

## Dysphoria and the prediction and experience of emotion

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Depression and dysphoria have been characterised by dampened positive emotional experiences. However, it remains unclear whether dysphoria is also characterised by dampened expectancies about positive emotional experiences. In the present study, participants with (dysphoric group;  $n = 36$ ) and without (non-dysphoric group;  $n = 36$ ) dysphoria reported on their expected and actual emotional responses to winning and losing money in a computer task. Results showed the dysphoric group predicted and experienced less happiness and contentment after winning money than the non-dysphoric group. Results also showed the dysphoric group predicted and experienced as much negative emotion after losing money as the non-dysphoric group. Moreover, the dysphoric group predicted they would experience more happiness after winning money than they actually did, whereas the non-dysphoric group experienced as much happiness as they had predicted. Results suggest that disturbances in positive emotional responding are characteristic of people experiencing dysphoria.

**Keywords:** Depression; Dysphoria; Emotion; Happiness; Prediction; Expectancy.

Symptoms of major depressive disorder (MDD) include persistent sad mood and loss of interest in pleasurable activities, suggesting that people with MDD may experience heightened negative emotion and dampened positive emotion. Studies have shown that compared to individuals without MDD, people with MDD are less responsive to positive films (Rottenberg, Kasch, Gross, & Gotlib, 2002), reward contingencies (Henriques & Davidson, 2000), and pleasant pictures (Allen, Trinder, & Brennen, 1999; Dunn, Dalgleish, Lawrence, Cusack, & Ogilvie, 2004; Sloan, Strauss, & Wisner, 2001). However, research supporting heightened negative emotional responding in MDD is equivocal. Some studies have shown that people with dysphoria

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(i.e., the experience of significant depression symptoms not necessarily at diagnostic threshold for major depressive disorder) are more responsive to negative social scenarios (Sigmon & Nelson-Gray, 1992) and negative test feedback (Golin, Hartman, Klatt, Munz, & Wolfgang, 1977) than people without dysphoria. However, other studies have shown that people with MDD are *less* responsive to startling noises (Allen et al., 1999) and report less negative emotion when viewing sad and fearful films (Rottenberg et al., 2002) compared to people without MDD.

Though a number of studies have examined positive and negative emotional responding in MDD and dysphoria, few studies have examined *predictions* about emotional experience in people with MDD or dysphoria. Perhaps as important as one's actual emotional experience is one's prediction or expectation about that experience. Previous research suggests that predictions about valence and intensity of emotional experience have motivational qualities that influence choice (e.g., Mellers, Schwartz, & Ritov, 1999). In other words, people often choose to do things they predict will "feel very good" and choose to avoid things they predict will "feel very bad". Another line of research suggests that these predictions are not always exactly accurate. Though people may accurately predict the valence (positive or negative) of future emotional responses to various events, they tend to overestimate the intensity of these responses (see Gilbert, Driver-Linn, & Wilson 2002, for a review). This overestimation effect has been documented in a range of healthy participant populations; however, little is known about the prediction of emotional responses in people with MDD or dysphoria. This is surprising given that a key intervention in cognitive behaviour therapy for MDD and dysphoria (e.g., Burns, 1999; Persons, Davidson, & Tompkins, 2001) relies on the assumption that people with depression symptoms experience little positive emotion because they have low expectations and low motivation to pursue pleasurable events. This intervention involves planning and engaging in positive activities in order to increase expectancies and experiences of positive emotion.

To our knowledge, only two studies have examined whether persons with MDD or dysphoria have difficulty predicting emotional responses. In one study, participants with and without MDD were asked to predict the intensity of their emotional responses to a series of hypothetical positive events (MacLeod & Salaminiou, 2001). Participants with MDD predicted they would feel less happy about the occurrence of hypothetical positive events than participants without MDD. Unfortunately, this study did not examine predictions about emotional responses to negative events, and the events studied were hypothetical and not actual experiences of the participants. In a second study, participants with dysphoria predicted and reported their emotional responses to having or not having a date on Valentine's Day (Hoerger & Quirk, 2006). Dysphoria was associated with

lower levels of predicted and experienced happiness at having a date, as well as with an increased tendency to overestimate happiness at having a date. Though their predictions and experiences of happiness were low, participants with dysphoria still overestimated how happy they would feel about having a date.

