



Stable expression recognition abnormalities in unipolar depression

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ABSTRACT

Although abnormalities in emotion recognition during a depressed episode have frequently been reported in patients with depression, less is known about the stability of these abnormalities. To examine the stability of emotion recognition abnormalities, this longitudinal study assessed patients with unipolar depression on three separate occasions at 3-monthly intervals. Recognition of sad, angry, fearful, disgusted, happy and neutral facial expressions was assessed in a matching task and a labelling task. Patients performed as well as matched healthy controls on the matching task. On the labelling task, patients showed higher accuracy and higher response bias than controls for sad expressions only, which remained stable over a 6-month interval. Over the same period, symptom severity, as measured with the Beck Depression Inventory and the Hamilton Depression Rating Scale, decreased significantly in the patient group. Furthermore, labelling performance for sad expressions was not associated with symptom severity or with changes in severity over time. This stable bias for sad expressions might signal a vulnerability factor for depression, as proposed by cognitive theories of depression.

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1. Introduction

There is ample evidence of abnormalities in the recognition of emotional facial expressions in patients with unipolar depression (Phillips et al., 2003; Leppänen, 2006; Venn et al., 2006 for reviews). Abnormal emotion recognition in depression has attracted much interest because of the possible links with poor social functioning and structural or functional brain abnormalities. Another reason why emotion recognition is of interest is as a possible manifestation of cognitive vulnerability to depression. A frequently observed abnormality in emotion recognition in depressed patients is the negative bias: the enhanced tendency for depressed patients to judge expressions as displaying negative emotions. This bias shows a resemblance to the negative bias in memory for emotional material or the attentional bias towards negative stimuli (Matt et al., 1992; Watkins et al., 1996; Gotlib et al., 2004) reported in depressed patients. Negative biases in information processing may reflect underlying negative schemata proposed by cognitive theories of depression (Beavers, 2005; Scher et al., 2005), which represent potential vulnerability factors for depression. This proposal implies that negative biases are stable characteristics of vulnerable persons.

Numerous studies have reported abnormalities in emotion recognition during a depressive episode, but less is known about the stability of these effects. Although cross-sectional studies found no significant differences in the ratings of facial expressions between patients in

episode or in remission (Levkovitz et al., 2003) or identified abnormal recognition of fearful expressions in remitted patients (Bhagwagar et al., 2004), longitudinal designs can provide stronger evidence for stability of emotion recognition abnormalities. Bouhuys et al. (1996) showed that in patients with depression, perception of sadness and rejection in ambiguous schematic faces remained stable over a 30-week period. Furthermore, patients who saw more negative emotions in ambiguous faces at discharge were more likely to relapse 6 months later (Bouhuys et al., 1999), suggesting a link with vulnerability to relapse. Leppänen et al. (2004) reported a tendency to label neutral faces as sad in depressed patients that remained in remission. Limitations of these longitudinal studies include the absence of a non-depressed control group to confirm that emotion recognition in the patients was abnormal (Bouhuys et al., 1996, 1999) or inclusion of sad as the single negative expression (Leppänen et al., 2004), making it impossible to distinguish a negative bias from a selective bias towards sad. The present study aimed to further investigate the selectivity of emotion recognition abnormalities in depression and the stability of these effects using a longitudinal design.

2. Method

2.1. Participants

Nineteen patients (11 females) with moderate-to-severe unipolar depression participated. The diagnosis was made in a structured clinical interview conducted by a qualified psychiatrist (authors JP, RS and OR) using the criteria of the International Classification of Diseases (ICD-10: World Health Organization, 1992). Inter-rater reliability of ICD-10 for the diagnosis of depression is classed as good ($\kappa = 0.66$; Sartorius et al., 1993). Five patients had co-morbid anxiety disorders, the remaining

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Table 1

Mean age and years of education at time 1 for patients and controls and mean scores on Beck Depression Inventory (BDI) and the Hamilton Depression Rating Scale (HDRS) at times 1–3.

	Patients		Controls		
	M	(S.D.)	M	(S.D.)	
Age (years)	46.05	(11.15)	47.80	(11.75)	
Education (years)	12.63	(2.79)	12.68	(2.28)	
BDI	Time 1	23.53	(12.06)	6.08	(4.23)
	2	16.79	(12.26)	5.64	(4.31)
	3	15.94	(13.86)		
HDRS	Time 1	15.16	(7.58)		
	2	10.68	(7.91)		
	3	7.25	(6.26)		

patients had no co-morbid illnesses. Seventeen patients had experienced one or more previous depressive episodes. All patients, except one, received antidepressant medication, consisting of selective serotonin re-uptake inhibitors (SSRIs), tricyclic anti-depressants, selective noradrenaline re-uptake inhibitors (SNRIs), noradrenaline and serotonin selective inhibitors (NaSSAs), lithium or anti-psychotic medication. The doses followed recommendations by the British National Formulary. The control group consisted of 25 healthy persons (18 female) who matched the patients for age and years of education (see Table 1). Control participants were recruited from the community and came from the same geographical region as the patients. Control participants were screened for current depression using the Beck Depression Inventory-II (BDI-II). Any control participants with scores of 16 or higher on the BDI-II were not included in the study.

2.2. Materials

Patients were administered the self-report Beck Depression Inventory-II (BDI-II; Beck et al., 1996) and the Hamilton Depression Rating Scale (HDRS; Hamilton, 1967). In line with HDRS guidelines, this scale was completed by the psychiatrist who tested the patient in a structured interview. The controls completed the BDI-II, but not the HDRS as the psychiatrist did not test the controls.

