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A preliminary investigation of the effect of hypomanic personality on the specificity and speed of autobiographical memory recall

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There is some evidence that patients with bipolar disorder recall more overgeneral than specific autobiographical memories, a pattern widely reported in depression. However, there are also theoretical arguments (Barnard, Watkins, & Ramponi, 2006) suggesting that experiential processing should predominate during mania/hypomania, with an associated prediction of an increase in specific rather than overgeneral memories. This hypothesis was explicitly tested using the Autobiographical Memory Test (AMT). The specificity and speed of autobiographical recollection was compared for those with high or low levels of hypomanic personality as indexed by the Hypomanic Personality Scale (HPS). High HPS scorers recalled specific autobiographical memories in response to unpleasant cues more frequently and faster than low scorers. These results provide partial support for the hypothesis, but only for unpleasant cues.

Bipolar disorder, which affects 1–1.5% of the population (Bebbington & Ramana, 1995), is a mood disorder characterised by repeated episodes of depression and mania or hypomania. Mania includes symptoms such as elevated mood, grandiosity, decreased need for sleep, pressure of speech, flights of ideas, increased goal-directed activity, and excessive involvement in risky activities (APA, 2000). Hypomania involves the same symptoms but without significant impairment in functioning. Hypomanic personality characteris-

tics, which can be found in healthy members of the population, include being energetic, working long hours with little sleep, and tackling numerous commitments within the same time period (Eckblad & Chapman, 1986). Hypomanic personality is also associated with significant negative outcomes, including higher rates of substance and alcohol use, more depressive episodes, and lower rates of engagement on work-related tasks (Eckblad & Chapman, 1986; Krumm-Merabet & Meyer, 2005; Meyer, Rahman, & Shepherd,

2007). Furthermore, high levels of hypomanic personality were predictive of transition to bipolar disorder and substance use disorders in a 13-year follow-up study (Kwapil et al., 2000).

Individuals with mood disorders often exhibit a broad range of cognitive deficits. For example, impairments in memory, attention, visuospatial function, and choice reaction time have all been reported during mania and depression (Clark & Sahakian, 2005). Previous research has demonstrated that depressed patients named the colour of depression-relevant words, such as ''sadness'' and ''failure'', on a Stroop task more slowly than emotionally neutral words (Williams & Broadbent, 1986a). Following this, Bentall and Thompson (1990) found that students who scored highly on a hypomanic personality questionnaire also had delayed reaction time for colour naming of depression-related, but not euphoria-related, words. These results appeared to indicate that depressive processes may play a key part in the vulnerability for bipolar disorder: a proposal supported by the finding that depressive processes can also be observed in bipolar patients who are currently in remission (Scott, Stanton, Garland, & Ferrier, 2000; Winters & Neale, 1985).

Dysfunctional beliefs are also thought to contribute to the susceptibility for depression and mania. According to Beck (1977), underlying negative schemata distort cognitive beliefs about the self and external events, which leads to depressogenic thinking styles. Goldberg, Wenze, Walker, Steer, and Beck (2005) compared the dysfunctional cognitions of unipolar depressed patients and bipolar manic or hypomanic patients to a control group. The bipolar manic group rated cognitions associated with mania, such as excitement and risk taking, higher than both the unipolar depressed group and controls. Although these results suggest maladaptive attitudes may be a risk factor for mania and hypomania, other studies have found that both unipolar and bipolar disorder groups show elevated levels of dysfunctional thinking compared to controls, but do not differ significantly from each other (Jones et al., 2005; Lam, Wright, & Smith, 2004)

The extent to which memory functioning is affected in depression has been a longstanding issue (Blaney, 1986), and more recently some attention has been directed at memory functioning in mania (see e.g., Clark & Sahakian, 2005; Murphy & Sahakian, 2001; Quraishi & Frangou, 2002). Specifically, biases in memory recall that may contribute to mood disorders have been of interest, with particular reference to the specificity of autobiographical recollection (Williams et al., 2007).

Autobiographical memory is a form of hierarchically organised episodic memory, containing events that have occurred in a person's life (Conway, 1996; Conway & Rubin, 1993). It is widely believed that mood state facilitates the recall of mood-congruent memories. Conway and Pleydell-Pearce (2000) argue that autobiographical memories are a fundamental component of the experience of emotions and consist of three hierarchical levels of specificity: lifetime periods, general events, and event-specific knowledge (ESK). Together these form an autobiographical knowledge base. The broadest level of memory, lifetime periods, consists of general thematic and temporal knowledge of common aspects of a distinct time period, e.g., ''*when I was in school*''. The next level, general events, is more specific and heterogeneous than lifetime periods. General events encompass repeated and single events, often featuring goal-attainment knowledge, which form thematically related event clusters (e.g., ''*when I play golf*''). Contextualised within the general events is the most specific level of memory, ESK. ESK often involves visual imagery and is thought to be the defining feature of memory vividness. Thus, according to this model, specific knowledge is located within the wider autobiographical system.

Researchers have found that during clinical depression, autobiographical memory recall is typically overgeneral (Park, Goodyer, & Teasdale, 2002; Williams & Broadbent, 1986b): memories only refer to general descriptions of events rather than specific events and the associated ESK. According to Conway and Pleydell-Pearce's model, this occurs because retrieval is stopped at the general level. Once categories of information have been recalled, the search for specific information is curtailed. This is argued to protect the self from the threat of recalling negative self-referring information. Additionally, Williams and Scott (1988) suggested that overgeneral encoding of memories may contribute to dysfunctional recall during depressive episodes. If fewer specific details are encoded, then fewer will be available when recall is attempted.

