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Specificity of Attentional Bias in Panic Disorder and Social Phobia

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Abstract — Anxious individuals have an attentional bias for threatening information. However, the specificity of this attentional bias among patients with different anxiety disorders remains unclear. The primary goal of this study was to compare Stroop response times to a range of emotionally positive and threatening words in patients with different anxiety disorders and nonanxious controls. Patients with panic disorder (n = 15), social phobia (n = 15), and control subjects (n = 15) participated in a computerized Stroop color-naming task of positive and threatening words related to panic, social concerns, general concerns, as well as neutral words. When compared to others, patients with panic disorder exhibited longer response times to all threatening word types, whereas patients with social phobia demonstrated longer response times to social-threat words only. These findings suggest that patients with panic disorder may possess a broader fear network and thus display more generalized attentional bias to threat than socially anxious patients. *Copyright © 1996 Elsevier Science Ltd*

Anxious individuals have been found to have an encoding bias favoring the processing of threatening information (MacLeod, 1991). In the general population, much information-processing bias is adaptive and facilitates early detection of real danger. However, in anxious individuals, it may focus attention on nondangerous threats and activate the sympathetic nervous system response redundantly (Williams, Watts, MacLeod, & Mathews, 1988). Existence of a maladaptive attentional bias has been demonstrated through an interference paradigm in which subjects are asked to ignore extraneous stimuli while performing a task unrelated to threat (MacLeod, 1991). In the widely used modified Stroop paradigm, subjects are asked to name the color of words as quickly as possible. Delays in color-naming are assumed to reflect direction of attentional resources toward the meaning of a word. Relative to control subjects,

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individuals with a range of anxiety disorders show slowed response latency to threatening words in comparison to neutral words on the Stroop task.

Several important questions regarding the existence and measurement of attentional bias in anxious individuals have been raised (McNally, 1994). First, MacLeod and Mathews (1988) noted that differences between anxious and nonanxious subjects in response to emotionally valenced stimuli may be related to a general performance impairment that threat-related information triggers in anxious individuals, rather than attentional bias. Second, the Stroop paradigm is not a pure measure of attentional bias (MacLeod, 1991). The dot-probe task is another paradigm that measures attentional bias more directly (e.g., Asmundson, Sandler, Wilson, & Walker, 1992; MacLeod, Mathews, & Tata, 1986). Despite its limitations, however, the Stroop paradigm is widely used to gauge how anxious individuals process information in general and is accepted as a common tool to measure attentional bias.

Current studies suggest that patients with panic disorder show longer delays naming the colors of panic words in comparison to nonpanic words (Ehlers, Margraf, Davies, & Roth, 1988). Individuals with social phobia show similar results with social-evaluative threat words (Hope, Rapee, Heimberg, & Dombeck, 1990). Mattia, Heimberg, and Hope (1993) found that individuals with social phobia were generally slower than control subjects in responding to social and physical threat words, but particularly so for social threat words. McNeil et al. (1995) used a modified Stroop color-naming test to assess differences between two generalized social phobia groups (with and without avoidant personality disorder) and a circumscribed speech phobia group. Interference effects for negative social evaluative words were reported in all three groups. In addition, the circumscribed speech phobia group showed delayed responding to specific speech stimuli words but not in response to general social threat words. The two generalized social phobia groups showed delayed responding to specific speech and general social threat words. The above data were found to be consistent with current conceptualizations of social phobia subtypes (McNeil et al., 1995).

Attentional bias has been explained using Bower s (1981) network model of emotion. Fear networks are hypothetical storage structures of threatening information in long-term memory. Nodes in these networks correspond to emotional states and share associative connections (Bower, 1981). Bower (1981) predicts that anxiety activates an anxious emotion node, and that activation spreads to other connected nodes. Consequently, anxious individuals are hypothesized to process information related to anxiety more quickly because it matches the mood-congruent memories that have been activated. In a Stroop color-naming task, it is hypothesized that anxious individuals show delays on words they cannot avoid processing in terms of their content.

