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BRIEF COMMUNICATION

Cognitive vulnerability in patients with bipolar disorder

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ABSTRACT

Background. No study has simultaneously explored key components of Beck's model of cognitive vulnerability to depression in people with bipolar disorders.

Methods. We compared 41 euthymic bipolar patients with 20 healthy control subjects. All subjects were assessed on the Hamilton Rating Scale for Depression, the Autobiographical Memory Test and the Mean Ends Problem-Solving procedure and also completed the Beck Depression Inventory, the Dysfunctional Attitude Scale, the Sociotropy Autonomy Scale and the Rosenberg Self-Esteem Questionnaire.

Results. In comparison to control subjects, patients with bipolar disorder demonstrated significantly higher levels of dysfunctional attitudes (particularly perfectionism and need for approval) and sociotropy, significantly greater over-general recall on an autobiographical memory test and significantly less ability to generate solutions to social problem-solving tasks. These between group differences remained significant when age, intelligence, latency to respond to autobiographical memory test cue words, and subjective mood ratings were included as co-variates in the statistical analysis. Within the patient group, cognitive dysfunction was significantly correlated with level of morbidity (as measured by number of previous illness episodes).

Conclusions. This study suggests that cognitive vulnerability in patients with bipolar disorder is similar to that described in unipolar disorders. It is not clear whether this dysfunction is a cause or an effect of repeated episodes of bipolar disorder. However, the findings may have implications for clinical treatment as well as suggesting a number of important new avenues of research into psychological models of affective disorder.

INTRODUCTION

Recent publications (Prien & Potter, 1990; Scott, 1995) have highlighted the poor outcome of bipolar disorder (BD) and the need to explore psychosocial as well as biological factors that may influence the course of BD. Such approaches proved critical in schizophrenia research, leading to the development of a more coherent stress-vulnerability model and paving the way for the introduction of cognitive therapy as an adjunct to medication. Few publications have explored psychological aspects of BD such as self-esteem (Winters & Neale, 1985), attributional style (Bentall *et al*. 2000), or coping skills (Lam & Wong, 1997), and no study has simultaneously assessed more than one cognitive vulnerability factor in bipolar patients.

This is the first study that explores whether cognitive variables purported to differentiate between healthy control subjects and individuals at risk of episodes of unipolar depression can also distinguish healthy controls from individuals at risk of BD. Beck's original cognitive theory (1976; Beck *et al*. 1979) suggested that individuals at risk of major depressive disorder are characterized by high levels of dysfunctional attitudes, and over-general negative thinking particularly in relation to their recall of auto-

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biographical material and their self-evaluation. Subsequently, Beck (1983) hypothesized that two personality dimensions, sociotropy (characterized by greater dependency on relationships with others) and autonomy (characterized by greater emphasis on independence and achievement), may be associated with different symptom profiles, different treatment responses and different triggering events for depressive episodes. A further cognitive deficit identified in populations of depressed patients is poor problem-solving ability (Marx *et al.* 1992), and Evans *et al.* (1992) found that subjects who exhibited over-general memory recall were less effective at solving social problems.

This paper represents part of a larger project examining cognitive and neuropsychological predictors of outcome in BD. This study compares cognitive functioning and deficits in healthy control subjects with those of euthymic BD patients.

METHOD

Subjects

Forty-one patients gave informed consent, met DSM-IV criteria for bipolar 1 disorder (American Psychiatric Association, 1994) for a minimum of 5 years, were currently assessed as euthymic and were receiving regular prophylactic medication. Patients scoring seven or more on the Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960) and/or 20 or more on the Manic State Scale (MSS; range, 0–60; Bech *et al.* 1976) were excluded, as were individuals with rapid cycling disorder, substance misuse, or psychiatric or physical co-morbidity.

