INVESTIGATION OF AN ATTENTIONAL BIAS FOR FEAR-RELATED MATERIAL IN OBSESSIVE-COMPULSIVE CHECKERS

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Prior studies on attentional biases in obsessive-compulsive disorder (OCD) have yielded conflicting results. Using a new methodology based on a spatial cueing paradigm, it was investigated whether OCD checkers display heightened vigilance for concern-related material or difficulties disengaging from such stimuli. Twenty-eight OCD patients, 21 of whom were checkers, were compared to 27 controls. In the spatial cueing paradigm task, patients and controls responded to a visual target at one out of two possible locations, which was preceded by a verbal cue word presented at the same or at the opposite location of the target. Cue words were either checking-relevant (e.g., doubt), neutral (e.g., box), or paranoia-related (e.g., spy). No evidence for an attentional bias in OCD checkers was found. This study is in accordance with previous studies, which were unable to detect attentional biases in OCD patients. Depression and Anxiety 25:225–229, 2008. © 2008 Wiley-Liss, Inc.

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INTRODUCTION

Neurocognitive and psychophysiological studies have consistently demonstrated that stimuli with fear-inducing properties, particularly stimuli depicting items of evolutionary relevance (e.g., snakes, predators) are preferentially processed by humans when compared to non-fearful stimuli such as flowers or mushrooms [e.g., Lipp and Derakshan, 2005]. Notwithstanding its basic normality, a pathologically enhanced attentional bias toward mood-congruent and fear-relevant material has been observed in patients with anxiety disorders over and beyond the levels displayed by normal volunteers and has been put forward as a potential vulnerability or maintenance factor for anxiety disorders as well as depression [for an early review, see Williams et al., 1996]. A number of experiments, using the emotional Stroop or the dot-probe paradigm, have shown that patients with posttraumatic stress disorder [Bryant and Harvey, 1995; Foa et al., 1991; Paunov et al., 2002; Williams et al., 1996], spider phobia [van den Hout et al., 1997; Watts et al., 1986], or social phobia [Carrigan et al., 2004; Mogg et al., 2004] orient their attention to stimuli relevant to their primary concerns and fears. For example, vietnam veterans took longer to process fear-related words such as Vietnam and Charlie in an emotional Stroop task relative to neutral words or control stimuli [e.g., McNally et al., 1990].

Whether an equivalent attentional bias exists in patients with obsessive-compulsive disorder (OCD) is subject to an ongoing controversy [e.g., Moritz et al., 2004]. The studies published so far have provided
conflicting findings. Although several studies have found such a bias [Foa et al., 1991; Lavy et al., 1994; Novara and Sanavio, 2001], others failed to find processing differences for emotional material in OCD [Kyrios and Iob, 1998; McNally et al., 1994, 1992, 1999; Moritz et al., 2004]. In their review, Summerfeldt and Endler [1998] even proposed that the absence of an attentional bias in OCD could be used as an additional indicator for the separation of OCD from other anxiety disorders. However, before dismissing the existence of an attentional bias in OCD prematurely, several moderators have to be considered which may partially explain failed replications in the past: (i) some studies utilized general threat words and not OCD-related material. (ii) Similarly, even if OCD-stimuli were general threat words and not OCD-related explain failed replications in the past: (i) some studies utilized general threat words and not OCD-related material. (ii) Similarly, even if OCD-stimuli were employed these may not have been sufficiently idiosyncratic given the heterogeneity of OCD beliefs [Moritz et al., 2004] and thus are unlikely attention-grabbing for a considerable sub-group (e.g., a patient with fears about asbestos may not show attentional biases for words like dirt or bacteria). (iii) The bias may only operate in certain subgroups (e.g., checkers, washers).

Conventional emotional paradigms, particularly the emotional Stroop task as well as the dot probe paradigm [Koster et al., 2004] cannot discern whether response slowing is due to an enhanced accessibility for certain stimuli or post-lexical rumination or distraction. To address this caveat, this study utilized a newly developed methodology [Amir et al., 2003; Fox et al., 2001], which draws upon a spatial cueing paradigm developed by Posner [Posner and Cohen, 1984]. In the standard cueing paradigm, a target located at one of the two locations is either preceded by a valid or an invalid cue. It has been typically found that the initial facilitation effect turns into an inhibition effect at longer cue-target intervals for cued target locations, that is, reaction times (RTs) become slower for validly primed targets in comparison to invalidly primed targets [inhibition of return (IOR)]. On a behavioral level, the (IOR) mechanism inhibits attention from returning to previous attended locations to facilitate the re-direction of the cognitive system to novel locations (e.g., Klein, 2000).

