

# Risk Taking Behaviour in Bipolar Affective Disorder

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## Abstract

This piece of research was designed to explore the nature of risk taking behaviour and impulsivity in bipolar affective disorder. Involvement in pleasurable activities that have a high potential, or risk, for unwanted consequences forms one of the DSM IV diagnostic criteria for (hypo)mania; however, little research has investigated the prevalence of risk taking behaviour in this population, nor the possible meaning of such behaviour. Furthermore, research has demonstrated that individuals diagnosed with bipolar disorder have elevated trait levels of impulsivity, as well as increased levels of state impulsivity during mood episodes. Much research has theoretically linked impulsivity with risk taking behaviour; however, little research has measured both constructs simultaneously. Therefore, this research was designed to measure both the propensity to engage in risk taking behaviour and levels of impulsivity via multiple methods in individuals diagnosed with bipolar disorder who were currently euthymic, to establish a baseline measure in the absence of clinically significant symptomatology. Two control groups were used; one was comprised of individuals with no history of psychiatric disorder and a group of individuals diagnosed with major depressive disorder, to establish the specificity of any findings to bipolar disorder rather than affective disorders in general. The bipolar group scored more highly on the behavioural measure of impulsivity and some aspects of the self-report measure than the two control groups, who did not differ significantly. The two clinical groups also reported higher levels of unhelpful coping strategies when experiencing depressed mood, including engaging in dangerous activities; however, there were no between groups differences on the behavioural risk taking task. The findings were discussed in relation to psychological models of bipolar disorders. Limitations of the research and ideas for future research were also discussed.

ACKNOWLEDGEMENTS .....	2
Abstract .....	3
Chapter 1: Introduction .....	7
Aims .....	7
Literature review.....	7
Risk taking behaviour in bipolar disorders .....	8
Decision making in bipolar disorders .....	9
Impulsivity.....	11
Definition and measurement .....	11
Underlying processes .....	12
Impulsivity in bipolar disorders .....	12
The functions of impulsivity .....	14
Decision making and impulsivity in bipolar disorders.....	16
Risk taking behaviour .....	17
Pathways to risk taking behaviour.....	18
Summary of general research on risk taking behaviour .....	19
Psychological factors in bipolar disorders .....	19
Neuropsychological factors .....	19
Personality traits .....	20
Beliefs and attitudes.....	20
During (hypo)mania .....	20
During depressive episodes .....	21
During euthymia.....	21
Self-esteem .....	22
During (hypo)mania .....	22
During depressive episodes .....	22
During euthymia.....	22
Summary.....	23
Psychological models of bipolar disorders .....	23
Dysregulation of the behavioural activation system.....	23
Self-reported BAS sensitivity and symptoms of bipolar disorder .....	24
Psychophysiological indices of BAS activity .....	26
Variability in BAS Functioning .....	26
The Behavioural Activation System and Goal-striving.....	27
The Behavioural Activation System and Risk Taking Behaviour.....	28
Limitations of the BAS Dysregulation Theory of Bipolar Disorders.....	28
Traditional Cognitive Behavioural Models of Bipolar Disorders .....	29
Outline of the Traditional Cognitive Behavioural Approach to Bipolar Disorders .....	29

Risk taking behaviour within the traditional framework of the cognitive behavioural approach .....	30
Limitations of the traditional CBT model .....	30
Summary of BAS dysregulation and traditional CBT models of bipolar disorders .....	31
Manic defence/depression avoidance hypothesis .....	32
Negative attributional style and attentional bias .....	32
Dissociation between Implicit and Explicit Measures of Self-relevant Processes .....	34
Self-concept and self-esteem .....	34
Compartmentalisation and self-complexity .....	35
Self-esteem instability .....	35
Life events and episode polarity .....	37
Depression avoidance and risk taking .....	37
Limitations of the depression avoidance hypothesis .....	39
An integrative cognitive model of mood swings and bipolar disorders .....	40
The role of self-relevant appraisals .....	41
Relationship between levels of activation, beliefs about the self and others' influence .....	42
Role of environmental factors .....	44
Risk taking as an ascent behaviour .....	45
Summary of the integrative cognitive model of mood swings .....	45
The role of risk taking behaviour in bipolar disorders .....	45
The Role of Risk Taking Behaviour in Psychological Models of Bipolar Disorders .....	47
Measurement of risk taking behaviour .....	48
The Balloon Analogue Risk Task (BART): Reliability and Validity .....	48
Research Questions .....	49
Chapter 2: Method .....	51
Design .....	51
Participants .....	51
Inclusion and exclusion criteria .....	51
Sample size .....	52
Measures .....	56
Procedure .....	58
Data Analysis .....	60
Ethical Approval .....	61
Chapter 3: Results .....	62
Sample characteristics .....	62
Sociodemographic characteristics of the sample .....	62
Table 1 .....	63
Descriptive characteristics of the sample .....	63
Psychiatric features of the clinical groups .....	64

Table 2.....	64
Summary of responses to measures of current mood and typical Responses to Negative Moods.....	64
Current mood .....	65
Research question 1 .....	65
Response styles questionnaire (RSQ): Coping with depressed mood.....	65
Responding to Depressed Mood by Engaging in Dangerous Activities .....	66
The Balloon Analogue Risk-Taking Task (BART) .....	66
Table 3.....	67
Balloon Analogue Risk Taking Task .....	67
Research question 2 .....	67
Table 4.....	69
Summary of data from impulsivity measures.....	69
Figure 1. ....	70
Mean trial type latencies for the three groups on the GoStop impulsivity task. Error bars represent standard error scores. ....	70
Figure 2. ....	71
Mean trial type latencies for the three groups on the GoStop impulsivity task when controlling for the effects of lack of premeditation. Error bars represent standard error scores. ....	71
Figure 3. ....	72
Mean trial type latencies for the groups according to DSM IV diagnosis on the GoStop impulsivity task, when controlling for the effects of lack of premeditation. Error bars represent standard error scores. ....	72
Summary of findings .....	72
Chapter 4: Discussion .....	74
Risk taking behaviour: The Balloon Analogue Risk Task (BART).....	74
Risk taking behaviour: The Response Styles Questionnaire (RSQ) .....	75
Impulsivity: The GoStop Impulsivity Task.....	76
Impulsivity: The UPPS.....	78
Urgent behaviour.....	78
Action as affect regulation .....	79
Clinical implications .....	80
Limitations .....	80
References .....	81
Pardoen, D., Bauwens, F., Tracy, A., Martin, F., & Mendlewicz, J. (1993). Self-esteem in recovered bipolar and unipolar out-patients. <i>The British Journal of Psychiatry</i> , 163, 755-762...87	87
Appendix 1 .....	90
Correlation matrix displaying bivariate relationships between mean scores on the main descriptive and experimental variables. ....	90

## Chapter 1: Introduction

### Aims

The aim of the present research is to test whether there is a relationship between bipolar disorders and risk taking behaviour whilst individuals are in remission. This was tested by comparing euthymic individuals diagnosed with bipolar disorder with euthymic individuals diagnosed with Major Depressive Disorder (MDD) and non-psychiatric controls. Additionally, levels of impulsivity were tested in the three groups. It was predicted that the bipolar group would display greater levels of both risk taking and impulsivity than the two control groups.

### Literature review

For many years bipolar disorders were regarded as largely biologically determined illnesses; however, it is now recognised that psychosocial factors can greatly affect the onset and course of episodes (Johnson, 2005). Generally, the disorder has a pernicious relapsing and remitting course, even when treated with medication; for example, one study found that 73% of participants followed-up for five years relapsed (Gitlin, Swendsen, Heller, and Hammen, 1995). Unsurprisingly, a diagnosis of bipolar disorder has been linked to decreased quality of life (Cooke, Robb, Young, and Joffe, 1996). Furthermore, rates of completed suicide in bipolar disorders have been reported to be fifteen times higher than rates in the general population (Harris and Barraclough, 1997); and one of the factors which is linked to increased risk of suicide is impulsiveness (Goodwin and Jamison, 1990). Indeed, bipolar disorders represent the 6<sup>th</sup> leading cause of disability in the world (Murray and Lopez, 1996) and therefore represent an important area for research and intervention to address the substantial human and financial costs of morbidity and mortality associated with this diagnosis.

Recently published guidance (NICE, 2006) outlining treatment overwhelmingly recommends the use of medication, in conjunction with structured psychological therapies, which contain elements common to many cognitive behavioural approaches to treating bipolar disorders (see, Lam and Wong, 2005). Evidence is mixed as to the efficacy of current CBT based interventions; some have found CBT to significantly improve outcome (Lam, Watkins, Hayward, Bright, Wright, Kerr, *et al.*, 2003; Lam, Hayward, Watkins, Wright, and Sham, 2005); however, a recent multicentre trial did not find CBT to be beneficial for patients who had experienced a high number of previous episodes (Scott, Paykel, Morriss, Bentall, Kinderman, Johnson, *et al.*, 2006). Clearly, currently available pharmacological and psychological interventions do not adequately reduce symptoms and increase quality of life for a substantial proportion of this population. As a result, psychological research has begun to elucidate what the important psychosocial variables related to increased risk of bipolar episodes, and decreased quality of life, might be, and exactly how they impact upon individuals. Although debate continues about whether there is a spectrum of

bipolar disorders, ranging from subclinical forms, such as cyclothymic temperament, through antidepressant-treated depression induced hypomania (Bipolar III), to Bipolar II, episodes of depression and hypomania, and ultimately Bipolar I, episodes of mania, with or without depressive episodes (Akiskal, 1996); much of the extant research has used participants with symptoms in the ‘softer’ end of the spectrum. Furthermore, studies using community samples report that up to 33% of people diagnosed with bipolar disorder report no lifetime history of depression (Karkowski and Kendley, 1997); however, this is rarely accounted for in research. Nevertheless, there is a growing evidence base highlighting areas of potential importance for models and interventions.

### Risk taking behaviour in bipolar disorders

Risk taking and engaging in dangerous activities have long been associated with bipolar disorder, and are generally considered to occur within manic or hypomanic episodes; indeed, one of the DSM IV (APA, 1994) criteria for diagnosis of a manic episode is, “excessive involvement in pleasurable activities that have a high potential for painful consequences”. Such behaviour can have devastating consequences in terms of the impact it has on: the physical safety of the individual and others, occupational functioning, financial difficulties, legal problems and relationships. For example, during (hypo)manic episodes, individuals with bipolar disorders may enter into affairs or engage in casual sex; consequently, established relationships may suffer and those not in such relationships may place themselves in dangerous situations or at risk from unplanned pregnancies and sexually transmitted infections. Indeed, one study found that spouses of individuals with bipolar disorder reported that had they known more about the condition, they would have reconsidered marrying and having children together (Targum, Dibble, Davenport, and Gershon, 1981). Moreover, such behaviour is often regretted during periods of depression, leading to feelings of guilt and shame; as well as the task of attempting to repair relationships and extricate oneself from complicated interpersonal situations (Lam, Jones, Hayward, and Bright, 1999). Clearly, unrestrained spending and gambling can have a devastating impact on individuals’ financial situations, which can also impact upon the precipitation and exacerbation of depressive symptoms. Relationships may be put under further strain, as friends and family members may be required to help manage debts, and partners and dependents may be severely affected by the impact of precarious borrowing and lending. Clearly, understanding of the processes that might be involved in occasioning and maintaining such behaviour could not only contribute to the development of psychological models, but perhaps specific interventions targeting these behaviours. Reducing risk taking could not only be beneficial in terms of its immediate impact on physical, financial and psychological well-being; but perhaps more so in terms of the allied effects on later negative feelings and damage to relationships.

As with many psychiatric diagnoses, social support is associated with improved functioning (Johnson, Winett, Meyer, Greenhouse, and Miller, 1999); therefore, preservation of social support may have a positive impact in and of itself. However, one difficulty with designing



interventions in this area is that individuals may enjoy, and even covet, the initial stages of hypomania (Goodwin and Jamison, 1990); therefore, it is important to understand the intricacies of the functions of any such behaviour, in order to be able to design means of intervening that clients will be happy and motivated to engage with.

Historically, research into bipolar disorder has frequently linked risk taking behaviour with impulsivity (Christodoulou, Lewis, Ploubidis, and Frangou, 2006), or deficits in decision making (Leahy, 1999).

#### Decision making in bipolar disorders

There is conflicting evidence regarding the quality of the, experimentally measured, decision making of individuals diagnosed with bipolar disorders. Research has found that during manic episodes individuals diagnosed with bipolar disorders show deficits in decision-making, when compared to controls and individuals with unipolar depression, on a simulated gambling task (Murphy, Rubinsztein, Michael, Rogers, Robbins, Paykel, *et al.*, 2001; Rubinsztein, Michael, Underwood, Tempest, and Sahakian, 2006). The only aspect that differentiated the decision making of the group experiencing manic symptoms from the unipolar depressed group was that the manic group showed an increased tendency to attempt to earn reward by betting on less favourable response options. Furthermore, individuals within the two groups recruited different brain regions while completing the task; manic individuals showed reduced activation in the right superior frontal gyrus and increased activation in the left dorsal anterior cingulate when compared to control participants, who showed increased activation in the inferior frontal gyrus (Rubinsztein, Fletcher, Rogers, Ho, Aigbirhio, Paykel, *et al.*, 2001). However, impairments in decision making on this task were not seen in individuals diagnosed with bipolar disorder who were in remission (Rubinsztein, Michael, Paykel, and Sahakian, 2000), suggesting that impaired decision-making is specifically associated with manic episodes and, perhaps, attributable to concomitant changes in brain functioning.

Using a modified version of the IGT (IGT; Bechera, Damasion, Damasion, and Anderson, 1994), a measure of decision making during which participants choose between four decks of cards which systematically vary in the magnitude of rewards and losses that they yield, Yechiam, Hayden, Bodkins, O'Donnell, and Hetrick (2008) obtained similar findings in terms of pattern of performance. In this study there were no overall group differences between a group of individuals diagnosed with Bipolar I disorder, experiencing varying levels of symptoms, and a group of non-clinical controls; however, application of a cognitive model of performance on the task showed that individuals in the bipolar group who were currently symptomatic demonstrated significantly less choice consistency, displayed by selecting cards in a fashion that appeared to be unpredictable and erratic, than non-clinical controls. Neither group differed significantly from individuals diagnosed with bipolar disorder who were currently euthymic; with lower levels of choice consistency evident in the participants who were receiving psychotropic medication – however, the authors emphasised

the small cell sizes involved in this comparison, and the likely confound of severity of symptoms with medication status. It is worth noting that choice consistency was measured using a cognitive model; choices that appear to be erratic and random to an observer, and by mathematical standards, may have subjective meaning and an internally consistent order for the individual that is obscured when using broad indices of measurement and aggregating scores at a group level. Nevertheless, degree of choice consistency added to the prediction of group status beyond other significant predictors, namely level of behavioural inhibition and level of impulsivity. Furthermore, this regression model explained far more variance for the individuals within the bipolar group who were currently symptomatic ( $r^2 = .66$ ) than those who were euthymic ( $r^2 = .35$ ); suggesting that this aspect of performance is somehow specifically related to bipolar symptoms. It is notable, and of relevance to later discussion, that there were no between group differences on levels of behavioural activation system sensitivity. The study failed to find any between group differences related to differential attention to gains as opposed to losses, or in terms of preferential attention to recent as opposed to past outcomes. Similarly, Clark, Iverson, and Goodwin (2002) found there to be no differences between a group of individuals diagnosed with bipolar disorders in remission and a non-clinical control group on the IGT.

However, Clark, Iverson, and Goodwin (2001) found a group of individuals diagnosed with bipolar disorders who had been hospitalised for a manic episode to perform more poorly than non-clinical controls on the same task. Similarly, Adida, Clark, Pomietto, Kaladjian, Besnier, *et al.* (2008) found that individuals diagnosed with bipolar disorders who were hospitalised during a manic episode did not develop the preference for choosing cards from the 'safe' decks on the IGT that was shown by non-clinical controls; furthermore, performance on the task was related to a proxy measure of lack of insight. Due to the multiplicity of processes that underlie performance on the IGT, it is difficult to interpret between groups differences in studies that did not measure the parameters along which performance may vary (Yechiam, Busemeyer, Stout, and Bechara, 2005). Furthermore, evidence suggests that university undergraduates show a preference for the disadvantageous decks on the traditional version of the task, and that this appears to be related to the frequency with which decks are rewarded, or reinforced, rather than the net loss or gain across many trials (Caroselli, Hiscock, Scheibel, and Ingram, 2006). Evidence suggests that individuals diagnosed with bipolar disorders who are currently euthymic show reduced and delayed acquisition of a response bias to more frequently rewarded stimuli, and that this is correlated with self-reported anhedonic symptoms (Pizzagalli, *et al.*, 2008). Furthermore, the performance of the bipolar group was affected by increased sensitivity to single rewards of disadvantageous stimuli, which led to behavioural switching – which could conceivably lead to the pattern of performance in the Yechiam, Hayden, Bodkins, O'Donnell, and Hetrick (2008) study. The authors interpreted the findings as evidence for reduced and delayed integration of reinforcements over time, which was attributed to hypothesised hyperresponsivity of the behavioural activation system to environmental reward incentives interfering with this process of integration, as the groups did not differ in reaction times or discrimination of the stimuli. This finding is somewhat contrary to the finding in

the Yechiam *et al.* study, which found there to be no difference between the bipolar and control group with regards to preferential attention to rewards; however, given the differences in the tasks used and the ways in which performance was measured, it is difficult to compare the results of the two studies.

Therefore, there is equivocal evidence regarding the quality of decision making in individuals with bipolar disorders; with some studies finding evidence of different patterns of performance on tasks measuring decision making in the context of possible reward. However, the overall performance of individuals diagnosed with bipolar disorders appears to be comparable with non-clinical controls, although there is some evidence for impaired performance whilst individuals are experiencing clinically significant levels of manic symptoms. It is unclear at present what might underlie this, as episodes of mania involve state dependent changes in numerous aspects of emotional and cognitive functioning, as well as alterations in levels of several neurotransmitters (Goodwin and Jamison, 2007).

## Impulsivity

### *Definition and measurement*

A number of different definitions of impulsivity exist. Barratt and Patton (1983) define impulsivity as: “a neurophysiologically based inability to conform behaviour to its context or consequences”. Similarly, Moeller *et al.* (2001) define impulsivity as: “a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others”. Clearly both of these definitions are quite general; Moeller *et al.*’s definition carries with it the implicit assumption of the possibility of some level of intentionality, thus extending the definition beyond an explanation in terms of biologically determined deficit. Furthermore, Moeller *et al.*’s definition can be applied to patterns of behaviour more readily. However, both definitions, perhaps necessarily, could encapsulate a variety of different behaviours and contexts. As a result, a number of different measures have been developed in order to quantify and measure this construct, including both self-report and performance measures. A number of factor analyses have been performed on these measures, in order to more precisely define the nature of impulsivity, and allow researchers to gauge the comparability of studies using different measures. A large factor analysis of 378 individual questionnaire items converged on three second order factors: spontaneous, persistent and carefree (Revelle, 1997). More recently, a principal components analysis of four commonly used scales identified three factors: non-planning dysfunctional (44.3% variance), Functional Venturesomeness (15.03% variance) and Drive/Reward Responsiveness (11.25% variance). The functional venturesomeness component was comprised of cognitive components and risky behaviours, and the items that loaded onto the drive/reward responsiveness component were essentially all of the items from Carver and White’s (1994) BIS/BAS scale. Lane, Cherek, Rhoades, Pietras, and Tcheremissine. (2003) looked at the relationships between a number of psychometric and behavioural measures. Correlations

between the behavioural and self-report measures were low, although correlations between the self-report measures were high – with the self-report measures loading onto a single factor. The behavioural measures loaded onto two factors: reward delay and response inhibition. Go-no go tasks, in which individuals are required to respond to certain stimuli ('go' trials) and withhold responses to other stimuli ('no go') trials, are the most common measure of response inhibition, and have been found to be the strongest correlate of self-reported impulsivity in non-clinical samples, after controlling for age and level of education (Keilp, Sackeim, and Mann, 2005).

### *Underlying processes*

Evidence from both human and animal studies implicates a number of brain regions thought to be involved in impulsive responding, including: the amygdala, the basal ganglia and various regions within the prefrontal cortex (Winstanley, Eagle, and Robbins, 2006). The functioning of the dorsolateral prefrontal cortex (DLPFC) has been implicated in regulating inhibitory processes and the orbitofrontal cortex (OFC) in mediating impulsive choice. It has been speculated that these regions contribute to a number of processes that underlie impulsivity, such as: working memory, executive functioning and self-regulation of affect, motivation and arousal (Barkley, 1997). Self-regulation refers to one's ability to control, modify and adapt one's impulses and desires (Murtagh and Todd, 2004). Rothbart and Bates (1998) argue that individuals lacking such self-regulation skills are more likely to engage in goal-defeating risky behaviours, especially when in situations involving frustration or anger.

### *Impulsivity in bipolar disorders*

Trait impulsivity, as measured using the SCID II, was found in 41.1% of 136 consecutive outpatients diagnosed with Bipolar II disorder; and was related to "excessive risky activities" and "irritable risky overactivity" (Benazzi, 2007). Some authors suggest that there may be state and trait components to impulsivity in bipolar disorder, which vary with phase of the condition and make impulsive behaviour more likely during manic episodes (Swann, Pazzaglia, Nicholls, Dougherty, and Moeller, 2003). Specifically, trait impulsivity as measured by the Barratt Impulsiveness Scale (Barratt, 1985) has been found to be elevated in Bipolar I individuals, compared to controls, in both manic and euthymic episodes; whereas behavioural measures of impulsivity were elevated only in individuals who were currently manic (Swann *et al.*, 2003). Similarly, Peluso, Hatch, Glahn, Monkul, Sanches, Najt, *et al.* (2007) compared groups of individuals with Bipolar I disorder who were depressed and euthymic, and individuals who had been diagnosed with unipolar depression, who were also either depressed or euthymic, with a non-clinical control group. The depressed and euthymic bipolar participants, along with the depressed unipolar participants, scored more highly than the non-clinical controls on all subscales of the Barratt Impulsiveness Scale, as well as on the total score. However, apart from the motor subscale, where individuals diagnosed with unipolar depression who were euthymic scored significantly more highly than controls, this group scored significantly lower than the other clinical groups and

were comparable with the control group. Therefore, it would appear that state-related impulsivity may be linked to affective episodes in both clinical groups, with an additional trait-related component linked to bipolar disorders. However, no individuals in the euthymic unipolar depressed group were taking any medication, whereas the majority of participants in the other three clinical groups were; therefore, any effects of which on impulsivity scores may have been confounded with group status. Additionally, there were more individuals in the bipolar groups with a past history of substance abuse; previous research has found that participants with a past history of substance abuse have increased impulsivity even in the absence of current substance abuse (Swann, Dougherty, Pazzaglia, Pham, and Moeller, 2004). Furthermore, substance abuse history was found to increase impulsivity additively in individuals diagnosed with bipolar disorder. Finally, a number of individuals had a comorbid anxiety disorder, which has been linked to increased impulsivity as measured by the Barratt Impulsiveness Scale, independently of demographic characteristics and comorbid ADHD; specifically with the non-planning and more strongly with the attentional subscales (Taylor, and Mansell, 2008).

The possibility of state-related impulsivity increases during depressive episodes, regardless of diagnosis, is suggestive of a link with depressive symptoms. However, there also appears to be a direct link with manic symptoms; Swann, Steinberg, Lijffijt, and Moeller (2007) found that levels of impulsivity, as indexed by the Barratt Impulsiveness Scale, increased linearly as manic symptoms increased in individuals diagnosed with Bipolar I or Bipolar II disorder who were experiencing a depressive episode. Clearly the combination of depressive symptoms and increased impulsivity represents a serious risk, as both variables are independently associated with suicidality (Swann, Dougherty, Pazzaglia, Pham, Steinberg, and Moeller, 2005). Interestingly, in this study anxiety was not related to self-reported impulsivity, nor were psychotic symptoms; although history of substance abuse and previous suicide attempts were. Manic symptoms, but neither anxiety nor psychotic symptoms, were also related to impulsive responding on the immediate memory task/delayed memory task (IMT/DMT; Dougherty, 1999). Previous research has found that individuals with a number of Axis I and Axis II disorders show impaired responding on the IMT/DMT, which has been linked to more impulsive scores on the Barratt Impulsiveness Scale (Swann, 2002); however, it is arguable that the IMT/DMT is better conceptualised as a measure of attentional processes; and impaired performance on measures of sustained attention has been robustly linked to bipolar disorder, and potentially represents a vulnerability factor (Clark, et al., 2002), therefore it is unclear what can be concluded from these findings.

