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Rumination, mood and social problem-solving in major depression

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ABSTRACT

Background. Ruminating when depressed is thought to lower mood and impair problem-solving, while distraction is thought to alleviate mood and assist problem-solving. The present study investigates each of these proposals using both naturally occurring and experimentally induced rumination and distraction in a sample of patients with major depression.

Method. Thirty-six patients with major depression and 36 control participants were randomly allocated to either a rumination or distraction induction condition. Levels of trait rumination and distraction were measured at baseline, mood and problem-solving were measured before and after the inductions.

Results. In terms of trait measures, depressed patients with higher levels of trait rumination reported poorer mood and gave less effective problem solutions than those who were less ruminative. Trait distraction was not associated with mood or problem-solving. In terms of induced responses, depressed patients who were made to ruminate experienced a deterioration in their mood and gave poorer problem solutions. For those receiving the distraction induction, mood improved in all patients and problem-solving improved in patients who were not naturally ruminating at a high level. Neither induction had an impact on mood or problem-solving in control participants.

Conclusions. Treatment for depression associated with adverse life events may need to target rumination as well as problem-solving deficits if interventions are to be effective. The differential effects of self-applied versus experimentally induced distraction require further investigation. Future research will need to consider that high levels of trait rumination may interfere with the impact of experimental inductions.

INTRODUCTION

One of the ways people who are vulnerable to depression differ from other people is that they ruminate in response to even normal everyday sadness (Roberts *et al.* 1998). According to Nolen-Hoeksema's (1991) response styles theory, this can create difficulties as ruminative responses result in longer lasting and more severe episodes of low mood, whereas distracting responses shorten and lessen the severity of these episodes. Rumination is defined as a repetitive pattern of thoughts and behaviours that focus an individual's attention on his/her depressed state. Distraction, on the other hand, can be defined as directing attention away from one's depression and on to pleasant or neutral stimuli in the external environment. The tendency to react to low mood with either rumination or distraction would appear to be a stable trait (Nolen-Hoeksema *et al.* 1994; Just & Alloy, 1997) and is independent of concomitant levels of depression (Kuehner & Weber, 1999).

Studies that have tested the response styles theory have either been experimental and used manipulations to temporarily induce rumination and distraction (Morrow & Nolen-Hoeksema,

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1990; Lyubomirsky & Nolen-Hoeksema, 1993; Nolen-Hoeksema & Morrow, 1993; Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky *et al*. 1998; Watkins *et al*. 2000) or naturalistic and measured these response styles as trait tendencies when mood is low (Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema *et al*. 1993; Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema *et al*. 1994, 1997; Schwartz & Koenig, 1996; Just & Alloy, 1997; Kuehner & Weber, 1999; Lam *et al*. 2003*a*).

Both experimental and naturalistic studies have produced highly consistent evidence for the predictive effects of rumination on mood. More specifically they have shown that rumination can (1) maintain and increase low mood in non-clinical samples (e.g. Nolen-Hoeksema & Morrow, 1991, 1993); (2) predict the onset and severity of depression as classified by the Beck Depression Inventory (BDI; Beck *et al*. 1961) in formerly non-depressed individuals (Just & Alloy, 1997); and, (3) predict the severity (Lam *et al*. 2003*a*) and chronicity (Kuehner & Weber, 1999) of episodes of major depression in clinical samples.

The findings for distraction and mood are more mixed. That is, while studies of experimentally induced distraction have provided reliable support for a relationship (e.g. Lyubomirsky *et al*. 1998), only two out of nine naturalistic studies found a link between trait distraction and less severe depressed mood. Kuehner & Weber (1999) followed a sample of depressed inpatients from admission to 16 months after discharge and examined the relationship between trait distraction and depression status at different time points. While several null relationships were reported, there was a trend for patients with low levels of trait distraction to be identified as a depression case at 4 months post-discharge. In Lam *et al*.'s (2003*a*) study, levels of trait distraction were associated with lower BDI scores in a clinical sample. The remainder of studies of trait distraction found that this tendency was not related to the severity or duration of depressive symptoms.

