

**Internal and External Attentional Biases in Social Anxiety:
The Effect of Effortful Control**

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(ABSTRACT)

Two cognitive processes have been proposed to play a role in social anxiety: self-focused attention and threat perception bias. Mansell, Clark, and Ehlers (2003) devised a novel dot-probe paradigm to simultaneously measure on-line attention to internal and external events among socially anxious adults. Their results indicated that high speech anxious individuals show an internal attention bias specific to a social threat condition. They did not find any differences between groups in a no-threat condition; however, the researchers did not account for processes of effortful control of attention. The current study replicated the Mansell et al. study with an added condition to control for effortful processes of attention. Fifty young adults (mean age = 19.8) were assessed using a self-report measure of social anxiety, as well as the Mansell et al. dot-probe paradigm. Half of the subjects were randomly assigned to a brief (250ms) stimulus presentation time with the other half to a 25 second condition, as used by Mansell et al. In addition, subjects were randomly assigned to social threat and non-threat conditions. A three-way interaction of anxiety x threat x length of stimulus presentation was predicted, such that socially anxious individuals would show an external attention bias when not under social threat (threat perception bias). However, under threat, it was hypothesized that anxious individuals would shift their attention internally (self-focused attention). Results of the current study did not support the hypothesized interaction, and provided only equivocal evidence for both self-focused attention and threat perception bias.

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Introduction

Social phobia, according to DSM-IV (American Psychiatric Association, 2000) is characterized by persistent, irrational fear of social situations. These situations include performance-based situations as well as interpersonal interactions. Presumably, fears of embarrassment or humiliation are at the core of social phobia. Two specific attentional processes have been proposed to play an important role in social phobia. Some researchers propose that, like other anxiety disorders, social phobia is characterized by vigilance for socially threatening stimuli in the external environment. In contrast, it has been suggested by others that socially phobic individuals engage in self-focused attention under conditions of social threat, at the expense of attention to the external environment. Basically, these positions pit external versus internal attentional biases against one another. Each claim has found support in the literature.

Evidence for an external threat-perception bias in social phobia has been established through use of probe detection tasks. Asmundson and Stein (1994) found that patients with generalized social phobia exhibited threat bias on a probe detection task. Patients responded faster to probes following socially threatening words than to those following either neutral words or physically threatening words. Similarly, Mogg and Bradley (2002) used a probe detection task in which probes were backward masked (e.g., interspersed with scrambled stimuli to restrict awareness of the stimuli). Their results showed that high socially anxious individuals were faster to respond to probes in the location of a threatening face than a neutral face. These probe detection studies suggest that the attention of the socially anxious individual is primed for distraction to external threat cues. Other researchers have found similar effects using Stroop tasks (Amir, Freshman, & Foa, 2002; Holle, Neely, & Heimberg, 1997; Mattia, Heimberg, & Hope, 1993; Spector, Pecknold, & Libman, 2003). For example, Spector et al. (2003) found that social phobics showed an attentional

bias to words describing either negative evaluation or anxiety symptoms that are noticeable to others. In this study, response latencies to social threat words were positively correlated to social anxiety. Using a different methodology, Gilboa-Schechtman, Foa, and Amir (1999) found that patients with generalized social phobia were better at detecting angry faces than happy faces in an array of neutral faces on a pop-out task, again suggesting that anxious individuals allocate more attention to threat than non-threat cues.

In contrast to the threat-perception bias theory, other researchers have hypothesized that social phobics engage in self-focused attention under threat conditions. Self-focused attention has been defined as “an awareness of self-referent, internally generated information” (Ingram, 1990, p. 156). In particular, Clark and Wells (1995) have proposed a cognitive model of social anxiety suggesting that under conditions of social threat, social phobics focus on monitoring themselves rather than their external environment. That is, socially phobic individuals turn their attention inward to their own anxiety-related internal sensations, thoughts, and behaviors. This self-monitoring leads to misleading interoceptive information, such as physiological reactions, images, and thoughts. Social phobics use this information as evidence that they are making a negative impression on others. Social phobics’ self-focus, therefore, leads them to view social situations with a negative bias and prevents disconfirmation of negative beliefs by limiting access to external information.

The theories of threat-perception bias and self-focused attention in social anxiety are not necessarily mutually exclusive. In fact, a sequential relationship may be more likely. That is, processes of threat perception bias may operate strongly when the social phobic is not under threat. Under relatively normal non-threat conditions, socially anxious individuals may continually scan their environment for cues of threat, and thus, may be more attuned to these cues than non-anxious

individuals. However, when the social phobic does detect threat cues, his or her attention may shift internally to monitor the cognitions and physiological reactions occurring in response to the threat.

Several behavioral studies have found evidence for self-focus among socially anxious participants. In a study requiring socially anxious individuals to converse with a stranger, the socially anxious individuals reported more public and private self-consciousness than low socially anxious individuals during the task (Hope, Heimberg, & Klein, 1990). In the same study, those high in social anxiety were less able to recall information about the conversation, and made more errors in recall. This would suggest that these individuals were selectively attending to internal information at the expense of external cues. A more recent replication of this study produced similar results (Hope, Sigler, Penn, & Meier, 1999). Likewise, when asked to make a speech to a monitor displaying six “judges,” high socially anxious individuals reported greater self-focused attention and less other-focused attention than low anxious subjects (Perowne & Mansell, 2002). The high socially anxious participants also reported worse overall success and lower scores on a behavior composite measure.

Recently, Pinelas and Mineka (2004) used the dot-probe technique to explore self-focused attention. The researchers found that high socially anxious individuals showed preferential attention to their own heartbeat, as opposed to images of a sound-wave. This bias for physiological information suggests a self-focused attention bias.

Although self-focused attention has been correlated with social anxiety, the direction of the relationship remains unclear. In recent years, Woody and her colleagues (1996; Woody & Rodriguez, 2000) manipulated focus of attention among individuals with social phobia during a speech task. Results indicated that increasing self-focused attention produced higher reported anticipated anxiety, task anxiety, and anxious appearance during the task. These results suggest that self-focused attention may in fact play a causal role in social anxiety.

Mansell, Clark, and Ehlers (2003) devised the first study to simultaneously test internal and external attention allocation processes on-line in socially anxious adults. In this innovative study, a modified dot-probe paradigm was developed, using both internal and external probes. High and low speech anxious participants were asked to detect these internal and external probes while viewing images of faces (happy, angry, or neutral) or household objects. The external probe was superimposed on these images. The internal probe was a pulse to the finger, which participants were told was measuring changes in their physiological arousal. In a social threat condition, participants were told that they would be required to give a videotaped speech. Under this condition, high socially anxious participants selectively attended to internal cues, while low anxious participants attended more strongly to external cues. This result supports the contention that socially anxious individuals exhibit self-focused attention when under social threat. However, unexpectedly, no differences in response times were found between high and low anxious subjects to emotional faces, as would be expected based on previous studies of external threat-perception biases (e.g., Asmundson & Stein, 1994; Mogg & Bradley, 2002). In fact, there was a trend for high anxious subjects to respond slower to these cues.

The failure of Mansell et al. (2003) to replicate the threat bias effect may be explained in part by their use of an extended stimulus presentation time (25 seconds). Mogg et al. (1993) have suggested that long presentation times may allow participants to volitionally redirect their attention away from the external threat cues. As a result, Mansell et al. may have failed to detect a threat bias, which may operate at a more automatic level of processing. Indeed, studies using presentation intervals of 1250 ms or longer have consistently failed to replicate findings of threat bias (e.g., see Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 2000). A recent dot-probe study by Derryberry and Reed (2002) has provided further evidence of this effect. In this study, all high anxious adults showed an attentional bias toward threat when the stimulus presentation interval was brief (250 ms).

However, when the interval was lengthened to 500 ms, the bias was seen only in those high anxious individuals who also had low levels of effortful attentional control, as defined by scores on the Attentional Control Scale. These results suggest that threat bias in anxious individuals operates at an automatic, reflexive level. Given even a small amount of extra time (500ms versus 250ms), some anxious individuals (those with high levels of attentional control) seem to be able to redirect their attention away from threat. It is thus possible that given sufficient time (i.e., 25 seconds), even those anxious individuals with low levels of effortful attentional control could redirect their attention away from threat. Therefore, Mansell et al.'s results may be more a function of methodological constraints (probe presentation time) than participant characteristics.

The current study attempted to replicate the work of Mansell et al. (2003) with the addition of a short presentation interval on the dot-probe task. In this way, the effects of effortful control of attention were controlled.

Hypotheses

In general, it was reasoned that threat-perception (external attention) bias and self-focused attention (internal attention) processes are not mutually exclusive. Rather, each process was believed to operate at different times in socially anxious individuals. In particular, it was hypothesized that these individuals scan their environments for social threat cues, picking out these cues faster than non-anxious individuals (threat bias). However, once faced with social threat, those who are socially anxious turn their attention inward and focus on their own thoughts, feelings, and physiology (i.e., Clark & Wells, 1995).

Long presentation interval condition.

The first condition of the present study replicated Mansell et al. (2003), using a 25-second presentation time for the modified dot-probe task. Under this condition, the following results were expected:

1. Under condition of social threat, socially anxious individuals will show an internal attention bias, indicated by faster responses to probes on their fingers than to external probes.
2. Under conditions of no social threat, socially anxious individuals will not respond any differently than normal (non-anxious) individuals.

