory processing. During the course of activation it is believed that worries, fears, or anxiety related to attachment are engaged, along with an associative network. Spider-fear is an established area of research, and the exposure to spiders was ascertained to be less likely to stimulate relationship-based worries or anxiety than many other constructs which induce anxiety. It was thus chosen to elicit both a different kind of associative network, as well as anxiety thought to be unrelated to attachment. Both domains (attachment and spider) were stimulated in comparable conditions. The memory performance was examined of persons in each condition who had a high initial vulnerability to activation of that domain. Surprisingly, there were no significant results for either domain tested (attachment or spiders). For persons high in

either anxious attachment or spider fear, there was no relationship between intensely activating the domain and ability to recall words or letters and numbers.

There are a few different considerations when examining this finding, and attempting to answer the question of whether an anxiety effect exists.

First of all, one of the current study's premises was that the specific domains would actually be activated. As drawn from the discussion for the first set of hypotheses, there was a lack of evidence to support that presupposition. A secondary question would be whether the domains could be judged to be intensely activated—again, it is not clear whether specific attachment or spider domains were activated or whether the methods stimulated a broader negative affect domain. However, it should be noted that differences in level of anxiety were seen, with persons exposed to the two "intense" conditions (reading about spider nightmares or a family death) reporting higher anxiety after the experiment than those subjects who read similar stories about a computer shopping trip (with one having embedded attachment words in the narrative). It is also interesting to note that only the women who read the stories about a mother's death experienced an increase in state anxiety from previously measured levels, and those who read either of the computer stories had a significant decrease in anxiety. Differences across level of vulnerability to vigilance also were found to impact post-experimental anxiety: high anxious attachment persons endorsed greater anxiety than those with low anxious attachment, when placed in the death story condition. A significant difference was not found for high / low levels of spider fear for women who read the spider story. Although these findings are suggestive of domain activation, an alternative explanation could be that the two

stories employed were different in intensity and quality of stimulation. It may be that reading a story about the death of a young women's mother, then asked to briefly reflect upon what that would be like for oneself, is more intense and more apt to emotionally effect someone than reading about nightmares regarding spiders.

Other important aspects to examine concern whether increases in anxiety occurred, and whether levels were broached that disrupted cognitive processing. Again, the women reading the death vignette were the only group to show an increase between baseline levels of state anxiety and anxiety after reading the story. However, this increase was not significant. Neither levels of post-experimental state anxiety nor amount of change (increase or decrease) impacted memory performance. Examining scores normed on a general population for age provides further insight here. The group of women with the highest scores (high levels of anxious attachment who read the story about death) did not have an abnormally high level of post-experimental anxiety, scoring "within normal limits" at the 59th percentile.

The current findings do not actually diverge from previous studies, as the sample used was nonclinical. Past research in the area has found that clinical levels of anxiety impact cognitive functioning when the population studied has been diagnosed with either an anxiety disorder alone (Dibartolo, Brown, & Barlow, 1997; Livingston, Haak, & Jennings, 1996), or comorbid with depression (Livingston, Haak, & Jennings, 1996; Waldenstein et al., 1997). However, the same relationship has not been found for nonclinical samples (Hoffman & al'Absi, 2003; Palav et al., 2000; Waldensten et al., 1997), and in one study, not even for

clinically anxious patients (Zalewski, Thompson, & Gottesman, 1994). One point of support for the prediction is that previous research has found a relation between high levels of anxious attachment and clinical diagnoses of anxiety disorders (Fonagy et al., 1996; Rosenstein & Horowitz, 1996; Warren, Huston, Egeland, & Sroufe, 1997). However, the current study was based on levels of anxious attachment in a general undergraduate population, as opposed to groups categorized into attachment classifications, which the studies cited relied upon. It would appear that a faulty assumption when studying a nonclinical population is that high levels of domain vigilance coupled with intense activation of that domain will result in clinically significant levels of anxiety.

What can be concluded from these findings is that women who are initially more vigilant to attachment issues report an increase in anxiety, and highest overall levels of anxiety, after being exposed to a story that induces negative affect. Vigilance to spider themes does not appear to result in a similar increase for women who read a story about spiders. The current study's manipulations did not result in abnormally high levels of state anxiety, which may be necessary in order to impact cognitive functioning. It is possible that different, more intense domain exposures would elicit very high levels of anxiety that would impact working memory. However, the two factors of interest (domain exposure and vulnerability) appear to influence levels of anxiety separately. Other researchers have failed to find a link between anxiety and bias for negative information in a subclinical population (Yovel & Mineka, 2004). These results, along with prior research, appear to weigh against finding such an effect when studying a nonclinical population.

Differentiating Methods of Activating Attachment

Two different methods of activating attachment were employed, one overt (the story about death), the other covert (the story with attachment words embedded). These different methods were meant to reflect differences in methods currently being employed across studies in this area. It was predicted that the overt, intense activation of attachment would decrease memory performance for women when compared to those given the covert, embedded attachment words vignette to read. A trend was noted in support of the hypothesis, but the result was not significant.

Interestingly enough, a difference between the two groups was shown regarding changes in anxiety from pre- to post-experiment. Only women who read the death story reported increases (although not significantly different from prior levels); women who read the computer story with embedded attachment words showed a significant decrease in anxiety. One explanation for this, however, is that the embedded words made no impact regarding attachment activation, as the control group who read the same story without attachment words also showed a significant decrease in anxiety. Furthermore, neither level of post-experimental anxiety nor amount of change in anxiety was related to the total recall of words.

No prior studies have directly compared the ability to recall number of words based on prime comparison. Although several studies have used attachment or threat type primes with neutral prime groups for comparison (Mikulincer, et al., 2000; Mikulincer, et al., 2002; Pereg & Mikulincer, 2004), and others have investigated similar recall tasks of headlines (Pereg & Mikulincer,

2004), attachment sentences (Poole, 1995), or word recall (Rowe & Carnelley, 2003), reports of overall performance (how many items recalled) were not reported.

Drawing on a preceding discussion, it is uncertain whether the specific domains were activated or if a broader domain of negative affect was induced instead. The present study offered some evidence that the two priming methods were different regarding the change of anxiety that occurred. However, one method was not differentiated from the control condition regarding this change in anxiety, and thus may not have activated the attachment domain. Different priming methods did not result in significantly different memory performance; however, a trend in the direction predicted suggests that further examination of the impact of differing priming methods may enhance research in this area.

