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Ryan W. Hansen

Automatic Spatial Processing of Threatening and Positive Information in Participants with High and Low Levels of Trait Anxiety

By

Ryan Hansen

B.S., Friends University, 2005

A Thesis

Submitted to the Graduate Faculty

Of the University of Richmond

In Candidacy of

Master of Arts in Psychology

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Under Dr. Beth Crawford

Abstract

The study sought to investigate potential differences in automatic spatial processing of threatening and positive information in anxious and non-anxious individuals. Participants evaluated threatening and positive words and pictures in a memory task in which the stimuli's varying spatial position was incidental to the task. Participants demonstrated increased accuracy with threatening stimuli, and a decreased accuracy when the word location varied between initial presentation and test. The results did not provide evidence that threatening stimuli were associated with an increased degree of spatial processing, or that this relationship would be influenced by trait anxiety.

I certify that I have read this thesis and find that, in scope and quality, it satisfies the requirements for the degree of Master of Arts.

Dr. Beth Crawford, Thesis Advisor

Dr. Peter O. LeViness

Dr. Roxann Roberson-Nay

AUTOMATIC SPATIAL PROCESSING OF THREATENING AND POSITIVE INFORMATION IN PARTICIPANTS WITH HIGH AND LOW LEVELS OF TRAIT ANXIETY.

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The processing of spatial information is an essential and often automatic component of how the brain perceives stimuli. Its automatic nature is evidenced by the Simon effect, in which the irrelevant spatial position of stimuli has been shown to affect the reaction time of participants on a variety of verbal and visual tasks (Simon and Rudell, 1967). Often these effects are fleeting and on the millisecond scale. However, a recent study of the Simon effect conducted by Zhang and Johnson (2004) shows evidence that task irrelevant spatial information can affect both reaction time and accuracy on a letter probe task in periods of time exceeding 2 seconds. Furthermore, they posit that the decrease in the Simon effect is due not to decay of the information, but to inhibition by other processes.

There is additional evidence that this automatically encoded spatial information is retained for much longer periods of time. Spivey and Geng (2001) demonstrated that participants were more likely to look at a shape's previous location then other areas of a computer screen after the shape had been removed during the recall of the shape's orientation. A study by Richardson and Spivey (1999) reported that during recall participants made significantly more saccades to the area in which a stimulus paired with auditory semantic information was originally presented. This tendency of participants to "look-back" to the stimuli's prior location shows not only that the stimuli's spatial information was encoded even though it was irrelevant to the task, but that it was also available during recall.

A significant limitation in these investigations into the automatic possessing and encoding of spatial information is the lack of consideration for stimuli that are not affectively neutral. Research suggests that negative or threatening information might be more easily associated with spatial information then positive information. Crawford and Cacioppo (2002) reported that participants were more likely distinguish a correlation between valence and spatial location with negative pictures then positive pictures. Furthermore this bias was found even when there was a relatively low correlation (.3) between spatial location and valence. Additionally, Grey (2001) reported that participants that had been shown a scary video clip made fewer errors on a spatial memory task, but more errors on a verbal memory task, then participants who had been shown a comedy. This suggests that the anxious state of the participants might facilitate spatial memory.

This might be explained by an inherent tendency to process threatening information differently then neutral information. In a review of emotional Stroop-task literature, Eich and colleagues posit that emotional stimuli attract attention, particularly when the individual is in an emotional state, because from an evolutionary standpoint this facilitated making judgments about the potential consequences of stimuli (Eich, Kihlstrom, Bower, Forgras & Niedenhal, 2000). For example, it is much more important to attend to some threatening aspects of one's environment, such as stimuli signaling the potential approach of a predator, then to other more neutral or beneficial stimulus, such as trees or food.

This is supported by research which suggests that frightening information is processed more quickly then other information. Detection of fear-relevant stimuli has been shown to be facilitated in spider and snake phobic individuals (Ohman, Flykt, & Esteves, 2001). Threatening stimuli have also been shown to hold attention longer. Spider phobic individuals have been shown to be significantly slower at detecting a neutral stimulus (such as a flower) within a field of spider pictures (Miltner, Krieschel, Hecht, Trippe & Weiss, 2004), suggesting difficulty in disengaging their attention from the threatening stimuli.

Given that threatening information is sometimes processed differently then non-threatening information, it might be expected that there would also be a difference in the automatic processing of spatial information. The additional attention due either to the facilitated detection or decreased disengagement from threatening stimuli could be expected to enhance the encoding of spatial information. With this greater uptake of spatial information, it would be expected that interference from that information could affect performance and behavior on tasks even when spatial position is irrelevant to that task.

However, several potential confounds should be addressed when considering the processing of threatening information. Subjects might not process or respond to threatening stimuli equally. Anxious individuals have been shown to process and respond to threatening information differently then non-anxious individuals. Anxious participants have been shown to have increased difficulty disengaging from threatening stimuli (Fox, Russo, Bowles, & Dutton, 2001). Bradley, Mogg, and Millar (2000) reported that individuals with high trait anxiety showed facilitated evaluation of threatening faces. Calvo (2003) reported that phobic-anxious participants demonstrated delays on an emotional Stroop task involving words that implied physical harm, whereas evaluative-anxious participants showed delays on words pertaining to ego-threat.

Numerous studies have explored this selective attention and memory for threatening information in clinically anxious populations. In an experiment conducted by Mathews and Macleod (1986), auditory presentation of threatening words in an unattended channel during a word repetition task slowed the reaction time of participants with generalized anxiety disorder significantly more then a control group, suggesting an automatic increase in attention towards threatening stimuli. A related study conducted by Foa & McNally (1986) found not only the same effect within participants with obsessive-compulsive disorder, but that this effect was eliminated once the participants had undergone a successful course of therapy.