Studies on the prediction of emotional responses in healthy individuals have primarily focused on one emotion—happiness (Gilbert et al., 2002). Little is known about people's predictions about negative emotions or other positive emotions. However, emotions can be differentiated by valence and arousal (e.g., Barrett, 2006; Russell, 1980). Thus, in order to make general claims about the prediction of emotion, predictions for multiple emotions (varying in valence and arousal) should be assessed. In the present study, we examined participants' predictions and experiences of *happiness* (a high arousal positive emotion), *contentment* (low arousal positive), *irritation* (high arousal negative), and *disappointment* (low arousal negative).

The distinction between valence and arousal may also be important for understanding emotion in MDD and dysphoria. For example, in one study, participants with MDD rated positive slides lower in positive valence and arousal than participants without MDD (Dunn et al., 2004), but didn't differ in their valence or arousal ratings of negative slides. Sloan et al. (2001) asked participants with and without MDD to rate *how they felt* in terms of valence (pleasant to unpleasant) and arousal (very aroused to very relaxed) after viewing emotional slides. Participants with MDD reported feeling less pleasant and less aroused after viewing positive slides than participants without MDD, but didn't differ in their experience of negative slides, in terms of valence and arousal. Taken together, people with depression may perceive and experience less high arousal positive emotion than people without depression.

### The present study

The present study sought to examine both predictions and experiences of positive and negative emotions among people with and without dysphoria. Previous research has shown that depression exists on a continuum (e.g., Flett, Vrendenburg, & Krames, 1997) and that dysphoria (i.e., subthreshold level of depression) is associated with significant psychological distress and disability (e.g., Maier, Gaensicke, & Weiffenbach, 1997; Rucci et al., 2003). Thus, the study of people with dysphoria, who may not meet diagnostic criteria for MDD, is important for expanding our understanding of the nature of depression.

Participants were asked to make predictions about future emotional experiences, as well as report on their actual emotional experiences of winning and losing money in a computer task that has previously been used

in studies of healthy individuals (e.g., Mellers et al., 1999). Monetary rewards and losses have commonly been used to elicit emotion in past research (e.g., Knutson, Adams, Fong, & Hommer, 2001) and are salient in daily life. However, this type of laboratory manipulation has not been well studied in the context of dysphoria. Participants rated their emotional responses across two specific positive emotions and two specific negative emotions, rather than just one emotion, in order to assess high and low arousal positive and negative emotions.

We tested a number of hypotheses. First, based on prior research suggesting that people overestimate the intensity of future emotional responses, we predicted that all participants would experience less positive emotion after winning money than they had predicted and less negative emotion after losing money than they had predicted. Second, based on previous research on the experience of positive emotion in MDD and dysphoria, we predicted that participants with dysphoria would report experiencing less positive emotion after winning money than participants without dysphoria. Furthermore, we predicted that this difference would be most salient for high arousal positive emotions. Because findings pertaining to the experience of negative emotion in MDD and dysphoria have been equivocal, we did not expect differences between participants with and without dysphoria in the experience of negative emotion after losing money. Third, given both empirical and clinical suggestions of a deficit in expectations about positive emotion, we hypothesised that participants with dysphoria would predict feeling less positive about winning money than participants without dysphoria, particularly for high arousal positive emotions, but would not differ in their predictions about negative emotional responses to losing money.

## METHOD

### Participants

Seventy-two undergraduates received course credit for participating in the study. Depression symptoms were assessed using the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Participants with BDI scores over 17 were assigned to the dysphoric group ( $n = 36$ ), and participants with scores below 10 were assigned to the non-dysphoric group ( $n = 36$ ). Prior research with the BDI indicates that scores above 17 correspond with clinically significant experiences of depression (Kendall, Hollon, Beck, Hammen, & Ingram, 1987). Participants were required to meet BDI score criteria at two time points: (1) as part of a pre-screening inventory, and (2) upon re-administration at the first laboratory session (two to four weeks later). Out of a pool of 2000 students, less than

3% qualified for the dysphoric group, supporting the rigor of the selection criteria.