An alternative explanation, the rumination hypothesis, proposes that ruminative self-focus upon symptoms and their consequences contributes to and maintains the retrieval of overgeneral memories during depression, thereby

exacerbating the depressive symptoms (Williams, 1996). In support of this claim, Park, Goodyear, and Teasdale (2004) found that rumination in adolescents with first-episode major depressive disorder increased depressed mood and the recall of overgeneral memories, whereas distraction helped to minimise these symptoms. Therefore overgeneral autobiographical memory recall is both a symptom of depression and may also exacerbate the condition itself.

One general account of the effects of mood on memory focuses on representations of meaning and how attention to meaning is allocated among them. The Interacting Cognitive Subsystems model of depression (ICS; Barnard & Teasdale, 1991; Teasdale & Barnard, 1993) suggests that central executive functions are affected by bidirectional interactions between two subsystems that process different types of meaning: propositional and implicational. The propositional subsystem processes specific semantic relationships between concepts. The implicational subsystem creates abstract, generic, personal schematic models by combining the products of processing current and stored propositions, with the products of distal and bodily sensations. These models are linked to the experience of emotion. The ICS account of depression holds that these states are linked to a form of processing "interlock" where relatively undifferentiated schematic models of the self are continually regenerated in the dialogue between these two levels of meaning. The interlocked state is in part sustained because attention is predominantly focused at the propositional level of meaning, with relatively little attention directed at more extensive processing of schematic model content. In contrast, it has been argued that manic states are allied with attention to meaning being predominantly focused on schematic model content (Barnard, 2004).

Evidence consistent with the wider proposal for differential attention to two types of meaning in normal healthy controls has been found both for language comprehension tasks (Scott, Barnard, & May, 2001) and for the attentional blink phenomenon (Barnard, Scott, Taylor, May, & Knightley, 2004). Further, in a computational model attention to these two levels of meaning derived from ICS provides a good fit to the attentional blink data where to be attended targets are semantic categories (Su, Bowman, & Barnard, 2007). Differential attention to two levels of meaning has also been related to recollection of word lists and to the specificity of autobiographical memory retrieval (Ramponi, Barnard, & Nimmo-Smith, 2004). The theoretical argument is relatively simple.

If the processing of specifically self-related information were to be biased in favour of attending to the implicational level, then relevant schematic models would be easily accessed and inter-related one to another, aiding comparison with stored information. This experiential mode of processing meaning would allow more detailed and differentiated propositions to be generated, thereby facilitating recovery of specific autobiographical memories. In contrast, if attention were biased to processing propositional meaning, then an analytical and evaluative form of thinking would prevail, focusing processing on examining discrepancies between the current and desired outcomes characteristic of rumination (Watkins, 2004). With attention focused predominantly at the level of propositional meaning, interpretation by the implicational subsystem proceeds relatively automatically, with less inter-relating and elaboration of schematic model content. This would result in greater reliance on generic relationships and, with that, fewer specific memories. In support of this, Ramponi et al. (2004) report that both schematic model differentiation and a ruminative response style predict specificity of autobiographical recollection.

Barnard et al. (2006) further tested the role of different modes of attending to meaning by creating a normal analogue of rumination. The generation of repeated, self-related, analytical thinking was compared to a schematic, experiential thinking style in healthy non-dysphoric controls. Continually generating material on the same self-related theme led to an increase in the proportion of overgeneral memories compared to specific memories. This result provided further support for a possible causal role for analytical self-processing in the production of overgeneral autobiographical memories. This led Barnard et al. (2006) to hypothesise that bipolar patients experiencing a depressed episode would exhibit overgeneral memory recall but would also display reduced levels of overgeneral memory during hypomanic episodes. It can be argued that, in hypomania, attention would be predominantly directed at implicational rather than propositional meanings. During this state, positive self-models are often produced and assigned extensive elaborative processing, creating what amounts to a positive feedback loop between the two levels of meaning (Barnard, 2004). With

relatively little attention directed at specific propositional meanings, discrepancies between them would pass unnoticed, much as they do in the "Moses illusion" (Erickson & Mattson, 1981). Under these circumstances differentiated schematic models would evolve with the potential to increase the specificity of autobiographical memory retrieval.

Many studies investigating the specificity of autobiographical memory recall have used the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986b) in which participants recall personal memories in response to positively and negatively valenced cue words. However, very few studies have investigated autobiographical memory recall in bipolar disorder. Using this method, Scott et al. (2000) reported higher levels of overgeneral autobiographical memory in euthymic bipolar patients compared with healthy controls. These findings appear to coincide with Barnard et al.'s (2006) prediction, as most "euthymic" bipolar patients have been found to exhibit subsyndromal depressive symptoms (Judd et al., 2003).

Mansell and Lam (2004) adapted the AMT to use cue words specifically relevant to bipolar disorder. They found that remitted bipolar patients recalled more general than specific memories, especially for a negative cue word, compared to a remitted unipolar group and healthy controls. Consistent with Conway and Pleydell-Pearce's (2000) suggestion that ESK involves visual imagery, specific memories were found to be more associated with images than general memories. Although this seems to conflict with Barnard et al.'s (2006) proposal that positive self-models are produced during mania, both Mansell and Lam's (2004) and Scott et al.'s (2000) studies assessed remitted individuals likely to be experiencing significant levels of depressive symptomatology.