In their study on social phobia Amir et al. [2003] administered words from three different conditions (socially relevant threat words, positive words, neutral words), which appeared for 600 ms at either a left or right location. Subsequently, the cue word disappeared and an asterisk was shown at one of the two locations. The subjects were asked to press one of the two buttons indicating the position of the asterisk (left or right). The results suggested that phobic patients have a problem disengaging from social threat words relative to controls (i.e., disproportionally longer RTs for incongruent trials, where the asterisk appeared at the opposite location of the word) rather than hypervigilance for such stimuli. For the latter case, facilitated responses for asterisk locations cued by social threat words would have been predicted (for similar findings on subclinical anxiety patients, see Fox et al. [2001]).

This study utilized a modified spatial cueing paradigm to investigate whether OCD checkers share an enhanced vigilance toward or rather display difficulties disengaging from checking-related stimuli. Special care was devoted to select disorder-relevant items to rule out the above-mentioned problems of prior research.

Since an enhanced vigilance for certain stimuli is likely an automatic phenomenon and disengagement rather a controlled process, we manipulated the interval [stimulus onset asynchrony (SOA)] between cue and target according to recommendations in the literature [Neely, 1991]. In view of mixed findings regarding the existence an attentional bias in OCD no specific hypothesis were made.

**METHODS**

**PARTICIPANTS**

All subjects spoke German as their first language. Twenty-eight patients who met criteria for OCD participated in the study, which were inpatients or outpatients from the Cognitive-Behavioral Unit of the University Medical Center of Hamburg [11 males, 17 females; age: 32.64 years (SD = 8.95); years of education: 10.93 (SD = 1.49); number of previous hospitalizations: 1.79 (SD = 1.20)]. The healthy control group consisted of 27 participants [10 males, 17 females; age: 29.74 years (SD = 7.40); years of education: 12.63 (SD = 0.88)].

The presence of an OCD diagnosis according to DSM-IV criteria was determined using a semi-structured interview (Mini International Neuropsychiatric Interview; Sheehan et al. [1998]). In addition, medical records were carefully screened for symptoms incompatible with a diagnosis of OCD. Participants did not reveal a history of comorbid drug abuse, substantial neurological disorder (e.g., stroke, multiple sclerosis, head trauma, previous brain operations), or current or previous psychotonic symptoms. The Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Goodman et al. [1991]; German translation by Hand and Büttner-Westphal [1991]) was administered to quantify the degree of OCD symptomatology in patients ($M = 24.86$, $SD = 6.14$). The Hamilton Depression Rating Scale [Hamilton, 1960] was administered to assess the degree of depressive symptomatology in patients ($M = 14.79$, $SD = 4.59$). Six patients were unmedicated, whereas 17 patients were on antidepressant agents and five received a combination of antidepres sant and neuroleptic agents (olanzapine and/or risperidone).

The short form of the Hamburg Obsessional Compulsive Inventory (HOCI; Klepsch [1991]) was administered to OCD patients. The HOCI assesses 72 obsessions and compulsions along six scales [checking; cleaning; arranging things (order); counting, touching,
and speaking; thoughts of words and pictures; thoughts of doing harm to self/others (aggressive thoughts)]. Patients were dichotomized into checkers and non-checkers according to norm values of the HOCl (high symptom group: scores ≥ STANINE 5).

Healthy controls were mainly drawn from an established subject pool at the University Medical Center of Hamburg. Healthy participants were all screened for psychopathological disturbances or substance abuse. All participants gave written informed consent to participate after they had been fully informed about the study.

EXPERIMENT

Apparatus. Stimuli were presented on a Sony 17-inch Trinitron monitor with a graphic resolution of 640 × 480 Pixel, driven by a Pentium II 300 MHz PC. The room was dimly illuminated to prevent reflections on the monitor. Participants viewed the monitor from a distance of approximately 60 cm. Participants’ responses were recorded using the right and left buttons of a serial Microsoft mouse, with the track ball removed to improve timing accuracy [Segalowitz and Graves, 1990].