These findings have clinical implications as they suggest that while attempting to distract oneself (i.e. trait distraction) is ineffective at alleviating depressed mood, experimentally induced distraction may be effective. The latter suggestion requires further investigation however, as none of the controlled experimental studies have been carried out on a full clinical sample.

In an elaboration of the response styles theory, Nolen-Hoeksema *et al*. (1993) proposed that rumination amplifies and prolongs depressed mood by increasing negative thoughts and impairing complex problem-solving. More specifically, it is thought that as rumination continues, negative thinking becomes more dense, appraisals of problem situations become more distorted and ability to select adaptive solutions decreases. By contrast, distraction is thought to dampen and shorten depressive episodes by preventing self-contemplation and increasing the likelihood of the person reaching a non-distorted conclusion about their problems and selecting effective solutions.

A relationship between rumination and negative thinking is supported by the findings from studies measuring pessimism for future life events (Pyszczynski *et al*. 1987), negatively biased autobiographical memories (e.g. Lyubomirsky *et al*. 1998); and causal attributions for hypothetical events (Lyubomirsky & Nolen-Hoeksema, 1995; Lam *et al*. 2003*b*). In terms of rumination and social problem-solving, to date there has only been one study in this area. This involved dysphoric and non-dysphoric students and found that dysphoric students in the rumination condition showed poorer problem-solving than those in the distraction condition who performed at a similar level to non-dysphoric controls (Lyubomirsky & Nolen-Hoeksema, 1995). These findings support Nolen-Hoeksema *et al*.'s view (1993) that ruminating in the presence of dysphoric or depressed mood can interfere with problem-solving and that distraction may be a useful short-term strategy when there are real-life difficulties to be addressed. However, a major limitation of this study is that it did not involve a clinical sample and did not measure problem-solving before the rumination and distraction inductions.

As discussed above, the literature on response styles has provided reliable support for a relationship between mood and induced rumination, induced distraction and levels of trait rumination (but not trait distraction). Consequently there is a possibility that trait rumination may interact with attempts to induce

ruminative or distracting responses. Indeed, in explaining the non-significant tendency towards a change in mood following the rumination and distraction inductions, Watkins *et al.* (2000) suggested that participants' natural levels of rumination may have interacted with the manipulations and moderated their impact. This point echoes the work of Teasdale (1988) who suggested that high levels of rumination naturally occur in major depression. This raises the possibility that depressed patients may be ruminating at a ceiling level prior to receiving response inductions. If this were the case, a rumination induction may be expected to have little additional effect and it may be difficult for distracting inductions to impact on this tendency and effect a change in mood or problem-solving in depressed patients. If an interaction exists, this will highlight the need for trait rumination to be considered either in the design or analysis stage of future experimental studies on induced response styles.

The present study had both experimental and naturalistic components (i.e. response inductions and measurement of trait response styles), involved participants with major depression and non-depressed controls and assessed problem-solving both before and after the response inductions. Thus, it is a fully controlled, clinical investigation of the relationships between response styles, mood and social problem-solving. It is also the only study to examine the influence of both induced and trait response styles within the same sample and therefore provides a test of the suggestion that ceiling levels of trait rumination may block the effects of rumination and distraction inductions.

There were three hypotheses. First, we predicted that at baseline, while depressed patients with high levels of trait rumination will report more severe low mood and be poorer problem-solvers than those who are less ruminative, there will be no difference in mood or problem-solving for patients with high and low levels of trait distraction. Second, we expected mood and problem-solving to deteriorate for depressed patients who are induced to ruminate, improve for depressed patients who are induced to distract and remain unchanged for control participants in either induction condition. Third, we predicted that the association between the response inductions and changes in mood and problem-solving would be stronger for low rather than high trait ruminators.

