ASSOCIATION BETWEEN FEAR AND VISUAL MEMORY FOR CENTRAL AND PERIPHERAL DETAILS

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ASSOCIATION BETWEEN FEAR AND VISUAL MEMORY FOR CENTRAL AND PERIPHERAL DETAILS

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ASSOCIATION BETWEEN FEAR AND VISUAL MEMORY FOR CENTRAL AND PERIPHERAL DETAILS

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Christopher Fredric Anderson, son of Fredric Anderson and Zada Ericson-Anderson, was born July 7, 1972. He graduated from Chatsworth High School in 1990. He earned a Bachelor of Science degree in Psychology with a minor in Animal Behavior from San Diego State University in 1995. After obtaining his degree, Christopher settled in Homer, Alaska and worked at the local community mental health center as a case manager for chronically mentally ill adults. After working at the community mental health center for several years, he entered Graduate School at North Dakota State University where he earned a Masters of Science degree in Clinical Psychology. He entered the doctoral program in Clinical Psychology at Auburn University in 2000 and attended the Portland Veterans Affairs Medical Center for his predoctoral internship training. He is married to Fawn Marie Anderson and has two children, Thomas Christopher and Ava Marie.

DISSERTATION ABSTRACT

ASSOCIATION BETWEEN FEAR AND VISUAL MEMORY FOR CENTRAL AND PERIPHERAL DETAILS

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The present study sought to determine if phobic individuals have improved memory for stimuli that are related to their phobic fear relative to non-anxiety provoking stimuli. Four hundred fifty-eight participants were screened until 41 participants met inclusion criteria for a spider phobic group and 39 participants met criteria for a non-phobic group. The 80 participants each viewed one of two stimulus-displays. One stimulus-display presented spider stimuli (central details) and other non-anxiety provoking stimuli (peripheral details). The other stimulus-display had the same arrangement of peripheral details as the first; however, in place of the spider stimuli, additional non-anxiety provoking stimuli (office supplies) were used. Participant's recall, positional memory, and recognition memory for the stimuli on the display boards were than assessed.

The purpose of the study was to examine the assertion proposed in the attentional-narrowing hypothesis that stimuli that cause anxiety or a negative emotional state are remembered better than are neutrally valenced stimuli. We hypothesized that spider phobic individuals would have better memory for the spider stimuli relative to the other stimuli on the board. Additionally, we hypothesized that if cognitive resources are being diverted towards frightening stimuli and away from non-frightening stimuli, then spider phobic participants should exhibit superior memory for spider stimuli relative to peripheral stimuli and superior memory for spider stimuli relative to non-phobic's memory for spider stimuli.

Results did not support the hypotheses. Significantly more office-supply stimuli were recalled and recognized compared to spider stimuli and other peripheral stimuli on the boards. Phobic status did not have a significant effect on the pattern of recall or recognition.

Explanations for this pattern of results are discussed in the context of two competing theories related to memory for phobic stimuli. However, the most likely explanation for this pattern of results appears related to the choice of office-supply items as control stimuli.

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I. INTRODUCTION

Anxiety disorders affect approximately 18.1% of the adult population (Kessler, Chiu, Demler, & Walters, 2006) and are the most common mental health condition in the United States. Of the anxiety disorders, specific phobias are the most common. Specific phobias are irrational fears of certain objects and situations. According to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV; American Psychological Association, 1994) individuals with specific phobias are characterized by: 1) a marked and persistent fear directed towards a limited set of stimuli, 2) an intense emotional response of anxiety when confronted with these feared stimuli, and 3) avoidance of phobic stimuli whenever possible.

Some Theories Regarding the Etiology of Specific Phobias

Non-cognitive theories. Many theories have been proposed regarding the etiology of specific phobias. One of the first modern theories was Mowrer's (1939) two-stage theory of fear development. Mowrer proposed that fears are developed through the process of aversive classical conditioning. Once an individual is conditioned to fear an object or situation, they avoid such situations. This avoidant behavior, in turn, is negatively reinforced by fear attenuation. Hence, avoidance persists.

Seligman (1971) proposed the preparedness theory of phobia development in response to what he perceived as an inadequacy of Mowrer's two-stage theory; it did not explain why people were more likely to develop phobic fear of some stimuli than others.

According to Seligman, humans have a biological predisposition, or “preparedness” to acquire certain paired associations. According to the aversive classical conditioning theory of learning, any stimulus can be paired with an unconditioned aversive stimulus to produce a conditioned response. However, only a limited set of objects and situations participate in phobias. According to Seligman, it is this limited set for which we readily develop fear because, evolutionarily, it had been advantageous for humans to do so. He further postulated that since a phobic level of fear can be developed in one trial, the development of phobias is likely non-cognitive in nature.

Rachman (1977) also argued that the aversive conditioning theory of fear development was not comprehensive enough. In his review of the literature on the conditioning of fear, he noted that the conditioning theory of fear development does not adequately account for all conduits of fear development. Although he suggested that there was a lot of empirical support for the theory that fear was developed through aversive conditioning, he argued that aversive conditioning alone could not account for all the channels through which fear develops. Rachman proposed that the acquisition of fear can occur through three pathways; through aversive conditioning mentioned above, through vicarious learning, and through the transmission of information and/or instruction. Although he acknowledged that there was not a lot of direct evidence for these last two pathways of fear development, he suggested that these indirect pathways of fear development in conjunction with the aversive conditioning theory and Seligman’s (1971) preparedness theory, provide the most comprehensive explanation for the development of phobic fear.

Cognitive theories. One of the first individuals to propose a comprehensive theory regarding emotion and cognition was R. S. Lazarus (1982). He theorized that thought was a necessary condition of emotion but cognition did not necessarily need to precede an emotion. According to Lazarus, humans are meaning- oriented creatures who evaluate the environment from the perspective of their well-being. However, all information in the environment does not have to be completely processed to produce an emotional reaction. In fact, according to Lazarus, it is incomplete information that usually elicits emotional responding.

Beck and Emery (1985) further elaborated the role cognition plays in the development and maintenance of anxiety and fear. They theorized that past knowledge and experience, labeled schemata, influence the way information is organized, processed and encoded. Information that is congruent with individuals' schemata is attended to and encoded, while incongruent information is ignored or discarded.

Eysenck (1992) proposed a theory of hypervigilance that describes how the cognitive processes of anxious individuals differ from those of less anxious individuals. According to the hypervigilance theory, the primary purpose of anxiety is to promote the detection of danger in the environment. In highly anxious individuals, like those with specific phobias, their danger detection system is highly sensitive, overactive, and often maladaptive. Additionally, the way in which anxious individuals attend to, interpret, and remember threatening information facilitates and maintains this overactive danger detection system. Research over the past several decades has focused on attentional, interpretive, and memory biases.

Cognitive Biases in Specific Phobias

In 1994, Mathews and MacLeod's review entitled "Cognitive Approaches to Emotion and Emotional Disorders" focused on individual differences in cognitive processing and how these differences influence susceptibility to emotional disorders. Their review explored three main areas in which emotion affects cognitive processing: selective encoding (also referred to as attentional bias), selective interpretation, and selective memory. Although their review did not focus on specific phobias, Mathews and MacLeod concluded that research supports three synergistic hypotheses regarding anxiety and selective cognitive processes which could be applied to specific phobias. First, elevated levels of anxiety increase an individual's tendency to prioritize the encoding of emotionally negative material relative to emotionally neutral material, but do not increase the speed with which individuals process such information. Second, as levels of anxiety increase, so does an individual's tendency to impose negative interpretations on ambiguous information. Finally, elevated levels of anxiety do not increase an individual's ability to recall emotionally negative information. If the above three hypotheses hold true for specific phobias, one would expect phobic individuals to exhibit an interpretive bias, as evidenced by ratings of neutral stimuli as emotionally negative compared to ratings among non-phobic individuals. In addition, the more similar stimuli are to the individual's phobic stimulus, the more likely they would be interpreted as having negative attributes. Additionally, phobic participants would be more likely to encode information related to their phobic stimulus than information related to stimuli that are neutral in nature. Finally, based on Mathews and MacLeod's third hypothesis, we would

not expect phobic individuals to have a memory bias for stimuli related to their phobic stimulus relative to neutral stimuli.

Since Mathews and MacLeod's (1994) review, considerable research has supported the notion that individuals with specific phobias have encoding (e.g., Thorpe & Salkovskis, 1997; Thorpe & Salkovskis, 1998; Kindt & Brosschot, 1998a, Martin & Jones, 1995), and interpretative (e.g., Tolin, Lohr, Sawchuk, & Lee, 1997; Sawchuk, Lohr, Westendperf, Meunier, & Tolin, 2002; Koch, O'Neill, Sawchuk, & Connolly, 2002) biases for fearsome stimuli. Less research has examined memory biases for frightening stimuli.

Specific phobias and memory. What makes some facts or stimuli more memorable than others? One factor that psychologists have been studying over the past several decades is emotion. Previous research has shown that people remember details of emotional events differently than details of neutral events (see Mathews & MacLeod, 1994; Christianson, 1992, for reviews). Most research has focused on two competing hypotheses regarding memory for threatening stimuli in specific phobics. The first is the cognitive avoidance hypothesis proposed by Williams, Watts, MacLeod, and Mathews (1988). Individuals are initially vigilant towards perceived threats in the environment; however, once a threat is identified they purposefully avoid cognitively processing this information as an adjustment strategy. As a result, phobic individuals are less likely to remember threatening information compared to remembering neutral stimuli in the environment. This hypothesis is congruent with earlier theories of fear development (e.g., the two-stage story) as it suggests that by not remembering an event, an individual is reducing the amount of fear they experience and this reduction in fear negatively

reinforces cognitive avoidance. Alternately, the attentional-narrowing hypothesis proposed by Christianson states that individuals focus their attention towards information in the environment that is congruent with their current emotional state. Individuals with specific phobias, who are presented with a threatening stimulus, are likely to focus their attention on this threatening stimulus and any other stimuli they interpret as threatening. This focusing of attention leads to an improved memory for threatening stimuli compared to neutral stimuli.

Christianson first proposed his attentional-narrowing hypothesis in his 1992 review of the eyewitness memory literature. Christianson's stated purpose of his review was to examine the results from eyewitness memory research in relation to the Yerkes-Dodson law (1908) and Easterbock's cue utilization hypothesis (1959), as these were the two most cited theories within the eyewitness memory literature. Christianson concluded from his review that memory for emotional events is governed by a complex interaction between the type of event (neutral or emotional), the type of detail (central or peripheral), and the time between the exposure to the emotion provoking stimulus and the time of attempted recall. Christianson further concluded in his review that there was little evidence supporting the notion that emotional stress negatively effects memory and suggested that emotional stress leads to an individual focusing his/her attention on the stimulus causing the emotional stress (i.e., central detail information). This focusing of attention on the central details of a situation, in turn, leads to increased cognitive processing of central details, and to improved recall of central details relative to peripheral information. Although Christianson proposed that central details were recalled better than peripheral details, his review revealed that there was inconsistent evidence

regarding whether this improved recall for central detail information is at the expense of recall for peripheral details. It might be that while experiencing an emotionally stressful event, individuals focus their attention on the central details (i.e., the source of their anxiety), and thus recall them better than the peripheral details. However, research cited in Christianson's review did not consistently support this assertion.

Mathews and MacLeod (1994) concluded in their literature review that highly anxious individuals cognitively avoid information that could be anxiety provoking and that research supports the notion that phobic individuals have poor memory for frightening stimuli, an assertion congruent with the information-processing theory proposed by Williams et al. (1988). Since this review, little research has specifically examined memory biases in individuals with specific phobias, and results from the little research that has examined this phenomenon has not uniformly supported their conclusions.

Kindt and Brosschot (1998b) conducted a study examining whether anxious individuals selectively avoid processing threatening information as a strategy to reduce anxious affect. They hypothesized that anxious individuals selectively attend to threatening stimuli in the environment; however, once they have identified a threat, avoid processing this information. This initial bias of focusing attention towards threatening stimuli would facilitate the early detection of and escape from the threatening stimulus. However, once detected, phobic individuals would avoid cognitively processing the characteristics of the stimulus in an attempt to reduce anxiety, an assertion in line with the cognitive avoidance theory proposed by Williams et al. (1988). To test this hypothesis, Kindt and Brosschot had spider phobic or non-phobic participants perform a

free recall task after completing a negative priming task. In the negative priming task, participants were required to identify the location of a target non-word (e.g., “XXXXX”) by pressing a button that indicated the location of the non-word on the computer screen, which was divided into four equal quadrants. They were also to ignore a distractor word presented in an alternate quadrant of the screen. Two successive screens were displayed for each trial, a prime word followed by a probe. The prime word was either a no-distractor or a distractor, and the probe was either a control or ignored repetition. In the no-distractor prime condition only the non-word target was presented on the screen while in the distractor prime condition the target non-word and another word (either a threat-related word or control word) were presented simultaneously. In the ignored repetition probe, the prime word was in the same quadrant location as the non-target word probe (upper right, upper left, lower right, or lower left). In the control condition, the non-word probe was in an alternate quadrant of the screen as the previously displayed prime word. The negative priming experiment used 72 different words that were classified as stimulus-related threat words (i.e., spider, web, creep), as stimulus-related neutral words (i.e., chair, table, light), as response-related threat words (i.e., nervous, anxious, repelled), or as response-related neutral words (i.e., lazy, calm, sleepy). All words were presented three times for 500 milliseconds. After completing the negative priming task, participants were given a five-minute distractor task followed by a free recall task in which they were instructed to write down as many previously seen words as they could remember.

