Behavioural and Cognitive Psychotherapy, 2006, 34, 385–395
Printed in the United Kingdom doi:10.1017/S1352465806002803

Attentional Disruption in the Presence of Negative Automatic Thoughts

Amy Wenzel

University of Pennsylvania, Philadelphia, USA

Abstract. The present study examined attentional disruption in the presence of negative automatic thoughts specific to panic and social anxiety. Participants with panic disorder ($n = 18$), participants with social phobia ($n = 19$), and nonanxious participants ($n = 19$) completed a dichotic listening task in which they shadowed ambiguous passages heard in their dominant ear while ignoring lists of panic-related, social anxiety-related, or control automatic thoughts that were presented in their non-dominant ear. In addition, they completed a simultaneous simple reaction time task. Both patient groups made more shadowing distortions than the nonanxious group. Panic participants committed more shadowing omissions in trials in which they heard panic-related automatic thoughts as compared to trials in which they heard other automatic thoughts. Results suggest that both patient groups experienced some disruption on this demanding task but that only panic patients exhibited an anxiety-specific attentional bias.

Keywords: Attentional bias, dichotic listening, panic disorder, social phobia, cognition.

Introduction

Itis well documented that individuals with anxiety disorders selectively attend to threat-relevant stimuli, such that they detect these stimuli more quickly than nonanxious individuals, and they detect these stimuli more quickly than they detect neutral stimuli (see Mathews and MacLeod, 1994; McNally, 1996; Mogg and Bradley, 2003; Williams, Mathews and MacLeod, 1996 for reviews). Anxiety researchers have theorized that these attentional biases maintain and exacerbate anxiety symptoms because anxious individuals ignore information that signifies safety or that provides information to make a more realistic appraisal of the situation (e.g. Beck and Emery, 1985). At present, selective attention in the anxiety disorders is considered a truism (Williams, Watts, Mathews and MacLeod, 1997), and several recently proposed cognitive models of anxiety regard selective attention as a cornerstone of their theories (e.g. Beck and Clark, 1997; Eysenck, 1997).

In order to shed light on the etiology and maintenance of psychopathology, it is important to move beyond description of pathology-relevant biases and design experimental studies that isolate the mechanism by which these biases arise. One of the most common accounts that has been posited to explain the occurrence of attentional biases is the activation of maladaptive schemas. Most cognitive psychopathologists regard schemas as hypothetical

Reprint requests to Amy Wenzel, Psychopathology Research Unit, Department of Psychiatry, University of Pennsylvania, 3535 Market St., Room 2032, Philadelphia, PA 19104, USA. E-mail: awenzel@mail.med.upenn.edu

cognitive structures that guide the allocation of cognitive resources to processing information in the environment (e.g. Beck and Emery, 1985). Several researchers who have documented attentional biases associated with anxiety disorders attribute their findings to the fact that maladaptive schemas are activated when participants are confronted with threat-relevant stimuli (e.g. Mathews and MacLeod, 1985; Hope, Heimberg, Rapee and Dombeck, 1990; Thrasher, Dalgleish and Yule, 1995). However, this explanation is contrary to tenets of Beck and Clark's (1997) three-stage model of information processing and anxiety. According to this model, the stage of processing in which attentional biases arise is primarily automatic, and schemas influence cognition only in tasks that require more elaborate processing. If this is the case, then a mechanism other than the activation of maladaptive schemas underlies attentional biases toward threat.

In order to examine whether maladaptive schemas are related to attentional biases toward threat, it is important to ensure that stimuli included into such experiments either activate or are representative of the contents in these cognitive structures. One way to do this is to incorporate statements representing anxiety-relevant automatic thoughts as stimuli in experiments designed to examine cognitive biases toward threat. Automatic thoughts (ATs) are cognitions experienced in particular situations that are assumed to be representative of an individual's schema (Hollon and Kendall, 1980; Kendall and Hollon, 1989). They are usually characterized by short sentences such as "I am in danger" or "I won't be able to cope." Although these statements are different than the stimuli usually incorporated into tasks measuring attentional biases toward threat (e.g. single words), it is argued here that they are more directly representative of schema content than stimuli that have been used in the past.