Twenty healthy adult volunteers were recruited from spouses and friends of the patients. The control group all gave informed consent and showed a similar distribution of age, gender, intelligence and social situation, but they did not have a current or past psychiatric history, did not have a family history of affective disorder and did not meet any other exclusion criteria.

Materials

Basic demographic information was noted for all subjects. In the BD group, information about duration of illness and number of episodes of depression, hypomania and mania was also recorded. Patient and control group subjects then completed a package of mood and cognitive style measures presented in a standardized format. (A battery of neuropsychological tests was also administered, but is not reported here.) The following questionnaires were used.

(*i*) *Beck Depression Inventory* (*BDI*)

This is a 21-item self-rating questionnaire used to assess the severity of depressive symptoms (Beck *et al.* 1961).

(*ii*) *Intelligence Quotient* (*IQ*)

IQ was calculated from scores on the National Adult Reading Test (NART; Nelson, 1982). Intellectual functioning was included as age and IQ may influence autobiographical memory recall and problem-solving.

(*iii*) *Autobiographical Memory Test* (*AMT*)

This test contains ten cue words, five positively toned (e.g. pleased, amazed) and five negatively toned (e.g. grief, awful) taken from a study by Brittlebank *et al.* (1992). The words were presented in a random order. For each word subjects were instructed to describe a specific personal memory they associated with the cue word. The test is robust and results are not influenced by medication use, although recent research has questioned whether responses are influenced by age or IQ (Williams, 1992).

Subjects were allowed to practice the procedure until they understood the requirement to be specific, i.e. memories of one particular event or occasion. Scores for each set of cue words (either positive or negative) were combined to calculate specificity and latency of recall. As in previous research (e.g. Brittlebank *et al.* 1992), overall specificity was also calculated by measuring the ratio of specific to non-specific responses for all ten cue words.

(*iv*) *Dysfunctional Attitude Scale* (*DAS*)

Dysfunctional beliefs were assessed using the 40-item version of the DAS (Weissman, 1979). Total scores range from 40 to 280, with higher scores representing more dysfunctional beliefs. Scores on three subscales (global, need for approval and perfectionism) were also assessed.

(*v*) *Sociotropy–Autonomy Scale* (*SAS*)

The SAS was developed by Beck *et al.* (1983) to assess sociotropy and autonomy. Scores for each construct range from 0 to 120 with higher

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scores indicating higher levels of that particular trait.

(*vi*) *Rosenberg Self-Esteem Questionnaire* (*SEQ*)

The SEQ (Rosenberg, 1965) comprises five positive and five negative items which are each rated on a 1–4 scale. Positive and negative ratings are combined; high positive scores indicate higher self-esteem.

(*vii*) *Means–Ends Problem-Solving* (*MEPS*) *Procedure*

The MEPS procedure (Platt & Spivack, 1975) is used to measure thinking ability in social problem-solving. As proposed by Marx *et al.* (1992), subjects were asked to 'find the ideal strategy' for a third person to overcome four social problems. Responses were scored for the number of steps (relevant means) identified by the subject that helped resolve the problem situation. Using Marx *et al.*'s (1992) criteria the experimenter rated each strategy for effectiveness on a 3-point Likert scale (0 = 'not effective at all', 1 = 'effective', 2 = 'very effective'). Patients and controls also rated effectiveness on this scale to provide a subjective measure of problem-solving ability. Ratings for each scenario were then added together to give a total score for relevant means, observer rated effectiveness and subjective effectiveness.

Statistics

As well as simple descriptive analyses, multivariate analyses were also undertaken using age, intelligence, mood self-ratings, and latency to respond to AMT cue words as covariates. Backward step-wise logistic regression was used to identify cognitive variables that best classified subjects as healthy controls or patients with BD. In the BD group, Pearson product moment correlations and partial correlations (controlling for age, IQ, BDI score and latency to respond to AMT cues) were used to assess patterns of association between variables.

