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Short communication

Reduced detection of positive expressions in major depression

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ABSTRACT

In patients with depression, negative biases have been reported in various cognitive domains, but few studies have examined whether even detection is affected, i.e. are depressed patients more likely to detect the presence of negative stimuli? This study compared detection of sad and happy faces in patients (n=17) and healthy participants (n=18) using an attentional blink task. Patients with depression detected significantly fewer happy faces than matched healthy participants, but for sad faces the group difference was non-significant. The results suggest that depression may affect the detection of positive stimuli.

1. Introduction

Negative biases in patients with major depression are characterised by a stronger tendency to respond to stimuli with a negative emotional meaning compared to stimuli with a positive or neutral emotional meaning. Negative biases have been observed in several cognitive domains, including memory, attention and recognition. Patients with depression recalled more negative words than positive words (Matt et al., 1992), were faster to shift attention towards negative words (Gotlib et al., 2004; Leyman et al., 2007) or mislabelled neutral expressions as sad (Leppänen et al., 2004).

Cognitive theories of depression propose that negative biases reflect underlying dysfunctional psychological processes (Beck, 2008; Beevers, 2005). Schemas involving loss and failure would be more readily accessible in people with depression, resulting in negative bias (Sheppard and Teasdale, 2004). Negative bias in information processing is regarded as a vulnerability factor for depressive episodes and would be one of the sources of dysfunctional thought in depression, the other source being reduced ability to control negative thoughts and feelings (DeRaedt and Koster, 2010).

Cognitive theories of depression would predict that negative schemas can influence most, if not all, aspects of information-processing. Negative biases have indeed been found in a range of domains, but what is less clear is whether negative biases can be found even in simple detection tasks. That is, are patients with depression more likely to detect the presence of negative stimuli? Current evidence suggests that negative biases arise at later stages of information processing, requiring relatively long presentation times (DeRaedt and Koster, 2010; Gotlib et al., 2004), which would imply that detection of briefly presented stimuli should not be affected by negative biases. However, few studies to date have assessed detection of emotional stimuli in patients with depression and those which have done so have typically used indirect measures of detection, e.g. reaction times. Suslow et al., (2004) used a spatial attention task and presented displays containing schematic faces. The schematic faces could either all have a neutral expression or one of the faces had a sad or a happy expression. Participants had to indicate whether all faces had the same expression or whether one face had a different expression and their response times were recorded. Suslow et al., (2004) found that patients with depression were slower than healthy participants to detect the presence of a happy face among neutral distractors, while there was no group difference for sad faces. What these findings do not reveal is whether patients with depression were more likely to detect the presence of negative stimuli, or less likely to detect the presence of positive stimuli.

The attentional blink paradigm can provide a more direct measure of detection and has been used to demonstrate the effect

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of emotional meaning on detection. The attentional blink (AB) refers to the phenomenon that detecting a visual target (T2) presented in a rapid stream of visual stimuli is impaired when it appears shortly after another target (T1), which observers need to identify. Healthy participants were more likely to detect the presence of happy expressions as T2 than sad or neutral expressions (De Jong et al., 2009; Miyazawa and Iwasaki, 2010; Srivastava and Srinivasan, 2010).

The AB task has also been used to show enhanced detection of self-relevant stimuli in participants with clinical or subclinical anxiety (De Jong et al., 2009; Fox et al., 2005; Olatunji et al., 2013; Van Dam et al., 2012). Koster et al., (2009) did use the AB task in dysphoric students and showed that negative words presented as T1 reduced detection of words presented as T2, suggesting slower disengagement from negative information. However, Koster et al., (2009) did not directly examine the effect of T2 valence on detection, that is, whether negative stimuli were more likely to be detected. To our knowledge no previous study in depression has used emotional T2 stimuli, preceded by a neutral T1, to study detection of mood-congruent and incongruent stimuli in depression.

The aim of this study was to examine whether the negative bias affecting various information-processing domains in patients with depression can also occur at early processing stages and affect detection of sad or happy faces in an AB task. Based on previous reports of biases towards negative, mood-congruent stimuli in depression, including those mentioned above (Gotlib et al., 2004; Leppänen et al., 2004; Leyman et al., 2007; Matt et al., 1992), our hypothesis was that sad faces would be more likely to be detected by patients than happy expressions, as reflected in an attenuated attentional blink for sad faces compared to happy faces. For the healthy comparison group we expected the opposite pattern, better detection of happy compared to sad faces, meaning an attenuated attentional blink for happy faces in line with previous studies, mentioned above, in healthy participants.