The present study was designed to examine attentional biases in the context of threat-relevant ATs associated with two anxiety pathologies – panic disorder and social phobia. Because full sentences take longer to process than single words or pictures, the Emotional Stroop and probe detection tasks were deemed inappropriate, as participants could name ink colors or respond to probes without having read all of the text. Instead, Mathews and MacLeod's (1986) dichotic listening task was used to present ATs auditorily in participants' unattended channel while they simultaneously shadowed short stories in their attended channel and completed a simple reaction time task on a computer. The materials presented in the unattended channel were lists of ATs relevant to each anxiety pathology as well as automatic thoughts associated with normality. It was hypothesized that individuals with panic disorder and individuals with social phobia would show disruption (i.e. more shadowing errors, slowed reaction time) in the presence of ATs specific to their diagnosis compared to nonanxious control individuals. Further, it was expected that individuals with one type of anxiety disorder would show more disruption in the presence of ATs specific to their diagnosis as compared to individuals with the other type of anxiety disorder.

Method

Participants

Participants were 18 individuals diagnosed with social phobia, 19 individuals diagnosed with panic disorder, and 19 nonanxious individuals who reported no current psychopathology who were recruited from outpatient psychiatry and psychology clinics, private practitioners,

https://doi.org/10.1017/S1352465806002803 Published online by Cambridge University Press

and newspaper advertisements. Diagnoses were made according to criteria specified in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994) using the *Structured Clinical Interview for DSM-IV Disorders-Patient Version* (SCID-P; First, Spitzer, Gibbon and Williams, 1994). All participants were between the ages of 18 and 55 years old. Inclusion criteria included current primary diagnoses of social phobia or panic disorder with or without agoraphobia. Exclusion criteria included current major depressive episode or alcohol or substance dependence, a current primary diagnosis of GAD, obsessive compulsive disorder, or PTSD, and a history of mania, psychosis, dementia, head injury, or hearing impairment. Participants recruited for the social phobia sample were excluded for a comorbid diagnosis of panic disorder, and participants recruited for the panic disorder sample were excluded for a comorbid diagnosis of social phobia. Exclusion criteria were the same for nonanxious participants, with the exception that they were required to be free of symptomatology consistent with a diagnosis of social phobia or panic disorder.

Participants had a mean age of 39.9 years, 100% were Caucasian, and 57% were married. The mean education level was 14.9 years, and the mean socioeconomic status rating was 39.6 (highest possible score = 63; Hollingshead, 1975). These demographic variables did not differ among groups. However, groups differed significantly in their gender composition, x^2 (2) = 7.83; $p = .02$. Whereas 50% of the panic group was female, the percentage of female participants was 79% in the nonanxious group and 89% in the social phobic group.

Stimuli selection

A pool of automatic thoughts (ATs) specific to social phobia and panic disorder (i.e. diagnosis-specific ATs) were identified through a literature review and normed extensively before being included as stimuli in the battery of cognitive tasks. Anxiety experts ($n = 16$), or individuals with well-established research programs investigating cognitive behavioral approaches to anxiety disorders, rated the pool of possible ATs for relevance to either social phobia or panic disorder on a seven point scale (1 = not at all related; 7 = extremely related). Individuals making the ratings reported a mean of 11.1 ($SD = 4.3$) years of experience working with anxiety disorders. An AT was included as a *diagnosis-specific stimulus* if its mean rating was at least a 4.5 for the relevant diagnosis and a 3 or less for the other diagnosis. Thus, *panic disorder-specific* ATs were those that received a rating of at least 4.5 on the panic disorder scale and no more than 3 on the social phobia scale. Similarly, *social phobia-specific* ATs were those that received a rating of at least 4.5 on the social phobia scale and no more than 3 on the panic disorder scale.