A possible relationship between the emotional value attached to the information and the extent of the attentional bias in response to such information is currently debated. The term specificity refers to both the content and the

valence of the information presented. In terms of content, some researchers propose that only information directly related to the *individual's concerns* produces attentional bias (Hope et al., 1990), while others have shown that a broader range of threatening information causes attentional bias in patients with panic disorder. Ehlers et al. (1988), for example, reported that panic patients and nonclincal panickers, but not normal control subjects, showed interference in processing words related to physical threat, separation, and embarrassment. In terms of valence, while some researchers have found that all emotional words, positive and negative, cause attentional bias in anxious individuals (Martin, Williams, & Clark, 1991), others have found that positive words do not produce the same degree of interference as threat words (McNally et al., 1994). Riemann and McNally (1995) reported that panic patients exhibit delays in response to information related to their positive and negative personal concerns. Mathews and Klug (1993) propose that only positive words that are linked to threat concerns in that they are opposites to threat cause interference in anxious individuals. Therefore, attentional bias (as demonstrated by Stroop interference) may involve selective allocation of attention to both positive and negative stimuli (the "emotionality" hypothesis). Alternatively, attention may be selectively captured only by information directly representing the individual s current fears and concerns (the "specificity" hypothesis) or by any information that represents the potential threat (the "generality" hypothesis). In short, although an attentional bias in processing particular information is a widely supported phenomenon, the question of specificity remains unclear. It therefore warrants careful examination and may assist in furthering our understanding of the cognitive functions in anxious individuals.

The current study addressed the question of specificity, using a Stroop paradigm with word categories containing a range of positive and threatening information relevant to a number of anxiety concerns. Furthermore, two different groups of anxiety disordered patients were compared to control subjects. We expected different response times to different stimuli in two clinical groups of subjects. More specifically, we anticipated two major patterns of response: a generality pattern where patients respond to all threatening information more slowly than to neutral information and a specificity pattern where patients respond with delay to threat information related to their disorder only. In addition, we examined the emotionality hypothesis where patients respond with a delay to both positive and negative threat-related information, when compared with neutral words.

METHOD

Subjects

Fifteen panic disordered patients (aged 21–49 years), 15 social phobia patients (aged 19–38 years), and 15 control subjects (aged 18–22 years) participated in this study. All panic disordered and social phobia patients were seeking

treatment at the Anxiety Disorders Program of the Neuropsychiatric Institute at the University of California at Los Angeles (UCLA). All patients were administered either the Anxiety Disorders Interview Schedule-Revised (ADIS-R; DiNardo & Barlow, 1988) or a modified version of it, and were assigned *DSM-III-R* (*Diagnostic and Statistical Manual of Mental Disorders*; American Psychiatric Association, 1987) diagnoses of either panic disorder or social phobia as a principal diagnosis. Each patient was interviewed by a staff psychologist and a psychiatrist. Only those patients who were diagnosed as having panic disorder or social phobia by both clinicians participated in the study. Panic disordered patients did not meet criteria for additional social phobia, and social phobia patients did not meet criteria for additional panic disorder. There were no differences between social phobia and panic disorderd patients on a 0-to 8-point severity rating of distress/disablement associated with the disorder that is assigned after administering the ADIS-R. However, the groups differed significantly in terms of the duration of the current disorder, with social phobia patients reporting a much lengthier episode (panic disorder: $M = 5.3$ months, $SD = 4.8$; social phobia: $M = 24.2$ months, $SD = 11.2$; $t(27) = 5.84$, $p < .001$). Possible implications of this difference are addressed in the Discussion section of this paper. Subjects were excluded on the basis of major depression, substance abuse, or severe medical conditions. No subjects were medicated at the time of the experiment; 60% stopped using benzodiazepines or tricyclics by 2 weeks prior to the experiment. An equal number of subjects from the panic disorder and social phobia groups were withdrawn from medication. Control subjects were recruited from undergraduate psychology classes at UCLA and were given course credit for their participation.

