SHORT REPORT

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Categorical and Dimensional Reports of Experienced Affect to Emotion-Inducing Pictures in Depression

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Abstract

Categorical and dimensional reports of affect to emotional pictures in Major Depressive Disorder (MDD) were examined. The results revealed significant differences in response to positive images (reduced arousal ratings, less pleasant valence ratings, decreased self-report of happiness, increased self-report of sadness) in MDD, relative to control participants. There were no clear group differences in response to negative stimuli. Extending earlier findings of reduced responsiveness to positive, but not negative, stimuli in MDD, the data indicate that blunted response to positive stimuli is found when using both categoric and dimensional ratings. Further, the data replicate earlier findings of elevated sadness reports to positive stimuli, which may reflect broader difficulties in regulating emotions in MDD. Implications for theory and treatment are discussed.

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Introduction

Two central themes in the phenomenology of depression are a pervasiveness of negativity - of mood, emotion and cognition (e.g. Beck, Rush, Shaw & Emery, 1979) - and a loss of pleasure and interest in previously enjoyable activities (anhedonia and apathy) (e.g. Sloan, Strauss & Wisner, 2001). These two themes receive differential emphasis across the major theoretical accounts of depression. For example, cognitive theories tend to emphasize the primacy of negative thinking and negative emotion experience (e.g., Beck et al., 1979). In contrast, central notions of a number of behavioural accounts are a reduction in response to reward-related stimuli, a lack of positive reinforcement (Costello, 1972; Ferster, 1973; Lewinsohn & Graf, 1973), and a deficit in approach behaviour (Straumann, 1999; Henriques & Davidson, 2000).

Influential empirical work (Berenbaum & Oltmanns, 1992; Sloan, Strauss, Quirk & Sajatovik, 1997; Sloan et al., 2001) has provided evidence suggesting that a relatively diminished responsiveness to positive non-autobiographical stimuli, rather than increased responsiveness to negative non-autobiographical stimuli, is a key feature of the emotion profile in clinical depression[1]. For example, Sloan et al. (2001) presented depressed and non-depressed women with positive, negative or neutral pictures and measured their responses using observer ratings of facial expression and self-report. The depressed women reported feeling less pleasant, less emotionally aroused, and displayed less frequent and intense emotion facial expressions to positive pictures relative to controls, but did not differ significantly from controls in their response to the negative pictures. Broadly similar data were reported by Sloan et al. (1997) and Berenbaum and Oltmanns (1992). Sloan et al. (2001) drew two conclusions from these three studies. Firstly, they emphasized the apparent diminished response to positive material in depression: “the results of three studies support the idea that a fundamental emotional concomitant of depression is anhedonia – a diminished response to pleasant emotional stimuli” (pp. 490-491). In addition, they concluded “there appears to be no heightened responsivity to stimuli that elicit unpleasant emotions, including sadness specifically” (p.491). Taken at face value, then, such data (Berenbaum & Oltmanns, 1992; Sloan et al., 1997; 2001) provide clear support for those theories of depression referred to above that emphasize a reduced response to positive emotional material (e.g. Davidson & Irwin, 1999) while perhaps offering less support to theories that focus on enhanced emotional responsiveness to negative stimuli (e.g. Beck et al., 1979).

However, examination of the methodological details of these studies suggests that some caution is merited before we interpret their findings at a theoretical level. Taking the

Sloan et al. (2001) research as the prototypical example, in this study self-reported responsiveness to different emotional stimuli was assessed using simple arousal and valence dimensions rather than in terms of categoric emotions such as sadness, joy, and so on. Furthermore, with respect to valence, the pleasantness and unpleasantness of the affective response were not assessed separately but were conflated on a single scale anchored with *very pleasant* at one end and *very unpleasant* at the other.

What this means is that the key finding in the Sloan et al. (2001) study was that depressed participants' mean rating for their response to positive stimuli was both closer to the *unpleasant* end and further from the *pleasant* end of the rating scale than the mean for the control sample. It is clear therefore that depression might best be characterised by an increased unpleasant affective response to positive stimuli as well as, or even instead of, a decreased pleasant response. Furthermore, if one thinks hypothetically in terms of categoric emotions one could conceive that the response of depressed individuals to pleasant stimuli could be due to, say, increased sadness rather than, or as well as, decreased happiness or joy. Clearly, such a hypothetical pattern of findings would suggest a different interpretation of the data (with different theoretical implications) to that proposed by Sloan et al. (2001).