METHOD

Participants

Participants were 36 depressed and 36 non-depressed individuals aged 18–65 years. All depressed subjects were in-patients or out-patients at the South London and Maudsley NHS Trust and were recruited via referrals from psychologists and psychiatrists in the Trust. Control participants were recruited from advertisements in the local Job Centre and Post Office. To be included in the depression group patients had to meet DSM-IV (APA, 1994) criteria for a major depressive episode without organic, psychotic or manic features, be free from a co-morbid anxiety disorder and have a BDI score of 10 or above. Control participants were matched with the depressed group on gender. Applicants were accepted if they did not meet DSM-IV criteria for any Axis 1 disorder, had a BDI score of 9 or lower and did not have a history of emotional disorder. Diagnostic assessments were performed using the Structured Clinical Interview (SCID; First *et al.* 1997) by one of the authors (C.D.).

The clinical and demographic characteristics of the participants along with the results from group comparative statistical tests involving these characteristics are given in Table 1. Compared to controls, patients had significantly higher levels of anxiety although within the patient group, there was no differences in anxiety for those allocated to the rumination and distraction conditions ($t = 0{\cdot}47$, df = 34, $p = 0{\cdot}64$). While there was a significant difference between the depressed and control group on the measure of trait rumination, the groups did not differ on trait distraction.

Materials

BDI

The BDI is a 21-item self-report measure which assesses the severity of a range of affective, somatic and cognitive symptoms of depression. It shows high internal consistency ($\alpha = 0{\cdot}86$), moderate to high test–retest reliability (0·48–0·86) and concurrent validities of greater than 0·70 with clinician and self-rated measures of depression (Beck *et al.* 1988*b*).

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Table 1. *Demographic and clinical variables*

	Control group	Depressed group	Test statistic and degrees of freedom	*p*
Gender ratio (F/M)	23/13	23/13		
Age (years)	43·2 (11·9)	45·6 (10·8)	$t=0{\cdot}9$ (df = 70)	$p=0{\cdot}38$
Mill Hill Vocabulary	23·0 (3·8)	21·7 (5·6)	$t=1{\cdot}1$ (df = 70)	$p=0{\cdot}27$
Beck Depression Inventory	4·4 (2·7)	24·3 (8·5)	$t=13{\cdot}4$ (df = 70)	$p<0{\cdot}0005$
Beck Anxiety Inventory	3·4 (3·6)	15·6 (9·5)	$t=7{\cdot}3$ (df = 70)	$p<0{\cdot}0005$
VAS Depression at baseline	9·3 (9·0)	45·6 (23·1)	$t=8{\cdot}8$ (df = 70)	$p<0{\cdot}0005$
Trait Rumination score	14·2 (9·6)	34·2 (11·4)	$t=8{\cdot}0$ (df = 70)	$p<0{\cdot}0005$
Trait Distraction score	13·1 (5·6)	13·2 (5·7)	$t=0{\cdot}1$ (df = 70)	$p=0{\cdot}93$
Problem solving at baseline	7·1 (2·0)	6·9 (1·6)	$t=0{\cdot}6$ (df = 70)	$p=0{\cdot}52$

VAS, Visual Analogue Scale.
Means and (standard deviations) are given for age, questionnaire, VAS and problem-solving scores.

Beck Anxiety Inventory (*BAI*)

The BAI (Beck *et al.* 1988*a*) is a 21-item self-report measure which assesses the severity of both physiological and cognitive symptoms of anxiety. The scale shows high internal consistency ($\alpha=0{\cdot}92$) and test–retest reliability over 1 week ($r=0{\cdot}75$) (Beck *et al.* 1988*a*).

Mood Rating Scale

Consistent with Lyubomirsky & Nolen-Hoeksema's (1995) study, a self-report visual analogue scale (VAS) was created to allow participants to rate their mood along a continuum ranging from 0 (not at all depressed) to 100 (extremely depressed).