ATs associated with normative responses to stressful situations served as control stimuli. Undergraduate research participants ($n = 58$) were presented with instructions similar to those used by Glass, Merluzzi, Biever and Larsen (1982) and Kendall and Hollon (1989) in their thought generation procedures. Specifically, participants were instructed to imagine instances in their lives in which they experienced anxiety or nervousness and to write down the thoughts that "ran through their mind" during those times in order to collect a range of ATs associated with the general experience of anxiety for most people. Thoughts that were listed by at least two individuals (cf. Kendall and Hollon, 1989) were rated by undergraduate psychology students ($n = 14$) for pleasantness (1 = extremely unpleasant; 7 = extremely pleasant). Individuals different than those who generated the stimuli rated these thoughts in order to minimize the

Table 1 Mean ratings for ATs included in dichotic listening task

	Panic disorder-specific ATs	Social phobia-specific ATs	Control ATs
Relation to PD	5.46 (0.76)[b]	1.96 (0.64)[b]	–
Relation to SP	2.31 (1.01)[b]	5.90 (0.45)[b]	–
Pleasantness	2.19 (0.35)[a]	2.52 (0.16)[a]	3.95 (0.62)
Length	4.91 (1.11)	5.06 (1.34)	5.30 (1.08)
Examples	I feel like I'm dying.	They'll think I'm inept.	It will be alright.
	I'm having a stroke.	I will sound stupid.	I'll try harder next time.
	I feel like I'm trapped.	I feel awkward and dumb.	I'll try not to think about it.
	I can't catch my breath.	People will laugh at me.	I don't need to be here.

Note: SP = social phobia; PD = panic disorder. Length was measured in number of words. Values in parentheses are standard deviations. Ratings for relation to PD and SP ranged from 1 (not at all related) to 7 (extremely related). Ratings for pleasantness ranged from 1 (extremely unpleasant) to 7 (extremely pleasant). Control ATs were not rated for their relation to social phobia or panic disorder because they were collected after those ratings were made. AT stimuli ranged in length from three to seven words.
[a] = significantly different than control ATs ($p < .05$); [b] = significantly different than the other pathology-relevant ATs ($p < .05$).

possibility that their subjective emotional experience would confound the ratings. In order to be included in the battery of cognitive tasks, these control stimuli were required to have a rating between 3.0 and 5.0 on the pleasantness scale and be similar in length to ATs associated with the diagnostic groups. A rating between 3.0 and 5.0 on the pleasantness scale ensured that control stimuli were relatively neutral in valence. Individuals who participated in this norming session also rated the pleasantness of the diagnosis-specific ATs.

Table 1 displays the properties of stimuli included in the dichotic listening task, as determined by the ratings from anxiety experts (i.e. the extent to which diagnosis-specific ATs were related to panic disorder and social phobia) and the ratings by undergraduate psychology students in norming sessions (i.e. pleasantness). As expected, panic disorder-specific ATs were rated by experts as more related to panic disorder than social phobia-specific ATs, $t\ (39) = 15.81, p < .001$, and social phobia-specific ATs were rated by experts as more related to social phobia than panic disorder-specific ATs, $t\ (39) = -22.94, p < .001$. Analysis of pleasantness ratings revealed significant group differences, $F\ (2, 56) = 81.45, p < .001$, such that both groups of diagnosis-specific ATs were less pleasant than control ATs but did not differ from each other. Groups of ATs did not differ in their mean length.

Dichotic listening task

The dichotic listening task was modeled after Mathews and MacLeod (1986). Twelve stories were presented in the dominant channel of the participants, which was determined by their handedness. Each passage was read by a male reader and lasted for 58 seconds. Stories were read in succession with 5 seconds separating each passage. Each story described an ambiguous but potentially threatening situation. All situations described generally threatening situations with both physical threat and social threat components. For example, one story described a scenario in which the individual was approached by a stray dog during a leisurely walk through a public park. Using a dual channel headset, participants attended to the information

being presented in the dominant channel, determined by participants' handedness, and ignored stimuli presented in the non-dominant channel. Participants were instructed that they were to shadow verbally the information heard in the dominant channel as quickly and as accurately as possible. Responses were audio-taped for later analysis.