Eysenck (1997) reported that participants with Obsessive-Compulsive Disorder were more likely to remember negative words out of a list of words that they were told was irrelevant to the task they were performing. A Hunt, French and Keogh (2006), individuals with high anxiety sensitivity were shown to show an attention bias in a dot probe task toward threatening words related to anxiety or social situations. Subjects showed increased vigilance when these words were presented for periods as brief as 16ms. This suggests that this bias is due at least in part to differences in pre-attentive processes.

Given the demonstrated differences in attention and memory for threatening stimuli in anxious individuals, it is possible that anxiety might interact with any potential differences in the automatic spatial processing of threatening stimulus. Anxiety dependent attentional effects have been demonstrated in state-anxious (currently in an anxious state), trait-anxious (a higher propensity towards anxiety), and clinical populations. In his review of experiments concerning the emotional Stroop effect and the dot-probe paradigm, MacLeod (1998) concluded that both state and trait anxiety can influence attention bias towards threatening information. However, he points out that the effects of experimental conditions designed to influence state-anxiety are often modulated by the participant's trait anxiety. The current study will focus on differences between individuals with high or low trait anxiety to eliminate the need for a mood manipulation within the laboratory, but data on state anxiety will also be collected. This study seeks to extend the current research by examining if the participant's anxiety level interacts with automatic spatial processing in non-clinical populations in such a way as to increase or decrease any differences in the processing of spatial information.

Two similar experiments were conducted to examine the possibility of a link between the automatic processing of spatial information, stimulus valance, and anxiety. In both experiments, participants were shown a series of positive and threatening words and pictures and were tested on their ability to discriminate these previously shown stimuli from foils. The locations of the stimuli sometimes differed between presentation and test, allowing for the possibility of Simon-effect like interference from the task-irrelevant spatial location on the participant's performance. This study seeks to use any interference in the performance of the participants due this change in location as an indirect measure of the amount of spatial information which is automatically processed and recalled. The first experiment is designed to detect any differences in the reaction time and accuracy. In the second experiment, accuracy as well as the participant's eye movements were tracked to monitor for potential saccades to a stimulus's previous position, allowing for potential differences in the "look-back" effect to be observed.

Experiment 1

METHOD

Participants

30 participants (14 females and 16 males) were recruited from an introductory psychology class and were compensated for their participation with course credit. Participants were required to be native English speakers to reduce potential confounds. One participant's data on the picture task was not included in the analysis because their average accuracy was less then 2.5 standard deviations from the mean accuracy for the experiment.

Materials

Participants were asked to complete a computerized questionnaire containing the Spielberger State-Trait Anxiety Inventory (Spielberger, 1983) as a measure of state and trait anxiety, as well as the Epworth Sleepiness Scale (Johns, 1991) as a measure of sleepiness as a potential confound. The questionnaire also requested the participants' gender and asked if they were currently taking any prescription medication to treat anxiety. Da6ta about prescription use was not included in this study due to potential confusion regarding the instructions on the survey. Additionally, participants completed a brief paper and pencil questionnaire containing the 6 racial categories used in the 2000 US census (US Census Bureau, 2007) for the purposes of determining the diversity of the sample.

Stimuli for the word memory task were drawn from the Affective Norms for English Words dataset (Bradley and Lang, 1999). A list of 25 threatening and 25 positive words were selected for use in the experiment. Threatening words were defined as negative words that depict a concept or action that could potentially cause bodily harm. For example, words such as "murder" and "rabies" were included in the list because of their violent or debilitating nature, whereas "loneliness" and "depression" were not because they are not physically dangerous in an of themselves. Additionally, a list of 25 positive and 25 threatening words were selected as foils to test the memory of the participants for the original list. All word lists were balanced with regard to valence, arousal, word length, and frequency of use.

Stimuli for the picture memory task were selected from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2005). A selection of 25 positive and 25 threatening pictures were selected for use in the experiment using the same definition of threat, as well as 25 positive and 25 threatening pictures for use as foils. All pictures were balanced with regard to valance, arousal, and size.

Procedure

Participants were briefed as to the procedures used in the experiment and asked to sign an informed consent document. Participants completed the paper and pencil racial questionnaire, as well as the computerized questionnaire. Once both questionnaires were completed the participants were presented with written instructions on the computer screen for the word memory task and were asked to complete a practice version of the task containing four neutral words. Participants were presented with an opportunity for clarification or questions before starting the word memory task.

The word memory task began with the presentation of the 25 positive and 25 threatening words individually in a randomized order for one second each, followed by a two second pause. Each word was presented in light grey on a black background in Arial font 1.3cm tall. The words were randomly presented at the top or bottom quarter of the computer screen with a centered horizontal position. Participants were asked to pay close attention to the words, as they would be asked to identify them later in the experiment.

Once all 50 words had been shown, participants were presented with a list of the previously viewed words mixed with 50 foils and asked to discriminate between them. All 100 words were presented individually at randomized vertical locations such that each previously presented word had an equal chance of being presented in its previous location or in the opposite half of the screen. The participants pressed either the "y" button on the key board if it was a word they had seen on the previous list or the "n" button if it was a new word. Participants were instructed to respond to the word as quickly as possible once it was displayed on the computer screen. Immediate feed back was provided in the form of a green empty screen if they responded correctly, or a red empty screen if they responded incorrectly. There was a one second pause before the next word was presented.