The dysphoric and non-dysphoric groups were matched according to gender (61.1% female), age ( $M = 19.54$ ,  $SD = 1.49$ ), and ethnicity (66.7% Asian, 25.0% Caucasian, 5.6% Latino, 2.8% African American), and thus did not differ with respect to these demographic variables. By design, the two groups differed in BDI scores, with the dysphoric group ( $M = 24.03$ ,  $SD = 4.27$ ) scoring higher than the non-dysphoric group ( $M = 2.31$ ,  $SD = 2.36$ ),  $t(70) = 26.69$ ,  $p < .01$ . The proportion of female to male participants in the groups reflects the higher reported rates of depression among women than men in college (e.g., Hankin, Abramson, Moffit, Silva, & McGee, 1998) and community samples (e.g., Nolen-Hoeksema, 2001).

## Procedure

Upon arriving in the lab, participants were informed that they would be participating in a study of emotion and chance events. They were told that participation in the experiment involved a chance of winning money as well as a risk of losing money. Participants were told that should they win more money than they lost, they would be paid in cash. However, should they lose more money than they won, they would be required to work their losses off in the laboratory by doing menial tasks. Despite this risk, no one declined participation in the study. In the first laboratory session, participants completed the prediction task. Because memory of one's predictions might influence one's experiences, the experience task was completed in a second session one to two weeks later. Both tasks were adapted from Mellers et al. (1999).

*Prediction task.* Participants were presented with a series ( $n = 24$ ) of colour-coded pie charts on a computer monitor (shown in Figure 1). The colour and proportion of the pie slices indicated the probability that the participant would win or lose money. The pie slices varied in colour (red indicating a win and blue indicating a loss) and proportion (small slices indicating a 20% chance of winning/losing money, half slices indicating a 50% chance of winning/losing money, and large slices indicating an 80% chance of winning/losing money). The amount of money potentially won alternated between \$8 and \$32, and the amount of money potentially lost alternated between  $-\$8$  and  $-\$32$ . Participants were told to imagine that a spinner would randomly spin at the centre of each pie chart and that wherever the spinner landed, they would win or lose money accordingly. Participants were asked to predict their emotional responses to each possible spin outcome across two positive emotions (*happy* and *content*) and two

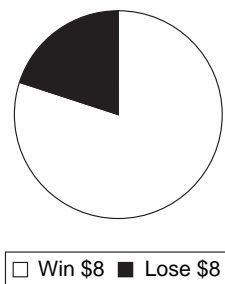
negative emotions (*disappointed* and *irritated*), using a 5-point Likert scale (1 = *very little or not at all*, 5 = *extremely*).

*Experience task.* Participants were presented with the same 24 pie charts from the prediction task on a computer monitor. In this task, there was an actual spinner that spun at the centre of each pie chart. The participants were told that the spinner would spin randomly, and wherever it landed, they would win or lose money accordingly. They were also told that the computer would keep track of their total wins and losses. After each spin, participants were asked to rate how they felt about the spin outcome with the same scale used in the prediction task. In actuality, the spin outcomes were not random, and all participants were exposed to the same wins and losses. All participants were paid \$8 and debriefed about the manipulation after completing the study.

## RESULTS

Because we were interested in differences among specific emotions, separate analyses were conducted for *happy*, *content*, *disappointed*, and *irritated* ratings. Thus, ratings for the four emotions were entered as dependent variables in four separate 2 (Group: dysphoric, non-dysphoric)  $\times$  2 (Task: prediction, experience)  $\times$  3 (Chance: 20, 50, 80%)  $\times$  2 (Win: \$8, 32)  $\times$  2 (Loss: -\$8, -32) repeated measures mixed-model ANOVAs. For the positive emotions, we examined responses to monetary wins; for the negative emotions, we examined responses to monetary losses.