Concurrent with each passage, one of three lists of ATs was presented in the non-dominant channel. Lists included ATs associated with social phobia, ATs associated with panic disorder, and control ATs. They were constructed such that verbal readings of these lists lasted for 48 seconds and were composed of approximately 20 successive ATs. Lists were read by a man with a distinctly different voice than the man who read the ambiguous stories. These lists were presented in the non-dominant channel 5 seconds after the onset of the story and concluded 5 seconds before the conclusion of the story (cf. Mathews and MacLeod, 1986). Of the twelve trials, four were accompanied by ATs associated with social phobia, four were accompanied by ATs associated with panic disorder, and four were accompanied by control ATs. Participants were randomly assigned to one of two orders of presentation of passages. Different lists of ATs were matched with different passages in each other. Orders and matchings were determined randomly, with the exception that not more than two lists of the same ATs could occur on contiguous trials.

In addition to the shadowing task, participants were instructed to attend to a computer monitor for a simple reaction time task. Eight visual reaction time probes were presented during the course of each story. Participants directed their attention to a row of five Xs on the screen and clicked the mouse as quickly as possible when the Xs changed to the word CLICK. Reaction time to the visual probe was the dependent measure of interest in this component. One reaction time probe occurred randomly in the 5 seconds prior to the onset of the AT stimuli in the non-dominant channel, and one reaction time probe occurred randomly in the 5 seconds after the ATs in the non-dominant channel ended. The remaining 48 seconds were divided into 6 blocks of 8 seconds each, and the visual reaction time probe was presented once randomly within each block with the exception that no two probes could occur within one second of each other. Participants completed four practice trials and twelve study trials.

There were two dependent variables of interest in this task: (a) shadowing errors, and (b) reaction time. Shadowing errors were classified into four types. *Commissions* were instances in which participants inserted extra words into their expression of the passages. *Omissions* occurred when participants left out words in their expression of the passages. *Substitutions* were instances in which participants inserted a related word in the place of target words. Finally, *distortions* occurred when participants expressed the main idea but changed a small portion of the word (e.g. confusion of singular and plural forms, change in tense). Two trained coders identified each of these types of shadowing errors as a function of the type of AT being presented in the unattended channel. Coders attained reliabilities of .94 for commissions, .99 for omissions, .79 for substitutions, and .62 for distortions on 35 cases. Final values for these cases were determined by consensus coding.

After the dichotic listening task, participants completed a written forced choice recognition task in which each of the ATs and three foils of a similar nature were presented. Participants were instructed to indicate which AT in each grouping was presented in their unattended channel. The foils were constructed to have similar sentence construction and meaning as the target AT. For example, for the target stimulus "Others will criticize me", the foils included "Others will judge me", "Others will blame me", and "Others will find fault in me". This

Table 2 Means and standard deviations on self-report inventories

	Panic disorder ($n = 18$)	Social phobia ($n = 19$)	Nonanxious ($n = 19$)
BAI	13.78 (10.86)[a]	11.58 (7.30)[a]	2.61 (2.81)
BDI	10.61 (7.68)[a,b]	9.68 (7.14)[a]	2.79 (3.01)
FNE	15.50 (9.33)[a]	22.74 (8.79)[a,b]	6.74 (6.43)
SAD	10.50 (8.54)[a]	19.47 (8.34)[a,b]	3.16 (3.22)

Note: BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; FNE = Fear of Negative Evaluation Scale; SAD = Social Avoidance and Distress Scale. Values in parentheses are standard deviations.
[a] = significantly different than nonanxious controls ($p < .05$); [b] = significantly different than other patient group ($p < .05$).

task determines whether the stimuli presented in the unattended channel were truly outside of awareness, which is pivotal in interpreting whether any observed biases reflect automatic or strategic processing (cf. Mathews and MacLeod, 1986).

