Evaluating the Mood State Dependence of Automatic Thoughts and Dysfunctional Attitudes in Remitted Versus Never-Depressed Individuals

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The cognitive model of depression specifies the role of schema-driven negative processing biases in the onset and maintenance of depression. Research has shown that cognitive reactivity, or the ease with which negative thinking patterns are activated by mild changes in negative mood, is related to relapse and recurrence. The goal of this study was to examine cognitive reactivity following a mood prime in individuals vulnerable to depression. Formerly (n = 28) and never (n = 36) depressed individuals were assessed on two measures of negative cognition, the Automatic Thoughts Questionnaire (ATQ) and Dysfunctional Attitudes Scale (DAS), before and after participating in a sad or neutral mood induction procedure (MIP). The negative mood induction resulted in increased belief in negative automatic thoughts across groups; however, only the formerly depressed participants assigned to this condition demonstrated increased DAS scores. Importantly, individuals who completed the neutral mood induction did not exhibit increases in negative cognition, providing evidence against the possibility that the MIP itself may lead to increases in negative cognition. These findings are discussed in relation to understanding the role of negative cognition and vulnerability to depression.

Keywords: depression; sad mood induction; neutral mood induction; automatic thoughts; dysfunctional attitudes scale

findings in this study further indicate that negative cognitive reactivity is a predictor of the development of future MDD. Participants were 46 euthymic, non-depressed community volunteers (50% women) with a history of past MDD, examined in the Structured Clinical Interview for DSM-IV at the time of the study and 3 years later. Participants were randomly assigned to daily brief newspaper advertisements during the 3-year follow-up period. They were told that the advertisements were part of a larger study, which would include interviews and other assessments, and that participation was voluntary. At baseline, participants completed measures of cognitive reactivity, trait anxiety, and depression. At follow-up, participants were re-interviewed for MDD, and completed self-report measures of cognitive reactivity, trait anxiety, and depression. Results showed that participants who showed greater pre-existing cognitive reactivity were more likely to develop MDD over the 3-year follow-up period. The results of this study suggest that cognitive reactivity may be a useful predictor of the development of future MDD.

**METHOD**

Participants were 46 euthymic, non-depressed community volunteers (50% women) with a history of past MDD, examined in the Structured Clinical Interview for DSM-IV at the time of the study and 3 years later. Participants were randomly assigned to daily brief newspaper advertisements during the 3-year follow-up period. They were told that the advertisements were part of a larger study, which would include interviews and other assessments, and that participation was voluntary. At baseline, participants completed measures of cognitive reactivity, trait anxiety, and depression. At follow-up, participants were re-interviewed for MDD, and completed self-report measures of cognitive reactivity, trait anxiety, and depression. Results showed that participants who showed greater pre-existing cognitive reactivity were more likely to develop MDD over the 3-year follow-up period. The results of this study suggest that cognitive reactivity may be a useful predictor of the development of future MDD.

**Self-Report Measures of Depressive Cognition**

**Automatic Thoughts Questionnaire** (ATQ; Hallon et al., 1980) is a 10-item scale that assesses automatic thoughts related to depressed mood and negative cognitive reactivity. The ATQ assesses the frequency and intensity of automatic thoughts associated with depression. It consists of two parts: the Negative Somatic subscale and the Negative Affective subscale. The Negative Somatic subscale assesses automatic thoughts related to physical symptoms, while the Negative Affective subscale assesses automatic thoughts related to mood and emotional state. Items are rated on a scale of 1 to 5 (1 = never, 5 = always). The ATQ has good reliability and validity. It has been used to assess changes in automatic thoughts in response to interventions and to monitor changes in automatic thoughts over time.

**Diary of Depressive Thoughts (DIT)** (Kendall et al., 1990) is a daily self-report measure that assesses the frequency and intensity of automatic thoughts related to depressed mood and negative cognitive reactivity. The DIT consists of two parts: the Negative Affective subscale and the Negative Somatic subscale. The Negative Affective subscale assesses automatic thoughts related to mood and emotional state, while the Negative Somatic subscale assesses automatic thoughts related to physical symptoms. Items are rated on a scale of 1 to 7 (1 = not at all, 7 = extremely). The DIT has good reliability and validity. It has been used to assess changes in automatic thoughts in response to interventions and to monitor changes in automatic thoughts over time.