RESULTS

Comparison of bipolar disorder and healthy control groups

The BD group comprised of 27 females (67%) and 13 males with a mean age of 44·7 years (S.D. 10·5) and a mean IQ of 110 (S.D. 9·8). The healthy control group comprised of 11 females (55%) and nine males with a mean age of 42 years (S.D. 14·6) and a mean IQ of 111·5 (S.D. 5·7). Ratings on the HRSD and MSS confirmed that both groups met observer criteria for euthymia. The median HRSD scores in the BD and the control group were 3 and 1 respectively, while the median MSS scores were 5 and 4 respectively. However, mean BDI scores were significantly higher (ANOVA; df 1, 60; $F = 11{\cdot}3$; $P < 0{\cdot}001$) in the BD (mean 7·7; S.D. 6·7) as compared to the control group (mean 2·4; S.D. 3·0).

On the AMT, the BD group were non-significantly slower (mean latencies: positive cues = 77·5 s; negative cues = 75·9 s) than the control group (mean latencies: positive cues = 68·8 s; negative cues = 60·8 s) to recall autobiographical memories in response to cue words. In comparison to control subjects, BD patients showed significantly less specificity in their memory for personal events in response to positive and negative cue words (see Table 1). The ratio of specific to non-specific memories was 0·71 (S.D. 0·17) in the BD group and 0·81 (S.D. 0·16) in the control group (ANOVA; $F = 5{\cdot}1$; df 1, 59; $P < 0{\cdot}03$). This difference was significant when an ANCOVA was undertaken using age, IQ, BDI score and latency to respond to AMT cues, as co-variates ($F = 4{\cdot}2$; df 5, 55; $P < 0{\cdot}04$).

Mean scores on the DAS (BD = 132·7, S.D. 34·8; control = 104·4, S.D. 16·2) showed significant between group differences ($F = 11{\cdot}9$; df 1, 59; $P < 0{\cdot}001$). Higher mean scores in the BD group as compared to the control group were particularly marked on the Perfectionism subscale (BD group = 44·9; control group = 27·3; $F = 28{\cdot}2$; df 1, 59; $P < 0{\cdot}0001$), with a similar pattern on the Approval subscale (BD group = 34·7; control group = 27·1; $F = 7{\cdot}4$, df 1, 59; $P < 0{\cdot}01$). Differences in Perfectionism were also significant when an ANCOVA was undertaken using age, IQ and BDI as co-variates ($F = 13{\cdot}9$; df 4, 55; $P < 0{\cdot}001$).

Mean scores on the SAS again demonstrated between group differences, with BD subjects showing higher mean levels of sociotropy (BD = 68·9; control = 58·4) and autonomy (BD = 68·6; control = 63·4) than healthy control subjects. The between group for mean scores on the sociotropy subscale was statistically significant

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Table 1. *Demographic and cognitive measures in control subjects and patients with bipolar disorder*

Variable	Control group ($N = 20$)	Bipolar disorder group ($N = 41$)	ANOVA P
Gender (M:F)	45%:55%	33%:67%	—
Mean age (S.D.)	42·0 (14·6)	44·7 (10·5)	—
Mean IQ (S.D.)	111·5 (5·7)	110 (9·8)	—
Mean BDI score (S.D.)	2·4 (3·0)	7·7 (6·7)	< 0·001
Mean AMT scores (S.D.)			
Latency for +ve cues (s)	68·8 (34·4)	77·5 (33·3)	—
Latency for −ve cues (s)	60·8 (33·4)	75·9 (26·8)	—
Specificity ratio	0·81 (0·16)	0·71 (0·17)	< 0·03
Mean DAS scores (S.D.)			
Total DAS	104·4 (16·2)	132·7 (34·8)	< 0·001
Perfectionism Subscale	27·3 (7·5)	44·9 (13·9)	< 0·0001
Approval Subscale	27·2 (6·1)	34·7 (11·6)	< 0·01
Mean SAS scores (S.D.)			
Sociotropy	58·4 (13·6)	68·9 (17·3)	< 0·02
Autonomy	63·4 (10·9)	68·7 (17·3)	—
Mean SEQ score (S.D.)	9·2 (5·1)	5·3 (8·2)	—
Mean MEPS scores (S.D.)			
Relevant means	11·3 (3·0)	9·3 (3·1)	< 0·02
Observer-rated effectiveness	4·5 (1·3)	4·3 (2·1)	—
Self-rated effectiveness	5·6 (1·6)	5·0 (1·8)	—