Trait rumination and trait distraction

The Response Style Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) assesses dispositional response styles when 'feeling down, sad or depressed'. The questionnaire has two scales: the Ruminative Responses Scale (RRS: 22 items) and Distracting Responses Scale (DRS: 13 items) measuring trait rumination and distraction respectively. That is, the RRS measures responses to negative emotion that are self-focused and the DRS measures responses that divert attention externally. Both subscales have internal consistencies of greater than 0·70 (Nolen-Hoeksema *et al.* 1994; Just & Alloy, 1997; Kuehner & Weber, 1999) and moderate to high test–retest reliabilities have been reported (Nolen-Hoeksema *et al.* 1994; Just & Alloy, 1997; Kuehner & Weber, 1999). Subjects' scores correspond to their use of ruminative and distracting responses to depressed mood in a 30-day diary study (RRS 0·62, DRS 0·61; cited in Nolen-Hoeksema & Morrow, 1991).

Problem solving

Platt & Spivack's (1975) Means-Ends Problem-Solving (MEPS) procedure assesses the ability to conceptualize the step-by-step means of moving towards a problem solution. Four of the original 10 MEPS problem situations were used: (1) you realize a friend is avoiding you; (2) your partner leaves you after an argument; (3) you are having trouble getting along with your boss at work; and, (4) you have moved to a new area and do not know anyone. Problems that were excluded had previously been criticized for citing unrealistic circumstances or failing to invoke social problem-solving strategies (Nezu & Ronan, 1988). Two problem situations were administered before and two after the response inductions. Order effects were controlled with random number tables. The validity of estimating means–ends problem-solving using such a small number of situations is supported by the findings from several studies (e.g. Lyubomirsky & Nolen-Hoeksema, 1995). Participants were given a description of the problem and its outcome and asked to report the ideal rather than the actual strategies they would use to bring about the solution in order to reduce the influence of motivational factors (Butler & Meichenbaum, 1981). Responses were tape-recorded and ratings made of the overall effectiveness on a 7-point Likert scale ranging from 'not at all effective' (1) to 'extremely effective' (7). Scores for the two situations at each time point were summed to give pre- and post-induction scores.

All situations were rated by C.D. and the responses of a randomly selected sample of subjects were independently scored by D.L. who was blind to group membership (i.e. patient or control) and induction condition (i.e. rumination or distraction).

Procedure

Prior to the response inductions (Time 1), participants completed the questionnaire assessments and provided responses to two problem solving situations. Participants were then assigned in a randomized blocked manner to either the rumination or distraction condition and completed the 8-minute period of response induction. In order to monitor the effects of the inductions on mood, participants re-rated their level of depressed mood using the 0–100 VAS. The second set of two problem situations was then administered.

Response inductions

On the basis of Nolen-Hoeksema's (1991) definition of ruminative responses, the rumination condition required participants to focus their attention on a series of statements that were designed to promote thoughts related to emotions, behaviours and the self. Participants were not told specifically to think about negative emotions or negative personal attributes. For example, they were asked to think about 'your current level of energy' and 'what your feelings might mean'. These items were developed by Lyubomirsky & Nolen-Hoeksema (1995) and adapted for British subjects by C.D. Two independent raters scored the statements to ensure they were neutral and not negative in tone and this characteristic distinguishes rumination inductions from negative mood inductions such as the Velten procedure. Indeed, past research has shown that there is no mood effect when euthymic subjects receive this rumination induction (e.g. Lyubomirsky & Nolen-Hoeksema, 1993, 1995). The distraction induction attempted to focus attention externally and involved playing a board game (either noughts and crosses or Scrabble).

Main analyses procedures

Preliminary analyses were conducted first in order to examine the equivalence of the problem-solving situations using a one-way analysis of variance and the inter-rater reliability for problem-solving effectiveness using Cohen's Kappa. There was also an initial re-examination of the baseline difference in problem-solving between the control and depressed group by running a t test with the inclusion criteria for entry to the depressed group raised from 10 to 16 on the BDI. If significant group differences were found then the remaining analyses would be based on this smaller clinical group.

To test the hypothesis that trait rumination but not trait distraction would influence mood and problem-solving in patients at Time 1, stepwise multiple regression analyses were carried out. In the first analysis, VAS depression in patients at Time 1 was regressed on trait rumination and trait distraction. In the second, problem-solving at Time 1 was regressed on these variables and BDI depression. The latter analysis examined whether trait responses made an independent prediction of problem-solving after controlling for depressive symptoms. These analyses were then repeated for the control group.

