ELSEVIER

Behaviour Research and Therapy 41 (2003) 1325–1335

BEHAVIOUR RESEARCH AND THERAPY

www.elsevier.com/locate/brat

Attentional bias to threat in social phobia: facilitated processing of threat or difficulty disengaging attention from threat?

N. Amir [a,*], J. Elias [a], H. Klumpp [a], A. Przeworski [b]

[a] *Department of Psychology, University of Georgia, Athens, GA 30602-3013, USA*
[b] *Pennsylvania State University, USA*

Received 31 July 2002; received in revised form 6 February 2003; accepted 12 February 2003

Abstract

There is a growing body of research pointing to the possibility that anxious individuals may have difficulty disengaging their attention from threat-relevant information when this information is task irrelevant (e.g., Amir, N., & Elias, J. (2002). Allocation of attention to threat in social phobia: difficulty in disengaging from task irrelevant cues, Manuscript under review; The Quarterly J. Exp. Psycho. 54A (2001) 665). In the current paper, we report a direct test of this hypothesis in individuals with social phobia. Participants performed a variation of the Posner paradigm (Quart. J. Exp. Psycho. 32 (1980) 3). Social threat, neutral, or positive words cued one of two locations on the computer screen. After the cue disappeared, participants had to detect a probe ("*") that appeared in one of the two locations. On some trials the cue was valid (i.e., the probe appeared in the same location as the cue). On other trials the cue was invalid (the probe appeared in a different location than the cue). Yet, on other trials, no cue was presented. All participants were slower in detecting probes following invalid cues than probes following valid cues. Furthermore, individuals with social phobia showed significantly longer response latencies when detecting invalidly cued targets than did controls, but only when the probe followed a social threat word. These results suggest that individuals with social phobia may have difficulty disengaging their attention from socially threatening material.

Keywords: Social phobia; Attention; Disengagement

* Corresponding author. Tel.: +1-732-445-2194; fax: +1-732-445-1329.
E-mail address: amir@egon.psy.uga.edu (N. Amir).

0005-7967/$ - see front matter © 2003 Published by Elsevier Ltd.
doi:10.1016/S0005-7967(03)00039-1

1. Introduction

Individuals with social phobia tend to show preferential attention to threat-relevant information (e.g., Asmundson & Stein, 1994; Hope, Rapee, Heimberg, & Dombeck, 1990). However, the mechanisms underlying this bias are not well delineated. Recently, a number of researchers have implicated the role of difficulties in disengaging attention from threat-related information in anxious individuals (e.g., Amir & Elias, 2002; Fox, Russo, Bowels, & Dutton, 2001; Fox, Russo, & Dutton, 2002; Yiend & Mathews, 2001). These researchers have used the methods of basic human attention research (e.g., Posner, 1988) to address this question. Attention researchers have identified at least two processes that may contribute to selective attention (e.g., Posner, 1988; Posner, Inhoff, Friedrich, & Cohen, 1987; Posner & Petersen, 1990). For example, Posner suggested that visual spatial attention involves facilitation and inhibition of various spatial locations. The presentation of a cue increases alertness and directs attention to that spatial location. This mechanism enhances the processing of targets in this location. As attention is directed to that specific location, a second mechanism is initiated resulting in less efficient (i.e., inhibited) processing of all other locations. Posner (1988) referred to this second mechanism as the "cost" of attending. More specifically, Posner (1988) decomposed spatial attention into a series of basic processes: 1) interruption of ongoing activity, 2) disengaging attention from the present stimuli, 3) moving attention to the new location, and 4) reengaging attention to the new stimulus.

