

Explicit Memory Bias for Threat Words in Generalized Anxiety Disorder

BRUCE H. FRIEDMAN

Virginia Polytechnic Institute and State University

JULIAN F. THAYER

University of Missouri-Columbia

THOMAS D. BORKOVEC

The Pennsylvania State University

Although findings of an implicit memory bias for threat words in generalized anxiety disorder (GAD) are fairly robust, the data regarding an explicit bias in this disorder are less consistent. This issue was investigated in the context of two studies directed primarily at the examination of attentional and physiological underpinnings of GAD. In these experiments, GAD clients and nonanxious control participants (35 and 29 in Study 1, and 22 and 31 in Study 2, respectively) engaged in an S1-S2 conditioning procedure that involved the presentation of a series of neutral stimuli (colored dots) paired with threat and nonthreat words, followed by a free recall test. Instructions were to simply look at the dot and read the word silently. A free recall task was administered at the end of each experimental session. Contrary to previous trends in the literature, a marked bias in the GAD group toward recall of the threat words emerged in both studies. These results are considered in the light of methodological differences with previous research, information processing characteristics of GAD, and the role of physiological assessment in cognitive studies of anxiety.

Information processing approaches to anxiety have yielded numerous insights into the cognitive mechanisms that operate in generalized anxiety disorder (GAD). In particular, examination of memory biases for disorder-congruent information suggests that characteristic cognitive styles can distin-

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Address correspondence to Bruce H. Friedman, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0436; e-mail: BHFRIEDM@VT.EDU.

guish among various psychopathologies. For example, an *implicit* memory bias (enhancement of stimulus recognition by prior stimulus exposure or "priming," without conscious recollection of the exposure; see Squire, 1992) has been typically associated with anxiety, and an *explicit* memory (available to conscious recall) bias has been found more characteristic of depression (see Williams, Watts, MacLeod, & Mathews, 1997, for review). Implicit memory processes activate stored information, thereby improving its accessibility, though not necessarily affecting its direct retrievability (Graf, 1994). Conversely, explicit memories involve conscious, deliberate recall of information that was elaborated at the time of encoding, and are therefore more available due to embellishment from contextual cues. Anxiety is marked by a nonconscious, automatic, pre-attentive bias toward threat cues (Mathews, 1990) that may prime such information in implicit memory tests. However, this defensive attentional mechanism thwarts further processing of anxiety-provoking stimuli, and so no explicit memory bias appears for such material. In contrast, depression is characterized by conscious elaboration of sad material, which increases its availability for explicit, directed recall.

However, these specific memory effects in anxiety may not generalize across diagnostic categories. For example, although the prediction of an implicit but not explicit memory bias for disorder-congruent material has been replicated in GAD (MacLeod & McLaughlin, 1995), others have found both implicit and explicit memory biases for relevant stimuli in panic disorder (Cloitre & Leibowitz, 1991). A direct comparison between panic disorder and GAD revealed an explicit memory bias in the former, but not the latter (Becker, Roth, Andrich, & Margraf, 1999). Becker et al. suggested that methodological inconsistencies across studies might account for these discrepant memory effects in the anxiety literature, and advocated the combination of incidental learning and free recall as the optimal paradigm for detecting memory biases in clinical anxiety. They further proposed that this pairing is enhanced with compatible learning and retrieval tasks; that is, both should be either conceptual or perceptual (e.g., Eysenck & Byrne, 1994).

An opportunity to meet these standards and thus conceptually replicate Becker et al.'s (1999) investigation of explicit memory bias for threat emerged in two of our ongoing studies that were directed primarily at attentional and physiological elements of GAD. An *S1-S2* paradigm, which entails the presentation of a series of paired stimuli separated by a fixed inter-stimulus interval (Bohlin & Kjellberg, 1979), was used in these two studies to examine higher order conditioning to threat in GAD clients and matched control groups. In the first study, a colored dot (*S1*) was consistently paired with either threat or nonthreat words (*S2*) over multiple trials (see Thayer, Friedman, Borkovec, Johnsen, & Molina, 2000, for details). Individuals were instructed to simply look at the dot and then read the word silently. The second study was an exact replication of the first: the physiological and attentional data from Experiment 2 have not yet been reported (Thayer, Friedman, & Borkovec, 2000). To address the issue of a potential memory bias, a free

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