Tzemou and Birchwood (2007) assessed the autobiographical memory recall of participants with bipolar disorder (two thirds in a manic episode, the other third depressed) and unipolar depression during an episode and after recovery, to overcome the problems with controlling for mood and illness phase. During episodes, bipolar and unipolar groups demonstrated more overgeneral recall than controls but did not differ from each other. At the follow-up, the bipolar group gave more specific responses to cue words and the unipolar group gave fewer specific responses to cues than during the original testing.

This pattern of results was mirrored when responses to positively valenced cues alone were considered. The groups did not differ for the number of specific responses to the negatively valenced cues. As the bipolar group included both currently manic and depressed participants, these results are unclear in relation to Barnard et al.'s (2006) prediction. Participants who experienced fewer traumatic intrusive memories produced more overgeneral memories, suggesting that it is the coping style used in response to the intrusions, rather than the processing style, that may account for the differences between bipolar and unipolar disorders.

In addition to examining the proportion of specific versus general autobiographical memories that are recalled, the AMT allows the speed of memory retrieval to be investigated which gives an indication of its availability. As the AMT incorporates both positively and negatively valenced cue words, comparing the latencies for the recall of pleasant and unpleasant memories could demonstrate which of these are more accessible.

In an early study, Williams and Broadbent (1986b) found that the depressed participants did not show a speeded retrieval of negative memories, as would be expected when considering the mood-congruency effect on memory recall (Teasdale, Taylor, & Fogarty, 1980), but rather demonstrated a slowed retrieval of positive memories. Williams and Scott (1988) found the same pattern of results using participants with a diagnosis of major depressive disorder. Similar results were also reported in the seminal study by Lloyd and Lishman (1975). They found a positive correlation between the speed of recall for unpleasant memories and severity of depression. However, to date no studies have investigated the speed of autobiographical memory recall in relation to mania or risk for bipolar disorder.

Recent evidence using a simple question-answering task and mood induction provides some support for the likely adoption of a more schematic and experiential mode of processing meaning in patients with bipolar disorder (Lomax, Barnard, & Lam, 2009). However, to the best of our knowledge, there is currently no clear evidence to support or refute Barnard et al.'s (2006) hypothesis regarding specificity of autobiographical memory in bipolar disorder or hypomanic personality. Additionally, no studies have looked at the speed of recall in relation to either.

In the current study an analogue sample of participants at high behavioural risk of hypomania (Kwapil et al., 2000), as indicated by their Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) score, will be compared to participants with low levels of hypomanic personality using the AMT to assess specificity and speed of memory recall. The original AMT, which comprises a series of emotional valenced cues, will be utilised rather than Mansell and Lam's (2004) adapted test, with just one positive and one negative cue word, as it allows for more reliable analysis of the specificity and speed of autobiographical memory retrieval. The use of non-clinical participants helps to overcome the problems associated with the effects of chronic illness and medication, often apparent in clinical samples. It also allows us to bypass any practical difficulties associated with testing patients in a full manic state where there may be many concurrent cognitive impairments (Murphy & Sahakian, 2001). Using an analogue sample does mean that the results could only indicate possible areas that may be useful to study in clinical samples, rather than giving direct insight into the processes involved in bipolar disorder. However, given that key characteristics in processing are shared, the prediction from the ICS model should nonetheless hold, with those at high behavioural risk of hypomania being more biased towards an experiential mode of processing meaning and hence more likely to recover specific autobiographical memories than those at low behavioural risk of hypomania.

METHOD

Design

Stage one involved a web-based screening process, using the HPS, to select participants. Two groups were selected, those with a high risk of developing bipolar symptoms (participants in the top quartile of all HPS scores, HPS score ≥ 22) and those with a low risk (participants in the bottom quartile of all HPS scores, HPS score ≤ 12), forming the control group.

Stage two of the study employed a between-groups experimental design involving two questionnaires and a memory test, with one independent variable (bipolar risk) with two levels (high or low). The dependent variable was the type of autobiographical memories recalled (specific or general).

Participants

In stage one an opportunity sample of 278 University of Manchester students, 75 male and 200 female (three undisclosed; mean age = 21.25, $SD = 4.83$, range 17–49 years) were recruited via email and completed an online HPS. Of these, 25 participants were excluded from the screening process due to missing or repeated data.

Of the screened participants, 111 gave contact details so that they could be invited to partake in stage two of the study (57 high-risk and 54 low-risk). Of these, 73 participants declined and 38 participants (21 high-risk and 17 low-risk) agreed to participate in an experimental session. From the high-risk group, 14 participants (4 male and 10 female; mean age = 22.0, $SD = 4.90$) were ultimately recruited as 7 participants failed to attend. From the low-risk group, 14 participants (2 male and 12 female; mean age = 19.64, $SD = 2.24$) were recruited as 3 participants failed to attend.

Materials

Hypomanic Personality Scale (HPS). The HPS (Eckblad & Chapman, 1986) is a 48-item true–false self-report measure of hypomanic personality style, containing statements that are either keyed true (''I seem to be a person whose mood goes up and down easily'') or keyed false (''I can usually slow myself down when I want to'') aimed at identifying those at risk of developing bipolar disorder. Eckblad and Chapman (1986) reported that 78% of high HPS scorers met SADS-L (Spitzer & Endicott, 1977) criteria for clinical hypomania compared with none of the controls. Individuals in late adolescence or early adulthood with elevated scores on the HPS have also been found to be at a heightened risk for DSM-IV diagnosis of bipolar disorder in adulthood (Kwapil et al., 2000). The HPS has a reported coefficient alpha reliability of 0.87 in an undergraduate sample and test–retest reliability of 0.81 after 15 weeks (Eckblad & Chapman, 1986).