Posner and colleagues (e.g., Posner, Cohen, & Rafal, 1982) used a cued target paradigm to study covert shifts of spatial attention. The paradigm involves a trial-by-trial cuing procedure. The specific sequence of events is the following: 1) participants are instructed to focus on a fixation point between two rectangles, 2) a cue is presented, (e.g., brightening of one of the rectangles), 3) an asterisk appears in one of the two rectangles, and 4) participants are instructed to press one of two buttons indicating the position of the asterisk (i.e., in the right or left rectangle). On two thirds (2/3) of the trials the cue draws participants' attention to the rectangle in which the asterisk will appear (valid trials). On one sixth (1/6) of the trials the cue draws participants' attention away from the rectangle in which the asterisk will appear (invalid trials). Finally, on the remaining 1/6 of the trials no cue is presented, i.e., neither rectangle is brightened and participants receive no information as to where the asterisk will appear (uncued trials). Participants are faster at responding to asterisks following a valid cue than asterisks following an invalid cue (Posner, 1980; Posner, Walker, Friedrich, & Rafal, 1984). This speeding of response latency on valid trials compared to invalid trials is thought to reflect cue dependency.

Researchers have used variations of the Posner paradigm to examine disengagement difficulties in anxious and non-anxious individuals. For example, Stormark, Nordby and Hugdahl (1995) investigated the role of emotional cues in moderating attentional processes using a modification of the Posner task. They presented participants with emotionally valenced and neutral stimuli as cues during valid and invalid trials. Uncued trials were included to keep participants from becoming sensitive to the fixed cue-target interval but were not analyzed further. These authors found that participants were faster in detecting validly cued targets than invalidly cued targets, but only when emotion words served as cues. Thus, the authors concluded that emotional stimuli serve to attract attention and also to impair the ability to shift attention. The authors also collected brain activity data associated with various components of attention using event-related potentials (ERPs). They concluded that the reaction time data were consistent with both facilitated attention

to emotional stimuli as well as difficulty disengaging from it, and that the ERP data supported mainly facilitation. However, because neutral words did not produce the expected cue dependency effect (valid trials faster than invalid trials), the generalizability of this study is limited.

Compton (2000) used the Posner task to evaluate general disengagement difficulties for non-emotional information. Participants completed the Posner task and the Profile of Mood States questionnaire (POMS; McNair, Lorr, & Droppleman, 1971) before viewing a 10-minute film documenting the personal account of a Holocaust survivor. Participants were then administered the POMS a second time after viewing the film. Compton (2000) examined their reaction time data in relation to changes in negative affect by calculating indices of attentional "benefits" and "cost" (i.e., facilitation and disengagement) for each participant. The attentional benefits index was defined as mean reaction time on uncued trials minus mean reaction time on valid trials, and the attentional cost index was defined as mean reaction time on invalid trials minus mean reaction time on uncued trials. Thus, scores on each index could be positive or negative, where positive scores indicate greater attentional benefit or cost. Compton found that scores on the cost index (i.e., disengagement) were positively correlated with increase in negative affect from pre- to post-viewing, while scores on the benefit index (i.e., facilitation) were not correlated with changes in negative affect. However, because the participants in the Compton (2000) study were unselected undergraduate students and the orienting of attention involved non-threat material, this study may have limited relevance to anxious individuals' processing of threat-relevant material.

Yiend and Mathews (2001) used threatening and non-threatening pictures from the International Affective Pictures Systems (IAPS; Lang, Bradley, & Cuthbert, 1995) to examine anxiety and attention. In the second experiment in that paper, these authors examined components of visual attention, engagement and disengagement, using the Posner paradigm (Posner, 1988). To this end, these authors presented their participants with validly cued, invalidly cued, and uncued trials. Participants saw a target arrow, pointing either up or down, that replaced one of the two picture cues. They were asked to determine whether the arrow was facing up or down. The results indicated that the high anxious group was slower in detecting the orientation of an invalidly cued target than a validly cued target, but only when the cue picture was threatening. The authors concluded that: "There is no evidence to suggest that greater engagement with threatening pictures led to speeding. The significant slowing seen following invalid threatening cues (486 ms) thus indicates that the main effect of threatening pictures was to delay attentional disengagement" (Yiend & Mathews, 2001, p. 674-675). These findings indicate that anxious individuals have difficulties disengaging attention from threat-related information.