Materials and Procedure

Subjects participated in a computerized version of the Stroop task. Seven categories of word type were included: panic-threat (e.g., dizzy, collapse), panic-positive (e.g., healthy, safety), social-threat (e.g., criticized, embarrassed), social-positive (e.g., admired, friendly), general-threat (e.g., mutilated, violence), general-positive (e.g., pleasant, optimistic), and neutral (e.g., structure, house). Ten words were generated for each category (see Appendix). Words were generated from previously used word lists in published attentional bias studies (MacLeod, 1991; Mathews & Klug, 1993; McNally et al., 1994). A group of anxiety researchers (postdoctoral and graduate students) categorized an initial word list (i.e., social-threat vs. panic-threat, etc.). The agreement percentage was calculated by dividing number of raters agreeing on the category by total number of raters. Words for which 70% agreement was reached were included. For panic-positive words, however, a 50% agreement criterion was used because of difficulty in reaching 70% agreement. Each word was presented four times throughout the experiment; once in red, yellow, blue, and white. Words were presented randomly with the condition that no same category or color was presented in sequence.

Subjects were instructed to ignore the meaning of the words and to name the color of the word as quickly as possible. A voice-activated relay was used to record response latencies in milliseconds. After five practice trials, subjects color-named the experimental words. Each word appeared on the screen following a 500 ms attention cross in the middle of the screen. The maximum duration of the word on the screen was set at 10,000 ms; however, responses greater than 3,000 ms were eliminated as outliers. A 2- to 4-min interval allowed subjects to rest after the first half of the trials. All interactions were tape-recorded to identify errors in color naming and activation of relay by non-task-related noise or waffling noises while considering a response. These error trials were excluded from the analysis.

Specific comparisons were conducted because a priori directional hypotheses had been specified. In this case, planned comparisons of the a priori directional hypotheses can be conducted without testing the overall interaction effect (Keppel, 1982). Family-wise Bonferroni corrections were applied for each set of hypotheses.

Following the experiment, subjects completed the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986) and "word emotionality" ratings. Each word was rated on a scale of 3, *Not at all emotional*, to +3, *Very emotional.*

RESULTS

Stroop Analyses

Error trials, in which subjects prematurely tripped the voice relay, responded too quietly to trip the relay, or responded incorrectly, constituted less than 2% of the total trials and were omitted from analyses. Means and standard deviations for remaining response latencies are shown in Table 1.

As a confirmation of past research findings, we first tested whether anxious patients showed more Stroop interference for relevant threatening information than neutral information (alpha = .05). Panic disorder patients (see Figure 1) showed longer response times to panic-threat versus neutral words, $F(1,42) = 6.44$, $p < .02$, and social phobia patients (see Figure 2) showed longer response times to social-threat versus neutral words, $F(1,42) = 5.16$, $p < .03$. Control subjects (see Figure 3, on the other hand, showed no difference in response times to threatening (panic-threat, social-threat, and general-threat) versus neutral words.

To evaluate the specificity hypothesis, we tested whether anxious patients showed longer response latencies to threatening information not directly relevant to their anxiety and whether anxious patients differed in their response times among different types of threat words (alpha = .017). Panic disordered patients (see Figure 1) responded with longer latencies to social threat, $F(1,42) = 10.06$, $p < .003$, and general threat words, $F(1,42) = 10.90$, $p < .003$, than to neutral words. They did not differ in their response times to the three

TABLE 1
MEAN RESPONSE TIMES (MS) ON STROOP TASK (*SD* PRESENTED IN PARENTHESES)

	Group					
	Panic Disorder		Social Phobia		Control	
Word Type	*M*	*SD*	*M*	*SD*	*M*	*SD*
Neutral	677	(90)	752	(120)	694	(93)
Panic-threat	698	(99)	761	(119)	689	(94)
Social-threat	699	(90)	767	(134)	692	(95)
General-threat	697	(94)	760	(142)	687	(104)
Panic-positive	684	(95)	755	(126)	685	(93)
Social-positive	679	(89)	750	(118)	673	(77)
General-positive	686	(86)	756	(117)	690	(94)

different types of threatening words (i.e., panic-threat, social-threat, and general-threat).