It is possible that some of the between groups differences are attributable to differences in the tools used to measure impulsivity. Holmes, Bearden, Barguil, Fonseca, Monkul, Nery, *et al.* (2009) compared groups of individuals diagnosed with Bipolar I or II disorder who were euthymic or experiencing a depressed or (hypo)manic episode, who either had a lifetime, but not current, history of alcohol abuse, or no such history, with a non-clinical control group. All of the bipolar groups scored more highly than the control group on the Barratt Impulsiveness Scale, with those with a history of alcohol abuse scoring more highly on the motor subscale than those without such

a history; however, only the bipolar participants with history of alcohol dependence exhibited differences in performance on the Balloon Analogue Risk Task (BART), popping significantly more balloons than the other groups. The BART will be described in significant detail later and was designed as a measure of risk taking, rather than impulsivity; therefore, it is unclear how to interpret these findings, as it is unclear why balloon explosions should be interpreted as indicating greater levels of impulsivity. Furthermore, 93.5% of the participants with a history of alcohol abuse were diagnosed with Bipolar I disorder, as opposed to Bipolar II disorder, whereas only 79.2% of the participants without a history of alcohol abuse were diagnosed as Bipolar I; which may have confounded interpretation of the results somewhat, should there be differences in any variables affecting performance on the BART that are differentially associated with Bipolar I and Bipolar II disorder. Strakowski et al. (2009) compared the performance of individuals diagnosed with Bipolar I disorder who were either currently manic or in a mixed episode with controls on a number of performance measures, including a go-no go task, and found the manic group to perform more impulsively than the mixed group, and the mixed group to perform more impulsively than the control group; with performance unrelated to severity of current affective symptoms. However, a number of participants had comorbid conditions, including ADHD, which may have impacted on levels of impulsivity. Furthermore, the response inhibition tasks were sensitive to medication effects, making the findings difficult to interpret. However, a more recent study found impulsivity to be differentially related to depression and mania; with total and attentional impulsivity scores on the Barratt Impulsiveness Scale relating independently to both depression and mania, whilst motor impulsivity was related only to mania, and non-planning impulsivity related only to depression (Swann, Steinberg, Lijffijt and Moeller, 2008).

Given the increased risks associated with impulsivity in terms of exacerbating symptoms, and increasing aggression and suicidality (Henry, et al., 2001; McElroy, et al., 1996), any links with bipolar disorders need to be properly explicated and understood in order to design targeted and effective interventions. On the basis of the available evidence regarding decision making and impulsivity, which have been invoked to explain risk taking behaviour within manic episodes, it has been suggested that they, “may represent behavioural manifestations of the same underlying biological mechanism” (Christodoulou, Lewis, Ploubidis, and Frangou, 2006, p. 270). However, no studies have employed performance measures of impulsivity other than the IMT/DMT in a sample of participants diagnosed with bipolar disorders, which may not be a valid measure of impulsivity. Furthermore, it has been argued that the Barratt Impulsiveness Scale has, “unacceptable internal validity” (Patton, Stanford, and Barratt, 1995). Perhaps most importantly, little research has been conducted investigating such behaviour in the context of every day life, nor exploring individual’s perceptions of the motivations behind their behaviour.

#### *The functions of impulsivity*

Findings that levels of impulsivity show different patterns of elevation in manic and euthymic phases may, in part, be due to the fact that impulsivity is a heterogeneous construct; therefore,

overtly similar behaviours may have different aetiologies and serve different functions. A recent factor analysis of nine commonplace self-report measures of impulsivity found that four factors could be discerned, which arose from different aspects of personality and served different behavioural functions (Whiteside and Lynam, 2001). One of these factors, ‘premeditation’, reflected difficulty in considering and reflecting upon the consequences of an act before engaging in that act; a description which is congruent with much of the literature on impulsivity. Indeed, research has linked high scores on this subscale with a number of externalising behaviours, such as: antisocial behaviour and substance use, as well as symptoms of ADHD; disorders characterised by impulsivity (Miller, Flory, Lynam, and Leukefeld, 2003). Furthermore, research found premeditation to be the only factor on the UPPS to be linked with poorer performance on the IGT (Bechara, Damasio, Damasio, and Anderson, 1994), a commonly used measure of decision making, which has also been described as a measure of cognitive impulsivity (Zermatten, Van der Linden, d’Acremont, Jermann, and Bechera, 2005).

In contrast, a relatively understudied facet of impulsivity measured by the scale is the ‘urgency’ factor. Urgency represents the tendency to engage in impulsive behaviours, despite their potential for harmful longer term consequences, under conditions of negative affect. After validating the measure with a number of clinical groups the authors concluded that urgency was the construct that most differentiated clinical groups from non-clinical groups (Whiteside, Lynam, Miller, and Reynolds, 2005). Whiteside and Lynam suggest that individuals who have elevated scores on this subscale may engage in such behaviours as a means of emotion regulation. Indeed, urgency emerged as a strong, unique predictor of borderline personality features, as well as eating problems, in a clinical sample; with the UPPS scales accounting for 64% of the variance in measures of borderline psychopathology (Whiteside, Lynam, Miller, and Reynolds, 2005). This finding is interesting, as it has been suggested that Borderline Personality Disorder may lie on the bipolar spectrum, given the overlap between the two disorders in terms of affective lability and unstable sense of self (MacKinnon, 2006). Therefore, this poses a tentative hypothesis that some of the impulsivity observed in bipolar disorders may function in this fashion; however, this is speculative as the question of the relatedness of the two disorders is contentious (Henry, Mitropoulou, New, Koenigsberg, Silverman, and Siever, 2001).

Nevertheless, a recent study using a non-clinical sample found urgency to be cross-sectionally predictive of a number of maladaptive coping strategies, after controlling for current symptoms of depression and anxiety, namely: bulimic symptoms, drinking alcohol to cope and excessive reassurance seeking (Anestis, Selby, and Joiner, 2007). Additionally, residual changes in urgency score between two time points four weeks apart was found to predict residual change scores in the three coping behaviours; however, the use of residual change scores renders the interpretation of the finding ambiguous, as change in scores could represent change in error rather than change in levels of urgency. Furthermore, the sample were predominantly female young adult university students; therefore, it is arguable that this is a group of people for whom, due to their stage of social, emotional and neural development, may be more likely to utilise these coping

strategies than other portions of the general population. Nevertheless, Time 1 urgency scores did directly predict Time 2 excessive reassurance seeking, which is interesting, as previous research has linked this behaviour, prospectively, with the development of depression (Hankin, Kassel and Abela, 2005). As previously reported, scores on the urgency factor were not linked to poor performance on the IGT; demonstrating that although many behaviours and populations may be described as being impulsive, the underlying mechanisms driving the behaviour(s), and impact on other areas of functioning, may be very different.

#### *Decision making and impulsivity in bipolar disorders*

Evidence is amassing that impulsivity is linked to bipolar disorder, and some have argued that it may form part of any endophenotype conferring vulnerability to the disorder (Congdon and Canli, 2005). Furthermore, some preliminary evidence suggests that individuals diagnosed with bipolar disorders may show different patterns of responding on laboratory based decision making tasks when compared to non-clinical controls, and stronger evidence to suggest that during episodes of mania, individuals diagnosed with bipolar disorders show impaired decision making under some conditions. Given that individuals diagnosed with bipolar disorder behave in 'risky' ways when (hypo)manic, it is unsurprising that deficits in decision making and elevated levels of impulsivity have been proposed as potential contributors to this behaviour; especially as areas of the brain thought to be integral to decision making processes and non-impulsive responding are areas that have been linked to the neural substrate underlying some of the symptoms of the disorder, for example, effective decision making has been linked to functioning of the dorsolateral prefrontal cortex and working memory (Bechera, 2005), areas identified as being compromised in bipolar disorders (Rajkowska, Halaris, and Selemon, 2001 and Thompson, Gray, Hughes, Watson, Young, and Ferrier, 2007, respectively). However, there is little evidence actually linking impaired decision making and heightened impulsivity with risk taking behaviour; rather, these relationships have been inferred for theoretical reasons. For example, there is some overlap between activation in the neurophysiological areas underlying performance on a risk taking task, a modified version of the Balloon Analogue Risk Task, and areas implicated in both decision making and impulsivity tasks, most notably in the dorsolateral prefrontal cortex (Rao, et al., 2008). Furthermore, several theories considering the development of risk taking behaviour implicate impulsivity and emotional processing as important components (see Boyer, 2006 and Steinberg, 2008); and there is clearly evidence for elevated levels of impulsivity in bipolar disorders, as well as evidence for difficulties in the perception, generation and regulation of emotion (Green, Cahill, and Malhi, 2007).

In the next section I will review research regarding risk taking behaviour; given the paucity of research examining risk taking behaviour within bipolar disorders, I will review research relating to risk taking more generally, and the way in which this may relate to such behaviour within bipolar disorders, as well as consider the available disorder-specific evidence.



## Risk taking behaviour

Risk taking has been defined as, engaging in behaviours that simultaneously involve the possibility of reward and the potential for punishment (Leigh, 1999). As with impulsivity, recent research posits that risk taking is unlikely to be a unidimensional construct, and individuals may exhibit differential levels of risk taking in different domains (Hanoch, Johnson, and Wilke, 2006), which implies that a number of variables are involved in contributing to an individual's propensity to take risks. Indeed, Zaleskiewicz (2001) demonstrated that two distinct orientations toward risk taking could be distinguished. Instrumental risk taking is related to taking investment risks, and is connected to rational information processing and a future orientation. Stimulating risk taking is related to taking recreational, ethical, gambling, and health risks, and is connected to high scores on measures of arousal seeking, and thrill and adventure seeking. Although both factors were intercorrelated and correlated with measures of impulsivity, they would appear to differ in function; instrumental risk taking represents a means of achieving a particular goal, whereas stimulating risk taking appears to be behaviour that is experienced as intrinsically pleasurable and reinforcing. Furthermore, evidence suggests that current affective state can influence individual's risk taking behaviour. For example, the concurrent experience of high arousal and negative affect has been linked to making 'risky' bets on a gambling task in a non-clinical sample (Leith and Baumeister, 1996). In a series of experiments, participant's affectivity and arousal were systematically manipulated before being offered the choice of two lotteries: one with a low probability of a large reward and the other with a high probability of a small reward. To enhance the 'riskiness' of the task, participants were led to believe that losing the lottery would result in experiencing an aversive stimulus. Participants experiencing negative affect accompanied by high arousal, such as embarrassment, anger or frustration, were significantly more likely to choose the riskier option. However, physiological arousal alone did not increase choice of the risky option in this fashion. Furthermore, Kim (2008) induced a negative mood in participants prior to completing a risk taking questionnaire. Some participants completed the questionnaire immediately following the mood induction, while some waited for three minutes and a final group completed an anagram task in between. The participants who completed the anagram reported a greater attenuation of their negative mood following the task, and endorsed less risky choices on the questionnaire. This was interpreted in terms of Forgas's (1998) theory that information processing can act as an emotion regulation strategy, suggesting that some intense affective states may enhance risk taking behaviour. However, it would be unwise to generalise too widely from two studies using undergraduate samples until the results have been replicated in a more representative variety of populations.

There is evidence that poor cognitive and emotion regulation is linked to risk taking behaviour. Cognitive regulation relates to the control of thoughts and actions involved in the planning and execution of behaviour, and is fairly synonymous with executive functioning, whilst emotion regulation relates to the control of affect, drive and motivation (Banfield, Wyland, Macrae,

Münte, and Heatherton, 2004). In an undergraduate sample, Magar, Phillips and Hosie (2008) found that poor cognitive regulation was linked to greater endorsement of risky activities, an emphasis on the benefits associated with risky activities, as compared to the costs, and a higher incidence of experiencing problems associated with excessive alcohol consumption. Poor emotion regulation was linked to greater participation in risky behaviours, such as smoking and alcohol-related problem behaviour; however, cognitive regulation was related to a more diverse range of risk taking behaviours and judgements. Given the nature of the sample one should be cautious in generalising the findings; given that the participants were university students in their early twenties they may be more inclined to engage in the aforementioned risky behaviours given their developmental stage, in terms of experimenting with and establishing their identities (Erikson, 1968), and in terms of the continuing development of the prefrontal areas necessary for supporting the executive functions measured in the study (Blakemore and Choudhury, 2006). It would be interesting to replicate this study sampling from a wider range of the population, and especially in bipolar disorders; which are linked to increased involvement in risk taking behaviours when symptomatic, and in whom a number of deficits in emotion regulation and executive functioning have been identified (Green, Cahill, and Malhi, 2007). Should these two variables be significantly linked, it would be useful to measure their relationship over time in order to determine whether a causal relationship exists between the two; a finding that could contribute to psychological models of bipolar disorders, as well as offering an avenue for direct clinical intervention.

#### *Pathways to risk taking behaviour*

Cooper, Agocha, and Sheldon (2000) proposed a motivational model of risk taking behaviour, within which two distinct pathways independently lead to risk taking behaviour. One pathway is via the desire to pursue/enhance positive affect and feelings of well-being; the enhancement motive. The other is via the desire to avoid or escape aversive emotional states; the coping motive. It is posited that positive emotionality, essentially extraversion, drives the enhancement motive, whilst negative emotionality, or neuroticism, drives the coping motive. Cooper, *et al.* proposed that impulsivity interacts with these two pathways by facilitating the response tendency that is dominant for the individual. The model was tested by measuring levels of extraversion, renamed surgency in the paper, due to the focus on the agentic aspects of positive emotionality, neuroticism and impulsivity, motives and the frequencies of risky sexual behaviours, heavy (alcohol) drinking and drinking alcohol to cope. The expected relationships were found between extraversion and enhancement motives, and neuroticism and coping motives. Additionally, the two motivational pathways were found to mediate the majority of extraversion and neuroticism's effects on the risky behaviours, which were complex – for example, coping motives for alcohol use was predicted by an interaction between high neuroticism and either high impulsivity or high extraversion. Furthermore, the personality factors accounted for 23% of the variance in coping motives, but only 7% of the variance in enhancement motives. Clearly a large proportion of the variance remained unexplained, but only three facets of personality were measured so this was expected. Importantly,

there was substantial overlap between extraversion, neuroticism and impulsivity; therefore, studies that have linked impulsivity to risk taking behaviour without controlling for extraversion and neuroticism may have overestimated the role of impulsivity. Although these were the results from a single study, with a young adult sample, they do demonstrate the dynamic relationships between psychological variables, goals and behaviours involved in understanding risky behaviours that goes beyond traditional descriptions of risk taking in terms of unidimensional constructs, such as being risk adverse (Kahneman and Tversky, 1979). Furthermore, although preliminary, the results do suggest that risk taking and impulsivity are dissociable, but interact.

### Summary of general research on risk taking behaviour

Evidence suggests that impulsivity and risk taking propensity are multidimensional constructs which, although producing objectively similar behaviours, are related to different functions and cognitive variables. Furthermore, affective state, goals and motivation appear to mediate some aspects of risk taking behaviour. Given the finding that some difficulties in executive functioning are evident in first degree relatives of individuals diagnosed with bipolar disorders (Bora, et al., 2009), it seems reasonable to hypothesise that these difficulties may impact upon the development of self-regulation strategies – an area which remains underexplored. Therefore, research into bipolar disorders may benefit from further investigating the exact nature of the relationship between: impulsivity, executive functioning, self-regulation and risk taking behaviour; especially given the impact these variables can have on many areas of psychosocial functioning.

A number of psychological models have been proposed in relation to bipolar disorders; however, this review will only focus on three models, and the way in which risk taking is treated within each framework. Firstly, psychological factors related to bipolar disorders will be briefly reviewed.

### Psychological factors in bipolar disorders

#### Neuropsychological factors

A number of differences in neuropsychological functioning have been observed between individuals diagnosed with bipolar disorders and non-clinical controls. In a recent meta-analysis, Bora, Yucel, and Pantelis (2009) identified response inhibition as being the most prominent factor, with individuals diagnosed with bipolar disorders who were currently euthymic, and their first degree relatives, showing marked deficits on the Stroop Colour Word test (Lezac, 1995). These two groups also showed impaired performance on measures of set shifting, verbal memory and sustained attention when compared to non-clinical controls; suggesting that these processes represent potential endophenotypes. In addition, processing speed, verbal working memory and visual memory were found to be related to the presence of clinical symptoms of bipolar disorders;

processing speed showed a relationship with antipsychotic medication. Given that slowed processing speed can impact upon the measurement of other cognitive functions, it is difficult to ascertain whether deficits evident in some studies are partially attributable to the effects of treatment status. The deficits in verbal memory were more severe in those with an earlier age of onset. The authors concluded that deficits in verbal memory and set shifting may be trait markers in individuals with a history of psychosis, regardless of diagnosis, as similar deficits are evident in individuals diagnosed with schizophrenia. In contrast, the deficit in response inhibition would appear to be specific to bipolar disorders.

### Personality traits

A number of studies have compared individuals with bipolar disorders with either other clinical groups or non-clinical participants on a number of personality traits. The most robust findings are that individuals diagnosed with bipolar disorder score more highly on measures of extraversion and openness to experience when compared to both clinical and non-clinical comparison groups (Bagby, Young, Schuller, Bindseil, Cooke, Dickens, *et al.*, 1996; Tackett, Silberschmidt, Krueger, and Sponheim, 2008). Individuals diagnosed with bipolar disorders have been found to score lower on agreeableness than other clinical groups (Tackett, *et al.*), and higher than a non-clinical group on neuroticism, but lower than individuals diagnosed with generalised anxiety disorder, dysthymia and social phobia (Tackett, *et al.*). A euthymic bipolar group was also found to score more highly than a matched control group on harm avoidance, which was positively correlated with depressive symptoms (Loftus, Garino, Jaeger, and Malhotra, 2008). In studies using non-clinical samples, higher levels of both extraversion and openness to experience have been, independently, related to higher levels of risk taking behaviour (Nicholson, Soane, Fenton-O'Creevy, and Willman, 2005; Lauriola and Irwin, 2001, respectively), and higher levels of sensation seeking (Roberti, 2004). Similarly, as discussed earlier, high levels of extraversion were also linked to risk taking in the context of enhancing positive mood states in the developmental model of Cooper, *et al.* (2000). Furthermore, the combination of high levels of extraversion and high levels of neuroticism has been proposed to be characteristic of high impulsivity; as well as linked to the functioning of the behavioural activation and inhibition systems, respectively, to be discussed later (Gray, 1972). Therefore, when considering the nature of risk taking behaviour in bipolar disorders it would be wise to bear the no doubt complex interplay of these underlying personality factors in mind.

### Beliefs and attitudes

#### *During (hypo)mania*

Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) found (hypo)manic participants to evince significantly greater levels of overgeneral autobiographical memory in the recall of negative events than non-clinical controls. Furthermore, manic participants scored higher on a

measure of autonomy than non-clinical controls, as well as on a measure of sociotropy; on which they scored significantly lower than participants experiencing depressive episodes.

#### *During depressive episodes*

A number of studies have found individuals diagnosed with bipolar disorders, when depressed, to have similarly negative dysfunctional attitudes, negative automatic thoughts and self-blaming encoding style as individuals diagnosed with unipolar depression (Hill, Oei, and Hill, 1989; Reilly-Harrington, Alloy, Fresco, and Whiteside, 1999; Hollon, Kendall, and Lumry, 1986). Furthermore, both individuals diagnosed with bipolar disorder and unipolar depression, when depressed, have been found to be significantly more self-critical than non-clinical controls (Rosenfarb, Becker, Khan, and Mintz, 1998).

#### *During euthymia*

Reilly-Harrington, Alloy, Fresco, and Whiteside (1999) found there to be no differences between euthymic bipolars, euthymic unipolars and non-clinical controls on attributional style, dysfunctional attitudes or most measures of self-referent information processing. Furthermore, Hollon, Kendall, and Lumry (1986) found that euthymic bipolars did not differ from euthymic unipolars or non-clinical controls on measures of dysfunctional attitudes or automatic thoughts.

However, Alloy, Abramson, Walshaw, and Neeren (2006) found that individuals diagnosed with a bipolar spectrum disorder scored more highly than non-clinical controls in terms of: having a more negative inferential style (Cohen's  $d = .35$ ); higher levels of perfectionism on the DAS ( $d = .39$ ); higher levels of autonomy ( $ds = .32-.44$ ); higher levels of self-criticism ( $d = .74$ ); higher levels of private self-consciousness ( $d = .61$ ); and, higher levels of rumination ( $d = .80$ ). However, there were no differences in terms of levels of sociotropy or dependency. Similarly, Rosenfarb, Becker, Khan, and Mintz (1998) found that females diagnosed individuals diagnosed with Bipolar I disorder did not differ from females diagnosed with unipolar depression on a measure of self-criticism, but both groups scored more highly than a non-clinical group. Lam, Wright and Smith (2004) found individuals diagnosed with Bipolar I disorder to score more highly than individuals diagnosed with unipolar depression on the goal-attainment component of the Dysfunctional Attitudes Scale (Weissman and Beck, 1978), with no other difference reaching significance. Furthermore, Alloy, et al., (1999) found that individuals diagnosed with cyclothymia and dysthymia did not differ from one another, but evinced more negative attributional style and dysfunctional attitudes on self-report questionnaires than currently hypomanic participants or non-clinical controls. Conversely, Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) found there to be no differences between those with bipolar disorder and non-clinical controls on attributional style.

However, Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) did find there to be significant between group differences on both perfectionism and sociotropy; with euthymic individuals scoring lower than those in depressive episodes, not significantly differently

from those in manic episodes and significantly higher than non-clinical controls on sociotropy. On autonomy, euthymic individuals demonstrated similar scores to those who were depressed and manic, all of whom scored more highly than non-clinical controls. Scott, Stanton, Garland and Ferrier (2000) found that individuals diagnosed with Bipolar I disorder did score more highly than a matched control group on sociotropy, as well as reporting higher levels of perfectionism, generating fewer solutions on a problem-solving task, greater endorsement of dysfunctional attitudes and greater implicit over-general recall on an autobiographical memory task. The two groups were best differentiated by perfectionism and overgeneral autobiographical memory. Overgeneral autobiographical memory has been identified as a transdiagnostic process evident in a number of psychological disorders; with some proposing that it represents a form of passive/functional avoidance of distressing material in order to regulate affect (Williams, Barnhofer, Crane, Hermans, Raes, *et al.*, 2007).

## Self-esteem

### *During (hypo)mania*

Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) found that during (hypo)manic episodes, individuals reported equivalent levels of self-esteem to non-clinical controls, which was significantly higher than that of euthymic and depressed participants, when recording self-esteem ratings in a daily diary for one week. Findings were similar on the Rosenberg Self-esteem Scale, except (hypo)manic participants reported equivalent self-esteem to euthymic participants, higher levels of self-esteem than depressed participants and lower self-esteem than non-clinical controls.

### *During depressive episodes*

Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) found that during depressive episodes individuals reported significantly lower self-esteem than non-clinical controls and participants who were euthymic or (hypo)manic on the Rosenberg Self-esteem Scale, as well as when using a daily diary method was for one week.

### *During euthymia*

A number of studies have found there to be no differences between the self-reported self-esteem of individuals diagnosed with bipolar disorder and non-clinical controls (Pardoen, Bauwens, Tracy, Martin, and Mendlewicz, 1993; Scott, Stanton, Garland and Ferrier, 2000; Tracy, Bauwens, Martin, and Pardoen, 1992). However, Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) found that during euthymia, individuals reported significantly higher self-esteem than depressed participants on the Rosenberg Self-esteem Scale, comparable levels of self-esteem to those experiencing (hypo)mania, but significantly lower self-esteem than non-clinical controls. There

was a similar pattern for mean level of self-esteem collected from a diary that participants kept for one week, except that euthymic participants scored significantly lower than manic participants.

## Summary

Clearly there is some inconsistency in findings across studies and methodologies; however, research to be discussed later suggests that it may be self-esteem stability, rather than mean level of self-esteem, that is most pertinent to bipolar disorders. Similarly, evidence regarding the nature of prototypical beliefs and attitudes in individuals diagnosed with bipolar disorder is conflicting. This may partly be due to differences in the samples (Bipolar I vs. bipolar spectrum; non-clinical controls vs. unipolar depressed controls, as well as episodic status within bipolar groups) and measures used between studies, making direct comparisons difficult. However, conflicting beliefs and attitudes and variable self-esteem may be intrinsic to the psychology of bipolar disorder, and therefore these elements may be exactly what needs to be understood in order to develop an integrative model of the disorder. Alternatively, it may be that it is current symptomatology that is the important variable to consider when measuring beliefs and attitudes; Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall (2009) conducted a factor analysis on the battery of measures administered to participants in their study and found five interpretable factors; of these, between group differences on negative cognitive style, on which sociotropy, autonomy, BIS and rumination had high loadings, significantly discriminated between diagnostic groups (depressed = euthymic > controls, both  $p < .001$ ) after controlling for the effects of current affective symptomatology. However, between group differences on the excitement factor, on which RSQ risk taking and the three BAS scales had high loadings – both to be discussed further later, became non-significant after controlling for current symptomatology. Suggesting that clinically significant episodes within bipolar disorders may be comprised of a complex confluence of trait and state related psychological factors, as well as biological changes, rather than stable profiles of particular variables; the challenge of a comprehensive psychological model is to accommodate this complexity and diversity – and in all likelihood it may be more pragmatic to develop models of specific processes, which may co-occur and interact in complex ways at different levels and have differential significance between individuals, much as psychological models of psychosis have tackled hallucinations and delusions separately, to great effect.

## Psychological models of bipolar disorders

### Dysregulation of the behavioural activation system

A number of researchers have proposed that bipolar disorders are linked to dysregulation of the behavioural activation system (BAS) (Depue and Iacono, 1989; Depue and Collins, 1999). The BAS is described as a generalised motivational system governing appetitive motivation and

approach behaviour, thought to be heavily dependent on dopaminergic projections from the ventral tegmental area, which innervate multiple regions within the prefrontal cortex. In situations of possible reward, BAS activity is linked to increased motivation, goal-directed activity and BAS-relevant cognitions, such as increased confidence and expectations for success (Urošević, Abramson, Harmon-Jones, and Alloy, 2008). This is accompanied by an increase in positive emotions and some negative emotions, such as anger and irritability (Fowles, 1988; 1993). The BAS is proposed to work in the concert with the BIS, which governs avoidance behaviour, anxiety and BIS-relevant cognitions, such as hopelessness. Dysregulation of the BAS, resulting in hyperresponsivity to relevant stimuli has been proposed to be the biological vulnerability that is inherited in bipolar disorders; which results in greater variability in state levels of BAS activation, over time and across situations, as well as requiring a longer recovery period to return to baseline following activation (Urošević, *et al.*, 2008).