In summary, a number of studies have implicated the role of disengagement difficulties in anxious populations. However, it is not clear whether any observed differences on attention are due to emotional valence of the material (positive or negative; Martin, Williams, & Clark, 1991) or are specific to negative emotional information. In the current study, we modified the Posner paradigm to measure disengagement difficulties in individuals with social phobia. To examine the specificity of the effect to social threat we also included neutral and positive words.

2. Method

2.1. Participants

Participants were 18 clients (81% males) diagnosed with social phobia and 20 (50% males) non-anxious controls. The socially phobic group was comprised of individuals seeking treatment for their disorder at the Center for the Understanding and Treatment of Anxiety at the University of Georgia. All socially phobic individuals were diagnosed according to DSM-IV criteria (American Psychiatric Association, 1994) and met these criteria as their primary diagnosis. They participated in the study before beginning their treatment. The non-anxious control group comprised university and community volunteers. The non-anxious group did not meet any DSM-IV Axis I diagnosis as determined by the Structured Clinical Interview for DSM-IV (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1995).

Participants completed the Fear of Negative Evaluation scale (FNE; Watson & Friend, 1969), the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), the Beck Depression Inventory (BDI; Beck & Steer, 1987), and the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Socially phobic individuals were more fearful of negative evaluation, more anxiety sensitive, more depressed, more state anxious, and more trait anxious than controls. Demographic information as well as the means and standard deviations for the above scales are presented in Table 1.

2.2. Procedure

The words used in this study were selected from the list provided by Asmundson and Stein (1994). We used eight socially relevant threat words (e.g., embarrassed, stupid, humiliated), eight positive words (e.g., delighted, confident, steady), and eight neutral words (e.g., dishwasher, tile, hanger). The computer displayed brief instructions for the experiment. All words were presented in lowercase (3–5 mm in height), white letters against a black background, in the center of a Crystal Scan SVGA color monitor connected to a Gateway 2000 P200 Pentium computer. The

Table 1
Demographic and psychometric data[a]

	Socially phobic M (SD)	Control M (SD)	t	p
Age	38 (6.4)	27 (6.2)	5.2	0.01
Education (years)	15 (2.8)	15 (2.3)	0.06	ns
FNE	27.5 (2.9)	7.9 (5.8)	12.3	0.001
ASI	17.5 (6.9)	11.4 (6.7)	5.2	0.001
BDI	9.9 (5.5)	4.4 (2.4)	8.2	0.001
STAI-S	36.5 (11.6)	27.3 (7.8)	2.5	0.02
STAI-T	44.1 (15.6)	27.9 (5.8)	4.4	0.01

[a] FNE = Fear of Negative Evaluation; ASI = Anxiety Sensitivity Index; BDI = Beck Depression Inventory, STAI - S/T = State - Trait Anxiety Inventory - State/Trait Form.

participants were seated 30 cm from the screen. Word types were matched on frequency of usage in English (Francis & Kucera, 1982) and average word length.

Participants saw 288 experimental trials. Two thirds (2/3) of the trials were validly cued (192 = 8 words x 3 word types x 2 word position x 4 repetitions), 1/6 were invalidly cued (48 = 8 words x 3 word types x 2 word position), and 1/6 were uncued (48 = 8 words x 3 word types x 2 word position). The decision to use these proportions was based on previous research (Posner, 1988; Stormark et al., 1995). Trials were presented in a different random order to each participant.

Participants were instructed to focus on a fixation point between two rectangles. The presence of a cue word then directed the participants' attention to one of two screen locations in either of the two rectangles. The word remained on the screen for 600 ms. An asterisk then appeared in one of the two rectangles on the screen and the participants were instructed to press one of two mouse buttons indicating the position of the asterisk (i.e., right or left). Presentation of the probe ended when the participant responded by pressing the right or the left mouse button, or after a 3 sec period if the participant failed to make a response. The inter-trial interval from the target offset to the next fixation cross was 1650 ms.