Social phobia patients (see Figure 2) responded as quickly to panic-threat and general-threat words as they did to neutral words. They did not differ in response times among the three types of threatening words.

To test the emotionality effect of positive information, we tested whether anxious patients responded with longer response latencies to positive words rel-

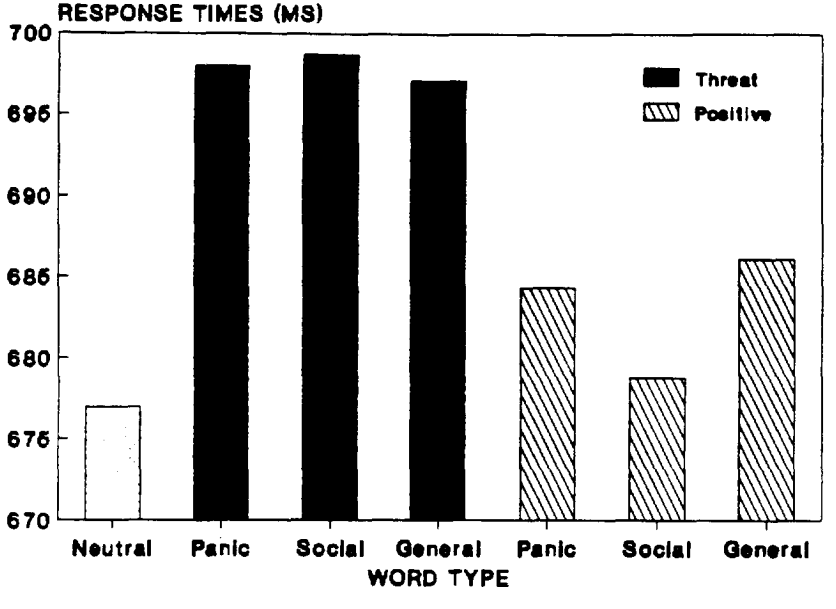

FIG. 1. STROOP RESPONSE TIMES FOR PANIC DISORDER GROUP.

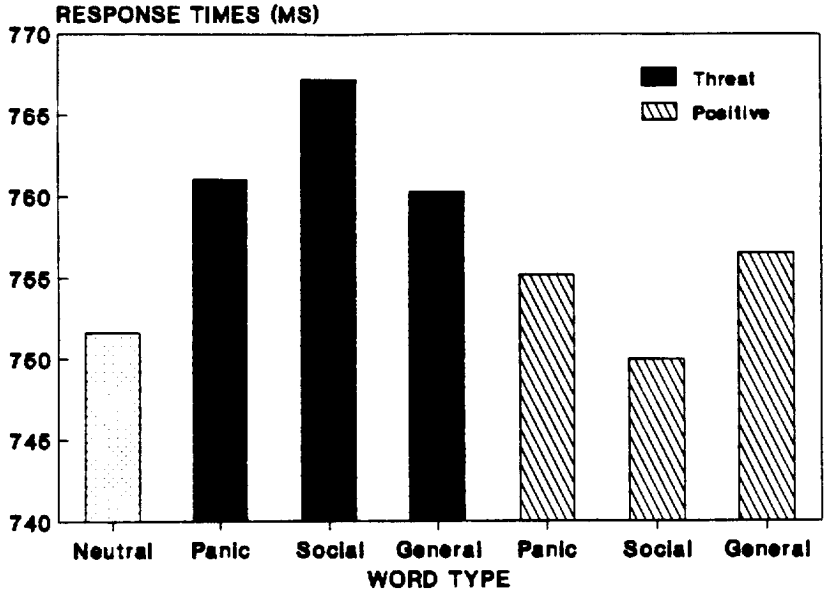

FIG. 2. STROOP RESPONSE TIMES FOR SOCIAL PHOBIA GROUP.

evant to their anxiety than to neutral words (alpha = .05). Then, to test the specificity of this effect, we tested whether anxious patients differed in their response times among the three different types of positive words (alpha = .017).