There are some empirical data to support this hypothesised alternative take on the Sloan et al. (2001) findings. In a study by Rottenberg, Kasch, Gross and Gotlib (2002) depressed participants reported both increased sadness and decreased amusement to amusing film clips, relative to healthy controls. This indicates that responsiveness to positive (albeit specifically amusing) stimuli in depression is altered in different ways for different emotions, rather than simply being "diminished" (Sloan et al., 2001). There could be various reasons for why depressed individuals report increased sadness to positive stimuli. It is possible that in depression the realisation that normally positive stimuli no longer produce positive emotions, could induce a degree of sadness about the experiences being missed out on and remind the depressed individuals of the lack of positive things in their life. Alternatively, it has been argued that elevated sadness and reduced happiness may both reflect reduced activity in a broad approach motivational system (Depue & Iacono, 1989). Unfortunately, Rottenberg et al. (2002) did not elicit arousal and valence ratings in their studies and so more direct comparison with the Sloan et al. (2001) data is not possible.

In addition to these issues concerning responsiveness to positive stimuli, the use of simple arousal and valence ratings has implications for any data concerning responsiveness to negative stimuli. For example, one could imagine that depressed individuals could feel increased sadness but decreased fear to an unpleasant stimulus (or vice versa), relative to

controls. If they are forced to translate this mixed hedonicity (Lambie & Marcel, 2002) onto a single valence scale as in the Sloan et al. studies, the two streams of experience may well 'cancel out' with respect to the final rating, thus giving the impression that depressed participants' experience is similar to that of controls. Again, the Rottenberg et al. (2002) data provide some support for this kind of hypothesis as their depressed participants differed in the degree of sadness, but not the level of fear, that they reported to different film clips.

These possible alternative conceptualisations of the data from the studies by Sloan at al. (1997, 2001) and Berenbaum and Oltmanns (1992) are of more than simply theoretical importance. In terms of clinical implications, accepting Sloan et al.'s (2001) conclusions about these data might suggest that less therapeutic emphasis should be placed on reducing an assumed enhanced responsiveness to negative stimuli in depressed individuals and more emphasis placed on augmenting a flattened response to positive stimuli. In contrast, our hypothetical alternative accounts of their data would indicate that increased negative responsiveness to both positive and negative stimuli is also important in depression and a legitimate target for therapy.

For this reason, it is important to examine whether the patterns of findings on dimensions of arousal and valence from the existing studies (Berenbaum & Oltmanns, 1992; Sloan et al., 1997, 2001) are mirrored when categoric emotion responses such as sadness and happiness are also considered. The combination of both arousal and valence ratings and categoric emotion ratings has previously been used in studies exploring how healthy participants experience emotional images (Bradley, Codispoti, Sabatinelli & Lang, 2001), but has not yet been extended to depression.

In a pilot study, therefore, we have examined how dysphoric (N = 20) and control (N=20) participants rated arousal and valence, as in the earlier studies (e.g. Sloan et al., 2001), along with their experience of sadness, happiness, and fear, to sets of emotional images (Dunn, 2002). Dysphoria was found to be characterized by reduced self-reported pleasantness (valence) ratings of positive images but not by reduced arousal ratings, thus only partly replicating the earlier pattern of findings of Berenbaum and Oltmanns (1992) and Sloan et al. (1997, 2001) in clinically depressed groups. In terms of categoric emotions, the dysphoric sample reported decreased happiness and a trend towards increased sadness when viewing positive pictures (cf. Rottenberg et al., 2002), but did not differ from controls in terms of their emotional response to negative pictures[2].