Replication of Patterns of Word Recall and Additional Analyses

It was hypothesized that the patterns of recall previously found in the literature would be replicated or extended to memory performance (versus reaction time outcomes). First, it was predicted that women who were exposed to attachment cues (via either the story about death or the story with embedded attachment words) would remember more attachment words from the word list than non-attachment words. Unexpectedly, women primed with attachment cues remembered significantly more non-attachment words (spider words) than attachment words. In fact, all subjects, regardless of condition, had higher recall of spider words than attachment words.

Second, it was predicted that patterns specific to attachment status would be replicated and extended in this study. Specifically, it was expected that

women high in anxious attachment, when given attachment cues, would recall significantly more negative attachment words and fewer positive attachment words than all other subjects. Conversely, it was predicted that women low in attachment anxiety, when given attachment cues, would recall significantly more positive attachment words and fewer negative attachment words than all other subjects. There were no significant differences between groups for either of the analyses. These results are contrary to previous findings using attachment or negative primes and memory recall (Beinstein-Miller, 1999; Hahn, 1995; Pereg & Mikulincer, 2004; Rowe & Carnelley, 2003), as well as similar studies using reaction time outcomes (Baldwin & Kay, 2003; Baldwin & Meunier, 1999; Maier et al., 2004; Mikulincer et al., 2000; Mikulincer et al., 2002).

A probable explanation for a lack of results here is a combination of arguments already addressed: adding concrete, easily visualized words such as the spider words probably created a processing interference that was unexpected, the current study employed a measure that only targeted high or low anxious attachment (with low attachment not being entirely comparable to high levels of secure attachment), and that it may be these priming methods and variables employed tap into broader domains than expected.

Another explanation for a lack of results may be found through examining the additional analyses substituting a different attachment scale from the RAQ, Compulsive Care-Seeking, for the Anxious Attachment scale. One of the group differences found was unexpected (women with high levels of Compulsive Care-Seeking who read the spider story had the highest recall of positive words compared to other groups). The expected pattern for recall of positive

attachment words was found for women exposed to attachment cues (those low in Compulsive Care-Seeking recalled higher levels of positive attachment words, and those high in the dimension recalled fewer positive attachment words). An explanation for these findings may be that reading the attachment-relevant stories stimulated a preoccupation with negative attachment themes for the women high in Compulsive Care-Seeking, as expected, but that reading the stories about spiders activated a negative domain which did not tap into negative preoccupation with relationship themes, but rather fears, worries or anxiety about insects that this group was motivated to avoid by focusing on the positive words. It does not explain, however, why similar results were not found using the Anxious Attachment scale. This calls into question whether the anxious attachment measure used captures the characteristics of the construct in a way similar to other, more commonly used measures. The additional analyses did not reveal significant results for negative attachment words. Significant outcomes for securely attached subjects in this area of research have mainly been linked to positive stimuli, and has been attributed to how secure persons are thought to respond to attachment themes with positive expectations and memories (Maier et al., 2004; Pereg & Mikulincer, 2004). This suggests that Compulsive Care-Seeking may target aspects of secure attachment underlying the results of previous research. Related questions to ask are: to what extent do different measures either overlap with each other, solidly defining the dimensions of anxious and secure attachment, and also, to what degree do these measures capture characteristics outside the generally agreed-upon limits of attachment features?

It has been questioned in the past whether certain measures or constructs attributed to attachment are better attributed to personality traits or cognitive style. Crowell, Fraley, and Shaver (1999) reported on efforts to discern whether certain attachment dimensions were "redundant" with traits in the five-factor model of personality. Results showed moderate overlap of the anxious attachment dimension with neuroticism, and the secure dimension with agreeableness and extraversion. Pereg and Mikulincer (2004), also reported interesting findings on attachment and cognitive style. They measured attachment and asked subjects to rate the causes of hypothetical relationship scenarios based on perceptions of how internal/external, stable/unstable, and global/specific they were. When considering the negative relationship scenario, secure persons tended to rate them as having unstable and specific causes, whereas the anxiously attached subjects perceived these situations as having stable, global causes. These attributional patterns are well-established in the social psychology literature as perceptions of control in negative situations, with stable, global, and internal attributions linked to vulnerability to depression, and unstable, specific, and external attributions linked to optimism (Brehm & Kassin, 1996). It should be noted that this was one of a series of attachment studies conducted, one of which included priming and memory tasks. Using the same attachment scale (Mikulincer, Florian, & Tolmacz, 1990), these researchers reported that compared to being given a neutral prime, secure persons given the negative one had a higher level of positive recall, and that anxiously attached persons given the negative prime had a lower level of positive recall. A question to answer would be whether recalling positive information was truly due to the

influence of attachment, or whether it could be in part due to the presence or absence of depression or optimism. This information about the relation of attachment and personality or cognitive traits suggests the need to discern to what degree these other traits may be influencing attachment research. The differing results between the current study and previous research may be an artifact of using the RAQ Anxious Attachment scale as opposed to more commonly employed scales, and there being (unknown) intervening variables present which are responsible for the results (in the case of past research) or the lack thereof (in the case of the current research).

Clinical Implications

Insecure attachment has long been established in connection to psychopathology, including such clinical diagnoses as depression, anxiety disorders, and borderline personality disorder (Dozier, Stovall, & Albus, 1999). Understanding the cognitive component of attachment is a valuable aspect of considering therapeutic interventions in these disorders. In order to better know how to intervene with the highly anxiously attached individual, it is helpful to understand the mechanisms leading to (for example) flooded emotional reactions leading to obsessive ruminations or preoccupation with attachment relationships. However, the findings in this investigation appear to negate the specificity of attachment-relevant networks as of import. Rather, clinicians may infer from this a general vulnerability towards negative affect, and bias to negative cognitions, for those persons high in attachment anxiety. Additionally, our outcomes suggest that a focus on traits such as optimism or level of depression may make more sense than restricting treatments based on attachment cognitive networks. Such

traits may drive attachment relationship tendencies; thus, it appears that key areas for interventions would appear to be broader negative affect and cognitions. Rowe and Carnelley's work (2003) suggests that priming secure attachment schemas induces a bias towards positive information, which may in turn influence or tap into ones' overall optimistic stance. Future research is needed, however, to delineate whether this would be a useful intervention with clinical patients, or whether broader-based interventions (priming positive affect) would work as well or better.

Strengths and Limitations

The present study has both strengths and limitations which are relevant to a discussion of the outcomes. First, a significant strength of the study is the employment of an experimental design with random assignment to conditions and manipulation of conditions of interest. Utilizing such a design allows for a closer control of variables and the opportunity to measure causal mechanisms. Second, the study is the first to empirically test methods of activating attachment systems using comparison groups. The methodology of the study was also unique to research in this area, with both independent and dependent variables specifically targeting attachment themes (as opposed to threat, stress, or negative affect). This allowed for examination of whether attachment was being activated or not. The study was also first to use two different kinds of techniques to activate attachment (as reflected by the variety of techniques used in the literature) in order to test a comparison of the two methods, and determine whether they differentially affected memory outcomes. Another strength of the study is that it was limited to female subjects, as verbal recall and levels of

anxiety have been found to differ significantly by gender. This controlled for a potential confound.