Panic disordered patients did not show longer response times to panic-positive than to neutral words. Similarly, social phobia patients did not show longer response times to social-positive than to neutral words. Furthermore, neither anxious group demonstrated different response times among panic-positive, social-positive, and general-positive words. Control subjects (see Figure 3) showed no difference in response times to positive (panic-positive, social-positive, and general-positive) versus neutral words.

Although social phobia patients appeared to display longer response times overall to Stroop words, no significant group differences emerged in response times across word types. Generally, response times of panic disordered patients were similar to those shown by control subjects. Social phobia patients showed longer response times to social-positive words than did control subjects, $F(1,28) = 4.51$, $p < .05$. No other group differences were found.

Additional Analyses

Panic disordered patients reported significantly greater anxiety sensitivity on the ASI scale ($M = 33.23$, $SD = 9.51$) than control subjects ($M = 7.47$, $SD = 3.11$), $t(26)$, $p < .001$. Similarly, social phobia patients reported greater anxiety sensitivity ($M = 34.13$, $SD = 7.58$) than control subjects, $t(28)$, $p < .001$.

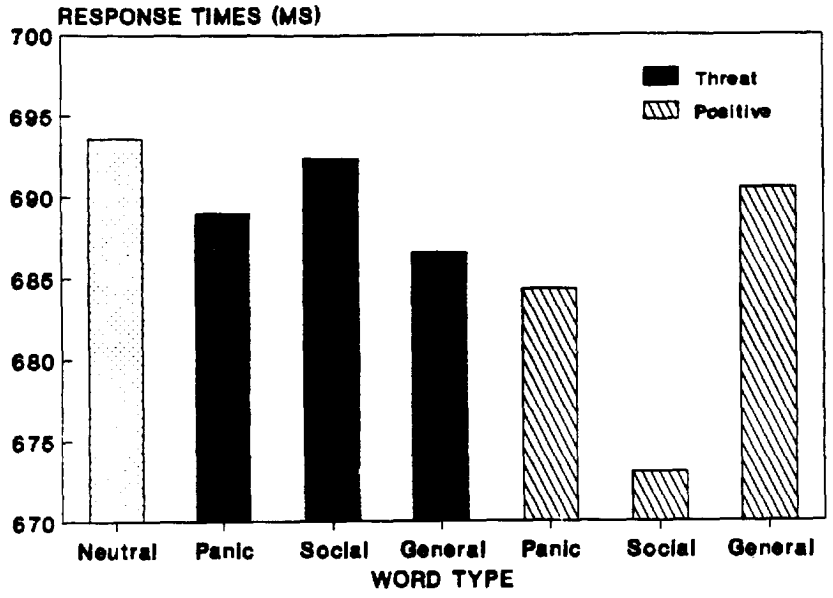

FIG. 3. STROOP RESPONSE TIMES FOR CONTROL GROUP.

Panic disorder and social phobia patients did not differ significantly, however, on ASI scores.

Average absolute emotionality ratings for Stroop words were compared among the three groups using a 3 (Group) × 7 (Word Type) mixed design ANOVA. Means and standard deviations are shown in Table 2. A significant interaction effect was found, $F(12,68) = 4.31$, $p < .001$. To determine overall differences in ratings of positive, neutral, and negative words, all threat words were collapsed into an overall threat category, as were positive words, for subsequent simple effects analyses (alpha = .017 for each group). Panic disordered patients rated threatening words, $F(1,39) = 65.02$, $p < .001$, and positive words, $F(1,39) = 109.49$, $p < .001$, as more emotional than neutral words. They did not differ in their emotionality ratings for threatening and positive words. Social phobia patients rated threatening words, $F(1,39) = 51.64$, $p < .001$, and positive words, $F(1,39) = 134.44$, $p < .001$, as more emotional than neutral words. Also, social phobia patients rated positive words as more emotional than threatening words, $F(1,39) = 12.44$, $p < .01$. Control subjects rated threatening, $F(1,39) = 46.45$, $p < .001$, and positive words, $F(1,39) = 129.13$, $p < .05$, as more emotional than neutral words. Also, control subjects rated positive words as more emotional than threatening words, $F(1,39) = 14.04$, $p < .001$.