There were a number of aspects of these findings that were surprising. The first was the fact that the strong and reliable effect involving valence ratings to positive stimuli

reported in earlier studies (Berenbaum & Oltmanns, 1992; Sloan et al., 1997, 2001) were not repeated. Secondly, the finding of increased sadness to amusing stimuli in the study by Rottenberg et al., (2002) was not reflected by a similar significant pattern involving positive stimuli in the data, although the results were in the expected direction with a medium effect size (Cohen's d = 0.42). One possible reason for these discrepancies was that the previous studies involved clinically depressed participants (Berenbaum & Oltmanns, 1992; Sloan et al., 1997, 2001) whereas our pilot study used a dysphoric group. It may be that changes in self-reported valence and sadness to positive stimuli are only apparent in individuals with clinical levels of symptoms. Finally, we had predicted increased sadness ratings to negative stimuli in the dysphoric group, relative to controls, and there was no evidence to support this. Again, this may have been due to the non-clinical nature of the pilot sample.

The present study therefore attempted to address these issues by using clinically depressed participants and never-depressed control volunteers in a repetition of the pilot study. The specific hypotheses were, firstly, that response to positive stimuli would be characterised by reduced pleasantness and arousal in depressed individuals, relative to controls, as in the earlier studies (Berenbaum & Oltmanns, 1992; Sloan et al., 1997, 2001), secondly that this would be reflected in both decreased happiness and increased sadness to these stimuli (cf. Rottenberg et al., 2002) and thirdly, that response to negative pictures would be characterised by increased sadness in depressed participants relative to controls.

Method

Participants

Twenty five people diagnosed with a current major depressive disorder (MDD) according to the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV; American Psychiatric Association [APA], 1994) were compared to 25 never-depressed control participants. MDD diagnosis was ascertained using the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon & Williams, 1994). Twenty four individuals were outpatients and one was an inpatient. Nine had a pure diagnosis of MDD (9 females), ten had marked anxiety symptoms (5 females; 5 males), and six had co-morbid Panic Disorder (3 females; 3 males). All of the depressed patients were using anti-depressant medication: SSRIs (16); SSRIs and anxiolytics (4): SSRIs and tri-cyclics (2); tri-cyclics and anxiolytics (3). The depressed sample was moderately to severely depressed, according to the 21 item Hamilton Depression Rating Scale (HDRS, Hamilton, 1960), Mean = 21.40; SD = 5.45. Testing took place within two weeks of diagnosis. The never-depressed controls were

recruited from the departmental participant panel. Those with a BDI score greater than ten or with past or current MDD or dysthymia based on SCID assessment were excluded.

All volunteers were between 18 and 65 years of age and were excluded if they had a history of brain injury, psychosis, learning disability, or substance abuse problems, based on administration of a brief semi-structured interview over the telephone prior to participation. The groups were group-matched for age, gender and estimated IQ according to the National Adult Reading Test (NART; Nelson, 1982) (see Table 1). All participants provided written informed consent prior to the experimental session. Control participants were paid £5 per hour for their participation in the study and the depressed participants had their travel expenses reimbursed.

INSERT TABLE 1 ABOUT HERE

Affective Picture Task

As in the earlier studies by Sloan et al (1997, 2001), in order to measure emotion processing participants were shown images selected from the International Affective Picture Set (IAPS), a series of emotional and neutral images that have detailed normative rating data (CSEA-NIMH, 1999). Participants viewed blocks of ten images in each of the following categories: positive, fearful, sad, and neutral. The positive block included images of people smiling (5), exciting sports (3), and beautiful natural scenes (2). The fearful block was made up of images of frightening animals (5) and scenes of human attack (5). The sad block had images of people crying (4), injury (2), and loss (4). The neutral block was made up of pictures of common household (8) and roadside (2) objects. Selection of pictures for each block was initially based on a pilot study of 6 people viewing 100 images from the IAPS. Images were selected that generated a high rating on the target emotion and were classified by participants as the target emotion and not other emotions. The emotional images were also matched on arousal ratings (CSEA-NIMH, 1999). The images chosen have subsequently been validated on over 60 healthy participants and shown to reliably induce the desired discrete emotions (with little induction of other emotions) as measured by self-report and to generate distinct valence and arousal ratings as intended (Dunn, 2002)[3].