Brief presentation interval condition.

In a second condition, stimuli were presented for a very brief interval (250 ms), in order to prevent effortful control of attention among the participants. When effortful shifts in attention were not possible, the following results were expected:

1. Under conditions of social threat, those who are socially anxious will show an internal attention bias. This bias should be equal to or stronger than the bias found for those individuals in the long interval condition.
2. Under conditions of no social threat, socially anxious individuals will show an external attention bias (threat bias). This will be indicated by faster responses to external probes than non-anxious individuals overall. In addition, socially anxious participants were hypothesized to have faster response times to external probes than internal probes.

Method

Participants.

In the screening phase of the study, 1,079 undergraduate student volunteers were screened on demographic characteristics (see Appendix A) and the Social Phobia and Anxiety Inventory (SPAI; Beidel, Turner, Stanley, & Dancu, 1989; Appendix B). All participants received credit from their introductory psychology classes for their participation. The SPAI has been validated for the identification of socially phobic individuals, as well as prediction of level of distress associated with social anxiety (Beidel, Borden, Turner, & Jacob, 1989; Beidel, Turner, Stanley, & Dancu, 1989).

Before participating, all participants gave informed consent for their participation. There were 401

males in the sample. Mean age was 19.56 (SD=2.81), with a range from 16 to 44 years. The majority of this sample (72%) was Caucasian, with 7.5% Asian, 4% African-American, 2.5% Hispanic, and 2.6% from other backgrounds. The mean SPAI score was 46.19 (SD=27), with a range from -14.45 to 137.50 (see below for normative details). 112 of these individuals reported taking medication for an emotional difficulty.

Of the students who were screened, all were informed of the opportunity to participate in the second phase of the study, and the first 50 who agreed to participate were enrolled. These participants included 18 males and 32 females. Mean age was 19.81 (SD=1.70), with a range from 17 to 27 years. Again, the majority of the sample (64%) was Caucasian, with 15% Asian, 9% African-American, 6% Hispanic, and 6% from other backgrounds.

The mean SPAI score in this sample was 53.12 (SD=33.43). A median split (median=47.45) was used to divide participants into a high socially anxious (SA) group and a low socially anxious group (NA). The mean score in the NA group was 26.82 (SD=14.06), with a mean score in the SA group of 82.56 (SD=22.09). 72% of the SA group were at or above the clinical cutoff score of 60 on the SPAI, indicating the presence of significant symptoms of social phobia in this sample. Of this sample, 7 individuals reported taking medication for an emotional difficulty.

Analyses revealed no differences between those included in the second phase of the study as compared to the overall screened group on the basis of age ($t(1, 1077)=-0.76$), gender ($\chi^2(1, 1077)=0.16$), or medication status ($\chi^2(2, 1077)=2.85$). However, the included group did have significantly higher SPAI scores than the overall group ($t(1, 1077)=-1.98$).

Measures.

Diagnostic Interview.

Participants were interviewed using several modules of the Anxiety Disorders Interview Schedule-Lifetime Version (ADIS-IV-L; DiNardo et al., 1994). The ADIS-IV-L is a semi-structured

diagnostic interview designed to assess current and lifetime *DSM-IV* anxiety, mood, and substance use disorders. A clinical severity rating (CSR), ranging from 0 to 8, is assigned to each diagnosis based on the clinician's judgment of the distress and interference associated with a disorder (0 = “none” to 8 = “very severely disturbing/disabling”). Diagnoses that meet a threshold for formal *DSM-IV* diagnoses are assigned a CSR of 4 (“definitely disturbing/disabling”) or above. For purposes of the current study, only the modules for Social Phobia, Generalized Anxiety Disorder, and Major Depressive Disorder were administered. Brown, DiNardo, Lehman, and Campbell (2001) have reported good to excellent reliability for the *DSM-IV* diagnostic categories in the ADIS-IV-L, with kappas of .77 for Social Phobia, .67 for Generalized Anxiety Disorder, and .67 for Major Depressive Disorder.

Materials.

The current study used the standardized emotional face images developed by Matsumoto and Ekman (1988). The images were matched by eye for brightness, and it was ensured that each picture had a minimal amount of background, which was the same color for each. Images were presented on a 16 inch computer screen, and were programmed to occupy the full screen. Twelve images were selected and counterbalanced for gender and facial emotion type (happy, angry, neutral). In addition, four images of common household objects were included as control images. Faces with different emotional expressions were selected since Mansell et al. (2003) found a trend toward an interaction of face type with speech anxiety on dot-probe performance. That is, high-anxious individuals tended to direct attention internally when presented with an emotional expression (happy or angry) whereas low-anxious individuals tended to direct attention more externally when an emotional face was presented.

Pictures were divided into four blocks of four images (one object, one happy face, one angry face, and one neutral face). Images within blocks appeared in a fixed random order. Blocks were presented consecutively in four different latin-square orders.

Internal and external probes.

Long presentation interval condition. In the first condition, each picture was displayed on the computer screen for 25 seconds. During each presentation, four external and four internal probes occurred. The external probes consisted of a black, 1 cm letter “E.” The probes were superimposed in the center of the pictures, close to the center of the eyes when presented on a face. Internal probes consisted of light vibrations to the tip of the index finger of the participant’s left hand. Vibrations were created and transmitted using a 9 volt motor driven by a 555 oscillator circuit. Participants were told that internal probes were occurring in response to changes in their heart rate. To increase plausibility, participants were connected with three standard silver chloride electrodes attached to their sternum, rib cage, and collarbone to a PC computer, using an ambulatory monitoring system.

The probes were displayed in four different fixed random orders and counterbalanced across the four types of pictures. Repetitions of internal probes and external probes were matched.

The first probe was presented 500 ms after the pictures finished building (approximately 120 ms). Duration between the remaining probes followed one of two patterns (per Mansell et al., 2003): X (3750 ms; 3000 ms; 2250 ms; 3000 ms; 3750 ms; 2250 ms; 3000 ms) and Y (3000 ms; 3750 ms; 3000 ms; 2250 ms; 3000 ms 2250 ms; 3750 ms). The computer waited for a response up to three seconds after each probe was presented. After this time, the response was coded as an error.

Over the task, the picture type (happy face, angry face, neutral face, object) and the nature of the probe (external, internal) were counterbalanced. Over the participants, social anxiety group, social threat (social threat or no social threat), latin-square order of blocks and sequence timing (two

balanced associations between the four sequences of probes and the two patterns of duration times between them) were counterbalanced.

Brief presentation interval condition. In the second condition, each picture was displayed on the computer screen for only 250 ms. The brief interval time was selected based on previous research suggesting that this presentation interval is brief enough to limit effortful shift of attention (Lonigan, Vasey, Phillips, & Hazen, 2004). Internal probes and external probes in the brief interval condition were identical to probes used in the long interval condition.

128 critical trials were presented. Each trial began with presentation of a picture for 250 ms. Immediately following stimulus presentation, one probe was presented (external or internal). Again, the computer waited three seconds for a response. After three seconds, the response was coded as an error. The inter-trial interval was 2437 ms, calculated so that the entire task time was approximately seven minutes, equal to the task time in the long presentation condition.

Again, the probes were counterbalanced across the four types of pictures. Repetitions of internal probes and external probes were matched.

As in the long presentation condition, picture type (happy face, angry face, neutral face, and object) and the nature of the probe (external, internal) were counterbalanced over the task. Over the participants, social anxiety group, social threat (social threat or no social threat) and latin-square order of blocks were counterbalanced. In this way, the number of internal and external probes presented for each picture were matched with the long presentation interval condition.

Physiological measurement.

Although internal probes were not responding to actual changes in physiology, physiological measures were collected. Heart rate responses have been shown to be related to anxious reactions to cued threat (Thayer, Friedman, Borkovec, Johnsen, & Molina, 2000). Specifically, such reactions are marked by increases in heart rate and decreases in heart rate variability. For purposes of the

current study, heart rate responses were recorded using an ambulatory monitoring system (AMS) V. 3.6 (Klaver, de Geus, & de Vries, 1994). Heart rate (HR) was measured using heart beats, while heart rate variability was measured with the root mean of squared successive differences (MSSD). MSSD is an index of cardiac control that is vagally mediated. HR and MSSD were averaged over each task performed (Baseline, ADIS interview, practice at computer task, computer task). ECG electrodes were disposable 8mm Ag/AgCl that were placed in the following three locations: the jugular notch of the sternum, 4 cm under the left breast between the ribs; and on the right lateral side between the two lower ribs.

Manipulation checks.

Participants' belief that the internal probe reflected changes in their actual physiology was assessed by asking them to rate how much they believed this explanation on a scale from 0 to 8. Participants in the social threat condition were also asked to rate how much they believed they would have to interact with a stranger on a scale from 0 to 8. On these scales, 0 represented "Did not believe at all" and 8 represented "Completely believed." See Appendix C.

Mood ratings and questionnaires.

Participants' mood was assessed at three time points: immediately after attention task instructions (including threat induction for the threat group), as well as immediately before and immediately after the attention task. Mood was assessed using 0 to 8 scales, where 0 represented "I do not feel at all X" and 8 represented "I feel extremely X." For the four different scales, X was happy, anxious, angry, and depressed. See Appendix D.

Procedure.

