



The effect of a negative mood priming challenge on dysfunctional attitudes, explanatory style, and explanatory flexibility

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Ninety-seven undergraduates, 48 of whom had a history of self-reported major depression, completed measures of mood and cognitive style (e.g. explanatory style, explanatory flexibility, dysfunctional attitudes) prior to and directly after a negative mood priming challenge that consisted of listening to sad music and thinking about an upsetting past event. Eighteen of the previously depressed participants endorsed baseline levels of depression, explanatory style for negative events, and dysfunctional attitudes higher than levels reported by never depressed participants or euthymic participants with a history of depression. All three groups (never depressed participants, dysphoric participants with a history of depression, euthymic participants with a history of depression) demonstrated increases in dysphoria and dysfunctional attitudes in response to the negative mood priming challenge. Dysphoric participants with a history of depression, but not the other two groups, evidenced modest increases in explanatory style following the negative mood priming challenge. Finally, euthymic participants with a history of depression, but not the other two groups, evidenced drops in explanatory flexibility. Findings from the present study suggest that the cognitive theories of depression may benefit from examining both cognitive content and cognitive flexibility when assessing risk for depression.

Two prevailing cognitive theories of depression state that stable, dispositional cognitive styles serve as vulnerabilities to depression when stressful life events occur (Abramson, Metalsky, & Alloy, 1989; Abramson, Seligman, & Teasdale, 1978; Beck, 1967, 1976). Dysfunctional attitudes and explanatory style are the hypothesized cognitive diatheses in Beck's (1967, 1976) theory and helplessness theory (Abramson *et al.*, 1978), respectively.

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Beck's theory

Beck (1967, 1976) views dysfunctional attitudes as stable personality traits that are latent in certain individuals who are vulnerable for depression. The occurrence of stressful life events can activate dysfunctional attitudes in vulnerable individuals. These dysfunctional attitudes are often organized as negative schema about one's self, one's world and one's future, often referred to as the negative cognitive triad (Beck, 1967, 1976; Beck, Rush, Shaw, & Emery, 1979).

Helplessness and hopelessness theories

Explanatory style is the cognitive diathesis in the reformulated learned helplessness theory (Abramson *et al.*, 1978). Individuals who assign internal, stable and global causes to negative events are considered to be at risk for depression when negative life events occur. The hopelessness theory of depression, the most recent theoretical statement of this group (Abramson *et al.*, 1989), de-emphasizes the internality dimension, instead emphasizing the dimensions of stability and globality for negative events. Abramson *et al.* (1989) refer to this vulnerability factor as 'generality'. Metalsky and colleagues (Metalsky, Halberstadt, & Abramson, 1987; Metalsky & Joiner, 1992) have provided support for aspects of hopelessness theory by studying the effect of naturally occurring stressors in student populations.

Tests of cognitive theories

One early assumption of the cognitive theories was that cognitive vulnerabilities would represent enduring characteristics of at-risk individuals even when not in episode. However, minimal evidence supports this particular assumption. For example, longitudinal studies demonstrate that measures of cognitive style are not stable over time and that, as depression remits, so does negative cognitive style (Dobson & Shaw, 1986; Dohr, Rush, & Bernstein, 1989; Eaves & Rush, 1984; Hamilton & Abramson, 1983; Hammen, Miklowitz, & Dyck, 1986; Klein, Harding, Taylor, & Dickstein, 1988; Persons & Rao, 1985; Seligman *et al.*, 1988; Simons, Garfield, & Murphy, 1984). A similar set of findings is reported from cross-sectional studies showing that recovered depressives do not differ from normal controls on measures of dysfunctional attitudes (Blackburn & Smyth, 1985; Dobson & Shaw, 1986; Dohr *et al.*, 1989; Hamilton & Abramson, 1983; Hollon, Kendall, & Lumry, 1986; Reda, Carpiniello, Secchiaroli, & Blanco, 1985). However, proponents of cognitive theories counter that participants received some form of treatment to alleviate depression, which may have also had the effect of lessening their negative cognitive style (Alloy, Hartlage, & Abramson, 1988; Persons & Fresco, 1998).

Mood state hypothesis

Miranda and Persons (1988) proposed that dysfunctional attitudes and attributions are stable personality traits but that an individual's ability to report them depends on one's current mood state. According to this mood-state hypothesis, as an individual's depression remits and mood state improves, underlying negative beliefs are de-activated and become less accessible. Indeed, recovered depressives tend not to report elevated scores on measures of underlying beliefs when they are not experiencing a negative mood state (Hollon *et al.*, 1986).