Participants viewed each image for ten seconds and then rated how much happiness, sadness, and fear they experienced using computerised 100-point sliding visual analogue scales (from 1: *not at all*, to 100: *extremely*). Participants also used an Affect Grid (Russell, Weiss & Mendelsohn, 1989) to rate how pleasant (from 1: *extremely unpleasant*, to 9:

extremely pleasant) and arousing (from 1: *not at all arousing*, to 9: *extremely arousing*) each image was. There was a three-second interval between trials and a one-minute break between blocks. To control for order effects, block presentation order was fully counterbalanced across participants and picture presentation within each block was randomised for each participant. A blocked design was used to minimise contamination effects of the previous trial on the response to the current trial, without having to introduce an overly long inter-trial interval. The task was programmed in Microsoft Visual Basic 6.0 (Microsoft Corporation, 1998) and presented on a PC computer with a 15 inch monitor. Instructions emphasised that participants should report exactly how they felt, rather than how they thought they should have felt. The task took on average 35 minutes to complete.

Procedure

Participants were screened, completed the BDI and the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) along with other measures not discussed here, and then completed the affective picture task. Testing took place in a quiet, softly lit room, with participants seated in a comfortable chair facing the computer monitor.

Results

Table 2 plots the mean levels of self-reported happiness, sadness, and fear, as well as the ratings of arousal and valence reported for negative (fear and sadness), neutral and positive picture blocks (cf. Sloan et al., 2001) by the depressed and control participants.

INSERT TABLE 2 ABOUT HERE

For the following statistical analyses, the ratings for the sad and fearful pictures were averaged to create composite ratings of negative pictures[4]. For each participant the ratings of self-reported emotion response scores to neutral pictures were then subtracted from the comparable scores for positive and negative pictures in line with the analyses by Sloan et al. (2001).

Categoric Ratings of Happiness, Sadness and Fear

A Group (depressed, control) by Picture (positive, negative [relative to neutral]) repeated measures multivariate analysis of variance (MANOVA) was carried out with the 3 self-reported categorical emotion ratings (fear, sadness, happiness) as the dependent variables. The multivariate output revealed a significant main effect of Picture, Wilks' Lambda = .16, $F(3, 46) = 81.00$, $P < .001$ and a significant Picture by Group interaction, Wilks' Lambda = .75, $F(3, 46) = 5.25$, $P < .01$, though no significant effect of Group, Wilks Lambda = .89, $F(3, 46) = 1.98$, ns. Follow-up univariate analyses for each self-reported categorical emotion (sadness, happiness, fear) revealed significant effects of Picture for all three emotion ratings, $Fs(1, 48) > 90$, $Ps < .001$, though a significant main effect of Group emerged only in the case of happiness ratings, $F(1, 48) = 4.11$, $P < .05$, other $Fs < 1$. These main effects were qualified by a significant Group by Picture interaction in the case of happiness ratings, $F(1, 48) = 14.83$, $P < .001$, a near-significant Group by Picture trend in the case of sadness ratings, $F(1, 48) = 3.90$, $P = .05$, though no significant interaction in the case of fear ratings, $F < 1$.

The univariate Picture by Group interaction for happiness ratings was broken down by looking at happiness ratings across groups for each picture type (positive, negative) using independent sample t-tests. This allowed examination of the *a priori* hypothesis that depressed participants, relative to controls, would report decreased happiness to positive pictures relative to neutral pictures (using a directional test), as well as indicating the profile of happiness responses to negative pictures across the two groups. The results revealed that the depressed group reported significantly lower levels of happiness to positive pictures relative to neutral, $t(48) = 3.36$, $P < .01$, Cohen's $d = 0.97$, though no significant difference between groups in terms of happiness ratings to negative pictures, relative to neutral, $t(48) = 0.99$, ns.

Following on from the near-significant trend for a Picture by Group interaction for sadness ratings, the *a priori* hypotheses regarding higher levels (relative to neutral) of sadness in depressed participants compared to controls to both positive (cf. Rottenberg et al., 2002) and negative pictures (Beck et al., 1979) were examined. Independent sample directional t-tests were therefore carried out for sadness ratings between groups for each picture type separately. The depressed group, compared to the controls, reported significantly higher levels of sadness to positive pictures, relative to neutral, $t(48) = 1.84$, $P < .05$, Cohen's $d = 0.53$. However, the hypothesis that depressed participants would differ to control participants in reporting increased sadness to negative pictures (relative to neutral pictures) was not supported, $t < 1$.