Internal States Scale (ISS). The ISS (Bauer et al., 1991) is a 16-item self-report measure gauging self-perceptions about mood state over the past 24 hours, using a visual analogue scale format to assess manic and depressive symptom

severity simultaneously. Participants place an X along fifteen 100-millimetre lines running from "not at all, rarely" to "very much so, much of the time" in response to statements such as "Today my mood is changeable", to give a single summary of how they have felt over the last day. The last statement to be responded to is "Today I feel:" for which participants place an X along a 100-millimetre line labelled from "depressed/down" to "normal" to "manic/high". The ISS consists of four subscales measuring perceived conflict, sense of well-being, depression index, and activation level. The perceived conflict subscale, comprising 11 items such as "Today I feel irritable", measures the level of symptoms present that could occur as part of either mania or depression. The well-being subscale, including three items, e.g., "Today I feel energised", detects the presence of depression and is highly correlated ($r = .73$) with the Hamilton Depression Rating Scale (HDRS; Hamilton, 1960). The depression index subscale, also highly correlated with the HDRS ($r = .84$), contains two items—for instance, "Today I feel depressed"—that determine the severity of depressive symptoms. Finally, the activation subscale, including five items such as "Today I feel impulsive", correlates positively ($r = .60$) with the severity levels of manic symptoms as assessed by the Young Mania Rating Scale (YMRS; Young, Biggs, & Meyer, 1978). The subscales have a coefficient alpha for internal consistency of .81, .87, .92 and .84, respectively (Bauer et al., 1991).

Autobiographical Memory Test (AMT). The AMT (Williams & Broadbent, 1986b) is a verbally administered memory test that measures the tendency to recall either specific or general autobiographical memories. This test uses a set of 10 emotional cue words (taken from Robinson, 1976) to prompt autobiographical memory recall. Of the 10 words, 5 are pleasant ("happy", "safe", "interested", "successful", and "surprised") and 5 are unpleasant ("sorry", "angry", "clumsy", "hurt" [emotional], and "lonely"). Participants recall a specific personal memory related to the given word and then date when each memory occurred. Recalled memories are categorised as specific if the recalled event occurred at a particular time and place and lasted for less than a day. General memories are classified as repeated events or events that lasted longer than a day.

Procedure

The study was conducted in accordance with ethical guidelines of the University of Manchester following receipt of institutional ethical approval. In stage one, participants were invited to take part in the study via an email that directed them to a webpage. Participants provided demographic information and contact information (if they were willing to participate in stage two), and completed the HPS to enable selection of suitable high-risk and low-risk groups for the second stage.

Screened participants were individually recalled to complete stage two of the study. Participants completed the ISS followed by the AMT, which was verbally administered using the instructions given by Williams and Broadbent (1986b). Ten cue words were presented to participants by the experimenter, alternating between pleasant and unpleasant cues in a standard fixed order (happy, sorry, safe, angry, interested, clumsy, successful, hurt, surprised, lonely). Participants were given 1 minute in which to recall a specific personal memory in response to the word. The latency to the first word of the response made by the participant was recorded. If the recalled memory was not specific, the experimenter gave the prompt "Can you think of a specific time; one particular episode?". This prompt was repeated if the subsequent responses remained inappropriately general. In this case, the cumulative time (combining the first response time with the time taken from the last word of the prompt to the first word of the subsequent responses) was recorded. This method of measuring the cumulative time was used to avoid any confound with the time taken by the experimenter in prompting participants whose original response was not specific. If a specific memory was not recorded within the minute, a time of 60 seconds was recorded and the experimenter proceeded to the next item. After all 10 cue words had been presented the experimenter provided each word again in turn and asked the participant to date each of the memories as accurately as possible. If required, the participant was reminded of the memory they had recalled. These memories were coded, following Barnard et al. (2006), according to how long ago the memory took place on a 6-point scale: $1 =$ Less than a week ago, $2 =$ Less than a month ago, $3 =$ Less than three months ago, $4 =$ Less than six months ago, $5 =$ Less than a year ago, $6 =$ More than a year ago. The responses given by the

participants were tape-recorded so the memories could be categorised after the experiment had been completed. The timings and classification of the memories for the AMT by the experimenter were checked for reliability by an independent rater using a random sample of approximately 10% of the responses for each measure.

Analysis plan

All data that were not nominal were tested for deviation from the normal distribution using Kolmogorov-Smirnoff tests. Parametric statistical analyses were used where data were normally distributed. Skewed data were normalised using square root or log transformation. Where this was not effective, non-parametric tests were applied. Chi-square tests were used to analyse whether the groups differed on the demographic variables. Mann-Whitney U-tests and independent samples t-tests were conducted to compare the groups on the HPS and ISS measures. For the AMT, reliability of the latencies that were recorded by the experimenter and independent rater was checked using Spearman's rho correlations. The mean latencies were compared using Mann Whitney U-tests and agreement for memory classification was checked using a chi-square test and kappa test. To look for differences between the groups on measures of autobiographical memory recall one-way analyses of covariance, controlling for the current mood symptoms that differed between the groups (ISS perceived conflict and activation scales), were used except where data could not be normalised, in which case the Mann Whitney U-test was employed. One data set, corresponding to a high-risk participant's response to the cue word "Clumsy", was excluded as the participant did not understand the meaning of this word and therefore could not respond. The dates given by each group for the recalled memories were compared using independent samples t-tests and Mann Whitney U-tests. All tests were two-tailed.