Mood priming studies

Mood priming experimental manipulations have been used successfully to induce a negative mood in individuals with and without a history of major depression. Several methodologies, such as listening to negative self-statements (Miranda & Persons, 1988) or listening to sad music and thinking about a personally upsetting event (Segal, Gemar, & Williams, 1999) have been utilized for this purpose. Specifically, Miranda and Persons (1988) demonstrated that dysfunctional attitudes changed as a function of either a positive or negative mood priming challenge. The positive mood prime led to statistically significant decreases in dysfunctional attitudes scores. Interestingly, although not statistically significant, the negative mood priming challenge led to increases in dysfunctional attitudes comparable to a medium effect size ($d = .54$; Cohen, 1988) based on the reported t test. Two additional studies have essentially replicated the methodology of Miranda and Persons (1988), but reported divergent findings. Brosse, Craighead, and Craighead (1999) exposed female college students to a sadness induction (an upsetting film clip) and found that dysphoric mood as well as dysfunctional attitudes increased as a function of the mood priming challenge for all participants, irrespective of history of depression. Miranda, Gross, Persons, and Hahn (1998) exposed a community sample of women to the same mood priming challenge. In contrast to Brosse *et al.* (1999), change in dysfunctional attitudes was related to change in dysphoric mood for previously depressed participants, but not for participants who had never experienced depression.

Segal *et al.* (1999) exposed a sample of recovered depressed patients, treated to symptom remission with either medication or cognitive behaviour therapy (CBT), to a negative mood induction procedure. Medication responders tended to show greater elevations than did CBT responders in dysfunctional attitudes following the induction procedure. Further, patients who demonstrated significant elevations in dysfunctional attitudes, irrespective of the treatment they received, experienced significantly more episodes of depression in the subsequent 3 years than individuals who did not demonstrate elevations in dysfunctional attitudes.

In all the studies reviewed above, cognitive style was defined in terms of dysfunctional attitudes and assessed using the Dysfunctional Attitudes Scale (Weissman & Beck, 1978). To date, no published studies have examined the effects of a mood priming challenge on explanatory style.

Explanatory flexibility

A novel way to conceptualize cognitive risk for depression is to assess how flexible or rigid individuals are at assigning causes to events (Fresco, Rytwinski, & Craighead, 2006). Explanatory flexibility is related conceptually and methodologically to explanatory style, the cognitive diathesis of the reformulated learned helplessness (Abramson *et al.*, 1978) and hopelessness (Abramson *et al.*, 1989) theories. Explanatory style is assessed with the Attributional Style Questionnaire (ASQ; Peterson *et al.*, 1982). In contrast to explanatory style, which emphasizes the content of one's explanations for negative events, explanatory flexibility emphasizes the responsiveness of the individual to variations in situational context in arriving at explanations of events. Individuals who view each situation separately and contextually are considered to be flexible in their assigning of causes to events (Beck *et al.*, 1979; Peterson & Bossio, 1991). Fresco, Rytwinski, and Craighead (2006) operationalized explanatory flexibility as the standard deviation of an individual's responses to the stable and global ('generality') items for negative events from the ASQ. A small standard deviation was taken as a measure of

rigidity, while a large standard deviation was taken as a measure of flexibility (Fresco, Rytwinski, & Craighead, 2006). In that study of unselected undergraduates, explanatory flexibility demonstrated only a modest correlation with explanatory style ($r = -.25$). Importantly, explanatory flexibility, but not explanatory style, moderated the relationship of negative life events to levels of depression measured 8 weeks later. The association of negative life events to subsequent levels of depression was strong among participants with low explanatory flexibility whereas negative life events were unrelated to subsequent levels of depression among participants with high explanatory flexibility. In this study, the ASQ was completed in the absence of a mood priming manipulation.

Although not a mood priming study, Fresco, Schumm, and Dobson (2006) have demonstrated theoretically meaningful changes in explanatory style and explanatory flexibility using an experimental methodology. Fresco, Schumm, & Dobson (2006) conducted a secondary analysis of the Jacobson *et al.* (1996) component analysis of Beck *et al.*'s (1979) cognitive therapy for depression. In the original study, 150 patients with major depression were randomly assigned to receive 20 weeks of behavioural activation (BA; activity scheduling, contingency management, and problem-solving without any explicit cognitive interventions) or BA plus identification and disputation of negative automatic thoughts (AT) or the entire manualized cognitive therapy (CT). Findings from this study revealed equivalence between the three conditions in treating participants to remission of depression (Jacobson *et al.*, 1996) as well as protection against relapse in the subsequent 2 years (Gortner, Gollan, Dobson, & Jacobson, 1998). In the re-analyses by Fresco, Schumm, & Dobson (2006), responders in the BA condition evidenced increases in explanatory flexibility whereas the explanatory style of responders in the AT condition became less optimistic. Further, higher levels of post-treatment explanatory flexibility conferred more protection against relapse of depression for all responders, irrespective of treatment condition, than did more optimistic explanatory style.