There were no *a priori* hypotheses regarding fear responses in depression and so, in the absence of a significant univariate Picture by Group interaction for fear ratings, no further analyses were performed[5].

Dimensional Ratings of Valence and Arousal

A Group (depressed, control) by Picture (positive, negative [relative to neutral]) repeated measures ANOVA was carried out to examine the arousal rating data. There was no main effect of Picture and no Picture by Group interaction, Fs < 1, but there was a significant main effect of Group, F (1, 48) = 4.69, P = .04. Depressed participants reported lower arousal ratings than control participants (relative to neutral) overall. The specific *a priori* hypothesis derived from the Sloan et al. (1997, 2001) data that arousal ratings would differ across groups for positive but not negative pictures relative to neutral was examined by comparing the difference in arousal ratings for positive and neutral picture blocks across groups using a directional test. The results indicated that the depressed group reported lower arousal to positive pictures relative to neutral compared to the control group, t (48) = 2.60, P < .02, Cohen's d = 0.75. There was no difference between groups for arousal ratings of negative images relative to neutral, t (48) = 1.46, ns.

A final Group by Picture ANOVA was carried out for the valence ratings. There was a significant main effect of Picture, F (1, 48) = 332.97, P < .001, no main effect of Group, F (1, 48) = 1.59, ns, and a significant interaction of Group by Picture, F (1, 48) = 8.34, P < .01. The *a priori* hypothesis derived from the Sloan et al. (1997, 2001) data that valence ratings would differ across groups for positive pictures relative to neutral was examined by comparing the difference in valence ratings for positive and neutral picture blocks across groups using a directional test. The depressed group rated the positive images as less pleasant (relative to neutral) than the control group, t (48) = 3.15, P < .01, Cohen's d = 0.91, but there was no difference between groups for negative images, t < 1.

Discussion

Previous research (Berenbaum & Oltmanns, 1992; Sloan et al., 1997, 2001) using self-report dimensions of arousal and valence purports to show a "diminished response" (Sloan et al., 2001) to positive visual, non-autobiographical emotional stimuli in depressed participants compared to healthy controls and provides no evidence for differences across groups in responding to negative stimuli. The present study investigated the possibility that the use of broad dimensions such as arousal and valence in these earlier studies may have masked a

relative increase in categoric negative emotions such as sadness to both positive and negative material in depressed individuals. Emotional response to positive and negative emotional pictures was measured using self-report arousal, valence, and categoric emotion ratings in a group of clinically depressed participants, compared to a group of never-depressed controls.

The first hypothesis that depression would be characterized by reduced self-reported pleasantness (valence) and arousal ratings to positive (relative to neutral) pictures, compared to controls, was confirmed. The second hypothesis that depression would be characterized by increased sadness (cf. Rottenberg et al., 2002) as well as decreased happiness to positive pictures (relative to neutral) was also supported. The third hypothesis that depressed individuals would report more sadness to negative pictures (relative to neutral) compared to controls was not confirmed.

These results broadly replicate the earlier findings concerning arousal and valence ratings of emotional visual stimuli in depression (Berenabaum & Oltmanns, 1992; Sloan et al. 1997, 2001). They extend them by showing that a similar pattern emerges when categoric ratings of experienced happiness to positive stimuli, relative to neutral, are also taken.

In addition, there was evidence to support increased relative sadness to positive information in clinically depressed participants as predicted from earlier research looking at response to amusing stimuli (Rottenberg et al., 2002) and consistent with cognitive theories of depression (e.g. Beck et al., 1979). It should be noted, however, that the relative increase in sadness to positive images reported by the clinically depressed sample was small in magnitude and was much lower than the sadness ratings elicited by the negative images. It therefore cannot be concluded that depressed participants felt genuinely ‘sad’ while viewing the positive images. A slight elevation of sadness ratings to positive stimuli may be a product of the realisation that such stimuli no longer make the person happy, focusing them on the perceived lack of positive things in their life and their reduced ability to experience pleasure.