On some trials, the cue word drew the participants' attention to the rectangle in which the asterisk would appear (valid cue). On other trials, the cue word drew the participants' attention to the rectangle opposite to the one in which the asterisk would appear (invalid cue). If socially phobic individuals show facilitated attention to threat related information, they should show speeding of response latencies when detecting validly cued targets following social threat words compared to controls. On the other hand, if socially phobic individuals have difficulty disengaging their attention from social threat information, they should have longer response latencies when detecting invalidly cued targets following social threat words than do controls. Based on previous studies (Compton, 2000; Yiend & Mathews, 2001), we predicted socially phobic participants will exhibit disengagement difficulties from threat-relevant material. We did not predict any such differences for neutral or positive words.

3. Results

We first eliminated response latencies for inaccurate trials. Inaccurate trials consisted of trials where the probe was presented on the left side and the participant pressed the button corresponding to the right side or visa versa. This resulted in the elimination of 1% of the trials. Furthermore, response latencies less than 50 ms and greater than 1200 ms were considered outliers and eliminated from the analysis. These ranges were determined based on the inspection of the data using box plots and resulted in eliminating 1% of the trials. Next, for each participant we calculated the mean response latency for each word type and each cue condition. These data are presented in Table 2.

The no cue condition was included to prevent participants from developing an automatic response set due to the fixed cue interval (see Stormark et al., 1995). However, this condition is usually not entered into the analysis (e.g., Yiend & Mathews, 2001, however see Compton, 2000). The pattern of results regarding the ordinal position of no cue, validly cued and invalidly cued trials in our experiment were consistent with previous research (e.g., Posner et al., 1987, Experiment 2).

Table 2
Mean response latency by cue type and word type for each group

Word type	Socially phobic M (SD)	Control M (SD)
Threat		
Valid	739 (221)	665 (134)
Invalid	852 (239)	727 (119)
No cue	857 (241)	809 (117)
Neutral		
Valid	733 (195)	657 (125)
Invalid	829 (199)	760 (127)
No cue	885 (255)	872 (249)
Positive		
Valid	737 (211)	659 (121)
Invalid	821 (189)	740 (130)
No cue	865 (277)	816 (216)

The mean response latencies for each participant were submitted to a 2 (Group: socially phobic, non-anxious controls) x 2 (Cue Type: valid, invalid) x 3 (Word Type: social threat, positive, neutral) analysis of variance (ANOVA) with repeated measurement on the last two factors. This analysis revealed a main effect of Cue Type [$F(1, 36) = 102.07$, $p < 0.001$] that was modified by an interaction of Cue Type x Word Type x Group [$F(2, 72) = 6.05$, $p < 0.006$]. None of the other main effects or interactions were significant[1]. To examine this 3-way interaction further, we conducted separate Group X Cue Type analyses for each word type.

For social threat words, this analysis revealed a main effect of Cue Type [$F(1, 36) = 59.4$, $p < 0.001$] that was modified by an interaction of Group x Cue Type [$F(1, 36) = 6.44$, $p < 0.02$]. The main effect of Group was not significant [$F(1, 36) = 2.62$, $p = 0.11$]. We then conducted simple effects analyses to explore this interaction further. Simple effects of Cue Type revealed that the socially phobic group took significantly longer to respond to invalidly cued social threat words than did non-anxious controls [$t(36) = 2.07$, $p < 0.05$] but that groups did not differ in their response latencies to validly cued social threat words [$t(36) = 1.1$, $p > 0.3$]. Simple effects of Group revealed that the socially phobic group [$t(17) = 6.54$, $p < 0.001$] and the non-anxious controls [$t(19) = 4.07$, $p < 0.001$] took longer to respond to invalidly cued social threat words than they did to respond to validly cued social threat words.