Two analyses of covariance (ANCOVAs) were performed in order to examine the impact of the rumination and distraction inductions on mood and problem-solving at Time 2. In both, the between-subjects factors were Group (2: controls, patients) and Induction (2: distraction, rumination). In the first ANCOVA, VAS depression at Time 2 was the dependent variable and VAS depression at Time 1 was a covariate. For the second, problem-solving at Time 2 was the dependent variable and problem-solving at Time 1 and change in VAS depression were covariates. This enabled a check to be made to determine whether the effects of inductions were independent of changes in mood. If interactions were found further ANCOVAs were performed one each for patients and controls followed by separate paired samples t tests for patients in the rumination and distraction conditions. These t tests involved either mood at Time 1 and 2 or problem-solving at Time 1 and 2 as the paired variables and allowed pre- and post-induction differences in these outcomes to be detected.

Simultaneous multiple regression analyses were used to test the prediction that high levels of trait rumination would interfere with the effects of the inductions on mood and

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Table 2. *Details of multiple regressions for mood and problem-solving at Time 1*

Dependent variable	Regression					Predicting variable	*B*	S.E.	*t*	*p*
	R	R^2	*F*	df	*p*					
VAS-Dep patients	0·51	0·26	11·74	1, 34	0·002	Trait rum	1·0	0·30	3·42	0·002
						Trait dist				N.S.
VAS-Dep controls	0·39	0·15	6·21	1, 34	0·018	Trait rum	0·37	0·15	2·49	0·018
						Trait dist				N.S.
Prob Solv patients	0·49	0·24	10·98	1, 34	0·002	Trait rum	−0·14	0·04	3·31	0·002
						Trait dist				N.S.
						BDI				N.S.

VAS-Dep, Visual Analogue Scale – Depression scores at Time 1; Prob Solv, Problem-solving scores at Time 1; Trait rum, Trait rumination; Trait dist, Trait distraction; N.S., non-significant; BDI, Beck Depression Inventory.

problem-solving in patients at Time 2. In the first regression VAS depression at Time 2 was the dependent variable and in the second problem-solving at Time 2 was the dependent variable. Explanatory variables were as follows: scores at Time 1 (either VAS depression or problem-solving), trait rumination, Induction (2 categories: induced rumination = 0; induced distraction = 1) and an interaction term (trait rumination × induction). If the trait rumination × induction interaction was significant we then analysed the data for patients who had received the rumination and distraction induction separately using partial correlation procedures. These tests allowed Time 1 scores to be controlled while the relationship between trait rumination and the Time 2 variables was explored.

All analyses were performed using version 10.0.7 of SPSS (SPSS, 1999).

RESULTS

Preliminary analyses

There were no differences in the scores obtained by subjects on the four situations [$F(3, 69) = 1{\cdot}1$; $p = 0{\cdot}38$], indicating that they were equivalent in terms of ease/difficulty of resolution. Agreement between problem-solving ratings was based on a sample of fifteen participants' responses and was high with kappa being 0·68 (standard error = 0·08, $p < 0{\cdot}005$). When statistical tests were repeated with only patients who scored above 16 on the BDI ($n = 30/36$ patients), problem-solving differences at baseline were still non-significant ($t = 0{\cdot}38$, df = 64, $p = 0{\cdot}71$). As a result all of the analyses that follow have been based on the full sample of 36 depressed patients.

All statistical tests initially involved gender as a between-subject factor. However there were no significant main effects, interactions or relationships with gender of participant and therefore all of the analyses were collapsed across this variable.

Mood, problem-solving and trait response styles at Time 1

Table 2 shows the results of the regression analyses to examine the relationships between mood and problem-solving at Time 1 and trait responses. Mood at Time 1 in patients and controls was predicted by trait rumination with 26% ($r = 0{\cdot}51$) and 15% ($r = 0{\cdot}39$) of the variance being explained respectively for each group. Trait distraction was not entered into either of the regression equations. Problem-solving at Time 1 in patients was predicted by trait rumination with 24% of the variance being explained ($r = 0{\cdot}49$). No variables were entered into the regression equation for the control group.