Participants were asked to complete the same task using pictures. 25 positive and 25 threatening pictures which were 6.5cm tall and 10cm wide were presented against a black background for one second each separated by a two second pause with a random vertical location. As before, participants were asked to identify these pictures as quickly as possible from a list including the original 50 pictures and 50 foils presented individually at random vertical locations. Upon completion of the word and picture memory tasks, participants were asked to rate each of the 100 words and 100 pictures used as to its degree of personal threat. Due to problems with data collection and instruction clarity, these responses were not used within this analysis.

RESULTS

Participant's scores on the Speilberger state-trait anxiety inventory were computed, and participants were grouped into low or high anxiety on each of these dimensions using a median split within the sample. Trials in which the reaction time was greater then 2.5 standard deviations from the mean were not included in the analysis. Participant's accuracy by valance, location constancy (whether the word had changed location between its initial presentation and the test), and trait anxiety levels on non-foil trials were submitted to separate 2 X 2 X 2 mixed model repeated measure ANOVAs for the word and picture tasks to determine any possible main effects or interactions. Participant's reaction times on correct, non-foil trials were analyzed by valance, location constancy, and trait anxiety levels in separate 2 X 2 X 2 mixed model repeated measure ANOVAs for the word and picture tasks.

Analysis of the average accuracy by subject in the word memory task showed a significant main effect of valance ($F(1,29)= 22.7$, $p=.001$), such that participants were more accurate at discriminating threatening words from their foils than positive words (data summarized in figure 1). Location constancy did not have a significant effect on accuracy, nor did any interaction between location constancy, valance, and anxiety. Analysis of the average reaction time on the word task reveals a near-significant effect of valance ($F(1,29)= 4$, $p=.055$), such that participants responded more quickly to threatening words then non-threatening words (data summarized in figure 3). There was no main effect of location constancy or trait anxiety, or any significant interaction between location constancy, valance, and anxiety.

Analysis of the average accuracy on the picture task revealed a significant main effect of location constancy ($F(1,28)=7.135$, $p= .01$), with participants having a lower average accuracy when the picture changed location between initial presentation and test (data summarized in figure 2). There were no main effect of valance, trait anxiety or significant interactions between the stimuli's valance, location constancy, and the participant's trait anxiety level. Analysis of the average reaction time on the picture task suggested a near-significant main effect of valance ($F(1,28) = 4.02$, $p=.055$), with participants responding more quickly to threatening pictures then positive pictures (data summarized in figure 4). However, there was no main effect of location constancy, and no interactions between location constancy, valance, and anxiety.

DISCUSSION

Participants' performance on the word memory task suggests that there was a significant difference in the way participants responded to the threatening than to the positive words. Participants responded more quickly and more accurately to threatening words, which is consistent with the previous findings reviewed above. Interestingly, participants' performance on the picture memory task indicates that the spatial location of the picture's prior location decreased the participant's accuracy when it was presented in a different location, suggesting that the picture's task-irrelevant spatial information was causing interference.

This experiment did not provide evidence of differences in automatic spatial processing in threatening and positive stimuli, or that their relationship might be modulated by the participant's anxiety level. The interference evidenced by the main effect of location constancy within the picture task suggests that this procedure is capable of measuring some degree of automatic processing. However, the small sample size used within the study might have obscured any relationships that might have existed. Furthermore, differing strategies to responding "as fast as possible" might have led some participants to value accuracy over speed and vise versa, adding additional confounds within the experiment. Thus, a second experiment was conducted concurrently with an increased sample size, more controlled timing, and an additional measure of spatial processing.

Experiment 2

METHOD

Participants

75 undergraduate students (43 females and 32 males) were recruited using fliers, emails, or from an introductory psychology course and were compensated $10 or course credit for their participation. Participants were required to be native English speakers to reduce potential confounds. Additionally, participants were required to have normal or corrected to normal vision through the use of contacts or glasses. Participants who required eyewear that corrected for astigmatism were excluded from the study due to potential interference with the eye tracker's measurements.

Five participants were excluded from the analysis on the word memory task due to low accuracy on either the new or old words, defined as being 2.5 standard deviations below the mean for the experiment, leaving a total of 70 participants. Three participants were excluded from the analysis on the picture memory task using the same criteria, leaving a total of 72 participants. It was not possible to collect viable eye tracking data on several participants due to difficulties with eye-wear, mechanical problems, and human error. Sufficient data was collected on 65 participants in the word memory task and 56 participants in the picture memory task for their inclusion in the eye tracking data analysis.

Materials and Apparatus

The same survey and stimuli lists were included from the previous experiment. During the completion of the word and picture memory tasks, the participants' eye movements were recorded using an Applied Science Laboratories Eye Tracker 5000 remote eye tracking system. This system uses a desk mounted camera sensitive to infrared light to measure the reflections off of the eye's surface in order to determine the relative angle of the participant's gaze. The system samples the participant's pupil and corneal positions at a rate of 60hz.

Procedure

Participants were briefed on the procedures used in the experiment and asked to sign an informed consent document. As before, participants completed the computerized and paper and pencil questionnaires. Participants were shown the eye tracking equipment and were given an introductory explanation as to how it works in order to increase their comfort with its use within the experiment. Participants were seated approximately 60 cm in front of the eye tracking unit, which was positioned directly under the computer screen used to display the word and picture stimuli. The participants completed a brief calibration procedure before beginning the word and picture memory tasks.