Extreme responding on the Attributional Style Questionnaire

Although not a focus of the current study, other researchers have examined one kind of rigidity in terms of causal explanations for negative events. Specifically, Teasdale *et al.* (2001) recently reported findings consistent with the conclusion that cognitive rigidity represents a vulnerability to relapse of depression. In their study, 158 patients with partially remitted major depression were randomly assigned to receive medication continuation ($N = 78$) or medication continuation plus cognitive therapy ($N = 80$). Patients who endorsed extremely depressotypic or nondepressotypic responses (responding with 7 or 1, respectively) on the ASQ were at greater risk for relapse than participants who did not respond so extremely. Further, the reduction in the tendency to make these extreme responses appeared to be the mechanism by which cognitive therapy conferred protection against relapse.

Current study

Given the novelty of the construct, no studies have yet examined the effects of a mood priming challenge on explanatory flexibility. Similarly, no published studies have reported the effects of a mood priming study on explanatory style. Thus, the present study sought to do so by using the mood-priming methodology first utilized by Miranda and Persons (1988). The hypotheses of the current study were:

- (1) Euthymic individuals with a history of depression, relative to individuals with no history of depression, would show greater increases in dysfunctional attitudes and a more pessimistic explanatory style following a negative mood induction.
- (2) Euthymic participants with a history of depression, relative to individuals with no history of depression, would demonstrate larger drops in explanatory flexibility (i.e. become more rigid) following a negative mood induction.

Method

Participants

Participants were 430 introductory psychology students who were presently euthymic and endorsed either a history of past major depression or no lifetime history of depression were identified from a larger sample of undergraduate students ($N = 761$; 554 women, 207 men). Previously depressed participants and a randomly selected subset of never depressed participants were contacted by telephone and asked if they would like to participate in a study that involved the completion of a battery of questionnaires and listening to two pieces of music. The final sample consisted of 97 participants (72 women, 25 men) with a mean age of 19 ($SD = 0.2$). Forty-eight participants (36 women, 12 men) endorsed having experienced prior major depression whereas 49 participants (36 women, 13 men) reported never experiencing major depression.

The percentage of participants with a history of self-reported major depression corresponds favourably to community samples in young adults (25.2%; Kessler & Walters, 1998) and adolescents (24%; Lewinsohn, Clarke, Seeley, & Rohde, 1994). Interestingly, in a recent study using a sample of adolescents/young adults from New Zealand, Hankin *et al.* (1998) found that rates of major depression in this age group were equally high for participants attending college or not attending college.

Materials

The *Inventory to Diagnose Depression-Lifetime* (IDDL; Zimmerman & Coryell, 1988) is a 22-item self-report inventory used to assess a lifetime history major depression using criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition* (DSM-III; American Psychiatric Association [APA], 1980). Each item contains five statements arranged in order of increasing symptom severity. An item score of 2 or more is counted as a symptom, and the symptom must be present for more than 2 weeks to meet the criteria for DSM-III major depression. Zimmerman and Coryell (1988) report adequate convergence ($\kappa = .60$) with a diagnosis of DSM-III major depression derived from the Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Ratcliff, 1981). Hayes, Harris, and Carver (2004) have recently reported excellent internal consistency for the IDDL in an undergraduate population ($\alpha = .92$).

The *Beck Depression Inventory* (BDI; Beck *et al.*, 1979) is a 21-item instrument that broadly assesses the symptoms of depression including the affective, cognitive, behavioural, somatic and motivational components as well as suicidal wishes. Beck, Steer, and Garbin (1988) conducted a meta-analytic study of the BDI and reported a mean coefficient α of .86 in psychiatric populations and .81 in non-psychiatric populations across 25 years of research. The BDI achieved a strong internal consistency in the current study ($\alpha = .79$).

The *Multiple Affect Adjective Checklist* (MAACL; Zuckerman & Lubin, 1965) is a 132-item self-report inventory of adjectives that describe an individual's current mood state. The MAACL consists of three subscales: depression, anxiety, and hostility. The subscales may be used separately, but are highly correlated with each other (r 's = .72 to .75). The depression subscale (MAACL-D) comprised 20 negatively valenced words (e.g. alone, blue, hopeless, sad) and 20 positively valenced words (e.g. active, alive, glad, strong). Scores are computed by summing the number of negatively valenced words endorsed with the number of positively valenced words that are not endorsed, thus creating a scale with scores ranging from 0 to 40. Zuckerman and Lubin (1965) reported the MAACL-D to have strong reliability (α = .92) in a sample of college students. Lubin, Van Whitlock, Reddy, and Petren (2001) have also demonstrated strong internal consistency in college students (α = .89).