Mood and problem-solving at Time 2 and induced rumination and distraction

Table 3 shows the mean mood and problem-solving scores for participants before and after the response inductions. The ANCOVA for mood at Time 2 found a main effect of Group [$F(1, 67) = 11{\cdot}4$; $p = 0{\cdot}001$] and Induction [$F(1, 67) = 27{\cdot}9$; $p < 0{\cdot}0005$] and a significant Group × Induction interaction [$F(1, 67) = 16{\cdot}4$; $p < 0{\cdot}0005$]. When the patient and control data were examined separately, Induction

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Table 3. *Mood and problem-solving by Group and Induction*

Group	Induction			
	Before Rumination Induction	After Rumination Induction	Before Distraction Induction	After Distraction Induction
VAS Depression*				
Controls	9·7 (8·8)	11·4 (10·6)	8·9 (8·3)	6·7 (6·7)
Patients	43·1 (21·9)	55·6 (21·5)	48·1 (24·6)	41·7 (21·9)
Problem-Solving†				
Controls	7·2 (2·0)	6·9 (1·6)	7·1 (2·1)	7·1 (1·6)
Patients	7·6 (1·5)	5·8 (1·5)	6·1 (1·3)	6·6 (2·1)

Means and (standard deviations) are given.
VAS Depression = Ratings of depressed mood on a 0–100 visual analogue scale.
* Higher scores indicate more severe depressed mood.
† Higher scores indicate fewer problem-solving difficulties.

significantly determined mood in patients [$F(1, 33) = 24{\cdot}8$; $p < 0{\cdot}0005$] but not controls [$F(1, 33) = 0{\cdot}26$; $p = 0{\cdot}613$]. Paired samples t tests revealed that, after the inductions, depressed patients who were made to ruminate had significantly higher VAS depression scores ($t = 3{\cdot}6$, df = 17, $p = 0{\cdot}002$), and those who were made to distract had significantly lower scores ($t = 4{\cdot}1$, df = 17, $p = 0{\cdot}001$).

The ANCOVA for problem-solving found main effects of Group [$F(1, 67) = 4{\cdot}1$; $p = 0{\cdot}041$], Induction [$F(1, 67) = 7{\cdot}0$; $p = 0{\cdot}010$] and a significant Group × Induction interaction [$F(1, 67) = 4{\cdot}3$; $p = 0{\cdot}039$]. Separate analyses for patients and controls showed that the Inductions had an effect on problem-solving in patients [$F(1, 33) = 7{\cdot}1$; $p = 0{\cdot}012$] but not controls [$F(1, 33) = 0{\cdot}26$; $p = 0{\cdot}613$]. Paired samples t tests on the patient data showed a significant deterioration in problem-solving for those in the rumination condition ($t = 4{\cdot}5$, df = 17, $p < 0{\cdot}0005$) but no change in scores for those in the distraction condition ($t = 1{\cdot}1$, df = 17, $p = 0{\cdot}28$).

Interactions between trait rumination and induced response styles

The results of the regression analyses to check if levels of trait rumination had influenced the effect of the response inductions are presented in Table 4.

VAS depression in patients at Time 2 was predicted only by VAS depression at Time 1 and Induction with 53% of variance being explained ($r = 0{\cdot}73$). For control subjects, only VAS depression at Time 1 made a significant prediction accounting for 62% of variance ($r = 0{\cdot}79$).

Problem-solving in patients at Time 2 was predicted by problem-solving at Time 1, Induction and the trait rumination × Induction interaction with 37% of variance explained ($r = 0{\cdot}61$). Partial correlations for the rumination and distraction conditions separately indicated a significant negative correlation between problem-solving and trait rumination in the distraction condition ($r = -0{\cdot}43$, $p = 0{\cdot}04$). The relationship was not significant in the rumination condition ($r = 0{\cdot}28$, $p = 0{\cdot}13$). These findings suggest that high levels of trait rumination interfered with the ability of the distraction induction to improve problem-solving. When the regression procedure was repeated on the control subject data, only problem-solving at Time 1 was in the model accounting for 54% of the variance ($r = 0{\cdot}73$).