Similar analyses for positive [$F(1, 36) = 49.06$, $p < 0.001$] and neutral [$F(1, 36) = 46.36$, $p < 0.001$] words only revealed a main effect of Cue Type[2]. In both cases, examination of the means revealed that participants were faster to respond to validly cued targets than they were to respond to invalidly cued targets. None of the other main effects and interactions were significant.

[1] Group $F(1, 36) = 2.26$, $p = 0.13$; Word Type $F(2, 72) = 0.4$, $p = 0.7$; Group x Word Type $F(2, 72) = 1.26$, $p = 0.3$; Group x Cue Type $F(2, 72) = 1.03$, $p = 0.3$; Word Type x Cue Type $F(2, 72) = 0.57$, $p = 0.6$.

[2] Main effects of Cue type for positive [$F(1, 36) = 49.06$; $p < 0.001$]; main effects of Cue Type for neutral [$F(1, 36) = 46.36$, $p < 0.001$]; The interaction of Group x Word Type for positive [$F(1, 36) = 0.007$, $p = 0.9$]; The interaction of Group x Word Type for neutral [$F(1, 36) = 0.07$, $p = 0.8$].

We also calculated a validity effect (Compton, 2000) by subtracting response latencies for validly cued trials from the response latencies for invalidly cued trials. The validity effect is a measure of cue dependency. These data are depicted in Fig. 1. The socially phobic group had a significantly a larger validity index for social threat words [$t(36) = 2.54$, $p < 0.02$] than did controls. Groups did not differ in their validity index for positive [$t(36) = 0.08$, $p = 0.9$] or neutral [$t(36) = -0.026$, $p = 0.7$] words.

4. Discussion

The results of this study show that individuals with social phobia have difficulty disengaging their attention from social threat words. As revealed in the analysis of validity cue, the dependence on threat-related cues may explain the enhanced interference from negative information in socially phobic individuals. This paradigm allowed us to examine the mechanisms of attentional bias in social phobia (i.e., facilitation vs cost; Posner, 1980). We conclude that the cost of attending to irrelevant social information may be the primary mechanism responsible for anxious individuals' attentional bias in typical information processing paradigms (e.g., Stroop task, dot probe). This is in contrast to the typical suggestion that anxious individuals are characterized by an attentional bias toward threat. Although our suggestion may seem inconsistent with previous research implying the role of attentional facilitation for threat in social phobia, there are both theoretical and empirical reasons in support of our suggestion.

From a theoretical perspective, a tendency to detect sources of threat should be evolutionarily adaptive (e.g., Bond & Siddle, 1996). Therefore, it is unlikely that such a tendency would be disadvantageous for individuals with anxiety. Indeed the often-reported complaint heard from socially phobic patients is not that they tend to detect an extraordinary number of threat cues in