Results from the free recall task partially supported their hypothesis. Analysis revealed that spider phobics recalled significantly more threat-related words compared to non-phobic participants. Additionally, this relationship indicated that this selective

memory bias for threat-related words was only present for stimulus-related words. Spider phobic participants recalled significantly more stimulus-related threat words than either control words or response-related threat words. However, contrary to their hypothesis, spider phobics did not recall significantly fewer response-related threat words compared to control words, either response or stimulus related.

Although Kindt and Brosschot's (1998b) hypotheses were only partially supported, their results are interesting in that they provide possible explanations for discrepant findings within the selective memory research literature. Their results support the theory that anxious individuals selectively attend to threatening stimuli in the environment, as evidenced by selective memory for these stimuli. Results did not suggest that phobic individuals cognitively avoid processing this information after it is identified since there was not a significant difference in the number of response-related threat words recalled compared to control words. This selective attention may only be related to semantic stimuli describing the threatening objects or situations and not stimuli describing possible responses or reactions to the objects or situations. The fact that phobic individuals differentially recalled stimulus and response-related words suggests that if researchers are going to use semantic stimuli, they should carefully select the semantic stimuli they use to produce anxiety in phobic individuals. Alternately, a literature review examining selective cognitive processes in individuals with specific phobias (unpublished work by Anderson, 2003) concluded that semantic stimuli in general may not be frightening enough to produce a cognitive bias. Regardless, until further research specifically examining phobic individual's responses to semantic stimuli

is performed, future research examining cognitive biases in phobic individuals should probably use non-semantic stimuli to elicit emotional responses.

It has been hypothesized that anxious individuals evaluate a potential threat before completely identifying the source of the threat. When presented with a possible threat, anxious individuals use superficial information or an abstract analysis of the situation to anticipate possible outcomes of a confrontation with threatening stimuli. In an experiment examining individuals' memory for abstract anticipatory information (information generated by an individual's analysis of a potentially dangerous situation) and its association with attenuation of physiological reactivity to threat, Kindt, Brosschot and Boiten (1999) had spider phobic and non-phobic women perform an auditory script recall task. The script described a confrontation with a spider and consisted of 23 sentences containing sensory information (i.e., bicycle pump is placed in between long threads of cobwebs) intermixed with 23 sentences containing anticipatory information (i.e., there will probably be spiders in the barn). Participants were read the scripts and told to imagine the scene as vividly as possible. At the end of each script, participants were asked to stop imagining the scene and relax. Participants then completed a questionnaire assessing state and trait anxiety. Participants then performed a seven-minute distracter task followed by a recognition task that required them to indicate which descriptions had appeared in the imaginary script heard before. Finally, half of the participants were exposed to a live spider. The participants' heart rate, skin conductance, and blood pressure were monitored throughout the experiment.

Results indicated that compared to non-phobic participants, spider phobic individuals rated the scripts as more vivid and more threat provoking, and reported trying to distract themselves more from the images produced by the scripts than the non-phobic participants. Spider phobic individuals also had a significantly larger heart rate increase compared to non-phobic individuals and less decrease in skin conductance compared to non-phobic participants when listening to the script. In addition, spider phobic individuals recalled significantly more information than non-phobic individuals and also recalled significantly more abstract anticipatory information than sensory information compared to non-phobic individuals. Based on the results the researchers concluded that spider phobics interpreted the scripts as more threatening and more vivid, and that they spent considerably more cognitive resources trying to distract themselves from the image produced by the script than non-phobic participants. What is interesting about these findings is they suggest that although phobic individuals were trying to cognitively avoid processing this information, this process of exerting cognitive resources to distract themselves from the frightening stimuli improved their memory for the frightening stimuli.

Differential Recall of Central and Peripheral Details

Although the above mentioned studies provide support for a memory bias for frightening stimuli over neutral stimuli, whether this memory bias for frightening stimuli is at the expense of cognitive resources for other, non-frightening stimuli in the environment, remains unclear. Interestingly, although several studies were performed prior to Christianson's review (1992) examining the differential recall of central and peripheral details, since he proposed his attentional-narrowing hypothesis few studies

have specifically examined this phenomenon. Of those studies that have examined this phenomenon since Christianson's review, the majority have come out of the eye-witness memory literature and have used non-phobic undergraduate participants (e.g., Wessel, van der Kooy, & Merckelbach, 2000; Libkuman, Stabler, & Otani, 2004). Few studies to date have used individuals with phobias to explore whether this increased recall for central detail information is at the expense of recall for peripheral information.

Libkuman, et al.'s (2004) study used a divided attention task to evaluate whether emotional arousal affects an individual's memory for central and/or peripheral details on negative or positive valenced slides. In their study, undergraduate participants were presented with a series of 36 slides. Eighteen slides in the series were selected because they had a negative emotional valence; nine of these slides were selected because they produced low levels of arousal and nine nine selected because they produced high levels of arousal. Additionally, 18 emotionally positive slides were selected, nine of which produced low levels of arousal and nine of which produced high levels of arousal. After viewing the slides, participants were given a distraction task followed by a cued recall task. In general, the results showed that when slides were rated as producing high levels of arousal, participants' memory for central details was better on both negative and positive slides compared to slides that produced low levels of arousal, and that arousal was associated with improved memory for peripheral details on the positive valenced slides only. These results support Christianson's attentional-narrowing hypothesis (1992) in that they did show an improved memory for central details; however, the study failed to show that this improvement in memory for central details is at the expense of memory for peripheral details. A possible explanation could be found in the methodology and

participant sample used in the study. During the cued recall task there were a total of 44 questions regarding central details and 46 questions regarding peripheral details on the 36 slides. As such, for the majority of slides, there was only one question assessing memory for central detail information and one question assessing memory for peripheral detail information. It is difficult to assess whether attention was being diverted away from peripheral details when memory of peripheral and central information on a slide is assessed with only one question. It is possible that participants did have worse memory for peripheral details compared to central details; however, given the small sample size of questions, the researchers were not able to detect it.

Using non-phobic participants, Wessel, et al. (2000) performed three experiments to examine if emotional arousal promotes the recall of central details and/or hampers the recall of peripheral details. In their first experiment, three groups of undergraduate participants were shown a series of 15 slides depicting a University student going to class. In each of the slides, participant's memories for two critical details was assessed, one that was considered central and one that was considered peripheral. All the slides were the same for the three groups except for one experimental slide. In one group the experimental slide was designed to be unusual (i.e., the student was standing on their hands in the middle of a crosswalk), one group saw a slide that was meant to produce a negative emotional response (i.e., a young girl lying in the crosswalk with blood on her head), and one group saw a slide that was meant to be neutral (i.e., a girl walking in a cross walk). It should be noted that all of the "central" details in the slides were not actually central details as they were neither frightening or anxiety provoking. They were just considered "central" to the story that the slides were conveying and were related to

the actual central detail that was presented in the experimental slide. After viewing the slides, participants completed a memory task. Results from the first experiment did not show an improved recall for central details in the emotional group compared to the neutral group nor did the group that saw the negative emotional arousal slide differ from the group that saw the neutral slide in the number of peripheral details they recalled.

In their second experiment Wessel et al. (2000) attempted to replicate the study performed by Christianson and Loftus (1991) using the slide series Wessel et al. had used in their first experiment. Christianson and Loftus' study mainly differed from Wessel et al.'s first experiment in that Christianson and Loftus only assessed whether participant's recalled the color of the peripheral and central stimuli. Results from their second study did show that participants who viewed the slide series with the emotion-provoking slide were more likely to correctly identify the color of the central detail compared to participants who viewed the slide series with the unusual slide or neutral slide. Their results again did not show a difference in the recall of the color of the peripheral detail.

Wessel et al. (2000) hypothesized that the duration of exposure to the stimuli may be a factor contributing to the differential recall of peripheral and central details. They postulated that the effect of differential attentional focus occurs the first few moments stimuli are presented. If an individual has additional time, they may be able to adequately process all the stimuli in the environment. Wessel et al. hypothesized that the briefer the amount of time the stimuli were presented, the more likely individuals would be to display the differential recall pattern proposed by the attentional-narrowing hypothesis. Participants were presented essentially the same protocol as in their first experiment, in addition to manipulating the valance of the experimental slide; the duration that each

slide was presented was also manipulated. Some participants viewed each slide for 4 seconds followed by a 6.6 second inter-stimulus interval; some participants viewed each slide for 3 seconds with a 1 second inter-stimulus interval. Results showed that the duration of slide presentation did not affect recall of peripheral or central details. What was interesting was that regardless of the duration the slide was presented, those who viewed the emotional slide series recalled fewer central details compared to those who viewed either of the other two slide series, results that contradict findings from their first experiment and run counter to the assertions of the attentional-narrowing hypothesis.

Why Wessel et al. (2000) would perform three different experiments using the same stimuli and produce three different sets of results is unclear. It is possible that Wessel et al. would have gotten more consistent results had they measured participants' memories for more than one central detail and one peripheral detail per slide. Without any variability in the participant's responding it is difficult to know if their attention was actually being narrowed towards central details and away from peripheral details. Additionally, only one response was scored correct for peripheral detail. If peripheral details are any stimuli not associated with the source of arousal, than the researchers were artificially narrowing the scope of correct peripheral items that a participant could recall. Furthermore, since some of their central details were not actually frightening or anxiety provoking, it is possible that there was a memory bias present that they were not able to detect.

Wessel and Merckelbach (1997; 1998) performed two studies examining whether phobic individuals recall significantly more phobic-related details (central details) at the expense of recalling non-phobic related details (peripheral details). These two studies

currently represent the only research using participants who have a specific phobia to examine the attentional-narrowing hypothesis. In their first study, Wessel and Merchelbach (1997) presented participants with a live spider surrounded by other non-spider-related stimuli. Spider phobic and non-phobic individuals were instructed to sit in front of a table where there was a spider in a jar and other non-spider-related details on the table. However, all items on the table were classified as central details regardless of whether they were spider related (e.g., a blue cloth on the table was considered a central detail). Peripheral details were objects that were placed in the room and thought to be in the participant's visual field and were deliberately made outstanding (i.e., items not expected to be in a laboratory such as toy animals and plastic tulips). Results from this study showed that there was a difference in the recall of peripheral stimuli, with spider phobic participants recalling significantly fewer peripheral items than non-phobic individuals. Results from their study did not show a significant difference in recall of central details between phobic and non-phobic participants. Although Wessel and Merckelbach failed to obtain a significant difference in recall of central details between phobic and non-phobic participants, their study had some methodological weaknesses that may have limited their ability to detect a difference in recall between the two groups. First, Wessel and Merckelbach only used one detail that was related to the phobic participants' phobia (i.e., the spider in the jar). All of the other central details were proximally located to the spider but were not actually stimuli related to the emotional response the phobic participants would have to the spider. If we define a central detail as information that is connected to emotional arousal then, by definition, all of the central

details in Wessel and Merckelbach's study were not actually central details and were only in close proximity to the only true central detail (i.e., the spider).

In Wessel and Merckelbach's (1998) second study, examining the recall of central and peripheral details by phobic individuals, participants viewed one of two bulletin board displays with spider-relevant (central detail) and non-spider-relevant (peripheral detail) stimuli. One bulletin board was a spider-centered version while the other was a spider-scattered version. In the spider-centered version, all spider stimuli were clustered in the center of the bulletin board while baby and pen stimuli were at the margins of the board. In the spider-scattered version, stimuli with similar characteristics were grouped together (e.g., drawings, photographs) on the bulletin board. Their results showed that on a free recall task, compared to non-phobic participants, spider phobics recalled significantly more spider-related stimuli and significantly fewer non-spider-related stimuli. However, on a position recall task and a recognition task, spider phobics did not differ from non-phobics in their memory for central and peripheral details. Whether spider phobic participants viewed the spider-centered board or spider-scattered board did not influence participants' memory of stimuli. These results provide partial support for the attentional-narrowing hypothesis. Wessel and Merckelbach's results provide partial support for their hypothesis that the focusing of attention on central detail information is done at the expense of attention for other stimuli in the environment. Additionally, since there was no difference in the recall of stimuli between participants who saw the spider-centered and spider-scattered display, it appears that the position of emotionally central details within the visual display does not influence the recall of stimuli.

Rational for Present Study

Research over the past decade that has examined memory biases in phobic individuals has mainly supported the assertion proposed in the attentional-narrowing hypothesis (Christianson, 1992) that stimuli which evoke a negative emotional state are remembered better than are neutrally valenced stimuli. Little research has examined whether this narrowing of attention towards central details is at the expense of attention to peripheral details. The research that has examined this differential recall has not produced consistent results. The present study sought to correct some of the methodological weaknesses of research examining whether there is a differential recall of peripheral as well as central details in anxiety provoking situations relative to neutral situations.