DISCUSSION

The main clinical findings were that for patients with major depression: (1) both trait and induced rumination had a detrimental effect on mood and problem-solving; (2) trait distraction had no effects; and (3) induced distraction improved mood and, providing patients were not already ruminating at a high level, also improved problem-solving.

Before considering the findings further, it is worth noting the limitations of the present study and the unexpected results.

A major problem for research on depression is the high levels of anxiety found in depressed patients (Clark, 1989). The present study is no exception. Thus it is possible that the reason why the response inductions had an effect on the depressed but not the control group was that the patient group had higher levels of anxiety rather than depression. It is important to note however that anxiety levels do not explain the differential effects of the response inductions on mood and problem-solving within the depressed group as patients in the rumination and distraction conditions had equivalent BAI scores.

The present study did not attempt to identify mediating variables in the relationships between induced response styles and mood and problem-solving. Consequently, when considering the

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Table 4. *Details of simultaneous multiple regressions to test hypothesis 3*

Dependent variable	Regression					Predicting variable	*B*	S.E.	*t*	*p*
	R	R^2	*F*	df	*p*					
VAS-Dep patients	0·73	0·53	8·81	4, 31	<0·0005	VAS Dep @ T1	0·47	0·13	3·67	0·001
						Trait rum				N.S.
						Induction	39·1	18·6	2·11	0·043
						Tr rum × Induction				N.S.
VAS-Dep controls	0·79	0·62	12·5	4, 31	<0·0005	VAS Dep @ T1	0·82	0·15	5·49	<0·0005
						Trait rum				N.S.
						Induction				N.S.
						Tr rum × Induction				N.S.
Prob Solv patients	0·61	0·37	4·46	4, 31	0·006	Prob Solv @ T1	0·58	0·19	3·02	0·005
						Trait rum				N.S.
						Induction	4·77	1·66	2·88	0·007
						Tr rum × Induction	0·09	0·05	1·99	0·050
Prob Solv controls	0·73	0·54	9·06	4, 31	<0·0005	Prob Solv @ T1	0·56	0·10	5·70	<0·0005
						Trait rum				N.S.
						Induction				N.S.
						Tr rum × Induction				N.S.

VAS-Dep, VAS depression at Time 2; Prob Solv, Problem-solving at Time 2; Trait rum, Trait rumination; Trait dis, Trait distraction; Tr rum × Induction, Trait rumination × Induction interaction; N.S., non-significant.

findings it is worth bearing in mind that the relationships may not be direct and that other factors may be involved.

There are three main unexpected findings that bear mention. Firstly, the data for problem-solving at baseline showed that the depressed and control group did not differ. An explanation may be that in other studies of major depression the mean BDI scores were at least five points higher than in the present study (Marx *et al.* 1992: mean = 30·1; Goddard *et al.* 1996: mean = 31; Goddard *et al.* 2000: mean = 30·2; present study: mean = 24·3). Thus, it may be that group differences in problem-solving are only evident in patients with more severe depressive symptoms. However, this seems unlikely as differences in problem-solving have been found between controls and dysthymic individuals (Gotlib & Asarnow, 1979; Lyubomirsky & Nolen-Hoeksema, 1995). Furthermore problem-solving differences at baseline remained non-significant when the analysis was repeated only using data from patients with more severe depressive symptoms.

The second unexpected result was the absence of an overall enhancing effect of distraction on problem-solving in depressed patients. This finding does not concord with those of Lyubomirsky & Nolen-Hoeksema's (1995) study with dysphoric individuals. However trait rumination is higher in depressed compared to dysphoric individuals and, as was confirmed here, should have interfered more with the distraction induction.