Procedure

First, participants completed the SCID screening questions and modules. Next, in the context of a larger study, participants completed the dichotic listening task, which was administered by an individual different to the one who administered the SCID. At the end of the session, participants completed the *Beck Anxiety Inventory* (BAI; Beck and Steer, 1990), the *Beck Depression Inventory* (BDI; Beck and Steer, 1987), the *Fear of Negative Evaluation Scale* (FNE; Watson and Friend, 1969), and the *Social Avoidance and Distress Scale* (SAD; Watson and Friend, 1969). Table 2 displays mean scores on these inventories for each group.

Results

Table 3 displays dichotic listening shadowing and reaction time performance data by group. Because there were only four observations for each type of AT, medians for the shadowing performance variable were calculated so that outliers would not influence the measure of central tendency. A logarithmic transformation on the total number of shadowing errors (base 10, y + 1) was made on the data before subjecting them to analyses to achieve a normal distribution because untransformed values were negatively skewed (Kirk, 1995). The reaction time variable consisted of the median value of responses in which lists of panic disorder-specific, social phobia-specific, and control ATs were presented. Because patient groups scored significantly different on the BDI, BDI scores were included in ANOVAs as covariates.

Shadowing errors

A series of four 3 (group) × 3 (stimuli) mixed ANCOVAs with repeated measures on the second variable was conducted for each type of shadowing error. There were no main effects or interactions for *commissions* or *substitutions*. For number of *distortions*, there was a main effect for group, $F\ (2, 55) = 4.14$, $p = .021$, but no main effect for stimuli or group by

https://doi.org/10.1017/S1352465806002803 Published online by Cambridge University Press

Table 3 Dichotic listening task performance

	Panic disorder ($n = 18$)	Social phobia ($n = 19$)	Nonanxious control ($n = 19$)
Shadowing errors (*n*)			
Commissions			
Panic disorder AT	2.86 (3.58)	2.03 (1.76)	1.90 (2.69)
Social phobia AT	2.25 (4.19)	1.78 (1.84)	1.58 (1.91)
Control AT	2.28 (2.47)	2.20 (1.87)	1.83 (2.62)
Omissions			
Panic disorder AT	5.33 (6.73)[a]	2.83 (3.44)	1.40 (1.72)
Social phobia AT	4.25 (6.20)[a]	3.53 (4.26)[a]	0.95 (1.36)
Control AT	2.69 (3.40)[a]	3.73 (4.53)[a]	0.95 (0.96)
Substitutions			
Panic disorder AT	1.25 (1.32)	1.13 (0.78)	1.13 (0.67)
Social phobia AT	1.00 (0.77)	0.98 (0.92)	1.00 (1.26)
Control AT	1.44 (1.01)	1.00 (0.71)	0.80 (0.62)
Distortions			
Panic disorder AT	1.40 (0.91)[a]	1.44 (0.88)[a]	0.70 (0.57)
Social phobia AT	1.46 (1.23)[a]	1.31 (0.73)[a]	0.79 (0.68)
Control AT	1.46 (1.28)[a]	1.38 (0.52)[a]	0.73 (0.60)
Reaction time(s)			
Panic disorder AT	0.59 (0.15)	0.53 (0.09)	0.53 (0.08)
Social phobia AT	0.56 (0.09)	0.54 (0.11)	0.52 (0.08)
Control AT	0.56 (0.11)	0.53 (0.10)	0.53 (0.09)

Note: AT = automatic thought. Values in parentheses are standard deviations. All data in the table were subjected to a logarithmic transformation for analyses in order to achieve a normal distribution. The table presents raw rather than log-transformed data.
[a] = significantly different than nonanxious controls ($p < .05$); [b] = significantly different than other patient group ($p < .05$).

stimuli interaction. Overall, panic and social phobic participants made more distortions than nonanxious participants (*p*s = .012, .033, respectively), but they did not differ from each other on this variable.