The majority of studies examining anxiety's influence on the differential recall of peripheral and central details have relied on participants' recall of a single central and peripheral detail (e.g., Wessel, et al., 2000). These studies have presented different groups of participants with a series of slides where the details of one slide in the series are manipulated and one group's memory for a series of slides is compared to another group's memory of a different slide series. Since a participant's memory is being judged based on their recall of only a single stimulus, it is difficult to examine whether cognitive resources were being diverted from the processing of peripheral details. Other studies have classified peripheral details as central details because they were in close proximity of the "true" central detail (Wessel, et al.). If we use the definition of central detail as a stimulus that elicits a negative mood, than just because an item is in close proximity to another stimulus does not necessarily mean it is a central detail. Finally, although Wessel

and Merckelbach (1998) did use more than one central and peripheral detail in their stimulus display board, their stimuli were a mixture of pictures, printed words, and toy representations of stimuli. Anderson (2003) suggested in his review of the literature examining the cognitive process associated with emotional disgust and fear that semantic stimuli may not be anxiety provoking enough to produce a memory bias. As such, some of the stimuli on Wessel and Merckelbach's display may not have produced the desired emotional response.

The current study tested the assertion proposed by Christianson's (1992) attentional-narrowing hypothesis that negative emotional states promote the recall of central details (those stimuli causing the negative emotion) over the recall of peripheral details (stimuli not related to the cause of the negative emotion) while improving the methodology used by Wessel and Merckelbach (1998). Wessel and Merckelbach's results showed phobic individuals had better memory for central details compared to non-phobic individuals' memory for central details. They were not able to show a difference in recall for peripheral details between non-phobic and spider phobic participants. Numerous methodological weaknesses limit the utility of these results. The current study addressed these weaknesses by: 1) using a stimulus-display board that did not use semantic stimuli. As previously mentioned, an unpublished literature review by Anderson suggested that semantic stimuli may not be frightening enough to phobic individuals to produce a cognitive bias towards these types of stimuli; 2) in an effort to improve on the authenticity of the frightening stimuli, actual spider specimens mounted on cards were placed on the board as the frightening stimuli; and 3) in addition to the stimulus-display board with spider related stimuli, a stimulus-display board with the identical arrangement

of peripheral details but non-frightening stimuli in place of the spider stimuli was included to compare phobic and non-phobic individuals responses to peripheral details in general.

We hypothesized that spider phobic individuals would recall significantly more spider details (spider stimuli) compared to peripheral details. We also hypothesized that spider phobic participants would recall significantly more spider details compared to the number of spider details recalled by non-phobic participants. Furthermore, we hypothesized that since the spider stimuli should not be frightening to the non-phobic participants, and as such are not true central details, non-phobic participants would not differ in their recall of central (either spider or office-supply stimuli) and peripheral details. Finally, if the spider phobic participants are using cognitive resources to process central details (i.e. spiders) at the expense of cognitive resources to process peripheral stimuli, than spider phobics who view the stimulus-display board with spider relevant stimuli would recall fewer peripheral stimuli than would spider phobic participants who viewed the stimulus display board without spider-relevant stimuli.

II. METHOD

Participants

Screening session participants. A total of 458 individuals (329 females, 129 males) participated in a screening protocol. All participants were at least 18 years of age and were undergraduate students at Auburn University. Additionally, all participated in this experiment for extra academic credit. The mean age of those who participated in the screening protocol was 20.4 years (*SD* = 2.01) and ages ranged from 18 to 37 years.

Memory session participants. Eighty undergraduate students (65 females, 15 males) were selected to participate in the memory session of the study. The age of participants averaged 20.2 years (SD = 1.91) and ranged from 19 to 32 years. Sixty-nine were Caucasian, 7 were African-American, 1 was Hispanic, 1 was Asian, 1 indicated he/she was multiracial, and 1 indicated his/her race as other. Forty-one participants were selected to the spider phobic group, and 39 participants were selected to the non-phobic group. The two groups did not differ significantly in age or race.

Apparatus and Materials

Stimulus display-board. Participants were randomly assigned to view one of two different versions of the stimulus-display board. Both versions were 30 in. wide and 48 in. tall. The display board was mounted 24 in. off of the ground in a white wooden frame. Both the control and experimental stimulus display board showed 24 stimuli. Each board had six butterflies/moths, six costume jewelry broaches, and six toy trucks. These

objects were located in the same position on each of the two boards. The control board (Appendix A) had an additional six office-supply items (i.e., ballpoint pen, small orange stapler, small bottle of correction fluid, green page tabs, and pink eraser). In the place of these items, the experimental board (Appendix B) had six different spiders. With the exception of the office-supply stimuli on the control board and spider stimuli on the experimental board, the two displays were identical.

Stimuli placement was accomplished in a semi-random fashion. Items were initially placed on the board so that the different items within the categories (e.g., trucks, butterflies/moths) were not clustered together. Next, three undergraduate research assistants and four graduate researchers examined the board to determine if any objects were more readily apparent than the others. Items judged to stand out from the other items were moved around the board until they were no longer judged to be prominent compared to the other items. This process continued until all eight individuals (i.e., primary investigator, three undergraduate research assistants, and four graduate researchers) agreed that the items did not appear to be placed in a systematic formation and no item stood out visually in relation to the other items.

Psychometric measures. A demographic and historical questionnaire was included to assess participants' personal and historical characteristics (Appendix C). The questionnaire included items assessing participant gender, ethnicity, age, level of education, and medical visit history. With the exception of age, which asked for the participant to write their age down, each question was worded in a multiple-choice format.

The Spider Phobia Questionnaire (SPQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974) was administered to measure self-reported spider phobia characteristics (Appendix D). The SPQ is a 31-item true/false questionnaire measuring behavioral, cognitive, and emotional responses to spiders (e.g., "I am terrified by the thought of touching a harmless spider," "The way spiders move is repulsive"). Each of the 31 items on the SPQ is a statement regarding spiders, and the participant indicates whether the statement accurately reflects their beliefs or behaviors. An item answered in a manner indicating a fear or avoidance of spiders is scored as one point. Scores for the 31 items are summed to obtain a total score, ranging from 0-31. Klorman et al. originally reported that the SPQ had an internal consistency ranging from 0.83 to 0.90 and was fairly homogenous in content. A more recent study performed by Muris and Merkelbach (1996) compared the psychometric properties of the SPQ and the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) and found that the SPQ had a test-retest stability of 0.94 ($p<.001$) over a three-week interval. They also found that the SPQ correlated with an individual's performance on a behavioral avoidance task (0.33, $p<.01$ for non-phobic individuals, –0.69, $p<.001$ for spider phobics), and was sensitive to treatment effects.

In addition to the demographic questionnaire and the SPQ, participants completed seven questionnaires whose data were not recorded for this study. These seven additional questionnaires were the Fear Reactivity Index (Vernon & Berenbaum, 2001), the Disgust Sensitivity Index (Haidt, McCauley, & Rozin, 1994), the Medical Avoidance Survey (Kleinknecht, 1991), the Medical Fear Survey (Kleinknecht, Thorndike, & Walls, 1996), and three surveys that measured participants' attitudes and beliefs regarding smoking cigarettes.

Procedure

Screening session. Participants were selected for the memory session of the study through a screening protocol used to select spider phobic individuals in other studies (e.g., Anderson, Vernon, & Rousseau, 2003). This more elaborate screening protocol was used for two reasons: 1) It was an established protocol that had been used to determine participant eligibility for other ongoing research programs and had already produced data on 640 undergraduate participants; 2) By administering irrelevant questionnaires to potential participants, those chosen were less likely to identify the reason they were selected to participate in the study. As noted already, the screening protocol had participants provide demographic information (e.g., age, gender, school class standing) and included questionnaires assessing spider phobia, blood-injection-injury phobia, disgust sensitivity, sensitivity to fear elicitation, and attitudes and behaviors regarding smoking and tobacco use. Only participants' scores on the SPQ were used for assigning group membership.

Undergraduate students seeking extra credit were solicited for participation in the study through on-campus flyers and classroom announcements. The announcements and flyers described the study as exploring emotional responses to different stimuli. The screening session began by having participants sign a consent form indicating they were at least 19 years of age and had not previously participated in this project (Appendix E). Additionally, participants were asked to indicate on the consent form whether they would like to be contacted about participating in the second phase of the study. Prior to receiving the questionnaire packet each participant's name was checked with a list of previous participants in order to ensure he or she had not previously participated in the

screening session. After signing the consent form and being checked on the list of previous participants, individuals were handed the screening packet.

Cutoff scores used to identify spider phobic and non-phobic participants for the memory session were calculated using the SPQ scores of 640 participants who had earlier completed the same research questionnaire packet as part of a prior research project. Separate cutoff scores for each gender were established when it was discovered in the original 640-participant sample that females in general tended to score higher on the SPQ than males. Research on the psychometric properties of the SPQ performed by Klorman et al. (1974) also found that females scored significantly higher on the SPQ than comparable groups of males. The criterion of the top 15% was used to identify spider phobic individuals as it was believed that it would idenitfy all of the spider phobics in addition to any individuals who might have a phobic level of fear related to spiders but had not experienced the disruption of daily activities required by the DSM-IV-TR (American Psychiatric Association, 2000) diagnostic criteria. Forty-one of those who scored in the top 15% for their gender were randomly assigned to the spider phobic group while 39 of those who scored in the bottom 30% for their gender were randomly assigned to the non-phobic group.

Memory session. Once participants were identified as being eligible to participate in the memory session of the study, they were contacted via telephone or e-mail to schedule an individual appointment for the second phase. After coming to the research laboratory and signing a consent form (Appendix F), participants walked into a research room where there was a desk, a computer with monitor, equipment to measure physiological responses, two chairs, and the stimulus-display board which was covered

by a Venetian blind. The computer and monitor were located on top of the desk, and the display board was positioned adjacent to the desk. The participant's chair had arms that allowed the participant to sit comfortably with their arms supported, thus reducing any movements that might interfere with physiological recording. The chair was placed 36 in. in front of the stimulus display board and adjacent to the physiological monitoring equipment. The researcher's chair was placed in front of the monitor so that the researcher could view the monitor with the physiological recording software running.

After sitting in the chair, participants were informed that the experiment was designed to examine individual's physiological responses to different stimuli and that three electrodes would be placed on their fingers to measure skin conductance and heart rate. After the electrodes were placed on the participant's fingers and a satisfactory signal was being received, participants were asked to sit quietly and to move as little as possible so that baseline measurements could be obtained. Once the participant had sat quietly for three minutes, the Venetian blind covering the stimulus board was raised and the participant was allowed to view the stimulus board for two minutes. After two minutes the Venetian blind was lowered and the electrodes were removed.

Next, participants were escorted out of the room where they had viewed the stimulus display board and were taken to another room where they completed distraction and memory tasks. Participants were asked to read several pages of text and to circle every letter "C" that they found on every page. The text they were given described a carriage ride through the countryside of Cambridge and was four pages in length (see Appendix G). This particular text was selected as it had a large number of "Cs" in the text

and had no mention of spiders. Participants were allowed five minutes to circle every "C" they could find in the text.

After five minutes had elapsed, the distraction task was ended and the participants were given a free-recall task. A packet of lined paper (see Appendix H) was given to participants, and they were asked to correctly describe as quickly as they could every object they saw on the board. Participants were told they had only five minutes to complete the task and were to provide only enough detail so that the researcher would know which item they were referring to. Additionally, participants were told they could describe the object's location on the board if it helped differentiate one object from another.

Next, participants were given a position-recall task. They were provided with a sheet of paper with an outline of the display board that was drawn to scale and was divided into eight sections (Appendix I). Participants were allowed to keep the descriptions of objects they had previously written in the free recall task, and were asked to indicate on the sheet of paper where on the board each item was located. Participants were told that they could refer to the numbered items they had previously described and would have five minutes to complete the task. After five minutes had elapsed, the free-recall and position-recall forms were collected.

Finally, participants were given a picture-recognition task that required them to indicate whether an object had been present on the stimulus board. Participants were given a spiral-bound binder with pictures of 36 different stimuli. All 24 stimuli presented on the stimulus display board were represented in the spiral binder in addition to three pictures from each of the stimulus categories (i.e., three trucks, three butterflies, three

broaches, and either three different office items or three spiders) that had not been present on the stimulus-display board. Those participants who viewed the experimental stimulus-display board (i.e., the stimulus board with spiders and not office-supplies) were presented with extra pictures that were spiders, while those who viewed the control stimulus-display board (i.e., the stimulus board with office supplies) were presented with extra pictures of office supplies (see Appendix J and K). Participants were required to circle “YES” if the picture represented an object that was present on the stimulus board and to circle “NO” if the picture represented an object that was not present on the stimulus board.

After completing the memory portion of the study, participants were debriefed regarding the purpose of the experiment and asked if they had any questions. They were asked not to discuss the tasks they performed during the experiment and were given an extra credit voucher.