Display and stimuli. The display contained a fixation cross in the middle of the screen (size 0.8° visual angle) and two rectangle boxes (6° wide and 3° high), one presented to the left and the other to the right of the fixation cross (7° center to center distance). Box lines were one pixel thick and drawn in dark gray (7 cd/m²) on a black background (0.4 cd/m²). The cue—a short brightening of one of the peripheral boxes—was created by changing the color of the box for 50 ms from dark gray to white (35 cd/m²). Words were presented in font “Courier”, the letter size was 0.6 × 0.6°, large enough to allow reading words presented in the peripheral box while fixating on the fixation cross. The target, a small light gray (17 cd/m²) filled square (size 0.25° visual angle), was shown in the center of one of the two boxes (see Fig. 1).

Word stimuli. With the help of eight clinicians who had profound experience in the treatment of OCD and schizophrenia, 30 words were compiled that were either checking-relevant, paranoia-relevant, or neutral (i.e., not related to OCD and schizophrenia and non-affective in content). The paranoid words served as negative control condition and were used for a yet unsubmitted study on schizophrenia. All words were German. Conditions were comparable regarding word length, word type (noun versus non-noun), word frequency, and concreteness (uncorrected t-tests \( P > .1 \)). The following words served as neutral stimuli: Vers (verse), bewegen (to move), schriftlich (written), Treppe (stairs), Luft (air), Kühlshrank (refrigerator), Kasten (box), Strand (beach), Einstellung (attitude), and reagieren (to react). As stimuli for the paranoia-relevant condition the following words were selected: Verschwörung (conspiracy), Verfolgung (persecution), Überwachung (surveillance), Spion (spy), Schatten (shadow), geheim (secret), drohen (to threaten), CIA (CIA), ausspähen (to spy out), and Agent (secret service agent). As stimuli for the checking-relevant condition we employed the following words: Zweifel (doubt), vergessen (to forget), unsicher (unsure), Unfall (accident), Schuld (guilt), Kontrolle (control), perfekt (perfect), Verantwortung (responsibility), Brand (fire), and absichern (to secure).

Procedure and design. The sequence of events in a trial is illustrated in Figure 1. The fixation cross and the two boxes were permanently displayed, that is, throughout a block of trials. A trial was initiated with the brightening of the central fixation cross for 800 ms, followed by a 200 ms period where the cross changed its color back to gray. In direct succession, the cue word was presented for 300 ms with equal probability at one of the two peripheral boxes. The word onset was accompanied by a short brightening (for 50 ms) of the box containing the word (i.e., the dark gray box turned to light gray). The cue word was then followed by the target, which appeared in 66% of the trials at the cued box and in 33% of the trials at the uncued box. The SOA between cue and target was either 400 or 1,000 ms (i.e., the inter stimulus interval was either 100 ms or 700 ms). Participants were instructed to press the left button as quickly as possible when the target was in the left box, and, vice versa, the right button when the target was in the right box. Acoustic error feedback was provided when buttons were pressed too early (before target onset) or too late (more than 2,000 ms after target onset), or when the wrong button was pressed. The inter-trial interval was 1,000 ms.

A total of 360 experimental trials were presented in fully randomized order. These trials were divided into nine blocks of 40 trials, with 5 s breaks between blocks. Before the experiment participants received 40 practice.
trials. In addition, each block started with three unrecorded “warm-up” trials. The dependent variable was RT. RTs smaller than 100 ms or larger than 2,000 ms were counted as errors. Mean RTs were calculated individually for each participant and for each combination of word type, validity, and SOA.

RESULTS

SOCIODEMOGRAPHIC BACKGROUND

The groups did not significantly differ regarding age, $t(53) = 1.31$, $P > .1$, or gender distribution, $\chi^2(1) = 0.29$, $P > .8$. However, patients attended fewer years of school, $t(53) = 5.13$, $P < .001$, which was therefore carefully considered as a potential confound.