AMT, Autobiographical Memory Test; DAS, Dysfunctional Attitudes Scale; SAS, Sociotropy Autonomy Scale; SEQ, Self-Esteem Questionnaire; MEPS, Means Ends Problem-Solving Scale.

using ANOVA ($F = 5·7$; df 1, 59; $P < 0·02$) and ANCOVA ($F = 4·8$; df 4, 55; $P < 0·04$). In comparison to healthy controls, BD subjects had a non-significantly lower mean level of self-esteem (BD = 5·3; control = 9·2).

Scores on the MEPS demonstrated that BD subjects generated significantly fewer relevant means for solving problem situations than control subjects (mean scores – BD = 9·3; control = 11·3; $F = 5·6$; df 1, 57; $P < 0·02$). However, the solutions suggested were regarded as equally effective on objective ratings (mean BD group = 4·3; mean control group = 4·5) and subjective ratings (BD = 5·0; control = 5·6).

Cognitive variables as predictors of group classification

Backward step-wise logistic regression was used to determine the combination of cognitive and personality variables that best predicted group membership. A model using the Perfectionism subscale score from the DAS (odds ratio (OR) 3·7; 95% confidence interval (CI) 1·8 to 28·6; $P < 0·001$) and the specificity ratio of the AMT (OR −2·2; 95% CI −1·4 to −12·9; $P < 0·04$) correctly classified 84% of subjects into the BD or control group ($\chi^2 = 36·1$; $P < 0·001$). This model had a sensitivity of 80% and a specificity of 86%.

The pattern of cognitive vulnerability within the bipolar disorder group

In the BD group, the median duration of illness was 16 years (range 5–36) and the median number of episodes of BD was 6 (depression = 4; hypomania/mania = 2). Pearson product moment correlations demonstrated that higher BDI scores were associated with longer duration of illness ($r = 0·29$; $P < 0·05$) and greater number of episodes of BD ($r = 0·56$; $P = 0·01$).

The association between poor problem-solving skills and over-general memory was investigated in BD subjects using partial correlation techniques that controlled for self-rated severity of depressive symptoms on the BDI, latency to respond to AMT negative cues, age and IQ level. Partial correlation coefficients demonstrated that greater overgenerality of autobiographical memory was significantly correlated with lower MEPS ratings of number of relevant means for solving a problem ($r = 0·37$; $P = 0·01$), lower observer rated effectiveness ($r = 0·41$; $P = 0·004$) and lower self-rated effectiveness ($r = 0·35$; $P = 0·01$). Partial correlation

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coefficients for sociotropy and problem-solving effectiveness were also significantly negatively correlated (with observer rating, $r = 0{\cdot}3$; $P = 0{\cdot}04$; with subjective rating, $r = 0{\cdot}34$; $P = 0{\cdot}02$). Using the same partial correlation variables, number of episodes of BD were also significantly correlated with: fewer relevant means ($r = -0{\cdot}64$; $P = 0{\cdot}01$), lower subjective effectiveness ($r = -0{\cdot}6$; $P = 0{\cdot}02$), lower observer rated effectiveness ($r = -0{\cdot}52$; $P = 0{\cdot}04$), and higher levels of sociotropy ($r = 0{\cdot}54$; $P = 0{\cdot}03$). Further analysis demonstrated a significant association between number of episodes and low self-esteem ($r = -0{\cdot}56$; $P = 0{\cdot}03$). A similar pattern of partial correlations was found between duration of illness and cognitive and personality variables.

