



Mood-congruent attention and memory bias in dysphoria: Exploring the coherence among information-processing biases

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ABSTRACT

Recent studies indicate that depression is characterized by mood-congruent attention bias at later stages of information-processing. Moreover, depression has been associated with enhanced recall of negative information. The present study tested the coherence between attention and memory bias in dysphoria. Stable dysphoric ($n = 41$) and non-dysphoric ($n = 41$) undergraduates first performed a spatial cueing task that included negative, positive, and neutral words. Words were presented for 250 ms under conditions that allowed or prevented elaborate processing. Memory for the words presented in the cueing task was tested using incidental free recall. Dysphoric individuals exhibited an attention bias for negative words in the condition that allowed elaborate processing, with the attention bias for negative words predicting free recall of negative words. Results demonstrate the coherence of attention and memory bias in dysphoric individuals and provide suggestions on the influence of attention bias on further processing of negative material.

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In recent years, cognitive models of depression increasingly emphasize that some of the hallmark features of depression such as sustained negative affect, impaired emotion regulation, and rumination can be explained by information-processing biases resided at the level of attention and memory (Clark, Beck, & Alford, 1999; Teasdale & Barnard, 1993; Williams, Watts, MacLeod, & Mathews, 1997). Indeed, there is empirical data supporting valence-specific biases at the level of attention as well as memory in depression (for a review, see Clark et al., 1999). Moreover, there is emerging evidence that these information-processing factors play a role in emotional reactivity and the etiology and maintenance of depressive symptoms (Beevers & Carver, 2003; Compton, 2000). Usually, these information-processing factors are examined in isolation. The present study sought to examine the coherence of mood-congruent attention and memory bias in dysphoria.

There has been extensive research on the presence of attention bias in depression and dysphoria with early studies suggesting the absence of attention bias (for a review, see Williams et al., 1997). However, recent studies indicate that under certain conditions, mood-congruent attention bias can be observed in depression. That is, when negative information is presented for longer durations (>500 ms), researchers were able to demonstrate attention biases

for negative information in depression and dysphoria (Gotlib et al., 2004; Joormann & Gotlib, 2006). Such biases are not observed when stimuli are presented only briefly (<500 ms) (Mogg & Bradley, 2005). Koster, De Raedt, Goeleven, Franck, and Crombez (2005), for example, used an emotional modification of Posner's spatial cueing task (Posner, 1980) to examine attention bias in dysphoria. In this task, a cue (emotional or non-emotional) correctly predicts the location (valid trial) or incorrectly predicts the location of a target (invalid trial). Typically, at short intervals between cue onset and target onset (Cue Target Onset Asynchrony; CTOA < 300 ms), participants are faster to respond to the valid compared with the invalid trials (the "cue validity effect"), because attention is allocated to the cue. It was found that dysphoria is associated with maintained attention for negative cues (Koster et al., 2005) under conditions of longer presentation durations (500 ms and 1500 ms) and absent at the brief presentation duration (250 ms). In a follow-up study, maintained attention for negative information was replicated in clinically depressed individuals (Leyman, De Raedt, Schacht, & Koster, 2007). Studies using eye-registration methodology have provided additional support for the hypothesis that depression is primarily characterized by maintained attention for negative information (e.g., Caseras, Bradley, & Mogg, 2007). It is important to note that there is some inconsistency between studies in the nature of negative information that is associated with a depression-related attentional bias. Some studies have only found this for depression-related material (e.g., Eizenman et al., 2003; Gotlib et al., 2004), whereas other studies have also observed biases

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in the processing of interpersonally threatening information (Leyman et al., 2007).

The literature on memory bias in depression has revealed a relatively consistent pattern of data, with dysphoric and depressed individuals showing enhanced memory for negative material compared with neutral and positive material whereas healthy controls show enhanced memory for positive material compared with negative and neutral material (e.g., Bradley, Mogg, & Williams, 1995; Denny & Hunt, 1992). This finding has been observed on explicit memory tests but not on tests of implicit memory (for a review, see Watkins, 2002). This has led to the idea that depression is associated with enhanced elaboration on negative material (Williams et al., 1997).

Although Beck's cognitive model predicts mood-congruent biases at several stages of information processing, little research has examined the coherence of attention and memory bias. In a seminal study (Gotlib et al., 2004) it has been found in clinically depressed individuals that incidental recall of emotional words did not correlate with attentional bias. However, in that study stimuli from the attentional tasks (pictures) were different from those in the recall task (words), reducing the probability of finding any strong correlations. There are however, reasons to assume that more targeted research might be able to observe coherence in attention and memory bias.