A number of limitations also existed in the study. First, there were limitations related to measures and procedures. One limitation that has already been discussed is the addition of spider words to the word list that may have been much easier to recall, resulting in a possible interference of processing that could not be statistically controlled for. Another is the use of a word list that was not previously validated (i.e., did the attachment words really link to an attachment associative network?). The measurement of anxiety in the study was also potentially problematic. First, pre- and post-experimental anxiety were measured in different venues, the pre- version being given online and the post-version given in-person. There is potential for a social desirability effect here for only one of the data points, which would impact the measure of how much subjects' level of state anxiety had changed after the experimental manipulation. The second issue is the use of a self report questionnaire for the anxiety measure; a study employing physiological measurements would be greatly strengthened, as the conceptual questions are better answered by the subject's actual state of anxiety, as opposed to their perception of it. Another limitation was the use of an attachment measure that hasn't been previously used in this particular area of research. Although West and colleagues (1998) cross-validated the measure against Shaver and Hazan's self-report scale (1997) , the measures, of course, did not overlap completely. The particular appeal of the RAQ is that it targets different dimensions of attachment that are, for example, combined in order to reflect such characteristics as anxious attachment. It is

difficult to determine whether the RAQ's Anxious Attachment scale can be equated to other measures which have targeted anxious attachment, and have been used by researchers in this area. However, in examining those other measures, they vary as to whether they are dimensional or categorical, or if they even measure the same categories of attachment (Bartholomew & Horowitz, 1991). The study and subsequent conclusions would have benefited by the use of one of the two most commonly applied measures, The Experiences in Close Relationships Scale (Brennan, Clark, & Shaver, 1998), or the Mikulincer, Florian, and Tolmacz (1990) adaptation of Hazan and Shaver's prototype attachment scale (1987).

Other limitations include the inability to generalize the findings to a broader population, and the sample size. The current study was limited in that the sample consisted of young female adults who were mainly Caucasian. Future studies would benefit from looking at male subjects, differing age groups, and different racial/ethnic groups. Another issue concerned the number of subjects in the study. Although an a priori power analysis was conducted, the effect size used in the analysis was medium, an estimate based on a reaction time study, as opposed to word recall. The largest effect size in the current study fell between small and medium (found in the additional analysis with the Compulsive Care-Seeking variable). It is possible that the effect of the manipulated conditions on the memory outcomes are smaller than those previously found in reaction time studies. An increase in sample size would have increased the observed power for the one- and two-way ANCOVAs used in the analyses (power for corrected models ranged from .39 to .77, and averaged .57).

If, indeed, the power was not high enough to detect small or small-medium effect sizes, an increase may have resulted in more significant outcomes for the study. However, the means reported for groups were not in the direction(s) predicted.

Future Directions

Further research is needed in order to clarify several different issues in the area of attachment and cognition research. First, it is not clear whether the priming methods commonly employed in this area actually activate a domain specifically devoted to attachment, or a broader domain of negative affect. The current study did not provide evidence that attachment was clearly activated. However, a methodological issue with target words called into question our results concerning this. In order to answer this question, it is recommended that future studies use an experimental design with a control condition and a comparison condition, as the present study did. Using primes and target words that are specific to attachment is necessary, as well. Suggestions for improving upon the current study's design, as well as that of prior research, are to carefully consider the attachment and comparison target words used for outcome measures, and to choose ones that are comparable in how easily they are processed and retrieved. Levels of ease of processing that might be considered are whether words are semantic or episodic, deeply processed or shallowly, concrete and easily visualized or abstract, and degree of self referential processing. This will enhance studies which predict that certain events, such as priming attachment, are the reason for particular patterns of recall. Another issue which needs to be addressed to answer this question is differentiating attachment activation from broader domains (such as negative affect) as well as

more specific domains (such as spider fear). Using comparison condition primes of negative affect and examining whether cognitive outcomes vary significantly is one way to begin examining this area.

Second, it would be useful to examine the extent to which personality traits or cognitive styles may be responsible for cognitive outcomes, versus attachment styles. One aspect of this kind of exploration is to differentiate between theoretical issues and measurement problems. Not all self reports of attachment will measure dimensions and styles comparably, which could impact cognitive outcome research. Regarding theoretical implications, cognition studies are needed which delineate where the influence of attachment ends and personality or cognitive styles begin, or indeed, if there is significant overlap between them. Initial research should target the traits of neuroticism, agreeableness, optimism, extraversion, and depressive cognitive styles, as prior research has found significant correspondence between them and attachment dimensions.

Third, it appears that differences among priming methods need to be further examined. This is, of course, secondary to confirming that priming actually does activate attachment systems. The present study indicated that different techniques resulted in differing change in state anxiety from baseline. One particular focus here might be to examine different cognitive performance tasks, such as reaction time tests and Stroop interference tasks, which may be impacted by anxiety differently.

Finally, it is important to determine whether anxiety effects on cognition occur in child samples. A conclusion from the current study is that such an effect

is unlikely to be found in an adult nonclinical population. It is important, however, to answer questions arising from research on attachment groups and intelligence. Some researchers make a strong case that testing situations may induce very high levels of anxiety in anxiously attached children; furthermore, it is thought that attachment is more of a primary system in childhood than for adults. It would be helpful clinically as well as theoretically to understand whether the lower cognitive scores found for anxiously attached children in some previous studies is due to a temporary state of high anxiety or whether these scores are truly reflective of the usual functioning of these children. Suggestions to approach this question are using attachment classifications (categorical rather than dimensional, as much of the childhood research has relied upon the group classifications), diagnostic interviews, both nonclinical and clinical child samples, and physiological measures of anxiety rather than self report scales.

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APPENDIX A

Social Style and Memory Study
Online Consent Form

You are invited to participate in this study on social style and memory. Your participation is completely voluntary. You will be asked to fill out some questionnaires as well as participate in tasks measuring attention and memory. The entire interview will take about 1 hour to complete in two sessions. The first session is online and lasts up to ½ hour. The second session is in-person and lasts up to ½ hour. You will receive a total of 2 research credits for your participation in this study when both sessions are completed. All of your answers and responses will be kept completely confidential. Your privacy will be protected to the maximum extent allowable by law.