III. RESULTS

Free Recall

The total number of experimental and peripheral stimuli recalled correctly was determined by checking the participant's descriptions of the items against a previously generated item description key (see Appendix L). The item description key was developed by having two graduate research assistants and the primary investigator write down brief descriptions of the items while viewing each stimulus board. The researchers were instructed to write down key characteristics of each item including its location on the board. The three lists of descriptions that were generated were combined into one master list. Next, four undergraduate research assistants viewed each of the two stimulus boards for two minutes (the same length of time participants were later going to view the board), and wrote down brief descriptions of all the items they saw. A graduate research assistant and the primary investigator then compared the descriptions the undergraduate research assistants generated to the master list. When the undergraduate research assistants generated an item description that was not on the master list, the description was added to the master list if both graduate research assistant and primary investigator agreed that it uniquely described a particular item.

If a participant's description of an item corresponded to one of the descriptions on the master list, the item was scored as correctly recalled. Since there were three times as many peripheral items as there were experimental items on the stimulus boards, the total

number of peripheral items was divided by three to facilitate comparisons with the experimental variable. The number of experimental stimuli recalled was calculated by totaling the number of spider stimuli recalled for those participants who viewed the experimental stimulus-board or totaling the number of office-supply stimuli recalled for those participants who viewed the control stimulus-board.

Reliability rating. To determine that participants' descriptions were being scored consistently, a second rater independently scored responses from a randomly selected sample of eight participants. Overall, the two raters agreed on 88.5% of the items. Interrater reliability varied from 85.4% agreement on peripheral stimuli, to 97.9% agreement on experimental stimuli. Table 1 provides a summary of the frequency of items that the two raters agreed/disagreed upon by each stimulus category.

Table 1

Frequency and Percentage of Interrater Concurrence for Free Recall Stimuli

Category		*Frequency*	*Percent*
Truck	Disagree	7	14.6
	Agree	41	85.4
Broach	Disagree	5	10.4
	Agree	43	89.6
Butterfly/moth	Disagree	9	18.8
	Agree	39	81.2
Spider	Disagree	0	0
	Agree	12	100
Office-supply	Disagree	1	2.8
	Agree	35	97.2

Data analysis. A 2 (Stimuli Type: Experimental Stimuli, Peripheral Stimuli) x 2 (Board: Control, Experimental) x 2 (Group: Spider Phobic, Non-phobic) repeated measures ANOVA (repeated on Stimuli Type) within scores for numbers of items recalled revealed a significant main effect for Board, $F(1, 76) = 51.250$, $p<.001$, and for Stimuli Type, $F(1, 76) = 73.21$, $p<.001$, as well as a significant interaction for Stimuli Type x Board, $F(1, 76) = 22.11$, $p<.001$. Table 2 provides the mean recall scores for each group.

Table 2

Mean Free Recall of Experimental and Peripheral Stimuli

Board	*Group*	*Stimuli Type*	*Mean*	*SD*
Experimental	Spider Phobic	Spiders	1.73	(1.32)
		Peripheral	1.30	(.77)
Experimental	Non-phobic	Spiders	2.11	(1.32)
		Peripheral	1.40	(.77)
Control	Spider Phobic	Office-Supplies	3.79	(1.32)
		Peripheral	2.11	(.77)
Control	Non-phobic	Office-Supplies	4.20	(1.32)
		Peripheral	1.92	(.77)

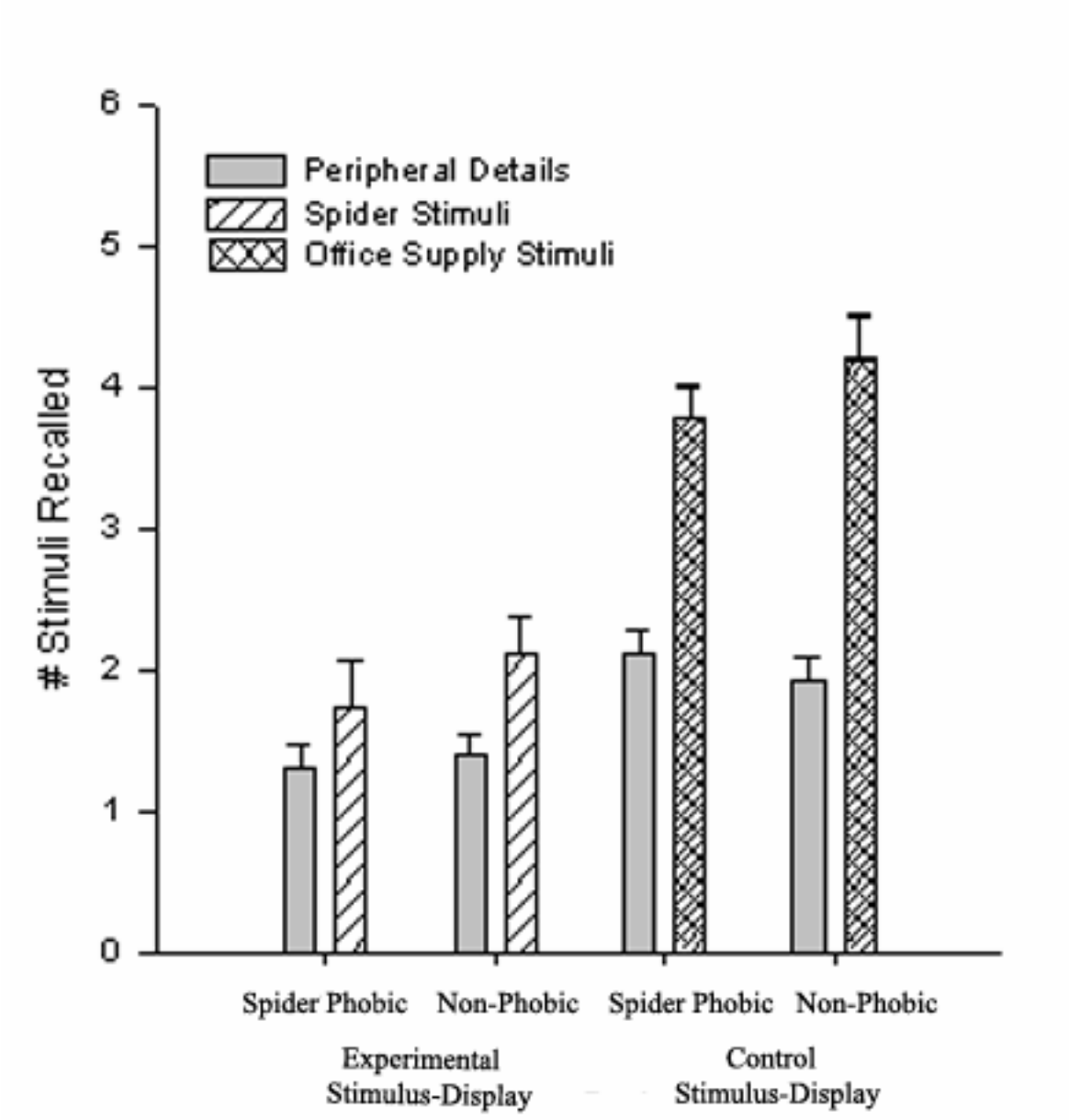
The significant interaction of Stimuli Type x Board was a function of participants who viewed the control stimulus-board (both spider phobic and non-phobic) recalling more office-supply stimuli than peripheral stimuli $F(1, 37) = 82.45$, $p<.001$, and more

office-supply stimuli than the number of spider stimuli recalled by participants who viewed the experimental stimulus-display $F(1, 76) = 76.24$, $p<.001$ (see Figure 1).

To examine the assertion that anxiety causes a focusing of attention towards stimuli that are the cause of the anxiety (i.e., central details) and away from other non-anxiety provoking details (i.e., peripheral details) in the environment, several post-hoc comparisons were performed. First, total recall of experimental and peripheral stimuli was compared between spider phobics who viewed the experimental (spider) stimulus-board and spider phobics who viewed the control (office-supplies) stimulus-board. It is hypothesized that if attention is being directed toward threat, then spider phobics who view the experimental board should recall more spider stimuli than spider phobics who view the control board recall office-supply stimuli. Contrary to the above hypothesis, comparisons showed that spider phobics recalled significantly more office-supply stimuli than spider stimuli $F(2, 76) = 13.68$, $p<.001$. Additionally, if this focus of attentional resources towards central details (threat) were at the expense of cognitive resources used to process other stimuli in the environment, then one would expect spider phobics who view the board with spiders to recall significantly fewer peripheral details than spider phobics who view the board with office supplies. Contrast comparisons showed that spider phobics who viewed the control stimulus-board (office supplies) recalled significantly more peripheral items than spider phobics who viewed the experimental board $F(2, 76) = 6.32$, $p<.005$.

Figure 1

Mean Experimental and Peripheral Stimuli Recalled by Phobic Group and Board Type



Contrasts were next performed to determine if spider phobics who viewed the experimental stimulus-board differed in the number of stimuli they recalled from non-phobics who viewed the experimental stimulus-board. If Christianson's attentional-narrowing hypothesis is correct, then we would expect spider phobics who viewed the experimental stimulus board to recall significantly more spider stimuli and significantly fewer peripheral stimuli than non-phobics. Comparisons did not show a significant difference between spider phobic and non-phobic individuals who viewed the experimental stimulus-board in the number of peripheral stimuli, $F(1, 39) = .766$, $p = .387$ or experimental stimuli, $F(1, 39) = .183$, $p = .671$ they recalled.

Position Recall

A scoring key was developed by dividing each stimulus-board into eight equal sections. The section location of each item was then recorded. If an item happened to reside in more than one of the eight sections, then all sections that the item resided in were considered correct. The numbers of correctly positioned peripheral stimuli and experimental stimuli were then separately totaled. Since there were three times as many peripheral stimuli on the stimulus-boards than experimental stimuli, the total number of peripheral stimuli positioned correctly was divided by three to facilitate comparisons.

Reliability rating. To ensure that participants' positional recall of stimuli was being scored consistently, a second rater independently scored data from a randomly selected sample of eight participants. Overall, the two raters agreed on 85.9% of the items. Interrater reliability varied from 85.4% agreement on experimental stimuli to 86.1% agreement on peripheral stimuli. Table 3 provides a summary of the frequency of items that the two raters agreed/disagreed upon by each stimulus category.

Table 3

Frequency and Percentage of Interrater Concurrence for Positional Recall Stimuli

Category		*Frequency*	*Percent*
Truck	Disagree	6	12.5
	Agree	42	87.5
Broach	Disagree	7	14.6
	Agree	41	85.4
Butterfly/Moth	Disagree	7	14.6
	Agree	41	85.4
Spider	Disagree	1	8.3
	Agree	11	91.7
Office-Supply	Disagree	6	16.7
	Agree	30	83.3

Data analysis. A 2 (Stimuli Type: Experimental Stimuli, Peripheral Stimuli) x 2 (Board: Control, Experimental) x 2 (Group: Spider Phobic, Non-phobic) repeated measures ANOVA (repeated on Stimuli Type) within score for numbers of items correctly positioned revealed a significant main effect for Stimuli Type, $F(1, 76) = 26.99$, $p<.001$. There were no significant interactions. An examination of the means showed that the main effect of Stimuli Type was a function of participants correctly positioning significantly more experimental stimuli (spiders or office items) than peripheral stimuli. Table 4 provides the mean positional recall scores for each of the experimental groups.

Table 4

Mean Position Recall of Experimental and Peripheral Stimuli

Board	*Group*	*Stimuli Type*	*Mean*	*SD*
Experimental	Spider Phobic	Spiders	2.32	(1.42)
		Peripheral	1.71	(.75)
Experimental	Non-phobic	Spiders	2.58	(1.42)
		Peripheral	1.45	(.75)
Control	Spider Phobic	Office-Supplies	2.32	(1.42)
		Peripheral	1.74	(.75)
Control	Non-phobic	Office-Supplies	3.1	(1.42)
		Peripheral	2.12	(.75)

Recognition Memory

Total items recognized was calculated by giving participants one point for each item they correctly identified as having been on the display board as well as one point for each item correctly identified as not having been on the display board. The total numbers of peripheral and experimental stimuli correctly identified were then calculated separately. Since there were three times as many peripheral stimuli on the board as experimental stimuli, the total number of peripheral items that participants recognized correctly was divided by three. The total numbers of peripheral and experimental stimuli recognized ranged from 0 to 9.

Data Analysis. A 2 (Stimuli Type: Experimental Stimuli, Peripheral Stimuli) x 2 (Board: Control, Experimental) x 2 (Group: Spider Phobic, Non-phobic) repeated measures ANOVA (repeated on Stimuli Type) within the data for number of stimuli recognized revealed a significant main effect for Board, $F(1, 76) = 28.36$, $p<.001$, and Stimuli Type, $F(1, 76) = 101.74$, $p<.001$, as well as a significant interaction for Stimuli Type x Board, $F(1, 76) = 10.55$, $p<.005$. Table 5 provides the mean recognition scores for each of the experimental groups.