Four male and five female faces displaying expressions of anger, fear, sadness, happiness, disgust or a neutral expression were selected from a standard set of expression photographs (Ekman and Friesen, 1976). Intensity of the emotions expressed in the faces had been manipulated through morphing by adding increasing proportions of neutral expression to the prototypical emotional expression (Young et al., 1997). Each emotion was presented at four levels of intensity, 20% (e.g., 20% sad, 80% neutral), 40%, 60% and 80%. The same expressions appeared in a matching task and a labelling task. No prototypical expressions (100%) were presented in either task. All expression stimuli were presented on a computer screen and SuperLab software controlled the presentation timings and response recording.

In the facial expression matching task, each trial consisted of three successive presentations of the face of the same model. Face 1 and face 2 were always different with one displaying a neutral expression and the other displaying one of the five emotions at one of the four levels of intensity. The third face in the trial was the same as either face 1 or face 2 and the participant had to indicate whether the third face matched face 1 or face 2 by means of a key press. A trial started with a fixation cross presented for 500 ms followed by a blank screen for 250 ms, after which the three faces appeared one after another separated by 750 ms of blank screen. Face 1 and face 2 were displayed for 1 s each and the third face stayed on the screen for 2 s during which period participants had to respond. There were 160 trials presented in random order, 32 trials for each emotion, with eight trials for each level of intensity.

The same faces used in the matching task were also presented in the expression labelling task. Faces in the labelling task were displayed one by one and participants had to choose from six emotion labels (neutral, happy, sad, angry, disgusted and fearful) the label that best described the expression shown. A trial started with a fixation cross for 500 ms followed by 250 ms of blank screen after which the face was displayed for 500 ms. The face was replaced by a blank screen that remained blank until the participant made a response. There were 100 trials presented in random order, 20 displaying neutral faces and 16 for each of the five emotions, with four trials at each intensity.

2.3. Procedure

The patients were first tested while in a depressive episode and were retested on two further occasions at approximately 3-month intervals. The mean interval between time 1 and 2 was 3.8 months (S.D. 1.03) and mean interval between time 2 and 3 was 3.6 months (S.D. 0.98). The control participants were tested twice with a mean interval of 3.3 months (S.D. 0.35). The intervals between time 1 and 2 for patients and controls did not differ significantly ($P > 0.07$). At each assessment participants started with the matching task, followed by the labelling task. Following the expression tasks all participants completed the BDI-II and the patients were also administered the HDRS.

3. Results

3.1. Symptom severity

Mean BDI and HDRS scores from the patient and control groups at the different assessments are displayed in Table 1. As expected, BDI scores were significantly higher in the patients than in the controls at times 1 and 2 ($P < 0.01$, Mann–Whitney). BDI and HDRS scores within the patient group decreased significantly from time 1 to 2 ($P < 0.05$, Wilcoxon) and from time 1 to time 3 ($P < 0.05$, Wilcoxon). Within the control group BDI scores did not change from time 1 to time 2.

3.2. Matching task

For the initial analyses of both the matching task and the labelling task, scores for each expression were collapsed across the four levels of intensity. If these collapsed scores showed significant group differences for specific emotions, the influence of intensity was examined further. The reason for this approach was that because of the relatively small sample size and the limited number of stimuli per intensity level, effects of intensity could reflect random variation in performance and be of little interest. Instead, group differences in collapsed scores could either reflect a large group effect at one level of intensity or a consistent group effect across several levels of intensity.

Percentages of correct responses on the matching tasks are shown in Table 2. Comparison of percentage correct for each expression, collapsed across intensity, at assessments 1 and 2 in a 2 (group) \times 2 (time) \times 5 (expression: anger, disgust, fear, happy, sad) analysis of variance (ANOVA), revealed a significant effect of expression ($F(4, 164) = 29.56$, $P < 0.0001$, $\eta_p^2 = 0.41$), but no other main or interaction effects. Matching performance in both groups was best for happy, followed by fear, anger, disgust and sad. Comparing matching performance across all three assessments within the patient group showed only an effect of expression ($F(4, 64) = 13.22$, $P < 0.001$, $\eta_p^2 = 0.45$) but no main effect of time and no interaction. On the matching task the patients performed as well as the controls and showed the same pattern of performance as the controls, which remained stable of time.

3.3. Labelling task

Performance on the labelling task was expressed as accuracy and response bias scores following the 2HT model (Corwin, 1994). Accuracy scores (Pr) for each expression were calculated by subtracting the false alarm rate (e.g., incorrect responding “sad” to expressions other than sad) from the hit rate (e.g., correctly responding “sad” to “sad expressions”). Response (Br) scores for each expression were calculated using the formula presented in Corwin (1994): (false alarm rate)/

Table 2

Mean percentages correct on the matching task at times 1–3.

Expression	Time	Patients	Controls
		M (S.D.)	M (S.D.)
Sad	1	78.78 (9.05)	80.21 (6.49)
	2	77.47 (13.36)	79.55 (8.49)
	3	79.41 (11.54)	
Happy	1	88.98 (6.69)	88.93 (6.89)
	2	88.48 (6.75)	89.45 (4.85)
	3	90.07 (5.20)	
Fear	1	84.53 (7.68)	86.45 (6.01)
	2	85.19 (9.01)	84.76 (6.66)
	3	85.29 (6.87)	
Disgust	1	81.90 (9.11)	84.24 (5.33)
	2	80.42 (10.25)	84.24 (7.28)
	3	85.84 (8.05)	
Anger	1	78.12 (13.58)	85.54 (5.74)
	2	83.05 (10.06)	85.67 (7.25)
	3	83.63 (8.23)	

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