If you have any questions or concerns about this research project, you may contact Peggy O'Toole at (517) 355-9564, or Professor Anne Bogat at (517) 353-0812. If at any time you decide that you cannot or do not want to continue, you may withdraw from the study. You may also decline to complete any item or portion of the interview. Further questions about your rights as a research participant can be answered by David Wright of the University Committee for Research Involving Human Subjects at Michigan State University at (517) 355-2180.

Your submission of this form indicates your voluntary agreement to participate in this study.

Thank you very much for your help.

APPENDIX B

Demographics questionnaire

Please answer the following questions about yourself:

1. **Age:** ____ **Date of birth:** _____

2. **Education – indicate highest level attained: (Circle one)**
a. vocational training/trade school/nursing
b. college – undergraduate (no degree)
c. college – undergraduate degree BA/BS
d. other (please indicate type):_____

3. **Ethnicity:**
____African American
____Asian American
____Caucasian
____Hispanic
____Native American
____Other (please indicate):_____

4. **Marital status:**
   A. Married
   B. Partnered (unmarried, living together)
   C. Single
   D. Divorced
   E. Widowed

5. **What is your family's total yearly income reported for the last year for tax purposes? (Circle one)**
   A. under $10,000
   B. $10,000-$19,999
   C. $20,000-$29,999
   D. $30,000-$39,999
   E. $40,000-$49,999
   F. $50,000-$59,999
   G. $60,000-$69,999
   H. $70,000-$79,999
   I. $80,000-$89,999
   J. $90,000-$99,999
   K. $100,000 and over

7. **A. Are you currently employed? Yes/No**
   B. If so, do you work:
   a) 40 hours/week or more
   b) between 30-40 hours/week
   c) between 20-30 hours/week
   d) between 10-20 hours/week
   e) less than 10 hours/week

8. **Have you experienced any of the following in the past 3 years? (Circle all that apply)**

   a. Death of a spouse/partner
   b. Death of a close family member
   c. Death of a good friend

9. **Identify your attachment figure. This is the person you have been <u>most likely to turn to or depend on for comfort or help when facing stress</u>.**

   This person may be a parent, a spouse/partner, a friend, a family member or someone else. You may have several people in your life whom you are close to in different ways, or it may be difficult to think of one person who means that much to you. Think of **<u>the person you feel closest to right now</u>**. Please report the relationship you have to this person **(circle one):**

   1. Parent—mother
   2. Parent—father
   3. Spouse/romantic partner
   4. Friend
   5. Other family member (specify):_____
   6. Other (specify):_____

APPENDIX C

Reciprocal Attachment Questionnaire

In this questionnaire, you will find questions about your relationship to your attachment figure. Remember, your attachment figure is:

- **The person you have been most likely to turn to or depend on for comfort or help when facing stress.**

Please circle a number to indicate how you feel each statement applies to you.

1 2 3 4 5

Strongly Disagree Somewhat agree Agree

1. I turn to my attachment figure for many things, including comfort and reassurance. **1 2 3 4 5**
2. I wish there was less anger in my relationship with my attachment figure. **1 2 3 4 5**
3. I put my attachment figure's needs before my own. **1 2 3 4 5**
4. I get frustrated when my attachment figure is not around as much as I would like. **1 2 3 4 5**
5. I feel it is best not to depend on my attachment figure. **1 2 3 4 5**
6. I want to get close to my attachment figure but I keep pulling back. **1 2 3 4 5**

6. I often feel too dependent on my attachment figure. **1 2 3 4 5**

8. I can't get on with my work if my attachment figure has a problem. **1 2 3 4 5**
9. I enjoy taking care of my attachment figure. **1 2 3 4 5**
10. I don't object when my attachment figure goes away for a few days. **1 2 3 4 5**
11. I'm confident that my attachment figure will try to understand my feelings. **1 2 3 4 5**
12. I wish that I could be a child again and be taken care of by my attachment figure. **1 2 3 4 5**

1 2 3 4 5

Strongly Disagree Somewhat agree Agree

13. I worry that my attachment figure will let me down
1 2 3 4 5
14. I wouldn't want my attachment figure relying on me.
1 2 3 4 5
15. I resent it when my attachment figure spends time away from me.
1 2 3 4 5
16. I have to have my attachment figure with me when I'm upset.
1 2 3 4 5
17. I rely on myself and not my attachment figure to solve my problems. **1 2 3 4 5**
18. When I'm upset, I am confident my attachment figure will be there to listen to me. **1 2 3 4 5**
19. I usually discuss my problems and concerns with my attachment figure.
1 2 3 4 5
20. I feel abandoned when my attachment figure is away for a few days.
1 2 3 4 5
21. I have a terrible fear that my relationship with my attachment figure will end. **1 2 3 4 5**
22. I do not need my attachment figure to take care of me.
1 2 3 4 5
23. My attachment figure only seems to notice me when I am angry.
1 2 3 4 5
24. I talk things over with my attachment figure.
1 2 3 4 5
25. It's easy for me to be affectionate with my attachment figure.
1 2 3 4 5
26. I expect my attachment figure to take care of his/her own problems.
1 2 3 4 5
27. I'm afraid that I will lose my attachment figure's love.
1 2 3 4 5
28. I feel lost if I'm upset and my attachment figure is not around.
1 2 3 4 5

1 2 3 4 5

Strongly Disagree Somewhat agree Agree

29. I'm furious that I don't get any comfort from my attachment figure.
1 2 3 4 5

30. I'm so used to doing thing on my own that I don't ask my attachment figure for help. **1 2 3 4 5**

31. I'm confident that my attachment figure will always love me.
1 2 3 4 5

32. I'm never certain about what I should do until I talk to my attachment figure. **1 2 3 4 5**

33. I would be helpless without my attachment figure.
1 2 3 4 5

34. Things have to be really bad for me to ask my attachment figure for help.
1 2 3 4 5

35. I get really angry at my attachment figure because I think he/she could make more time for me. **1 2 3 4 5**

36. I often feel angry with my attachment figure without knowing why.
1 2 3 4 5

37. I feel that the hardest thing to do is to stand on my own.
1 2 3 4 5

38. I feel that there is something wrong with me because I'm remote from my attachment figure. **1 2 3 4 5**

39. I don't make a fuss over my attachment figure.
1 2 3 4 5

40. I don't sacrifice my own needs for the benefit of my attachment figure. **1 2 3 4 5**

41. My attachment figure is always disappointing me.
1 2 3 4 5

42. When I am anxious I desperately need to be close to my attachment figure. **1 2 3 4 5**

43. It makes me feel important to be able to do things for my attachment figure. **1 2 3 4 5**

APPENDIX D

BDI

In answering these questions, think about each item carefully and circle the answer out of the group of 4 items that best reflects how you have been feeling **during the past week.**

1. [1] I do not feel sad.
[2] I feel sad.
[3] I am sad all the time and can't snap out of it.
[4] I am so sad or unhappy that I can't stand it.