The word and picture memory tasks were identical to the previous experiment with the exception of several additions necessary to maximize the utility of the eye tracking data. All instructions were presented verbally to reduce potential interference from the printed words on the screen. Each word was individually presented in a random vertical location as before. However, during the testing phase the words were presented for a constant time of one second. Participants were then given a mandatory pause of two seconds, signaled by the computer screen turning dark blue, before they were allowed to respond in order to allow the eye tracker to collect sufficient data while the participants process the stimuli. After this pause the screen turned black and the participants were asked to respond as before. Upon the evaluation of all of the words, participants completed the same procedure using the 50 pictures and 50 foils.

RESULTS

Analysis of the average accuracy by subject on the word task indicates a significant main effect of valance ($F(1,69) = 69.7, p = .001$), such that participants were more accurate in identifying threatening words then the positive words (data summarized in figure 5). There was no main effect of location, and no interactions between location constancy, valance, and the participant's anxiety level. Analysis of participants average accuracy on the picture task revealed a significant main effect of valance ($F(1,70) = 9.875, p = .02$), and location constancy ($F(1,70) = 4.391, p = .04$)) (data summarized in figure 6). Participants were more accurate on trials in which the stimuli were threatening rather then positive and were less accurate when the picture changed location. There were no significant interactions between valance, location, and anxiety level. The data is 666summarized in graphs 3 and 4.

The eye tracking data was analyzed using the Applied Science Laboratories Eye-Trac 6000 Data analysis software (version 2.66) to determine the number, duration, and position of fixations. Fixations were defined as a participant's gaze remaining steady within a 3 eye-tracking unit area over a period of 100 milliseconds. Fixations were considered to have ended once the participant's gaze has remained outside of that 3 unit area for more than 48 milliseconds. The position of the fixation was computed as the average of the positions on each of the 16ms measurements within the fixation. Fixations with locations outside of the boundaries of the screen were not included in the analysis. Additionally, fixations that last longer then a single phase of each trial (word presentation, pause, or response) were truncated, such that a fixation that starts on one phase of the trial did not continue on through the next phase of the trail.

The eye tracking data was analyzed with regard to fixations during the mandatory pause after the stimuli's presentation during the testing phase of the word and picture tasks. In order to detect possible look-back effects, the ratio of the total amount of time spent looking in the opposite half of the screen from the stimuli's immediately prior location (looking away from the word) to the total amount of time recorded for each trial during the pause was computed separately for trails in which the word changed location and trials in which the stimuli's position remained the same. A 2(Trait Anxiety) X 2(stimulus valance) X 2(location constancy) repeated measures mixed model ANOVA was conducted on the participants' ratios of looking away from the word's immediately prior location for the word and picture tasks.

Within the word memory task, there was a significant main effect of location on the participants' ratio of time spent looking away ($F(1,63) = 4.340$, $p = .4$), such that participants spent more time looking away from the word's immediately prior location when the word had changed location (data summarized in figure 7). This could also be viewed as spending more time looking at the stimuli's initial location while the participants were determining whether or not they had seen the word before. There was not a main effect of valance, or any interactions between valance, location constancy, or anxiety level. Within the picture memory task, there were no significant main effects of valance or location constancy, and no interactions between valance, location constancy, and trait anxiety level (data summarized in figure 8).

DISCUSSION

The main effect of valance upon participant's average accuracy within the word memory task is consistent with the previous experiment, with participants being more accurate in identifying threatening words then positive words. Within the eye tracking analysis of the word memory task there is strong evidence of a look-back effect based on the statistically significant effect of location constancy, which could be interpreted as the participants looking back to the word's previous location. However, the lack interaction between valance and location constancy does not support the hypothesis of a difference in automatic processing between threatening and non-threatening stimuli.

The main effect of valance and location on the picture task suggests that the threatening pictures used within the study were remembered more accurately then the positive pictures, and that there was some Simon effect-like interference on trials in which the picture's location changed. Again, the lack of an interaction between them does not support the hypothesis of differences in automatic spatial processing. The lack of any significant effects within the eye tracking analysis of the picture memory task might be due in part to complications arising from the apparatus and the procedures used. Data was not able to be collected on several subjects due to glitches with the machinery itself. The picture task's position as the last component of an hour long experiment might have led to an increase in body movements and eye fatigue on the part of the participants, which is suggested by an overall decrease in the amount of data collected per participant.

GENERAL DISCUSSION

The overall goal of this study was to examine any potential differences in automatic spatial processing between threatening and positive stimuli and to determine if any of these potential differences were affected by the participant's anxiety level. It was hypothesized that the differences in attention toward threatening and negative information reviewed above might be generalized to automatic spatial processing such that there would be a greater interference from task-irrelevant spatial information with threatening stimuli. However, the results of the study do not support any such difference, or any interaction with anxiety.

In general, results of the study corroborate many of the findings reviewed earlier, in that participants reacted more quickly to threatening words and demonstrated a higher average accuracy identifying threatening words and pictures. There was evidence of a Simon-like effect with the location constancy's impact on the participants' accuracy with words. Similarly, there was evidence of the "look-back" effect within the eye tracking analysis of the word memory task. Thus, there is evidence for this procedure's viability in investigating potential differences in automatic spatial processing.

One potential confound might have arisen from differences in general attention paid towards the two categories of stimuli. The stimuli used in the experiment were selected with care to be nearly equal in average "arousal" using the tables in the IAPS and ANEW databases in an effort to remove how "interesting" the stimuli is so that a direct comparison between positive and threatening stimuli could be made. There is the possibility that these effects might be due in part to artifacts introduced in the selection process of the stimuli, as threatening words and pictures tend to be more arousing then positive ones. The inclusion of an evaluation of the stimuli with regard to arousal by each participant would have helped to ensure that the statistically normed values published within these datasets were valid for this sample of students.