**Visual Analog Scale (VAS)** (Kendall et al., 1990) is a daily self-report measure that assesses the frequency and intensity of automatic thoughts related to depressed mood and negative cognitive reactivity. The VAS consists of two scales: the Negative Affective subscale and the Negative Somatic subscale. The Negative Affective subscale assesses automatic thoughts related to mood and emotional state, while the Negative Somatic subscale assesses automatic thoughts related to physical symptoms. Items are rated on a scale of 0 to 100 (0 = none, 100 = worst possible). The VAS has good reliability and validity. It has been used to assess changes in automatic thoughts in response to interventions and to monitor changes in automatic thoughts over time.
TABLE 1. SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF FORMERLY AND NEVER-DEPRESSED GROUPS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Formerly Depressed</th>
<th>Never Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>37.4 (12.0)</td>
<td>36.8 (12.4)</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11 (39)</td>
<td>16 (44)</td>
</tr>
<tr>
<td>Female</td>
<td>17 (61)</td>
<td>20 (56)</td>
</tr>
<tr>
<td>Annual income</td>
<td>$27,614 (20,165)</td>
<td>$39,350 (24,105)</td>
</tr>
<tr>
<td>Years of education</td>
<td>16.7 (2.7)</td>
<td>16.7 (2.4)</td>
</tr>
<tr>
<td>WAIS-III Digit Symbol</td>
<td>12.7 (2.7)</td>
<td>12.4 (2.8)</td>
</tr>
<tr>
<td>WRAT-3 Reading</td>
<td>109.3 (10.4)</td>
<td>105.8 (10.8)</td>
</tr>
<tr>
<td>BDI-II*</td>
<td>4.4 (3.4)</td>
<td>2.4 (2.9)</td>
</tr>
<tr>
<td>HRSID*</td>
<td>2.4 (2.1)</td>
<td>0.7 (0.8)</td>
</tr>
<tr>
<td>BAI**</td>
<td>5.6 (4.9)</td>
<td>1.9 (2.6)</td>
</tr>
</tbody>
</table>

Note. Formerly depressed, n = 28; never depressed, n = 36. WAIS-III = Wechsler Adult Intelligence Scale-III (Wechsler, 1997); WRAT-3 = Wide Range Achievement Test-3 (Wilkinson, 1993); BDI-II = Beck Depression Inventory-II (Beck et al., 1996); HRSID = Hamilton Rating Scale for Depression (Hamilton, 1960); BAI = Beck Anxiety Inventory (Beck & Steer, 1993). *p < .05. **p < .001.

indicated their current mood by placing a mark on the line between the two end points. This measure has been used in previous mood-induction studies (e.g., Segal et al., 1999; Segal et al., 2006).

Sad Mood Induction. The sad mood induction employed a methodology that combined music and autobiographical recall to create a mild, transient sad mood. This induction method has been validated by previous research (Martin, 1990; Segal et al., 1999; Segal et al., 2006). Individuals were asked to listen to a digitally remastered, half-speed, nonlyrical piece of classical music presented on a CD player and were asked to try and recall a time in their lives when they felt sad. The music came from previous work by Clark and Teasdale (1985) who employed the orchestral introduction by Prokofiev entitled “Russia under the Mongolian Yoke” from the film Alexander Nevsky. The approximately 8-min taped segment was played to patients through earphones.

Neutral Mood Induction. The procedure for the neutral mood induction was similar to that described earlier for the sad mood induction except that the music was “Suite in E minor, BWV 996, part V (‘Bourée’) and part VI (‘Gigue’)” by Bach. The music was matched in terms of time to the sad mood induction. The piece of music was deemed to be neutral in terms of quality by the experimenters as compared to the piece of music employed for the sad mood induction. Individuals were asked to listen to this music presented on a CD player and were asked to try and recall a time in their lives when they felt neutral—that is, neither particularly happy nor particularly sad.

PROCEDURE

Testing took place over two sessions separated by approximately 1 week. In the first session, the experimenter obtained informed written consent; administered the SCID, the Hamilton Rating Scale for Depression (HRSID; Hamilton, 1960), the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996), the Beck Anxiety Inventory (BAI; Beck & Steer, 1993); and assessed participants’ eligibility to participate in the study.

In the second session, participants completed the ATQ, DAS (one of two forms: Form A or B), and other measures outside this article’s scope. The administration of the two forms of the DAS was counterbalanced. Participants were randomized to participate in the sad or neutral mood induction. Prior to the MIP, participants completed the VAS mood rating. Immediately following the mood induction, participants completed a second VAS mood rating, the ATQ, and the alternate form of the DAS. The administration order of the measures was counterbalanced across participants.

To help cover expenses (e.g., parking, travel), participants were reimbursed $15/hr. The study was approved by the research ethics board at the Centre for Addiction and Mental Health.