2. [1] I am not particularly discouraged about the future.
[2] I feel discouraged about the future.
[3] I feel I have nothing to look forward to.
[4] I feel that the future is hopeless and things cannot improve.

3. [1] I do not feel like a failure.
[2] I feel I have failed more than the average person.
[3] As I look back on my life, all I can see is a lot of failures.
[4] I feel I am a complete failure as a person.

4. [1] I get as much satisfaction out of things as I used to.
[2] I don't enjoy things the way I used to.
[3] I don't get real satisfaction out of anything anymore.
[4] I am dissatisfied or bored with everything.

5. [1] I don't feel particularly guilty.
[2] I feel guilty a good part of the time.
[3] I feel quite guilty most of the time.
[4] I feel guilty all of the time.

6. [1] I don't feel I am being punished.
[2] I feel I may be punished.
[3] I expect to be punished.
[4] I feel I am being punished.

7. [1] I don't feel disappointed in myself.
[2] I am disappointed in myself.
[3] I am disgusted with myself.
[4] I hate myself.

8. [1] I don't feel I am worse than anybody else.
[2] I am critical of myself for my weaknesses or mistakes.
[3] I blame myself all the time for my faults.
[4] I blame myself for everything bad that happens.

9. [1] I don't have any thoughts of killing myself.
[1] I have thoughts of killing myself, but I would not carry them out.
[2] I would like to kill myself.
[4] I would kill myself if I had the chance.

10. [1] I don't cry any more than usual.
[2] I cry more now than I used to.
[3] I cry all the time now.
[4] I used to be able to cry, but now I can't cry even though I want to.

11. [1] I am no more irritated by things than I ever am.
[2] I am slightly more irritated now than usual.
[3] I am quite annoyed or irritated a good deal of the time.
[4] I feel irritated all the time now.

12. [1] I have not lost interest in other people.
[2] I am less interested in other people than I used to be.
[3] I have lost most of my interest in other people.
[4] I have lost all of my interest in other people.

13. [1] I make decisions about as well as I ever could.
[2] I put off making decisions more than I used to.
[3] I have greater difficulty in making decisions than I used to.
[4] I can't make decisions at all anymore.

14. [1]I don't feel that I look any worse than I used to.
[2] I am worried that I am looking old or unattractive.
[3] I feel that there are permanent changes in my appearance that make me look unattractive.
[4] I believe that I look ugly.

15. [1] I can work about as well as before.
[2] It takes an extra effort to get started at doing something.
[3] I have to push myself very hard to do anything.
[4] I can't do any work at all.

16. [1] I can sleep as well as usual.
[2] I don't sleep as well as I used to.
[3] I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
[4] I wake up several hours earlier than I used to and cannot get back to sleep.

17. [1] I don't get tired more than usual.
[2] I get tired more easily than I used to.
[3] I get tired from doing almost anything.
[4] I am too tired to do anything.

18. [1] My appetite is no worse than usual.
[2] My appetite is not as good as it used to be.
[3] My appetite is much worse now.
[4] I have no appetite at all anymore.

19. [1] I haven't lost much weight, if any, lately.
[2] I have lost more than five pounds.
[3] I have lost more than ten pounds.
[4] I have lost more than fifteen pounds.

20. [1] I am no more worried about my health than usual.
[2] I am worried about physical problems such as aches or pains, or upset stomach, or constipation.
[3] I am very worried about physical problems and it's hard to think of much else.
[4] I am so worried about my physical problems that I cannot think about anything else.

21. [1] I have not noticed any recent change in my interest in sex.
[2] I am less interested in sex than I used to be.
[3] I am much less interested in sex now.
[4] I have lost interest in sex completely.

APPENDIX E

STAI-Y1

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel ***right*** now, that is, ***at this moment***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Some-what	*Moder-*ately so	Very much so
1. I feel calm	[1]	[2]	[3]	[4]
2. I feel secure	[1]	[2]	[3]	[4]
3. I am tense	[1]	[2]	[3]	[4]
4. I feel strained	[1]	[2]	[3]	[4]
5. I feel at ease	[1]	[2]	[3]	[4]
6. I feel upset	[1]	[2]	[3]	[4]
7. I am presently worrying over possible misfortunes	[1]	[2]	[3]	[4]
8. I feel satisfied	[1]	[2]	[3]	[4]
9. I feel frightened	[1]	[2]	[3]	[4]
10. I feel comfortable	[1]	[2]	[3]	[4]
11. I feel self-confident	[1]	[2]	[3]	[4]
12. I feel nervous	[1]	[2]	[3]	[4]
13. I am jittery	[1]	[2]	[3]	[4]
14. I feel indecisive	[1]	[2]	[3]	[4]
15. I am relaxed	[1]	[2]	[3]	[4]
16. I feel content	[1]	[2]	[3]	[4]
17. I am worried	[1]	[2]	[3]	[4]
18. I feel confused	[1]	[2]	[3]	[4]
19. I feel steady	[1]	[2]	[3]	[4]
20. I feel pleasant	[1]	[2]	[3]	[4]

STAI-Y2

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you ***generally*** feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Some-times	Often	Almost always
21. I feel pleasant	[1]	[2]	[3]	[4]
22. I feel nervous and restless	[1]	[2]	[3]	[4]
23. I feel satisfied with myself	[1]	[2]	[3]	[4]
24. I wish I could be as happy as others seem to be	[1]	[2]	[3]	[4]
25. I feel like a failure	[1]	[2]	[3]	[4]
26. I feel rested	[1]	[2]	[3]	[4]
27.I am "calm, cool, and collected"	[1]	[2]	[3]	[4]
28. I feel that difficulties are piling up so that I cannot overcome them	[1]	[2]	[3]	[4]
29. I worry too much over some-thing that really doesn't matter	[1]	[2]	[3]	[4]
30. I am happy	[1]	[2]	[3]	[4]
31. I have disturbing thoughts	[1]	[2]	[3]	[4]
32. I lack self-confidence	[1]	[2]	[3]	[4]
33. I feel secure	[1]	[2]	[3]	[4]
34. I make decisions easily	[1]	[2]	[3]	[4]
35. I feel inadequate	[1]	[2]	[3]	[4]
36. I am content	[1]	[2]	[3]	[4]
37. Some unimportant thought runs through my mind and bothers me	[1]	[2]	[3]	[4]
38. I take disappointments so keenly that I can't put them out of my mind	[1]	[2]	[3]	[4]
39. I am a steady person	[1]	[2]	[3]	[4]
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	[1]	[2]	[3]	[4]

APPENDIX F

Trail Making Test, Part A instructions

Sample item instructions
"On this page are some numbers. Begin at number 1 and draw a line from 1 to 2, 2 to 3, 3 to 4 and so on, in order, until you reach the end. Draw the lines as fast as you can. Ready—begin."