There is also a difficulty in comparing threatening stimuli to positive stimuli, in that it could be argued that they are not being measured on the same dimension. The threatening stimuli used in this experiment were all negative stimuli as well, and thus further experimentation would be required to tease apart any potential confounds between effects due to valance and effects due to threat alone. The data collected on the participants evaluation of how threatening each stimuli was would have proven useful toward this end.

Separate tasks for words and pictures were included in this experiment to decrease the possibility of potential differences being missed due to the selection of stimuli. There was a concern that the semantic processing of words might lead to a greater disassociation with the word's original location. Similarly, there was a possibility that the picture's more direct representation might have a stronger spatial tie and overpower any potential differences due to threat. However, both words and pictures showed some effect of both valance and spatial location.

The lack of any statistical impact of participant's anxiety levels might be an artifact created by the choice of statistical measures used in this experiment. By using a median split the participants were artificially divided into groups of high and low anxiety which resulted in a substantial loss of power. However, the measures were selected to maximize the possibility of detecting potential differences in the automatic spatial processing of threatening information. Without establishing these effects, it is not possible to determine how they might be mediated by anxiety.

Another potential confound within this experiment is participant fatigue. The second experiment with its eye tracking procedures could last up to an hour. The length of the procedure combined with the evaluation of similar stimuli might have caused some participants to become less attentive in the task. The number of stimuli was selected to make the tasks sufficiently difficult that differences in accuracy could be observed. However, the inclusion of more breaks with engaging tasks might eliminate this concern.

In conclusion, this study did not discover any differences in the automatic processing of spatial information between threatening and positive stimuli, or the role of trait anxiety as a mediating variable. This study did provide evidence of Simon-like interference and the "look-back" effect as indirect measures of spatial processing. It also corroborated an increase in accuracy and reaction time to threatening stimuli. Thus, there is some evidence of this study's viability as a procedure to investigate automatic spatial processing. However, the experiment was not sensitive enough to detect any differences if they do exist.

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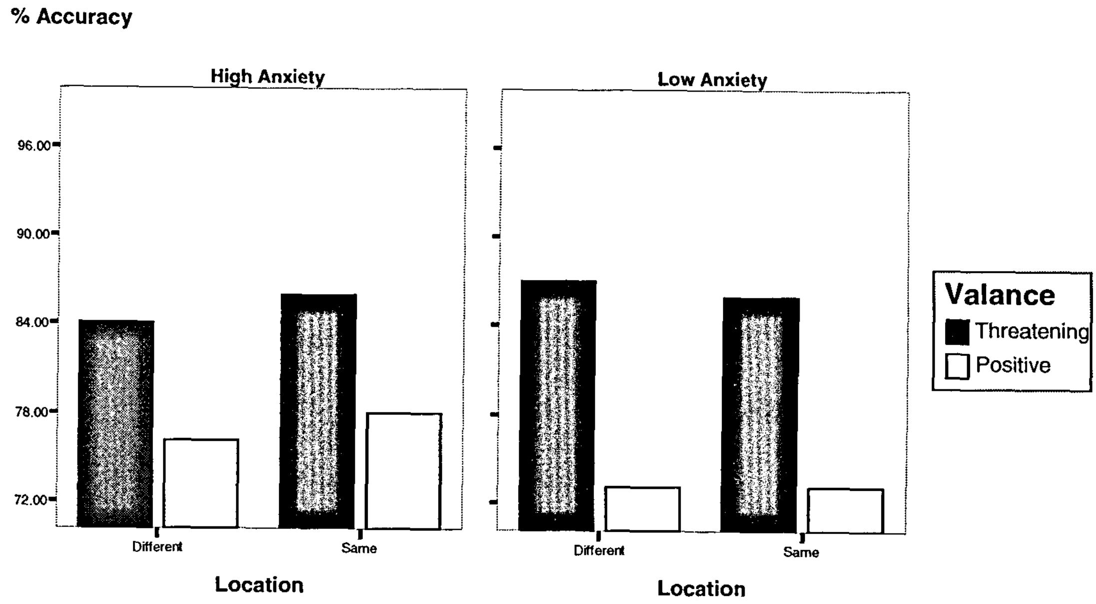
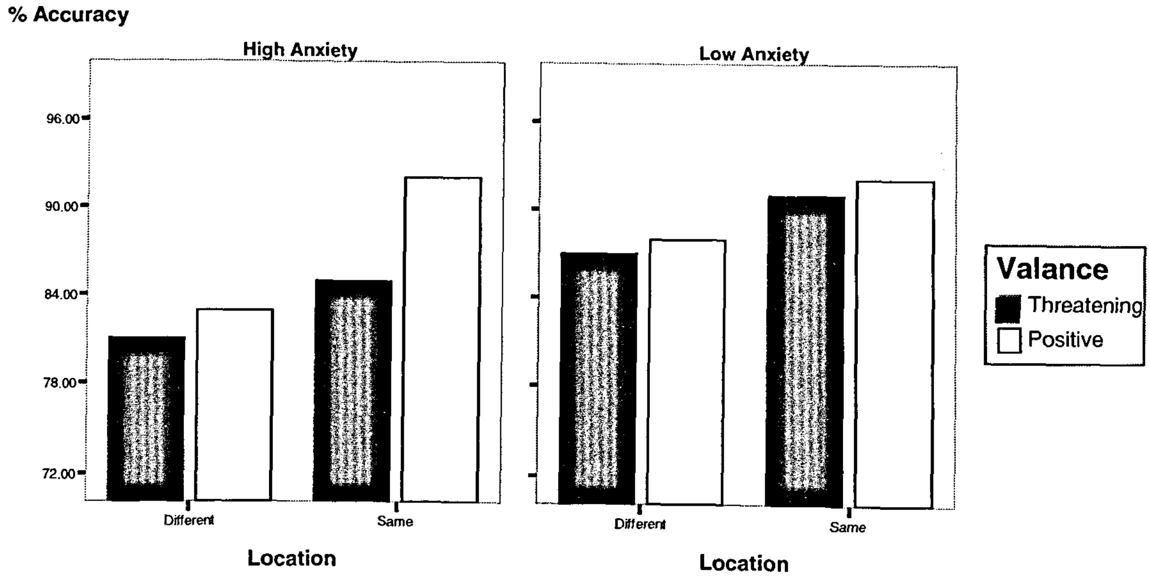
Figure 1