RESULTS

Preexperiment Cognitive Measures

Formerly and never-depressed participants assigned to the sad and neutral mood induction conditions were compared on prelood induction ATQ scores. A 2 (group: formerly depressed, never depressed) × 2 (valence: sad, neutral) analysis of variance (ANOVA) conducted on ATQ scores revealed a significant main effect of group, F(1, 59) = 11.35, p < .01. Formerly depressed participants (M = 42.64, SE = 2.49) endorsed a higher degree of belief of automatic thoughts than never-depressed control participants (M = 34.63, SE = 4.89). Similarly, a 2 (group) × 2 (valence) × 2 (DAS order: DAS A or B) ANOVA conducted on pre-mood induction DAS scores controlling for DAS version revealed only a nearly significant main effect of group, F(1, 55) = 3.38, p = .07. There was a trend for formerly depressed participants (M = 116.07, SE = 5.42) to endorse higher levels of dysfunctional attitudes than never-depressed participants (M = 98.26, SE = 3.50).

Manipulation Check for the Mood Induction

A 2 (group) × 2 (valence) × 2 (time: preinduction, postinduction) mixed-design ANOVA on VAS mood ratings revealed significant main effects of valence, F(1, 58) = 9.74, p = .003, and time, F(1, 58) = 19.65, p < .001, but that these main effects were qualified by a significant valence by time interaction, F(1, 58) = 6.08, p < .05. Thus, although there were no significant differences in preinduction VAS ratings among participants assigned to the sad (M = 1.43, SE = .42) versus neutral (M = 2.00, SE = .36) conditions, postinduction VAS ratings were significantly higher for participants in the sad (M = .57, SE = .50) versus neutral (M = 1.40, SE = .26) mood induction, F(1, 56) = 10.61, p < .01. In addition, there was a nearly significant main effect of group, F(1, 58) = 2.79, p = .10, and a nearly significant group by valence interaction, F(1, 43) = 3.72, p = .059.

Cognitive Measures: Response to the Mood Induction

We predicted that, relative to individuals with no history of depression, formerly depressed individuals would demonstrate a significantly greater endorsement of degree of belief in negative automatic thoughts and dysfunctional attitudes following a negative versus a neutral mood induction. In addition, we predicted that neither formerly nor never-depressed participants would exhibit cognitive reactivity following the neutral mood induction.

Degree of Belief in Automatic Thoughts

To evaluate this hypothesis, we conducted a two 2 (group) × 2 (valence) × 2 (time) mixed-design ANOVA analyses for the degree of belief of automatic thoughts. Inconsistent with this hypothesis, there was a significant main effect of group, F(1, 58) = 12.05, p < .01; a significant valence by
time interaction, F(1, 58) = 6.26, p < .02; and a nonsignificant group by valence by time interaction, F(1, 58) = .27, p = .606. Formerly depressed participants (M = 44.0, SE = 1.93) endorsed a greater degree of belief in automatic thoughts than never-depressed participants (M = 35.0, SE = 1.75). In addition, formerly and never-depressed participants assigned to the sad mood induction condition endorsed a greater degree of belief in automatic thoughts after (M = 42.0, SE = 2.43) versus before (M = 37.9, SE = 1.49) the mood induction t(31) = 2.17, p < .05.

In line with predictions, all participants in the neutral mood induction condition showed no change in endorsement of automatic thoughts after (M = 37.5, SE = 2.23) versus before (M = 38.7, SE = 2.22) the mood induction, t(30) = 1.51, p = .143.

**Dysfunctional Attitudes**

To further test our hypothesis, we conducted a 2 (group) × 2 (valence) × 2 (time) × 2 (DAS order) mixed-design ANOVA. Consistent with our hypothesis, there were significant main effects of group, F(1, 57) = 5.09, p < .05, and time, F(1, 57) = 5.20, p < .05, which were qualified by significant valence by time, F(1, 57) = 5.25, p < .05, time by DAS order, F(1, 57) = 5.58, p < .05, and group by valence by time, F(1, 57) = 4.34, p < .05, interactions. Of the participants assigned to the negative mood induction condition, only formerly depressed participants evidenced a significant increase in the endorsement of dysfunctional attitudes (preinduction M = 117.3, SD = 21.8; postinduction M = 129.1, SD = 23.9), whereas never-depressed participants demonstrated essentially no change in DAS scores (preinduction M = 96.2, SD = 16.8; postinduction M = 96.7, SD = 28.0).