Table 5

Mean Recognition of Peripheral and Experimental Stimuli

Board	*Group*	*Stimuli Type*	*Mean*	*SD*
Experimental	Spider Phobic	Spiders	6.41	(1.30)
		Peripheral	5.55	(.98)
Experimental	Non-phobic	Spiders	7.05	(1.31)
		Peripheral	5.47	(.94)
Control	Spider Phobic	Office-Supplies	8.16	(1.31)
		Peripheral	5.9	(.94)
Control	Non-phobic	Office-Supplies	8.4	(1.31)
		Peripheral	5.9	(.94)

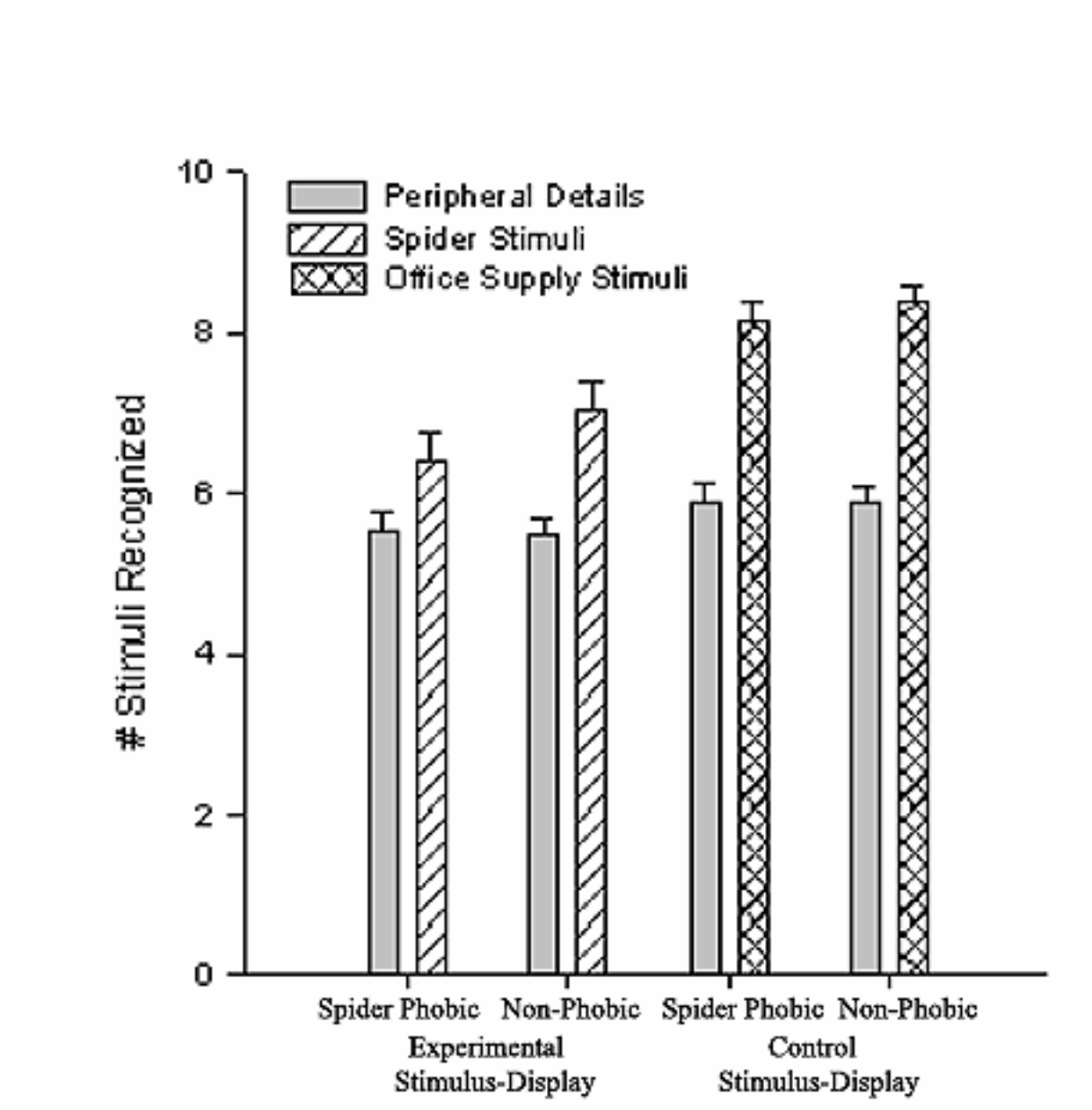
The significant interaction of Stimuli Type x Board was a function of participants who viewed the control stimulus-board recognizing more office-supply stimuli than peripheral stimuli, $F(1, 37) = 82.45$, $p<.001$. Additionally, more office-supply stimuli

were recognized by participants who viewed the control board than the spider stimuli recognized by participants who viewed the experimental stimulus-display, $F(1, 76) = 247.76$, $p<.001$ (see Figure 2).

To examine the hypothesis that anxiety causes a focusing of attention towards stimuli that are the cause of the anxiety (i.e., central details) and away from other details (i.e., peripheral details) in the environment, several post-hoc comparisons were performed. First, recognition of experimental and peripheral items was compared between spider phobics who viewed the experimental stimulus-board and spider phobics who viewed the control stimulus-board. It is hypothesized that if attention is being directed towards threat, then spider phobic participants who view the experimental board should recognize more spider stimuli compared to the number of office-supply stimuli recognized by spider phobic participants who view the control stimulus-board. Contrary to this hypothesis, comparisons showed that spider phobics recognized significantly more office supply stimuli than spider stimuli, $F(2, 76) = 15.77$, $p<.001$. Additionally, if a direction of attentional resources towards central details is at the expense of attention to other stimuli, then spider phobics who view the board with spider stimuli should recognize significantly fewer peripheral details than spider phobics who view the stimulus-board without spider stimuli. Contrast comparisons did not show a significant difference between the two groups in their recognition of peripheral stimuli, $F(2,76) = 1.11$, $p=.336$.

Figure 2

Mean Experimental and Peripheral Stimuli Recognized by Phobic Group and Board Type



Simple contrasts were also performed to determine if spider phobics who viewed the experimental stimulus-board differed in the number of stimuli they recalled from non-phobics who viewed the experimental stimulus-board. If Christianson's (1992) attentional-narrowing hypothesis is correct, then we would expect spider phobics who viewed the experimental stimulus-board to recognize significantly more spider stimuli and significantly fewer peripheral stimuli than non-phobic participants who viewed the experimental stimulus-board. Comparisons did not show a significant difference between spider phobic and non-phobic participants who viewed the experimental stimulus board with respect either to the number of peripheral stimuli, $F(1, 39) = .054$, $p=.818$ or spiders recalled, $F(1, 39) = 1.75$, $p=.194$.

IV. DISCUSSION

The purpose of this study was to examine the effect fearsome stimuli have on phobic individual's recall of central and peripheral details of scenes in which the stimuli appear. Christianson (1992) proposed in his attentional-narrowing hypothesis that fearsome stimuli are better recalled than non-fearsome stimuli. The work presented here tested that proposal and improved on some of the methodological weaknesses employed in past experiments. Our study included a sample of phobic participants in addition to non-phobic participants so that the central details presented would more likely produce the desired emotional response (i.e., fear), as stimuli that are frightening to phobics are readily known. Memory for more than one central detail and more than one peripheral detail within the environment was also assessed here as some prior research had only assessed participants' memory for only one peripheral detail and one central detail. Finally, a control stimulus display was incorporated into the experiment to evaluate whether attention to emotionally central details occurs at the expense of attention to peripheral details.

Free Recall

Results from measures assessing free recall showed that regardless of participants' phobic status, those who viewed the control stimulus-display recalled more of the office-supply stimuli than they recalled peripheral stimuli. Additionally, participants who viewed the control stimulus-display recalled more office-supply stimuli

than participants who viewed the experimental stimulus-display recalled spider stimuli. This pattern of results neither supports Christianson's (1992) attentional-narrowing hypothesis nor Williams, et al.'s, (1988) cognitive-avoidance theory. To support Christianson's attentional-narrowing hypothesis, spider phobics who viewed the experimental stimulus display would have had to recall significantly more spider stimuli than spider phobics who viewed the control stimulus display recalled office-supply stimuli. This pattern of differential recall was not observed. In fact, spider phobic participants who viewed the control stimulus board recalled significantly more office-supply stimuli than spider phobics who viewed the experimental stimulus display recalled spider stimuli.

Although these results do not support Christianson's (1992) attentional-narrowing hypothesis, an interesting finding appears to be the lack of differential recall between spider phobic and non-phobic participants who viewed the board with spider-related stimuli. Recent research suggests that anxiety promotes the recall of frightening stimuli relative to non-frightening stimuli (e.g., Kindt & Brosschot, 1998b); however, Mathews and MacLeod (1994) concluded in their literature review that anxiety impairs recall and recognition. The current pattern of results suggests anxiety does not influence an individual's recall of information either way. Christianson's theory is based on the assumption that there is an attentional bias towards threatening stimuli; this attentional bias leads to an increase in cognitive processing of stimuli, and this increase in cognitive processing leads to improved memory. Although research does support the notion that there is an attentional bias toward frightening stimuli (e.g., Thorpe & Salkovskis, 1997; Thorpe & Salkovskis, 1998; Kindt & Brosschot, 1998a, Martin & Jones, 1995), this

attentional bias does not appear to lead to improved memory in the manner Christianson suggests. It is possible that Williams, et al.'s, (1988) cognitive-avoidance theory is correct and that individuals do process frightening stimuli more thoroughly than non-frightening stimuli but avoid recalling the information as a strategy to avoid experiencing the negative emotion of anxiety. However, in our study spider phobic participants did not display impaired memory for spider stimuli relative to other stimuli on the board as this hypothesis would predict.

Williams et al.'s (1988) cognitive-avoidance theory generates the prediction that individuals will show superior recall and recognition for non-anxiety-provoking stimuli compared to their recall for anxiety-provoking material. Their theory does not explain why all participants recalled more office-supply stimuli relative to all other non-anxiety-provoking stimuli. If we assume that the office-supply stimuli did not produce a negative emotional state relative to the other stimuli on the two stimulus-displays, than we must assume there was another characteristic about the office-supply stimuli that facilitated their recall relative to all other stimuli on the board.

Although all the stimuli on the board were unique, an examination of items within each category (e.g., spider stimuli, butterfly/moths, toy trucks) indicates that items within the office-supply category were more heterogeneous than items within the other categories. Items within the other categories (i.e., spider stimuli, toy trucks, butterfly/ moths, jewelry/broaches) were all similar versions of the same items (e.g., all spider stimuli were spiders); however, items within the office-supply stimuli category were all unique items that would be found in a typical office (e.g., a stapler, a pen, an eraser). It is possible that since each of these items was unique and had more features that an

individual could use to differentiate one from the other, participants were able to better recall the office-supply items relative to the other stimuli on the board.

Some research from the eye witness memory literature suggests that unique or unusual stimuli are remembered differently than neutral or emotionally negative stimuli (Christianson & Loftus, 1991; Christianson Loftus, Hoffman, & Loftus, 1991; Wessel, et al., 2000); however, research in this area has not produced consistent results. Christianson and Loftus presented participants with one of three slide series. Each of the slides within the series depicted a scene a person might see while going to work (e.g. bus stop, a table in a kitchen). Each of the three slide series was identical with the exception of one critical slide. For one of the slide series, the critical slide was designed to be neutral (i.e. a girl riding her bike), for another of the slide series the critical slide was designed to be unusual (i.e. the girl carrying her bike), and the other slide series was designed to elicit a negative emotional response (i.e. the girl laying next to her bike and a tree with blood on her head). As with much of the eyewitness research that has used different slide series to examine emotion's effect on memory, only one central detail on the critical slide was scored as correct and only one peripheral detail on the critical slide was scored as correct. They concluded that participants in the unusual condition performed poorly when recalling central and peripheral details relative to the performance of participants who viewed the emotional slide series.

Christianson et al. (1991) used the same basic methodology and slide series described above to conduct a series of experiments designed to examine if the duration of eye fixation on a stimulus could account for individual's improved memory of central detail information relative to peripheral detail information. Results showed improved

recall for the central detail in the unusual and emotional slide relative to recall of the central detail on the neutral slide even when the duration of eye fixation on the stimulus was restricted to be equal for the different stimuli.

Wessel et al. (2000) conducted three experiments where they used the same methodology as Christianson and Loftus (1991) described above but with three slightly different series of slides. Their first experiment showed participants had improved recall for the central detail that was unusual relative to participants' recall of the central detail that was considered emotional or neutral. Their two follow-up studies did not show a difference in recall of the central details between participants who viewed the unusual and neutral slide series. Given the conflicting results produced from this area of research it is difficult to determine if the uniqueness of the items facilitated memory.