RESULTS

Demographic variables

Table 1 shows the demographic variables (gender, mean age, previous contact with mental health services, and ethnicity) for the high-risk

TABLE 1
Demographic variables of high-risk and low-risk participants

Demographics	High-risk participants	Low-risk participants
Gender	4m/10f	2m/12f
Mean age (SD)	22.00 years (4.90)	19.64 years (2.24)
Previous service contact*	4 (28.57%)	1 (7.14%)
Ethnicity		
Asian/Asian British	2 (14.29%)	2 (14.29%)
Chinese/Other	2 (14.29%)	–
White	10 (71.23%)	12 (85.71%)

*Number of participants with previous contact with mental health services.

and low-risk groups. The groups did not differ on any of these variables.

The HPS scores were not significantly related to age, gender, previous contact with mental health services, or ethnicity. Only age related to whether participants had previously been in contact with mental health services.

Self-report measures

Table 2 shows the comparison of the self-report measure scores for the high-risk and low-risk groups. As intended, there was a significant difference between the hypomanic personality scores for the participants of the low-risk and high-risk groups ($U < 0.001$, $N_1 = 14$, $N_2 = 14$, $p < .001$). High-risk participants scored higher on the ISS perceived conflict, $t(26) = 3.938$, $p = .001$, and activation subscales, $t(26) = 2.162$, $p = .040$.

Autobiographical memory recall

Inter-rater reliability. A random sample of 10% of the AMT responses was analysed by an independent rater. The first response latencies recorded by the experimenter and rater were highly correlated ($rho = .966$, $N = 30$, $p < .001$), as were the cumulative response latencies ($rho = .979$, $N = 30$, $p < .001$). There were no significant differences between the latencies recorded by the experimenter and the independent rater for the first ($U = 400$, $N_1 = 30$, $N_2 = 30$, $p = .460$) or cumulative response times to recall of specific memories ($U = 399$, $N_1 = 30$, $N_2 = 30$, $p = .451$).

There was no significant difference between the raters for the classification of memories as "Specific" or "General" ($\chi^2 = 0.333$, $df = 1$,

TABLE 2
HPS and self-report scores of mood/coping strategies for high-risk and low-risk participants

Self-report measure	High-risk participants		Low-risk participants	
	Mean	SD	Mean	SD
HPS	28.43	4.82	8.07	3.83
ISS				
Perceived conflict	169.27	46.66	103.36	41.77
Well-being	136.29	29.28	149.43	46.23
Activation	197.21	83.16	130.16	80.95
Depression index	59.14	43.37	37.93	27.45

$p = .564$, 2-tailed). Within the sample, inter-rater agreement was 93.33% ($\kappa = 0.877$).

Category of memory recall. Table 3 illustrates the number of times each category of memory was recalled initially in response to the cue words. The total number of specific memories, general memories, and memories that were not recalled are shown. The comparisons of the categories of memories recalled for all the cue words as well as the pleasant and unpleasant words separately are also shown. The data for memories recalled in response to all the cue words required normalising using a square root transformation. The data for the pleasant memories could not be normalised.

No difference was found between groups in specificity of memories recalled for all the cue words combined, $F(1, 28) = 2.696$, $p = .114$. Also, a U test showed that there was no group difference for the pleasant cue words alone

($U = 84.500$, $N_1 = 14$, $N_2 = 14$, $p = .501$). In contrast, a higher proportion of specific memories were recalled by the high-risk group in response to the unpleasant cue words, $F(1, 28) = 5.400$, $p = .029$

Speed of memory recall

First response latencies. First response latencies are the times (in seconds) taken by participants to recall a memory in response to the cue words. The data for the first response latencies were normalised using a log transformation. Table 4 shows the mean first response latencies for each group.

The combined first response latencies for all cue words were significantly shorter in the high-risk group, $F(1, 23) = 4.494$, $p = .045$. The same pattern was also observed for first response times to unpleasant cue words, $F(1, 23) = 4.473$, $p = .045$. The first response latencies for pleasant cue

TABLE 3
Number of memories recalled

Category of memories recalled	High-risk participants		Low-risk participants		All participants	
	Mean	SD	Mean	SD	Mean	SD
All cue words						
Specific	7.71 (77.7%)	1.86	7.29 (72.9%)	1.33	7.50 (75.3%)	1.60
General	2.21 (22.3%)	1.72	2.36 (23.6%)	1.55	2.29 (22.9%)	1.61
Not recalled	0 (0.0%)	0	0.36 (3.6%)	0.50	0.19 (1.8%)	0.39
Pleasant cue words						
Specific	3.71 (74.3%)	1.27	4.07 (81.4%)	0.93	3.89 (77.9%)	1.10
General	1.29 (25.7%)	1.27	0.79 (15.7%)	0.80	1.04 (20.7%)	1.07
Not recalled	0 (0.0%)	0	0.14 (2.9%)	0.36	0.07 (1.4%)	0.26
Unpleasant cue words						
Specific	4.00 (81.2%)	0.96	3.21 (64.3%)	1.12	3.61 (72.7%)	1.10
General	0.93 (18.8%)	0.92	1.57 (31.4%)	1.22	1.25 (25.2%)	1.11
Not recalled	0 (0.0%)	0	0.21 (4.3%)	0.43	0.11 (2.2%)	0.31

Number of memories of each category recalled for all cue words, pleasant cue words, and unpleasant cue words for high-risk, low-risk, and all participants.