For number of *omissions*, there was a main effect for group, $F\ (2, 55) = 3.70$, $p = .031$, that was qualified by a group by stimuli interaction, $F\ (4, 110) = 3.54$, $p = .036$. Follow-up tests of between-groups simple effects indicated that panic participants made more omissions in the presence of each of the three types of ATs than nonanxious participants (p [PD AT] = .016; p [SP AT] = .026; p [CT AT] = .034). Social phobic participants made more omissions than nonanxious participants in the presence of SP ATs ($p = .014$) and CT ATs ($p = .011$) but not in the presence of PD ATs. Panic participants and social phobic participants did not differ in the number of omissions committed as a function of AT. Within-group comparisons suggested an anxiety-specific attentional bias toward threat in the panic participants, such that they committed more omissions in the presence of PD ATs than CT ATs ($p = .043$). In addition, there was a trend for panic participants to make more omissions in the presence of SP ATs than CT ATs ($p = .057$). There were no within-group differences in omissions for social phobic or nonanxious participants.

https://doi.org/10.1017/S1352465806002803 Published online by Cambridge University Press

Reaction time

A 3 (group) × 3 (stimuli) mixed ANCOVA with repeated measures on the second variable yielded no significant main effects or interactions. Thus, unlike the pattern of results observed for shadowing errors, there was no evidence of attentional disruption or bias for this dependent variable.

Recognition test

A one-way ANOVA was conducted to examine differences among groups on the recognition test. This analysis revealed no significant differences among groups in the extent to which the ATs entered into awareness, $F\,(2, 56) = .02$; $p =$ ns. The mean performance on the recognition task was 39%. Chance performance, or 25%, was subtracted from each participant's recognition test score and subjected to a one-sample *t*-test to determine whether participants performed significantly better than would be expected by chance. This *t*-test was significant, $t\,(60) = 11.36$; $p < .001$, indicating that the lists of ATs indeed entered into awareness.

Discussion

The present study was designed to determine whether attentional biases toward threat occur in two anxiety disorder groups when experimental stimuli were representative of maladaptive schema content. Two indices of attentional bias (i.e. shadowing errors, reaction time) were considered. No evidence of attentional biases emerged from reaction time data. However, both patient groups made more shadowing distortions than the nonanxious group. Moreover, between-group analyses suggested that both patient groups committed more omissions than the nonanxious group in the presence of diagnosis-specific ATs, although within-group analyses indicated that these biases were specific to anxiety-relevant stimuli only in the panic disorder group. Thus, both patient groups performed more poorly than the nonanxious group on this difficult task, but only participants with panic disorder demonstrated an anxiety-specific attentional bias.

Results must be interpreted in light of the fact that the ATs presented in the unattended channel entered into awareness, although the low recognition test performance of 39% suggests that participants were not consistently registering this material. This finding contrasts with results reported by Mathews and MacLeod (1986), whose participants recognized stimuli presented in their unattended channel at a level no greater than chance. The fact that stimuli were in awareness in the present does not diminish the fact that attentional biases were demonstrated on one of the two indices; rather it means that, at times, participants might have been consciously allocating their attention toward the threat-relevant material presented in the unattended channel. Although there is robust evidence in the literature demonstrating that anxious individuals selectively attend to threat outside of awareness (e.g. Mogg and Bradley, 2002; Mogg, Bradley, Williams and Mathews, 1993), in several instances researchers have failed to detect an attentional bias for threat-relevant material clearly presented within awareness (Mogg, Bradley, Miles and Dixon, 2004; see Mogg and Bradley, 2003, for a discussion). Mogg and her colleagues have proposed that attentional biases toward threat fail to persist over time, and their vigilance-avoidance theory suggests that anxious individuals avoid directing attention toward particularly threatening material when it is in awareness (Mogg et al., 2004). Results from this study are not consistent with this explanation.

From a schema activation perspective, it is possible that the processing of full sentences moved participants from automatic processing to elaborate processing, when relevant schemas begin to influence cognition. This explanation is sensible when one considers the indices for which biases were and were not found. Contrary to Mathews and MacLeod's (1986) findings, no biases were detected by the simple reaction time variable in the present study. As evidenced in Table 3, participants reacted to prompts approximately a half second after they were presented, which is indicative of automatic processing. Threat-relevant schemas would not have been activated or have had the opportunity to bias information processing. In contrast, it is likely that when participants' attention was drawn to the full sentences presented in the unattended channel, they were unable to complete the shadowing task at hand because of the ATs required substantial cognitive resources for elaborate processing. Leaving out portions of the shadowing, or omissions, would be most indicative of this process.