In line with predictions, for participants assigned to the neutral mood induction, neither formerly depressed (preinduction M = 115.2, SD = 37.1; postinduction M = 113.8, SD = 32.9) nor never-depressed (preinduction M = 100.1, SD = 25.6; postinduction M = 103.0, SD = 22.8) participants demonstrated any significant change in DAS scores. Finally, there was a nearly significant group by valence by time by order interaction, F(1, 57) = 2.81, p = .099.

**DISCUSSION**

To our knowledge, this is the first study to compare the effects of a sad versus neutral mood induction on automatic thoughts—in addition to dysfunctional attitudes—in formerly and never-depressed individuals. Following a negative mood induction, formerly depressed participants were predicted to endorse significantly more automatic thoughts than never-depressed participants. Contrary to predictions, increased negative automatic thoughts following the negative mood induction were observed for both groups. This finding is consistent with a previous demonstration of increased automatic thoughts in both formerly and never-depressed individuals experiencing naturally occurring negative mood (Roberts & Kassel, 1996). The results suggest that the degree of belief in automatic thoughts following increased sad mood does not differentiate formerly from never-depressed individuals. One interpretation is that surface-level cognitions measured immediately after a negative mood induction may not represent a cognitive vulnerability factor in formerly depressed individuals. Alternatively, it is possible that measuring the degree of belief in automatic thoughts immediately after the mood induction was too premature to detect an effect. Perhaps the relationship between automatic thoughts and vulnerability to depression is only revealed after a period of rumination (Smith & Alloy, 2009). Future research is needed to explore this possibility.

In addition to examining automatic thoughts, the study sought to replicate the finding that increased sad mood leads to greater dysfunctional attitudes in formerly versus never-depressed participants (Gemar, Segal, Sagrati, & Kennedy, 2001). Our finding that there were no differences in response to the sad mood induction between formerly versus never-depressed individuals is consistent with previous findings (Dykman, 1997; Fresco, Heimberg, Abramowitz, & Bertram, 2006; Gemar et al., 2001; Ingram & Ritter, 2000; LeMoulh, Joormann, Sheridan, Wright, & Gotlib, 2009; McCabe, Gotlib, & Martin, 2000; Meites, Deveney, Steele, Holmes, & Pizzagalli, 2008). As expected, increases in the endorsement of dysfunctional attitudes were observed only for formerly depressed individuals following the negative mood induction. This finding is consistent with most of the mood-priming studies (Lau, Segal, & Williams, 2004; Scheer et al., 2005).

To examine whether changes in negative cognition are artifacts of the mood-priming procedure itself, a neutral mood induction was included in the protocol. As predicted, a neutral mood induction was not associated with cognitive reactivity. The absence of cognitive changes (i.e., ATQ, DAS) in the neutral mood induction condition for both formerly and never-depressed participants is consistent with a previous study demonstrating no DAS changes for individuals diagnosed with MDD using a neutral Velten MIP (Nelson & Stern, 1988). Importantly, the demonstration that the neutral mood induction had no effect on DAS scores extends previous findings as it challenges the possibility that the MIP itself increases ATQ and DAS scores (Dykman, 1997).

A potential limitation of the study is related to baseline group differences on measures of depression and anxiety. The formerly depressed group endorsed significantly more depressed and anxious symptoms than the never-depressed group, which raises the possibility that some of the results were influenced by preexisting mood and anxiety symptoms. Unfortunately, any attempt to statistically control for pretreatment group differences (e.g., analysis of covariance) is inappropriate when group membership is determined nonrandomly (Miller & Chapman, 2001). Despite this limitation, it is unlikely that the results were influenced by group differences in mood and anxiety symptoms for two reasons. First, although significant differences were found between the groups, examination of the means indicated that both groups were well below the symptomatological range on measures of depression and anxiety. For example, the mean score for the formerly depressed group on the BDI was 4.4 compared to 2.4 for the never-depressed group. In this sense, both groups scored on the low end of the minimal symptom range on the BDI. Second, the formerly and never-depressed groups did not differ on self-reported mood ratings prior to the mood induction.

Another limitation of this study relates to the ecological validity of the design. Nelson and Stern (1988) have argued that an induced sad mood state may not be equivalent to a clinically depressed state. It is possible that the validity might be improved by using alternative methods to induce a sad mood state such as being rejected by a social partner or by viewing an upsetting film clip.

In conclusion, the results of the study have replicated the finding that primed dysfunctional thoughts are endorsed to a greater degree in individuals vulnerable to depression. In addition, the study has extended previous research by demonstrating that the MIP itself is not responsible for the increased endorsement of dysfunctional attitudes by formerly depressed individuals.

**REFERENCES**


Mood State Dependence of Negative Cognition


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