TABLE 4
First response latencies for high-risk participants, low-risk participants, and total for all participants (seconds)

Cue word	High-risk participants		Low-risk participants		All participants	
	Mean	SD	Mean	SD	Mean	SD
All cue words	8.83	8.46	14.00	14.72	11.42	12.27
Pleasant cue words	9.01	9.26	14.00	14.09	11.50	12.14
Unpleasant cue words	8.65	7.63	14.00	15.43	11.34	12.45

words were not significantly different between the two groups, $F(1, 24) = 3.462$, $p = .075$, but showed a trend towards the high-risk group recalling memories in response to the pleasant cue words faster than the low-risk group.

Cumulative response latencies. Cumulative response latencies represent the time (in seconds) taken by participants to recall a specific memory for each word. This time is either equivalent to the first response latencies if a specific memory was recalled directly in reply to a cue word, or consists of the first response latency combined with the subsequent time(s) taken to recall a specific memory after the prompt(s). The data for the cumulative response latencies were normalised using a log transformation. Table 5 shows the

mean cumulative response latencies for the each group.

A significant difference between the groups for the total cumulative latencies taken to reach specific memories for all the cue words was found, $F(1, 23) = 4.976$, $p = .036$, with the high-risk group recalling specific memories more quickly. The high-risk group also recalled specific unpleasant (but not pleasant) memories significantly faster than the low-risk group, $F(1, 23) = 7.456$, $p = .012$.

Recency of recalled memories

There were no significant differences found between the recency of the memories that were

TABLE 5
Cumulative response latencies for high-risk, low-risk, and all participants (seconds)

Cue word	High-risk participants		Low-risk participants		All participants	
	Mean	SD	Mean	SD	Mean	SD
All cue words	11.43	12.38	16.90	17.05	14.18	15.13
Pleasant cue words	12.58	14.41	15.98	15.60	14.28	15.06
Unpleasant cue words	10.27	9.89	17.83	18.46	14.08	15.26

TABLE 6
Recency scores for recalled memories

Cue word	High-risk participants		Low-risk participants		Total	
	Mean	SD	Mean	SD	Mean	SD
Happy	2.57	1.95	3.64	2.10	3.11	2.06
Safe	2.92	1.98	3.57	2.28	3.25	2.12
Interested	2.14	1.56	2.29	2.23	2.21	1.89
Successful	3.29	1.68	3.50	1.87	3.39	1.75
Surprised	3.64	1.82	3.57	2.21	3.61	1.99
Sorry	3.21	1.97	2.79	2.29	3.00	2.11
Angry	3.50	2.03	2.79	2.26	3.14	2.14
Clumsy	2.21	1.97	2.57	2.06	2.39	1.99
Hurt	4.00	1.92	4.00	2.45	4.00	2.16
Lonely	2.86	1.96	3.93	1.98	3.39	2.01

given by each group for any of the cue words. Table 6 shows the mean recency scores for each of the cue words for each group.

DISCUSSION

Many studies have reported overgeneral memory biases in depression. To date, the specificity of autobiographical memory recall in bipolar disorder has been studied very little. Investigations by Scott et al. (2000) and Mansell and Lam (2004) suggest that remitted bipolar patients (likely to be experiencing subsyndromal symptoms of depression) recalled more general than specific memories, especially for negative memories. Tzemou and Birchwood (2007) found that a mixed group of acutely depressed or manic bipolar patients recalled overgeneral memories, but gave more specific memories when not in an episode. The present results extend these findings by demonstrating that increased specificity can occur in response to negative cue words in a group at high risk of developing the condition. In addition, previous research has found that depressed patients are slower at retrieving positive memories than controls, rather than being faster at retrieving negative memories (Williams & Broadbent, 1986b; Williams & Scott, 1988). The current experiment shows the opposite pattern. Our high-risk group exhibited not just increased availability of specific memories to unpleasant cue words but also more rapid access to them.

Demographic variables

As HPS scores were not related to the demographic variables the groups were comparable, as they only differed in levels of hypomanic personality; i.e., there were no extraneous socio-economic factors that could have influenced the results. There were no confounds due to previous treatment that could have affected memory retrieval, as only age related to the number of previous contacts with mental health services, which is as would be expected during the course of a lifetime. Although not significantly different, the high-risk group had a greater number of previous contacts with mental health services than the low-risk group, which may prove to be consistent with their status as ''high risk'' but cannot be determined with the size of the current sample.

One factor that was not formally screened for was the linguistic fluency of participants. This variable would be worth investigating in a larger-scale replication of the present research in case differential fluency might impact on performance.

Self-report measures

The self-report measures were consistent with the assumption that the high HPS scorers share some processing characteristics with the clinical symptoms of mania. This group reported significantly more putatively mania-related mood symptoms (ISS perceived conflict and activation) than low scorers. Importantly, they did not differ in terms of depressive symptoms (ISS well-being or depression index). However, as the subscales measuring depressive symptoms had few items compared to the subscales measuring manic symptoms, it is possible that more subtle differences in depressive symptoms might have been missed.