Relatedly, the third set of unexpected findings concern the fact that high levels of trait rumination did not interact with the effects of all inductions on all outcome measures. To begin with, trait rumination interfered with the impact of the distraction induction on problem-solving but not mood. Part of the explanation here concerns the possibility that unlike the mood VAS, the problem-solving task, wherein patients are asked to analyse and provide solutions for hypothetical interpersonal problems, may have involved an element of rumination. If this were the case, then the task may have reactivated this information processing style more readily in habitual ruminators and cancelled out any problem-solving improvements caused by the distraction induction. The other issue here is that high levels of trait rumination did not hinder the rumination induction at all. These findings indicate that ceiling levels of rumination had not been reached prior to the inductions and suggest that, inducing rumination, that is, augmenting the existing thinking style, is a relatively straight forward procedure providing there is adequate spare capacity.

In terms of expected findings, the results have provided strong support for a relationship between rumination and poor mood and

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problem-solving and confirmed the lack of efficacy of self-applied distraction. Also, while the results have provided some support for the benefits of induced distraction they have also shown that background rumination can prevent strategies such as induced distraction from having their otherwise positive effects on skills such as problem-solving.

These findings have implications for clinical practice as they suggest that it will be important for psychological therapies for depression to explicitly target rumination and to do this early in treatment so as not to disable potentially useful coping strategies. Furthermore since it is likely that the relationship between rumination and problem-solving is bidirectional with deficits in problem-solving causing depressed patients to focus more on their internal state, interventions should also include training in problem-solving (cf. Nezu & Perri, 1989). This combination of reducing rumination and improving problem-solving may also help patients to tolerate and stay engaged with the problems and issues that need to be addressed during their recovery from depression.

One way of intervening with patients who ruminate at a high level would be to examine their rationale for engaging in this behaviour. Recent research has shown that people often perceive rumination as advantageous, for example they believe that rumination affords greater insight into their difficulties (Lyubomirsky & Nolen-Hoeksema, 1993) or makes them better problem-solvers (Watkins & Baracaia, 2001). Furthermore, a study by Papageorgiou & Wells (2001) showed that these positive beliefs were significantly correlated with the tendency to ruminate. These findings suggest that it may be possible to target positive beliefs about rumination and challenge their validity with cognitive behavioural techniques (e.g. comparing ruminative and non-ruminative periods in terms of insight and problem-solving). Other interventions which aim to reduce rumination are mindfulness based cognitive therapy (MBCT; Teasdale *et al*. 2000) and attention training (ATT; Wells, 1990) both of which have been shown to decrease the risk of relapse in patients with recurrent depression (Papageorgiou & Wells, 2000; Teasdale *et al*. 2000). These treatment studies provide further support for the idea that teaching individuals to disengage from ruminative thinking can improve their ability to manage periods of low mood.

The findings about the lack of efficacy of self-applied versus experimentally induced distraction are interesting as they suggest that formal distraction training may be indicated even for patients who self-distract. However this proposal implies that the type of distraction used in research trials is more sophisticated than the type of distraction used by patients themselves. This seems unlikely given the nature of the distraction techniques used in studies: reading distracting statements (Watkins *et al*. 2000); sorting cards into categories (Morrow & Nolen-Hoeksema, 1990), playing board games (the present study). Another difference between self-distraction and experimentally induced distraction is the person directing this response.

In Watkins & Baracaia's (2001) study, which tried to establish why people ruminate, many of the reasons offered centred on the theme of preventing future mistakes and problems. It has also been shown that depressed patients blame themselves for causing their mental health problems (Wall & Hayes, 2000) and that beliefs concerning personal responsibility for harm to oneself and others are associated with depressive mood in a non-clinical sample (Aardema *et al*. 1997). Thus it may be that when distraction is carried out on an experimenter's instruction, the responsibility for not ruminating, and therefore for ceasing attempts to prevent future mistakes, is assumed by the experimenter. Studies which explore the relationship between the tendency to ruminate and responsibility beliefs may help to elucidate this matter further.

Finally, in terms of the design of future research, the findings suggest that including a measure of trait rumination may be helpful in interpreting the results from experiments based on rumination and distraction inductions.

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