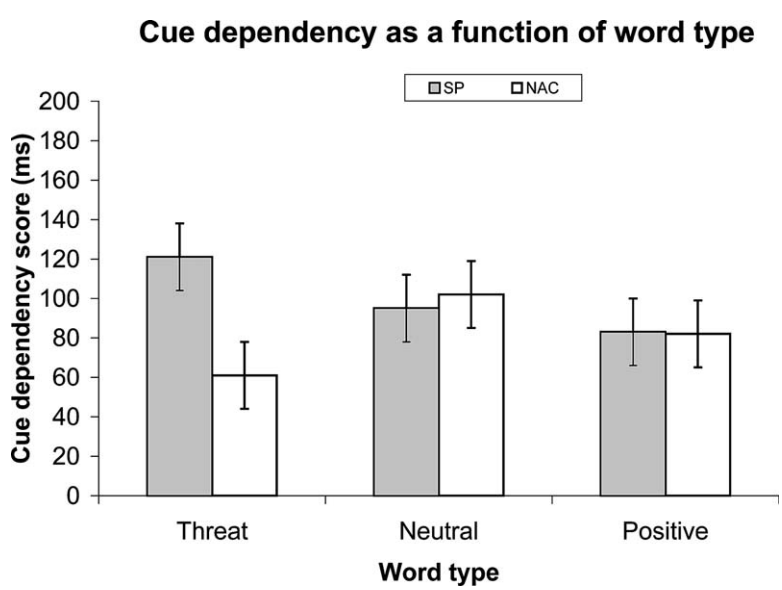

Fig. 1. Cue dependency by word type in individuals with social phobia and non-anxious controls.

their environment (e.g., seeing many angry faces), but rather that they have difficulty dismissing such threat cues once they have been detected (i.e., not thinking about a negative social interaction). Of course, effortful attempts at dismissing threatening thoughts are far removed from the speeded detection of threat cues and one's difficulty in disengagement attention from such cues. However, both tasks may be influenced by the same mechanisms (i.e., inhibitory difficulty).

Empirically, there are also at least three lines of research consistent with our suggestion that anxious individuals may have difficulty disengaging their attention from threat cues. *First*, the reduced efficiency in disengaging attention from social threat in the current study parallels research examining the role of disengagement difficulty in anxiety. As reviewed earlier, Compton (2000) found that slower disengagement of attention from invalid cues predicted an increase in negative affect after watching a Holocaust film. This researcher used non-emotional stimuli (boxes) to obtain her measure of disengagement difficulty, a seemingly more stringent method of identifying this bias than the methodology we used. Similarly, Yiend and Mathews (2001) concluded that attentional bias in high trait anxious participants is due to difficulty in disengaging their attention from threat. Finally, Fox et al. (2002) extended these results by showing that high trait anxious individuals have difficulty disengaging their attention from emotional facial expressions in the Posner paradigm. Thus, these studies, as well as ours, highlight the role of attentional disengagement difficulties in predicting anxiety status and response.

Second, neuro-physiological studies on visual memory and attention support the notion that disengagement is a crucial mechanism involved in selective attention. In brief, current models of selective attention suggest that attention facilitates processing of information in or near a location, leaving other locations inhibited (e.g., Arrington, Carr, Mayer, & Rao, 2000). When a target appears near a valid cue, the participant responds appropriately. On invalidly cued trials, however, the participant must reorient his or her attention to the target location before making a decision about the target. Thus, the difference between valid and invalid cues is the insertion of an extra step. This assertion is consistent with neurobiological studies that show activation of brain regions thought to be involved in disengagement in such tasks (e.g. right lateral temporoparietal junction, middle temporal junction, and medial frontal gyrus; Arrington, Carr, Mayer & Rao, 2000). But, is there any evidence for a faulty disengagement mechanism in anxiety? Indirect evidence for this perspective comes from the animal literature. For example, LeDoux and colleagues (Morgan, Romanski, & LeDoux, 1993) showed that rats with lesions in the medial prefrontal cortex (PFC) showed slower rates of extinction of learned aversive responses compared to control rats. These findings may imply that the disruption of the inhibitory pathways from the medial PFC to the amygdala may be an active component of extinction processes (Davidson, Jackson, & Kalin, 2000). When these inhibitory pathways are disrupted, the amygdala may remain activated and unchecked leading to increased anxiety. This explanation would be consistent with our results implying the role of disengagement difficulty in anxiety.

Third, Amir and Elias (2002) used a modification of the probe detection task in order to disentangle the two mechanisms that may be involved in attentional bias for threat: 1) directing attention toward threat and 2) difficulty disengaging attention from threat when it is task irrelevant. Participants saw a pair of words, one above the other. The words then disappeared and a letter ("E" or "F") appeared in the location of the top or bottom word. In two studies, participants with social phobia were slower in responding to a probe following a neutral word when it was paired with a social threat word than when the same neutral word was paired with another neutral word.

