



A FOLLOW-UP STUDY OF COGNITIVE BIAS IN GENERALIZED ANXIETY DISORDER

KARIN MOGG^{1*}, BRENDAN P. BRADLEY¹, NEIL MILLAR¹
and JIM WHITE^{2†}

¹Department of Experimental Psychology, University of Cambridge, Downing Street,
Cambridge CB2 3EB, England and ²Department of Clinical Psychology, Hairmyres Hospital,
East Kilbridge, Scotland

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Summary—Patients with generalized anxiety disorder (GAD) without concurrent depression ($n = 11$) and normal controls ($n = 17$) were tested twice, about 2 months apart, on a modified Stroop colour-naming task, which presented anxiety-related, depression-related and neutral words in masked and unmasked exposure conditions. GAD patients received cognitive behaviour therapy in the test–retest interval, and were also retested at follow-up, about 20 months after initial testing. GAD patients showed interference in colour-naming negative words across both masked and unmasked conditions before treatment, but not post-treatment, compared with controls. Reduced interference effects of masked threat words over time correlated with reduced ratings of anxious thoughts at post-treatment, and at follow-up, in GAD patients. Thus, the preconscious bias for threat information in GAD appears to vary over time in association with changes in anxious thoughts and worries.

INTRODUCTION

Several studies have used modified versions of the Stroop colour-naming task to investigate processing biases for negative information in generalized anxiety disorder (e.g. Mathews & MacLeod, 1985; Mogg, Mathews & Weinman, 1989; Mogg, Bradley, Williams & Mathews, 1993; Mathews, Mogg, Kentish & Eysenck, 1995; Bradley, Mogg, Millar & White, 1995). In such studies, GAD patients have typically shown greater interference in colour-naming negative than neutral words, compared with normal control Ss. Such findings are consistent with cognitive formulations of anxiety (e.g. Beck, Emery & Greenberg, 1986; Williams, Watts, MacLeod & Mathews, 1988; Mathews, 1993). According to cognitive models of anxiety, processing biases for threat information may contribute to the development and maintenance of clinical anxiety states. Thus, it is of potential theoretical and clinical importance to establish whether or not such processing biases are eliminated by treatment. For example, if cognitive biases reflect an enduring vulnerability to clinical anxiety, these biases may remain evident in anxiety-prone individuals even when anxious mood has been alleviated by treatment.

The effects of treatment on cognitive biases have been examined in a variety of anxiety disorders, and results have commonly indicated that such biases disappear as a function of treatment, for example, in spider phobia (e.g. Lavy, van den Hout & Arntz, 1993; Watts, McKenna, Sharrock & Trezise, 1986), social phobia (Mattia, Heimberg & Hope, 1993), obsessive compulsive disorder (e.g. Foa & McNally, 1986), and GAD (Mathews *et al.*, 1995). In the latter study, which used the modified Stroop task to examine the effect of cognitive-behaviour therapy (CBT) on processing biases, the results indicated that the colour-naming interference effect of threat words was no longer present in GAD patients after treatment. These findings suggest that cognitive bias measures, such as colour-naming interference effects of threat stimuli, do not reflect an enduring vulnerability marker of anxiety-prone individuals. Instead, these results may indicate that such cognitive bias indices are primarily a function of current anxious mood state or, alternatively, such biases

*Requests for reprints should be sent to Karin Mogg or Brendan Bradley.

†Jim White is now at Gartnavel Royal Hospital, Glasgow.

may be an interactive function of anxious mood state and an enduring trait vulnerability to anxiety (i.e. only shown by anxiety-prone individuals who are currently anxious).

However, it has been proposed that anxiety is primarily characterised by a bias for threat information which operates in *preconscious* processes (i.e. before information has entered awareness; e.g. Mathews & MacLeod, 1986; Williams *et al.*, 1988). Evidence consistent with a preconscious bias for threat in GAD has come from several studies using, for example, a dichotic listening task (Mathews & MacLeod, 1986) and masked stimulus presentations in the modified Stroop paradigm (Mogg *et al.*, 1993; Bradley *et al.*, 1995). In the latter two studies, words were presented on a computer screen individually on a coloured background patch; half the words were presented in a subthreshold exposure condition (i.e. words were presented very briefly and masked, such that *Ss* were unaware of their presence) and half the words were presented in a suprathreshold condition (i.e. words were displayed until *Ss* response). In both studies, GAD patients without a concurrent diagnosis of depression showed selective interference in colour-naming negative words in both suprathreshold and subthreshold exposure conditions. These results were consistent with a preconscious bias for negative information in GAD.

No study has yet examined whether such biases in preconscious processes in GAD are modified by CBT. Previous research into treatment effects in GAD (Mathews *et al.*, 1995) has used cognitive tasks in which the stimuli were presented under suprathreshold conditions (i.e. available to awareness). Thus, the cognitive bias measures from these tasks may reflect the influence of strategic controlled processes, rather than preconscious processes. Consequently, one of the main aims of the present study was to examine whether a bias in preconscious processes in GAD is invariant over time, and to assess whether it can be modified by CBT. Given that CBT primarily relies on training *Ss* to modify their controlled strategies for dealing with anxiety-provoking situations, it is unclear whether a preconscious bias, that occurs outside awareness, might be amenable to CBT, particularly if this bias reflects an enduring predisposition to clinical anxiety. Furthermore, the present study improved on the previous study of treatment effects on cognitive bias in GAD by using a computerised version of the modified Stroop task. This is likely to be more sensitive than the card version of the task because as it allows separate assessment of colour-naming latency and accuracy for each individual stimulus word.

In the present study, we followed-up the anxious patients from Bradley *et al.*'s (1995) study, who each had a diagnosis of GAD without depression, and retested them on the modified Stroop task with masked and unmasked exposure conditions after they had received group CBT. The control *Ss* from Bradley *et al.* were also retested after a similar time interval, of about 2 months. Patients with a concurrent diagnosis of depression were not included in the present study because of evidence from Bradley *et al.* (1995) and Mogg *et al.* (1993) that such individuals do not show reliable colour-naming interference effects for negative words. Given that the present study was primarily concerned with the effect of psychological treatment on cognitive biases in GAD, it therefore seemed preferable to exclude patients with mixed affective disorders.

Our main hypotheses were as follows: GAD patients will show relatively greater colour-naming interference for negative words, compared with controls, an initial testing but not at second testing following CBT. This pattern of results is predicted for the unmasked (suprathreshold) exposure condition from Mathews *et al.*'s (1995) findings, and if the preconscious processing bias for threat is susceptible to treatment effects, this pattern will also be found in the masked (subthreshold) condition.

In addition, the GAD group was tested on a third occasion, at follow-up, about 20 months after the initial test session. This allowed us to examine the relationship between changes in cognitive bias and changes in anxiety measures over a relatively long period.

METHOD

Subjects

These were 11 GAD patients and 17 normal control *Ss* from Bradley *et al.*'s (1995) study. The GAD patients were all selected for anxiety management group training at an out-patient clinic. The main criterion for selection for the study was a principal diagnosis of GAD in the

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