Autobiographical Memory Test

The effect of hypomanic personality on the specificity of autobiographical memory recall was analysed by comparing the categories of memories retrieved in response to the AMT cue words by each group. There was no reliable effect of hypomanic personality on the specificity of recall of pleasant memories or of the memory set overall. In contrast, high-risk participants recalled more specific unpleasant memories than the low-risk group. The proportions of specific memories recalled by each group suggests that there may have been an interaction between cue word valence and group; i.e., the proportion of specific memories recalled in response to pleasant cue words by the high-risk group (74.3%) is lower than that for the low-risk group (81.4%), whereas the opposite is true for unpleasant memories (81.2% for the high-risk group compared to 64.3% for the low-risk group). However, this could not be tested, as the data set for the pleasant cue words could not be normalised.

The overall pattern is consistent with an experiential thinking style in the high-risk group that is marked only when processing unpleasant cues. This partially supports Barnard et al.'s (2006) prediction that the processing mode is focused on an experiential mode of attending to

implicational meanings during (hypo)mania. In this context, it is perhaps significant to note that our high-risk group did not show elevated levels of well-being but did show elevated levels of perceived conflict and activation relative to the low-risk group. This opens up the possibility that the high-risk group could have been no more likely than the low-risk group to have been elaborating positive self models at or around the time of test, with consequential lower availability of specific information relevant to positive cues.

The results contrast with Scott et al.'s (2000) and Mansell and Lam's (2004) findings indicating that remitted bipolar patients (likely to be experiencing subsyndromal symptoms of depression) recall more general than specific memories, particularly negative memories, than healthy controls and remitted unipolar patients. Consistent with the possibility of a mood-related effect, Mansell and Lam (2004) also found that the remitted bipolar group recalled negative memories more frequently during everyday life than controls. We did not record everyday life recall in this study, so it is not possible to say whether the higher rate of recall of specific unpleasant memories in the high-risk group was also associated with the frequency effect observed by Mansell and Lam (2004) for their clinical participants. Tzemou and Birchwood (2007) found that bipolar and unipolar participants who reported more overgeneral memories experienced fewer distressing intrusive memories. This finding is consistent with Conway and Pleydell-Pearce's (2000) model, which argues that the recall of specific unpleasant memories might indicate a failure to protect the self from the harmful effects of recalling negative self-referring knowledge. Our data are consistent with the idea that this mechanism could well be in place in healthy individuals at risk for bipolar disorder.

Analysis of the first response and cumulative response latencies showed that the high-risk group retrieved specific memories faster than the low-risk group. Separate analyses of the first response latencies and cumulative response latencies for pleasant and unpleasant cue words showed that this effect was apparent in faster recall of unpleasant (but not pleasant) memories by the high-risk group, which would suggest increased availability of stored memories of this type. This would also be consistent with greater use of an experiential mode of processing in individuals with high levels of hypomanic personality who

would be less likely to evaluate the content of specific propositions.

The relative speed of recall of pleasant and unpleasant memories found in this study contrasts with the pattern of recall found by Williams and Broadbent (1986b) in suicidal patients. The suicidal patients had delayed recall of positive memories, rather than speeded recall of negative memories, as was found in this study. Thus it seems that suicidal participants may have impaired access to positive memories, whereas our high-risk participants appeared to have enhanced access to negative memories. This pattern is also consistent with a manic-defence/depression avoidance model (Bentall, 2003; Neale, 1988) in which hypo(manic) experiences are recruited as a means of avoiding painful negative affect.

An alternative interpretation of the differences in response speeds could be that the high-risk participants are generally faster responders, independent of task type. Although the discrepancy between response time to positive and negative memories suggests this might be unlikely, it would be wise in future research to include a control task, such as a semantic word association or object-naming task, to evaluate response latency independent of AMT performance. Conversely, the low-risk group may have simply demonstrated a delayed retrieval of memories in response to negative cues. This would be consistent with a general "healthy" bias towards the recall of positive personal memories, as assumed by Conway and Pleydell-Pearce's (2000) model. The high-risk group may lack this capability and therefore does not display the same pattern of retrieval.

In addition, the response latencies that were recorded may have been affected by any differences in the linguistic fluency of the participants in each group, as this variable was not formally assessed. However, in only one instance in this study was it apparent that any participant had problems comprehending the meaning of a cue word: one member of the high-risk group did not understand the meaning of the word "Clumsy" and these data were removed from the analysis. It is also highly unlikely that more subtle fluency differences would lead to the observed group differences in response rates to specific unpleasant memories in particular. However, formal assessment of any impact of linguistic fluency on task performance would be a worthwhile element for future replications or extensions of the present study.

Combining the findings regarding the categories of memory recall and response latencies indicates that the high-risk group had increased specificity of autobiographical memories compared to the low-risk group. The high number of specific memories recalled by the analogue sample conflicts with previous findings, which used clinically diagnosed bipolar patients who retrieved a higher ratio of general to specific memories. However, both this study and clinically based studies demonstrate that the specificity effect was clearest for negative memories. It may therefore be the case that a risk factor for bipolar disorder is associated with the recollection of negative memories.