These results support a faulty disengagement theory of attentional bias in social phobia. Thus, both theoretical and empirical considerations point to the role of a faulty disengagement mechanism in anxiety.

What are the clinical implications of this disengagement difficulty in social phobia? Successful cognitive-behavioral treatment for social phobia involves social skills training, exposure exercises to threat, and cognitive restructuring (e.g., Hope, Heimberg, Juster, & Turk, 2000). The active ingredients in social skills training and exposures may involve teaching clients to disengage their attention from threat cues (e.g., their internal state or an ambiguous comment) and allow the client to process alternative sources of feedback in social situations. Thus, these treatments may enable clients to practice disengagement strategies. Direct data for this proposition comes from experimental work (e.g., MacLeod, Rutherford, Campell, Ebsworthy, & Holker, 2002). MacLeod, Rutherford, Campbell, Ebsworthy and Holker (2002) showed that induction of attentional bias to threat serves to modify emotional vulnerability in non-anxious participants. Such a bias can then be used to predict emotional reactions to stress.

Our study has limitations. For example, because we did not include other control groups (e.g., depressed individuals) in this study, we cannot speak to the specificity of the findings to social phobia (Garber & Hollon, 1991). More specifically, the experimental group met criteria for social phobia as their primary diagnosis. However, co-morbid diagnoses, e.g., Dysthymia, Generalized Anxiety Disorder, may have contributed to the results. Also, because we did not include other types of threat (e.g., physical threat words), we cannot conclude that these results are specific to social threat words. Furthermore, it is difficult to determine whether the positive words were as socially relevant as the negative words. Some of the positive words (e.g., confident) can certainly be construed as socially relevant. But it is not clear if there was an exact match in social relevance of negative and positive words. Thus the word types may be different in social relevance as well as valence.

In summary, our results are consistent with that of other studies implicating the role of attentional bias for threat in anxious individuals. However, the use of the Posner paradigm allowed us to examine the components of such biased attention to threat. In doing so, we found no evidence for differences between socially phobic and non-anxious groups in their facilitated attention to social threat. Instead, the results of the current study suggest that anxious individuals exhibit disengagement difficulties and that this may be the primary mechanism of attentional bias in these populations.

Acknowledgements

The preparation of this manuscript was supported by faculty development grants from the University of Georgia Institute for Behavioral Research (IBR) and University of Georgia Research Foundations Inc. awarded to the first author.

References

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

Amir, N., & Elias, J. (2002). Allocation of attention to threat in social phobia: difficulty in disengaging from task irrelevant cues, Manuscript under review.

Arrington, C. M., Carr, T. H., Mayer, A. R., & Rao, S. M. (2000). Neural mechanisms of visual attention: object-based selection of a region in space. *Journal of Cognitive Neuroscience*, *12*, 106–117.

Asmundson, J. G., & Stein, M. B. (1994). Selective processing of social threat in patients with generalized social phobia: Evaluation using a dot-probe paradigm. *Journal of Anxiety Disorders*, *8*, 107–117.

Beck, A. T., & Steer, R. A. (1987). *Beck depression inventory manual*. San Antonio, TX: The Psychological Corporation.

Bond, N. W., & Siddle, D. A. T. (1996). The prepared account of social phobia: some data and alternative explanations. In R. M. Rapee (Ed.), *Current controversies in the anxiety disorders* (pp. 291–316). New York: Guilford Press.

Compton, R. J. (2000). Ability to disengage attention predicts negative affect. *Cognition and Emotion*, *14*, 401–415.

Davidson, R. J., Jackson, D. C., & Kalin, N. H. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin*, *126*, 890–909.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, K. B. W. (1995). *Structured clinical interview for DSM-IV axis 1 disorders*. Washington, DC: American Psychiatric Press.

Fox, E., Russo, R., Bowels, R., & Dutton, K. (2001). Do threatening stimuli draw or hold visual attention in subclinical anxiety? *Journal of Experimental Psychology: General*, *130*, 681–700.