The features of BAS activation, such as: increased energy levels, goal-directed behaviour, positive affect, confidence in one's ability to achieve goals, irritability and anger, in conjunction with hyperhedonia, pressured speech, decreased need for sleep and flight of ideas, fits neatly with the symptoms of (hypo)mania. In terms of affective valence, it has recently been proposed that environmental cues are likely to influence whether mood is euphoric or irritable; with irritability linked to frustrative non-reward under conditions of perceived self-efficacy to obtain the reward (Urošević, *et al.*, 2008). Conversely, deactivation of the BAS is proposed to account for depressive symptoms, such as anhedonia, hopelessness and decreased goal-directed activity. Within bipolar disorders, an excessive increase in BAS activity is linked to (hypo)mania and an excessive decrease in activity is linked to depression.

#### *Self-reported BAS sensitivity and symptoms of bipolar disorder*

A number of studies have found elevated scores on a self-report measure of BAS activity, the BIS/BAS Scale (BIS/BAS; Meyer, Johnson, and Carver, 1999) in Bipolar I individuals compared to controls (Meyer, Johnson, and Winters, 2001; Salavert *et al.*, 2007) and individuals diagnosed with bipolar spectrum disorders (Alloy, *et al.*, 2008; Meyer, Johnson, and Carver, 1999). However, other researchers have found no differences between either people diagnosed with bipolar spectrum conditions or people diagnosed with Bipolar I disorder and non-clinical controls (Nusslock, *et al.*, 2008; Yechiam, *et al.*, 2008, respectively). Additionally, studies have identified elevations on the individual subscales that comprise the BAS. In non-clinical samples 'reward responsiveness' has been found to predict scores on the HPS (Jones, Shams, and Liversidge, 2007) and to be negatively correlated with depression and predictive, along with self-dispositional attributions for depressive symptoms, of current depressive symptoms (Jones and Day, 2008). Additionally, reward responsiveness scores, although not significantly different between individuals diagnosed with bipolar spectrum conditions and non-clinical controls, have been found to predict shorter time to onset of a (hypo)manic episode, in conjunction with BAS total scores (Alloy, *et al.*, 2008). However, several studies have failed to find a link between scores on the HPS in people diagnosed



with bipolar spectrum conditions and non-clinical controls on reward responsiveness (Alloy, et al., 2008; Jones and Day, 2008; Nusslock, et al., 2008) or between Bipolar I individuals and controls (Hayden, et al., 2008; Yechiam, et al., 2008). However, the Jones and Day (2008) study found reward responsiveness scores to be negatively correlated with lifetime depressive symptoms. Furthermore, the Hayden, et al. (2008) study also employed a physiological index of BAS activity, with which they did find significant group differences. It is possible that some of the inconsistencies in findings are attributable to the questionable validity of the reward responsiveness subscale, as several authors have noted that many of the items that comprise the scale have low loadings; furthermore, some items load onto both the BIS and BAS scales, which are intended to measure very different constructs (Jorm, et al., 1999; Ross, et al., 2002).

Results have been more consistent for the 'drive' and 'fun seeking' scales. Alloy, et al. (2008) found bipolar spectrum participants to score significantly higher on the drive subscale, as did Nusslock, et al. (2008). Additionally, Nusslock et al. found that BAS drive interacted with impulsive nonconformity to predict academic performance in university students diagnosed with bipolar spectrum conditions; with no parallel effect in non-clinical control participants. However, both Jones, Shams, and Liversidge (2007) and Jones and Day (2008) failed to find a significant relationship between BAS-drive and scores on the HPS in a non-clinical sample. Two studies have reported that people diagnosed with bipolar spectrum disorders scored significantly higher than controls on the fun seeking scale (Alloy, et al., 2008; Nusslock, et al., 2008). Furthermore, fun seeking scores emerged as an independent predictor of HPS scores in a non-clinical sample (Jones, Shams, and Liversidge, 2007); and, along with BIS scores and positive self-dispositional interpretations of (hypo)manic symptoms, predicted scores on the HPS in a separate non-clinical sample (Jones and Day, 2008). However, the only study to report scores for a group of Bipolar I participants did not find any differences between clinical and non-clinical participants (Yechiam, et al., 2008). However, it should be noted that in this study the bipolar group was extremely heterogeneous, with participants experiencing a mixture of affective symptoms; therefore, any state related elevations may have been obscured. Furthermore, in a study validating the structural distinctions between the BAS subscales, Smillie, et al. (2006) confirmed the drive and reward responsiveness scales, although others have questioned the validity of the reward responsiveness subscale, but found the fun seeking scale to have a broader focus, being equally related to reward reactivity and impulsivity. Therefore, findings of elevated scores on this scale may partially reflect between groups differences in impulsivity.

In addition to cross-sectional data, longitudinal studies have linked BAS sensitivity to mood symptoms over time. Alloy, et al. (2006) found that self-reported BAS sensitivity, BAS total scores, prospectively predicted greater likelihood, and shorter time to onset, of bipolar episodes in people diagnosed with bipolar spectrum disorders over a 3.5 year follow-up. Similarly, Salavert, et al. (2007) found that participants diagnosed with Bipolar I disorders who had lower BAS total scores were more likely to relapse with a depressive episode, than a (hypo)manic episode, over an eighteen-month follow-up period

### *Psychophysiological indices of BAS activity*

The behavioural activation system has been linked to activity in the prefrontal cortex, with relatively greater activation in the left hemisphere linked to approach motivation, or BAS activity, and relatively greater activation in the right hemisphere linked to withdrawal motivation, or BIS activity. Decreased left frontal cortical activation as measured by electroencephalogram (EEG) is associated with depression, and posited to be a possible trait marker (see Davidson, Pizzagalli, Nitschke, and Putnam, 2002 for a discussion). Hayden, et al. (2008) found that symptomatic bipolar participants, in a variety of mood episodes, showed greater relative left frontal activation during a task eliciting a positive agentive state. The task involved sorting cards to obtain a reward, and although the symptomatic bipolar group showed the greatest relative increase in activation, it was the euthymic bipolar group who successfully sorted the most cards; suggesting that BAS activation and its functional correlates do not necessarily translate into enhanced performance in the goal-directed activities towards which motivation is directed. In this study there were no between groups differences on the BIS/BAS scales, nor was there any significant relationships between the self-report and EEG measures; suggesting that the self-report scales may not be as sensitive to BAS activity as the physiological measurement. Harmon-Jones, Abramson, Sigelman, Bohlig, and Hogan (2002) found that bipolar spectrum participants showed greater relative left frontal cortical activation than non-clinical participants whilst engaged in a very difficult task involving a mixture of rewards and punishments, whilst there were no between groups differences on easy or moderately difficult tasks. In fact, control participants' showed a reduction in activation between the moderately and very difficult tasks; whilst the bipolar group only showed this pattern for trials involving only punishment – suggesting that the effects are specific to rewarding situations, as described by the BAS dysregulation theory. Moreover, Urosevic, et al. (2008) found that under conditions of experimentally induced anger evocation, proposed to be BAS-relevant, individuals described as prone to depression evinced lower relative frontal cortical activation; whilst those prone to hypomania showed the opposite pattern of activation.

### *Variability in BAS Functioning*

The above research was largely cross-sectional in nature, producing evidence which both supported and questioned the theory that individuals on the bipolar spectrum would display higher levels of BAS activity, as well as some prospective studies describing levels of BAS activity at Time 1 with any changes in mood symptoms at Time 2. However, to build a clearer picture of the relationships between BAS functioning, environmental events and mood symptoms, a small number of studies have investigated the hypothesis that individuals on the bipolar spectrum show greater variability in levels of BAS activation. Depue, Slater, Wolfstetter-Kausch, Klein, Goplerud, and Farr (1981) found that individuals diagnosed with cyclothymia showed greater within- and between day variability in state behavioural engagement level over a four week period than a non-clinical

control group. Furthermore, using a daily diary method, Goplerud and Depue (1985) found that individuals diagnosed with cyclothymia and non-clinical controls showed comparable changes in indices posited to represent BAS functioning following a naturally occurring BAS-relevant event; however, the cyclothymic group took significantly longer to return to their baseline level of functioning. This study supposed all stressful events to lead to BAS deactivation; however, negative events may lead to BAS activation as individuals strive to overcome the adversity (Wright, Lam, and Brown, 2008). Therefore, Wright, *et al.* conducted a similar study, but focussed specifically on events involving reward and frustrative non-reward; which are theoretically linked to BAS activation and deactivation respectively. In contrast to Goplerud and Depue, Wright, *et al.* found there to be no difference in initial response or time taken to recover from these events between euthymic individuals diagnosed with Bipolar I disorder and non-clinical controls. However, following rewarding events recovery time increased as number of previous manic episodes increased, and recovery time following frustrative non-reward increased as both number of previous manic and depressive episodes increased. The authors acknowledged that the findings may have been confounded by medication obscuring underlying mood and approach tendencies. Furthermore, between groups differences may have been obscured by the exclusion of data from participants who had not returned to baseline level of BAS activity by the study end. However, should these findings be replicated, there would appear to be a more complicated relationship between behaviour activation and bipolarity; a number of possibilities were posited to account for the findings, namely, longer recovery time representing: psychological scarring from previous episodes; demarcation of subgroups within the diagnosis of bipolar disorder; and, that quantity of previous episodes may indicate vulnerability to future episodes, and be correlated with higher levels of other vulnerability variables, such as magnitude of BAS dysregulation.

#### *The Behavioural Activation System and Goal-striving*

In relation to this theory, the impact of goal-striving and goal attainment on (hypo)manic symptoms has been investigated; as such events represent prototypical examples of the type of rewarding events that should elicit increased BAS activity. In accordance with a goal dysregulation model of bipolar disorder, Johnson, *et al.* (2000) found that goal-attainment life events predicted increases in manic symptoms, but not depressive symptoms, in individuals diagnosed with Bipolar I disorder. To investigate the relationship between goal-striving and hypomanic symptoms in a more controlled fashion, Nusslock, Abramson, Harmon-Jones, Alloy, and Hogan (2007) found that BAS sensitivity scores moderated the presence of particular hypomanic symptoms during a circumscribed period of goal-striving, final exams, in individuals diagnosed with Bipolar II disorder and/or cyclothymia. Specifically, total scores on Carver and White's (1994) BAS scale predicted inflated self-esteem/grandiosity and increased goal-directed activity/psychomotor agitation. These effects remained significant after controlling for sleep loss. Interestingly, when bipolar spectrum participants in the exam group were compared with bipolar spectrum control participants not taking exams, regression analyses indicated that the participants in the two

conditions did not exhibit significant differences in the experience of a number of DSM-IV hypomanic symptoms, including excessive involvement in pleasurable activities with high potential for painful consequences - this was despite significantly more participants in the exam group experiencing hypomanic episodes.

Although these findings involved a highly selected group of participants, undergraduates who may have a number of protective factors and for whom goal-striving is likely to be particularly salient; the results illustrate the fact that different profiles of symptoms may be better accounted for by some psychological models than others. For example, during periods of increased goal-striving, there is likely to be little opportunity for involvement in 'reckless', risky activities; whereas, for individuals whose lives lack the opportunity to strive for attainment goals, (hypo)mania may manifest with a different cluster of symptoms via different mechanisms. Therefore, given the complexity of the disorder, and the fact that psychological research in this area is at an early stage, it is likely that elements of many models are actually complementary; describing different elements and different stages of the disorder.

#### *The Behavioural Activation System and Risk Taking Behaviour*

Within this model risk taking behaviour could intuitively be related to increased BAS activity in situations of reward, as behaviours such as engaging in sexual activity, substance abuse and spending sprees are likely to be intrinsically rewarding, and thus preferentially sought out and/or 'created'. However, research thus far has not focussed on this area. Therefore, although research indicates promising links between BAS dysregulation and bipolar disorders; current models do not describe the processes that might mediate the links between risk taking behaviours and BAS activity. Clearly, without such models it is difficult to develop interventions.

#### *Limitations of the BAS Dysregulation Theory of Bipolar Disorders*

It is unclear exactly where BIS functioning fits with the BAS dysregulation theory of bipolar disorders. Two studies have found individuals with Bipolar I disorder to score significantly more highly on this scale than non-clinical controls (Hayden, et al., 2008; Yechiam, et al., 2008). Conversely, Jones and Day (2008) found lower BIS scores to be predictive of higher HPS scores in an analogue sample; whereas another study found there to be no significant differences between Bipolar I individuals and non-clinical controls (Salavert, et al., 2007), nor between individuals diagnosed with bipolar spectrum conditions and non-clinical controls (Alloy, et al., 2008). However, these studies all employed the BIS/BAS scales to measure BIS levels which can only provide a proxy measure of BIS/BAS functioning; future studies using psychophysiological indices may provide a more valid measure of this construct. Heightened BIS activity has been linked to a number of psychiatric diagnoses, and it has been hypothesised that BIS activity may be linked to negative affect and irritability (Leibenluft, et al., 2003); which could potentially partially address the most damning criticism of the model, which is the fact that numerous factor analyses of manic symptoms have identified clusters of factors that include co-occurring affect of differing valence,

such as dysphoria coupled with euphoria and irritability (Cassidy, Forest, Murry, and Carroll, 1998). In isolation, the model is unable to account for this basic feature of mania; either positive emotion is linked to BAS activation and irritability/anger is linked to BAS deactivation, in which case the two simply cannot logically occur concurrently, or BAS activation is linked to positive emotionality and BIS activity is linked to negative emotionality; however, the original description of the systems stated that activation of either the BIS or the BAS results in inhibition of the other system (Fowles, 1988) – which is logical, as serious conflict between approach and avoidance would simply result in inertia.

Finally, although BAS dysregulation can adequately account for many symptoms associated with either depression or mania – despite equivocal empirical findings testing the theoretical links – and can accommodate findings relating to beliefs about goal attainment, perfectionism and autonomy; it is not intuitively obvious how findings relating to self-esteem, to be discussed in detail later, would fit in with this model. Evidence from a study using an analogue sample of undergraduates vulnerable to bipolar spectrum conditions suggests that elements of the BIS/BAS scales and self-appraisals for either hypomanic or depressive symptoms make independent contributions to predicting variance in HPS and lifetime depression scores (Jones and Day, 2008). It would be possible to argue that the anhedonia and dearth of goal-directed activity related to depression deprive individuals of reinforcement, which impacts negatively on their self-esteem; whereas the rush of confidence, euphoria and sociability experienced during (hypo)mania, in conjunction with biases in information processing, could bolster self-esteem. However, the self-esteem literature discussed later suggests that the profile of individuals' self-concepts and their self-esteem may be more complex than a one-to-one correlation between symptom profile and overall level of self-esteem.

### Traditional Cognitive Behavioural Models of Bipolar Disorders

#### *Outline of the Traditional Cognitive Behavioural Approach to Bipolar Disorders*

Since cognitive behavioural therapy (CBT) has demonstrated efficacy in the treatment of unipolar depression, these models have been adapted to incorporate the features of bipolar disorders (see Wright and Lam, 2004). As outlined earlier, outcomes from CBT trials have produced conflicting results regarding the utility of current CBT based interventions in treating bipolar disorders; however, some trials have produced successful outcomes, which is promising. The CBT framework upon which the interventions used in these trials were based emphasises the particular patterns of thoughts, feelings and behaviours, which, in interaction with a biological diathesis, precipitate and maintain episodes. The proposed biological vulnerability is instability of circadian rhythms, the effects of which are misinterpreted and attributed to aspects of the self; for example, sleep loss can lead to motor activation, which is attributed to positive characteristics of the self, such as being intrinsically dynamic and creative (Healy and Williams, 1989; Jones, 2001). Furthermore, dysregulation of the behavioural activation system also serves as a biological vulnerability factor

(Depue and Iacono, 1989). Within this model, cognition is characterised by dysfunctional attitudes relating to goal attainment and anti-dependency, and mood is either euphoric or dysphoric. Prototypical (hypo)mania-related behaviours are: impulsive and sensation seeking behaviour; a lack of routine; trying to make up for lost time; disregarding negative social feedback and highly-driven, goal-directed behaviour. Depression-related thoughts and behaviours involve: self-blame for failure to meet standards; rumination about the negative implications of depressive symptoms, and ambivalent behaviour towards others (Wright and Lam, 2004). In line with this model, there is evidence for some areas of cognition being fairly consistently associated with bipolar disorder, such as dysfunctional attitudes concerning: perfectionism, self-criticism and rumination (Alloy, *et al.*, 2005), along with goal-attainment (Lam, Wright, and Smith, 2004). Lam, Wright and Smith found these attitudes to be maintained following positive mood induction, whereas they were dropped by unipolar participants.

This theory proposes that individuals have bidirectional self-schemas, such that during periods of hypomania the self-concept is positive, with attendant positive beliefs relating to one's abilities (Newman, Leahy, Beck, Reilly-Harrington, and Gyulai, 2002). Evidence suggests that autobiographical event recall is mood dependent in both depression and mania, as is event generation in mania (Eich, Macauley, and Lam, 1997). Therefore, when mood is euphoric, positive thoughts and memories become more available and reinforce 'hyperpositive' beliefs about the self (Eich, Macauley, and Lam, 2005); conversely, dysphoric mood is related to negative views of the self. These aspects of cognitive functioning and biases in information processing provide the foundations for maintenance cycles, wherein mood-congruent memories and beliefs reinforce current mood, which serves to make further mood congruent thoughts and memories available.

#### *Risk taking behaviour within the traditional framework of the cognitive behavioural approach*

Within this framework, risk taking behaviour is linked to the emergence of hypomanic symptoms and accompanying: hyperhedonia, euphoric mood, grandiose beliefs, increase in libido, impulsivity and deficits in decision making. Thus, whilst hypomanic, individuals may enjoy their euphoric mood and engage in behaviours that intensify this, such as excessive use of caffeine, alcohol and street drugs, and engaging in spending sprees and sexual promiscuity (Lam, Jones, Hayward, and Bright, 1999).

#### *Limitations of the traditional CBT model*

Within this model, impulsivity and risk taking behaviour are implicitly treated as unidimensional constructs which arise, due to specific thoughts, feelings and behaviours, largely as a consequence of the emergence of a hypomanic state – which may be triggered by reward-related BAS activity or disruption of internal rhythms; and then serve to exacerbate and maintain hypomanic symptoms. There is little elaboration of what constitutes impulsivity and risk, taking, nor is there extensive elaboration of the mechanisms that drive the shifts in processing polarity within schemas (Power, 2005). Moreover, despite the centrality of emotion to the experience of bipolar disorders, the

outlined theory does not devote a great deal of attention to elucidating the nature of emotions within the overall framework, nor appear able to be sufficiently account for the course and phenomenology of the disorder, especially manic episodes. Within this model, mania is characterised by feelings of euphoria; however, manic episodes may occur in the absence of euphoria, in which case, it is unclear whether the types of the beliefs and behaviours outlined in the model would remain the same. Furthermore, manic episodes are frequently characterised by the co-occurrence of emotions of different hedonic tone (Goodwin and Jamison, 1990), which is difficult to reconcile with a linear CBT model in which emotions and thoughts of one polarity are linked and reinforce one another.

Further still, it is difficult to see how findings regarding disparities between implicit and explicit measures of self-esteem and attributional style (discussed later) can be conceptualised within the model. Discussion of later research indicates that the self-concept and self-esteem may be variables of importance for any comprehensive theory. Thus, although cognitive behavioural theories make some contribution to the understanding of bipolar disorders, and provide a framework for designing interventions, the current model does not appear to adequately describe the disorder. The fact that a large RCT found CBT not to be effective in prolonging remission or preventing relapse for individuals who had experienced a high number of previous episodes (Scott, *et al.*, 2006), suggests that, at present, CBT interventions may be lacking a sufficiently strong model of the disorder on which to base interventions that have more robust effectiveness for the populations typically seen in clinical practice. However, it is likely that the outcomes in the trial that produced unfavourable results cannot be entirely attributable to the underlying model on which the intervention was based; for example, large numbers of patients did not complete all the planned sessions and had complex presentations, which would have affected the results. However, this represents the realities of clinical practice, and the population for which interventions to be used within NHS settings must be designed.

#### Summary of BAS dysregulation and traditional CBT models of bipolar disorders

Both traditional CBT and BAS dysregulation models explain some findings regarding bipolar disorders; however, neither considers risk taking explicitly. Since research suggests that the tendency to engage in risk taking may be mediated by a number of variables, one of which is affect, psychological research could benefit from considering this type of behaviour in greater detail in relation to affective disorders. Furthermore, neither theory appears to be able to account for the frequent co-occurrence of emotions of different hedonic tone during mania (Goodwin and Jamison, 1990). Whilst it is difficult to reconcile the findings that during (hypo)mania people often hold a hyperpositive sense of self and evidence mood-congruent information processing biases with those that suggest that during (hypo)mania emotions of different hedonic tone occur in conjunction with one another. It is possible to hypothesise that irritability results from frustration with others' reactions or frustrative non-reward; however, such processes have yet to be explicated in detail.

However, given the fact that current CBT interventions have produced favourable results, this approach may well provide a solid foundation for building upon as research and theories develop and become refined. Risk taking behaviour is frequently linked to (hypo)mania; yet, in many respects such behaviour is often incompatible with goal-striving and attainment, which are also linked with (hypo)manic symptoms. However, just as unipolar depression is regarded as the end-point of multiple pathways (Sullivan, Neale, and Kendler, 2000); mania may arise in vulnerable individuals via a number of routes. Indeed, findings describing different types of manic episodes, such as euphoric mania and dysphoric mania, suggest that different patterns of important variables may coalesce and result in reliably different presentations, both within individuals over time, and between individuals.

#### Manic defence/depression avoidance hypothesis

There is a long tradition of theories suggesting that mania may represent a defence against depression, traditionally couched within a psychoanalytic framework (Abraham, 1911/1927). Modern reformulations of this theory in cognitive terms propose that when events are perceived to be a threat to fragile self-esteem, individuals attempt to cope with the ensuing feelings of helplessness and vulnerability by engaging in grandiose thoughts and behaviour in order to regain a sense of control and mastery (Neale, 1988). If this is successful, individuals may ‘spiral’ into mania; however, if this fails, or if the nature of the event mitigates the use of this strategy – such as encountering a negative life event of great magnitude and significance that it would be difficult to deal with using a cognitive defence mechanism - the negative aspects of their self-concept are activated and they may become depressed. Implicit in this theory is the hypothesis that there should be a dissociation between implicit and explicit self-representations, especially during manic episodes.

#### *Negative attributional style and attentional bias*

In an analogue sample of students, Bentall and Thompson (1990) found that high scorers on the Hypomanic Personality Scale (HPS; Eckblad and Chapman, 1986) showed slower colour naming for depression-, but not euphoria-related words on an emotional Stroop. This effect was demonstrated after controlling for current depressive symptoms ( $\omega^2=.72$ ). Additionally, high scores on the HPS were associated with making global attributions for both positive and negative events. This finding was replicated by French, Richards, and Schofield (1996), controlling for the effects of anxiety on Stroop performance. Furthermore, Knowles, Tai, Jones, Highfield, Morriss, and Bentall (2007) found euthymic bipolar and unipolar participants to make more internal attributions for negative events, whereas the non-clinical control group made more internal attributions for positive events. Conversely, a recent study did not find any differences in the attributional style of individuals diagnosed with bipolar disorders when compared to non-clinical controls (Van der Gucht, Morriss, Lancaster, Kinderman and Bentall, 2009). The authors speculated that this may



have reflected the fact that the Pragmatic Inference Test may be a poor indicator of negative cognitive style; which makes interpretation of previous positive results difficult to interpret.

Nevertheless, a pilot study with a high risk sample of children, with at least one parent diagnosed with a bipolar disorder, demonstrated similar biases in information processing (Gotlib, Traill, Montoya, Joormann, and Chang, 2005). Following a mildly negative mood induction, the children performed an emotional Stroop and a self-referent encoding task. Although the two groups did not differ on endorsement of positive and negative self-descriptors, the high risk group recalled significantly more negative words. However, on an emotional Stroop the high risk children did not show an attentional bias to depression-related words. Nevertheless, the high risk children did show slowed colour naming to 'social threat' and 'manic-irritable' words. These effects were found after controlling for anxiety and ensuring that the induced mood was indeed 'sad'. Five of the sixteen high risk children, and none of the control children, were diagnosed with non-affective Axis I disorders. Although these were controlled for in the analyses, it is unclear how this may have affected the results; especially as research suggests that anxiety and conduct disorders in childhood may be linked to later diagnosis of bipolar disorders (Henin, *et al.*, 2007). It is of interest that the children showed attentional bias to 'social threat' and 'manic-irritable', rather than 'manic-euphoric' or 'depressotypic' words; the latter is especially surprising, as prior to completing the task it was a sad mood that was induced. This may be due to general developmental differences between children and the adults on which prior studies have been based, or to differences in the presentation of paediatric hypomanic/manic states, as compared to adult (hypo)manic states, which are predominantly characterised by irritability (Carlson and Meyer, 2006). An elaborate interpretation is that sad mood was in some way semantically associated with manic-irritability. The bias towards social threat words may have been unintentionally primed by the manipulation check, which was a film of a child being teased. Alternatively, evidence from an adult bipolar sample suggests that evaluation of social rank may be intrinsically linked to feelings of well-being in this population; therefore, sad mood may have primed words related to social threat (Gilbert, McEwan, Hay, Irons, and Cheung, 2007). If these findings are replicated in larger samples, with fewer children with diagnoses linked to later onset of bipolar disorder, it may be that certain cognitive vulnerabilities precede the onset of affect symptoms in high risk samples. The methodology would also be informative for investigating adult samples; the finding of high levels of irritability, along with other non-euphoric emotions such as dysphoria, during mania is robust (Cassidy, Forest, Murry, and Carroll, 1998); furthermore, heightened activation has been proposed to be the cardinal feature of hypomania, rather than any particular category of emotion (Benazzi, 2007; Akiskal, Hantouche, Bourgeois, Azorin, Sechter, Allilair, *et al.*, 2001); therefore, it is possible that previous null findings in the adult literature for mania-related words could partially be explained by the use of stimuli which were not sensitive to the defining features of mania.