The *Attributional Style Questionnaire* (ASQ; Peterson et al., 1982) is a self-report inventory that assesses causal attributions for six hypothetical positive and six hypothetical negative events along the dimensions of internality, stability, and globality. Higher ratings represent a response endorsing internal, stable, and global causes while lower ratings represent external, specific and unstable causes. Generally, a composite negative (CN) score is computed by averaging the values of the 18 internal, stable and global items for the hypothesized negative events to produce a score that ranges from 1 to 7. A composite positive (CP) score with a range of 1-7 can also be computed. Recent restatements of the reformulated learned helplessness theory (Abramson et al., 1989) have de-emphasized the importance of the internality dimension, and demonstrated that *generality*, a composite score computed from the stable and global items, may show a stronger relationship to depression than the traditional internal, stable, and global composite. Metalsky et al. (1987) reported an α of .77 for generality for negative events, computed from an extended ASQ consisting of 12 hypothetical negative events. Explanatory flexibility was also computed from the ASQ in the manner described by Fresco, Rytwinski, and Craighead (2006) as the standard deviation of the stable and global items for hypothetical negative events - the same 12 items used for the generality subscale. In the present study, the generality for negative events and explanatory flexibility demonstrated α s of .67 at Time 1 and .73 at Time 2.

The *Dysfunctional Attitude Scale* (DAS; Weissman & Beck, 1978) is a 40-item self-report inventory used to assess dysfunctional thinking. Participants rate the degree to which they agree or disagree with statements that assess dysfunctional thoughts on a 7-point Likert scale from *totally agree* to *totally disagree*. The DAS has previously shown strong internal consistency (α = .89; Weissman, 1979). In the present study, the DAS demonstrated α s of .71 at Time 1 and .79 at Time 2.

Procedure

Upon arrival in the laboratory, the 97 participants gave informed consent, and then completed the first set of questionnaires that consisted of the BDI, MAACL, ASQ, and DAS. After completing the battery of questionnaires, participants were asked to listen through headphones to a piece of music and to think about a sad or upsetting time in their lives. The sad music consisted of approximately 8 minutes of Prokofiev's 'Russia Under the Mongolian Yoke' recorded at half speed. This piece of music was the same recording used by Segal et al. (1999). Immediately following the negative mood induction, participants again completed the MAACL, ASQ, and DAS.

In an effort to assure that participants were euthymic at study's end, they then listened to a second, more uplifting, piece of music (the first 10 minutes of Beethoven Symphony No. 5, fourth movement) and were instructed to think about a happy time in their lives. They were then debriefed about the study.

Results

Pre-experiment depression levels

Although an attempt was made to only include individuals who were currently not dysphoric, examination of current BDI scores revealed that individuals with a past history of depression ($M = 8.56$, $SD = 6.94$) were significantly more depressed, $F(1, 95) = 20.19$, $p < .001$, than individuals with no history of depression ($M = 3.55$, $SD = 3.52$). Although many researchers would resort to utilizing concurrent BDI scores as a covariate in an analysis of covariance (ANCOVA), Miller and Chapman (2001) have recently cautioned against the use of ANCOVA in instances when there is not random assignment to condition and when differences in the covariate do not occur by chance. Consequently, the previously depressed participants were stratified in terms of current dysphoria using a cut-off of BDI greater than nine (Kendall, Hollon, Beck, Hammen, & Ingram, 1987). Participants were placed into one of three groups: never depressed ($N = 49$; 36 women, 13 men), previously depressed, euthymic ($N = 30$; 24 women, 6 men), and previously depressed, dysphoric ($N = 18$; 12 women, 6 men). Given that the sampling of participants who were currently dysphoric was unintentional, we did not have any *a priori* hypotheses as to how the mood priming challenge would affect them. We have retained these participants and offer the findings as exploratory results.

Pre-experiment cognitive measures

The three participant groups were compared on pre-experiment scores of the three cognitive measures. Previously depressed, dysphoric participants endorsed higher levels of dysfunctional attitudes and generality for negative events than the other two groups, who did not differ from each other. The omnibus test for explanatory flexibility was not significant. Group means, standard deviations and omnibus tests are presented in Table 1.

Table 1. Means and standard deviations of pre-experiment cognitive measures as a function of group membership

	Never depressed	History of MDD euthymic	History of MDD dysphoric	Omnibus test $F(2, 94)$
T1 DAS	110.04 _a (20.92)	109.07 _a (23.25)	140.28 _b (26.43)	13.31*
T1 GENBAD	3.71 _a (0.88)	3.83 _a (0.59)	4.38 _b (0.75)	5.05*
T1 FLEX	1.37 _a (0.39)	1.41 _a (0.33)	1.27 _a (0.36)	1.10

Note. MDD = major depressive disorder; Time 1 DAS = Time 1 Dysfunctional Attitudes Scale Total Score; Time 1 GENBAD = Time 1 Generality subscale for negative events from the Attributional Style Questionnaire; Time 1 FLEX = Time 1 explanatory flexibility for negative events from the Attributional Style Questionnaire; * $p < .05$. Means with a different subscript are statistically different from one another.