Test item instructions
"On this page are numbers from 1 to 25. Do this the same way. Begin at number 1 and draw a line from 1 to 2, 2 to 3, 3 to 4 and so on, in order, until you reach the end. Remember to work as fast as you can. Ready—begin."

Appendix G

Spider-Story

This is a story about a 20 year old college student named Shayla who has nightmares.

Shayla came home from her new job in the research lab feeling very unsettled. They would be running an experiment requiring the handling of a live tarantula. Shayla hadn't expected how squeamish she would feel upon actually seeing it. The professor had brought one into the meeting and several research assistants had held it. Shayla had almost backed out of the room, and felt very anxious. She knew she would have to have to get used to picking it up, but she couldn't even imagine holding one of the huge things in her hand.

That night, Shayla had terrible nightmares. The first thing she dreamed of was entering the lab and putting on one of the testing smocks. She tied a strong knot in th strings and began to look over her job checklist. Slowly, she became aware of a tingling sensation on her abdomen. She scratched it several times before noticing that she began to feel it on her chest and arms as well. Alarmed, she peered down the front of the smock and saw dozens of newly hatched tarantulas, climbing inside her clothing, and touching her skin everywhere. She panicked, trying to rip the smock off, but only tightening the knot further. Shayla screamed, but she couldn't keep the creatures from climbing all over her, even getting into her hair and on her face. The sensation of them was horrible, and Shayla woke up with a start, shaking.

Later that night, Shayla had more nightmares. The second dream was in the lab, where she was told to dissect a tarantula. Shayla looked at the one she had in a jar and was afraid to open the lid, as it seemed very agitated. She carefully soaked her cloth with formaldehyde and hesitated before swiftly opening the jar. She tried to clamp down the cloth over the mouth of the jar, but her tarantula scrambled up and attached itself to the cloth, puncturing it through with its teeth. Fearfully, Shayla dropped the cloth, and the huge beast swiftly moved across the table towards her. Shayla shrieked and retrieved her cloth, dropping it on top of the writhing tarantula. Her breathing returned to normal as she watched it die slowly. Shayla waited a while before lifting up a corner of the cloth to look at it. Suddenly, the tarantula came back to life, clicking its mandibles and running towards Shayla. It leaped off the table and landed on her. She screamed and tried to shake it off, but it kept climbing and climbing.

Shayla had a third nightmare: she was getting up and making her breakfast, when she noticed something tickling the back of her neck and her arm. Annoyed, she twice tried to brush it off of her. Finally, she checked her arm. A gigantic tarantula at least 8 inches long was climbing up the back of her arm. Shayla tried to scream, but she felt paralyzed and couldn't move. The horrible thing crept slowly up her arm, the beady little wet eyes staring at her. Suddenly,

it reared back and then fell forward swiftly, sinking its huge, shiny mandibles into Shayla's arm over and over again. She tried to knock it off, but it wouldn't let go. Shayla woke up screaming.

Word count: 542

Spider-anxiety condition vignette questions

Imagine yourself in Shayla's situation, going through the same experiences that she did as you briefly answer the following questions. Refer to the story as needed.

1. What was the reaction that Shayla had when she first saw the tarantula? Would you have had the same reaction?
2. Give one word to describe Shayla's dreams:
3. Which of the nightmares was the worst one for you to read? Imagining yourself in the situation, tell us why.
4. Have you ever had to work in a lab with tarantulas? What do you imagine it would be like?
5. What happened in Shayla's 1st nightmare? What part of Shayla's first nightmare did you dislike the most?
6. In Shayla's second dream, she has to dissect a tarantula. Reread that section—what part of that bothered you the most and why?
7. What happened in Shayla's third nightmare? Have you ever had a dream that was similar in any way?
8. Would you take a position in a research lab working with tarantulas? Why or why not?

APPENDIX H

Attachment-Death Story

Shayla is a 20 year old college student whose mother has just died.

Shayla was trying to finish the reading for her government class, when the doorbell rang. She looked out the window and saw her older sister on the front steps. Shayla was surprised to see Maria at her new apartment, but delighted that she had dropped by. As soon as Shayla opened the door, though, she could tell that something was wrong. Maria's face was blotched and it looked as though she'd been crying. It took a moment to get the words out: "Mom's been killed in a car accident." Shayla could not believe what she was hearing. She had just seen her mother the day before when they had gone shopping for a new computer together. Shayla felt as though she'd been struck, and could not speak. Maria put her arms around her and held her while they both cried.

Their father had been gone on business that day. Maria had left a message on his cell phone, but he didn't call back for a few hours. Maria had laid down on Shayla's bed to try to relax, and Shayla answered the phone when he called. It was horrible to tell her dad that her mom had died. She couldn't stop crying and there was a shocked silence on her father's end of the phone. Finally, he asked where Maria was and if she knew. He told Shayla in a shaking voice that he loved them both and that he would be there as soon as possible. Shayla spent the rest of the day thinking of her mom and waiting for her dad to get there. She thought about the last morning she had seen her mother alive, trying to remember the last words they had said to each other. She and her mom had been so close. Shayla couldn't imagine a world without her in it. She had always been there for Shayla, when things were tough, to hold her when she cried, or just to listen. Shayla just couldn't believe that she would never see her again.

Shayla's father arrived that evening and stayed over at Shayla's apartment. The next day, the three of them drove home, and Shayla's dad called people to let them know and made funeral arrangements. Aunt Barbara came over to help. Shayla usually lit up when she saw her favorite aunt, but there was no joy in this occasion. She was exhausted with grief. Over the next few days, Shayla never thought she could feel pain so intense; she missed her mom so much it was like a physical aching inside. Her father and sister were in so much pain, too. No one had expected this.

Maria walked around like she was in a daze and cried a lot. Shayla's father mostly kept to himself when he wasn't on the phone, taking care of arrangements. Shayla wondered why her mom had to die. She missed her so much already, she didn't know if she could get through this. Shayla hadn't even had a chance to kiss her mother goodbye, give her one last hug, or anything; she

wished with all her heart that her mother was back again, even just to say goodbye to her and tell her that she loved her, one last time.