To determine differences further among the threat words, simple effects analyses compared each type of threat word (alpha = .017). Panic disordered patients rated panic-threat words as more emotional than social-threat words, $F(1,39) = 7.12$, $p < .017$, and general-threat words as more emotional than

TABLE 2
MEAN ABSOLUTE EMOTIONALITY RATINGS FOR EACH WORD TYPE (*SD* PRESENTED IN PARENTHESES)

	Group					
	Panic Disorder		Social Phobia		Control	
Word Type	*M*	*SD*	*M*	*SD*	*M*	*SD*
Neutral	0.23	(.28)	0.57	(.51)	0.43	(.39)
Panic-threat	1.95	(.56)	1.36	(.67)	1.12	(.58)
Social-threat	1.39	(.87)	2.18	(.68)	1.57	(.69)
General-threat	1.88	(.74)	1.80	(.71)	2.02	(.69)
Panic-positive	1.94	(.87)	2.05	(.54)	1.92	(.50)
Social-positive	1.79	(.79)	2.30	(.51)	1.89	(.69)
General-positive	2.00	(.69)	2.38	(.48)	2.38	(.62)

Note. Scores range from 0 to 3, where 0 = *nonemotional word* and 3 = *highly emotional word* (either very positive or very negative).

social-threat words, $F(1,39) = 6.03$, $p = .019$, but did not rate panic-threat and general-threat words differently. Social phobia patients rated social-threat words as more emotional than panic-threat words, $F(1,39) = 19.20$, $p < .001$, and general-threat words as more emotional than panic-threat words, $F(1,39) = 10.11$), $p < .017$, but did not rate social-threat and general-threat words differently. Thus, it appears that both groups of anxious subjects rated threat words specific to their anxiety and general-threat words as more emotional than threat words related to the other anxiety disorder.

The only group differences in emotionality ratings were found for panic-threat, $F(2,39) = 6.43$, $p < .005$, and social-threat words, $F(2,39) = 4.34$, $p < .05$. Specific analyses revealed that panic disordered patients rated panic-threat words as more emotional than did social phobia patients, $F(1,39) = 6.28$, $p < .05$, and control subjects, $F(1,39) = 12.43$, $p < .005$. Social phobia patients rated social-threat words as more emotional than did panic disorder patients, $F(1,39) = 7.54$, $p < .01$, and control subjects, $F(1,39) = 5.02$, $p < .05$.

DISCUSSION

Results showed that panic disorder and social phobia patients exhibited an attentional bias for threatening information relevant to their anxiety. However, panic disorder and social phobia patients did not respond to all emotionally valenced information, as positive words did not produce greater interference than neutral words for either group. Because threat words were not rated as more emotional than positive words for either anxious group, the greater interference for threat words cannot be attributed to the threat words possessing more emotional meaning for anxious patients. The finding of attentional bias

for threat words only is consistent with Hope et al. (1990) but not with Riemann et al. (1993). The results do not support the notion that anxious individuals selectively attend to all emotional information (Martin et al., 1991). Our subjects showed interference in processing information directly related to their concerns when that information was negatively valenced.

Panic disordered patients showed more *generality* in their attentional bias than social phobia patients, as evidenced by their longer response times to all threatening words relative to neutral words. Social phobia patients, on the other hand, showed a trend towards more *specificity* in attentional bias for threatening information, as evidenced by longer response times to threatening words related to their anxiety only relative to neutral words. When compared to panic and general threat words, however, the delay in response to social threat words was not significantly longer. This difference between the two anxious groups cannot be explained by differences in emotionality ratings among the different word types. Panic disordered patients did not rate all threat words as equally emotional, and social phobia patients did not rate social-threat words as more emotional than other threat words. Instead, both groups rated words relevant to their anxiety and general-threat words as more emotional than words related to another type of anxiety. Nor can this difference be attributed to panic disorder patients' being more distressed overall, because the groups did not differ on an overall severity scale.