Experimental manipulation check

Participants completed measures of dysphoric mood at three time points: before the sad mood induction, immediately following the sad mood induction, and immediately following the positive mood induction. A one-way ANOVA revealed differences among the three groups on baseline MAACL dysphoria, $F(2, 93) = 9.39, p < .001$. Dysphoric participants with a history of depression ($M = 19.67, SD = 6.01$) endorsed higher levels of MAACL dysphoria as compared with euthymic participants with a history of depression ($M = 15.70, SD = 3.55$) and never depressed participants ($M = 13.94, SD = 4.97$). The latter two groups did not differ from one another.

A 3 (Group: never depressed; previously depressed, euthymic; previously depressed, dysphoric) \times 2 (Time: before the sad mood induction; immediately after the sad mood induction) repeated measures ANOVA revealed a main effect for time, $F(1, 93) = 67.83, p < .0001$; Cohen's $f = .84$, as well as a non-significant group \times time interaction, $F(2, 93) = 0.80, ns; f = .11$. All groups experienced elevations in depressed mood after the negative mood prime ($M = 20.04, SD = 5.02$; $M = 20.17, SD = 5.02$; $M = 24.67, SD = 6.22$, respectively). The dysphoric participants with history of depression again evidenced significantly higher levels of MAACL dysphoria than the other two groups. Although not central to the hypotheses of the current study, participants listened to the positive piece of music at the end of the study to restore their mood to baseline levels. An additional repeated measures ANOVA of MAACL dysphoria scores from Time 2 to Time 3 suggests that participants from all three groups evidenced reductions in MAACL dysphoria ($M = 12.77, SD = 4.26$; $M = 13.08, SD = 4.20$; $M = 14.78, SD = 6.09$, respectively). There was a significant main effect for time, $F(1, 93) = 137.01, p < .0001$; $f = 1.21$, as well as a non-significant Group \times Time interaction, $F(2, 93) = 1.95, ns, f = .20$.

Cognitive measures: Response to the mood induction

To evaluate the effects of the mood priming challenge, three group (never depressed; lifetime history of depression-euthymic; lifetime history of depression-dysphoric) \times time (before the sad mood induction; immediately after the sad mood induction) repeated measures ANOVA (ANOVA) analyses were conducted for each of the cognitive measures.

Dysfunctional attitudes

Hypothesis 1 stated that, relative to individuals with no history of depression, individuals with a history of depression would endorse significantly greater levels of dysfunctional attitudes following the negative mood priming challenge. Inconsistent with this hypothesis, there was a significant main effect for time $F(1, 94) = 17.28, p < .001$ and a non-significant Group \times Time interaction $F(2, 94) = 1.43, ns$. The magnitude of the time main effect corresponded to a large effect ($f = .43$; Cohen, 1988), whereas the interaction corresponded to a small effect ($f = .18$). Participants with no history of depression, on average (post-induction $M = 113.02; SD = 23.09$), endorsed an increase of approximately three DAS points. Euthymic participants with a history of depression (post-induction $M = 122.95; SD = 27.49$) endorsed an increase of approximately 14 points. Dysphoric participants with a history of depression (post-induction $M = 148.06; SD = 29.86$) endorsed an increase of approximately eight DAS points.

Generality of negative events

Hypothesis 1 also posited that relative to individuals with no history of depression, individuals with a history of depression would endorse significantly greater levels of generality for negative events following the negative mood priming challenge. A significant main effect for time was found, $F(1, 94) = 6.44, p = .01$. There was a nearly significant Group \times Time interaction, $F(2, 94) = 2.77, p = .07$. The time main effect ($f = .26$) and the Group \times Time interaction ($f = .24$) corresponded to medium effects. Participants with no history of depression (post-induction $M = 3.71$; $SD = 0.99$) and euthymic participants with a history of depression (post-induction $M = 3.95$; $SD = 0.69$) evidenced negligible increases and dysphoric participants with a history of depression (post-induction $M = 4.78$; $SD = 0.81$) demonstrated small increases.

Explanatory flexibility

Hypothesis 2 stated that, relative to individuals with no history of depression, individuals with a history of depression would experience drops in explanatory flexibility (become more rigid) after the negative mood induction. In support of this hypothesis, a significant main effect for time, $F(1, 94) = 9.39, p = .003$, was qualified by a significant Group \times Time interaction, $F(2, 94) = 5.34, p = .006$. The time main effect ($f = .32$) and the Group \times Time interaction ($f = .34$) approached Cohen's (1988) convention for a large effect. Participants with no history of depression (post-induction $M = 1.33$; $SD = 0.40$) and dysphoric participants with a history of depression (post-induction $M = 1.21$; $SD = 0.69$) evidenced minimal decreases, whereas euthymic participants with a history of depression (post-induction $M = 1.17$; $SD = 0.40$) demonstrated larger decreases.