Previous research indicates that depression involves the slower recall of positive memories, which are retrieved as more overgeneral than negative memories. In this study an elevated risk of developing hypomania was found to involve the speeded recall of negative memories, which are recollected more specifically than positive memories. Therefore both cases involve faster and more specific recall of negative compared to positive memories, but this occurs to a greater extent in those with an increased likelihood of hypomania. This is supported by the finding that cognitive vulnerabilities found within bipolar disorder and unipolar depression are largely similar (Scott et al., 2000). Thus, the feature that distinguishes whether hypomania/mania or depression arises during a bipolar episode may be the availability and specificity of autobiographical information that can be used as a comparison when interpreting current situations. However, although the numbers of specific memories recalled by both groups in this study were similar to those of Barnard et al. (2006), who also used an analogue sample, these results were much higher than the number reported in studies using clinical samples. This suggests that there may be a crucial difference in cognitive processing between those at risk and those who eventually develop bipolar disorder.

Key findings

Previous research has indicated that remitted bipolar patients display an overgeneral memory bias. This study found that participants who were at risk but had not been clinically diagnosed with bipolar disorder exhibited an overspecific memory bias. In this study, and previous studies, the effect was found to be greater for negative than positive memories. Therefore the recall of negative memories is likely to play a key role in bipolar disorder. The difference in the direction of the biases found suggests that the effects of subsyndromal depressive symptoms and past episodes of depression impact on the cognitive processes used by patients.

Compared to depression, the specificity and speed of memory recall may increase with the risk of hypomania, indicating greater availability of stored memories of this type. As the memory recall is facilitated, this could further expand the chance that specific memories are called to mind. This suggests that hypomanic traits are linked to a more experiential mode of processing. As previous research has found that the frequency of recollection of unpleasant intrusive memories in everyday life impacts on the specificity of recall, it may be that experiential processing (which facilitates semantic elaboration of current experiences in relation to stored information) increases the availability of negative personal memories for retrieval. As a result, hypomanic traits may develop to counteract the impact of recalling information that poses a threat to the person's sense of self. It is unclear why this facilitation of recall should occur just for negative memories, and therefore warrants further investigation.

The results of this study partially support Barnard et al.'s (2006) prediction, based on the assumptions of the ICS model, that patients with bipolar disorder would display reduced levels of overgeneral memories during hypomanic episodes. The findings only upheld this assumption for unpleasant memories, hence more stringent criteria regarding the occurrence of the proposed effect need to be formulated and investigated. The current results reinforce the likely significance of negative material in hypomania specifically under circumstances where well-being is not substantially elevated. Further clarification of the relationships between attention to meaning on the one hand and the role of positive self-models and well-being on the other would be one obvious target for future empirical work.

Limitations

The cue words used within the AMT have not been tested for their relevance to bipolar disorder. It is possible that bipolar-significant positively valenced words may have facilitated the

recall of more specific pleasant memories. Thus combining this study with an extended version of the cue words used by Mansell and Lam (2004) in future work could give greater insight into the dysfunctional assumptions found within hypomania/mania. Furthering this, the content of the memories could be analysed to highlight potential underlying themes that affect autobiographical memory recall. The inclusion of a set of non-emotive control words would also show whether the recall of emotional memories in particular is affected by hypomania or if the memory retrieval process as a whole is distorted.

The imageability of the cue words was additionally not accounted for. Previous research has shown that the recall of specific memories is facilitated in response to words for which a mental image is easily produced compared to cues that do not involve imagery (Mansell & Lam, 2004; Williams, Healy, & Ellis, 1999), as vivid images are important in defining event-specific knowledge within the autobiographical knowledge base (Conway & Pleydell-Pearce, 2000). Therefore the imageability of the cues may have affected the search and retrieval strategies used to recall the memories. This should be controlled for in future work if possible.

The absence of a depressed group means that the differences in the memory recall of the groups cannot be fully attributed to the presence of hypomanic traits. The same findings may have been found for participants showing depressive tendencies, in which instance the findings might be due to particular characteristics that can be found within all mood disorders.

As this is only a preliminary study using a relatively small number of emotionally valenced cue words, the results must be considered with caution. As previous research studies investigating autobiographical memory recall in depression have shown, the direction of the valence effect of cue words is not consistent. Williams et al.'s (2007) review reported that memories tend to be more overgeneral in response to positive than negative cues but that this is not always the case. A similar discrepancy can be found when considering the inconsistent findings of previous studies looking at the specificity of autobiographical memory recall in relation to mania and hypomania. Therefore the results of this study would need further replication before the valence effect found here could be interpreted confidently.

Implications

This study suggests that dysfunctional memory recall within bipolar disorder may be more related to depression than has been previously thought; i.e., both involve faster and more specific recall of negative than positive memories. Therefore it may be of use in future studies to examine the similarities between these mood disorders rather than the differences. It may be possible to devise a single therapeutic technique that could be used to promote more adaptive thought processes and memory recall among all of the phases of bipolar disorder. This could potentially also be adapted for unipolar depression. By focusing on modifying the schema that are produced within each phase of bipolar disorder, more functional cognitive processes could be encouraged. For example, by promoting the retrieval of specific positive memories and the integration of negative memories into the autobiographical knowledge base, a more adaptive focus of attention could be endorsed, which may help to prevent and reduce the severity of episodes.

Conclusion

There is still limited understanding of the key psychological processes underpinning bipolar disorder. If the results of this preliminary study are replicated, the observation of enhanced access towards negative specific memories in individuals at risk for bipolar disorder might help to inform further developments in appropriate clinical techniques for individuals at risk and those who have a clinical diagnosis of bipolar disorder. Additional investigation into the effects of hypomania on autobiographical memory may further highlight the key factors that differentiate whether mania or depression is produced by the underlying problems and determine whether those with a behavioural risk eventually develop bipolar disorder or not.

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