Participants were fitted with the heart rate monitor and asked to sit alone quietly in the experiment room for five minutes, for purposes of acquiring a measure of baseline heart rate. Following the baseline measure, participants were interviewed using the ADIS-IV-L. At the end of

the interview, the attention task was introduced. The experimenter explained that during the task, the participant would be required to press a button as soon as they detected either one of two different signals. The first signal was a light vibration to the fingers, which was described as a signal from the participant's body that occurred whenever there was a slight change in heart rate. The other signal was described as being from the outside world: the letter "E" on the computer screen. Participants were asked to press one of two keys when the probes were detected. Specifically, they were directed to press the "F" key if an external probe was detected, or the "J" key for an internal probe. These keys are near to, and equidistant from, the center of the keyboard.

Practice at the attention task.

All participants were then seated directly in front of the computer monitor. Participants in the long interval condition were presented with a picture of a household object. They practiced responding to four internal probes and four external probes. At the end of the practice, participants were asked if they were able to detect the internal probe. All participants reported that the internal probe was detectable, so no adjustments in sensitivity were needed.

Participants in the brief interval condition were presented with the same picture of a household object. The picture was presented eight times at 250 ms, while participants responded to four internal and four external probes. As in the long presentation interval condition, all participants were asked about their ability to detect the internal probe. Again, no participants reported any difficulty detecting the probe.

Induction of threat.

Half of the participants in each group (socially anxious and non-anxious) were then given a threat induction. The participants were told that they would be asked to discuss the death penalty with a stranger for five minutes, while being videotaped by the experimenter. A video camera was set up in the room to make this claim more salient. In addition, participants were told that some of

the pictures in the computer task were of potential interaction partners for the discussion. Mansell et al. (2003) suggest that this should make the threat more task-relevant. Participants in the no-threat condition were told only that they would begin the full version of the computer task soon.

Attention task.

The experimenter then sat down behind the participant and allowed the participant to begin the task.

Manipulation check.

Following the attention task, participants were asked for their ratings regarding how much they believed that the internal probe was responding to changes in their physiology. Those in the threat condition were asked how much they believed they were going to actually interact with a stranger. All participants were then debriefed regarding the deception in the study.

Results

Diagnostic interview.

While anxiety groups were defined by a median split on the self-report measure (SPAI), each participant also received a clinician severity rating (CSR) for the diagnoses assessed on the ADIS, including Social Phobia (SoP), Generalized Anxiety Disorder (GAD), and Major Depressive Disorder (MDD). In the group defined as low-anxious, 6 of 25 (24%) participants met clinical criteria (CSR>4) for SoP and 6 of 25 (24%) also met criteria for GAD. No participants in this group were diagnosed with MDD, and 19 of 25 (76%) were diagnosis-free, with 3 individuals (12%) having both GAD and SoP. In the high anxiety group, 12 of 22 (55%) met clinical criteria for a diagnosis of SoP, 8 of 22 (36%) met criteria for GAD, and 2 of 22 (9%) met criteria for MDD. Among these participants, 8 of 22 (36%) were diagnosis-free, with 6 individuals (27%) having two or more diagnoses.

Attentional bias scores.

An attentional bias score was calculated for each participant by subtracting reaction times to internal probes from reaction times to external probes. Thus, positive values reflect faster detection of internal probes than external probes, and vice versa for negative values. The main analysis of bias scores was a three-way ANOVA. Between-subjects factors were social anxiety group (high anxious versus low anxious), condition (threat versus no threat), and probe presentation time (250 ms versus 25 sec). To rule out gender effects, analyses were repeated using sex as a covariate. In addition, analyses were repeated using belief ratings as a covariate, so as to rule out any effect of level of the participants' belief that internal probes reflect their true physiology. To rule out effects of true physiological responses, analyses were performed using heart rate variables (mean, mssd, and inter-beat interval) as covariates. In a final covariate analysis, state anxiety and depression were entered to rule out effects of immediate mood.

To examine differences due to type of stimulus (happy face, angry face, neutral face, object), bias scores were calculated separately for each stimulus type. The main three-way ANOVA was then repeated for each type. See Table 1 for descriptive statistics of all major study variables, and Table 2 for correlations among these variables.

Replication of previous study.

Before testing the main hypothesis of the current study, analyses were performed to replicate those reported by Mansell et al. (2004). Specifically, a three-way Sex x Social Anxiety x Threat ANOVA was performed, predicting attentional bias scores in those participants in the long stimulus presentation interval condition. Similar to Mansell et al., the analysis produced no main effect for anxiety, $F(1, 21)=0.73$ or threat condition, $F(1, 21)=0.01$. Unlike Mansell et al., no significant effect of gender was found, $F(1, 21)=0.01$. However, there was a trend toward a significant interaction of Anxiety x Threat, $F(1, 21)=2.83$, $p=0.11$. Mansell et al. found a significant two-way

Anxiety x Threat interaction, suggesting that high speech anxious individuals focused their attention more on internal versus external cues only when expecting to give a speech. Results of this analysis suggest a similar trend among socially anxious individuals who were expecting to interact with a stranger.

Effects of social anxiety on attentional bias scores.

The main hypothesis predicted that high socially anxious individuals would show an internal attention bias in the social threat condition, and an external attention bias in the non-threat condition. The latter external attention bias was expected only in the brief 250 ms interval condition. A three-way Social Anxiety x Threat x Length ANOVA produced no main effects for anxiety, $F(1, 49)=1.92$; threat condition, $F(1, 49)=0.20$; or length of presentation, $F(1, 49)=0.01$. No two-way interactions were found to be significant: anxiety x threat, $F(1, 49)=2.29$; anxiety x length, $F(1, 49)=2.06$; threat x length, $F(1, 49)=0.02$. Finally, the predicted three-way Social Anxiety x Threat x Length interaction was not found to be significant, $F(1, 49)=1.15$. Thus, unexpectedly, none of the hypothesized variables (social anxiety, threat condition, or length of stimulus presentation) were significant predictors of attentional bias. See Figure 1 for a graphical representation of these results

Gender effects.

To rule out effects of gender, the three-way Social Anxiety x Threat x Length ANOVA was repeated, using sex as a covariate. The overall model remained non-significant $F(8, 49)=1.05$, and no main effect for sex was found, $F(1, 49)=0.04$. This result is contrary to findings by Mansell et al., who found that a Social Anxiety x Threat interaction was significant for females but only in the threat condition. The interaction was not significant for males.

Belief ratings.

To rule out any effect of level of the participants' belief that internal probes reflect their true physiology, analyses were repeated using belief ratings as a covariate. The overall model again remained non-significant, $F(8, 49)=1.06$, and no main effect for belief ratings was found, $F(1, 49)=0.06$.

Physiology.

To further examine effects of the manipulation, analyses were conducted with regard to physiological responding. Scores were calculated for average heart rate change and MSSD change from baseline to computer task by subtracting baseline scores from attention task scores for each individual participant. Thus, positive scores indicate higher average heart rate and higher MSSD during the attention task than during the baseline. Negative scores indicate lower average heart rate and lower MSSD. Three-way Anxiety x Threat x Length ANOVAs were performed, predicting heart rate change and MSSD change. Analyses predicting heart rate change produced no main effects for anxiety, $F(1, 44)=0.002$, threat condition, $F(1, 44)=1.29$ or length, $F(1, 44)=0.65$. In addition, no two-way interactions of Anxiety x Threat, $F(1, 44)=0.19$, Anxiety x Length, $F(1, 44)=0.01$, or Threat x Length, $F(1, 44)=0.45$ were significant, and the three-way Anxiety x Threat x Length interaction, $F(1, 44)=0.07$ was borderline but not statistically significant.

Similarly, analyses predicting heart rate change produced no main effects for anxiety, $F(1, 44)=0.98$, threat condition, $F(1, 44)=0.22$ or length, $F(1, 44)=0.39$. In addition, the two-way interactions of Anxiety x Length, $F(1, 44)=1.19$, or Threat x Length, $F(1, 44)=0.41$ were significant. and the three-way Anxiety x Threat x Length interaction, $F(1, 44)=0.07$ was also nonsignificant. However, there was a trend toward a significant Anxiety x Threat interaction, $F(1, 44)=3.88$, $p=0.06$. In addition, the Anxiety x Threat x Length interaction was significant, $F(1, 44)=4.58$, $p<0.05$.

State anxiety and depression.

To investigate any potential effects of state general anxiety or depression, the analysis was repeated using state anxiety and depression scores as covariates. However, the model remained non-significant, $F(9, 49)=1.09$, and no main effects for state anxiety, $F(1, 49)=1.16$, or depression, $F(1, 49)=0.11$ were found.

Stimulus type.

To examine differences due to type of stimulus (happy face, angry face, neutral face, and object), bias scores were calculated separately for each stimulus type. The main three-way Social Anxiety x Threat x Length ANOVA was then repeated for each type.

In the case of attentional bias to happy faces, the three-way ANOVA produced no significant main effects for social anxiety, $F(1, 49)=2.00$, threat condition, $F(1, 49)=0.14$, or length, $F(1, 49)=0.44$. Two-way interactions of Anxiety x Threat, $F(1, 49)=0.44$, Anxiety x Length, $F(1, 49)=0.42$, and Threat x Length, $F(1, 49)=0.11$ were also non-significant. Finally, the three-way Social Anxiety x Threat x Length interaction was non-significant, $F(1, 49)=2.05$. Therefore, all participants, regardless of anxiety, threat condition, or length of stimulus presentation responded similarly to happy faces (see Figure 2).