Although these findings are compelling, it has been noted that a more reliable measure of attentional bias would be the dot probe task, which has not yet been employed in this population (Mansell and Pedley, 2008).

### *Dissociation between Implicit and Explicit Measures of Self-relevant Processes*

Winters and Neale (1985) found that when compared to non-psychiatric controls and individuals in remission from unipolar depression, individuals in remission from bipolar disorder scored higher on a self-report measure of self-esteem (Cohen's  $d$ s = 1.35 and 3.03, respectively). However, the attributions made by the bipolar group on the Pragmatic Inference Test (PIT), an implicit measure of attributional style presented as a memory test, were equivalent to those generated by the unipolar group. During the PIT participants are presented with self-referent stories with success and failure outcomes, about which they answer multiple choice questions, one of which concerns choosing an internal or external cause for the outcome. Both the unipolar and bipolar groups chose internal causes for negative outcomes and external causes for positive outcomes. Similarly, Lyon, Bentall and Startup (1999) found a similar pattern of responses when comparing individuals diagnosed with bipolar disorders in manic and depressed phases with non-psychiatric controls. The manic and control groups showed the normal self-serving bias, endorsing mainly positive adjectives about the self. In contrast, the depressed group endorsed mainly negative adjectives about the self. However, both the manic and depressed groups recalled mainly negative self-descriptors, and showed depressogenic responding on the PIT.

### *Self-concept and self-esteem*

Further evidence for the idea that representations of the self differ according to phase of disorder comes from a study of self-discrepancies in individuals during hypomanic/manic, depressed and euthymic phases of bipolar disorder, as well as non-clinical controls (Bentall, Kinderman, and Manson, 2005). Using the theoretical framework of Higgins' (1987) Self-Discrepancy Theory, Bentall *et al.* compared participants' self-perceptions in terms of the actual, ideal and ought domains of their self-concept, and the perceptions that they believed others would have of them. The depressed group showed marked discrepancies between their self-actual and self-ideal and self-actual and self-ought representations, which differed from the other experimental groups. In contrast, the hypomanic/manic group demonstrated higher consistency between their self-actual and self-ideal than the control group. This method of measuring self-representations has high face validity, as participants generate the self-descriptors themselves; therefore, the dimensions and categories on which they are rating themselves should be personally meaningful. Additionally, a within-participants longitudinal study measuring self-perceptions and cognitive styles, in individuals with bipolar spectrum disorders and non-psychiatric controls, found that although attributional styles and dysfunctional attitudes remained stable regardless of naturally occurring mood state, self-perceptions varied; being more positive during periods of hypomania and more negative during depressive episodes (Alloy, Reilly-Harrington, Fresco, Whitehouse, and Zechmeister, 1999). This highlights the fact that studies that have previously used global measures of self-esteem may have missed important nuances in the self-construct, which may have important implications for understanding affective disorders.

### *Compartmentalisation and self-complexity*

Preliminary evidence suggests that individuals diagnosed with bipolar disorders show a high level of compartmentalisation of their self-concept, in that separate aspects of the self tend to be described as being either extremely positive or extremely negative (Power, de Jong, and Lloyd, 2002). This finding contrasted with individuals diagnosed with diabetes, selected to control for the effects of being diagnosed with a chronic condition, who showed a more integrated degree of self-organisation. It has been suggested that compartmentalisation of the self in this fashion leaves individuals vulnerable to abrupt shifts in self-esteem, from very high to very low, depending on which aspect of the self is currently activated (Showers, 1992). Taylor, Morley, and Barton (2007) replicated this effect of significantly higher levels of compartmentalisation in individuals diagnosed with bipolar disorders when compared to a non-clinical control group. Furthermore, this study also found the bipolar group to evince higher levels of self-complexity, which was indexed by the number of self-aspects generated by participants, and the degree of overlap between them; with the bipolar group showing less overlap between these aspects. However, the degree of overlap increased when disorder-related representations were excluded from the analysis, suggesting that it is the way in which individuals characterised themselves when they were manic or depressed that was distinctive and differentiated this group from the non-clinical controls. The authors speculated that this may have been an adaptive affect regulatory strategy, as there was a large amount of negative content in these characterisations; therefore, keeping negative content modularised and separate may have been protective to an extent. However, as noted by Powers et al., this leaves individuals vulnerable to large shifts in mood and self-esteem, as triggering of any content in a very negative self-aspect would lead to rapid spreading activation to all of the other negative content contained within that aspect.

### *Self-esteem instability*

Research in non-clinical samples indicates that individuals with self-esteem that is highly contingent on meeting certain standards, whether those standards are internally or externally defined, show heightened “ego involvement” in everyday life experience (Kernis and Waschull, 1995). Heightened ego involvement is defined as an evaluative set, comprised of interlocking components: attentional, excessively focussing on information with potentially self-evaluative implications; bias, interpreting ambiguous events as self-esteem relevant; and, generalisation, linking immediate global feelings of self-worth to specific outcomes and events. This, in turn, is linked to self-esteem instability, which, in turn, has been linked to heightened responsivity to life events. Furthermore, day-to-day variability in self-esteem, in conjunction with stressful life events, has been linked to prospective prediction of depressive symptoms over a six-week period, after controlling for neuroticism, self-concept certainty and variability in daily affect (Roberts and Gotlib, 1997). Moreover, in non-clinical samples, unstable self-esteem is significantly correlated with the tendency to overgeneralise the negative implications of failure and a pessimistic

attributional style (Hayes, Harris, and Carver, 2004; Roberts and Gotlib, 1997). Therefore, unstable self-esteem, and the tendency to interpret ambiguous, mainly external, events in terms of the self is linked to depressive symptoms in non-clinical groups.

Given the evidence reviewed regarding the complex and compartmentalised organisation of the self-concept, in conjunction with fluctuating levels of self-esteem during different phases of the disorder in individuals diagnosed with bipolar disorders, it seems reasonable to hypothesise that this group may have above average levels of contingent, and therefore unstable, self-esteem; which would be reflected by the extent to which self-esteem is contingent upon evaluation of the match between the self-actual and self-ideal and self-ought aspects. Furthermore, findings of elevated scores on measures of social desirability and social conformism (Winters and Neale, 1985; Paroloen, Bauwens, Tracy, Martin, and Mendlewicz, 1993, respectively) support this hypothesis. Evidence from studies investigating the relationship between contingent self-esteem and affective symptoms in individuals without a history of affective disorder, suggests that this type of self-evaluation may leave individuals vulnerable to experiencing depressive symptoms. Furthermore, unstable self-esteem is associated with suicide in individuals with low self-esteem (de Man and Gutiérrez, 2002), and therefore an additional risk factor for individuals already in a high risk group for self-harm (Harris and Barraclough, 1997). It is important to differentiate factors that may confer vulnerability to particular symptoms from factors that reflect the impact of experiencing particular symptoms over a period of time. Findings from the Taylor, Morley, and Barton (2007) suggest that the aspects that differentiated the self-concepts of the bipolar group from the non-clinical controls were the degree of compartmentalisation and level of complexity, and that some of the between group differences disappeared when disorder-specific self-descriptors were removed from the analyses – suggesting that at least some of the features of self-organisation distinctive to the bipolar group may have developed in reaction to the experience of bipolar disorder.

However, in a study of high risk adolescents, with a parent diagnosed with bipolar disorder, instability of self-esteem was found to differentiate the high risk group from the control group (Jones, Tai, Evershed, Knowles, and Bentall, 2006). Moreover, this difference was especially marked in the adolescents who themselves had diagnoses of affective disorders. However, there were no differences between the groups in terms of mean levels of self-esteem. Furthermore, the high risk adolescents differed from the controls in terms of their mean level of negative affect, but not instability of negative affect, and in reporting higher levels of rumination; again, both differences were more marked in the adolescents with affective diagnoses. Although this is an initial finding, it indicates that fluctuations in self-esteem may developmentally precede fluctuations in affect. However, since the study was cross-sectional it is difficult to determine the causes and consequences of any findings. Contrary to findings in the adult literature, no differences were found between any of the groups in terms of: BAS scores, dysfunctional attitudes or social rhythms. However, the sample size was quite small, and thus may have lacked the requisite power to detect some differences. Nevertheless, a recent study comparing individuals diagnosed with bipolar disorder with individuals diagnosed with depression, who were currently euthymic, with

non-clinical controls on a one week daily diary measure of self-esteem and affect, found that the groups were comparable in terms of average levels of positive and negative affect and self-esteem; however, the bipolar group reported significantly greater fluctuations in affect and self-esteem than the other two groups, which did not significantly differ from one another.

#### *Life events and episode polarity*

Research in both unipolar and bipolar depression indicates that independent negative life events can trigger depressive episodes (Cuellar, Johnson, and Winters, 2005). A logical consequence of the depression avoidance hypothesis is that such events should trigger (hypo)manic episodes. Indeed, a study using a sample of individuals with bipolar spectrum disorders found that life stress predicted increases in hypomanic symptoms in participants with depressogenic cognitive styles (Reilly-Harrington, Alloy, Fresco, and Whiteside, 1999), as did a similar study using a sample of undergraduates with subsyndromal mood disorders (Alloy, Reilly-Harrington, Fresco, Whitehouse, and Zechmeister, 1999). However, evidence suggests that when used in isolation, high scores on the HPQ predominantly predict vulnerability to bipolar spectrum disorders characterised by hypomania, rather than mania (Kwapil, *et al.*, 2000; Blechert and Meyer, 2005); therefore, it is possible that these results are not generalisable beyond that subgroup of disorders. In fact, a large body of research indicates that independent negative life events are equally common before and after manic episodes; and thus would not appear to be linked to the development of mania (Johnson, 2005). Research focussing on predetermined categories of negative life events provides a good index of the effects of stress on symptoms, and is useful for objectively measuring this relationship. However, if the self-concept and self-esteem prove to be important variables in bipolar disorders, research of this kind may miss an important interaction between features of the event and aspects of an individual's self-concept upon which self-esteem is highly contingent. For example, the loss of a close relationship is likely to be highly stressful and upsetting, but if self-esteem is contingent upon high achievement and goal attainment rather than interpersonal relationships, this event may not activate negative self-representations and attendant negative affect.

#### *Depression avoidance and risk taking*

Although research has yielded several promising findings regarding psychological factors implicated in the development and maintenance of bipolar disorders, many areas require further elaboration in order to develop more comprehensive psychological models. Evidence described with regard to the 'depression avoidance' hypothesis suggests that there may be an important dichotomy between individual's explicit and implicit self-concepts, particularly during periods of (hypo)mania. However, as yet, the mechanisms involved in mediating this dichotomy have yet to be elucidated. Research into unipolar depression has consistently shown that adopting a ruminative response to depressed mood exacerbates and prolongs depressive episodes (Lyubomirsky and Tkach, 2004). Therefore, if individuals diagnosed with bipolar disorder are motivated to avoid

depression, they may respond to feelings of dysphoria in a different fashion. Nolen-Hoeksema's (1991) Response Styles Questionnaire (RSQ) measures individual's responses to depressed mood, originally in terms of: rumination, distraction, problem solving and indulging in dangerous activities. A recent factor analysis of the questionnaire, with additional items added to the dangerous activities scale, largely confirmed the reliability of the original styles, but showed a better fit when the distraction and problem-solving styles were combined to form an 'active coping' factor (Knowles, Tai, Christensen, and Bentall, 2005). In an analogue sample of students, the distraction, rumination and dangerous activities scales were related to elevated scores on the Hypomanic Personality Questionnaire (Thomas and Bentall, 2002). Although much of the hypomania variance remained unexplained, the relationship with the dangerous activities scale differentiated this group from the 'depressed' and control groups.

Similarly, in a sample of patients diagnosed with bipolar disorder in remitted, manic and depressed episodes, as well as non-psychiatric controls, patients experiencing manic episodes reported more risk taking, or dangerous activities, and active coping than the other groups (Thomas, Knowles, Tai, and Bentall, 2007). Furthermore, in regression analyses, scores on the RSQ and the Hamilton Rating Scale for Depression (Hamilton, 1960) predicted 40.8% of the variance in Bech-Rafaelson (Bech, Bolwig, Kramp, and Rafaelsen, 1979) mania scores; with risk taking, rumination, active coping and depression all retained as predictors. Conversely, in predicting depression scores, RSQ and Bech-Rafaelson mania scores only predicted 18.2% of the variance; with mania the only significant predictor. A more recent study found that individuals diagnosed with bipolar disorder who were currently manic endorsed significantly higher levels of risk taking on the RSQ than non-clinical controls (Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall, 2009). Furthermore, the manic participants reported equivalent levels of rumination to the currently depressed participants, which scored significantly higher than the euthymic bipolar participants, who in turn reported significantly higher levels than the non-clinical controls. Given the ubiquity of depressive features during mania it is possible that the high levels of rumination in the manic group were related to these symptoms; however, the findings from the Thomas, Knowles, Tai, and Bentall do not support this interpretation. It is possible that adopting a ruminative coping style is a vulnerability factor for affective disorders; indeed, children of parents diagnosed with bipolar disorder have been shown to be significantly more likely than control children to use a ruminative coping style, and this was more pronounced in the at risk children who themselves had a history of affect symptoms (Jones, Tai, Evershed, Knowles, and Bentall, 2006). Moreover, the children with a history of affective symptoms were more likely than the unaffected controls to engage in risk taking behaviours. However, it is unclear what the relationship between risk taking behaviour and other factors, such as developmental period, might be. Nevertheless, these early findings indicate that there is a relationship between (hypo)mania and responding to negative affect by means of distraction and risk taking. Due to the cross-sectional nature of the studies it is unclear what the nature of this relationship is; longitudinal studies tracking the temporal relationship between mood state and actual behaviour could clarify this.

Additional research on coping styles illustrates the impact that engaging in different types of behaviour can have on symptoms. For example, the use of strategies such as, “go out and spend money”, “drink to keep going” and “continue to move about and take on more tasks”, have been identified as being related to low psychosocial functioning. Conversely, individuals who employed strategies related to modifying behaviour and engaging in calming activities were more likely to have a high level of functioning (Lam and Wong, 1997). Furthermore, case reports from clinical practice illustrate the way in which engaging in behaviours such as: drinking more, taking drugs and looking for challenging work, can contribute to the exacerbation of manic symptoms (Mansell and Lam, 2003).

On the basis of the available research, it would appear that there are distinguishable modes of responding to negative affect, which, in turn, appear to be differentially linked to outcomes. Furthermore, one of these response styles is engaging in risk taking behaviour; therefore, such behaviour may be present outside of (hypo)manic episodes, and thus, not entirely attributable to the increased impulsivity and alterations in decision making processes that accompany such episodes. This behaviour may represent one means by which individuals attempt to avoid depressed mood, which is the central tenet of the depression avoidance hypothesis. Due to the early stages of research related to this, it is not possible to explicate if and how this response style precipitates actual episodes of (hypo)mania; however, it is likely to be via interaction with other variables. For example, certain risk taking activities are likely to be intrinsically rewarding, and therefore may increase BAS activity (Thomas, Knowles, Tai, and Bentall, in press). Thus far, the evidence cited in relation to response styles to depression has been based on self-report, rather than behavioural, measures of risk taking. Furthermore, there is evidence to suggest that bipolar disorders are associated with increased impulsivity, which might contribute to a propensity to engage in particular behaviours; however, this has not been measured, or controlled for, in studies reporting an association between risk taking responses and (hypo)mania.

#### Limitations of the depression avoidance hypothesis

Many of the findings supporting the depression avoidance hypothesis are in need of replication, particularly in clinical samples. The absence of evidence for mania-related biases in information processing, whilst depression-related biases have been found in several studies, does appear to support some version of the hypothesis. In periods of remission, subsyndromal depressive symptoms are often present (Marangell, 2004); thus, cognitive styles and aspects of the self-concept associated with depression may represent a ‘baseline’ in individuals with bipolar diagnoses. However, it is feasible that the effects of depressive and manic episodes on cognitive processes differ, with depressive episodes leaving greater cognitive ‘scars’; therefore, since the clinical populations studied had all experienced episodes of both depression and mania, these depressive biases would be evident in all participants. It is equally possible that cognitive biases confer specific vulnerability to depressive episodes, but are evident throughout different phases of

the disorder; whereas mania is unrelated to analogue cognitive vulnerabilities, and mediated by entirely different mechanisms. Conducting studies using participants diagnosed with unipolar mania would provide a useful point of comparison, especially since this group is difficult to account for within the depression avoidance framework. If such studies revealed depressogenic cognitive biases, it might be that this population is simply very good at avoiding depressive episodes, or have yet to develop any, but are at an increased risk should the necessary triggering conditions be present. Alternatively, it is unclear what the meaning of finding neither depressive nor mania-related cognitive biases would be. It is quite possible that the idea of depression avoidance will not be applicable to all cases of (hypo)mania. Furthermore, it has been proposed that depression and mania are actually two distinct disorders that simply show high comorbidity (Joffe, Young, and MacQueen, 1999); therefore, any effects found in bipolar populations might simply represent the existence of a history of depressive symptoms. The preliminary findings of Gotlib, Traill, Montoya, Joormann, and Chang (2005), if replicated with methodological confounds controlled for, would suggest that biases can be evident for mania-related stimuli.

Further studies of high risk samples, as well as longitudinal within-participant designs, would be useful in determining whether particular cognitive biases alter during the course of the disorder, and whether defensive responding translates into switching from dysphoric mood to (hypo)mania. Furthermore, it is unclear what specific events might lead to this avoidance reaction; although it is possible to speculate that events relating to the beliefs and attitudes described earlier might broadly relate to threats to self-esteem at a population level, there are likely to be individual differences. Moreover, it is unclear what mediates whether a threat to self-esteem precipitates a manic or depressive episode, and how the avoidance mechanism might operate. However, it is likely that the process would occur in conjunction with the aforementioned cognitive styles, effects of the BAS and, perhaps, social and circadian rhythm disruption.

#### An integrative cognitive model of mood swings and bipolar disorders

A recently proposed model of mood swings, which is very pertinent to the consideration of bipolar disorders, is similar in many ways to traditional models; however, in this model, the primary factor conferring vulnerability to bipolar disorders is fluctuations in internal state, whether this is in terms of mood, cognition or physiology (Mansell, Morrison, Reid, Lowens, and Tai, 2007). These fluctuations are thought to be on a continuum with fluctuations experienced throughout the population; however, these fluctuations may be more intense than those experienced by many people, in those diagnosed with bipolar disorders – indeed, evidence suggests that individuals diagnosed with bipolar disorders exhibit neurophysiological deficits in areas of the brain thought to underlie emotion perception and regulation; including increased limbic activity during emotion perception (Green, Cahill, and Malhi, 2007) and self-reported significantly more labile and intense emotions during euthymia than non-clinical controls (Henry, Van den Bulke, Bellivier, Roy, Swendsen, M'Bailara, *et al.*, 2008) – suggesting that there may be baseline differences in intensity



of affective experience between those diagnosed with bipolar disorders and other clinical and non-clinical groups. Nevertheless, it is the interpretation of these changes, rather than the nature of the changes themselves, that drive the behaviours which can exacerbate symptoms. A number of cognitions are implicated in the model, in line with the extant research concerning beliefs and attitudes in this population; however, the pivotal beliefs are the extreme and conflicting personal meanings attributed to internal states. It is hypothesised that fluctuations in internal state are appraised in terms of having extreme relevance for the self. These appraisals draw on beliefs about the self, world and others, as well as procedural beliefs concerning affect and its control, and are proposed to frequently relate to personal success or failure – in keeping with research regarding goal attainment, perfectionism and contingent self-esteem – or as signals of imminent catastrophe. The current appraisal, in conjunction with underlying beliefs formed through life experiences, including the current context, is used to select and implement behavioural sequences which attempt to enhance or control the activation level of the internal state via ascent and descent behaviours. Descent behaviours represent attempts to decrease the level of activation, and can include behaviours such as rumination, social withdrawal and extended sleep. Ascent behaviours represent attempts to increase the level of activation, and can include behaviours such as ingesting caffeine or other substances, taking on extra work, missing sleep and risk taking.

Given that individuals hold multiple and contradictory appraisals, but that only one appraisal can occupy awareness at any one time, individuals are vulnerable to switching between these appraisals – and therefore experiencing abrupt shifts in mood - as the cycle of symptoms evolves, and further changes in internal state are triggered, which are then appraised themselves, and acted upon. Furthermore, it is proposed that individuals hold both highly positive and highly self-critical beliefs regarding the same internal state; further exacerbating potential lability, as different beliefs can become accessible throughout the constantly changing cycle. It is posited that these cycles develop via an iterative process; with the component factors becoming progressively amplified, manifesting as increasing symptomatology.

#### *The role of self-relevant appraisals*

This model provides an alternative means of conceptualising the findings of both high and low self-esteem, complex organisation of the self-construct and self-esteem instability reviewed earlier. Furthermore, evidence suggests that individuals diagnosed with bipolar disorders score higher than non-clinical controls on a measure designed to explicitly assess beliefs and attitudes regarding hypomanic symptoms, the Hypomanic Attitudes and Positive Predictions Inventory (HAPPI; Mansell, 2006), when controlling for current affective symptoms (Mansell and Jones, 2006). Many of the items on this measure assess the attachment of significance to the self of internal states related to hypomania. Similarly, an analogue sample of individuals scoring highly on the HPS was found to score more highly than non-clinical controls on the Hypomanic Interpretations Questionnaire (HIQ; Jones, Mansell and Waller, 2006); a measure which assesses a narrower range of hypomania-relevant cognitions. This overinclusiveness in appraising stimuli associated with

emotion as being self-referent has, at least on one level, been theoretically linked to neuropsychological and social cognitive deficits (Larson, Shear, Krikorian, Welge, and Strakowski, 2005).

*Relationship between levels of activation, beliefs about the self and others' influence*

The focus on the activation level of the individual fits with the finding that the defining feature of (hypo)mania is a heightened state of activation, rather than affect of a particular valence. Conversely, bipolar depression is more frequently characterised by atypical features, such as hypersomnia, than unipolar depression (Mansell, Colom, and Scott 2005). Moreover, the prominence afforded to levels of activation fits with research indicating that individuals diagnosed with bipolar disorders have less stable and more variable circadian activity patterns than controls (Jones, Hare, and Evershed, 2005). Therefore evidence reviewed earlier in relation to BAS deactivation and negative cognitive style can be accommodated neatly within this theory.

In relation to (hypo)mania, there is some support for the hypothesis that heightened levels of activation differentially increase highly positive self-appraisals in individuals diagnosed with bipolar disorders when compared to non-clinical controls (Lam, Wright, and Sham, 2005); as well as negative self-appraisals in individuals scoring highly on the HPS (Taylor and Mansell, 2008). Although these findings are preliminary, and involved sub-clinical levels of activation, they do indicate that heightened states of activation may make particular beliefs about the self more accessible; and that, should these findings be replicated in samples of individuals diagnosed with a bipolar disorder and experiencing clinical levels of activation, the beliefs accessed may be positive or negative.

The findings of the Lam, Wright, and Sham (2005) study were related to beliefs regarding goal attainment; and goal directed activity has been found to be very important to individuals diagnosed with bipolar disorders (Lam, Wright and Smith, 2004; Johnson, 2005), and life events involving goal attainment have been found to be related to relapse in manic episodes (Johnson, Sandrow, Meyer, Winters, Miller, *et al.*, 2000). For this model, research evidence is needed that demonstrates the hypothesised relationships between differing levels of activation, self-relevant appraisals of these internal states and accompanying ascent and descent behaviours; as well as the interactions between these variables and known correlates of bipolar disorder diagnoses, such as difficulties in neuropsychological functioning and other relevant cognitive and behavioural variables. Along with the above evidence, research suggests that individuals who had recently exhibited hypomanic symptoms made internal attributions for success on a task, even when the outcome of the task was in reality attributable to chance, an effect that was not evident in individuals who not experienced such symptoms (Stern and Berrenberg, 1979). Furthermore, Johnson, Ruggero, and Carver (2005) found that high scorers on the HPS showed greater increases in confidence following success feedback regarding a task than low scorers on the HPS; and the chose to undertake a more difficult task when compared to low scorers on the HPS. A similar effect has been found in individuals diagnosed with Bipolar I disorder. Therefore, presumed changes in

internal state related to the success feedback via some mechanism(s) led to individuals, as a group, setting themselves a more difficult goal, which could be construed as an ascent behaviour, as it would theoretically involve increased effort and goal striving. Given the findings reviewed earlier regarding the BAS, and evidence for some degree of hyperreactivity in BAS responsivity in individuals who exhibit elevated levels of (hypo)manic symptoms, one could infer that increased goal striving would lead to a heightened level of activation, along with other BAS-relevant emotions, cognitions and behaviours.