2. Method

2.1. Sample size calculation

Estimation of the required sample size was based on a study in healthy participants comparing detection of happy and sad faces (Srivastava and Srinivasan, 2010). The effect size, based on within-group comparisons, was very large (Cohen's d = 1.36) and the corresponding required sample size was 6 participants in each group, assuming a power of 0.80 and a significance level of 0.05. Sample size calculations based on other relevant studies, which compared detection of happy and neutral faces in healthy participants (de Jong et al., 2009; Miyazawa and Iwasaki, 2010), produced recommended sample sizes of 20 and 14 in each group, respectively. Similar studies in patients with depression were not available.

2.2. Participants

Twenty patients (9 females) with an ICD-10 diagnosis of major depressive disorder and 18 healthy participants (10 females) were recruited The patients were in-patients or out-patients at Royal Cornhill Hospital, Aberdeen, United Kingdom, and were clinically assessed by a psychiatrist who confirmed the diagnosis, checked for exclusion criteria, took informed consent and administered the questionnaires and AB task. Main exclusion criteria were severe alcohol or drug abuse, dementia or any other neurological disorders, and comorbid diagnosis. The patients received antidepressant medication at doses as recommended by the British National Formulary. Healthy participants for the comparison group were recruited from the general public through convenience sampling to match the patients for age, gender and level of education (see Table 1).

Table 1
Demographic information, depressive symptoms and number of happy and sad T2 faces detected (max. = 20) in the two groups.

		Patients	Comparison
		M (SD)	*M* (SD)
Female/male		8/9	10/8
Age		49.5 (11.8)	50.9 (10.4)
Age range		24–64	22–61
Education level[a]		1.63 (0.95)	2.0 (0.91)
BDI		34.76 (11.41)**	3.56 (2.91)
SHAS		6.47 (3.32)**	0.22 (0.55)
Masked T2	sad	10.06 (5.6)	12.61 (4.6)
	happy	10.29 (5.5)*	14.00 (4.5)
Unmasked T2	sad	14.00 (5.8)	16.44 (2.6)
	happy	13.41 (6.1)*	17.39 (2.2)

* $p < 0.05$.
** $p < 0.001$.
[a] highest level of education achieved: 1. secondary school; 2. college; 3. university.

All participants completed the Beck Depression Inventory (BDI: Beck et al., 1996), as a measure of depression symptom severity, and the Snaith-Hamilton Anhedonia Scale (SHAS: Snaith et al., 1995), as a measure of anhedonic symptoms. The study was approved by the North of Scotland Research Ethics Committee.

2.3. Attentional blink task

The task was presented on a laptop computer and consisted of images of faces and scrambled faces presented in rapid succession. The task was based on a task used previously to study the effect of emotion on detection (Milders et al., 2006) and was adapted to make the task more suitable for a clinical population by reducing the number of trials and the length of each trial. All face stimuli came from a standard set of facial expression pictures (Ekman and Friesen, 1976) and scrambled faces were created by rearranging the internal features of two neutral faces, one male and one female. Pictures of faces of six individuals displaying sad, happy and neutral expressions were selected for the task. A trial contained two target faces (T1 and T2) presented among seven scrambled face images. Each image was presented for 100 milliseconds and immediately followed by the next image or a blank screen. T1 was the only image with a greenish tint, all other images were black and white. T1 was always neutral and female or male in 50% of the trials. T2 always appeared after T1, separated by a single scrambled face, and displayed either a happy or a sad expression in 50% of the trials. In the masked condition T2 was immediately followed by a scrambled face, in the unmasked condition T2 was followed by a blank screen for 100 ms. The attentional blink requires rapid succession of T1 and T2 as well as masking of T2. Therefore, removing the mask should largely eliminate the AB in this condition, which implies that the expected difference between detection of happy and sad expressions in the patients and comparison group should be most pronounced in the masked condition. The task consisted of 100 trials presented in random order, 20 control trials containing only T1, 40 masked trials (20 happy, 20 sad) and 40 unmasked trials (20 happy, 20 sad). At the end of each trial participants reported the sex of T1 and whether they had seen a second face. Correct sex discrimination of the T1 face formed the T1 scores and reporting a second face, when a second face had been presented, formed the T2 detection scores. Participants never had to report the expression on the target faces. AB tasks typically