A more plausible explanation for participant's improved recall of the office-supply stimuli may be related to how they cognitively organized the stimuli on the board. It was assumed that there were four distinct categories of stimuli on each of the stimulus-displays (i.e. butterfly/moths, toy trucks, jewelry/broaches, and either office-supply or spider stimuli). It is hypothesized that individuals have a tendency to organize stimuli into categories based on elements that the individual perceives the stimuli have in common (Mervis & Rosch, 1981). For example, participants may have organized all of the spider stimuli into one category as all spider stimuli had eight legs and resembled different versions of house spiders, and all of the toy truck stimuli into another category as they all had wheels, doors, and were roughly in the shape of a truck or car. Research has shown that groups of items which are heterogeneous are less likely to be cognitively chunked or clustered together in memory relative to items that are more similar (Hudson,

1969). Since items within the office-supply category were more heterogeneous than items within the other stimulus categories, participants may not have clustered the objects together in memory, or may have organized the office-supply stimuli into more discrete categories than the number of categories they organized the other stimuli types. Cognitively grouping items into categories has been shown to facilitate recall (Hudson, Roberts, & Davis, 1974). When individual items within a category are to be remembered, an individual must identify some element (such as color or shape) to discriminate one item within the category from another (Gobet et al., 2001). If office-supply stimuli were not grouped into categories or were grouped into more discrete categories than stimuli from the other categories on the stimulus-display, than there would be fewer items within each category and participants would have to identify fewer elements to differentiate items within the category. This would facilitate the recall of office-supply stimuli relative to the other stimuli types on the stimulus-display.

Position Recall

Results from measures assessing position recall showed that participants correctly positioned significantly more central details than peripheral details. No effect was found for phobic status or for board type. The lack of a significant effect for phobic status or a significant interaction of phobic status and board type does not support the attentional-narrowing hypothesis, as phobic individuals did not recall the positions of frightening stimuli better than they recalled those of non-frightening stimuli. The reasons for these results are unclear. It is possible that the unique characteristics of the office-supply stimuli mentioned above produced the null findings; however, this would not account for the fact that more spider stimuli were correctly positioned than peripheral stimuli. It is

possible that fear may not have an effect on an individual's position recall of stimuli. If fear works as an early detection system for threat in the environment, it is possible that once detected the exact position of the threat is not as important to remember, as is the ability to identify and remember what the threat was so that it can be avoided.

Recognition Memory

Results from measures assessing participants' recognition for central and peripheral details were similar to results obtained from measures assessing free recall. Regardless of participant's phobic status, those who viewed the stimulus-display with office-supply stimuli correctly recognized significantly more office-supply stimuli than peripheral stimuli. Additionally, participants who viewed the control stimulus-display recalled more office-supply stimuli than participants who viewed the experimental stimulus-display recalled spider stimuli. Again, this pattern of results neither supports Christianson's (1992) attentional-narrowing hypothesis nor Williams et al.'s, (1988) cognitive-avoidance theory. The fact that all participants, both phobic and non-phobic, who viewed the control stimulus display correctly recognized significantly more office-supply stimuli than all other stimuli on the board and significantly more office-supply stimuli than the number of spider stimuli recognized by participants who viewed the experimental stimulus display suggests that there was some characteristic about the office-supply stimuli that facilitated participants' memory for these items. As previously mentioned, with the exception of the office-supply stimuli, all items within each of the stimuli categories were different versions of the same item, whereas items within the office-supply stimuli category where all unique items that could be used in an office. This could have facilitated the cognitive chunking of office-supply stimuli into more

categories, and enabled participants to recognize more office-supply stimuli relative to peripheral or spider stimuli.

Limitations of the Study

The major limitations of this study revolve around the possible "uniqueness" of the office-supply stimuli and our selection criteria for inclusion of participants into the spider phobic group. As previously mentioned, participants had better recall and recognition for the office-supply stimuli compared to the other stimuli types on the two boards. We speculate that there was some other characteristic about the office-supply items that enabled participants to recall and recognize them better than the other stimuli. As noted earlier, all other stimuli within each of the four other categories were variations of the same item, whereas each item within the office-supply stimuli category was different. As some researchers have suggested that unique or unusual stimuli are remembered differently than emotional or pedestrian stimuli (Christianson & Loftus, 1991; Christianson Loftus, Hoffman, & Loftus, 1991; Wessel, et al., 2000), it may have been the uniqueness of the office-supply stimuli that lead to participants' superior recall and recognition. However, more likely true is the hypothesis that the heterogeneity of items within the office-supply stimuli category allowed participants to cognitively chunk stimuli within the office-supply stimuli group into smaller groups categories compared to items within the other stimuli categories, and this facilitated the memory of office-supply stimuli relative to the other stimuli on the display boards.

Although our inability to observe a memory bias for frightening stimuli may have been due to the use of a non-clinical sample, the selection criteria employed in the study are believed to be stringent enough to identify spider phobic individuals in addition to

any individuals who might have a phobic level of fear related to spiders but have not experienced the disruption of daily activities required by the DSM-IV-TR (American Psychiatric Association, 2000) diagnostic criteria. The selection criteria used in this study had been used in previous experimental protocols to identify individuals with spider phobia and data had already been collected on over 640 participants. These previously collected data were used to determine cut-off scores for this study. Although our cut-off scores were below the average SPQ scores reported by Muris and Merkelbach (1996) for individuals who met the DSM-III-R (American Psychological Association, 1987) criteria for spider phobia, it is difficult to make direct comparisons between our participant population and the participants in Muris and Merkelbach study. All spider phobic participants in Muris and Merkelbach's study were individuals who were seeking treatment for their spider phobia. It is possible that spider phobics who are seeking treatment may score higher than spider phobics who are not actively seeking treatment. Additionally, our study used gender specific cut-off scores; Muris and Merkelbach did not. Research on the psychometric properties of the SPQ performed by Klorman, et al., (1974) found that females scored significantly higher on the SPQ than comparable groups of males. Finally, our cut-off scores for inclusion in the spider phobic group were 1 and 1.5 standard deviations above the gender specific mean SPQ scores reported by Klorman, et al., (1974). Although it is believed that our selection criteria were stringent enough to only select individuals who were experiencing phobic levels of fear, the research should probably be done with participants who have been selected to meet all DSM-IV criteria for spider phobia.

Conclusions and Future Directions

The study reported here was designed to examine whether phobic individuals have better memory for frightening stimuli relative to non-frightening stimuli in the environment. Christianson (1992) proposed in his attentional-narrowing hypothesis that anxiety would cause individuals to focus their attention on the source of the anxiety, and this focusing of anxiety would lead to a more thorough processing of the stimuli. This more thorough cognitive processing would, in turn, lead to an improved recall and recognition for the anxiety-provoking stimulus relative to non-threatening stimuli within the environment. In brief, our results did not support the assumption that frightening stimuli are remembered better than are non-frightening stimuli. It is possible that there is not a memory bias for either frightening stimuli as Christianson has proposed or against frightening stimuli as Williams, et al., (1988) have proposed. Some researchers have proposed that there is no memory bias associated with anxiety and that memory biases are more likely associated with the emotion of depression (see Hertel, 2004). Since participants who viewed the experimental stimulus display, the one with spiders, did not exhibit a memory bias for or against these central details, it would appear that there is not an anxiety-associated memory bias. However, given the fact that office-supply stimuli were recalled more than peripheral or spider stimuli, the most plausible explanation for this pattern of results is the categorical heterogeneity of items within the office-supply stimuli group. It appears that this heterogeneity facilitated participant's memory for office-supply stimuli by allowing them to chunk the items into numerous subordinate categories of items within the superordinate category of office-supplies. The increase in number of categories, relative to a constant number of stimuli, would lead to fewer

stimuli within each category and thus would facilitate recall and recognition of more office-supply stimuli relative to participant's recall and recognition of the other stimuli on the display board. Future research examining anxiety's effect on the differential recall of central and peripheral details should use non-frightening stimuli that are categorically equivalent to items within the feared stimuli category.

It is possible that the lack of a true clinical sample hampered our ability to obtain an anxiety-associated memory bias. Although it was believed that the spider phobic participants were sufficiently fearful of spiders that they would be frightened of the spiders on the display board, it is possible that this was not true. Thus, future studies should attempt to use the dual display experimental design used in this study with a population that has a more pathological fear of spiders. Additionally, it may be interesting to have participants rate how anxious the stimulus display made them to ensure that they were sufficiently aroused. Alternately, although this research did not use the physiological data obtained during the experiment, future studies could use physiological measures to evaluate whether the stimulus-display is making the phobic individuals anxious. Finally, since the office-supply stimuli category was comprised of several different items and all other stimuli categories were comprised of different versions of the same item, it would be interesting to comprise the items within the office-supply stimuli category of different versions of the same item (e.g., six different erasers) to see if it was the uniqueness of the items that caused there to be a memory bias for these items.

REFERENCES

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed, revision). Washington, DC. Author.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC. Author.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC. Author.

Anderson, C. F. (2003). Threat in specific phobias: The cognitive processes of fear and disgust. Unpublished manuscript.

Anderson, C. F., Vernon, L. L., & Rousseau, G. S. (2003, November). Disgust and Attentional Bias: An exploration of phobic responses to disgust stimuli. Poster presented at the *Annual Meeting of the Association for the Advancement of Behavior Therapy*, Boston, MA.

Beck, A. T., & Emery, G. (1985). *Anxiety disorders and phobias: A cognitive perspective*. New York: Basic Books.

Christianson, S. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Review, 112,* 284-309.

Christianson, S., & Loftus, E. F. (1991). Remembering emotional events: The fate of detailed information. *Cognition and Emotion, 5,* 81-108.

Christianson, S., Loftus, E. F., Hoffman, H., & Loftus, G. R. (1991). Eye fixations and memory for emotional events. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 17,* 693-701.

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66,* 183-201.

Eysenck, M. W. (1992). *Anxiety: The cognitive perspective*. London: Lawrence Erlbaum.

Gobet, F., Lane, P. C., Croker, S., Cheng, P., Jones, G., Oliver, I., & Pine, J. M. (2001). Chunking mechanisms in human learning. *Trends in Cognitive Sciences, 5,* 236-243.

Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences, 16,* 701-713.

Hertel, P. (2004). Memory for emotional and nonemotional events in depression: A question of Habit? In D. Reisberg & P. Hertel (Eds.), *Memory and Emotion* (pp.186-216). New York, NY: Oxford University Press.

Hudson, R. L. (1969). Category clustering for immediate and delayed recall as a function of recall cue information and response dominance variability. *Journal of Experimental Psychology, 82,* 575-577.

Hudson, R. L., Roberts, J. D., & Davis, J. L. (1974). Effects of information and cueing on recall and organization of a categorizable word list. *Psychological Reports, 34,* 131-136.

Kessler, R. C., Cui, W. T., Demler, O., & Walters , E. E. (2006). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62,* 617-627.

Kindt, M., & Brosschot, J. F. (1998a). Stability of cognitive bias for threat cues in phobia. *Journal of Psychopathology and Behavioral Assessment, 20,* 351-367.

Kindt, M., & Brosschot, J. F. (1998b). Cognitive avoidance in phobias. *Journal of Psychopathology and Behavioral Assessment, 20,* 43-55.

Kindt, M., Brosschot, J. F., & Boiten, F. B. (1999). High level cognitions in phobics. Abstract anticipatory memory is associated with the attenuation of physiological reactivity to threat. *Journal of Anxiety Disorders, 13,* 473-489.

Kleinknecht, R. A. (1991, November). Dimensions of blood/injury and medically related fears: Development of the Medical Fears Survey. Paper presented to the *25th Annual Meeting of the Association for Advancement of Behavior Therapy*.

Kleinknecht, R. A., Thorndike, R. M., & Walls, M. M. (1996). Factorial dimensions and correlates of blood, injury, injection, and related medical fears: Cross validation of the Medical Fear Survey. *Behaviour Research and Therapy, 34*, 323-331.

Koch, M. D., O'Neill, H. K., Sawchuk, C. N., & Connolly, K. (2002). Domain-specific and generalized disgust sensitivity in blood-injection-injury phobia: The application of behavioral approach/avoidance tasks. *Journal of Anxiety Disorders, 16,* 511-527.

Klorman, R., Hastings, J., Weerts, T., Memamed, B., & Lang, P. (1974). Psychometric description of some specific fear questionnaires. *Behavior Therapy, 5,* 401-409.

Lazarus, R. S. (1982). Thoughts on the relationship between emotion and cognition. *American Psychologist, 37,* 1019-1024.

Libkuman, T. M., Stabler, C. L., & Otani, H. (2004). Arousal, valence, and memory for detail. *Memory, 12,* 237-247.

Martin, M., & Jones, G. V. (1995). Integral bias in the cognitive processing of emotionally linked pictures. *British Journal of Psychology, 86,* 419-435.

Mathews, A., & MacLeod, C. (1994). Cognitive approaches to emotion and emotional disorders. *Annual Review of Psychology, 45,* 25-50.

Mervis, C. B., & Rosch, E. (1981). Categorization of natural objects. *Annual Review of Psychology, 32,* 89-115.

Mowrer, O. H. (1939). A stimulus-response analysis of anxiety and its role as a reinforcing agent. *Psychological Review, 46,* 553-565.

Muris, P., & Merckelbach, H. (1996) A comparison of two spider fear questionnaires. *Journal of Behavior Therapy and Experimental Psychiatry, 27,* 241-244.

Rachman, S. (1977). The conditioning theory of fear-acquisition: A critical examination. *Behaviour Research and Therapy, 15,* 375-387.

Sawchuk, C. N., Lohr, J. M., Westendorf, D. H., Meunier, S. A., & Tolin, D. F. (2002). Emotional responding to fearful and disgusting stimuli in specific phobics. *Behaviour Research and Therapy, 40,* 1031-1046.

Seligman, M. E. P. (1971). Phobias and Preparedness. *Behavior Therapy, 2,* 307-320.