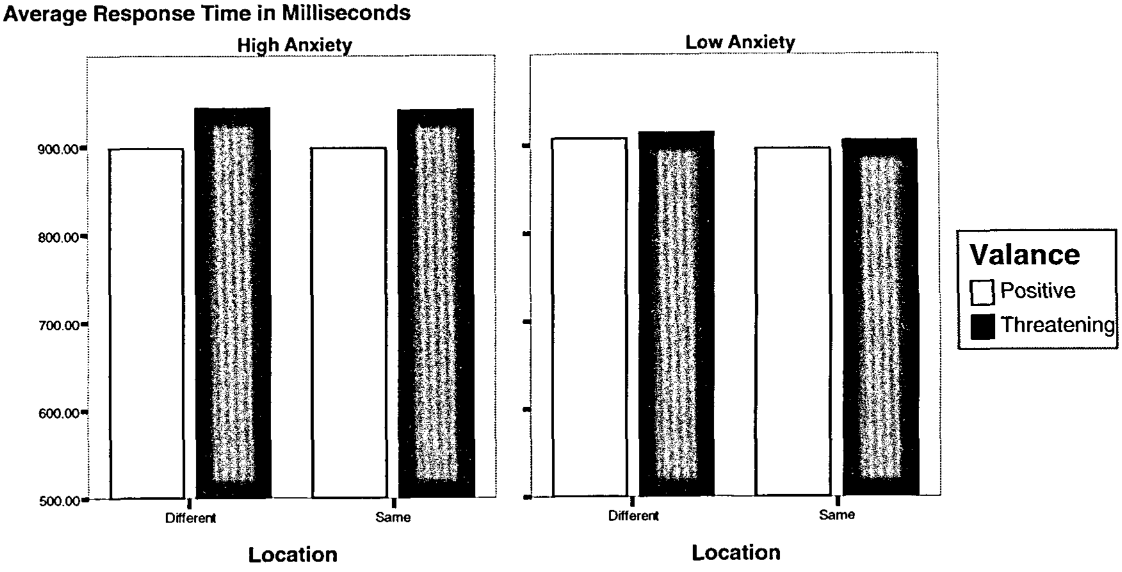
Average percent accuracy on the word memory task in experiment 1 by valance, location, and anxiety level.

Figure 2



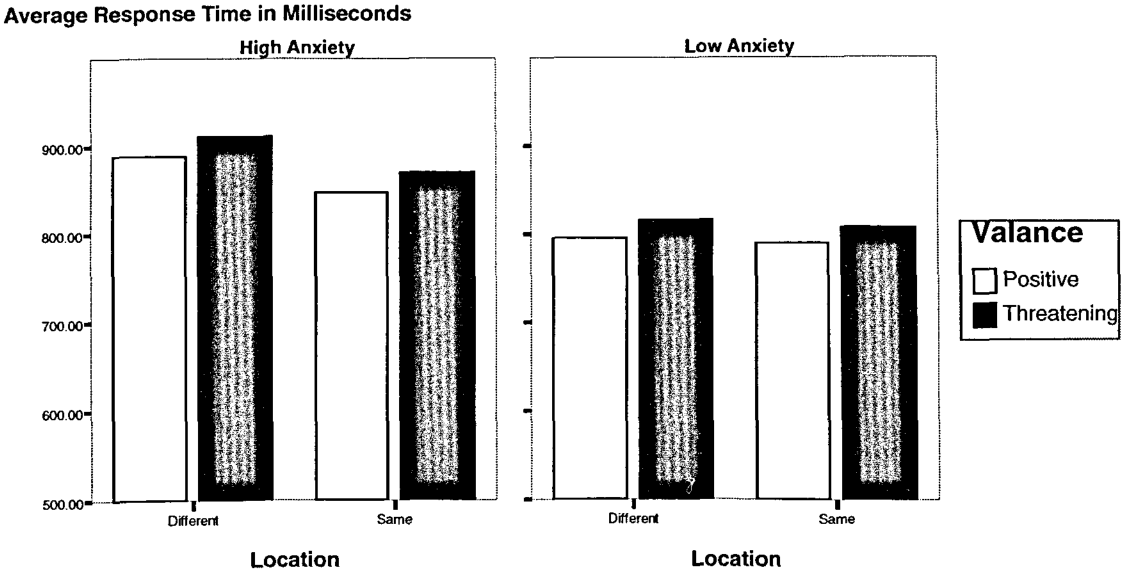
Average percent accuracy on the picture memory task in experiment 1 by valance, location, and anxiety level.