Fox, E., Russo, R., & Dutton, K. (2002). Attentional bias for threat: Evidence for delayed disengagement from emotional faces. *Cognition and Emotion*, *16*, 355–379.

Francis, W. N., & Kucera, H. (1982). *Frequency analysis of English usage*. Boston, MA: Houghton Mifflin.

Garber, J., & Hollon, S. D. (1991). What can specificity designs say about causality in psychopathology research? *Psychological Bulletin*, *110*(1), 129–136.

Hope, D. A., Heimberg, R. G., Juster, H. R., & Turk, C. L. (2000). *Managing social phobia: A cognitive-behavioral therapy approach*. Graywind Publications Inc.

Hope, D. A., Rapee, R. A., Heimberg, R. G., & Dombeck, M. J. (1990). Representations of the self in social phobia: Vulnerability to social threat. *Cognitive Therapy and Research*, *14*, 477–485.

Lang, P. J., Bradley, M., & Cuthbert, B. N. (1995). *International affective picture system (IAPS)*. Gainesville, FL: NIMH Center for the Study of Emotion and Attention, University of Florida.

MacLeod, C., Rutherford, E., Campbell, L., Ebsworthy, G., & Holker, L. (2002). Selective attention and emotional vulnerability: Assessing the causal basis of their association through the experimental manipulation of attentional bias. *Journal of Abnormal Psychology*, *111*, 107–123.

Martin, M., Williams, R. M., & Clark, D. M. (1991). Does anxiety lead to selective processing of threat-relevant information? *Behaviour Research and Therapy*, *29*, 147–160.

McNair, D., Lorr, M., & Droppleman, L. (1971). *Profile of mood states* (Manual). San Diego, CA: Educational and Industrial Testing Service.

Morgan, M. A., Romanski, L., & LeDoux, J. E. (1993). Extinction of emotional learning: Contribution of medial prefrontal cortex. *Neuroscience Letters*, *163*, 109–113.

Posner, M. I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology*, *32*, 3–25.

Posner, M. I. (1988). Structures and functions of selective attention. In T. Boll, & B. Bryant (Eds.), *Clinical neuropsychology and brain function* (pp. 173–202). Washington, DC: American Psychological Association.

Posner, M. I., Inhoff, A. W., Friedrich, F. J., & Cohen, A. (1987). Isolating attentional systems: A cognitive-anatomical analysis. *Psychobiology*, *15*, 107–121.

Posner, M. I., & Petersen, S. E. (1990). The attention systems of the human brain. *Annual Review of Neuroscience*, *13*, 25–42.

Posner, M. I., Walker, J. A., Friedrich, F. J., & Rafal, R. D. (1984). Effects of parietal injury on covert orienting of attention. *Journal of Neuroscience*, *4*, 1863–1874.

Posner, M. I., Cohen, Y., & Rafal, R. D. (1982). Neural systems control over spatial orienting. *Philosophical Transactions of the Royal Society of London. Series B*, *2908*, 187–198.

Reiss, S., Peterson, R. A., Gursky, D. M., & McNally, R. J. (1986). Anxiety sensitivity, anxiety frequency and the predictions of fearfulness. *Behaviour Research and Therapy*, *24*, 1–8.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the state-trait anxiety inventory*. Palo Alto, CA: Consulting Psychologists Press.

Stormark, K. M., Nordby, H., & Hugdahl, K. (1995). Attentional shifts to emotionally charged cues: Behavioural and ERP Data. *Cognition and Emotion*, *9*(5), 507–623.

Watson, D., & Friend, R. (1969). Measurement of social-evaluative anxiety. *Journal of Consulting and Clinical Psychology*, *33*, 448–457.

Yiend, J., & Mathews, A. (2001). Anxiety and attention to threatening pictures. *The Quarterly Journal of Experimental Psychology*, *54A*, 665–681.