In analysis of attentional bias to angry faces, the three-way ANOVA produced no significant main effects for social anxiety, $F(1, 49)=0.62$, threat condition, $F(1, 49)=0.08$, or length, $F(1, 49)=0.11$. Two-way interactions of Anxiety x Length, $F(1, 49)=1.22$, and Threat x Length, $F(1, 49)=0.69$ were also non-significant. However, there was a trend toward a significant Anxiety x Threat interaction, $F(1, 49)=3.65$, $p=0.06$. Thus, high anxious individuals attended more to internal than external cues when not threatened, but only when presented with angry faces. This may suggest that socially anxious individuals perceive more threat from an angry face than do non-anxious individuals, particularly when not in a threatening condition. This is consistent with a

threat-perception bias effect. However, the three-way Social Anxiety x Threat x Length interaction was non-significant, $F(1, 49)=0.003$. Thus, effortful control does not appear to affect the interaction of anxiety and threat in the case of angry faces (Figure 3).

Somewhat similar results were found in an analysis of attentional bias to neutral faces. Specifically, the three-way ANOVA produced no significant main effects for social anxiety, $F(1, 49)=1.33$, threat condition, $F(1, 49)=0.15$, or length, $F(1, 49)=0.58$. Two-way interactions of Anxiety x Length, $F(1, 49)=0.71$, and Threat x Length, $F(1, 49)=0.39$ were also non-significant. However, a significant Anxiety x Threat interaction was found, $F(1, 49)=7.74$, $p<0.01$. This result suggests that socially anxious individuals not under threat perceive more threat from a neutral face than do non-anxious individuals, particularly when not currently under threat. This again is consistent with a threat-perception bias effect. However, as above, the three-way Social Anxiety x Threat x Length interaction was non-significant, $F(1, 49)=0.67$, suggesting no additional effect of effortful control (see Figure 4).

Finally, in analysis of attentional bias to objects, the three-way ANOVA produced no significant main effects for threat condition, $F(1, 49)=0.11$, or length, $F(1, 49)=0.04$. However, a trend toward a main effect for social anxiety was noted, $F(1, 49)=2.86$, $p=0.10$. Two-way interactions of Anxiety x Length, $F(1, 49)=1.33$, and Threat x Length, $F(1, 49)=0.15$ were non-significant. However, again, the Anxiety x Threat interaction was significant, $F(1, 49)=4.71$, $p<0.05$. Once again, this result suggests that socially anxious individuals who are under threat perceive more threat from an object than do non-anxious individuals, or those who are not currently under threat. Finally, the three-way Social Anxiety x Threat x Length interaction was non-significant, $F(1, 49)=1.58$. Thus, as above, there was no effect of effortful control (see Figure 5).

Additional analyses.

In an exploratory analysis, the Anxiety x Threat x Length ANOVA was repeated using more stringent grouping criteria. Specifically, the high-anxious group was defined as those individuals meeting criteria for Social Phobia using the ADIS-IV. The low-anxious group was defined as those who did not meet diagnostic criteria for any diagnosis on the ADIS-IV. The ANOVA produced no significant effects for anxiety, $F(1, 30)=0.14$, threat condition, $F(1, 30)=0.06$, or length, $F(1, 30)=0.11$. In addition, none of the two-way interactions were significant, as follows: Anxiety x Threat, $F(1, 30)=1.66$, Anxiety x Length, $F(1, 30)=1.64$, and Threat x Length, $F(1, 30)=0.11$. Finally, the predicted Anxiety x Threat x Length interaction was also nonsignificant, $F(1, 30)=0.52$.

Discussion

Previous work by Mansell et al. (2004) suggest that speech-anxious individuals display a self-focused attentional bias when exposed to a social threat. The current study attempted to replicate the findings of Mansell and colleagues with several modifications. First, the current study employed a sample that was high in general social anxiety, in order to broaden the generalizability of the original study beyond speech anxiety. Secondly, the current study attempted to control for effortful control of attention by employing a very brief (25 ms) stimulus presentation time during the attention task. Thus, by controlling for volitional attention shifts, it was hypothesized that socially anxious individuals would display an internal attention bias (self-focused attention) when under threat, while displaying an external bias (threat-perception bias) when not under threat. In contrast, it was hypothesized that when effortful control of attention is not controlled, socially anxious individuals would show only an internal attention bias when under threat. The results of the current study provide some minimal support for the self-focused attention theory. However, no evidence was found for a threat-perception bias among socially anxious individuals.

In initial analyses, Mansell et al. found that speech anxious individuals focused their attention on internal versus external cues only when under threat of a speech task. The results of the current study indicate that a similar process may occur among more generally socially anxious individuals under social threat. These results, however, were not statistically significant, as in the study by Mansell et al. It is likely that this is due to the nature of the current sample, which was identified based on broad social anxiety, rather than specific speech anxiety. Commensurate with this broad anxiety identification, the social threat manipulation employed was also more general rather than specific (an interaction task versus a speech task). Thus, the present results were not as strong as those in the previous study and may have been affected by these procedural differences.

While the partial replication of Mansell et al.'s original analyses is somewhat promising, the main hypotheses of the current study involved effortful control of attention. Specifically, it was hypothesized that socially anxious individuals would show both an external attention bias when not under threat, as well as an internal bias when under threat. However, these processes were hypothesized to occur only when individuals did not have time to make volitional shifts in attention. Unexpectedly, none of the hypothesized variables (anxiety level, threat condition, or length of stimulus presentation) were shown to be significant predictors of attentional bias, whether the variables were considered independently or in interaction with each other.

Interestingly, results of the current study also did not replicate the findings of Mansell et al. that the interaction of social anxiety and threat affected the attention allocation of females but not males. However, gender effects on attentional bias are not typically reported in the literature, suggesting that Mansell et al.'s results may be anomalous in this area.

In addition, these non-significant findings were not explained by how much the participants believed the manipulation, or by their self-reported state anxiety or heart rate change as a result of the threat induction. Thus, one potential explanation for the lack of significant findings may be that

the threat induction was not strong enough to induce anxiety, and therefore, did not affect attentional biases. Other researchers using similar threat manipulations in dot-probe studies have also had difficulty inducing threat (e.g., Pinelas & Mineka, 2004). There are several possible explanations for this lack of saliency of threat induction. First, the threat manipulation involved anticipation of a future interaction task. It may be the case that socially anxious individuals display more anxiety while directly involved in a social interaction, rather than in anticipation of such an event. In addition, the threat of an interaction task may not have been salient to some subtypes of socially anxious individuals. Since this sample was defined based on broad social anxiety, it is unclear whether one-on-one interaction is an anxiety provoking situation for these participants, as opposed to other social situations such as public speaking, etc. In addition, it may be the case that all the socially anxious participants were socially stressed at the time of the task, due to the presence of the experimenter. Future research should seek to identify methods of inducing social threat that is immediate and simultaneous with the computer-based attention task, as well as being specifically relevant to the tested sample. Threat induction methods should also be sensitive to the special demands of experimenter interaction with the socially anxious participant, and techniques should be employed to foster rapport and comfort for the participant.

In contrast to the above results, anxious individuals in the threat condition did exhibit decrease in their heart rate variability from baseline to task. Such a decrease could indicate anticipation of threat (Friedman, Thayer, & Borkovec, 2000). However, lowered heart rate variability has also been interpreted as an index of attentional focus. Therefore, the current results could indicate that anxious individuals in the threat condition were simply more engaged in the task than were other participants.

Interestingly, while the results described thus far failed to provide support for either an internal or external attentional bias, subsequent analyses provide some support for the theories.

Specifically, when stimulus type is taken into consideration, interesting effects emerge. All participants responded similarly to happy faces, an overtly positive stimulus. However, when presented with negative social stimuli (angry faces), socially anxious individuals attended more to internal cues than did non-anxious individuals. Again, this is not surprising, and is consistent with the hypothesis that socially anxious individuals would display a self-focused attentional bias under threat. It is interesting that this effect occurred whether the participants were in the threat condition or in the non-threat condition. Thus, participants were responding to the angry face as a threat and attending to internal stimuli (i.e., physiology) than external stimuli.

However, the socially anxious participants showed identical patterns of responding when presented with neutral social stimuli (neutral faces) and neutral non-social stimuli (objects). This suggests that the socially anxious individuals are perceiving threat in neutral stimuli, and responding to such stimuli as if it is in fact threatening. Such results are somewhat consistent with findings in both the child and adult literature, suggesting that socially anxious individuals display a threat perception bias (Muris, Merckelbach, & Damsma, 2000; Asmundson & Stein, 2004). However, this result was somewhat counter to current hypotheses, which suggested that the threat bias would be displayed through faster responses to external cues versus internal cues. Instead, participants again displayed an internal attentional bias to neutral stimuli. It can be inferred that this internal bias occurred because of perception of threat in the neutral stimuli. This interpretation will require further study for clear support, however. In addition, it was unexpected that these results would apply to both social and non-social neutral stimuli. However, recent research (Putman, Hermans, & van Honk, 2004) suggests that heightened anxiety produces activation of the Behavioral Activation System (BAS), which produces a vigilance to negative stimuli. Thus, the participants in the current study may simply be over-generalizing their heightened threat vigilance to all neutral stimuli.