Figure 3



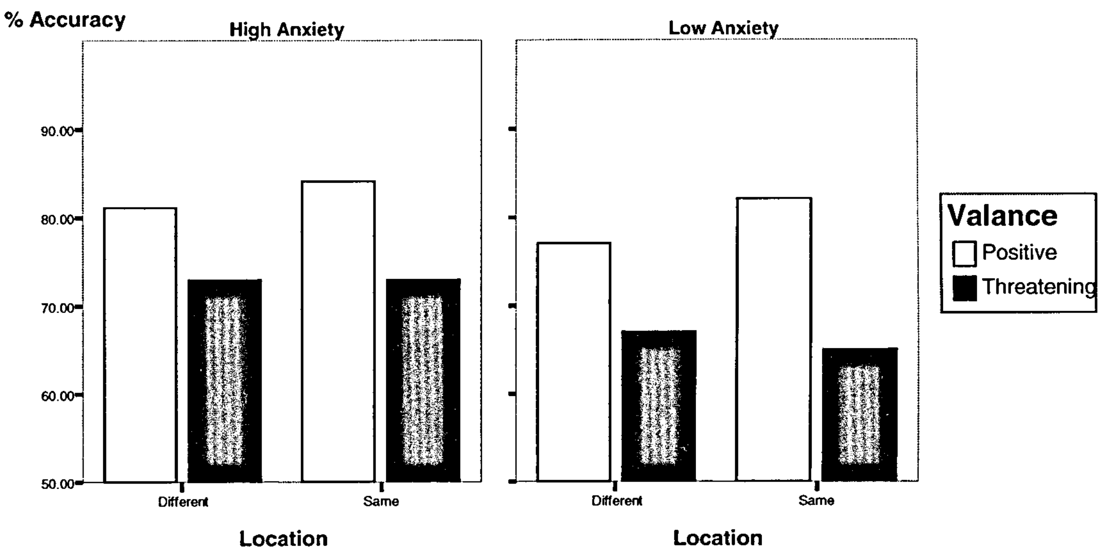
Average response time in milliseconds on the word memory task in experiment 1 by valance, location, and anxiety level.

Figure 4



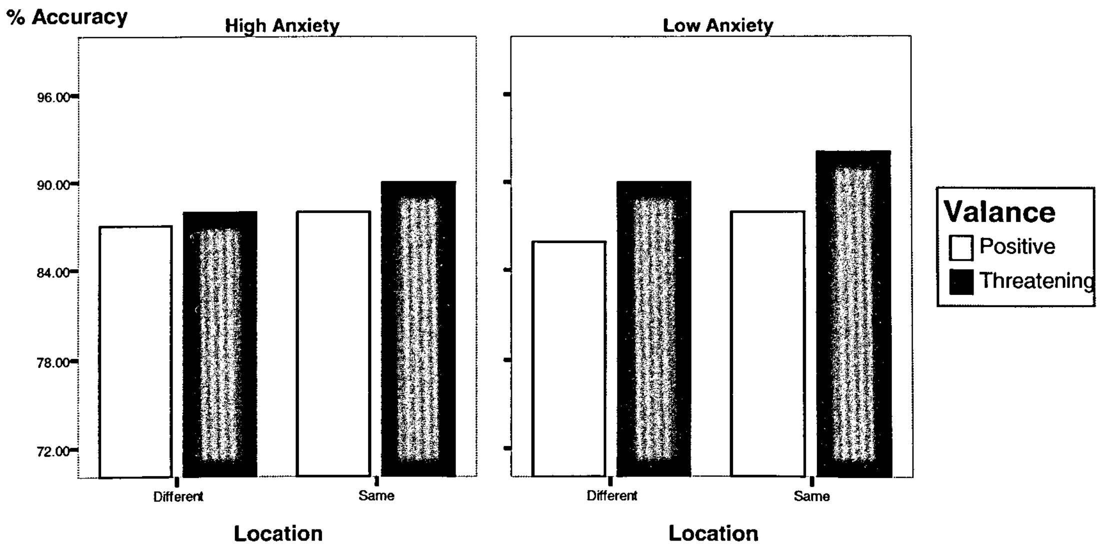
Average response time in milliseconds on the picture memory task in experiment 1 by valance, location, and anxiety level.

Figure 5



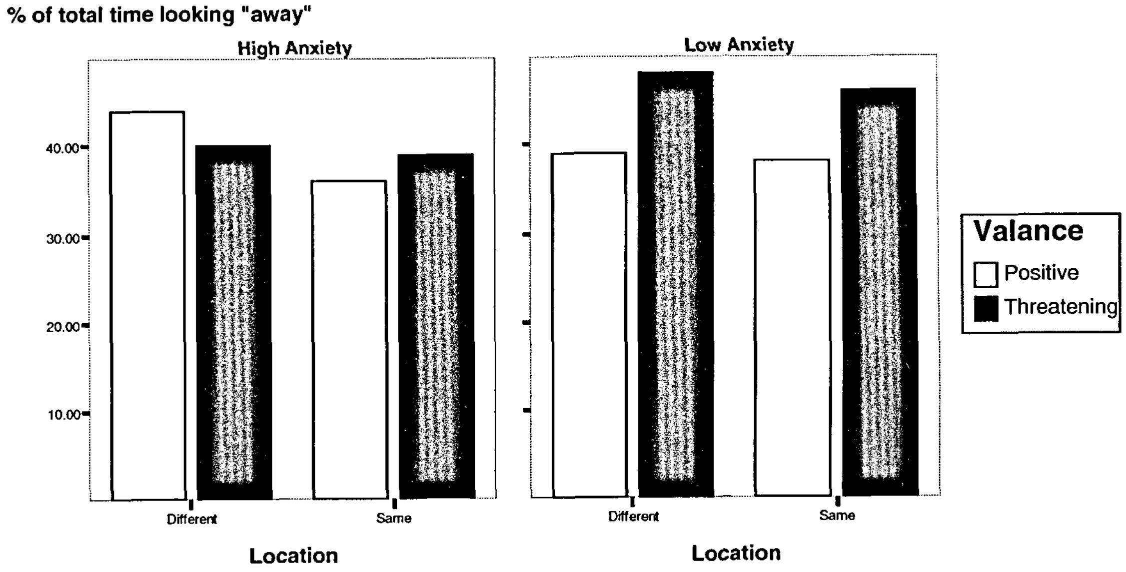
Average accuracy in the word memory task in experiment 2 by valance, location constancy, and anxiety level.