Although this pattern of results can be reconciled with schema theory, it is important to acknowledge several methodological limitations that bear on the interpretation of results. First, an argument could be made that the panic participants had more severe psychopathology as compared to the social phobic participants because panic participants had significantly higher scores on the BDI and were more likely to be taking psychotropic medications. Although BDI scores were partialled out of analyses, making it unlikely that results were driven by differences in severity of depression, it remains to be seen whether social phobic participants whose symptoms are confirmed to be at a similar severity would also demonstrate a pervasive pattern of attentional biases as well as an anxiety-specific attentional bias. Second, the theoretical rationale for this study rests on the notion that the AT stimuli used in the present study were indeed representative of maladaptive schema content. This assumption is justified by cognitive theory (Beck and Emery, 1985; Hollon and Kendall, 1980; Kendall and Hollon, 1989), but there is little empirical evidence to confirm that schemas exist and that their content is best captured in the form of ATs. Third, the experimental design of this study does not allow for examination of the degree to which maladaptive schema content *causes* information processing biases, as there was no condition in which maladaptive schemas clearly were *not* activated (e.g. comparison with a condition with single words instead of ATs). Finally, samples sizes were small, which might have limited the power to detect significant attentional biases. For example, within-group analyses revealed a trend for panic participants to demonstrate an attentional bias toward SP ATs. With larger sample sizes, it is likely this finding would have been statistically significant according to conventional standards.

The literature is abundant with empirical documentation of attentional biases toward threat in anxiety disorders. Cognitive psychopathologists are now conducting studies with more sophisticated experimental designs to examine the mechanism by which these biases exert causal effects on symptomatology (e.g. MacLeod, Rutherford, Campbell, Ebsworthy and Holker, 2002), to consider the manner in which several types of attentional biases might work simultaneously (Rinck and Becker, 2005), and to investigate difficulties with attentional disengagement (e.g. Fox, Russo, Bowles and Sutton, 2001; Fox, Russo and Dutton, 2002). However, a curious omission in this literature is the empirical investigation of maladaptive schema content and the degree to which it relates to information processing, given that it is a central part of several cognitive models of anxiety (e.g. Beck and Clark, 1997) and has been used to explain the presence of cognitive biases toward threat (e.g. Hope et al., 1990). Results from this study suggest that when anxiety-relevant material is within awareness, patients with panic disorder, but not patients with social phobia, allocate their attention to that material at

the expense of attending to the task at hand. It will be important for future researchers to determine the threshold of schema activation in both panic disorder and social phobia and to implement experimental designs that manipulate the degree to which maladaptive schemas are activated in the context of processing threat-relevant information.

Acknowledgements

The author would like to thank the following individuals who assisted with this research: Cassandra Cochran, Doug Coonrad, Erin Druley, Sarah Beth Golden, Terry Goodale, Anne Goughnour, Kristy Hunt, Jeff Jacobson, Michelle James, Alicia Kroenert, Julia Pupera, and Erica Wagner. Portions of this paper were presented at the 34th Annual Meeting of the Association for Advancement of Behavior Therapy and in the author's dissertation at the University of Iowa. This research was funded from dissertation grants awarded from the American Psychological Association, American Psychological Foundation, Association for Advancement of Behavior Therapy, Society for the Science of Clinical Psychology, and the University of Iowa Student Government.

References

American Psychiatric Association (1994). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. Washington, DC: American Psychiatric Association.

Beck, A. T. and Clark, D. M. (1997). An information processing model of anxiety: automatic and strategic processes. *Behaviour Research and Therapy*, *35*, 49–58.

Beck, A. T. and Emery, G. (1985). *Anxiety Disorders and Phobias: a cognitive perspective*. New York: Basic Books.