DISCUSSION

This study represents a cross-sectional analysis of a convenient sample of patients with BD. The design has obvious drawbacks and it is not possible to establish whether the statistical associations demonstrated between cognitive and illness variables represent cause or effect. However, there are three key findings that have theoretical and clinical implications. First, a substantial proportion of patients with BD report significant levels of residual depressive symptoms (30% had BDI scores > 10) despite being rated as euthymic by clinicians and observer ratings (HRSD and MSS), and having high levels of adherence with prophylactic medication. Secondly, even when level of self-rated depression and other potential confounding factors are taken into account, the cognitive patterns and deficits identified in patients with BD (in comparison to healthy control subjects) show a marked similarity to those identified in patients at risk of recurrent unipolar depression. Thirdly, within the BD group, there was a significant association between higher level of morbidity and higher level of cognitive dysfunction.

As with subjects vulnerable to unipolar depression, patients with BD did not possess, or were unable to access, problem-solving strategies (Platt & Spivack, 1975). This study also confirmed the findings of Evans *et al*. (1992), that subjects who were more overgeneral in their memory retrieval were the least effective at providing solutions to social problems. Evans *et al*. (1992) reported that this deficiency was not to be due to general slowness in responding nor to side-effects of medication and appeared to be a trait rather than a state deficit. We also found that higher levels of sociotropy were significantly correlated with poor problem-solving skills and greater morbidity. Hammen and colleagues (1992) reported that increased symptom levels in BD patients with high levels of sociotropy may arise because the individual fails to cope effectively with the consequences of a significant life event. In depression, higher levels of sociotropy have been found to predict poorer response to medication alone and greater number of illness episodes (Peselow *et al*. 1992).

This study showed that perfectionism and overgeneral memory were the most robust predictors of group membership (BD or control). Scott (1995) noted high levels of perfectionism as an underlying personality trait in BD and highlighted that this may adversely affect individuals' ability to accept the disorder and to adhere to medication. Also, difficulties in retrieving personal memories of specific events are a well-documented cognitive deficit associated with depression (Williams & Scott, 1988). As noted, over-general autobiographical memory may play a role in the maintenance of affective disorder because specific memories of how the individual coped with past situations are less accessible, and cannot be utilized to cope with current problems (Evans *et al*. 1992). Consequent feelings of hopelessness and the accumulation of unresolved stressors serve to maintain depression, while hypersensitivity to affective aspects of situations further contribute to indistinct encoding of memories (Williams, 1992).

It was shown that cognitive abnormalities in the BD group were more marked in patients with longer duration of illness and more frequent episodes of disorder. Coherent arguments can be proposed that suggest prolonged illness leads to higher levels of dysfunctional attitudes and other cognitive abnormalities, while an equally cogent hypothesis suggests that pre-morbid cognitive deficits can lead to poor prognosis BD. It will be important to determine cause and effect if we are to ascertain the role of cognitive abnormalities in the aetiology of BD. This study begins this important new area of research, but it will need to be developed further if we are to explain how cognitive abnormalities in euthymic

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bipolar patients evolve into the different affective, biological, behavioural and cognitive features seen in acute depressive and hypomanic episodes.

At a pragmatic level, the study highlights the need to expand the treatment options available in BD (Goodwin & Jamison, 1990). In unipolar disorders there is evidence that drug treatments alone do not reverse deficits in memory specificity or problem solving skills (Scott *et al*. 1996), and that certain dysfunctional attitudes (often associated with perfectionism and need for approval) remain active even after depressive symptoms have responded to medication (Reda *et al*. 1985). It may be that additional problem-solving and cognitive strategies that have been shown to be beneficial in improving the outcome of unipolar disorders may also be useful for similar abnormalities found in BD populations.

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