The difference between anxious groups may be due to panic disordered patients' possessing a wider range of concerns (e.g., physical, situational) than social phobia patients. That is, panic disorder patients may possess a broader fear network. This assumption is consistent with the notion that panic disorder patients respond with arousal to a wide range of environmental stimuli (Barlow et al., 1985). Physiological symptoms of arousal are then cognitively misinterpreted as potentially dangerous, leading to a panic attack (Barlow 1988). Lang (1985) proposed that fear networks of anxiety patients exist along a continuum, from individuals with specific phobias possessing the most cohesive network to panic disordered and generalized anxiety disordered patients displaying the least cohesive networks. The fear network of social phobia patients would fall in between specific-phobia and panic patients. As a result of a broader fear network in panic disordered patients, then, a wider range of stimuli matches network representations, thus possibly producing more generalized Stroop interference in panic disordered as compared to social-phobia patients. Similarly, patients with generalized anxiety disorder demonstrate attentional bias for different types of threat words (physical and social) relative to neutral words (Mathews & MacLeod, 1985). Future studies might ascertain the range of events that cause an anxious patient to become fearful and examine whether this range correlates with the pervasiveness of attentional bias for threatening information.

However, one curious finding in our study was that social-phobia patients reported being as concerned about physical sensations (i.e., ASI) as panic dis-

ordered patients. Thus, one might expect that social-phobia patients would show lengthier response times to panic-threat words relative to neutral words, as did panic disordered patients. The finding that social-phobia patients showed specific interference for only social-threat words may indicate that although physical sensations are of concern for social-phobia patients, their *primary* concern remains social evaluation and its consequences, as represented by the social-threat words, or the concern with physical sensations is restricted to social contexts. One limitation of this study is the absence of a measure of concern about negative evaluation that would have allowed us to determine whether negative evaluation was feared more than physical sensations by the socially anxious patients.

Finally, the significantly different durations of the current episode of the disorder may have influenced the findings. Although we believe the differences between social phobia and panic patients in terms of Stroop interference to be a function of the nature of the disorder, it is possible that because of a longer duration, patients with social phobia possessed a more "fixed schema" of social context, thus enhancing the specificity of social-threat word interference.

In the future, specificity versus generality in attentional bias among different anxious groups could be examined using an idiographic approach, similar to that used by McNally et al. (1994). That is, anxious patients rate the relevance of words within different categories of threat, and several relevant and nonrelevant words within each category are used for each patient, thus testing whether the effect of more general interference for panic patients and more specific interference for social-phobia patients is found only for each subject's relevant emotional words.

In summary, panic patients displayed attentional bias for a wide range of threat words, including panic-threat, social-threat, and general-threat, whereas social-phobia patients displayed a trend towards specific attentional bias for social-threat words primarily. Perhaps panic patients have a wider range of concerns about a variety of situations and symptoms, and thus a broader fear network, as compared to social-phobia patients. Neither panic nor social-phobia patients demonstrated attentional bias for positive words.

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APPENDIX

Word List for Each Category

Threat Words

Panic	Social	General
Dizzy	Mocked	Assault
Collapse	Foolish	Cancer
Suffocate	Criticized	Violence
Breathless	Embarrassed	Mutilated
Faint	Disgraced	Infectious
Numbness	Inferior	Destructive
Panic	Inept	Stab
Palpitations	Inadequate	Warfare
Gasping	Rejected	Coffin
Lightheaded	Ashamed	Illness

Positive Words

Panic	Social	General
Healthy	Admired	Happy
Fearless	Respected	Creative
Peaceful	Accepted	Brilliant
Relaxed	Capable	Splendid
Safety	Friendly	Beauty
Tranquil	Gracefully	Pleasant
Protected	Cordial	Paradise
Calm	Praise	Joy
Steady	Eloquent	Leisure
Sane	Skillful	Optimistic

Neutral Words

Plate
Button
Leaf
Identical
Similar
Incorporate
House
Ceiling
Structure
Curtain