Once individuals are experiencing heightened levels of hypomanic symptoms, a number of processes have been identified which could further escalate the levels of hypomanic symptoms (Mansell and Pedley, 2008). Jones and Day (2008) found there to be separate predictors of lifetime depressive and hypomanic symptoms; BAS-reward responsiveness negatively correlated with and predicted lifetime depression, along with the tendency to make self-blaming interpretations of depressive symptoms, whereas lifetime hypomanic symptoms were predicted by the tendency to make positive self-relevant interpretations of hypomanic symptoms; along with BAS-fun seeking and, negatively correlated with BIS scores. These effects accounted for a substantial and significant proportion of the variance after controlling for current affective symptoms. Multiple regression analyses have found: history of depressive symptoms, history of hypomanic symptoms and tendency to make upward positive generalisations to independently predict high scores on the HPS in an analogue sample of undergraduates, along with current hypomanic symptoms and history of depressive symptoms (Eisner, Johnson, and Carver, 2008). Upward positive generalisation was defined as the tendency to generalise from specific isolated events to broader positive expectations for the future. Negative generalisation or the tendency to generalise from specific incidents to an overall sense of self-worth was also related to lifetime depressive symptoms, but unrelated to current or past hypomanic symptoms. Similarly, Carver and Johnson (2008) found HPS scores to be predicted by positive generalisation in an analogue sample, along with self-reported incentive sensitivity, the subjective experience of intense positive emotions and impulsivity. Again, this study found there to be separate correlates for vulnerability to depressive symptoms, including: threat sensitivity, the subjective experience of intense negative emotions and the tendency to make negative generalisations; suggesting that there are separate vulnerability factors associated with the two sets of symptoms. Although there were clearly dissociable factors associated with the two sets of symptoms, the authors emphasised the overlap in terms of: the tendency to experience affect of high subjective intensity; the tendency to generalise cognitively from that experience; and, a ruminative focus on the relevant affect. The finding of a tendency to ruminatively focus on both negative and positive affect has been replicated in a sample of individuals diagnosed with bipolar disorders, with lifetime history of clinically significant (hypo)mania related to self-reported emotion-focussed responses to positive affect, whilst current (hypo)manic symptoms were related to both self-focussed and emotion-focussed responses (Johnson, McKenzie, and McMurrich, 2008). Emotion-focussed responses refer to focussing on the experience of the emotion, which is likely to enhance the experience – and could perhaps be construed as an activating strategy within this

model; whilst self-focussed responses refer to extrapolating from the feeling to more general self-referent cognitions, such as using the positive feeling as evidence for one's ability or potential. When considered alongside findings of elevated confidence following success or achievement, and consequent setting of more difficult goals, it is possible to imagine the way in which the three elements could work in concert, leading individuals to engage in more and more goal-directed activity, which would have the potential to interfere with circadian rhythms and elicit excessive BAS-related effects, as well as other potential (hypo)mania-relevant as yet unexplored corollaries.

Furthermore, during (hypo)mania, individuals have been found to exhibit a decreased ability to recognise facial displays of negative affect (Lembke and Ketter, 2002); an enhanced tendency to attend to facial displays of positive affect (Trevisani, Johnson, and Carver, 2007) and a positive emotional bias on an affective Go/No Go task performed following a positive mood induction (Roiser, Farmer, Lam, Burke, O'Neill, *et al.*, 2008). Furthermore, greater trait approach motivation has been linked to reduced attentional focus after viewing approach-motivating positive stimuli (Gable and Harmon-Jones, 2008), which could further feed into a confirmatory bias for stimuli that reinforced the current patterns of cognitions and behaviour. Moreover, initial evidence suggests that following a positive mood induction, individuals diagnosed with Bipolar I disorder who were currently euthymic did not heed advice given by a computerised image of a face displaying either a neutral, negative or positive emotional expression following a positive mood induction (Mansell and Lam, 2006) – although the authors acknowledged that this finding may have represented an isolated act of opposition rather than a stable response tendency. Furthermore, the bipolar group reported feeling less trusting of the faces; therefore it seems possible that this may have interfered with their willingness to use the advice, rather than the induced positive mood. However, should this finding be replicated using different methodology, this rejection of others' feedback could be an important component in allowing (hypo)manic symptoms to evolve in a relatively unconstrained fashion (Mansell, Morrison, Reid, Lowens, and Tai, 2007). Unfortunately, there is a difficulty in considering the extant research in terms of the possible confound of different studies employing different methodologies, especially when employing mood inductions; there is a growing body of research suggesting that changes in internal state appear to be related to cognitive and behavioural changes, however, at present, it is difficult to differentiate between the effects of positive mood, heightened level of activation and other symptoms of hypomania.

#### *Role of environmental factors*

It is proposed that life events can affect the model in two ways, via directly influencing the individual's internal state; for example, a life event involving sleep loss would disrupt circadian rhythms. Alternatively, life events may provide confirmation of one of the individual's extreme personal appraisals of their internal state. This proviso accommodates inconsistencies in the evidence base regarding the relationship between different types of life events and polarity of episode; with some research finding a relationship between negative life events and depressive, but not manic, episodes, whilst other research has detected a relationship between negative life events

and manic episodes (see Johnson, 2005 for a review). The idiosyncratic appraisals made at an individual level may not translate into findings of a reliable relationship at a group level; nor, given the conflict inherent in the proposed belief system of individuals diagnosed with bipolar disorders, may it translate into a reliable relationship between type of event and polarity of episode within the same individual over time.

#### *Risk taking as an ascent behaviour*

Mansell, Morrison, Reid, Lowens, and Tai (2007) hypothesised that risk taking behaviour could represent an example of an ascent behaviour. Previous research has indicated that individuals diagnosed with bipolar disorders endorse significantly higher levels of risk taking, or engagement in dangerous activities, in response to depressed mood than non-clinical controls or individuals diagnosed with unipolar depression on the RSQ (Thomas, Knowles, Tai, and Bentall, 2007; Van der Gucht, Morriss, Lancaster, Kinderman, and Bentall, 2009), as do individuals vulnerable to developing bipolar disorders by virtue of high scores on the HPS (Thomas and Bentall, 2002) and children of a parent diagnosed with a bipolar disorder, who themselves have a history of affective symptoms (Jones, Tai, Evershed, Knowles, and Bentall, 2006). However, there is currently no research linking risk taking behaviour with levels of activation, which would be necessary to place it within the context of the overall model.

#### Summary of the integrative cognitive model of mood swings

At present, the model proposed by Mansell, Morrison, Reid, Lowens, and Tai (2007) offers a comprehensive means of integrating the diverse range of findings related to the psychology of bipolar disorders. Given that the model is in its infancy there are a number of findings in need of replication and extension, most notably, given the dynamic and evolving nature of the model, longitudinal studies charting the course of symptoms and relationships between variables over time. However, research into the psychological underpinnings of bipolar disorders is currently burgeoning; therefore such research will no doubt be forthcoming.

#### The role of risk taking behaviour in bipolar disorders

Earlier research linked risk taking behaviour to periods of (hypo)mania and implicated deficits in decision making and elevated levels of impulsivity in its genesis. Although risk taking behaviour was not considered in detail within traditional CBT accounts, a broadly similar picture emerged. Again, risk taking behaviour was not considered explicitly with the BAS dysregulation theory, although the structure of the theory allowed inferences to be made regarding the likely direct relationships between many risky behaviours and BAS responsivity; suggesting that such activities are likely to be intrinsically pleasurable, and therefore reinforcing, and thus sought out and engaged in - especially whilst individuals are experiencing (hypo)manic symptoms. The depression

avoidance hypothesis conceptualises risk taking behaviours as a means of responding to, or coping with, negative affectivity; therefore, this theory would predict that levels of such behaviours will be increased in individuals diagnosed with bipolar disorders when experiencing heightened levels of negative affect. Somewhat similarly, despite differences in the central tenets of the theories, the integrative cognitive model of Mansell, Morrison, Reid, Lowens, and Tai (2007) hypothesises that risk taking may represent one form of ascent behaviour, which would be engaged in in order to enhance the activation level of the internal state. Both the depression avoidance hypothesis and the integrative cognitive model propose that risk taking behaviour would be precipitated by some form of information processing regarding the self.

The depression avoidance hypothesis does not provide a comprehensive model of bipolar disorders, but describes the relationships between a circumscribed set of variables that may be involved in the pathogenesis of (hypo)manic episodes; namely: a conflict between positive and negative sense of self, motivation to avoid negative affect, and perhaps activation of negative aspects of the self-concept and one possible pathway to the development of (hypo)manic symptoms, via engaging in dangerous or risky activities. Beyond this level of explanation it is possible to posit a number of mechanisms via which this process could occur; however, the reviewed research suggests that disruption of circadian rhythms and activation of a hyperresponsive BAS are likely to be implicated. Furthermore, a number of idiosyncratic individual level cognitive variables, which are likely to overlap broadly on a group level, no doubt contribute significantly to this process.

The notion that individuals with this diagnosis might be motivated to avoid negative affect could fit with the integrative cognitive model, as this model is proposed to have transdiagnostic utility for a understanding both subclinical levels of mood swings, as well as a range of diagnoses characterised by affective lability – notably in this context Borderline Personality Disorder (BPD). Theories pertaining to BPD have described beliefs regarding the dangerousness of emotion, as well as high levels of cognitive avoidance of emotions (McGinn and Young, 1996). Furthermore, research described earlier demonstrated that individuals diagnosed with BPD score highly on the urgency subscale of the UPPS impulsivity scale, which is a measure of the tendency to engage in ‘reckless’ behaviour when experiencing high levels of negative affect (Whiteside and Lynam, 2001); suggesting that individuals with this diagnosis also engage in high levels of behavioural avoidance of emotion. Moreover, there is a small body of research regarding the potential positioning of BPD on the bipolar spectrum, as well as some commonalities at a neurophysiological level in terms of demonstrated hyperresponsivity of the amygdala in both disorders (Deltito, Martin, Riefkohl, Austria, Kissilenko and Morse, 2001). Therefore, it is possible that there may be some overlap between the characteristic styles of responding to negative affect – regardless of the multitude of differences between the two diagnoses, and perhaps motivations for avoiding affect.

However, although both diagnoses are characterised by self-esteem instability, research would suggest that the roots of this differ considerably between the two; BPD is hypothesised to be

characterised by an unstable sense of self linked to an approach-avoidance dilemma concerning beliefs regarding fear of abandonment in the context of distrust of others' intentions (McGinn and Young, 1996). In contrast, research implies that bipolar disorders are characterised by conflicting beliefs about the self more strongly related to beliefs about the importance of achievement, goal-attainment and failure which are variably accessible in the context of frequently fluctuating internal states (Mansell, Morrison, Reid, Lowens, and Tai, 2007). As well as possessing numerous beliefs about the self that remain unresolved with respect to one another, individuals with bipolar disorders experience complex combinations of emotions which in some senses conflict with one another; for example, the concurrent experience of euphoria and sadness during mania (Cassidy, Forest, Murry, and Carroll, 1998). It is possible that the ubiquitous dysphoria and anxiety present in many (hypo)manic states may be related to the cognitive dissonance experienced as a result of experiencing these conflicting emotions simultaneously. Recently, cognitive dissonance has been reconceptualised as being an action-based phenomenon (Harmon-Jones and Harmon-Jones, 2007), in the sense that perceptions and cognitions serve as action tendencies; therefore, inconsistencies in action tendencies would serve to undermine the potential to act effectively, and adaptively – creating the discomfort of cognitive dissonance as a signal to resolve this scenario. Interestingly, neuroimaging research has linked the conflict resolution stage of research investigating cognitive dissonance with increased activity in the left prefrontal cortex (Harmon-Jones and Harmon-Jones, 2007) – an area independently linked to approach motivation, in which individuals diagnosed with bipolar disorders show relatively greater activity when compared to non-clinical controls during tasks involving BAS activation (Peterson and Harmon-Jones, 2008). It is conceivable that this sense of dissonance, and drive to reduce it, may feed into the cycles of cognitions and behaviours described by Mansell, *et al.* (2007); however, as outlined in their theory, evaluations and behaviours are frequently carried out in the absence of thorough, contextualised processing, and thus remain unresolved and the cycles are perpetuated.

Furthermore, Holmes, Geddes, Colom, and Goodwin (2008) have proposed that mental imagery may serve to amplify the experience of emotion, and that individuals diagnosed with bipolar disorders may be particularly disposed to experiencing imagery. Not only could intrusive imagery provide a point of access to the model, indirectly increasing the probability of ascent and descent behaviours in general. But evidence suggests that events that have been imagined are more likely to be acted upon (Holmes, Geddes, Colom, and Goodwin, 2008); therefore, theoretically, an increase in the quantity of imagined events could lead to an increase in the quantity of action – when considered in conjunction with the above evidence, this could manifest itself as a potentiation of urgency-based behaviours.

### The Role of Risk Taking Behaviour in Psychological Models of Bipolar Disorders

It would seem that there are a number of theoretical ways of conceptualising risk taking behaviour within the reviewed psychological models of bipolar disorders; however, as yet, the majority of

empirical evidence relating the two is in the form of self-report measures. The primary evidence necessary to clarify the link between risk taking and avoidance of negative affect, or ascent behaviours, would be to measure risk taking under conditions of negative affect or during heightened levels of activation. In addition, longitudinal research charting the relationship between these variables would provide a powerful test of the hypotheses. However, such research would need to be placed in the context of a baseline measure of risk taking propensity whilst individuals are euthymic, to clarify the specificity of any association with heightened affect or activation, as well as helping to delineate any trait and state components to such behaviour. Preliminary research has employed various measures of risk taking with this clinical group; however, it is questionable whether some of these tasks represent pure measures of risk taking, rather than measures of decision-making within stable and learnable parameters – conditions which do not accurately reflect risk taking within real-world contexts. Furthermore, the extant literature does not contain studies which have simultaneously measured, and controlled for, the impact of levels of impulsivity on levels of risk taking; therefore, these two constructs are likely to have confounded interpretation of the results.

#### Measurement of risk taking behaviour

It is difficult to measure risk taking experimentally, as sole reliance on self-report measures may be subject to a number of biases, such as: individual's accounts being affected by reinterpretation of behaviour in terms of implicit theories (Ross, 1989), such as 'meaning after the event' (Brown and Harris, 1978); mood at time of report (Stone, Neale, and Shiffman, 1993), and availability biases (McClelland, Koestner, and Weinberger, 1989). Furthermore, individuals may be reticent to report some behaviour due to concerns about self-presentation, a difficulty that may be especially pertinent in research with individuals diagnosed with bipolar disorders, as this group has been shown to score highly on measures of social desirability (Winters and Neale, 1985). Using behavioural paradigms allows for objective measurement of actual behaviour and for comparisons across individuals that controls for individual differences in: perceptions of what constitutes risky behaviour, memory of past behaviour and willingness to report such behaviour. Previous research has used tools such as the IGT as an index of risk taking; however, such tasks can be more accurately regarded as measures of decision making, as the task involves the learning of static contingencies, which rarely occurs in real-world situations involving risk.

#### *The Balloon Analogue Risk Task (BART): Reliability and Validity*

A recently developed measure, the BART, utilises contingencies that, to some extent, replicate naturally occurring risk taking; in that such behaviour is rewarded to a degree. However, it is also intermittently and unpredictably punished (Lejuez, Read, Kahler, Richards, Ramsey, Stuart, *et al.*, 2002). Although the BART is a relatively new task, evidence is beginning to accrue that supports its validity as a measure of risk taking. Scores on the BART accounted for additional variance in a



variety of self-reported real world risk taking behaviours, such as: alcohol use, gambling, substance use and engaging in unprotected sex. These effects were evident after controlling for demographic factors and risk-related constructs, such as impulsivity and sensation seeking, in adult and adolescent non-clinical samples (Aklin, Lejuez, Zvolensky, Kahler and Gwadz, 2005; Lejuez *et al.*, 2002; Lejuez, Aklin, Jones, Richards, Strong, Kahler, *et al.*, 2003). Furthermore, performance on the BART has been found to be uncorrelated with traditional self-report measures of impulsivity, such as Dickman's 'dysfunctional impulsivity' and Eysenck's 'narrow impulsivity'; suggesting that it is measuring a construct beyond that encompassed by measures of impulsivity (Vigil-Colet, 2007). 'Riskier' performance on the BART has also been shown to discriminate between smokers and non-smokers (Lejuez, *et al.*, 2003).

Scores on the BART have been shown to differentiate between groups of individuals who engage in high risk behaviours and those who do not. For example, BART performance is associated with the antisocial, but not emotional detachment, dimensions of psychopathy (Hunt, Hopko, Bare, Lejuez, and Robinson, 2005). Furthermore, Hopko *et al.* (2006) found there to be a systematic relationship between level of MDMA use and higher scores on the BART; with BART performance accounting for unique variance in discriminating between MDMA users, a group prior research suggests engage in multiple high risk behaviours, and controls. Clearly it is difficult to determine the extent to which performance on the task may have been affected by any neuropsychological effects of prolonged substance abuse. Nevertheless, the relationship remained after controlling for demographic variables and risk-related constructs, such as impulsivity and sensation seeking. Similar findings have been reported for adolescents with serious conduct and substance use problems, disorders associated with engaging in high risk activities (Crowley, Raymond, Mikulich-Gilbertson, Thompson, and Lejuez, 2006). Performance on the BART does not appear to be attributable to unplanned, rapid, impulsive responding; as adolescents with conduct and substance abuse difficulties responded more slowly. However, even though BART scores were corrected for IQ, it is plausible that slowed responding could result from subtle deficits in decision making.

### Research Questions

Since unipolar depression and bipolar disorder both appear to be characterised by negative views of the self and vulnerability to experiencing negative affect, the propensity to engage in risk taking behaviours in response to negative affect may represent a variable that discriminates between these groups, and is unique to bipolar disorder. As such, it may contribute towards differences in presentation between the two groups. Risk taking behaviour represents the cause of significant impairment in terms of social, occupational and interpersonal functioning in bipolar disorders. Preliminary evidence suggests that engaging in this behaviour may not simply be a consequence of (hypo)mania, although it may increase during (hypo)mania as a consequence of increased

impulsivity and hyperhedonia; but contribute to the development and maintenance of (hypo)manic episodes. Should this be the case, psychological interventions could be designed that addressed the cognitive and behavioural dimensions of this response style, thus improving psychosocial outcomes and decreasing levels of risk in this population.

The aim of the present study is to investigate the relationship between risk taking behaviour and bipolar disorder by comparing remitted bipolar, remitted major depressive disorder (MDD) and non-psychiatric control participants' scores on the BART (Lejuez, Read, Kahler, Richards, Ramsey, Stuart, *et al.*, 2002).

It is hypothesised that the bipolar group will: make a higher mean number of pumps per balloon, and per unexploded balloon and experience more balloon explosions on the BART than the MDD and non-psychiatric control groups. Furthermore, it is hypothesised that the bipolar group will endorse higher levels of dangerous activities on the Response Styles Questionnaire than the MDD and control groups, in line with the proposal that engaging in risk taking behaviour is a coping style used by individuals with bipolar disorders to mitigate negative affect; rather than simply the consequence of symptoms associated with (hypo)manic episodes.

The study will also explore the relationship between diagnostic group and impulsivity, as measured by the GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and Hicks, 2002) and the UPPS Impulsivity Scale (Whiteside and Lynam, 2001); with the hypothesis that the bipolar group will score more highly on both measures of impulsivity than either control group. Additionally, the relationship between the UPPS subscales and group status will be investigated, with the hypothesis that the bipolar group will score more highly on the urgency subscale than the other two groups. Given the lack of research in this area, the relationship between the subscales of the UPPS and levels of risk taking will be explored.

## Chapter 2: Method

### Design

In order to address the research questions, a group of currently euthymic individuals with a diagnosis of Bipolar I or Bipolar II disorder was compared to two control groups on behavioural measures of risk taking and impulsivity, as well as on the ‘dangerous activities’ scale of the Response Styles Questionnaire, which measures engagement in dangerous and risky behaviour in response to depressed mood. Furthermore, the groups were compared on a self-report measure of impulsivity. One of the control groups was comprised of participants with no self-reported history of psychiatric disorder. The second control group was comprised of euthymic individuals diagnosed with major depressive disorder (MDD); to ascertain whether any effects were specifically attributable to a diagnosis of bipolar disorder or related to affective disorders more generally. Given the evidence linking episodes of (hypo)mania and depression to various disturbances in cognition and increased levels of impulsivity, clinical participants were tested whilst euthymic to assess whether an increased propensity to take risks and behave impulsively is present outside of distinct mood episodes. Given the increased levels of impulsivity associated with substance abuse, participants were only included if they had no history of substance abuse or dependence in the three months prior to testing.

### Participants

#### *Inclusion and exclusion criteria*

The inclusion criteria for the remitted bipolar group were: a diagnosis of Bipolar I or Bipolar II disorder, as confirmed via the Structured Clinical Interview for DSM IV Disorders (SCID; First, Spitzer, Gibbon, Williams, and Benjamin, 1995); current remission, defined as the absence of an episode of depression or mania requiring clinical intervention in the preceding three months; and Bech–Rafaelson Mania Scale score of <6 and Hamilton Depression Scale score of <7 on the day of testing. The inclusion criteria for the remitted depressed group were: a diagnosis of major depressive disorder, as confirmed via the SCID; current remission, defined as the absence of an episode of major depression requiring clinical intervention in the preceding three months; Bech–Rafaelson Mania Scale score of <6 and Hamilton Depression Scale score of <7 on the day of testing.

The exclusion criteria for both of the clinical groups were: a diagnosis of substance use disorder within the past three months or experience of clinically significant psychotic symptoms outside of an episode of depression or mania, as confirmed via the SCID; Bech–Rafaelson Mania Scale score of >6 or a Hamilton Depression Scale score of >7 upon second administration of these measures; visual impairment which would prevent the participant from being able to adequately see

the stimuli on the computer screen; physical impairment which would prevent the participant from being able to press a key on the keyboard repeatedly in quick succession.

The inclusion criteria for the control group were: self-report of no history of psychiatric disorder; Bech-Rafaelson Mania Scale score of  $<6$  and Hamilton Depression Scale score of  $<7$  on the day of testing. The exclusion criteria for the control group were: self-reported history of psychiatric disorder; Bech-Rafaelson Mania Scale score of  $>6$  and Hamilton Depression Scale score of  $>7$  on the day of testing; visual impairment which would prevent the participant from being able to adequately see the stimuli on the computer screen; or physical impairment which would prevent the participant from being able to press a key on the keyboard repeatedly in quick succession.

### *Sample size*

At commencement of this research the BART had not been used with participants diagnosed with affective disorders; however, since research suggests that there is a large degree of overlap between bipolar disorders and substance use disorders (Swann and Rutherford, 2005), a power calculation was performed using G-power based on the effect size obtained in a study comparing polysubstance users with non-clinical controls on the BART (Hopko, *et al.*, 2005). This research yielded an effect size of  $d = .62$ , which equates to  $\delta = 2.52$  at  $p < .05$  for a one-tailed test. For a power value of .8, the total sample size needed for this study was 66 participants, or 22 per group.

### *Recruitment method*

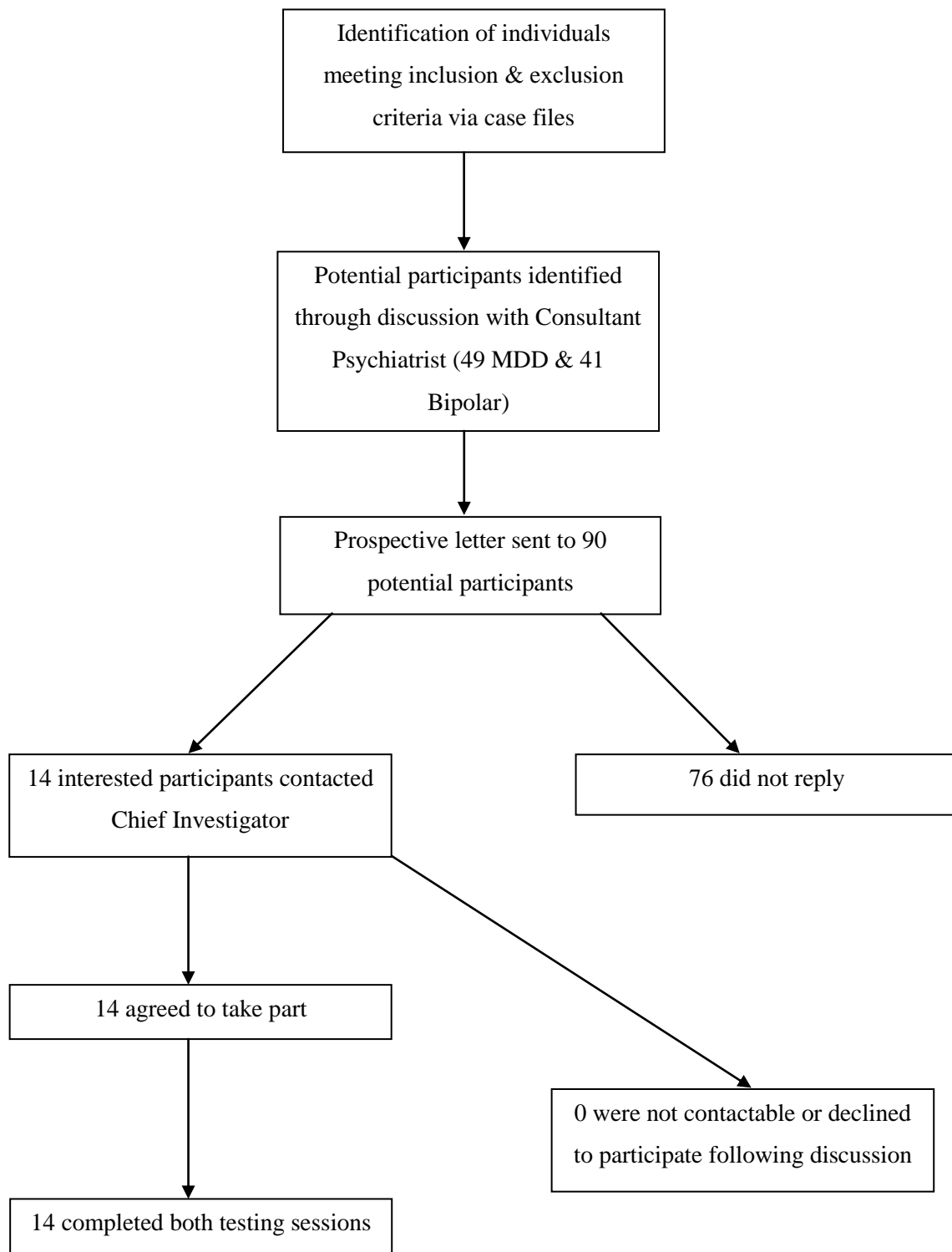
Participants for the clinical groups were recruited from two local sources in East and West Leeds. Both sources were secondary care mental health care services within Leeds Partnership NHS Foundation Trust. The Chief Investigator liaised with Consultant Psychiatrists at both centres to discuss the study and whether they considered there to be eligible potential participants on their clinic lists. Because of diagnostic variability in different psychiatrists' caseloads, and therefore clinic lists, it became apparent that it would be very difficult to recruit adequate numbers of participants during regular outpatient clinics; therefore, recruitment was conducted in two streams in West Leeds.