The results of the current study are certainly mixed, but provide some support for the presence of a self-focused attention bias among socially anxious individuals. Results are even less clear with regard a threat-perception bias. However, there are several limitations to the present study that should be addressed in future research. First, the current study employed a small sample. Statistical analysis indicates that the effects being examined are extremely small ($R^2=0.17$). Thus, a much larger sample would allow for a more in depth examination of these effects. In addition to being small in numbers, the sample was also non-clinical. The participants were undergraduate students at a large university, suggesting reasonably good overall functioning (particularly in the academic arena). Thus, the levels of social anxiety experienced by the participants may not have been great enough to produce the attentional biases under examination. Still, scores of our participants on both self-report and interview measures indicated clinically significant and interfering levels of social anxiety among the majority of our participants classified as “high anxious.” It is of concern, though, that there was some diagnostic overlap between the groups. That is, a proportion (24%) of participants classified as “low-anxious” qualified for a diagnosis of social phobia on the basis of the diagnostic interview. Likewise, a number of the participants defined as “high-anxious” did not meet clinical criteria for social phobia, either based on self-report, diagnostic interview, or both. However, analyses based on diagnostic status still did not find significant results. In the future, researchers should examine these effects with a clinically-referred sample.

Given these limitations, in addition to the questions noted above regarding the strength of the threat manipulation, it is clear that future research is necessary to determine the exact nature of attentional processes among the socially anxious. However, the preliminary results presented here provide some mild evidence for both a self-focused attentional bias, with indications for future research regarding an external threat bias. Effortful control of attention does not seem to play a role in these attentional biases for socially anxious individuals.

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Table 1. Descriptive statistics for major variables.

Variable	SA		NA		Total
	T	NT	T	NT	
	m (sd)	m (sd)	m (sd)	m (sd)	m (sd)
1. SPAI Tot	76.58 (23.28)	87.27 (20.75)	32.07 (12.10)	23.42 (14.53)	46.19 (27.01)
2. Bias Score (Overall)	-74.20 (66.23)	-45.71 (56.13)	-69.00 (73.83)	-106.79 (74.42)	-74.20 (69.74)
3. Bias Score-Angry Faces	-93.60 (117.96)	-40.27 (80.93)	-16.33 (64.77)	-82.68 (73.35)	-56.62 (86.51)
4. Bias Score-Happy Faces	-80.49 (114.14)	-91.29 (96.08)	-148.60 (85.94)	-110.87 (127.31)	-106.92 (107.00)
5. Bias Score-Neutral Faces	-91.19 (73.97)	-26.56 (88.76)	-49.15 (91.03)	-110.94 (61.25)	-72.61 (83.58)
6. Bias Score-Objects	-59.44 (50.36)	13.61 (62.50)	-37.18 (83.63)	-80.94 (92.65)	-39.73 (80.86)
7. Belief Score-Physiology	5.70 (2.45)	4.64 (2.37)	3.82 (2.89)	4.76 (2.80)	4.71 (2.64)
8. Belief Score-Interaction	6.56 (1.67)	--	6.91 (1.14)	--	6.52 (1.50)
9. State Anxiety	3.20 (1.55)	2.50 (1.65)	2.09 (1.51)	2.47 (1.42)	2.54 (1.53)
10. State Depression	0.50 (0.71)	0.21 (0.58)	0.18 (0.40)	0.41 (0.71)	0.33 (0.62)
11. Heart Rate Change	-3.59 (5.54)	-4.18 (3.96)	-2.57 (5.20)	-5.06 (3.42)	-4.06 (4.36)
12. MSSD Change	-11.08 (35.01)	5.00 (14.98)	18.95 (57.62)	-1.49 (9.59)	2.97 (31.89)

Note: SA=high-anxious, NA=low-anxious, T=threat condition, NT=non-threat condition, m=mean, sd=standard deviation.

Table 2. Correlations between major variables of interest.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. SPAI Tot	--	.03	.08	-.04	.21	.06	.10	.18	.18	-.01	.10	.24	.01	.05	-.18
2. Threat Condition		--	-.19	-.20	.03	.04	-.07	.00	-.06	.00	.40	.04	.01	.18	.03
3. Stimulus Presentation			--	.18	.00	-.02	-.12	-.04	.06	-.12	.08	-.11	-.05	.09	-.04
4. Gender				--	-.17	-.01	-.08	-.18	-.08	.17	.10	.09	.17	-.16	-.23
5. Bias Score (Overall)					--	.75***	.73***	.54***	.77***	-.08	-.06	-.07	-.17	.37**	-.15
6. Bias Score-Angry Faces						--	.37**	.25	.53***	-.12	-.31	-.08	.02	.23	-.06
7. Bias Score-Happy Faces							--	.11	.43**	-.03	-.10	-.15	-.11	.17	-.17
8. Bias Score-Neutral Faces								--	.33*	.02	.39	-.25	-.26	.31	-.08
9. Bias Score-Objects									--	-.03	.00	-.12	-.11	.12	-.17
10. Belief Score-Physiology										--	.33	.18	-.25	-.24	-.10
11. Belief Score-Interaction											--	.17	-.40	.02	.03
12. State Anxiety												--	.20	-.30	-.06
13. State Depression													--	-.18	.15
14. Heart Rate Change														--	-.36
15. MSSD Change															--

Note: *p<.05, **p<.01, ***p<.001.

Figure 1. Interaction of anxiety level, threat condition, and length of stimulus presentation in predicting attentional bias scores for all stimulus types.

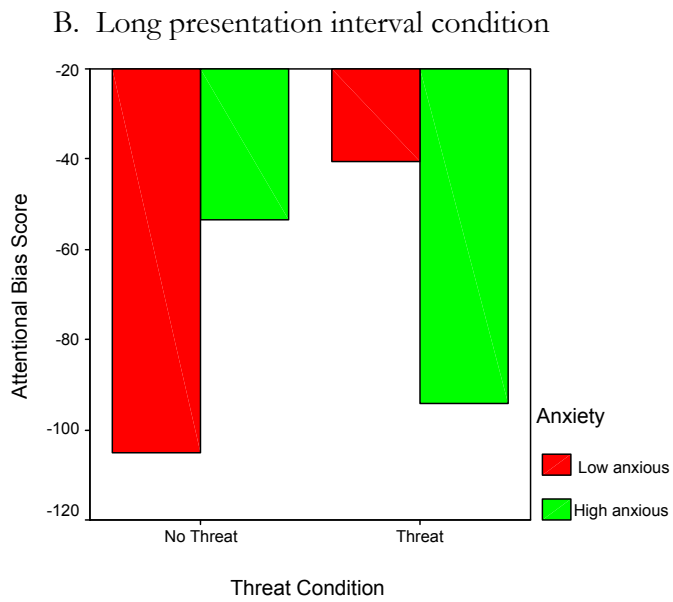
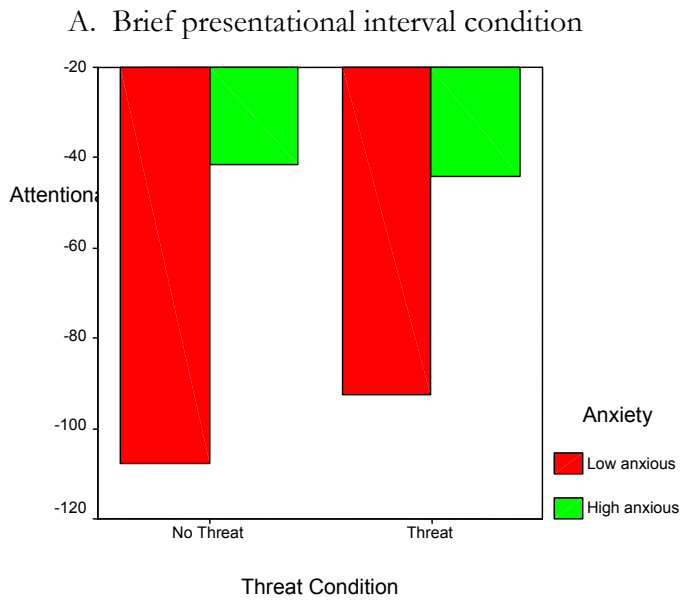


Figure 2. Interaction of anxiety level, threat condition, and length of stimulus presentation in predicting attentional bias scores for happy facial stimuli.

