

Research Article

A SPECIFIC ATTENTIONAL BIAS IN PANIC DISORDER?

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According to cognitive theories, panic patients are assumed to have an attentional bias toward bodily sensations. To date, there is only some indirect evidence of such a bias measured by an emotional Stroop task. Moreover, the content and disorder specificity of this bias is rather unclear. The aim of this study was to investigate the specificity of attentional bias in patients with panic disorder (PD). Patients with PD (n = 32), patients with mixed anxiety disorders (n = 25), and a healthy control group (n = 26) performed an emotional Stroop task with three word types: panic threat, general threat, and neutral. There were no differences on reaction times between the different groups, or on the different word types. Despite the generally accepted existence of attentional biases in anxiety disorders, we found no evidence of a specific attentional bias in patients with PD. Depression and Anxiety 25:951–955, 2008. © 2007 Wiley-Liss, Inc.

Key words: panic disorder; mixed control group; specific attentional bias; emotional Stroop task; content specificity; disorder specificity

INTRODUCTION

Selective attention plays a central role in cognitive theories [Beck, 1998; Beck and Emery, 1985; Clark, 1986] of panic disorder (PD). The theory states that PD patients misinterpret fearsome somatic sensations as evidence of an impending disaster (e.g., the feeling that one is going crazy, going to faint, or having a heart attack). This misinterpretation results in anxiety and increased bodily sensations, thereby reaffirming the initial misinterpretation. A key aspect of the theory is that people with PD become vigilant for bodily sensations, developing a so-called attentional bias towards cues associated with panic. As a result, the patient is likely to activate the circle of misinterpretation.

The term “attentional bias” can refer to the kind of disorder (i.e., disorder specificity) or to the type of stimuli used (i.e., content specificity). To speak of a disorder-specific attentional bias, it is necessary to distinguish PD patients from other subjects. To establish a content-specific attentional bias, panic patients must have a bias towards specific panic-related cues and not towards more general threat and neutral cues. Ideally, in order for an attentional bias to be specific, it must comply with both criteria of specificity.

A well-established instrument for measuring selective attention is the emotional Stroop task [Williams et al., 1996], in which participants have to name the color in

which words are printed while ignoring the meanings of the words. If patients are slow in color-naming emotionally relevant words, this could be an indication of attentional bias. PD patients are characterized by their fear of fear [Chambless and Gracely, 1989], their bodily sensations, and their catastrophic misinterpretations [Clark, 1986]. Thus, a word is emotionally relevant [McNally et al., 1990] for PD patients and PD patients only (disorder specificity) when it refers to (content specificity) fear per se (e.g., the words panic, anxiety), to its symptoms (e.g., dizziness, palpitations) or to the

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Received for publication 12 March 2007; Revised 5 July 2007; Accepted 11 July 2007

DOI 10.1002/da.20376

Published online 11 October 2007 in Wiley InterScience (www.interscience.wiley.com).

possible consequences of a panic attack (e.g., heart attack, fainting). In contrast, a general threat word is defined as one that refers to matters of concern in general (e.g., disease, fatality, funeral). A neutral word does not possess any emotional significance and has no referring valence.

During the last 15 years, several studies have investigated attentional bias in PD (Table 1).

The first study in this field was conducted by Ehlers et al. [1988]. In the first experiment, 24 PD patients and normals had to name the color of six word categories presented on flash cards, namely, physical harm, separation, social embarrassment, and three matching neutral word categories. In the second experiment, nonclinical panickers and normals had to name the color of physical threat words and neutral words. The words used in this study referred to general concerns and were not emotionally relevant for the PD patients. Thus, there was no content specificity. In the first experiment, no differences were found in reaction time. In the last experiment, there was an attentional bias for general threat words for both groups. Moreover, no disorder specificity could be found in this study.

In subsequent studies [McNally et al., 1990, 1992], the participants had to name the color of "catastrophic" words (i.e., words referring to the possible consequences of a panic attack), fear words, bodily sensation words (i.e., words referring to the symptoms of fear), and neutral words. Results showed that PD patients were generally slower than controls. PD patients as well as normals named catastrophic words significantly more slowly than other words. Thus, although there were indications for content specificity, no disorder specificity was found.