Decomposing interactions

A multiple regression strategy was adopted as a way to evaluate the significant interaction of group \times time for explanatory flexibility and the near significant group by time interaction for generality. The three-level categorical variable was converted into two dummy coded variables that corresponded to euthymic participants with a history of depression (Risk 1) and dysphoric participants with a history of depression (Risk 2). Never depressed participants were coded as 0 on both variables. Euthymic participants with a history of depression were coded as 1 on Risk 1 and 0 on Risk 2. Dysphoric participants with a history of depression were coded as 0 on Risk 1 and 1 on Risk 2. The cross products of Risk 1 and Time 1 cognitive measures as well as Risk 2 and Time 1 cognitive measures were also computed.

Two hierarchical, set-wise, multiple regression equations were solved with the respective Time 2 cognitive measures as the dependent measures. In each equation, the respective Time 1 cognitive measure and Risk 1 and Risk 2 were entered as main effects followed by the two-way interaction terms.

Generality of negative events

This regression analysis revealed a significant main effect for history of major depression with current dysphoria, $B = 0.53, SE = .18, t(93) = 3.00, p = .004, pr = .20$, Cohen's (1988) $f^2 = .10$, after controlling for Time 1 generality. This effect corresponds to a small effect size. No other main effects or interactions were significant.

Explanatory flexibility

This regression analysis revealed that the interaction of history of major depression without dysphoria by Time 1 explanatory flexibility, $B = -.66$ $SE = .18$, $t(91) = 3.58$, $p = .001$, $pr = -.26$, $f^2 = .14$, significantly added to the prediction of Time 2 explanatory flexibility above and beyond other main effects and interaction terms. This effect approaches Cohen's convention of a medium effect size. Figure 1 depicts simple regression slopes computed from this regression analysis revealing the effects of group membership and current dysphoria on the prediction of Time 2 explanatory flexibility.

Rigidity or extreme responding?

As noted above, Teasdale *et al.* (2001) identified one form of cognitive rigidity that conferred risk for relapse of depression. Notably, patients who tended to endorse ASQ items with extremely depressotypic (7) or nondepressotypic (1) responses were most prone to relapse. To evaluate the possibility that the current findings were accounted for by extreme responding on the ASQ, Time 1 and Time 2 measures of explanatory flexibility and explanatory style were correlated with one another. Extreme responding would be indicated by either strongly positive or strongly negative correlations between explanatory style and explanatory flexibility. For example, extreme responding in a nondepressotypic direction (1) would yield a small explanatory flexibility score and the two measures would be strongly and positively correlated. In contrast, extreme responding in a depressotypic direction (7) would also yield a small explanatory flexibility score, but their correlation would be strongly negative. Contrary to the findings of Teasdale *et al.* (2001), there was little relationship between explanatory style and explanatory flexibility. Time 1 explanatory style correlated strongly with Time 2 explanatory style ($r = .75$), but was uncorrelated with Time 1 ($r = -.06$) and Time 2 ($r = -.05$) explanatory flexibility. Time 1 explanatory flexibility was strongly correlated with Time 2 explanatory flexibility ($r = .63$) but was uncorrelated with Time 2 explanatory style ($r = .07$). Thus, the drops in explanatory flexibility evidenced by a mood priming challenge do not appear to be the result of extreme responses on the ASQ.

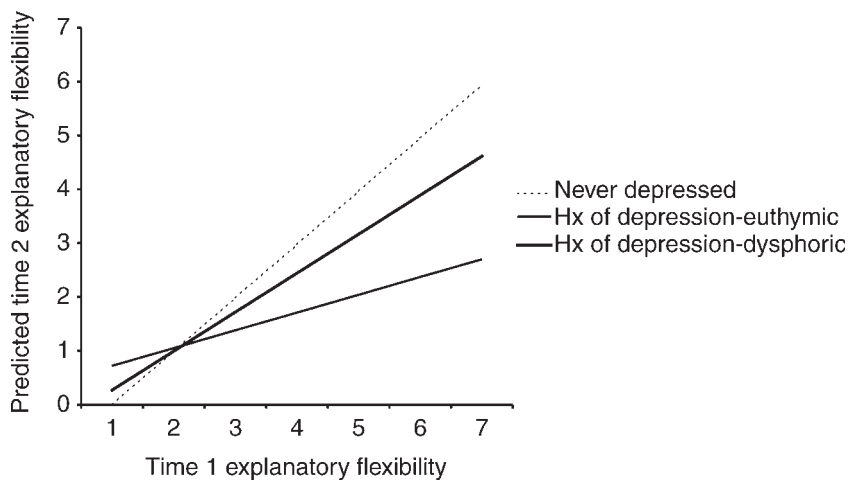


Figure 1. Simple regression slopes showing the effects of history of depression and current mood on the prediction of Time 2 explanatory flexibility.