Szymanski, J., & O'Donohue, W. (1995). Fear of Spiders Questionnaire. *Journal of Behavior Therapy and Experimental Psychiatry, 26,* 31-34.

Thorpe, S. J., & Salkovskis, P. M. (1997). Information processing in spider phobics: The Stroop colour naming task may indicate strategic but not automatic attentional bias. *Behaviour Research and Therapy, 35,* 131-144.

Thorpe, S. J., & Salkovskis, P.M. (1998). Studies on the role of disgust in the acquisition and maintenance of specific phobias. *Behaviour Research and Therapy, 36,* 877-893.

Tolin, D. F., Lohr, J. M., Sawchuk, C. N., & Lee, T. C. (1997). Disgust and disgust sensitivity in blood-injection-injury and spider phobia. *Behavior Research and Therapy, 35,* 949-953.

Vernon, L. L., & Berebaum, H. (2002). Disgust and fear in response to spiders. *Cognition and Emotion, 16,* 809-830.

Wessel, I., & Merckelbach, H. (1997). The impact of anxiety on memory for details in spider phobics. *Applied Cognitive Psychology, 11,* 223-231.

Wessel, I., & Merckelbach, H. (1998). Memory for threat-irrelevant cues in spider phobics. *Cognition and Emotion, 12,* 93-104.

Wessel, I., van der Kooy, P., & Merckelbach, H. (2000). Differential recall of central and peripheral details of emotional slides is not a stable phenomenon. *Memory, 8,* 95-109.

Williams, J. M., G., Watts, F. N., MacLeod, C., & Mathews, A. (1988). *Cognitive Psychology and Emotional Disorders.* Chichester: Wiley.

Yerkes, R.M., & Dodson, J.D. (1908). The relation of strength of stimulus to rapidity of habit-information. *Journal of Comparative Neurology and Psychology, 18,* 459-482.

APPENDIX A

Control Stimulus-Display Layout

APPENDIX B

Experimental Stimulus-Display Layout

APPENDIX C

Demographic and Historical Questionnaire

Subject # _____

1. Age: _____

2. Gender: O Male O Female

3. Which area best describes where you grew up?
   - O Rural (Country)
   - O Suburban/Small Town (Outside a large city or in a small town)
   - O Urban (City)

4. Which of the following best describes your primary race/ethnicity? (Please check only one choice.)
   - O Asian-American
   - O Black/African American
   - O Native American
   - O Hispanic
   - O White/Caucasian
   - O Multiracial(specify:_____)
   - O Other (specify: _____)

5. Which category does your major fall into?
   - O Arts (Art, Dance, Design, Language, Music, Theatre)
   - O Business (Accounting, Computer Science, Economics, Finance, Marketing)
   - O Health Professions(Athletic Training, Physical Therapy, Physician's Assistant, premed
   - O Humanities (Education, English, History, Philosophy, Journalism, Religion)
   - O Math/Engineering
   - O Natural Science (Biology, Chemistry, Physics, Geography)
   - O Social Science (Anthropology, Communication Disorders, Human/Child development, Political Science, Psychology, Sociology, Social Work)
   - O Undeclared
   - O Other (specify: _____)

6. What is your current year in school? (Please circle only one choice.)
   - O First year (Freshman)
   - O Junior
   - O Graduate
   - O Sophomore
   - O Senior

7. Approximately how many doctors visits have you had in the previous year?
   - O None
   - O 1-2
   - O 3-4
   - O 5-10
   - O More than 10

8. Do you have any tattoos or piercings other than ears?
   - O Yes
   - O No

APPENDIX D

Spider Phobia Questionnaire (SPQ)

Directions: Below are some statements about spiders. Please circle either true or false regarding how you feel about each statement.

		T TRUE	F FALSE
1.	I avoid going to parks or on camping trips because there may be spiders about.	**T**	**F**
2.	I would feel some anxiety holding a toy spider in my hand.	**T**	**F**
3.	If a picture of a spider crawling on a person appears during a motion picture, I turn my head away.	**T**	**F**
4.	I dislike looking at pictures of spiders in a magazine.	**T**	**F**
5.	If there is a spider on the ceiling over my bed, I cannot go to sleep unless someone kills it for me.	**T**	**F**
6.	I enjoy watching spiders build webs.	**T**	**F**
7.	I am terrified by the thought of touching a harmless spider.	**T**	**F**
8.	If someone says that there are spiders anywhere about, I become alert and on edge.	**T**	**F**
9.	I would not go down to the basement to get something if I thought there might be spiders down there.	**T**	**F**
10.	I would feel uncomfortable if a spider crawled out of my shoe as I took it out of the closet to put it on.	**T**	**F**
11.	When I see a spider, I feel tense and restless.	**T**	**F**
12.	I enjoy reading articles about spiders.	**T**	**F**
13.	I feel sick when I see a spider.	**T**	**F**
14.	Spiders are sometimes useful.	**T**	**F**
15.	I shudder when I think of spiders.	**T**	**F**
16.	I don't mind being near a harmless spider if there is someone there in whom I have confidence.	**T**	**F**
17.	Some spiders are very attractive to look at.	**T**	**F**
18.	I don't believe anyone could hold a spider without some fear.	**T**	**F**
19.	The way spiders move is repulsive.	**T**	**F**
20.	It wouldn't bother me to touch a dead spider with a long stick.	**T**	**F**
21.	If I came upon a spider while cleaning the attic I would probably run.	**T**	**F**
22.	I'm more afraid of spiders than any other animal.	**T**	**F**
23.	I would not want to travel to Mexico or Central America because of the greater prevalence of Tarantulas.	**T**	**F**
24.	I am cautious when buying fruit because bananas may attract spiders.	**T**	**F**
25.	I have no fear of non-poisonous spiders.	**T**	**F**
26.	I wouldn't take a course in biology if I thought I might have to handle live spiders.	**T**	**F**
27.	Spider webs are very artistic.	**T**	**F**
28.	I think that I'm no more afraid of spiders than the average person.	**T**	**F**
29.	I would prefer not to finish a story if something about spiders was introduced into the plot.	**T**	**F**
30.	Even if I were late for a very important appointment, the thought of spiders would stop me from taking a shortcut through an underpass.	**T**	**F**
31.	Not only am I afraid of spiders but millipedes and caterpillars make me feel anxious.	**T**	**F**

APPENDIX E

Screening Session Consent Form

Consent Form

Principal Investigators: Christopher Anderson and F. Dudley McGlynn
Title: Cognitive Processing Biases

The goal of this research study is to examine people's emotional reactions to a variety of objects, events, and situations. In this experiment you will be asked to complete several questionnaires about your emotional reactions to different stimuli and situations. Participation is voluntary and should take approximately 20 to 25 minutes. All responses will be confidential and to increase privacy your questionnaires will be labeled by a code number and your name will be kept in a separate place from your code number. Once your participation in the study has ended, your name will be erased and your responses will be identifiable by code number only. There are no known risks involved in being in this experiment beyond those experiences of everyday life.

Once you have completed these questionnaires your name will be entered into a pool including all other participants who have completed this study. Participant names will then be randomly selected from this pool, and those people selected will be contacted by a member of the research team and offered the opportunity to complete an additional research study for further psychology class credit.

If you agree to have your name entered into this pool, please initial the line below. By initialing the line, you are agreeing to be contacted if you are selected. Initialing the line does not guarantee your selection for the second study. If you are selected and you choose to participate in the second study, your name will be collected along with your questionnaire responses. After you complete the second study, your name will be used to match your responses from both studies and will then be erased and all data will be identifiable by code number only. Your name will not be connected to this code number.

_____ ***I have read the previous paragraph and agree to participate in the additional study if contacted by someone on the research team.***

By signing below you are agreeing to complete the questionnaires asking about your reactions of fear or disgust to different objects, events, or situations. You are also acknowledging that your participation in this study is voluntary and you may refuse to participate, or stop participating at any time without penalty. If you wish, you may keep a copy of the consent form.

Should you have any questions about the research, please feel free to contact Christopher Anderson at (334) 844-5562 (andercf@auburn.edu). Further information regarding this study may also be obtained from F. Dudley McGlynn at (334) 844-6472 (mcglyfd@auburn.edu).

_____	_____	_____
Signature	Print Name	Date

Note: Signing above will only declare your agreement to complete the questionnaires for the first study. If you initialed to be available for the additional study and are contacted to participate, an additional informed consent form will be provided at the time of participation.

APPENDIX F

Informed Consent Form for Memory Session

INFORMED CONSENT FOR
Cognitive Processing Biases

You are invited to participate in a research study of physiological responses to visual stimuli. This study is being conducted by Christopher Anderson under the supervision F. Dudley McGlynn, Ph.D. We hope to learn how individuals process different visual stimuli. You were selected as a possible participant based on your completed questions and agreement to participate in a previous study.

If you decide to participate, you will be asked to view a visual display while your skin conductance and heart rate are being monitored. Skin conductance and heart rate will be monitored through electrodes placed on the end of three fingers.

While participating in this experiment there is a slight risk that the electrodes measuring skin conductance will irritate the skin. Additionally, some individuals may become anxious or uncomfortable while viewing the visual display. If the electrodes do irritate your skin please let the experimenter know so that they can be repositioned to a spot that will not cause irritation. Additionally, if at any point you feel uncomfortable with completing the task you are free to discontinue your participation at any time without penalty and will still receive one hour of extra credit towards participating psychology courses.

This study will last approximately 30 minutes and you will receive one hour of credit towards applicable Psychology courses for your participation.

Any information obtained in connection with this study and that can be identified with you will remain or anonymous. After you complete this study, personal information identifying you with your responses in both studies (the questionnaire study and this memory bias study) will be destroyed. Information collected through your participation may be used to fulfill an educational requirement (e.g., dissertation research, published in a professional journal, and/or presented at a professional meeting, etc.) If so, none of your identifiable information will be included.

Your decision whether or not to participate will not jeopardize your future relations with Auburn University or the Psychology Department.

_____Participant's Initials

If you have any questions we invite you to ask them now. If you have questions later, Christopher Anderson at (334) 844-5562 (andercf@auburn.edu) and F. Dudley McGlynn at (334) 844-6472 (mcglyfd@auburn.edu) will be happy to answer them. You will be provided a copy of this form to keep.

For more information regarding your rights as a research participant you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu .

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature Date	Investigator's signature Date
Print Name_____	Print Name_____

APPENDIX G

Distractor Task Text

The round of visits to cities in France and Italy with the possible addition of visits to Austria, Germany, and the Netherlands which made up the itinerary of the Grand Tour served as a hands-on education for young noblemen in the eighteenth century. These travelers were the first tourists; in fact the term tourist is derived from the Grand Tour. Some of these travelers chose to take their own coach with them. We today might like to take our own car when possible because it is more familiar to us, but in those pre-insecticide days there was always a risk of renting a carriage which was infested with fleas or simply in poor repair. What was it like to take your coach with you on the eighteenth century Grand Tour?

The carriage itself was generally pulled by a team of two to four horses and might be a chaise guided by a postillion riding one of the lead horses or a coach controlled by a coachman who sat on the box at the front of the carriage and drove the team with reins. Carriages often had a roof of leather over a metal frame which could be let down like a convertible roof in good weather. They were high slung so as to pass over rough roads more easily. A carriage was entered by a side door with steps that folded onto the coach floor. The interior was richly upholstered with fabric and seats padded with horsehair with an overlay of goose down filled squabs. The interior might include seats that folded down into a travel bed and compartments for guns, liquor, a telescope, and maps.

A complement of servants for a nobleman who intended to spend one to four years traveling Europe on the Grand Tour would include two coachmen for each carriage, a pair of grooms for each carriage, armed outriders, and a tutor/guide at the least. Other possible servants might include a valet and a secretary.

If the tourist started from London it was a day long drive to Dover with stops every 8 to 10 miles to exchange the four horse team for fresh horses. The coach traveled at a speed of about 8 to 10 miles per hour. At Dover the coach would be hoisted onto a ship that must wait for a fair wind in the correct direction to make the passage to a European port, usually Calais. The trip might take only three hours with a favorable wind, but waiting a week for the wind to blow in the proper direction was not uncommon. Dr. Burney, the music historian, waited nine days in 1772 for good weather. In Calais, the coach was hoisted from the ship onto the dock with a crane.

After an inspection and obtaining a passport horses could be leased and the coach could follow the reasonably good post road to Paris with sightseeing stops along the way. After a long stay in Paris for lessons in fencing, etiquette, and a visit to the French court, the tourist must decide whether to enter Italy via the Alps or by crossing the Gulf of Genoa. Over the Alps

There were no coach roads through the Alps until the end of the eighteenth century, so to cross the Alps the entire coach had to be disassembles and packed over the mountains on mule back. The Mount Cenis pass on the route from Lyons to Turin was the most traveled route into Italy. The tourists were carried over the mountains by Swiss chairmen in a device like a chair without legs mounted on poles. A Miss Wilmot, who was one of the rare women to make the Grand Tour, reported that the Swiss chair carriers were happy men who burst into song as they approached the Alpine villages. Sometimes tourists had the thrill of sledding down a steep slope as Thomas Pelham did in 1777. Once in Turin the carriage was reassembled and the tourist began the slow trip around Italy.