Since we did not have specific hypotheses about chance or the amount won/lost, we simply summarise these results here. Consistent with prior research using this task (e.g., Mellers et al., 1999), all participants predicted



**Figure 1.** A pie chart presented to participants in the prediction task. The colour and proportion of pie slices indicated the probability of winning and losing money. Amount of potential win and loss were displayed below. In this example, the participant has a perceived 80% chance of winning \$8 and a perceived 20% chance of losing \$8.

and reported feeling more positive emotion after winning money when the probability of winning was low (i.e., 20%) than when it was high (i.e., 80%). Participants also predicted and felt more negative emotion after losing money when the probability of losing was low than when it was high. In addition, all participants felt more positive emotion about winning the larger amount of money (i.e., \$32) than the smaller amount (i.e., \$8) and more negative emotion about losing the larger amount of money than the smaller amount. There were no significant interactions between Chance, Win, or Loss and the variables central to the study hypotheses (Group and Task).

Consistent with our first hypothesis, the task main effect was significant for happy ratings,  $F(1, 70) = 5.90, p < .05$ , suggesting that all participants felt less happy after winning money than they had predicted. However, the task main effect for happy ratings was qualified by a significant Group  $\times$  Task interaction,  $F(1, 70) = 4.49, p < .05$ . Follow-up paired samples  $t$ -tests showed that participants in the dysphoric group felt less happy after winning money than they had predicted,  $t(35) = 2.70, p < .05$ , whereas participants in the non-dysphoric group felt as happy after winning money as they had predicted,  $t(35) = 0.29, ns$ . Thus, it was participants in the dysphoric group, who carried the task main effect for happy ratings. Contrary to our expectations, the task main effects for content, disappointed, and irritated ratings were not significant, indicating that all participants felt as content about winning money and as disappointed and irritated about losing money as they had predicted. In sum, only dysphoric participants exhibited our predicted overestimation effect, and only for happy ratings.

The group main effect was significant for happy,  $F(1, 70) = 6.47, p < .05$ , and content,  $F(1, 70) = 5.54, p < .05$ , ratings. As shown in Table 1, the dysphoric group predicted and experienced less contentment than the non-dysphoric group; the Group  $\times$  Task interaction for content ratings was not significant. However, as noted earlier, the Group  $\times$  Task interaction for happy ratings was significant. Follow-up independent samples  $t$ -tests showed that, in the experience task, the dysphoric group felt less happy about winning money than the non-dysphoric group,  $t(70) = 2.73, p < .01$ . Consistent with our second hypothesis, the dysphoric group also predicted feeling less happy about winning money than the non-dysphoric group,  $t(70) = 1.96, p = .054$ . Although this difference was just outside the traditional level of statistical significance, the effect size was moderate ( $d = 0.5$ ), suggesting that the difference between groups is fairly robust.

As expected, neither the group main effects nor the Group  $\times$  Task interactions were significant for disappointed and irritated ratings, indicating that the dysphoric group predicted and experienced as much negative emotion after losing money as the non-dysphoric group.

TABLE 1  
Mean (*SD*) ratings of predicted and experienced emotion

<i>Group</i>	<i>Predicted</i>				<i>Experienced</i>			
	<i>Happy</i>	<i>Content</i>	<i>Irritated</i>	<i>Disappointed</i>	<i>Happy</i>	<i>Content</i>	<i>Irritated</i>	<i>Disappointed</i>
Dysphoric	4.08 (0.68)	3.92 (0.80)	3.66 (1.00)	3.79 (0.83)	3.81 (1.05)	3.70 (1.06)	3.63 (1.11)	3.73 (1.03)
Non-dysphoric	4.35 (0.49)	4.20 (0.54)	3.63 (0.77)	3.70 (0.75)	4.34 (0.50)	4.22 (0.60)	3.61 (0.80)	3.85 (0.61)

*Note:* Tabled values are means, averaged across Chance, Win, and Loss. Happy and Content ratings for winning money, Irritated and Disappointed ratings for losing money.