WORD COUNT: 542

Attachment Activation condition vignette questions

1. If you were Shayla, how would you react to the loss of your mother? Would it be similar or different?
2. Imagine what it would be like to tell a family member that your mother had died. How would you do this?
3. Give two words to describe how Shayla's father reacts to the death:
4. Describe the emotion in this story. Is this how you or someone you know has experienced a death?
5. How do you think the loss of her mother has impacted Shayla?
6. How do Shayla and Maria respond in different ways to the loss of their mother? How are their reactions similar?
7. What part of this story did you like the least? Why?
8. If you knew it was going to be the last time you would see your mom, what would you say to her?

APPENDIX I

Attachment-Embedded Words Story

Shayla is a 20 year old college student who has decided to buy a new computer.

Shayla needed a new computer. The first step she took was to decide what type of computer she would prefer, a laptop or a desktop. Shayla considered her needs: a desktop would have more power and she could run more programs on it. However, a laptop was portable and she could take it to the library and other places to work on papers. Shayla decided that she liked the idea of being able to bring her computer along with her, so she decided on a laptop. Next, she thought about how much money she could reasonably spend on the purchase. Unfortunately, she didn't have very much in her bank account. However, her grandmother had called and left a message to expect a check in the mail both to help out with the computer and because Shayla's birthday was coming up soon. Shayla decided she could spend around $1300.

Shayla then thought about computer memory, the processor speed and the hard drive she wanted and whether or not she wanted a DVD burner. She decided that she wanted to get at least 256 MB of memory and a 40 GB hard drive. She also wanted to get a Pentium 4 processor or a Pentium M processor. Shayla briefly considered getting the HP T-340 with a DVD burner, but when she saw how much it cost, she quickly abandoned that idea. She then compared computer pricing for different brands, given what she wanted. She ended up with three computers that suited her needs: the Compaq V-5000, the Dell X-500, or an IBM G-550. She liked the Compaq because it had a wide screen; however, both the Dell and the IBM came with a graphics card that she liked.

The next day, Shayla was doing her reading for her government class, when she heard the mail carrier dropping off the mail. She rushed outside and saw an envelope from her grandmother. Inside was a birthday card along with a very generous check--this was the death of her money troubles! Shayla thought it would be a great day to go out and get her computer. Besides, her reading for her government class was far too boring to finish: it was on the separation between church and state. She decided she would rather not wait and went over to a local store that was advertising discounts on computers, Anderson's Department Store. In the electronics department, a salesperson named Jared approached and asked if he could assist her. Shayla replied that she was interested in either a Compaq V-5000, a Dell X-500, or an IBM Thinkpod G-550. Jared quickly went over some pricing for those units, and noted that they had run out of Dell X-500s. Shayla heard the prices Jared quoted and thought he must be completely divorced from reality. She turned to leave and saw an X-500 sitting alone on the shelf directly behind her. It was available at $300 off the regular price, so Shayla bought it immediately. She was very happy at the deal she made. On her way out of the store, Shayla saw a piece of furniture that she could

not resist; it was a distressed bedside table which would be perfect for her room. She bought that as well.

Word count: 541

Attachment Priming condition vignette questions

Imagine yourself in Shayla's situation, going through the same experiences above as you briefly answer the following questions. Refer to the story as needed.

1. Would you have decided on a laptop or a desktop?
2. Give one word to describe Shayla's shopping trip:
3. Shayla turns around and sees something while shopping that surprised her—what did she see? (alone)
4. What was the reading that Shayla was doing for class when the mail arrived? Would you enjoy the content of such an assignment (why or why not)? (separation)
5. If you had just bought a computer at Anderson's, would you have considered the second purchase as well? What was the second purchase? (distressed)
6. How did Shayla react to Jared's quoting of the high prices? Would you have reacted to him differently or in a similar way? (divorced)
7. What did Shayla do about the HP T-340? Would you have done the same? (abandoned)
8. If, like Shayla, you received a check in the mail, would you have come to the same conclusion that she did? Why or why not? (death)

APPENDIX J

Neutral Story

Shayla is a 20 year old college student who has decided to buy a new computer.

Shayla needed a new computer. The first step she took was to decide what type of computer she would prefer, a laptop or a desktop. Shayla considered her needs: a desktop would have more power and she could run more programs on it. However, a laptop was portable and she could take it to the library and other places to work on papers. Shayla decided that she liked the idea of being able to bring her computer along with her, so she decided on a laptop. Next, she thought about how much money she could reasonably spend on the purchase. Unfortunately, she didn't have very much in her bank account. However, her grandmother had called and left a message to expect a check in the mail both to help out with the computer and because Shayla's birthday was coming up soon. Shayla decided she could spend around $1300.

Shayla then thought about computer memory, the processor speed and the hard drive she wanted and whether or not she wanted a DVD burner. She decided that she wanted to get at least 256 MB of memory and a 40 GB hard drive. She also wanted to get a Pentium 4 processor or a Pentium M processor. Shayla briefly considered getting the HP T-340 with a DVD burner, but when she saw how much it cost, she quickly relinquished that idea. She then compared computer pricing for different brands, given what she wanted. She ended up with three computers that suited her needs: the Compaq V-5000, the Dell X-500, or an IBM G-550. She liked the Compaq because it had a wide screen; however, both the Dell and the IBM came with a graphics card that she liked.

The next day, Shayla was doing her reading for her government class, when she heard the mail carrier dropping off the mail. She rushed outside and saw an envelope from her grandmother. Inside was a birthday card along with a very generous check--this was the end of her money troubles! Shayla thought it would be a great day to go out and get her computer. Besides, her reading for her government class was far too boring to finish: it was on the division between church and state. She decided she would rather not wait and went over to a local store that was advertising discounts on computers, Anderson's Department Store. In the electronics department, a salesperson named Jared approached and asked if he could assist her. Shayla replied that she was interested in either a Compaq V-5000, a Dell X-500, or an IBM Thinkpod G-550. Jared quickly went over some pricing for those units, and noted that they had run out of Dell X-500s. Shayla heard the prices Jared quoted and thought he must be out of contact with reality. She turned to leave and saw an X-500 sitting there on the shelf directly behind her. It was available at $300 off the regular price, so Shayla bought it immediately. She was very happy with the deal she made.

On her way out of the store, Shayla saw a piece of furniture that she could not resist; it was a patterned bedside table which would be perfect for her room. She bought that as well.

Word count: 542

Control condition vignette questions

Imagine yourself in Shayla's situation, going through the same experiences above as you briefly answer the following questions. Refer to the story as needed.