First, recent experiments in healthy/non-clinical individuals show that enhanced recall of emotional information can be influenced by attentional factors. For instance, in two experiments a divided attention task was presented to participants, which included a picture task that included emotional and neutral pictures, followed by a free recall task (Talmi, Schimmack, Paterson, & Moscovitch, 2007). In this study it was found that attention, arousal, and relatedness influenced emotionally enhanced memory, with the influence of these factors being dependent on the emotional valence of the pictures.

Second, it is thought that attentional bias is a reflection of enhanced elaboration on negative material in depression and dysphoria. This would fit with the neuropsychological literature on mood-congruent attentional bias in depression (e.g., Davidson et al., 2002) where upon encounter of negative material sustained activity is observed in the amygdala in concert with less activity in the areas involved in attention regulation (e.g., dorsolateral prefrontal cortex and anterior cingulate cortex). The basic idea would be that mood-congruent information activates negative schemas with the initiation of processing of the negative material, depleting attentional control. Although several theorists have suggested that there is elaborated processing of negative material during depressed mood (Williams et al., 1997), studies on attentional bias in depression and dysphoria have not systematically investigated this idea. That is, the deployment of visual attention as examined in previous studies is not informative on the degree of processing that occurs in the attentional task. If attentional bias is related to enhanced elaboration on negative material this should cause enhanced memory of negative information.

Thus, the present study examines the coherence of attention and memory bias for emotional information. Such an examination is not relevant for theoretical purposes only. A better understanding of the interaction of mood-congruent processing bias at several stages of information-processing may also provide a better understanding of the influence of cognitive processes on the symptoms of depression. In particular, it seems plausible to assume that information-processing biases operate in concert and as such have interactive or additive effects on symptomatology. In this study, a modified version of the spatial cueing paradigm was designed to include conditions sensitive to the process of elaboration. In the present study we presented participants with a spatial

cueing task with negative, positive, and neutral words as cues that were presented for a brief duration (250 ms) under conditions of a short CTOA (300 ms) or a long CTOA (1550), preventing or allowing time for elaboration on the cues, respectively. A brief stimulus presentation was used to ensure that any attentional influences on memory were due to mental elaboration and not to prolonged stimulus presentation. In several studies brief stimulus presentations have been found to elicit attentional bias in dysphoric individuals (e.g., Koster, De Raedt, Tibboel, De Jong, & Verschuere, 2009). In cueing studies effects have typically been observed with longer stimulus presentations, however in these studies there is a confound between duration of stimulus presentation and CTOA.

In order to examine the degree of processing of negative material during the attentional task, recall of the stimuli presented in the spatial cueing task was examined. An incidental free recall test was administered immediately after the attention task. From Beck's cognitive model we derived the following hypotheses:

- (1) Dysphoric individuals will be characterized by mood-congruent attentional bias compared with non-dysphoric individuals;
- (2) Dysphoric individuals will be characterized by mood-congruent memory bias compared with non-dysphoric individuals;
- (3) If attentional bias in dysphoria is related to elaboration on negative material, attentional bias at the extended CTOA will be associated with enhanced recall of negative information in the dysphoric individuals.

Method

Participants

Dysphoria was assessed via the Beck Depression Inventory (BDI-II, version BDI-II-NL, see below). Using the criteria proposed by Beck, Steer, and Brown (1996), 41 stable dysphoric participants were selected on a BDI-II score > 13 at initial screening and at testing one month later. Another 41 students were selected on the basis of having stable low (<7) BDI-II scores. Participant characteristics are shown in Table 1. According to the criteria by Beck et al. (1996), at testing, individuals in the dysphoric group were mildly ($n = 15$), moderately ($n = 20$), and severely depressed ($n = 6$), respectively. In the dysphoric group, 4 individuals used antidepressant medication and 1 individual used anxiolytic medication. All individuals participated in return for course credit.

Materials

Measures

The Beck Depression Inventory (BDI-II-NL) was used to measure depression (Beck et al., 1996; Van der Does, 2002). The BDI-II is a 21-item, self-report measure of the severity of depressive symptoms. The acceptable reliability and validity of the BDI-II-NL have been well documented.

The trait version of the State and Trait Anxiety Inventory was administered to assess trait anxiety (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; Van der Ploeg, Defares, & Spielberger, 2000).

Stimulus words

Negative, positive, and neutral words were selected on valence, word length, and familiarity as indicated by a group of 100 Flemish undergraduates rating 300 words, with 100 words for each valence category (valence: 1 = extremely positive – 7 = extremely negative; familiarity: 1 = very unfamiliar – 7 = very familiar). The negative

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