In East Leeds the Chief Investigator reviewed the clinic lists to identify potential participants on the basis of the available recorded information; this shortlist was then discussed with the Consultant Psychiatrist to obtain his opinion about the suitability of each candidate. A prospective letter from the Consultant was sent to each identified individual, along with a Participant Information Sheet and the Chief Investigator's contact details, including a freepost address to return a reply slip to, should they be interested in obtaining more information about the research (see flow diagram). Interested individuals contacted the Chief Investigator to obtain further details about the study; an appointment was arranged with those who wished to participate at the Complex Psychological Problems and Psychosis Service located on Blenheim Terrace in Leeds. A similar procedure was followed in West Leeds; in addition, participants were recruited in

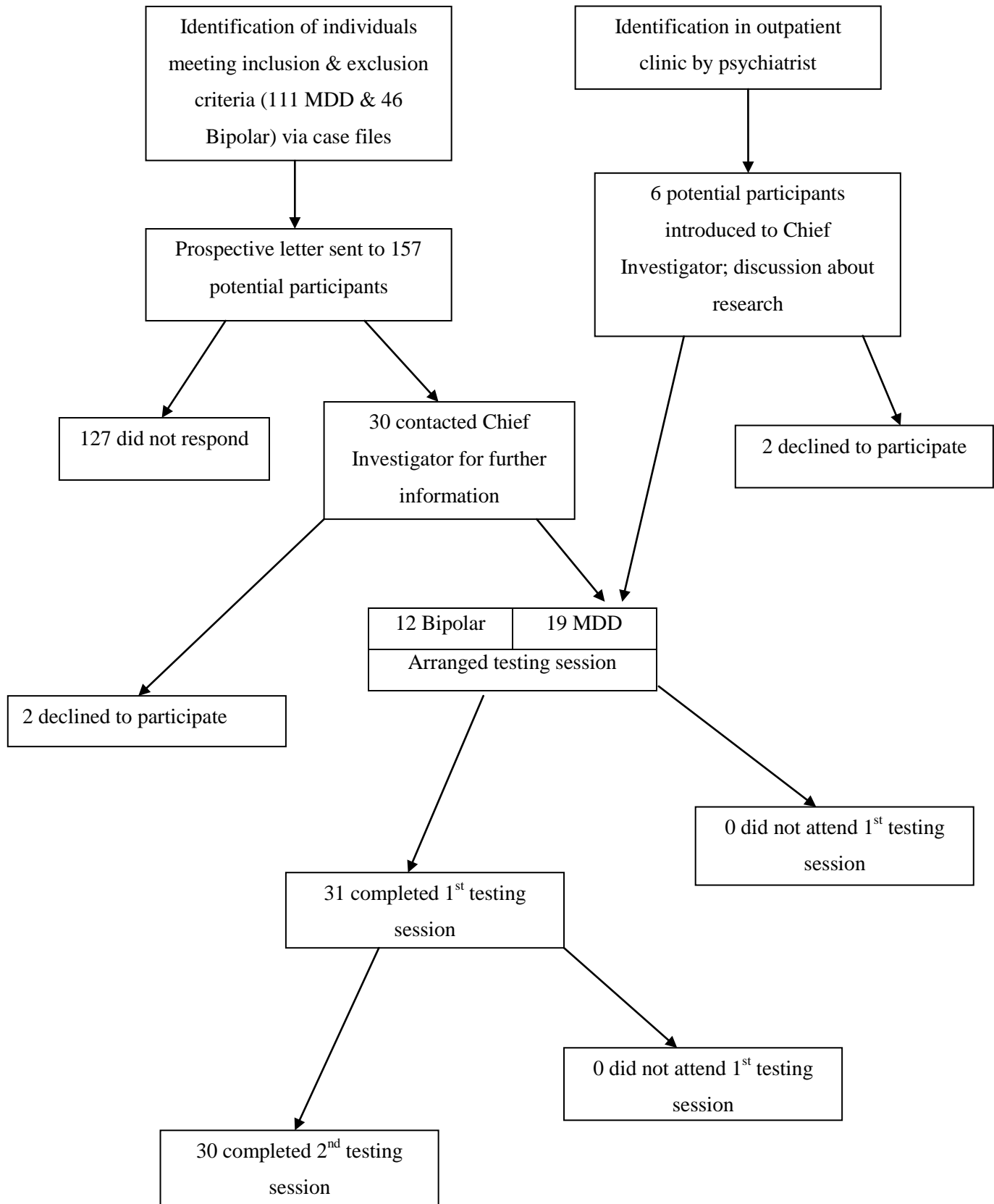
person during routine outpatient clinics, during which individuals identified as meeting the study inclusion and exclusion criteria were introduced to the Chief Investigator by the treating psychiatrist (see flow diagram). Initially participants were recruited for the clinical groups; after ten participants had been recruited in the bipolar group, recruitment of the control group began. Attempts were made to match the gender and age distribution within the control group to the bipolar group, as previous research has indicated that performance on the BART is subject to gender and age effects (Lejuez, Read, Kahler, Richards, Ramsey, Stuart, *et al.*, 2002).

Initial recruitment for the control group began by placing an advertisement in a news bulletin e-mail that was circulated to all staff employed by Leeds Partnership NHS Foundation Trust. However, adequate numbers were not recruited via this method; therefore, the remaining participants were recruited via snowball sampling through acquaintances of the initial set of control participants.

### East Leeds Recruitment



### West Leeds Recruitment



**Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, Williams, and Benjamin, 1995)** The SCID-IV is a diagnostic interview designed to assess the presence of current and lifetime Axis I disorders. Only modules to assess major depression, mania, hypomania, substance abuse, substance dependence, and psychosis were administered in this study. The section assessing history of dysthymia was not administered. All interviews were conducted by K. B., who received training in conducting the interviews prior to commencement of recruitment. The SCID-IV has demonstrated good test–retest reliability among trained interviewers (Williams, Gibbon, First, Spitzer, Davies, Borus, *et al.*, 1992).

**The Bech-Rafaelsen Mania Scale and the Hamilton Depression Scale (Bech, Bolwig, Kramp, and Rafaelsen, 1979):** is a semi-structured interview combining the Hamilton Depression rating scale (Hamilton, 1960) and Bech-Rafaelsen Mania Scale (Bech, Rafaelsen, Kramp, and Bolwig, 1978) to assess the severity of symptoms of depression (15-items) and mania (11 items) during the past week. Each item is rated on a 5-point Likert scale ranging from: 0 = not present, 1 = very mild or doubtful, 2 = mild, 3 = moderate to 4 = severe. The Bech-Rafaelsen Mania Scale has been shown to possess excellent interrater reliability ( $\alpha=0.90$ ) and adequate sensitivity to change in clinical trials (Bech, Baastrup, de Bleeker, and Ropert, 2001; Bech, 2002). The Hamilton Depression Scale has been shown to possess good reliability in clinical (Rehm and O’Hara, 1985) and community samples (Cole, Motivala, Dang, Lucko, Lang *et al.*, 2004);  $\alpha=0.76$  and  $\alpha=0.82$ , respectively.

**Beck Anxiety Inventory (Beck and Steer, 1990):** The BAI is a 21-item self-report questionnaire for measuring the severity of anxiety symptoms during the past week on a 4-point scale ranging from 0 (“not at all”) to 3 (“severely, I could barely stand it”). The summated score of all items measures the severity of generalised anxiety symptoms. The reliability of the instrument is high across both clinical and community samples, internal consistency of  $\alpha=0.91$  and test-retest coefficient of  $\alpha=0.66$  (De Ayala, Vonderharr-Carlson, and Doyoung, 2005).

**Response Styles Questionnaire – Expanded Version (RSQ-r) (Thomas and Bentall, 2002):** is an expanded version of Nolen-Hoeksema’s (1991) Response Styles Questionnaire, which measures an individual’s mode of coping with depressed mood in terms of the thoughts and behaviours that they engage in. The scale contains 48 items, rated on a 3-point scale according to how frequently the strategies are engaged in, which measures: rumination (25-items), adaptive coping (15-items) and dangerous activities (8-items). The rumination and adaptive coping scales have been shown to have good reliability ( $\alpha=0.91$  and  $\alpha=0.82$ , respectively), and the dangerous activities scale acceptable reliability ( $\alpha=0.68$ ) (Knowles, Tai, Christensen, and Bentall, 2005).



**The Balloon Analogue Risk Task (BART) (Lejuez, et al., 2002):** is a behavioural measure of risk taking propensity. At the start of the experimental session 4 items are displayed on a computer screen: a picture of a small balloon and a balloon pump; a reset button labelled, “Collect \$ \$ \$”; a, “Total Earned” display and a display labelled, “Last Balloon,” that lists the money earned on the last balloon. Each click on the pump with the mouse inflates the balloon incrementally (approximately 0.3 cm in all directions). With each pump, money is accumulated in a *temporary bank*, the holdings of which are never indicated to the participant. Money accumulates at a rate of 5 cents per pump. A *permanent bank* is displayed on the screen for participants to view, which consists of a square box containing a monetary amount (beginning with \$0.00). When a balloon is pumped past its individual explosion point, the computer generates a, “pop”, sound effect. When a balloon pops, all money in the temporary bank is lost, and the next un-inflated balloon appears on the screen. At any point during each balloon trial, a participant can stop pumping the balloon and click the, “Collect \$ \$ \$” button, which transfers all the money from the temporary bank into the permanent bank. When this happens the, “Total Earned” is incrementally updated, during which time a fruit machine payout sound plays to confirm payment. A new balloon appears after each balloon explosion or money collection until a total of 10 trials (i.e., balloons) have been completed. The probability that a balloon will explode is fixed at 1/128 for the first pump. If the balloon does not explode after the first pump, the probability that the balloon will explode is 1/127 on the second pump, 1/126 on the third pump, and so on up until the 128th pump, at which point the probability of an explosion is 1/1 (i.e., 100%). According to this algorithm, the average breakpoint for explosion is 64 pumps, which is proposed to model real-world situations, in which excessive risk often produces diminishing returns and increases threats to one’s health and safety. Each successive pump on any particular balloon trial: (a) increases the amount to be lost due to an explosion, and (b) decreases the relative gain of any additional pump. For example, after the first pump the next pump risks only the 5 cents accrued in the temporary bank and would increase the possible earnings on that balloon by 100%, yet after the 30th pump, the next pump would risk \$1.50 accrued in the temporary bank and increases possible earnings on that balloon trial by only 3.3%. Participants are given no precise information about the probability of explosion. The money earned on the BART will be virtual. Risk taking propensity is measured by the mean number of pumps per balloon made on trials in which the balloon does not explode, with a higher number of pumps indicating a greater propensity to take risks. Additionally, mean number of balloon explosions across the experimental session can be compared, with a greater number of explosions indicating greater risk taking propensity.

**The UPPS Impulsive Behaviour Scale (Whiteside and Lynam, 2001):** is a 45-item inventory designed to measure four distinct personality pathways to impulsive behaviour: Urgency, (lack of) Perseverance, (lack of) Premeditation, and Sensation Seeking. Urgency assesses an individual’s tendency to yield to strong impulses, specifically when accompanied by negative emotions. Perseverance assesses the ability to persist in tasks despite boredom, fatigue or distraction.

Premeditation assesses the ability to consider and reflect on potential consequences of behaviour before acting. Sensation Seeking measures an individual's preference for excitement and stimulation. Each item is rated on a 4-point scale from Strongly Agree to Strongly Disagree. All scales showed good reliability in a clinical sample: Urgency ( $\alpha=0.89$ ), Perseverance ( $\alpha=0.83$ ), Premeditation ( $\alpha=0.87$ ) and Sensation Seeking ( $\alpha=0.85$ ) (Whiteside, Lynam, Miller, and Reynolds, 2005).

**GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and Hicks, 2002):** involves the presentation of a series of 5-digit numbers in black on a white background. The randomly generated 5-digit numbers appear for 500 ms, once every 2 s (500 ms on, 1500 ms off). Participants are told to respond when the number they see is identical to the previous number: a *target trial*. Half of all target trials feature a *target-stop* trial, when the colour of the matching target's numerals changes from black to red at 50, 150, 250, or 350 ms after its presentation. Participants are instructed to respond to the identically matching numbers before the number disappears from the screen; however, they are told *not* to respond to a number that turns red. Target and target-stop trials each occur 25% of the time. The remaining 50% of the trials consist of numbers that differ randomly from the previous number. Within the target-stop trials, the interval during which the target remains black ('go') before turning red ('stop') has an equal probability of a 50, 150, 250, or 350 ms duration which results in 18–20 target-stop trials for each delay condition within the 12-min session. The number of responses withheld upon presentation of a 'stop' signal as a function of total presentations for each delay condition is used to calculate the percentage of inhibited (non-impulsive) responses. The GoStop task has been shown to differentiate between women with high and low trait impulsivity (Marsh, Dougherty, Mathias, Moeller, and Hicks), as well as between adolescents with disruptive behaviour disorders (Dougherty, *et al.*, 2003).

### Procedure

During the initial contact, the Chief Investigator explained the nature of the research and informed potential participants that should they meet the study criteria they would be invited to attend two testing sessions, both lasting for up to an hour each, and that should they attend both sessions they would be eligible to receive a £10 book voucher to thank them for their time and participation following the second session. Prior to participation and throughout testing participants were reminded that they were free to withdraw from the research at any time. Given evidence of diurnal variation in affect and arousal in individuals diagnosed with bipolar disorders (Feldman-Naim, Turner, and Leibenluft, 1997), as well in individuals according to levels of extraversion (Revelle, 1997), participants were offered the opportunity of participating in a morning or afternoon session to minimise the impact of these variables on the performance measures.

In the first session, diagnosis was confirmed via the Mood Disorders, Psychotic Disorders and Substance Use Disorders modules of the Structured Clinical Interview for DSM IV disorders

(SCID; First, Gibbon, Spitzer, Williams and Benjamin, 1997), in which the author received training prior to commencement of the study. Participants were only administered this subset of modules because it was felt that the overall length of the testing session would become too long if the diagnostic interview involved all components of the SCID. The mood and psychotic disorders modules were administered to ascertain the diagnosis of one of the affective disorders specified in the inclusion criteria, and to rule out potential differential diagnoses, such as schizoaffective disorder. The substance abuse module was included because past research indicates that levels of impulsivity are increased in individuals diagnosed with a substance use disorder, which would confound interpretation of the findings. There was no theoretical basis for suspecting that any other Axis I disorder would significantly bias our findings; although the presence of clinically significant anxiety might impact upon levels of impulsivity (Taylor, Hirshfeld-Becker, Ostacher, Chow, LeBeau, Pollack, *et al.*, 2008). Given the difficulty in recruiting a sample of individuals diagnosed with affective disorders with low levels of anxiety symptoms, a self-report measure of state anxiety was included to allow us to control for any effects in the analyses.

Following administration of the SCID, current levels of affective symptoms were ascertained via a semi-structured interview (Bech, Bolwig, Kramp and Rafaelsen, 1979). At this point one participant obtained a score above 7 on the HAM-D and was informed that unfortunately they were not currently eligible to participate in the second component of the study on that day, but encouraged to contact the Chief Investigator once the depressive symptoms had subsided. This participant did not complete the second element of the study; comparisons of the available demographic information between this participant and the remainder of the sample indicated that there were no significant differences between this participant and the final sample.

During the second component, which always took place within two weeks of the first session, participants completed: the Beck Anxiety Inventory (Beck and Steer, 1990); the UPPS Impulsive Behaviour Scale (Whiteside and Lynam, 2001); and the Response Styles Questionnaire – Expanded Version (RSQ-r) (Thomas and Bentall, 2002). Following this, participants completed the Balloon Analogue Risk Task (BART) (Lejuez, *et al.*, 2002) and the GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and Hicks, 2002) in a counterbalanced presentation order across participants. Following completion of all elements of the testing session, participants were debriefed and given the opportunity to ask any questions and discuss their experience of participation. Participants then received a £10 book voucher.

## Data Analysis

Prior to any analyses being conducted, descriptive statistics (mean, standard deviation, standard error, and minimum and maximum values) for each individual item on the self-report measures were inspected to identify possible errors in data entry. Data from the performance measures was automatically recorded in a database by the relevant programmes. Any impossible scores were checked and amended as necessary, and any outliers were noted to allow later analyses to be run with and without them included, to assess their impact upon the findings. Where missing values were identified, the relevant subscale mean for that individual prorated to account for this; the author of the UPPS impulsivity scale recommended that for a valid subscale score to be calculated, 70% of the relevant items should be available (S. Whiteside, personal communication) – this standard was adopted for all measures in this study.

Following this, mean scores on each measure, including the performance measures, were assessed to establish whether the data was normally distributed within each group via inspection of histograms and application of Kolmogorov-Smirnov and Shapiro-Wilk statistics. Transformations were applied to data that was significantly skewed in the order:

1. Square root transformation,
2.  $\text{Log}_{10}$  transformation,
3. Inverse transformation.

After each step the data was re-examined and only subjected to further transformation if it still contravened the normality assumption (Osbourne, 2002).

Prior to analysing the data in order to directly test the hypotheses, correlations using Pearson's Product Moment correlation Coefficient were performed to explore the relationships between: demographic variables, categorical variables and mean scores on all experimental measures. A correlation matrix was constructed and can be found in Appendix 1. Any significant relationships were further explored during multivariate analyses of the study hypotheses.

All categorical demographic data was compared using Chi Square tests. For comparisons of interval level demographic data across all three experimental groups, one way ANOVAs were employed; for comparisons between only two groups, Student's *t* tests were used.

Multivariate comparisons of the data pertaining to the hypotheses were conducted using a range of parametric tests, as no data contravened parametric assumptions. Research question one concerned levels of risk taking between the two groups, with the hypothesis that the bipolar group would endorse higher levels of risk taking on the self-report measure, and demonstrate riskier performance on the performance measure than the other two groups. Both sets of comparisons were made using one way ANOVAs. Where significant relationships existed between the variables under consideration and other variables in the study, ANCOVAs were conducted to control for the effects of the third variable(s), and assess their impact on the variables relevant to the hypotheses.

A similar procedure was followed when testing the second research question, which pertained to impulsivity; with the hypotheses that the bipolar group would endorse higher levels of impulsivity on the self-report measure, and demonstrate more impulsive performance on the behavioural measure. In addition, since the behavioural measure involved performance across two trial blocks, this data was subjected to a repeated measures ANOVA, with 'trial block' as the within participants variable. Again, significantly associated variables were controlled for in the analyses. Prior to conducting ANCOVAs, data was checked to ensure that it met additional parametric assumptions specific to ANCOVA; which it did in all instances. Where significant main effects were found between the three groups, Tukey's HSD test was used for post-hoc comparisons, as its conservative estimate of difference enables tighter control over Type I error (Benjamini and Braun, 2002).

### Ethical Approval

Full ethical approval was received from Leeds East Research Ethics Committee and R & D approval was received from West Yorkshire Mental Health R & D Consortium to recruit participants from the two sites located within Leeds Partnership NHS Foundation Trust.

## Chapter 3: Results

In this section the results of the study in relation to the research questions and hypotheses will be considered. The correlation matrix between the main descriptive and experimental variables can be found in Appendix 1. All categorical variables were compared using Chi Squared statistics; however, in cases where observed or expected cell sizes fell below five, categories were combined in meaningful ways in order to compare the groups. All other data was compared using t-tests or ANOVAs as appropriate.

### *Sample characteristics*

Table 1 displays the sociodemographic features of the sample, as well as basic psychiatric information for the two clinical groups.

### *Sociodemographic characteristics of the sample*

The three groups were comparable in terms of gender ( $p > .05$ ); however, they differed in mean age,  $F(2, 63) = 3.2, p = .05$ . Post-hoc testing using Tukey's HSD test revealed that there was no significant difference between the bipolar and control groups, or between the MDD and control groups; however, the bipolar group were significantly younger than the MDD group ( $p = .04$ ). The groups were compared on highest level of education by stratifying each group into those that had received a basic secondary education, or less, and those who had completed some form of higher education; in this respect the groups did not differ ( $p > .05$ ). There was no difference between the groups in terms of marital status ( $p > .05$ ) – the one participant who had been widowed was included in the 'divorced/separated' category for the purpose of this analysis. Given the high proportion of cells with values less than five in the contingency table for employment status the full-time, part-time and voluntary work categories were combined to form a 'meaningful occupation' category; there was a significant difference between the groups in terms of the proportions of participants who were and were not currently working. Inspection of the data revealed that a greater proportion of the participants in the non-clinical control group were employed than in either of the clinical groups.

Table 1.

Descriptive characteristics of the sample.

Variable	Remitted bipolar	Remitted unipolar	Healthy controls	$\chi^2$	<i>p</i>
Sex					
male/female ratio	7/15	12/10	7/15	3.17	.21
Age					
Mean (SD)	44.18 (11.09)	52.09 (9.04)	49.05 (11.20)	NA	NA
Education, no. (%)					
< G.C.S.E level	4 (18.20%)	3 (13.60%)	2 (9.10%)	5.29	.07
G.C.S.E. or equivalent	10 (45.50%)	5 (22.70%)	5 (22.70%)		
A'level or equivalent	3 (13.60%)	4 (18.20%)	8 (36.40%)		
Degree or equivalent	5 (22.70%)	8 (36.40%)	6 (27.30%)		
> Degree level	0 (0%)	2 (9.10%)	1 (4.50%)		
Marital status, no. (%)					
Married	8 (36.40%)	10 (45.50%)	12 (54.50%)	3.13	.54
Divorced/separated	6 (27.30%)	6 (27.30%)	3 (13.60%)		
Widowed	0 (0%)	1 (4.50%)	0 (0%)		
Never married	8 (36.40%)	5 (22.70%)	1 (4.50%)		
Employment status, no. (%)					
Full-time work	4 (19.00%)	1 (5.30%)	13 (59.10%)	20.9	.00
Part-time work	4 (19.00%)	2 (10.50%)	6 (27.30%)		
Voluntary work	3 (14.30%)	2 (10.50%)	1 (4.50%)		
Not working	10 (47.60%)	14 (73.70%)	2 (9.10%)		
Age of onset of disorder					
Mean (SD)	17.95 (10.79)	32.95 (16.83)	NA	NA	NA
Number of depressive episodes					
2	7	12		5.87	.02
3	1	4	0		
4+	14	6			
Number of (hypo)manic episodes					
1	1			NA	NA
2	8	0	0		
3	7				
4+	6				
Psychotic features,					
Present/absent ratio	9/13	3/19	NA	4.13	.042
Medication status, no. (%)*					
Medication free	3 (13.64%)	3 (13.64%)	22 (100%)	44.79	<.001
Takes 1+ antidepressant	13 (59.09%)	17 (77.27%)	0	1.68	.2
Takes 1+ mood stabiliser	16 (72.72%)	6 (27.27%)	0	.91	.003
Takes 1+ antipsychotic	9 (40.90%)	6 (27.27%)	0	.91	.34
Takes 1+ anxiolytic	1 (4.55%)	1 (4.55%)	0	NA	NA

\*some individuals were taking a variety of medication so totals exceed 100%

### *Psychiatric features of the clinical groups*

The bipolar group had a significantly younger self-reported age of onset of mood difficulties than the MDD group (17.95 vs. 32.95 years),  $t(42) = -3.52, p = .001$ . The frequencies for the number of previous manic or hypomanic episodes, as defined in the DSM IV, experienced by the bipolar group are reported in Table 1 along with the frequencies for the number of previous depressive episodes experienced. A substantial proportion of participants reported having had several depressive episodes every year for a number of years, and being unable to quantify this more precisely, therefore the data are reported in terms of participants having experienced: two, three or four or more episodes. For the purposes of analysis the groups were divided into those who had experienced less than four depressive episodes, and those who had experienced four or more; the groups differed significantly,  $\chi^2(1, 44) = 5.87, p = .02$ , with the bipolar group having experienced a greater number of previous depressive episodes. There was also a difference between the two groups in terms of whether participants did or did not experience psychotic symptoms during (hypo)manic or depressive episodes;  $\chi^2 = 4.13, p = .042$ , with the bipolar group containing a higher proportion of individuals who did experience psychotic symptoms. In terms of medication status, all control participants were medication free and an equal number of MDD and bipolar participants were medication free. The two clinical groups were compared for each type of medication separately, other than anxiolytic medication which was only taken by 1 participant in each clinical group. There was no difference between the two groups in terms of numbers of participants taking one or more antidepressant or antipsychotic, but more individuals in the bipolar group were taking at least one type of mood stabiliser,  $\chi^2(1, 44) = .91, p = .003$ .