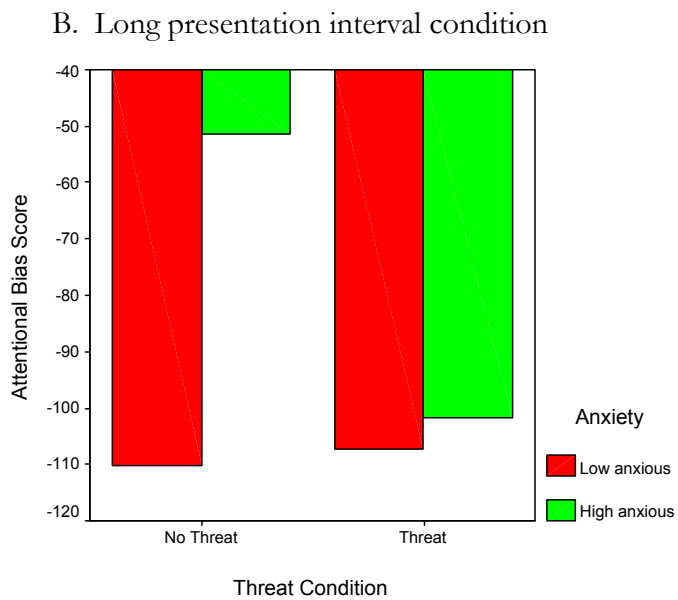
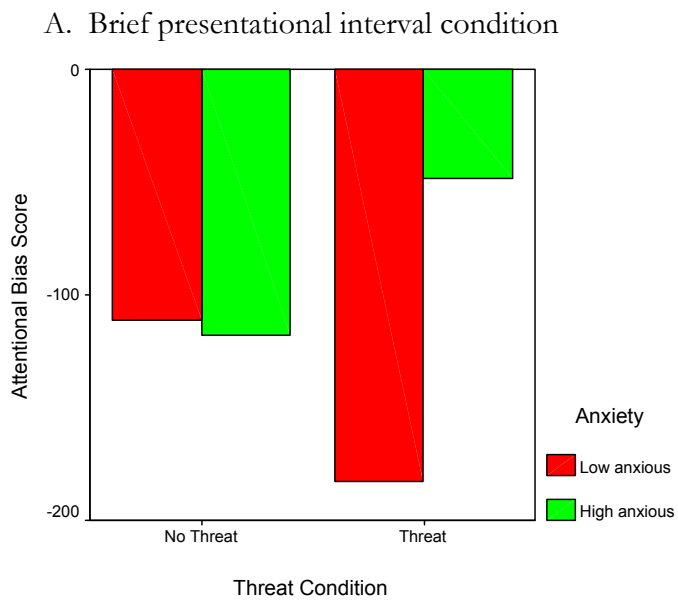
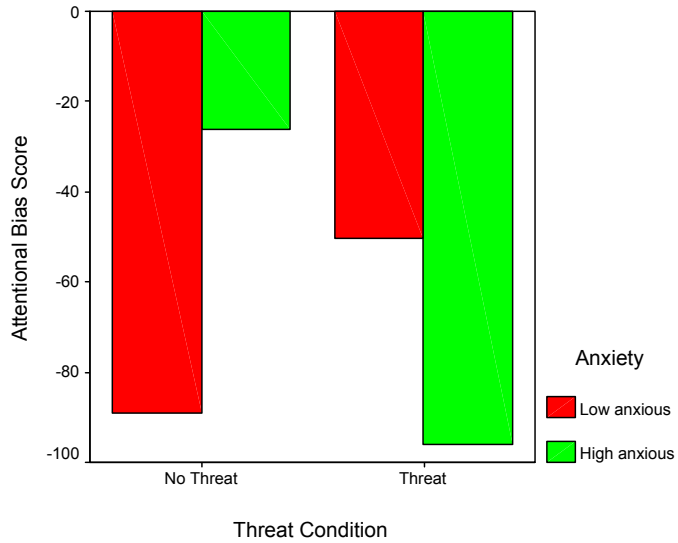


Figure 3. Interaction of anxiety level, threat condition, and length of stimulus presentation in predicting attentional bias scores for angry facial stimuli.

A. Brief presentational interval condition



B. Long presentation interval condition

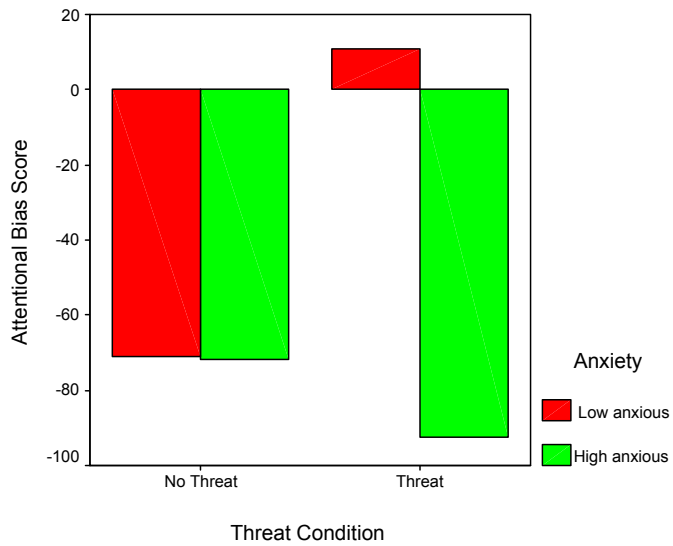


Figure 4. Interaction of anxiety level, threat condition, and length of stimulus presentation in predicting attentional bias scores for neutral facial stimuli.

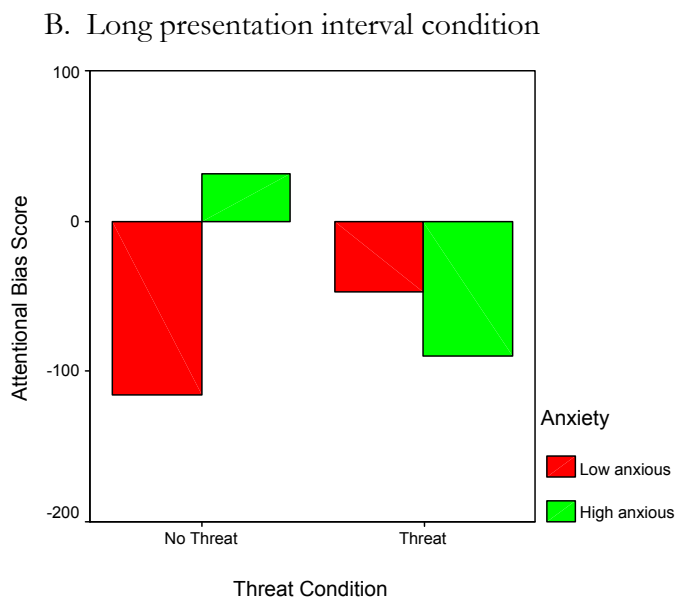
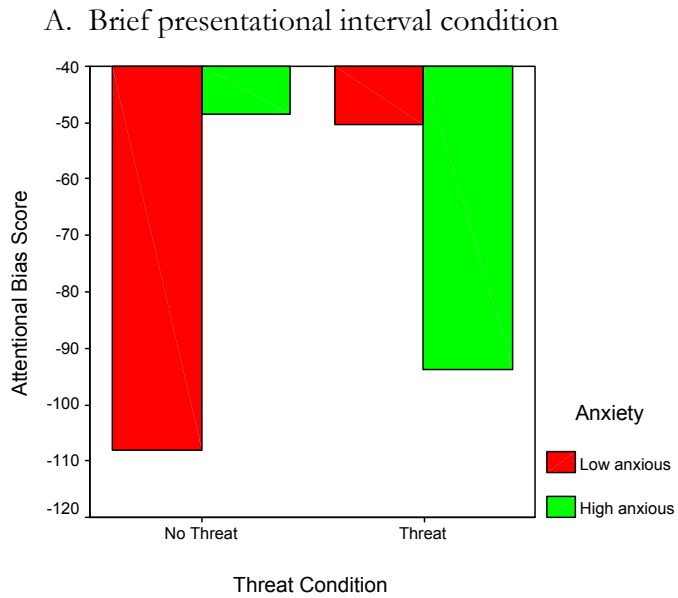
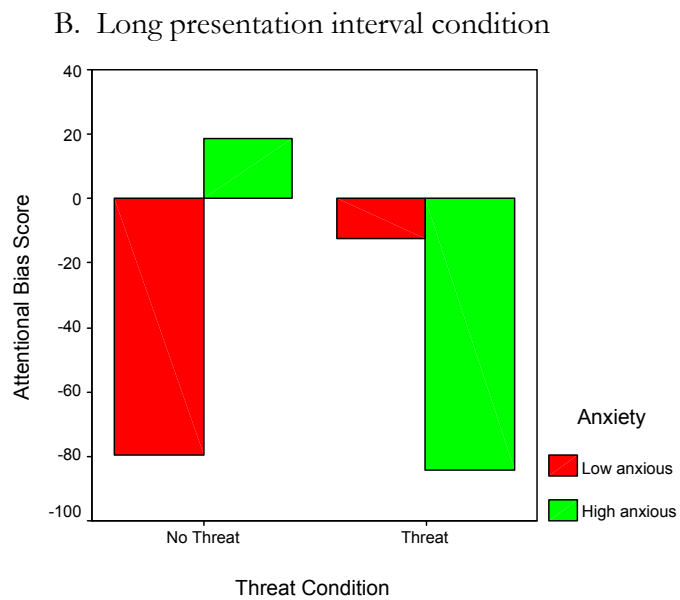
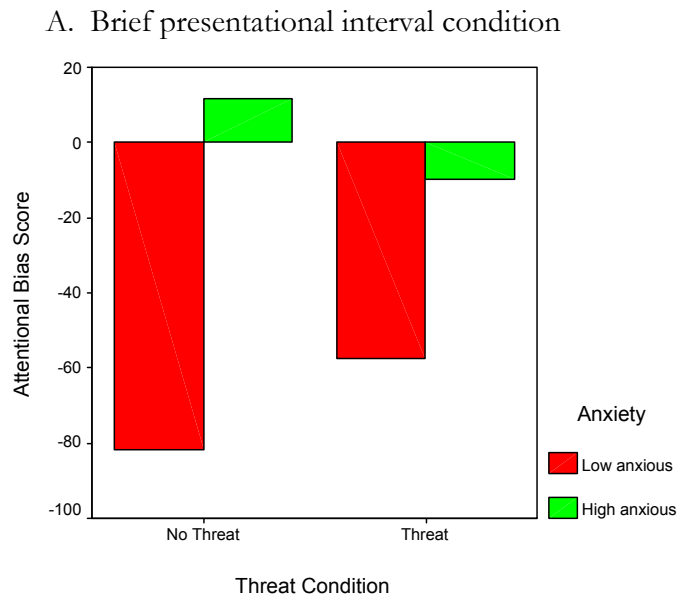


Figure 5. Interaction of anxiety level, threat condition, and length of stimulus presentation in predicting attentional bias scores for neutral object stimuli.