Figure 6



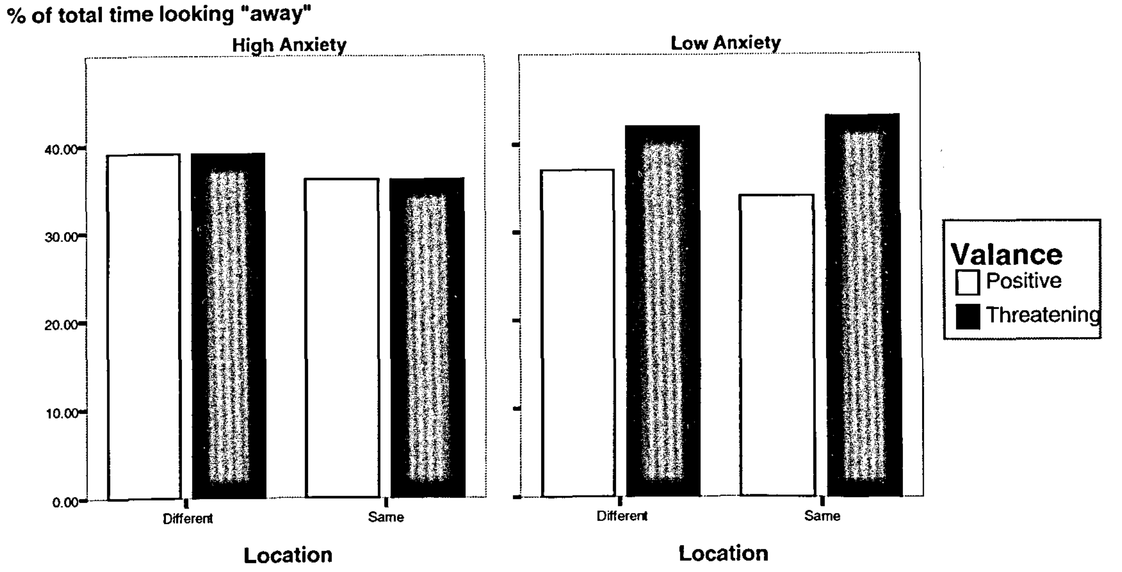
Average accuracy in the picture memory task in experiment 2 by valance, location constancy, and anxiety level.

Figure 7



Average percent of total time looking in the opposite half of the screen from the stimuli's immediately prior location in the word memory task in experiment 2 by valance, location, and anxiety level.

Figure 8



Average percent of total time looking in the opposite half of the screen from the stimuli's immediately prior location in the picture memory task in experiment 2 by valance, location, and anxiety level.

Vita
Ryan W. Hansen

Education:
University of Richmond, Richmond, VA, Expected August 2007
Master of Arts in Psychology
GPA: 3.8 on a 4.0 scale

Friends University, Wichita, KS, May 2005
Bachelor of Science in Psychology
Bachelor of Science in Biology
Bachelor of Science in Zoo Science
Minors in Chemistry and Spanish
Honors Program
GPA: 3.72 on a 4.0 scale

Research Experience:
Research Assistant, **Psychology Department**, University of Richmond
Under Dr. L. Elizabeth Crawford, August 2005-Present
Designed and implemented cognitive experiments examining spatial metaphors of emotion, visual processing, and category formation. Developed skills in experimental design, proposal, institutional review board submission, data collection, data analysis, and presentation. Gained experience in computer programming in E-Prime and eye tracking methodology.

Research Assistant**, Biology Department**, Friends University
Under Dr. Sarah Evans, June 2004-June 2005
Identified and characterized fungi from hyper-saline environments. Involvement included preparing media, plating isolates, collecting morphological data, and data management.

Research Interests:
Etiology and Maintenance of Anxiety Disorders
Pathophysiology of Fear and Anxiety
Cognitive Biases and Processing of Negative and Threatening Stimuli
Impact of Spatial Metaphors of Emotion on Memory and Cognition

Presentations and Papers:
Hansen, R.W. (2006). *Tracking Word Memory.* Poster presented at the annual University of Richmond Arts and Sciences Symposium, Richmond, VA
Evens, S. A., Hansen, R. W., and Schneegurt, M.A. (2005) *Identification and characterization of fungal isolates from the Salt Plains Microbial Observatory.* Poster presented at the annual meeting of the American Society of Microbiology, Atlanta, GA
Hansen, R. W. (2004) *The house always wins: A study of false beliefs about luck in gambling.* Paper presented at the annual Great Plains Psychology Convention, Overland Park, KS
Hansen, R. W. (2003) *The cost effectiveness of marijuana testing.* Paper presented at the annual PERK Psychology Convention, Wichita, KS