Other studies [Maidenberg et al., 1996; McNally et al., 1994] used the so-called panic threat words (i.e., words referring to the word "fear", to a catastrophe, or to a bodily symptom), general threat words, and neutral words. McNally et al. [1994] found that PD patients were significantly slower than normals. Panic patients exhibited greater interference for panic-related words than for neutral words. However, they showed the same interference for general threat words. Furthermore, healthy volunteers exhibited a pattern of responding that was similar to that of the patients. In the

Maidenberg et al.'s [1996] study, similar results were found. Panic patients showed significantly longer response times to panic-related and general threat words than to neutral words. The response times of PD patients were similar to those of control subjects. Thus, in both studies, neither content specificity nor disorder specificity could be demonstrated.

Only one study reported a specific PD-related Stroop effect [Lundth et al., 1999] that was not present in the control group. However, when one examines the specific words that were used in the category "panic" words, it appears that words were also used that have been labeled as general threat words in previous studies (e.g., "fear", "pain", "dreadful", "torment", "lethal"). Despite the existence of disorder specificity, no content specificity was present.

The study by Kampman et al. [2002] made use of a category of specific PD-related words. The results showed that PD patients generally responded more slowly than controls, but no attentional bias was found in any of the groups.

Van den Heuvel et al. [2005] also investigated attentional bias in anxiety disorders. Like Maidenberg et al. [1996], they found that PD patients and patients with hypochondriasis did not show a specific attentional bias, but rather a generalized attentional bias towards panic-related words and words related to obsessive-compulsive disorder.

In sum, when reviewing the relevant literature, it seems that none of the studies succeeded in demonstrating a PD-specific Stroop effect expressed as a combination of content specificity and disorder specificity. Nevertheless, results of these studies are generally interpreted as favoring the existence of such an effect [Bar-Haim et al., 2007; Williams et al., 1996], with the exception of Kampman et al. [2002] and van den Heuvel et al. [2005].

This study explores the existence of a PD-specific Stroop effect while taking into consideration the limitations of previous studies. Most of the studies mentioned had a modest sample size, ranging from 14 to 21 PD patients. Other aspects that did not favor specificity included the broad categorization of panic threat words [Lundth et al., 1999], the use of a nonclinical sample [Ehlers et al., 1988], the lack of a patient control group, and a general threat word type [Lundth et al., 1999; McNally et al., 1990]. Consequently, we decided to make use of a relatively larger sample of PD patients and to make a clear differentiation between general threat and panic-related words. We also included, in addition to a healthy control group, a mixed anxiety control group.

METHODS

PARTICIPANTS

The study involved three groups of participants. In addition to the panic group, an anxious control group

TABLE 1. Overview of studies on attentional bias and panic disorder using the emotional Stroop task in terms of content specificity and disorder specificity

	Content specificity	Disorder specificity
Ehlers et al. [1988]	—	—
McNally et al. [1990]	+	—
McNally et al. [1992]	+	—
McNally et al. [1994]	—	—
Maidenberg et al. [1996]	—	—
Lundth et al. [1999]	—	+
Kampman et al. [2002]	—	—
Van den Heuvel et al. [2005]	—	—

and a nonclinical control group were included in the design. In the panic group, 34 patients were selected who met the DSM-IV criteria for a diagnosis of PD. Two were later excluded due to loss of data, leaving a total of 32 PD patients (17 females). Their mean age was 42.5 years ($SD = 12.32$).

The mixed anxiety group consisted of 25 patients (19 females). Of these, 35% had obsessive-compulsive disorder, 23% social phobia, 38% specific phobia, and 4% generalized anxiety disorder as their primary diagnosis. Their mean age was 36 years ($SD = 13.55$). All patients were seeking treatment at the Academic Anxiety Center in Maastricht.

The healthy control group consisted of 30 participants (12 females). This group was matched with the panic group for sex and age. Participants had never had a psychiatric disorder diagnosed. Four subjects were excluded because of extremely high anxiety scores on a visual analogue scale (VAAS; >2 standard deviation) during the experiment. Their mean age was 43.8 years ($SD = 10.54$). They were recruited by advertisement.