1. Would you have decided on a laptop or a desktop?
2. Give one word to describe Shayla's shopping trip:
3. Shayla turns around and sees something while shopping that surprised her—what did she see?
4. What was the reading that Shayla was doing for class when the mail arrived? Would you enjoy the content of such an assignment (why or why not)?
5. If you had just bought a computer at Anderson's, would you have considered the second purchase as well? What was the second purchase?
6. How did Shayla react to Jared's quoting of the high prices? Would you have reacted to him differently or in a similar way?
7. What did Shayla do about the HP T-340? Would you have done the same?
8. If, like Shayla, you received a check in the mail, would you have come to the same conclusion that she did? Why or why not?

APPENDIX K

Letter-Number Sequencing Instructions

"I am going to say a group of numbers and letters. After I say them, I want you to tell me the numbers first, in order, starting with the lowest number. Then tell me the letters in alphabetical order. For example, if I say, B – 7, your answer should be 7 – B. The number goes first, then the letter. If I say 9 – C – 3, then your answer should be 3 – 9 – C, the numbers in order first, then the letters in alphabetical order. Let's practice."

Practice items:

6 – F	(6 – F)
G – 4	(4 – G)
3 – W – 5	(3 – 5 – W)
T – 7 – L	(7 – L – T)
1 – J – A	(1 – A – J)

Test items:

1.	1	**L – 2**	(2–L)
	2	**6 – P**	(6–P)
	3	**B – 5**	(5–B)
2.	1	**F – 7 – L**	(7–F–L)
	2	**R – 4 – D**	(4–D–R)
	3	**H – 1 – 8**	(1–8–H)
3.	1	**T – 9 – A – 3**	(3–9–A–T)
	2	**V – 1 – J – 5**	(1–5–J–V)
	3	**7 – N – 4 – L**	(4–7–L–N)
4.	1	**8 – D – 6 – G – 1**	(1–6–8–D–G)
	2	**K – 2 – C – 7 – S**	(2–7–C–K–S)
	3	**5 – P – 3 – Y – 9**	(3-5-9-P-Y)
5.	1	**M – 4 – E – 7 – Q – 2**	(2-4-7-E-M-Q)
	2	**W – 8 – H – 5 – F – 3**	(3-5-8-F-H-W)
	3	**6 – G – 9 – A – 2 – S**	(2-6-9-A-G-S)
6.	1	**R – 3 – B – 4 – Z – 1 – C**	(1-3-4-B-C-R-Z)
	2	**5 – T – 9 – J – 2 – X –7**	(2-5-7-9-J-T-X)
	3	**E – 1 – H – 8 – R – 4 – D**	(1-4-8-D-E-H-R)
7.	1	**5 – H – 9 – S – 2 – N – 6 – A**	(2-5-6-9-A-H-N-S)
	2	**D – 1 – R – 9 – B – 4 – K – 3**	(1-3-4-9-B-D-K-R)
	3	**7 – M – 2 – T – 6 – F – 1 – Z**	(1-2-6-7-F-M-T-Z)

APPENDIX L

Word list task

Instructions to subject:

"I am going to read a list of words to you. Listen carefully and try to remember as many as you can, because when I am done, I will ask you to tell me all the words that you recall. You can say them in any order, just say as many of them as you can."

Read word list to subject at a rate of 1 second per word; examiner writes down all words that subject generates

Second trial of word list:

"I am going to read you the same list again. Like before, tell me as many of the words as you can, in any order. Be sure to say words from the list that you told me the first time."

Read word list to subject at a rate of 1 second per word; examiner writes down all words that subject generates

1. jealous
2. spider
3. protected
4. web
5. unloved
6. creeping
7. mothering
8. cobweb
9. rejecting
10. itching
11. nurtured
12. hairy
13. insecure
14. rapid
15. comforted
16. jaws
17. clinging
18. poisonous
19. trustworthy
20. fast
21. longing
22. spindly
23. soothing
24. venom
25. yearn
26. crawling
27. caring
28. dangling
29. pining

30. bite
31. attentive
32. moving
33. heartbreak
34. legs
35. supportive
36. scurry
37. farewell
38. sting
39. reassured
40. bugs

APPENDIX M

Fear of Spiders Questionnaire

For this questionnaire, circle one number for each item, rating how well the statement describes you and how you feel.

1=not at all like you and 7=definitely like you

1)If I came across a spider now, I would get help from someone else to remove it.	1	2	3	4	5	6	7
2)Currently, I am sometimes on the look out for spiders.	1	2	3	4	5	6	7
3)If I saw a spider now, I would think it will harm me.	1	2	3	4	5	6	7
4)I now think a lot about spiders.	1	2	3	4	5	6	7
5)I would be somewhat afraid to enter a room now, where I have seen a spider before.	1	2	3	4	5	6	7
6)I now would do anything to try to avoid a spider.	1	2	3	4	5	6	7
7)Currently, I sometimes think about getting bit by a spider.	1	2	3	4	5	6	7
8)If I encountered a spider now, I wouldn't be able to deal effectively with it.	1	2	3	4	5	6	7
9)If I encountered a spider now, it would take a long time to get it out of my mind.	1	2	3	4	5	6	7
10)If I came across a spider now, I would leave the room.	1	2	3	4	5	6	7
11) If I saw a spider now, I would think it will try to jump on me.	1	2	3	4	5	6	7
12)If I saw a spider now, I would ask someone else to kill it.	1	2	3	4	5	6	7
13)If I encountered a spider now, I would have images of it trying to get me.	1	2	3	4	5	6	7
14)If I saw a spider now I would be afraid of it.	1	2	3	4	5	6	7
15)If I saw a spider now, I would feel very panicky.	1	2	3	4	5	6	7
16)Spiders are one of my worst fears.	1	2	3	4	5	6	7
17)I would feel very nervous if I saw a spider now.	1	2	3	4	5	6	7
18)If I saw a spider now I would probably break out in a sweat and my heart would beat faster.	1	2	3	4	5	6	7

APPENDIX N

Debriefing Information

Thank you for participating in our study. I will now explain the purpose of the experiment that you just completed. First, I would like to remind you that it is very important that you do not discuss this information with any of your classmates who might participate in the experiment. This is to avoid invalidating the results of the research. All of the data you have provided will be kept confidential and any identifying information you provided will be used only to match data from your pre-interview file to today's data, and to provide you with the appropriate amount of research credits.

The purpose of this experiment is to examine the effects that stable relationship styles have on the ability to process information. We are examining the extent to which predisposition to specific relationship styles leads to anxiety, and how that anxiety may interfere with a person's ability to remember and repeat words or numbers and letters. We are also comparing conditions which impact anxiety and seeing how those conditions differ in their outcomes. If you have questions about this experiment or would like to obtain information regarding the results, please contact the student investigator, Peggy O'Toole, at 355-9564.

Thank you again for your interest and participation.

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