If the Grand Tour traveler chose to sail to Italy, he would first travel to the south of France. The English were enchanted by the warm weather, sunshine, and the fields of lavender, calling Provence almost Paradise. To sail across the Gulf of Genoa a tourist engaged a fishing boat in Marseilles or Nice and had the coach once again hoisted onto a boat. Then they embarked for Genoa. The Gulf of Genoa was known for its sudden squalls. The specter of storm and shipwreck or attack by pirates hovered over this route. However it could be much quicker than the long arduous trek through the mountains, and Alpine passes were closed in the winter. The tourist might cross safely but find himself quite seasick as William Theed, the painter did. He complained in a letter to a friend that he was seasick during all the crossing and for sometime afterward.

In the port of Genoa the coach was hoisted from the boat onto the dock. Horses were obtained and the tourists began the round of Italian stops over the excellent roads that were themselves Roman remains. The city of Rome with its Roman buildings and Baroque churches, palaces, and fountains was a must see. Naples with its beautiful bay, wonderful climate and the rediscovered Roman cities of Pompeii and Herculaneum which were buried by the still active Mount Vesuvius in 79 A.D. was a favorite destination. Exotic Venice, the gateway to the East, was another usual stop in Italy.

The round of visits to cities in France and Italy with the possible addition of visits to Austria, Germany, and the Netherlands which made up the itinerary of the Grand Tour served as a hands-on education for young noblemen in the eighteenth century. These travelers were the first tourists; in fact the term tourist is derived from the Grand Tour. Some of these travelers chose to take their own coach with them. We today might like to take our own car when possible because it is more familiar to us, but in those pre-insecticide days there was always a risk of renting a carriage which was infested with fleas or simply in poor repair. What was it like to take your coach with you on the eighteenth century Grand Tour?

The carriage itself was generally pulled by a team of two to four horses and might be a chaise guided by a postillion riding one of the lead horses or a coach controlled by a coachman who sat on the box at the front of the carriage and drove the team with reins. Carriages often had a roof of leather over a metal frame which could be let down like a convertible roof in good weather. They were high slung so as to pass over rough roads

more easily. A carriage was entered by a side door with steps that folded onto the coach floor. The interior was richly upholstered with fabric and seats padded with horsehair with an overlay of goose down filled squabs. The interior might include seats that folded down into a travel bed and compartments for guns, liquor, a telescope, and maps.

A complement of servants for a nobleman who intended to spend one to four years traveling Europe on the Grand Tour would include two coachmen for each carriage, a pair of grooms for each carriage, armed outriders, and a tutor/guide at the least. Other possible servants might include a valet and a secretary.

If the tourist started from London it was a day long drive to Dover with stops every 8 to 10 miles to exchange the four horse team for fresh horses. The coach traveled at a speed of about 8 to 10 miles per hour. At Dover the coach would be hoisted onto a ship that must wait for a fair wind in the correct direction to make the passage to a European port, usually Calais. The trip might take only three hours with a favorable wind, but waiting a week for the wind to blow in the proper direction was not uncommon. Dr. Burney, the music historian, waited nine days in 1772 for good weather. In Calais, the coach was hoisted from the ship onto the dock with a crane.

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The roads in Germany and Austria were widely regarded as some of the worst in Europe. Even on main roads to Berlin and Hanover the carriages would often sink up to their axels in the muddy roadway. The inns were also notoriously bad. Many a letter was written home from Germany pining for the attentive landlord and excellent food of the English inn. On the other hand the travel on the rivers was commodious and swift. Lady Mary Wortley Montagu wrote of her trip on the Danube River from Regensburg to Vienna in 1716 in glowing terms.

The inns might be bad but the German courts were very hospitable and always invited English tourists to dinner without inquiry as to birth or title. Munich with its fine architecture particularly the Elector's palace which all the eighteenth century guide books particularly recommend was a favorite German destination. Vienna was also particularly recommended by the guidebooks. The Baroque Belvedere palace and the Schönbrunn palace were always visited.

Many Grand Tour travelers chose to either begin or end their tour in Holland. The Dutch were the kings of trade in the eighteenth century and passage home to England could be booked on one of their excellent merchants ships. Travel within the Low Countries was facilitated by excellent roads. The Antwerp-Brussels road was even paved. Lady Mary Wortley Montagu wrote that the whole country had the appearance of a garden. Holland must have seemed a garden indeed with the whole coast from Leiden to Haarlem heavily planted with tulips. Holland thus offered an excellent source of bulb plants and delftware china to take home as gifts and souvenirs.

Grand Tour travelers also purchased many souvenirs such as pieces of Roman art which might include vases and sculpture. The transportation of the bulky purchases and safety in numbers meant that very wealthy tourists generally took more than one carriage with them on the tour. The account book kept by Lord Burlington's head servant listed 878 pieces of baggage on their arrival back in Dover. Many of the pieces of baggage would have been crates of paintings, books, and antiquities. Other tourists of less exalted means tried to travel in tandem with fellow travelers they met along the way.

After the Channel crossing, the carriage would be once again hoisted onto the dock at Dover, England after years of travel. The wheels and harnesses would have been replaced more than once by this time. The coach would then convey the seasoned young adventurer back to his home, perhaps a learned man, but both carriage and man would certainly be well traveled.

APPENDIX H

Free Recall Participant Response Sheet

Participant # _____
Screening # _____
Date _____

Please write down and describe all the objects you saw on the board. Be as descriptive as possible when describing the objects. You may describe the objects location on the board if it helps you differentiate one object from the other.

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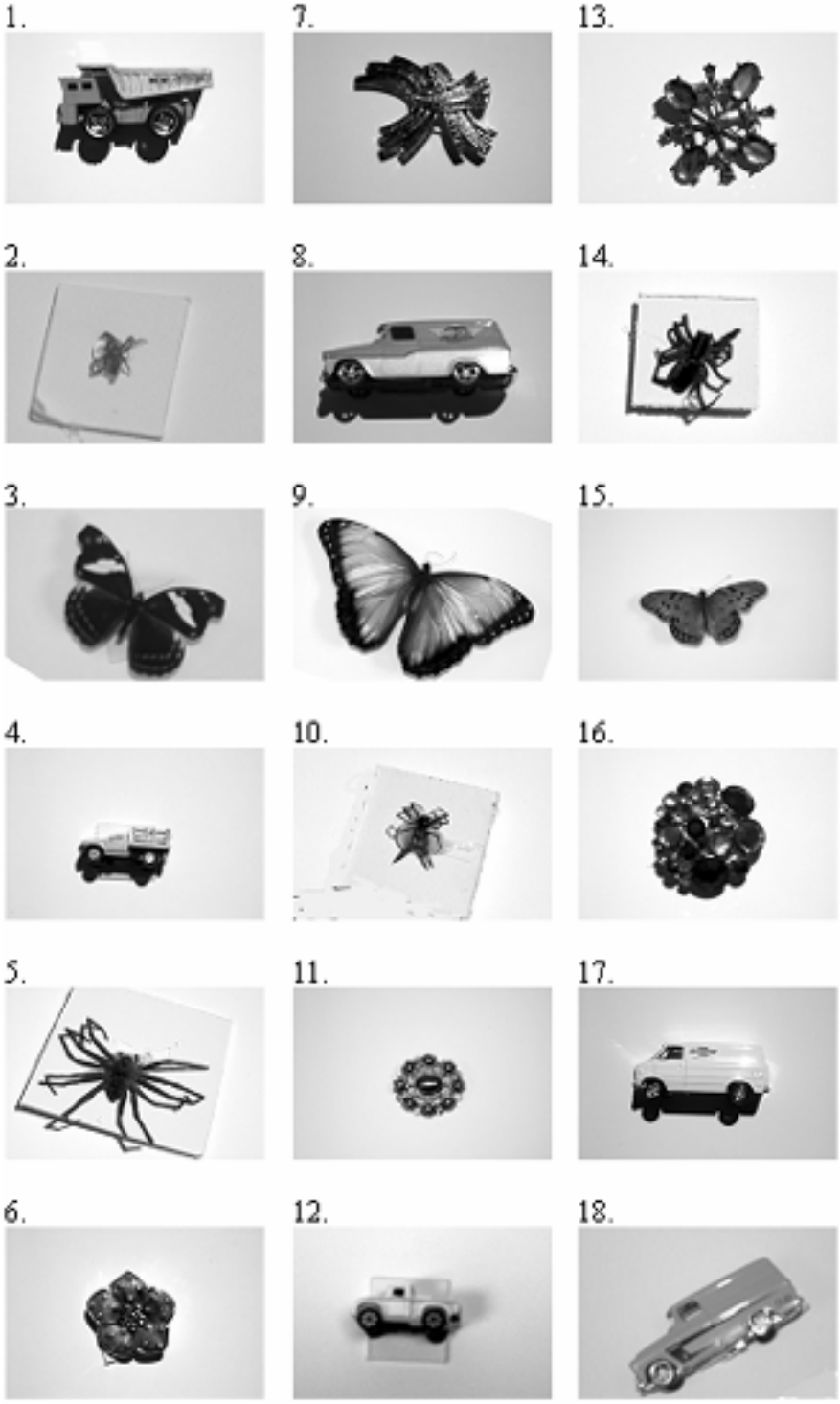
APPENDIX I

Position Recall Participant Response Sheet

APPENDIX J

Recognition Memory Participant Response Sheet Stimuli: Experimental Display



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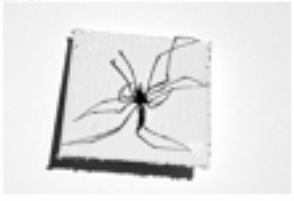

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APPENDIX K

Recognition Memory Participant Response Sheet Stimuli: Control Display

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APPENDIX L

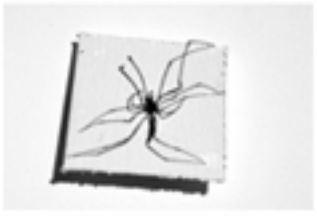
Free Recall and Position Recall Scoring Key

Object	Description	Location	Item code
1. 	Orange and grey dump truck Center/middle of board	4 (5,6)	Trk 1
2. 	Small yellow truck Bottom center White / silver top Orange stripe	8	Trk 2
3. 	Medium size Green and white Van/ SUV/ PT cruiser Top right corner Green micromachine	2	Trk3
4. 	Baby blue/ blue van Van/ Cruiser/ SUV/ Car Blue with black stripes Blue with racing stripes Bottom right Blue micromachine	6	Trk 4
5. 	White Van Van/ Cruiser/ SUV Blue Flames/ Racing stripes Upper left corner	1	Trk 5
6. 	Small orange car Black trim/ white door Top right	4	Trk 6

Object	Description	Location	Item code
10. 	Black and yellow butterfly Brown and yellow Medium size with bright yellow markings Upper left hand corner	1	BM 1
11. 	Big Blue Butterfly Lower part of board Center part of board Black and Blue Butterfly	7 (5,8)	BM 2
13. 	Black butterfly Medium size Stretched out looking Red/pink bands/ marks Yellow markings Middle/ right of board	6 (4)	BM 3
14. 	Metallic looking butterfly Purplish Blue with black/brown Upper/ center part of board	4	BM 4
17. 	Bright orange butterfly/moth Narrow/ thin Lower left	5	BM 5
18. 	Medium size butterfly Orange and black Yellow spots Monarch Center/ left side of board	3	BM 6

Object	Description	Location	Item code
19. 	Blue/ yellow broach Flower shaped Star shaped Middle left of board Blue-Green	3	J1
22. 	Sparkly green and purple Purplish Lowe left corner Purple Pin	7	J2
23. 	Black and silver Round Bunch of bubbles/ Diamonds Middle Left	5	J3
24. 	Red/ pink broach Red and black broach Large red stone surrounded by smaller ones Top/ middle of board	1	J4
26. 	Celtic style broach Black Black and silver broach Silver/ pewter Intricate Lowe half of board	6	J5
27. 	Peach/ Flesh colored broach Flower/ Square/ Diamond shaped Right/ center- upper half	4	J6

Object	Description	Location	Item code
28. 	White pen with black cap Bottom left corner Ink Pen	8	OF 1
29. 	Pink highlighter Upper part of board	2	OF 2
31. 	White out Correction fluid Small Center or left of board	3 (1)	OF 3
32. 	Pink eraser Lower right corner Eraser	8	OF 4
33. 	Orange stapler Center/ right of board	6	OF 5
34. 	Green tabs Left of center on board Green eraser Green page markers Tape dispenser	5	OF 6

Object	Description	Location	Item code
	Medium size brown spider 2 prong tail Bottom/ right of board	6	SP 1
38. 	Large brown spider Kind of fuzzy Thick legs Center to left	5	SP 2
40. 	Small thick spider Dark brown Upper right/ center of board Black and tan spider	2	SP 3
41. 	Small thick brown spider Crumbled legs Bottom right/ center of board	8	SP6
42. 	Brown spider lower right hand corner Medium size Thick body and legs	8	SP 4
43. 	Small leggy spider Mosquito Wispy spider Upper/ left part of board	3	SP 5