MATERIALS

In the emotional Stroop task, three categories of words were used: 15 panic-related words, 15 general threat words, and 15 neutral words (Table 2). The threat words were derived from former research [Maidenberg et al., 1996; McNally et al., 1994] and referred to their worries. The neutral words were neither positive nor abstract. To rule out a possible difference in results by presentation form, all categories were matched for word length and imagine ability.

The stimuli were presented on a personal computer. The words appeared in 12-cm block letters on a Philips color monitor and appeared in the colors red, blue, green, and yellow.

TABLE 2. Word list for each word type

Panic words	General threat words	Neutral words
Death	Sickness	House
Heart attack	Torture	Pencil
Brain tumor	Violence	Pen
Collapse	War	Paper clip
Going crazy	Accident	Neutral
Dizziness	Funeral	Computer
Heartbeat	Pain	Identical
Fainting	Hate	Signature
Suffocation	Loneliness	Common
Tingling	Danger	Clothes
Dyspnea	Cancer	Cup of coffee
Shaking	Abuse	Vacuum cleaner
Panic	Robbery	Street lamp
Loss of control	Flood	Ruler
Chest pain	Rape	Desk chair

QUESTIONNAIRES

All participants were administered the Mini International Neuropsychiatric Interview [Lecrubier et al., 1997]. To rule out possible side effects caused by depressive symptoms, all patients also completed the Montgomery-Asberg Depression Rating Scale [Montgomery and Asberg, 1979] and the Self-rating Depression Scale [Zung, 1965].

PROCEDURE

In the pretest screening, all questionnaires were administered after obtaining written informed consent.

In the test phase, when entering the experiment, patients scored their anxiety level on the VAAS. The Stroop task was presented on a computer screen. The participants were given the instruction to ignore the meaning of the word and to name its color as quickly as possible by pressing the corresponding button. As soon as the button was pressed, the next word appeared. First, there was a training phase of 20 words, followed by four blocks of 45 words each. Each block consisted of all the words of the different word types. Each word was presented four times throughout the experiment: once in red, once in yellow, once in blue, and once in green. Words were presented randomly (45×4 colors = 180 words). After the experiment, participants were asked to fill in the VAAS to score their anxiety level.

DESIGN

A repeated measures analysis of variance was conducted with group (three levels: PD patients, anxiety group, and normal control) as between-subject variable and word type (three levels: panic-relevant, general threat, and neutral) and block (blocks 1–4) as within-subject variables.

RESULTS

PD patients had slower responses to all words in contrast to the mixed anxiety group and normal control group, but this was not significantly different.

There was an effect of block ($F(3.52) = 20.22$; $P < 0.0001$), indicating that over the four blocks, participants were reacting faster, referring to a learning effect.

There were no group differences in reaction times ($F(2.80) = 1.35$; $P = \text{NS}$, not significant). Nor was there a main effect of word type ($F(2.160) = 1.03$; $P = \text{NS}$).

The crucial word \times group interaction was not significant ($F(4, 160) < 1$), indicating that PD patients, other anxiety patients, and normal controls all had the same pattern of responses to the word types (Table 3).

Because possible Stroop effects can be influenced by depression, a post-analysis was performed. The panic group was divided in a high- and low-depressive group

TABLE 3. Mean response latencies in milliseconds and median anxiety level on VAAS during the experiment

Word type	PD patients	Mixed anxiety patients	Normals
Panic	826 (148)	758 (142)	777 (142)
General threat	816 (138)	760 (138)	766 (148)
Neutral	820 (121)	764 (110)	771 (109)
Start_VAAS	24	7	0
VAAS_bef	23	6	0
VAAS_end	30	5	0

Start Vaas, entering experiment; Vaas_bef, before experiment; Vaas_af, after experiment of PD patients, mixed anxiety patients, and normal controls. The standard deviation is included within parentheses.

VAAS, visual analogue scale.

depending on their scores on the Montgomery–Asberg Depression Rating Scale (<12 = low depressive group). In the panic group with low depressive scores there were no differences in reaction time on the Stroop task. There was no main effect of word type ($F(2,30) = 0.52$, $P = \text{NS}$).

During the experiment, anxiety levels were assessed. The panic and mixed anxiety groups had a significantly higher overall anxiety level during the experiment than the normal group (Table 3; $P < 0.001$). Because anxiety can also influence reaction times, a post hoc analysis was performed on the panic subjects with low anxiety scores. Again, there was no main effect of word type ($F(2,30) = 0.26$, $P = \text{NS}$).