## DISCUSSION

Though emotion disturbances have been observed in MDD and dysphoria (e.g., see Kring & Bachorowski, 1999; Rottenberg, 2007, for reviews), research has only begun to more clearly elucidate the nature of these disturbances. As reviewed earlier, several studies have demonstrated dampened positive emotional responding among people diagnosed with MDD and people with dysphoria. However, previous studies have found both heightened and dampened negative emotional responding in people with MDD and dysphoria. In the present study, participants with and without dysphoria rated their emotional experiences in expectation of and in response to winning and losing money.

Consistent with our predictions, participants with dysphoria differed from participants without dysphoria in their experience of happiness and contentment after winning money. This finding is consistent with previous studies demonstrating dampened positive emotional experience in MDD and dysphoria. Also consistent with our predictions, participants with and without dysphoria reported experiencing equivalent amounts of disappointment and irritation after losing money. Taken together, the findings suggest that disturbances in emotional responding in dysphoria lie in the realm of positive emotion. Furthermore, the findings extend our understanding of these disturbances to the realm of financial reward, an experience that is relevant to daily life. People with dysphoria may react as strongly to negative events as people without dysphoria, but they may not react as strongly to positive events. This may seem counterintuitive, given that dysphoria is associated with feelings of sadness and hopelessness. However, it may be that the disproportion of positive to negative emotional experiences is a key feature in the emotional lives of people experiencing dysphoria.

We also examined expectations or predictions about emotional experiences. Contrary to expectations, participants with dysphoria predicted they would feel happier about winning money than they actually did, whereas participants without dysphoria felt as happy after winning money as they had predicted. The overestimation of happiness among people with dysphoria is consistent with findings of Hoerger and Quirk (2006) and may be clinically meaningful for people with dysphoria. Repeated experiences of an outcome not being as good as you had hoped might contribute to feelings of hopelessness and loss of interest in pleasurable activities. One way of mitigating the overestimation effect may be heightening the experience of positive emotion during a target event. By using cognitive techniques, such as reappraisal, one might be able to elevate the experience of positive emotion to predicted levels. For example, if I go to a theatre and pay particular attention to things I like about the show, I might feel happier about my overall experience of going to the theatre.

Contrary to expectations, neither participants in the dysphoric group nor participants in the non-dysphoric group overestimated how disappointed and irritated they would feel after losing money. That we found an overestimation effect for happiness but not other emotions suggests that this effect might be specific to self-ratings of happiness. Indeed, previous research on the prediction of emotional response has focused primarily on happiness. Additional research involving predictions about a variety of emotional responses to a range of life events is needed to determine the generalisability of the overestimation effect.

Although participants with dysphoria overestimated how happy they would feel after winning money, they nonetheless predicted they would feel less happy and content than individuals without dysphoria. In other words, in spite of having low expectations about positive emotional experience compared to controls, participants with dysphoria still managed to overestimate their own experiences of happiness. Previous research suggests that predictions about emotional experiences have motivational qualities that influence choice (e.g., Mellers et al., 1999). For example, low expectations about how happy or content an event will make one feel might, in turn, lower one's motivation to pursue that event. Thus, compared to people without dysphoria, people experiencing dysphoria may be less likely to pursue pleasant activities, whether they are high (e.g., going to a crowded party or engaging in strenuous exercise) or low in arousal (e.g., reading a book or going for a walk).

In summary, this study extends our understanding of emotion and dysphoria in important ways. First, we have shown that dampened positive emotional experience extends to individuals with depression symptoms who may or may not meet diagnostic criteria for major depressive disorder. Our findings suggest that dampening of positive emotion also affects those experiencing subthreshold levels of depression. Second, the study examined feelings associated with monetary rewards and losses. Though the computer task does not necessarily approximate daily life, financial gains and losses are nevertheless a central part of life. Third, these findings extend the study of emotion disturbances in depression to the domain of predictions or expectations about future events. Whereas people without dysphoria accurately predicted how happy they would feel after a positive event (a monetary win), people with dysphoria overestimated their experiences of happiness. Nevertheless, people with dysphoria predicted that future events would lead to less happiness and contentment than people without dysphoria did. Dampened predictions were not observed for negative emotions, suggesting that people with depression symptoms have neither heightened nor dampened expectations about negative emotional experiences. It will be important in future research to test the linkage between expectations about emotion and motivated behaviour.

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