Beck, A. T. and Steer, R. A. (1987). *Beck Depression Inventory Manual*. San Antonio, TX: The Psychological Corporation.

Beck, A. T. and Steer, R. A. (1990). *Beck Anxiety Inventory Manual*. San Antonio, TX: The Psychological Corporation.

Eysenck, M. W. (1997). *Anxiety and Cognition: a unified theory*. East Sussex, UK: Psychology Press.

First, M. B., Spitzer, R. L., Gibbon, M. and Williams, J. B. W. (1994). *Structured Clinical Interview for Axis I DSM-IV Disorders*. New York: Biometrics Research Dept.

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

Glass, C. R., Merluzzi, T. V., Biever, J. L. and Larsen, K. H. (1982). Cognitive assessment of social anxiety: self-statement questionnaire. *Cognitive Therapy and Research*, *6*, 37–55.

Hollingshead, A. B. (1975). *Four Factor Index of Social Status*. New Haven, CT: Yale University.

Hollon, S. D. and Kendall, P. C. (1980). Cognitive self-statements in depression: development of an automatic thoughts questionnaire. *Cognitive Therapy and Research*, *4*, 383–395.

Hope, D. A., Rapee, R. M., Heimberg, R. G. and Dombeck, M. J. (1990). Representations of the self in social phobia: vulnerability to social threat. *Cognitive Therapy and Research*, *14*, 177–189.

Kendall, P. C. and Hollon, S. D. (1989). Anxious self-talk: anxious self-statements questionnaire (ASSQ). *Cognitive Therapy and Research*, *13*, 81–93.

Kirk, R. E. (1995). *Experimental Design, third edition*. New York: Brooks/Cole.

MacLeod, C., Rutherford, E., Campbell, L., Ebsworthy, G. and 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.

Mathews, A. and MacLeod, C. (1985). Selective processing of threat cues in anxiety states. *Behaviour Research and Therapy*, *23*, 563–569.

Mathews, A. and MacLeod, C. (1986). Discrimination of threat cues without awareness in anxiety states. *Journal of Abnormal Psychology*, *95*, 131–138.

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

McNally, R. J. (1996). Cognitive bias in the anxiety disorders. In D. A. Hope (Ed.), *Perspectives on Anxiety, Panic, and Fear: Volume 43 of the Nebraska Symposium on Motivation* (pp. 211–250). Lincoln, NE: University of Nebraska Press.

Mogg, K. and Bradley, B. P. (2002). Selective orienting of attention to masked threat faces in social anxiety. *Behaviour Research and Therapy*, *40*, 1403–1414.

Mogg, K. and Bradley, B. P. (2003). Selective processing of nonverbal information in anxiety: attentional biases for threat. In P. Philippot (Ed.), *Nonverbal Behavior in Clinical Setting: series in affective science* (pp. 127–143). London: Oxford University Press.

Mogg, K., Bradley, B. P., Miles, F. and Dixon, R. (2004). Time course of attentional bias for threat scenes: testing the vigilance-avoidance hypothesis. *Cognition and Emotion*, *18*, 689–700.

Mogg, K., Bradley, B. P., Williams, R. and Mathews, A. (1993). Subliminal processing of emotional information in anxiety and depression. *Journal of Abnormal Psychology*, *102*, 1–8.

Mogg, K., Mathews, A. and Eysenck, M. (1992). Attentional bias to threat in clinical anxiety states. *Cognition and Emotion*, *6*, 149–159.

Rinck, M. and Becker, E. S. (2005). A comparison of attentional biases and memory biases in women with social phobia. *Journal of Abnormal Psychology*, *114*, 62–74.

Thrasher, S. M., Dalgleish, T. and Yule, W. (1995). Information processing in post-traumatic stress disorder. *Behaviour Research and Therapy*, *32*, 247–254.

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

Williams, J. M. G., Mathews, A. and MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological Bulletin*, *120*, 3–24.

Williams, J. M. G., Watts, F. N., MacLeod, C. and Mathews, A. (1997). *Cognitive Psychology and Emotional Disorders, second edition*. New York: John Wiley and Sons.