Discussion

A mood priming challenge produced similar increases in sad mood for individuals with and without a history of depression. However, never depressed participants, euthymic participants with a history of depression and dysphoric participants with a history of depression demonstrated different patterns of change on cognitive measures following the mood priming challenge. Euthymic participants with a self-reported history of depression demonstrated drops in explanatory flexibility following a negative mood priming challenge, whereas participants with no history of depression and dysphoric participants with a history of self-reported major depression did not. In contrast, dysphoric participants with a history of depression endorsed a more pessimistic explanatory style for negative events (generality) at baseline as compared with the other two groups. Dysphoric participants with a history of depression evidenced small increases in generality, whereas euthymic participants with a history of depression and never depressed participants did not. Finally, participants demonstrated increases in dysfunctional attitudes following the negative mood priming challenge, irrespective of current dysphoria or lifetime history of depression.

Findings from the present study are similar to the findings of Miranda and Persons (1988) and Brosse *et al.* (1999) with respect to dysfunctional attitudes; these previous studies reported that the effects of a negative mood priming challenge led to increases in dysfunctional attitudes in participants irrespective of history of depression. In both cases, the magnitude of the change corresponded to a large effect. Findings from the current study diverge from the findings of Miranda *et al.* (1998), who found that change in dysfunctional attitudes was associated with change in dysphoric mood, but only for previously depressed participants. However, Miranda *et al.* (1998) utilized a sample of community women whereas both Brosse *et al.* (1999) and the current study utilized college students. Perhaps some of the discrepancy is associated with differences in sample composition.

The findings of Miranda and Persons (1988) that participants evidenced increases in dysfunctional attitudes irrespective of history of depression and Miranda *et al.* (1998) who found that only previously depressed participants evidenced increases in dysfunctional attitudes may seem at odds with each other, despite similarities in sampling and design. However, Miranda and Persons (1988) did not evaluate whether changes in mood scores were associated with changes in dysfunctional attitudes scores 'because too few subjects received the negative mood induction and had no history of depression to conduct the analysis using postmanipulation scores' (p. 77). The manuscript does not provide the reader with the opportunity for secondary analysis.

Findings from the present study suggest that elevations in sad mood may lead individuals not presently dysphoric but with a history of depression to narrow their focus and view events as arising from similar causes rather than from specifically pessimistic or catastrophic causes. One question raised by these results is what possible function might be served by this narrowing of one's perspective? Both traditional (Ferster, 1973; Lewinsohn, 1974) and contemporary (Borkovec & Sharpless, 2004; Hayes, Strosahl, & Wilson, 1999; Jacobson, Martell, & Dimidjian, 2001; Linehan, 1993) behavioural approaches to psychopathology, which emphasize a functional analysis of behaviour, view behavioural and cognitive rigidity as arising and being maintained by its value as an escape or avoidance strategy. For example, in case of threat, the organism capable of narrowing its behavioural repertoire, allocating attention resources to the

danger and exhibiting high autonomic arousal will have a greater likelihood of fighting, escaping from, or remaining undetected when confronted with a predator or other danger. Similarly, in the case of depression or reinforcement deprivation, an organism that finds itself in an environment devoid of positive reinforcement (actual or perceived) may make a frantic effort to escape, and failing to do so, may become behaviourally inactive – possibly in an effort to preserve energy, until the circumstances have changed. Thus, one way to account for the finding that previously depressed, but euthymic participants exhibit drops in explanatory flexibility without corresponding increases in dysfunctional attitudes and pessimistic explanatory style is that increased cognitive rigidity provides a means of escaping or avoiding the brunt of the experimentally induced sad mood.

This line of reasoning is conceptually similar to research findings offered by McCabe and colleagues (cf. McCabe, Gotlib, & Martin, 2000; McCabe & Toman, 2000) in the study of attentional processes of individuals who vary on history of depression as well as whether they are currently dysphoric or euthymic. McCabe and colleagues utilize the deployment of attention task (Gotlib, McLachlan, & Katz, 1988) in which word pairs are presented on a computer screen. Neutral (e.g. calm, courteous), negative (e.g. despondent, inadequate) or positive (e.g. delighted, optimistic) words are paired with one another. Participants are instructed to look at both words, which are then replaced by colour bars, either red or green. Participants are told that one colour bar will appear first, but that the difference in timing would be very subtle (in fact, the two bars are presented simultaneously). Participants are instructed to press a key corresponding to the bar they see first. The degree to which a participant's choice of one bar varies significantly from chance is regarded as an index of biased attentional deployment. McCabe and colleagues have consistently found that euthymic participants, particularly euthymic participants with a history of depression, evidence a 'protective bias' (McCabe *et al.*, 2000, p. 428), or a preference for neutral or positive words when paired with a negative word, but their performance does not differ from chance when positive and neutral words are paired. Currently dysphoric individuals have not evidenced this protective bias as their performance has not differed from chance for any combination of words. McCabe and colleagues see the protective bias as a means of avoiding or warding off the effects of exposure to stimuli that might lead to the return of depression. By contrast, for currently dysphoric participants, this bias provides little benefit given the presence of sad mood.