Appendix A.

Demographics Questionnaire

(All personal information will be kept strictly confidential, will not be released to anyone outside of the current project except as required by safety or legal issues, and shall be destroyed at the conclusion of this investigation)

Date: _____

Name: _____

Age: _____ **Date of Birth:** _____ **Sex:** Female Male

Race: Caucasian Hispanic Other: _____
 African-American Asian

Telephone: (home) _____ **Best Times to Call:** _____

(cell) _____ **Best Times to Call:** _____

Marital Status: Single Married Separated Remarried
 Engaged Divorced Widowed

Current Grade Point Average (as displayed in unofficial transcripts on Hokie SPA): _____

Please Estimate Your Total Income (IRS + loans + parents' help/gifts/etc.): _____

How far did your mother go in school?

- less than 7th grade
- completed 9th grade
- partial high school education (10th or 11th grade)
- graduated from high school
- graduated from trade school or business school
- attended college or specialized training program
- graduated from college
- completed graduate school

What is her job title? _____

How far did your father go in school?

- less than 7th grade
- completed 9th grade

- partial high school education (10th or 11th grade)
- graduated from high school
- graduated from trade school or business school
- attended college or specialized training program
- graduated from college
- completed graduate school

What is his job title? _____

Questions-Please answer the following to the best of your abilities:

1. Are you currently at Virginia Tech? Yes No

If Yes, what description best captures you (choose one answer)?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate/Other Student
- Faculty/Staff

If Yes, how long have you been at Virginia Tech?

- <6 months
- 6 months to 1 year
- 1 to 2 years
- 2 to 3 years
- 3 to 4 years
- 4 to 5 years
- >5 years

2. Are you employed during this current academic semester? Yes No

If Yes, how many hours per week do you work on average (choose one answer):

- 0-10
- 11-20
- 21-30
- 31-40
- >40

3. Have you ever been hospitalized (inpatient) for an emotional difficulty? Yes No

4. Have you ever received psychiatric or psychological treatment (outpatient)? Yes No

If Yes, please provide a brief history of treatment:

1) When?: _____ For what reason?: _____

Nature of treatment?: _____

Result of treatment?: _____

2) When?: _____ For what reason?: _____

Nature of treatment?: _____

Result of treatment?: _____

5. **Have you ever taken medication for an emotional difficulty/problem?** Yes No

If Yes, please provide a brief history of treatment:

1) What medication?: _____ When?: _____

For what reason?: _____ Result?: _____

2) What medication?: _____ When?: _____

For what reason?: _____ Result?: _____

6. **Have you ever been diagnosed with a major medical problem/disease?:** Yes No

If Yes, please provide a brief description:

1) What diagnosis?: _____ When?: _____

Result of treatment?: _____

2) What diagnosis?: _____ When?: _____

Result of treatment?: _____

7. **Have you ever been diagnosed with a learning disability?** Yes No

8. **Have you ever been diagnosed with ADD or ADHD?** Yes No

9. **Do you drink alcohol?** Yes No

10. **Do you use substances?** Yes No

11. **Do you consider yourself an anxious person?** Yes No

12. **How anxious do you feel during an average 2-week period?**

 __ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
No Anxiety *A little* *Some* *A lot* *Very Anxious*

13. **Do you consider yourself a sad/depressed/hopeless person?**

14. **How sad/depressed/hopeless do you feel during an average 2-week period?**

 __ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8

No Anxiety *A little* *Some* *A lot* *Very Anxious*

15. Do you believe you have (choose one answer):

- More friends than most people your age
- The same number of friends as most people your age
- Fewer friends than most people your age

16. How many “good” friends do you have (choose one answer)?

- 0
- 1-3
- 4-6
- >6

17. How many people consider YOU one of their “good” friends (choose one answer)?

- 0
- 1-3
- 4-6
- >6

18. Do you wish you had more friends? Yes No

19. Currently, in social situations where you might be observed or evaluated by others or when you are meeting new people, do you feel fearful, anxious, or nervous?

0 1 2 3 4 5 6 7 8
No Anxiety *A little* *Some* *A lot* *Very Anxious*

20. Currently, are you overly concerned that you may do and/or say something that might embarrass or humiliate yourself in front of others, or that others may think badly of you?

0 1 2 3 4 5 6 7 8
No Anxiety *A little* *Some* *A lot* *Very Anxious*

Appendix B.
Social Phobia Anxiety Inventory

Below is a list of behaviors that may or may not be relevant for you. Based on your personal experience, please indicate how frequently you experience these feelings and thoughts in social situations. A social situation is defined as a gathering of two or more people. For example: A meeting; a lecture; a party; bar or restaurant; conversing with one other person or group of people, etc. **FEELING ANXIOUS IS A MEASURE OF HOW TENSE, NERVOUS OR UNCOMFORTABLE YOU ARE DURING SOCIAL ENCOUNTERS.** Please use the scale listed below and circle the number which best reflects how frequently you experience these responses.

Never 1	Very Infrequent 2	Infrequent 3	Sometimes 4	Frequent 5	Very Frequent 6	Always 7
1. I feel anxious when entering social situations where there is a small group.						
2. I feel anxious when entering social situations where there is a large group.						
3. I feel anxious when I am in a social situation and I become the center of attention.						
4. I feel anxious when I am in a social situation and I am expected to engage in some activity.						
5. I feel anxious when making a speech in front of an audience.						
6. I feel anxious when speaking in a small informal meeting.						
7. I feel so anxious about attending social gatherings that I avoid these situations.						
8. I feel so anxious in social situations that I leave the social gathering.						
9. I feel anxious when in a small gathering with:						
strangers						7
authority figures						7
opposite sex						7
people in general						7
10. I feel anxious when in a large gathering with:						
strangers						7
authority figures						7
opposite sex						7

- people in general 1 2 3 4 5 6 7
11. I feel anxious when in a bar or restaurant with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
12. I feel anxious and I do not know what to do when in a new situation with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
13. I feel anxious and I do not know what to do when in a new situation involving confrontation with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
14. I feel anxious and I do not know what to do when in an embarrassing situation with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
15. I feel anxious when discussing intimate feelings with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
16. I feel anxious when stating an opinion to:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
17. I feel anxious when talking about business with:
- strangers 1 2 3 4 5 6 7
 - authority figures 1 2 3 4 5 6 7
 - opposite sex 1 2 3 4 5 6 7
 - people in general 1 2 3 4 5 6 7
18. I feel anxious when approaching and/or initiating a conversation with:
- strangers 1 2 3 4 5 6 7

- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
19. I feel anxious when having to interact for more than a few minutes with:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
20. I feel anxious when drinking (any type of beverage) and/or eating in front of:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
21. I feel anxious when writing or typing in front of:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
22. I feel anxious when speaking in front of:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
23. I feel anxious about being criticized or rejected by:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
24. I attempt to avoid social situations where there are:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
25. I leave social situations where there are:
- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| strangers | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| authority figures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| opposite sex | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| people in general | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

26. **Before entering** a social situation I think about all the things that can go wrong. The type of thoughts I experience are:

Will I be dressed properly? 1 2 3 4 5 6 7

I will probably make a mistake and look foolish 1 2 3 4 5 6 7

What will I do if no one speaks to me? 1 2 3 4 5 6 7

If there is a lag in the conversation what can I talk about? 1 2 3 4 5 6 7

People will notice how anxious I am. 1 2 3 4 5 6 7

27. I feel anxious before entering a social situation. 1 2 3 4 5 6 7

28. My voice leaves me or changes when I am talking in a social situation 1 2 3 4 5 6 7

29. I am not likely to speak to people until they speak to me. 1 2 3 4 5 6 7

30. I experience troublesome thoughts when I am in a social situation. For example:

I wish I could leave and avoid the whole situation 1 2 3 4 5 6 7

If I mess up again I will really lose my confidence. 1 2 3 4 5 6 7

What kind of impression am I making? 1 2 3 4 5 6 7

Whatever I say it will probably sound stupid. 1 2 3 4 5 6 7

31. I experience the following prior to entering a social situation:

sweating 1 2 3 4 5 6 7

frequent urge to urinate 1 2 3 4 5 6 7

heart palpitations 1 2 3 4 5 6 7

32. I experience the following in a social situation:

sweating 1 2 3 4 5 6 7

blushing 1 2 3 4 5 6 7

shaking 1 2 3 4 5 6 7

frequent urge to urinate 1 2 3 4 5 6 7

heart palpitations	1	2	3	4	5	6	7
33. I feel anxious when I am home alone.	1	2	3	4	5	6	7
34. I feel anxious when I am in a strange place.	1	2	3	4	5	6	7
35. I feel anxious when I am on any form of public transportation (i.e., bus, train, airplane)	1	2	3	4	5	6	7
36. I feel anxious when crossing streets.	1	2	3	4	5	6	7
37. I feel anxious when I am in crowded places (i.e., stores, church, movies, restaurants, etc.)	1	2	3	4	5	6	7
38. Being in large open spaces makes me feel anxious	1	2	3	4	5	6	7
39. I feel anxious when I am in enclosed places (elevators, tunnels, etc.)	1	2	3	4	5	6	7
40. Being in high places makes me feel anxious (i.e., tall buildings)	1	2	3	4	5	6	7
41. I feel anxious when waiting in a long line.	1	2	3	4	5	6	7
42. There are times when I feel like I have to hold on to things because I am afraid I will fall.	1	2	3	4	5	6	7
43. When I leave home and go to various public places, I go with a family member or friend.	1	2	3	4	5	6	7
44. I feel anxious when riding in a car	1	2	3	4	5	6	7
45. There are certain places I do not go to because I may feel trapped.	1	2	3	4	5	6	7