*Table 2.*

*Summary of responses to measures of current mood and typical Responses to Negative Moods*

Measure	Group			F	p
	Remitted bipolar M (SD)	Remitted unipolar M (SD)	Healthy controls M (SD)		
Current mood					
HAM-D	3.82 (2.82)	4.09 (2.35)	3.41 (2.26)	.42	.66
BECH-R	2.77 (2.64)	.86 (1.25)	1.95 (1.94)	5.42	.007
BAI	10.68 (9.73)	11.32 (12.21)	5.14 (4.98)	3.06	.054
RSQ					
Rumination	2.26 (.46)	2.15 (.50)	1.50 (.25)	21.14	<.001
Adaptive coping	2.07 (.64)	2.01 (.45)	2.34 (.51)	2.37	.10
Dangerous activities	1.54 (.44)	1.33 (.25)	1.26 (.29)	4.19	.02

HAM-D=Hamilton Rating Scale for Depression; BECH-R=Bech-Rafaelsen Mania Scale; BAI=Beck Anxiety Inventory; RSQ=Response Styles Questionnaire



### *Current mood*

Table 2 includes summary data on the measures of current mood. All participants scored below the cut offs on the depression and mania scales measuring mood at the time of testing. Although no study-specific cut-off point on the anxiety scale was employed, the vast majority of participants reported only mild to moderate levels of anxiety. The three groups did not differ in terms of current depression (HAM-D),  $F(2, 63) = .42, p = .66$ . The distribution of scores on the Bech-Rafaelsen Mania Scale was significantly positively skewed for the bipolar and MDD groups, so a square root transformation was performed prior to analysis, which normalized the distributions. There was a significant difference between the groups,  $F(2, 63) = 5.42, p = .007$ , with the bipolar group reporting significantly higher levels of mania than the MDD group ( $p = .01$ ); there were no other significant between group differences. The distribution of the anxiety scores was similarly skewed and transformed using a square root transformation. Univariate analysis indicated that there was a significant overall difference between the groups in terms of anxiety at the time of testing,  $F(2, 63) = 3.06, p = .05$ ; however, post-hoc analysis using Tukey's HSD indicated that there were no significant between group differences: bipolar vs. MDD,  $p = .998$ ; bipolar vs. control,  $p = .085$ ; MDD vs. control,  $p = .095$ .

### Research question 1

It was hypothesised that the bipolar group would score more highly on measures of risk taking than the MDD and non-clinical control group, specifically: it was hypothesised that the bipolar group would endorse higher levels of dangerous activities on the Response Styles Questionnaire than the MDD and control groups. Furthermore, it was hypothesised that the bipolar group would make a higher mean number of pumps per balloon, and per unexploded balloon and experience more balloon explosions on the BART than the MDD and non-psychiatric control groups.

### *Response styles questionnaire (RSQ): Coping with depressed mood*

Table 2 contains summary data for the RSQ. Although the research question was primarily concerned with responses on the 'dangerous activities' subscale, responses to the other two subscales are reported to contextualise the levels of dangerous activities in terms of the variety of coping strategies individuals in the three groups engage in when depressed. Initial analyses indicated that the groups differed significantly in terms of their endorsement of engaging in ruminative responses when depressed ( $2, 63) = 21.14, p < .001$ . Post-hoc analysis indicated that there was no significant difference between the bipolar and MDD groups, but that both clinical groups reported significantly higher levels of rumination than the control group (both:  $p < .001$ ). Inspection of the correlation matrix indicated that a number of variables were significantly correlated with rumination scores. The impact of these variables on the relationship between group status and rumination scores was investigated by entering them as covariates in a univariate ANCOVA; only number of past depressive episodes contributed significantly to the model,  $F(1,$

62) = 4.44,  $p = .039$ , and negated the effect of group status,  $F(2, 62) = 0.66$ ,  $p = .520$ . There was no significant difference between the groups on the ‘adaptive coping’ scale; however, there was a strong negative correlation between previous episodes of depression and adaptive coping scores ( $r = -0.37$ ,  $p = .003$ ).

#### *Responding to Depressed Mood by Engaging in Dangerous Activities*

Initial analysis showed there to be a significant difference between the groups on the ‘dangerous activities’ scale,  $F(2, 63) = 4.19$ ,  $p = .02$ ; with the bipolar group endorsing engaging in more dangerous activities in response to depressed mood than the MDD group ( $p = .036$ ) and the control group ( $p = .008$ ), but there being no significant difference between the MDD and control group ( $p > .05$ ). Inspection of the correlation matrix indicated that age, current mania and current anxiety were all correlated with dangerous activities, so these were entered as covariates in a univariate ANOVA; anxiety did not contribute significantly to the model so was removed. In the final model, the group effect remained significant when controlling for age and current mania,  $F(2, 61) = 3.51$ ,  $p = .036$ , which both significantly added to the model; age:  $F(1, 61) = 6.54$ ,  $p = .013$  and current mania:  $F(1, 61) = 34.89$ ,  $p < .001$ . Pairwise comparisons indicated that when the effects of age and current mania were removed, there was no longer a significant difference between the bipolar and MDD groups ( $p > .05$ ), but that both clinical groups differed significantly from the control group (bipolar vs. controls,  $p = .047$ ; MDD vs. controls,  $p = .02$ ), endorsing higher levels of dangerous activities. Exploration of the dataset indicated that there were a small number of extreme values in response to the dangerous activities scale; the above analyses were repeated after removing these values. When these values were not included, age no longer contributed significantly to the model. Both current mania,  $F(1, 61) = 32.41$ ,  $p < .001$ , and group,  $F(2, 61) = 5.99$ ,  $p = .004$ , remained significant. Furthermore, post-hoc testing using Tukey’s HSD test indicated that the overall pattern of between group differences remained, but that the difference between the bipolar and control groups once again became more highly significant than the difference between the MDD and control groups: bipolar vs. MDD,  $p > .05$ ; bipolar vs. control,  $p = .003$ ; MDD vs. control,  $p = .008$ . The finding that the bipolar group reported engaging in higher levels of activity than the control group provides partial support for the hypothesis that individuals diagnosed with bipolar disorder may engage in risk-taking behaviour in response to MDD mood. However, it was hypothesised that the bipolar group would also report significantly higher levels of dangerous activities than the MDD group, which was not supported.

#### *The Balloon Analogue Risk-Taking Task (BART)*

Table 3 contains summary data for the BART. The three groups were compared on a number of measures taken from the BART: average pumps per balloon across the entire session, and average pumps per balloon across balloons 1-10, 11-20 and 21-30; adjusted average pumps per balloon – average number of pumps per balloon which did not explode – across the session and across balloons 1-10, 11-20 and 21-30; and total explosions across the session and across balloons 1-10,

11-20 and 21-30. The session means were compared using separate one-way ANOVAs for: average pumps per balloon, average pumps per unexploded balloon (adjusted average pumps) and total explosions, but all failed to find any significant between group differences. Furthermore, three repeated measures ANOVAs with the three blocks as levels of the within-participant variable, separately for average pumps, adjusted average pumps and explosions, and group status as the between participant factor were conducted; again, all main effects and interactions failed to reach significance. Inspection of the correlation matrix indicated that age was negatively correlated with the session totals for: average pumps, adjusted average pumps and explosions. The above analyses were repeated with age added as a covariate; however, no significant group differences emerged.

The findings from the BART do not support the hypothesis that the bipolar group would demonstrate higher levels of riskiness on a behavioural risk-taking task, as all three groups showed comparable levels of risk taking

*Table 3.*

*Balloon Analogue Risk Taking Task*

Measure	Group			F	p
	Remitted bipolar	Remitted unipolar	Healthy controls		
BART, mean (SD)					
Average pumps	32.12 (13.75)	25.79 (13.17)	29.65 (11.71)	1.35	.27
Average pumps 1-10	26.43 (13.86)	22.57 (11.60)	25.99 (12.19)	.62	.54
Average pumps 11-20	32.97 (13.43)	25.78 (13.82)	29.16 (14.27)	1.49	.23
Average pumps 21-30	36.96 (16.39)	29.02 (15.88)	33.80 (12.73)	1.54	.22
Adjusted average pumps	33.58 (15.50)	26.78 (13.78)	31.28 (14.13)	1.26	.29
Adjusted average pumps 1-10	26.50 (15.49)	22.23 (11.62)	27.45 (14.38)	.88	.42
Adjusted average pumps 11-20	35.13 (14.77)	27.87 (16.69)	32.19 (17.50)	1.10	.34
Adjusted average pumps 21-30	41.33 (20.05)	32.95 (20.72)	35.09 (14.01)	1.22	.30
Total explosions	8.36 (5.60)	6.05 (4.21)	7.59 (4.62)	1.31	.28
Explosions 1-10	2.27 (1.91)	1.64 (1.22)	2.41 (1.56)	1.49	.23
Explosions 11-20	3.00 (1.90)	1.95 (1.73)	2.41 (1.74)	1.88	.16
Explosions 21-30	3.09 (2.37)	2.45 (1.92)	2.77 (1.88)	.52	.60

## Research question 2

The study was designed to explore the relationship between diagnostic group and impulsivity, as measured by the GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and Hicks, 2002) and the UPPS Impulsivity Scale (Whiteside and Lynam, 2001); with the hypothesis that the bipolar group would score more highly on both measures of impulsivity than either control group. With regards to the UPPS, it was hypothesised that the bipolar group would score more highly than the other two groups on the urgency subscale. In addition, the study aimed to explore the relationship between impulsivity and risk taking.

Table 4 displays summary data for the self-report and behavioural impulsivity measures. There were no significant differences between the groups on the ‘(lack of) perseverance’, ‘(lack of) premeditation’ and ‘sensation seeking subscales’. Age was correlated with sensation seeking, with younger participants endorsing higher levels of sensation seeking ( $r = -0.43, p = < .001$ ). Furthermore, the presence of psychotic features was correlated with higher levels of both lack of premeditation and sensation seeking ( $r = .30, p = .02$  and  $r = .38, p = .002$ , respectively). Additionally, greater numbers of previous episodes of depression was related to higher sensation seeking and lack of perseverance scores ( $r = .26, p = .034$  and  $r = .26, p = .034$ , respectively); and higher levels of current depression was related to higher lack of perseverance scores ( $r = .40, p = .001$ ). However, the findings remained unchanged when controlling for all of these variables. Higher scores on the lack of premeditation subscale were correlated with higher scores on both lack of perseverance and sensation seeking ( $r = .42, p = .001$  and  $r = .29, p = .017$ ). In addition, higher sensation seeking scores were related to higher urgency scores ( $r = .27, p = .03$ ). Only lack of premeditation was related to performance on the behavioural measure of impulsivity, with higher lack of premeditation scores related to less impulsive responding on Block 1 of the GoStop impulsivity task ( $r = -.29, p = .025$ ).

The urgency subscale of the UPPS was significantly related to sensation seeking and no other UPPS subscales. Furthermore, higher levels of urgency were related to more impulsive responding on the GoStop impulsivity task ( $r = .26, p = .045$ ). Initial analysis indicated that there was a highly significant difference between the groups on the Urgency subscale,  $F(2, 63) = 16.60, p = < .001$ . Post-hoc testing using Tukey’s HSD test indicated that the bipolar group scored significantly higher than the MDD and control groups, (both  $p = < .001$ ), but that the MDD and control groups did not differ from one another. This finding was unaffected by controlling for the effects of all correlated variables (age of onset, number of depressive episodes, number of hypomanic episodes, psychosis, antidepressant and mood stabilising medication) and removing extreme values from the analyses. The urgency subscale measures the tendency to respond impulsively when experiencing negative affect; therefore, the finding that the bipolar group scored significantly more highly on this subscale than the other two groups provides partial support for the notion that individuals in this group may respond to negative affect by behaving in ways that appear ‘rash’. However, this subscale measures a range of responses and does not specifically measure risk taking behaviour. Nevertheless, scores on the urgency subscale were positively correlated with both rumination and dangerous activities ( $r = .47, p = < .001$  and  $r = .32, p = .009$ , respectively), suggesting that the ultimately unhelpful responses to negative affect clustered together in this sample.

Table 4 displays the means and standard deviations for the three groups across the two blocks of the GoStop impulsivity task, as well as the session totals. The scores represent the trial type at which participants were able to successfully inhibit responding following a stop signal on 50% of trials; longer latencies represent more impulsive responding, as participants required a longer duration to enable them to inhibit their prepotent response. A repeated measures ANOVA with trial block (Block 1 vs. Block 2) as the within-participants factor and experimental group (bipolar vs. MDD vs. control) as the between-participants factor was conducted on the trial type latencies. There was no significant within-participants effect across the two blocks, nor was there an interaction between trial block and experimental group. However, there was a significant effect across the three groups:  $F(2, 59) = 3.31, p = .04$  (see Figure 1). Post-hoc testing indicated that the bipolar group exhibited significantly more impulsive responding than the control group ( $p = .037$ ) but no other between group differences reached significance.

*Table 4.*

*Summary of data from impulsivity measures.*

Measure	Group			F	p
	Remitted bipolar M (SD)	Remitted unipolar M (SD)	Healthy controls M (SD)		
<b>GoStop Impulsivity Task</b>					
	(msec.)				
Block 1	230.95 (100.59)	202.63 (67.65)	190.91 (97.15)		
Block 2	252.38 (107.79)	197.37 (96.43)	168.18 (82.44)		
Session Total	250.00 (82.16)	223.68 (82.27)	172.73 (94.78)	3.31	.04
	Bipolar I				
Block 1	250.00 (109.92)	202.63 (67.65)	190.91 (97.15)		
Block 2	276.92 (128.48)	197.37 (96.43)	168.18 (82.44)		
Session Total	265.38 (92.16)	223.68 (82.27)	172.73 (94.78)		
	Bipolar II				
Block 1	200.00 (80.18)	202.63 (67.65)	190.91 (97.15)		
Block 2	212.50 (44.32)	197.37 (96.43)	168.18 (82.44)		
Session Total	225.00 (59.76)	223.68 (82.27)	172.73 (94.78)		
<b>UPPS</b>					
Urgency	3.00 (.36)	2.51 (.43)	2.34 (.38)	16.6	.00
Premeditation	2.02 (.75)	1.80 (.49)	2.07 (.46)	1.38	.26
Perseverance	2.20 (.86)	2.06 (.54)	1.82 (.40)	2.09	.13
Sensation seeking	2.51 (.80)	2.19 (.67)	2.03 (.86)	2.53	.088

Inspection of the correlation matrix indicated that lack of premeditation was related to Block 1 performance, therefore the above analysis was repeated with lack of premeditation as a covariate; lack of premeditation significantly added to the model,  $F(1, 58) = 4.17, p = .046$ , however, the effect of group status remained significant,  $F(2, 58) = 3.78, p = .029$  (see Figure 2). Furthermore, after controlling for the effects of lack of premeditation, the bipolar group responded more impulsively than both the MDD ( $p = .045$ ) and control ( $p = .012$ ) groups, which did not differ significantly from one another. The repeated measures ANOVA was repeated with mood stabilizer and antipsychotic included as covariates, as both types of medication were correlated with Block 2 of the GoStop; however, neither significantly added to the model.

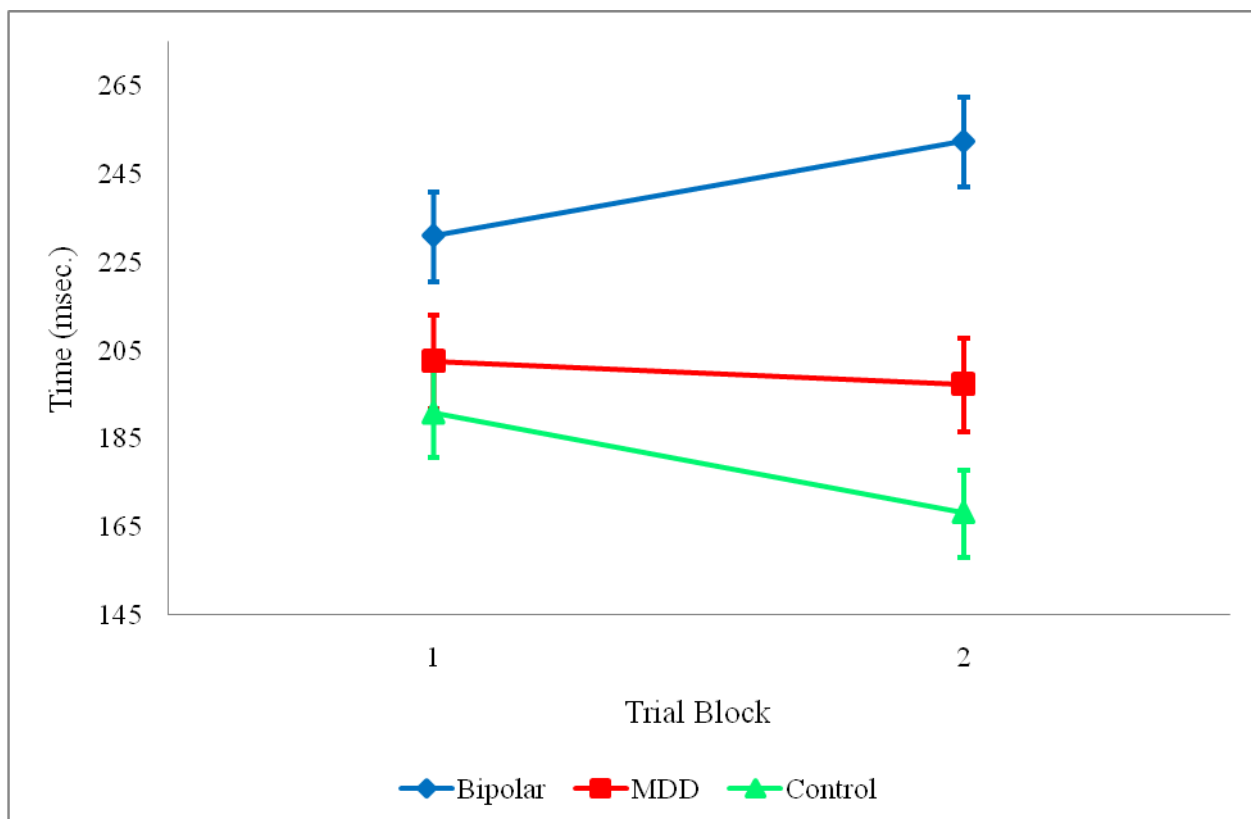


Figure 1.

Mean trial type latencies for the three groups on the GoStop impulsivity task. Error bars represent standard error scores.

In order to test how diagnosis-specific this effect was, the data for participants diagnosed with Bipolar I disorder and those diagnosed with Bipolar II disorder was examined separately using the same method of analysis as above (see Figure 3). As is evident from Figure 3, the group effect is largely attributable to the performance of those diagnosed with Bipolar I disorder; lack of premeditation:  $F(1, 57) = 4.90, p = .031$ , diagnosis:  $F(3, 57) = 3.72, p = .016$ . Pairwise comparisons indicated that the Bipolar I group differed significantly from the MDD ( $p = .009$ ) and control ( $p = .002$ ) groups, but not from the Bipolar II group ( $p = .074$ ); no other between groups differences emerged.

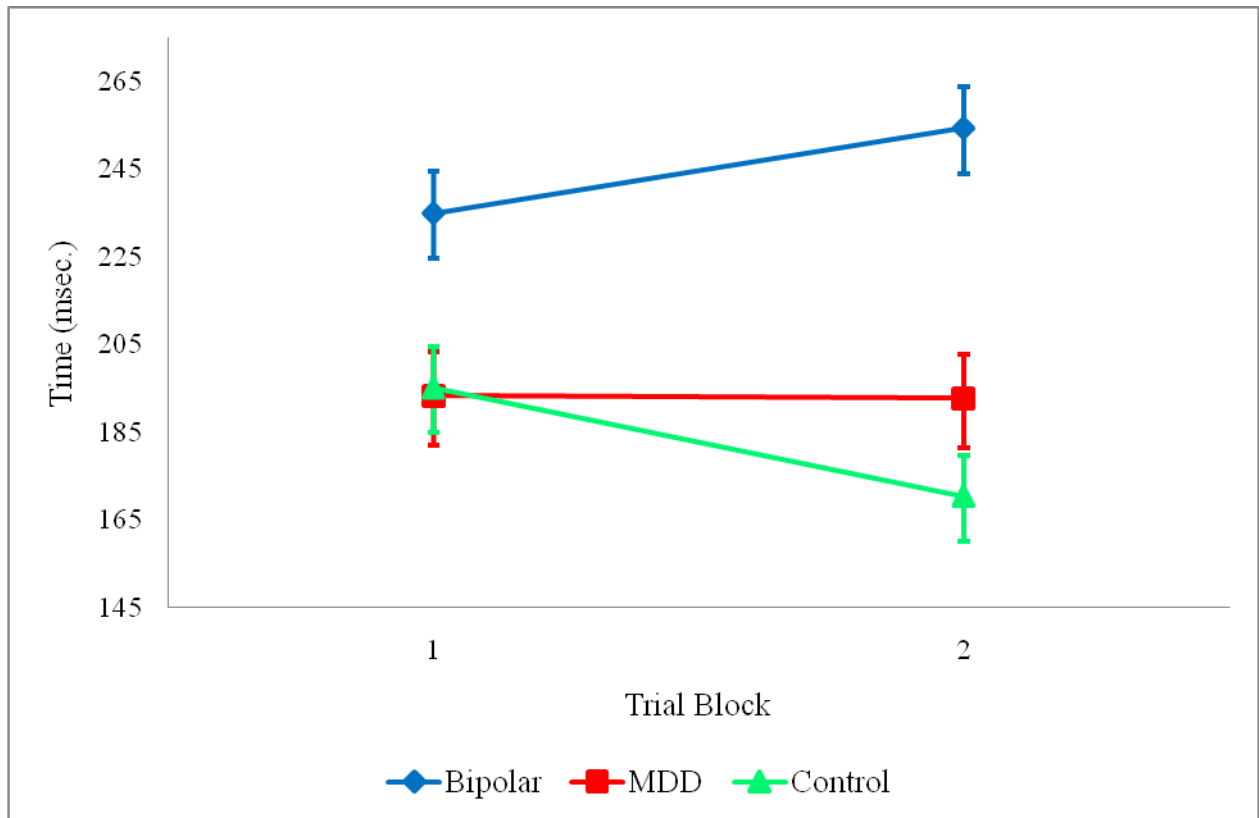


Figure 2.

Mean trial type latencies for the three groups on the GoStop impulsivity task when controlling for the effects of lack of premeditation. Error bars represent standard error scores.

The findings from the GoStop impulsivity task partially support the hypothesis that the bipolar group would evince more impulsivity than the other two groups; across both trial blocks the bipolar group were significantly more impulsive than the non-psychiatric control group, after controlling for lack of premeditation. Although there was no significant within-participants effect across the two trial blocks, visual inspection of the graphs demonstrates that the groups differed in terms of their performance across the task; with the control group improving, the MDD group remaining fairly constant and the bipolar group's performance becoming more impulsive over time. Interestingly, this difference between the experimental groups appears to be attributable to the participants diagnosed with Bipolar I disorder, with those diagnosed with Bipolar II disorder not differing significantly from the Bipolar I group, or the two control groups. The results of the questionnaire measures and the BART were reanalysed with diagnostic category (Bipolar I, Bipolar II, recurrent depression and non-psychiatric control) as the between-participants factor, rather than experimental group; however, no other significant differences emerged.