In contrast to the pattern of results for euthymic participants with a history of major depression, dysphoric participants with a history of depression evidenced increases in pessimistic explanatory style (generality) without corresponding drops in explanatory flexibility. In fact, these findings represent the first report of changes in explanatory style as a function of a mood priming challenge – albeit only for participants currently dysphoric.

Early on in the history of cognitive behavioural approaches to the aetiology and treatment of depression, some theorists (Seligman, 1981) placed an emphasis on the causal role of pessimistic or distorted thinking in the onset of depression. In turn, a major focus of treatment was to make pessimistic explanations more optimistic or less irrational and dysfunctional thoughts less distorted. However, the effects of cognitive therapy might be enhanced by placing some emphasis on understanding the context in which individuals assign causal explanations for negative events and assisting individuals to see negative events as distinct occurrences with potentially discrete and separate causes that may require unique and novel solutions. Indeed, the results of

Fresco, Schumm, and Dobson (2006) show that among responders in the Jacobson *et al.* (1996) study, high post treatment explanatory flexibility conferred greater protection from relapse than low explanatory flexibility, whereas an optimistic explanatory style provided no advantage over a pessimistic explanatory style.

The effects of a mood priming challenge led to reductions in explanatory flexibility that were not simply a function of extreme responding on the ASQ in either a depressotypic or nondepressotypic direction (c.f. Teasdale *et al.*, 2001). This lack of convergence though, may simply reflect the existence of more than one form of rigidity in assigning causes to negative events. Perhaps extreme responding on measures such as the ASQ represents rigidity in the form of dichotomous thinking, whereas low explanatory flexibility with a cognitive fixedness is characterized by an inability to generate alternatives. Although not a complete demonstration of this point, Fresco, Williams, and Nugent (in press) found that the association of explanatory flexibility to depression and anxiety symptoms was partially mediated by coping flexibility (a self-report measure of one's willingness to deploy a variety of coping strategies). The findings of this paper suggest that flexible thinking promotes flexible coping, which in turn is associated with lower levels of concurrent depression and anxiety symptoms. The lack of convergence with the findings of Teasdale *et al.* (2001) may also be associated with differences in methodology (mood priming challenge vs. treatment) and sampling (analogue depressed participants vs depressed patients).

Limitations

Although the findings from the current study are encouraging, there are some limitations that deserve mention. First, the sample consisted of undergraduate students, who were mainly high functioning. Previous mood priming studies (Miranda & Persons, 1988; Segal *et al.*, 1999) obtained samples from clinical or community settings. Replication in these settings is warranted before a broad generalization can be made.

Another limitation is the tool used to select participants for the current study. The IDDL was used to assess lifetime history of DSM-III (American Psychiatric Association, 1980) major depression. The diagnosis was based on self-report rather than clinician assessment. Although DSM-III criteria for major depression are fairly comparable to those found in the DSM-IV (American Psychiatric Association, 1994), replication with a sample of individuals with clinician-assessed DSM-IV major depression is important before the findings of the current study can be more widely accepted.

Future directions

Taken in context with the findings from Fresco, Rytwinski, and Craighead (2006) and Fresco, Schumm, and Dobson (2006), findings from the current study suggest that the construct of explanatory flexibility may complement the wealth of information demonstrating an association of cognitive styles to negative affective states. Furthermore, several areas of future research with respect to explanatory flexibility follow from other work on cognitive theories of depression. As noted above, Segal *et al.* (1999) reported that cognitive reactivity to a mood priming challenge in formerly depressed individuals treated to symptom remission was associated with greater risk for relapse. The Segal *et al.* (1999) study offers two important suggestions to the development of a programme of research to evaluate explanatory flexibility. First, just as the mood priming challenge represents an experimental methodology that allows one

to attempt to manipulate a variable such as explanatory flexibility, so too is the randomized controlled trial an experimental methodology that can potentially serve as a manipulation of explanatory flexibility. The findings of Fresco, Schumm, and Dobson (2006) offer an initial glimpse at the influence of psychotherapy on explanatory flexibility, but no study has yet been conducted with the deliberate goal of evaluating how therapy changes explanatory flexibility. A potentially fruitful area of research will be to assess whether explanatory flexibility scores change as a function of treatment response and change differentially depending on the modality of treatment (e.g. medication or CBT). A second suggested area of future research that follows directly from Segal *et al.* (1999) is whether persistently low explanatory flexibility despite improvements in depression is associated with greater relapse.

In conclusion, explanatory flexibility is a newcomer to the field of study of emotional disorders. However, early findings are encouraging and the wealth of research conducted within the cognitive behavioural framework provides many suggestions with respect to methodology and application.

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