As in the earlier studies, there was no clear evidence in the present data to support a differential emotional response to visual, non-autobiographical negative stimuli in depression. It may be premature to conclude that there is no alteration of the processing of negative stimuli in the disorder at all, however. In addition to the more robust findings of lower happiness ratings and higher sadness ratings to positive stimuli, consideration of Table 2 reveals that the depressed group showed lower sadness ratings to sad images and greater happiness ratings to fearful images. These differences were small and did not reach statistical significance after correction for multiple comparisons. Nevertheless, these trends may reflect

a broader phenomenon of difficulty regulating emotions in the disorder, as suggested by Rottenberg and colleagues (Rottenberg et al., 2002).

Together these data support Sloan et al.'s (2001) conclusions based on their own data (1997, 2002) and earlier findings from Berenbaum and Oltmann (1992) that clinical depression is characterized by a diminished response to positive stimuli. The present data extend these findings by showing that the blunted response to positive stimuli is found when categoric emotion ratings as well as ratings of arousal and valence are measured. Sloan et al.'s (2001) other conclusion that there is little evidence to support a difference between depressed participants and controls in terms of responsiveness to visual, non-autobiographical negative material was broadly supported, although there may a broader phenomenon of loss of regulation of emotional response to stimuli underlying the findings. Further, the present data indicate that clinical depression appears to be characterised by both a decrease in reports of happiness and a slight increase in reports of sadness to positive stimuli, even when response to neutral stimuli is controlled for. However, the effect for happiness was stronger (large effect size, Cohen , 1988) than the effect for sadness (medium effect size, Cohen, 1988). Finally, taken together with the results of the pilot study outlined in the Introduction, these data indicate that the diminished self-reported experience of happiness, allied with lower arousal ratings, to positive stimuli are present in both dysphoric and clinically depressed samples.

This extension of the earlier findings to show that depression is characterized by increased sadness to positive stimuli is important because it provides partial support for theoretical accounts of depression that emphasize increased negative emotional responses, particularly to stimuli that are not overtly negative (e.g. Beck et al., 1979). This suggests that the pattern of emotion dysregulation in depression is different for different emotions and this has implications for the psychological treatment of the disorder.

It is important to note some limitations of the present study. First, there was substantial co-morbidity of anxiety disorders in the depressed sample, reflecting the not uncommon overlap between these conditions in clinical presentation. Analysis of the sub-group of depressed participants with no co-morbid Panic Disorder or marked anxiety symptoms revealed a similar pattern of findings, however, suggesting that anxiety is not heavily biasing the results. Second, all of the depressed participants were on anti-depressant medication and the effect that this had on the data is not clear. However, the pilot study looking at emotional responding in dysphoria described in the Introduction (Dunn, 2002) has found comparable results to the present study, even when analysing the sub-group of

dysphoric participants not on medication. Further, previous research has shown no evidence of an effect of anti-depressant medication on self-reported response to discrete emotional stimuli (Rottenberg et al., 2002). Third, the groups in the study were of mixed gender and the sample sizes were not such that the effect of gender could be examined reliably. However, Sloan and colleagues reported similar findings across both mixed-gender (Sloan et al., 1997) and all-women samples (Sloan et al., 2001) and so it seems unlikely that gender played a significant role in the patterns of results. Finally, it is important to underline the fact that the stimuli used in the present study were visual and non-autobiographical. Emotional experience in depression may be shaped both by response to external, visual stimuli and also internal ruminations about past losses and failures, and the latter may lead to an increase in negative affect. It is therefore possible that different results may have been obtained had personally relevant, autobiographical stimuli (visual or verbal) encouraging such ruminations been used.

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Table 1

Demographic and Clinical Characteristics of Control and Clinically Depressed Groups

Variable	Control (n = 25)	Depressed (n = 25)
Age (in years)	48.48 (12.97)	45.96 (9.99)
NART Verbal IQ	113.72 (4.05)	109.63(10.25)
% Female	68	68
BDI	2.84 (2.56)	27.64 (8.69)*
STAI – state	26.24 (4.98)	57.24 (11.96)*
STAI – trait	30.60 (8.00)	64.48 (8.02)*
HDRS	-	21.40 (5.45)

Note.-

Data are mean (standard deviation) values. NART = National Adult Reading Test; BDI = Beck Depression Inventory; STAI = Spielberger State Trait Anxiety Inventory; HDRS = Hamilton Depression Rating Scale.