DISCUSSION

The results of this study show that neither PD patients, patients with other anxiety disorders, nor normal controls had longer response latencies to panic-specific threatening stimuli or general threat stimuli than to neutral words. Our results are in sharp contrast to the conclusions of previous research. We did not find any evidence of either disorder specificity or content specificity.

Theoretically, the lack of a specific Stroop effect could be due to suppression by other phenomena. It has been shown that external stressors can suppress a Stroop effect [Amir et al., 1996; Constans et al., 2004; Mathews and Mackintosh, 1998; Mathews and Sebastian, 1993; Mogg et al., 1993]. It is conceivable that the experimental set-up was experienced as more stressful by one group of participants than by the others. Indeed, if we look at the level of anxiety during the experiment, it appears that both patient groups were more anxious than the healthy controls. However, PD patients with high or low general anxiety did not differ in reaction times on the Stroop. Moreover, PD patients with the lowest level of general anxiety did not show any attentional bias toward panic words. Therefore, the overall anxiety level does not seem to explain the results.

Another possible source of suppression is the presence of depression [Grant and Beck, 2005], as shown in recent studies on social anxiety [Musa et al., 2003]. In this study, Stroop reaction times did not differ in participants with low depression scores, indicating that the results cannot be attributed to depression.

Most studies on PD have used the Stroop paradigm to investigate attentional bias. A drawback of this task is that attentional processes are not measured independently [Algom et al., 2004]. The dot probe detection task does not have this particular disadvantage. Two studies using the dot probe were performed in PD patients. The first study [Asmundson and Sandler, 1992] found PD patients to be quicker in detecting physical threat cues than social threat cues. This difference was not observed with control subjects. However, when looking at the specificity of the words used, they also referred to general threat words. An attempt to replicate these findings with more PD-specific words [Asmundson and Murray, 1994] failed to find an attentional bias favoring panic cues in PD patients. PD patients did not respond differently to dot probes that followed the presentation of panic symptoms/fear, social threat, or neutral cues, and they did not differ from control subjects.

More recently, a study was conducted in which heart rate was used to enhance ecological validity for PD [Kroeze and Van den Hout, 2000a]. Selective attention for heart rate was measured with a modified dot probe task. PD patients paid more attention to the heart rate than to neutral stimuli compared to normals. However, both groups had the same pattern of responding. Both PD and normal controls shifted their attention away from an accelerated heartbeat, and there was no attentional bias towards an accelerated heartbeat. Thus, even when using threatening sensations, there is no clear indication of a specific attentional bias in PD.

In a subsequent study [Kroeze and Van den Hout, 2000b], PD patients and healthy volunteers were instructed to either hyperventilate, to overbreathe under isocapnic conditions, or to make a neutral movement while performing another reaction time task in which tones of different length had to be discriminated. No difference was found between the two groups. Again, no evidence was found of selective attention to hyperventilatory sensations.

In conclusion, neither studies using a Stroop paradigm, nor those using a dot probe task or stimuli selected on the basis of their ecological validity provide any evidence of a specific attentional bias in PD. The generally accepted view that there is a specific attentional bias in PD is not supported by any available empirical evidence.

Some questions have been raised concerning the sensitivity of the emotional Stroop task as a measure of attentional bias [Algom et al., 2004]. However, selective attention has been already demonstrated in some other

anxiety disorders [Amir et al., 2002; Bar-Haim et al., 2007; Becker et al., 2001; Lavy et al., 1993; Paunovi et al., 2002], not only with the emotional Stroop task but also with the dot probe task. The lack of a specific attentional bias in PD as opposed to some other anxiety disorders needs further investigation and can potentially reveal some underlying mechanisms. Future research could, for instance, combine different paradigms (e.g., emotional Stroop task, dot probe task, eye movement registration) to measure attention and include different groups of anxiety disorders (e.g., PD, GAD, specific phobia, PTSD...). This way, a more detailed distinction could be made between these disorders as for the presence or absence of a specific attentional bias. Discussion on the possible underlying mechanisms, however, is open at this point.

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