REACTION TIME

A four-way mixed ANOVA was computed with Group (healthy, OCD) as a between-subject factor and Material Type (checking, neutral, paranoia), Interval (short, long), and Validity (valid, invalid) as within-subject factors. RT served as dependent variable. Only the interaction of Interval and Validity, as within-subject factors. RT served as dependent variable. Only the interaction of Interval and Validity, $F(1, 53) = 31.83$, $P < .001$, $\eta^2 = .38$, was significant.

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While for the short interval a facilitation effect occurred for valid cues (priming, 396 versus 421 ms), a small IOR effect occurred for the long interval (370 versus 362 ms). Moreover, OCD patients were slowed relative to healthy controls, $F(1, 53) = 4.96$, $P = .03$, $\eta^2 = .09$ (406 versus 368 ms). All other effects were non-significant ($F < 1$, $\eta^2 < .02$).

When years of schooling were entered as an additional between-subject factor, the group effect failed to reached significance, but all other significant results maintained their status. When the analysis was confined to the 21 OCD patients with core checking symptoms, an analogous ANOVA confirmed the significant interaction of Interval x Validity ($P < .001$). When the severity of checking compulsions as assessed with the HOCl, Y-BOCS total and subscores were correlated with several experimental indexes (e.g., RTs for valid checking condition—RTs for valid neutral condition; RTs for invalid checking condition—RTs for invalid neutral condition) no correlations emerged that surpassed the level of significance ($P < .01$ to guard against the possibility of false-positive findings).

ERROR RATES

The overall error rate was in both groups very low, with 0.8% errors for the healthy group and 0.7% errors for the OCD group. The corresponding four-way mixed ANOVA with Group as a between-subject factor and Material Type, Interval, and Validity as within-subject factors did not yield any significant effect ($F(2, 106) = 1.86$, $P > .4$, $\eta^2 = < .02$).

DISCUSSION

In accordance with previous studies on the IOR phenomenon [for a review see Klein, 2000], short intervals witnessed facilitation effects for cued locations (spatial priming) while this effect reversed for the long interval. Due to a rather short cue-target interval in conjunction with an excess of valid trials, the IOR effect occurred at the long interval, whereas the expected facilitation effect occurred at the short interval. This pattern of results occurred irrespective of psychopathology and replicates a previous finding that, overall, OCD patients do not show a deviant response pattern on this aspect of inhibitory functioning [Moritz and von Mühlener, 2005].

Unlike our pilot study, the focus of this investigation was on the processing of concern-related material in checkers. Incongruent with the assumption that OCD checkers process concern-related information differently, patients did neither reveal abnormalities for the condition sensitive to the perceptual access account (OCD-related items precedes target at the same location) nor the condition sensitive to the disengagement account (OCD-related items precedes target at the opposite location).

A limitation of this study is that patients were not asked to subjectively appraise the stimulus material. It is therefore not possible to entirely dismiss the possibility that the stimuli were not sufficiently attention-grabbing or concern-related. Notwithstanding this, we would like to emphasize that the target words were carefully chosen by experts and captured common themes of OCD checkers. At least eight out of the entire set of 10 stimuli were clearly relevant for most checkers (i.e., doubt, unsure, accident, guilt, control, perfect, responsibility, assure). Further, stimuli were presented for a duration (300 ms) sufficiently long to attract attention even in cognitively slowed individuals. Moreover, the sample was comparable and the effect sizes for interactions with Group were very small making it unlikely that the results reflect low statistical power. Another limitation was that OCD patients spent less years in school. When school education was controlled for group differences pertaining to slowing were absent but none of the other effects changed. As a final hypothesis, one may speculate that words in general are not evocative enough so that it may be worthwhile to continue to pursue this approach with pictures (e.g., picture of an accident or a fire) since pictures are extremely potent to elicit reactions in regions critical for emotion processing (especially the amygdala). Alternatively, an attentional bias may emerge with other paradigms (e.g., memory) or for other subtypes (e.g., washing).

However, since a verbal variant of the paradigm produced significant group differences in social phobia patients and against the background of increasing evidence in most prior studies failing to verify attentional biases in OCD patients, the possibility
should be entertained that OCD patients indeed do not have an abnormal attentional bias—or that such a bias is expressed at a neural but not at an overt behavioral level [see van den Heuvel et al., 2005].

REFERENCES