* Groups significantly differed ($P < .01$)

Table 2

Self Report of Emotional Experience to Neutral, Positive, Sad, Fearful and Negative Pictures in Control and Clinically Depressed Groups

Condition and group	Happiness Rating	Sadness Rating	Fear Rating	Valence Rating	Arousal Rating
Neutral images					
Control	11.70 (14.83)	3.74 (4.45)	2.80 (2.66)	4.84 (0.70)	2.14 (1.51)
Depressed	11.01 (12.47)	3.85 (5.73)	3.72 (4.44)	5.10 (1.04)	2.16 (1.48)
Positive images					
Control	55.49 (15.39)	3.42 (2.84)	5.33 (4.74)	6.99 (0.64)	5.04 (1.42)
Depressed	37.54 (24.20)	8.03 (12.56)	7.02 (7.73)	6.35 (1.11)	3.93 (1.98)
Sad images					
Control	2.90 (2.46)	54.64 (23.10)	12.28 (14.11)	2.76 (0.72)	4.80 (1.75)
Depressed	4.01 (4.81)	42.88 (25.26)	13.07 (17.34)	3.22 (0.95)	3.73 (1.87)
Fearful images					
Control	2.57 (1.66)	10.66 (9.75)	47.71 (25.09)	2.43 (0.92)	5.23 (2.22)
Depressed	6.79 (8.56)	14.09 (16.20)	41.19 (28.90)	3.09 (1.29)	4.65 (2.47)
Negative images†					
Control	2.73 (1.82)	32.65 (14.35)	30.00 (17.74)	2.59 (0.69)	5.01 (1.91)
Depressed	5.40 (5.61)	28.48 (18.15)	27.13 (20.75)	3.16 (0.85)	4.19 (1.92)

Note.-

Data are mean (standard deviation) values.

† Negative images are the average of sad and fearful images.

Footnotes

1 - We recognize that the use of the terms “positive” and “negative” stimuli is problematic (see Solomon & Stone, 2002), given that positive and negative are used in so many different ways. Here the terms positive and negative do not serve as key theoretical constructs. Rather, we use them in a purely descriptive way to classify pictorial stimuli that have been rated by large numbers of healthy individuals as evoking, on average, feelings of pleasantness to the self (positive) or unpleasantness to the self (negative).

2 – Data from the dysphoria study are available from the corresponding author.

3 - The IAPS numbers of the positive pictures used were 1710, 2304, 2340, 2530, 5623, 5830, 5831, 8190, 8380 and 8461, the sad pictures used were 2141, 2205, 2276, 2312, 2700, 2750, 2800, 2900, 9415, and 9561, the fearful pictures used were 1050, 1052, 1201, 1220, 1300, 1930, 3500, 6244, 6370, and 6510, and the neutral pictures used were 6150, 7000, 7002, 7006, 7009, 7020, 7100, 7130, 7211, and 7233 (CSEA-NIMH, 1999). Control rating data of the pictures used are available from the corresponding author.

4 - Preliminary analyses looking at the response to ‘sad’ and ‘fear’ pictures separately found no differences involving the Group factor in response to these images. To increase statistical power and to allow better replication of the Sloan et al. (2001) data, consequently ‘sad’ and ‘fear’ pictures were combined into a single ‘negative’ picture type. To control for the possibility that group differences reported were a result of the presence of co-morbid anxiety disorders, participants in the depressed sample with marked anxiety symptoms or a co-morbid diagnosis of Panic Disorder were excluded from the data set and the analysis repeated. An identical pattern of results emerged for the depressed non-anxious subgroup (except that there were no significant differences in arousal ratings as a function of group), suggesting that the effects found are not purely a secondary consequence of anxiety.

5 - Exploratory analyses revealed an additional group difference in categoric emotion ratings. The depressed group, relative to controls, experienced more happiness to the fearful images, $t(48) = 2.42$, $P = .02$. However, this effect did not survive correction for multiple comparisons addressing non *a priori* hypotheses.