Appendix C.
Belief questionnaire

1. How much did you believe that the buzzer on your finger was responding to changes in your heart rate?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
Not at all A little Some A Lot Completely believed

2. How much did you believe that you would be interacting with a stranger?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
Not at all A little Some A Lot Completely believed

Appendix D.
Mood Questionnaire

1. How happy do you feel right now?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
No Happy A little Some A Lot Very Happy

2. How anxious do you feel right now?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
No Anxiety A little Some A Lot Very Anxious

3. How angry do you feel right now?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
No Anger A little Some A Lot Very Angry

4. How sad do you feel right now?

__ 0 __ 1 __ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8
Not sad A little Some A Lot Very Sad

VITA

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EDUCATION

Doctoral Student, Clinical Psychology
Virginia Polytechnic Institute & State University.
Ph.D. expected 2008. Specialization: Child Clinical.

M.S., Psychology
Virginia Polytechnic Institute & State University, April 2006.
Specialization: Child Clinical
Thesis entitled: "Internal and External Attentional Biases in Social Anxiety: The Effect of Effortful Control"

B.A., Psychology
University of Virginia, May 2001. Highest Distinction.

EXPERIENCE

Clinic Assistant, Child Assessment Clinic, Child Study Center, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA August 2005-present.

- perform psychoeducational assessments of children presenting to Child Study Center

Research Assistant, Child & Adolescent Phobia Project, Child Study Center, Department of Psychology, Virginia Polytechnic Institute & State University, Blacksburg, VA August 2003-present.

- perform diagnostic assessments of children presenting to phobia clinic
- develop and implement coding systems for behavioral approach tasks and family interaction tasks
- perform administrative tasks including scheduling, recruitment, and data entry

Extern, Pulaski County Department of Social Services, Pulaski, VA May 2005-December 2005

- completed home study investigations for child custody cases
- developed and implemented a parent training class for families with children in foster care
- shadowed social work staff

Project Coordinator, Personality Assessment Lab, Department of Psychology, University of Virginia, Charlottesville, VA July 2001-July 2003.

- developed procedures & protocols for large-scale personality disorders study
- maintained IRB approval
- hired & supervised 15-20 undergraduate research assistants per semester
- supervised recruitment of 500-1,000 participants per year

Intern, Little Keswick School, Keswick, VA, August 2000-May 2001

- boarding school for emotionally-disturbed boys
- served as teacher's aide in high school classroom

- facilitator for Fast ForWord, a reading program designed for children with speech-language impairment
- calculated weekly student statistics for point/reward system
- prepared student information sheets for treatment team meetings

Research Assistant, Kids' Lives, Families, & Friends (KLiFF Project), Joseph P. Allen, Department of Psychology, University of Virginia, Charlottesville, VA. December 1999-May 2001.

- interviewed adolescent study participants
- recorded and transcribed video and audio data
- entered data using SAS

Intern, Shenandoah Valley Child Development Clinic, James Madison University, Harrisonburg, VA, May 2000-August 2000

- administered Woodcock-Johnson (Revised) Test of Achievement to child clients
- wrote and presented client reports to treatment team
- supervised one research assistant
- aided in research & development of specialty anxiety clinic for children and adolescents

Research Assistant, UVA Sibling Study, Eric Turkheimer, Department of Psychology, University of Virginia, Charlottesville, VA, February 1999-December 1999

- scheduled participant interviews for all lab research assistants
- performed assessments of study participants (including measurement of minor physical anomalies and psychosocial measures)
- data entry using SPSS

PRESENTATIONS & PUBLICATIONS

Whitmore, M. J. & Ollendick, T. H. Internal versus External Attentional Biases in Social Anxiety: The Effect of Effortful Control. Poster presented at the 26th annual conference of the Anxiety Disorders Association of America. March 25, 2006.

Pagan, J. L., Oltmanns, T. F., & **Whitmore, M. J.**, & Turkheimer, E. (in press). Personality disorder not otherwise specified: Searching for empirically based diagnostic criteria. *Journal of Personality Disorders*.

Whitmore, M. J. Ollendick, T. H., Raishevich, N., & Davis, T. The relationship of parental warmth & positive affect to child performance in a behavior approach task. Poster presented at the 39th annual convention of the Association for Behavioral and Cognitive Therapies. November 18, 2005.

Ollendick, T. H., Sirbu, C., Chelf, M., **Whitmore, M.**, Hannesdottir D., & Ost, L. Treatment sensitivity of the Behavioral Avoidance Test (BAT) for specific phobias in children. Poster presented at the 39th annual convention of the Association for Behavioral and Cognitive Therapies. November 18, 2005.

Sirbu, C., Chelf, M., Hannesdottir, D., Whitmore, M., Ollendick, T., & Ost, L.

Relationship between vagal tone, self-efficacy and danger beliefs in children with specific phobias. Poster presented at the 39th annual convention of the Association for Behavioral and Cognitive Therapies. November 18, 2005

Hannesdottir, D. K., **Whitmore, M. J.**, Davis, T. D., & Ollendick, T. H. Behavioral inhibition and performance on a behavioral avoidance task among children with specific phobias. Poster presented at the 38th annual convention of the Association for the Advancement of Behavior Therapy. New Orleans, LA. November 19, 2004.

Whitmore M. J. & Ollendick, T. H. Cognitive errors associated with BAT performance in children with specific phobias. Poster presented at the 38th annual convention of the Association for the Advancement of Behavior Therapy. New Orleans, LA. November 19, 2004.

Whitmore, M. J., Raishevich, N., & Ollendick, T. H. The relationship of child anxiety to maternal psychopathology and environmental expressiveness. Poster presented at the 38th annual convention of the Association for the Advancement of Behavior Therapy. New Orleans, LA. November 19, 2004.

Haden, S. C., **Whitmore, M. J.**, Scarpa, A., Friedman, B. H., & Ollendick, T. H. Familial environment and parental psychopathology impact children's basal cortisol. Poster presented at the 44th annual meeting of the Society for Psychophysiological Research. Santa Fe, NM, October 2004.

Whitmore, M. J. & Ollendick, T. H. Differential performance of children with anxiety disorders and ADHD on a continuous performance test. Poster presented at the 16th annual convention of the American Psychological Society. Chicago, IL. May 28, 2004.

Pagan J. L., Oltmanns, T. F., **Whitmore, M. J.**, and Turkheimer, E., Personality disorder not otherwise specified: Establishing empirically based diagnostic criteria. Poster presented at the 18th annual meeting of the Society for Research in Psychopathology, Toronto, Canada. October 16, 2003.

Whitmore, M. J., Turkheimer, E., & Oltmanns, T. F. A psychometric study of DSM-IV avoidant personality disorder and dependent personality disorder criteria. Poster presented at the 17th annual meeting of the Society for Research in Psychopathology. San Francisco, CA. September 30, 2002.

Whitmore, M. J. (2001). Late adolescent violent behavior: The role of internal control and peer relationships. Unpublished undergraduate thesis. University of Virginia, Charlottesville.

MEMBERSHIPS

Association for the Advancement of Behavior Therapy. 2004-present.

American Psychological Society. 2004-present.

Phi Beta Kappa, University of Virginia, 2001.

Psi Chi, University of Virginia, 1998.

- President 2000-2001
- Secretary 1999-2000

University Psychological Society, University of Virginia. 1998-2001.

- President 2000-2001
- Vice President 1999-2000

Golden Key National Honor Society, University of Virginia. 1998

National Society of Collegiate Scholars, University of Virginia. 1998

Phi Eta Sigma National Freshman Honor Society, University of Virginia.
1998

HONORS & AWARDS

Graduate Research Development Program Award. Virginia Polytechnic Institute & State University, 2005.

- \$225 for completion of master's thesis project

Graduate Student Assembly Travel Award. Virginia Polytechnic Institute & State University, 2004.

- \$157 for travel to 38th Annual Convention of the Association for the Advancement of Behavior Therapy. New Orleans, LA, November 18-21, 2004.

Distinguished Majors Program, Department of Psychology, University of Virginia, 2000-2001.

Intermediate Honors, University of Virginia, 1999.