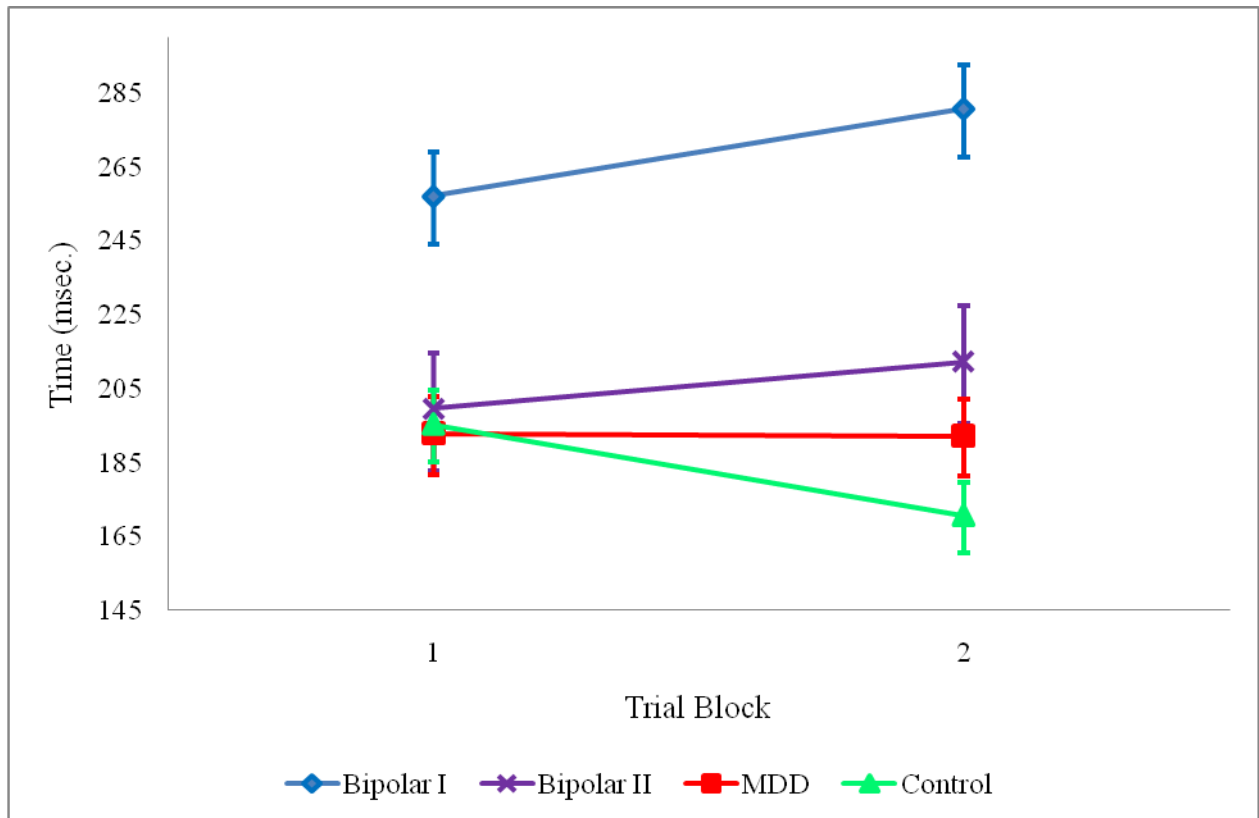


Figure 3.

Mean trial type latencies for the groups according to DSM IV diagnosis on the GoStop impulsivity task, when controlling for the effects of lack of premeditation. Error bars represent standard error scores.

#### Summary of findings

The findings of this study partially supported the hypotheses related to the both the first and second research questions. The first research question related to the theory that risk-taking behaviour evident in individuals diagnosed with bipolar disorder may, in part, represent an attempt by people to cope with negative affect; by engaging in behaviours that had the potential to provide immediate rewards, despite also carrying the potential for negative consequences, immediately or at a later point in time. It was hypothesised that the bipolar group would make a higher mean number of pumps per balloon, and per unexploded balloon, on the BART, and experience more balloon explosions than the unipolar and control groups. These hypotheses were not supported by the data.

It was also hypothesised that the bipolar group would endorse higher levels of dangerous activities on the Response Styles Questionnaire than the MDD and control groups; this hypothesis was supported by the present data.

The second research question related to the relationship between diagnostic group and impulsivity, as measured by the GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and



Hicks, 2002) and the UPPS Impulsivity Scale (Whiteside and Lynam, 2001). Previous research has indicated that individuals diagnosed with bipolar disorder show higher levels of impulsivity across all phases of the disorder on behavioural measures of impulsivity; however, findings using self-report measures have been conflicting. It was hypothesised that the bipolar group would score more highly on both measures of impulsivity than either control group. However, since no previous research has used the UPPS impulsivity scale with individuals diagnosed with bipolar disorders, the present research aimed to explore the relationship between the subscales of the UPPS and diagnostic status.

The bipolar group showed higher levels of impulsivity than the non-psychiatric controls across all aspects of the GoStop behavioural task; the MDD and non-psychiatric control groups showed comparable levels of impulsivity. Interestingly, the more impulsive responding of the bipolar group was attributable to the performance of the participants diagnosed with Bipolar I disorder; participants diagnosed with Bipolar II disorder did not differ significantly from the Bipolar I, MDD or control groups.

The only significant between groups difference to emerge on the UPPS was on the subscale of urgency; with the bipolar group scoring more highly than the other two groups. This difference was highly significant and remained so when controlling for other variables related to urgency scores. This supports the hypothesis that individuals diagnosed with bipolar disorder engage in risky behaviour when experiencing negative affect. Urgency scores were correlated with more impulsive GoStop session scores, and lack of premeditation was positively correlated with less impulsive responding on block one of the GoStop impulsivity task; there were no other significant relationships between the behavioural and self-report measures of impulsivity.

## Chapter 4: Discussion

Much of the literature regarding risk taking behaviour in bipolar disorders has focussed on the link between (hypo)manic symptoms and engaging in such behaviour. The present research sought to establish a baseline measure of the tendency to engage in risk taking behaviour by measuring risk-taking behaviour and levels of impulsivity in individuals diagnosed with either Bipolar I or Bipolar II disorder. Two control groups were employed; a non-clinical group and a group of individuals diagnosed with Major Depressive Disorder (MDD), in order to investigate the specificity of any effects to bipolar disorders rather than affective disorders in general. The first research question was concerned with risk taking behaviour; it was hypothesised that the bipolar group would endorse higher levels of dangerous activities on the Response Styles Questionnaire (RSQ), and demonstrate a riskier response style on the Balloon Analogue Risk Task (BART). Elements of these hypotheses were partially supported, as the bipolar group did endorse significantly higher levels of dangerous activities than the other two groups; therefore, this group self-reported engaging in dangerous activities as a means of coping with depressed mood more frequently than the other two groups. However, there were no between groups differences whatsoever on any aspect of the behavioural risk taking task.

The study was also designed to explore the relationship between diagnostic group and impulsivity, as measured by the GoStop Impulsivity Paradigm (Marsh, Dougherty, Mathias, Moeller, and Hicks, 2002) and the UPPS Impulsivity Scale (Whiteside and Lynam, 2001); with the hypothesis that the bipolar group would score more highly on both measures of impulsivity than either control group. With regards to the UPPS, it was hypothesised that the bipolar group would score more highly than the other two groups on the urgency subscale, which measures the tendency to engage in rash actions when experiencing high levels of negative affect.

### *Risk taking behaviour: The Balloon Analogue Risk Task (BART)*

Risky performance on the BART has been found to differentiate between a number of clinical groups in previous research; however, if the present findings should be replicated, it would seem that individuals diagnosed with bipolar disorders do not represent a group of people who are identifiable using this method. This finding supports previous research which also found there to be no differences in the average number of pumps per balloon on the BART between a group of individuals diagnosed with bipolar disorders, some of whom also had a history of alcohol dependence, and a control group (Holmes, Bearden, Barguil, Fonseca, Monkul, Nery, *et al.*, 2009). However, in this study, the participants with the history of alcohol abuse exploded significantly more balloons than the control group and the remaining bipolar participants. It is unclear what the significance of the history of alcohol abuse has in relation to the findings; future research could clarify this.

There a number of parameters across which performance on this task could vary; therefore it is difficult to know whether, despite not differing significantly in terms of overall performance,

there were any differences between the groups in terms of their approach to the task. For example, if a participant experienced an early explosion on the first balloon they pumped, their performance may be affected on later balloons in several ways; they may have adopted a more cautious strategy or they may have enjoyed the excitement of continuing to inflate the balloons knowing that it could explode at any moment. Previous research has linked riskier performance on the BART to higher levels of sensation seeking (Lejuez, Read, Kahler, Richards, Ramsey, Stuart, *et al.*, 2002), and sensation seeking was correlated with BART performance in this study – indeed, several participants in the current study remarked that they enjoyed it when the balloons burst; however, removing these participants from the analyses did not drastically alter the findings. Future research applying a cognitive modelling approach would be informative; however, given that there were no significant differences between the groups in terms of sensation seeking, if this is a pertinent variable to understanding performance on the task it is one that is not disorder specific. It would perhaps have been beneficial for participants to have completed the task without spending such a long time answering questions and filling out questionnaires beforehand, as this may have affected participants' willingness to spend a long time completing the task. During the present study it appeared that some of the participants were more involved in the task than others – for example, several participants commented that they may have performed differently should they have been playing for real money. However, the majority of participants felt that this did not affect their performance. Nevertheless, it would be interesting to investigate whether offering tangible rewards differentially affected the performance of the groups, especially given research suggesting that individuals diagnosed with bipolar disorders may be hyperresponsive to reward (Urošević, Abramson, Harmon-Jones, and Alloy, 2008).

It would be interesting to compare groups with a bipolar diagnosis whilst in different phases of the disorder, to investigate whether this particular type of risk taking becomes more pronounced when in (hypo)manic, mixed or depressed episodes. Interestingly, there were very few relationships between the risk taking task and the measures of impulsivity, suggesting that they represent very distinct constructs that may, at times, share underlying features but appear to be largely dissociable.

#### *Risk taking behaviour: The Response Styles Questionnaire (RSQ)*

The finding that the bipolar participants endorsed significantly higher levels of dangerous activities on the RSQ than the other two groups supports previous research which found higher levels of dangerous activities in bipolar participants (Thomas, Knowles, Tai, and Bentall, 2007) and in children at high risk of developing an affective disorder (Jones, Tai, Evershed, Knowles, and Bentall, 2006). The RSQ measures responses to depressed mood, and therefore represents a very different form of risk taking to the sensation seeking related BART. Both the integrative model of mood swings (Mansell, Morrison, Reid, Lowens, and Tai, 2007) and the depression avoidance hypothesis discussed earlier focus on the way in which individuals diagnosed with bipolar disorders respond to particular kinds of information about the self and affect. Depressed mood is

frequently linked with negative thoughts about the self, as well as pessimistic thoughts about the future which have negative implications for the self. Therefore, the finding that individuals who were confirmed to be euthymic at the time of testing did not behave riskily on the BART is compatible with both of these theories. Given the problems inherent in relying entirely on self-report measures, in terms of the difficulties in accurately reporting on past behaviour and states of mind, it would be useful to attempt to gather other forms of evidence as well. In terms of the integrative model discussed earlier, risk taking behaviour simply represents one potential form of ascent behaviour; therefore use of a risk taking task would not be a direct test of this model. However, use of such a task would be somewhat more specific to the depression avoidance hypothesis. Inducing a sad mood prior to completing the BART would be one means of measuring whether this prompts riskier performance; although there are probably qualitative differences between a temporary sad mood and a true depressed mood. Alternatively, using some sort of false failure feedback which would perhaps more directly trigger self-relevant cognitions might be more specific, but perhaps less ethical. The finding that both clinical groups endorsed engaging in higher levels of dangerous activities compared to the non-clinical controls was interesting and unexpected and a worthy topic of further investigation. It is notable that there was a significant correlation between engaging in dangerous activities in response to depressed mood and adopting a ruminative response to depressed mood; both responses which may be ultimately be unhelpful – and neither of these responses was correlated with adopting adaptive coping strategies. Rumination represents a transdiagnostic process, and was very much related to previous episodes of depression, which are common to both MDD and bipolar disorders; therefore, it is possible that engaging in dangerous activities in response to depressed mood represents a similar process in some respects. Future research more precisely conceptualising the frequency with which particular responses are adopted, and the extent to which they are successful may provide more information about whether there are subtle differences in these styles between the two disorders.

#### *Impulsivity: The GoStop Impulsivity Task*

Very few studies have assessed impulsivity in individuals diagnosed with bipolar disorder using behavioural means; however, as discussed in chapter one, behavioural measures can provide a direct test of an underlying tendency, rather than an individual's perception of their level of impulsivity. This study used a version of the Go/No Go task, which has good reliability and validity, and measures the type of impulsivity frequently referred to in the literature. On this task, both the MDD and non-clinical control groups were significantly less impulsive than the bipolar group. This supports previous findings suggesting that there is a trait, as well as a state, component to impulsivity in individuals diagnosed with bipolar disorder (Swann, Pazzaglia, Nicholls, Dougherty, and Moeller, 2003). However, previous research, using a different behavioural measure, found there to be no difference between a euthymic bipolar group and a non-clinical control group (Swann, *et al.*, 2003). As noted earlier, this study used the IMT/DMT as an index of impulsivity when it is perhaps a better measure of attention than impulsivity. Replicating these

findings could clarify whether there is behaviourally measured impulsivity present between episodes in individuals diagnosed with bipolar disorders. Interestingly, previous research using a non-clinical sample found that performance on a Go/No go task was significantly correlated with the motor subscale of the Barratt Impulsiveness Scale, but no other subscales or the total score (Gorlyn, Keilp, Tryon, and Mannhowever, 2005); as discussed in chapter one, elevated levels of impulsivity on this subscale have been found in euthymic bipolar and unipolar depressed participants in previous research (Peluso, Hatch, Glahn, Monkul, Sanches, Najt, *et al.*, 2007). However, in the present study there was no significant difference between the performance of the euthymic MDD group and the non-clinical control group on the Go Stop impulsivity task. Moreover, age was correlated with performance on this task – although this did not affect the findings when it was controlled for in the analyses – and the MDD group were significantly older than the bipolar group, but performed significantly less impulsively despite this.

Unlike previous research, the trait-like aspect of impulsivity – evident during periods of euthymia - was very evident on a behavioural task, and not inferred from any self-report measure; it is important to attempt to capture a construct by exploring different forms of measurement, but given that individuals with bipolar disorder have been known to score quite highly on measures of social desirability, use of an objective measure to support this finding is useful in learning to understand about the disorder, and therefore build interventions accordingly.

It was notable that the magnitude of the effect between the groups was entirely accounted by the Bipolar I participants' responses, with individuals diagnosed with Bipolar II disorder not differing significantly from any other group. It is possible that the elevated impulsivity in the bipolar group in some way contributed to the development of Bipolar I disorder; by behaving impulsively individuals may be more likely to quickly engage in activities others would think about and plan ahead for, which might contribute to some of the processes involved in the development of manic episodes. Alternatively, impulsivity may be a manifestation of the effects of multiple mood episodes, namely mania – as the recovered MDD did not show this trend, responding consistently throughout trials. The performance of the bipolar group became more impulsive over the course of the task, unlike that of the other groups. Given the literature regarding neuropsychological deficits in bipolar disorders, it is worth mentioning that there was no measurement of, or control for, potential confounds such as metacognitive efficiency or deficits in sustained attention; therefore, it is unclear what the relationship between Bipolar I disorder and increased impulsivity on this task is. Evidence regarding the pattern and severity of neuropsychological difficulties in the disorders is mixed, with some research suggesting that the pattern of deficits is more widespread and the severity more pronounced in Bipolar I than Bipolar II disorder (Simonsen, Sundet, Vaskinn, Birkenaes, Engh, Hansen, *et al.*, 2008), whilst other research suggests that the difficulties are equivalent (Dittmann, Hennig-Fast, Gerber, Seemuller, Riedel, Severus, *et al.*, 2008). Future research measuring and controlling for the effects of these factors would be very useful, especially in understanding the way in which the responses of the Bipolar I group became more impulsive over time, whilst the control group appeared to benefit from learning

across the two trials. The Bipolar II group's responses followed a slight trajectory that mirrored the Bipolar I groups', but was far less pronounced and impulsive – which could fit with an explanation in terms of similar, but less severe, neuropsychological difficulties in the two groups. Alternatively, it could be that an unmeasured variable connected to the diagnosis of Bipolar I disorder is also connected to this type of impulsivity.

#### *Impulsivity: The UPPS*

As with previous research, there were few correlations between the self-report and behavioural measures of impulsivity. The presence of psychotic features was positively correlated with lack of premeditation, which measures difficulty in thinking and reflecting on the consequences of an act before engaging in that act, as well as with the sensation seeking subscale, which measures the tendency to seek out novel or thrilling stimulation. The number of previous depressive episodes was positively correlated with sensation seeking and lack of perseverance, a failure to tolerate boredom or remain focused despite distraction. The subscales of the UPPS were relatively intercorrelated with one another, except for the urgency subscale, which only positively correlated with the sensation seeking subscale. The lack of premeditation subscale was correlated with performance on block one of the behavioural task; with higher levels of lack of premeditation linked to less impulsive responding on the task. Additionally, higher levels of urgency were correlated with more impulsive responding on the behavioural measure across both blocks. The urgency subscale was the only one of the four subscales on which there were significant between group differences; with the bipolar group endorsing higher levels than the other two groups, who did not differ from one another.

#### *Urgent behaviour*

The bipolar group endorsed significantly higher levels of urgency than the other two groups, even when controlling for all other correlated variables. This subscale measures one's tendency to engage in behaviours to mitigate strong negative affect in the short-term, but may have a negative impact on the individuals themselves in the long-term. Higher levels of urgency were related to higher levels of both engaging in rumination and dangerous activities in response to depressed mood. Within the two clinical groups, earlier age of onset was correlated with higher urgency scores. This may have somewhat confounded the results, as the participants in the bipolar group had a significantly younger age of onset than the depressed group; however, this may in itself be related to a number of other variables. It is possible that earlier age of onset may signal a more 'severe' form of disorder, in which case, there may be a stronger motivation, or perceived need, to 'defuse' negative affective states. Alternatively, earlier age of onset may be linked to biological vulnerability to some aspect of the affective disturbance, in which case these individuals would hypothetically be more likely to have at least one parent with some form of affective disturbance – in which case this could have many ramifications in terms of the milieu of the home environment,

the transactions that may have occurred between the parent and child and the types of coping styles that were modelled. Perhaps the most direct consequence of experiencing an earlier age of onset of affective disturbance would be that individuals would have had less opportunity to develop a range of coping strategies.

#### *Action as affect regulation*

A number of pieces of research reviewed in chapter one converged on the idea that individuals may engage in risk taking behaviour as a form of affect regulation. Ideally one would induce both positive and negative moods in participants prior to completing the task to measure the effect on performance. The link between sensation seeking and BART performance suggests that individuals who score more highly on sensation seeking behave more riskily on this particular task; which in some ways could be likened to an ascent behaviour or to the enhancement motive in the motivational model of Cooper, Agocha, and Sheldon (2000). However, future research would need to test these speculations more thoroughly. Alternatively, the higher levels of UPPS urgency and RSQ dangerous activities in the bipolar participants suggests that this group self-report engaging in risky activities when experiencing negative affect – the coping pathway in the Cooper, *et al.* model and the central tenet of the depression avoidance hypothesis. However, this is merely speculative, and future research directly measuring mood state and performance on the risk taking task would need to be conducted to clarify this. Given the relationship between urgency and Go Stop performance and research in non-clinical samples linking poor cognitive self-regulation with risk taking behaviours (Magar, Phillips and Hosie, 2008)), it may well be that cognitive processes contribute to the development of this response to negative affect via inhibitory deficits, and perhaps other areas of executive functioning.

It is difficult to place the findings in the context of psychological models of bipolar disorders without further data obtained whilst individuals are experiencing clinically significant symptomatology. The BAS dysregulation model of bipolar disorders proposes that individuals diagnosed with bipolar disorders are hyperresponsive to cues of reward; therefore, one would hypothesise that this would translate into risky performance on the BART, as individuals strive to maximise the level of reward. Within the integrative model of mood swings it has been proposed that risk taking behaviour may represent one form of ascent behaviour (Mansell, Morrison, Reid, Lowens, and Tai, 2007); however, the model is centred on the importance of making extreme, self-relevant appraisals of events, therefore it is difficult to situate the current findings in that context – as there was no manipulation of, or measurement of, participants decision making or idiosyncratic appraisals prior to and during the task. However, the evidence reviewed earlier suggested that individuals diagnosed with bipolar disorders focus on their emotional experiences, make self-relevant appraisals of these experiences and extrapolate from specific instances to more general self-relevant cognitions; therefore, when experiencing strong negative affect, individuals may focus on the experience, thereby intensifying it, experience it as an indicator of extreme personal significance and overgeneralise this interpretation. In terms of their model, individuals would then

be motivated to engage in ascent behaviour to enhance their current level of activation. However, if the goal is to avoid triggering unwanted parts of the self, it seems plausible, although untested, that different types of negative affect are likely to be associated with negative memories and images that comprise particular self-aspects. This is a slightly different area than that covered by this particular piece of research, and a more elaborate way of describing the ideas suggested by the depression avoidance hypothesis – which could, in an amended form, be incorporated into the overall model.

### *Clinical implications*

Given the scope of this piece of research there are no immediate clinical implications that follow directly from the findings. However, the finding that a number of ultimately unhelpful coping strategies clustered together in this sample suggests that there may be potential for simply focussing on this area initially; previous research has demonstrated that relapse rates in bipolar disorders are clearly linked to the use of particular coping strategies (Lam@@@@@). It would be useful for further research to elucidate what the underlying beliefs are regarding emotions and the self, as well as whether there are broad themes in the procedural beliefs regarding emotions and their avoidance and control. The results of this study are suggestive of at least some degree of overlap with the diagnosis of Borderline Personality Disorder, a point raised in the description of the model of mood swings, in terms of the importance of urgency. If this is the case, future interventions may benefit from incorporating elements of Dialectical Behaviour Therapy, which has proven to be efficacious in the treatment of Borderline Personality Disorder (Verheul, Van Den Bosch, Koeter, De Ridder, Stijnen, and Van Den Brink, 2003). This may be especially so for the mindfulness element, as the results are suggestive of a mode of acting very quickly to change or dissipate emotional experience, and becoming trapped in an ever evolving cycle of action within which many cognitions and emotions remain unresolved – much as described by Mansell, Morrison, Reid, Lowens, and Tai (2007).

### *Limitations*

Given the preliminary nature and small size of this research there are a number of ways in which it could be improved upon. Many potentially important variables were not measured and controlled for, such as elements of cognitive and neuropsychological functioning. Furthermore, measuring the strategies that people are using when completing the risk taking task, and more precisely establishing their goals when doing so would be informative; the underlying theories and speculation centre on the notion that engaging in risky or dangerous activities may be a response to a negative mood state. However, some individuals may also seek to enhance an already positive mood state – whilst these two aims may result in overtly similar behaviour, the underlying functions are very different. It would be useful to measure other aspects of personality that may be important in differentiating between individuals who fall under the umbrella of being diagnosed with a bipolar disorder and differentially impact upon the types of coping strategies employed.



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## Appendix 1

*Correlation matrix displaying bivariate relationships between mean scores on the main descriptive and experimental variables.*

	Sex	Age	Group	Clinical group	Age of Onset	No. Depressive Episodes	No. (Hypo)manic Episodes	Psychotic Symptoms	GoStop Block 1	GoStop Block 2	Adj. Av. Pumps	Rumination	Adaptive Coping	Dangerous Activities	Lack of Premeditation	Urgency	Sensation Seeking	Lack of Perseverance	Current Depression	Current Mania	Current Anxiety
Sex	1	.178	.000	.229	-.106	.069	-.053	-.139	-.032	.107	-.015	.107	-.078	.150	-.232	-.101	.122	-.112	-.090	.037	.070
Age		1	.185	.371	.050	-.111	-.171	-.257 (*)	-.049	.110	-.287 (*)	-.164	-.093	-.375 (**)	-.200	-.161	-.425 (**)	-.071	-.023	-.223	.038
Group			1	1	.872 (**)	NA	NA	-.433 (**)	-.185	-.350 (**)	-.065	-.586 (**)	.203	-.327 (**)	.034	-.566 (**)	-.267 (*)	-.247 (*)	-.068	-.157	-.235
Clinical group (1=bipolar; 2=MDD)				1	.477 (**)	-.314 (*)	-.914 (**)	-.306 (*)	-.165	-.265	-.231	-.116	-.056	-.296	-.178	-.532 (**)	-.220	-.101	.054	-.428 (**)	.029
Age of Onset					1	-.885 (**)	-.478 (**)	-.339 (**)	-.141	-.275 (*)	.028	-.631 (**)	.264 (*)	-.234	.128	-.411 (**)	-.209	-.233	-.106	.026	-.286 (*)
Number Depressive Episodes						1	.585 (**)	.360 (**)	.128	.168	.056	.656 (**)	-.366 (**)	.278 (*)	-.027	.456 (**)	.262 (*)	.261 (*)	.203	.098	.377 (**)
Number (Hypo)manic Episodes							1	.351 (**)	.128	.306 (*)	.088	.355 (**)	-.109 (*)	.274 (*)	-.015	.536 (**)	.207	.088	-.004	.323 (**)	.129
Psychosis								1	.001	.217	.123	.121	-.035	.270 (*)	.299 (*)	.327 (**)	.380 (**)	.053	-.149	.160	.022
GoStop Block 1									1	.515 (**)	-.153	.066	.061	-.209	-.285 (*)	.034	-.137	.063	.031	-.221	-.120
GoStop Block 2										1	-.062	.037	.036	.030	-.121	.241	-.080	-.001	-.226	-.047	-.190

	Sex	Age	Group	Clinical Group (1=bipolar; 2=MDD)	Age of Onset	No. Depressive Episodes	No. (Hypo)manic Episodes	Psychosis	GoStop Block 1	GoStop Block 2	Adj. Av. Pumps	Rumination	Adaptive Coping	Dangerous Activities	Lack of Premeditation	Urgency	Sensation Seeking	Lack of Perseverance	Current Depression	Current Mania	Current Anxiety
Average Pumps											.975 (**)	.167	-.073	.260 (*)	.271 (*)	.080	.252 (*)	.127	.205	.203	.107
Adj. Average Pumps											1	.119	-.011	.212	.228	.058	.271 (*)	.116	.162	.152	.057
Rumination												1	-.325 (**)	.464 (**)	.093	.467 (**)	.169	.454 (**)	.369 (**)	.081	.458 (**)
Adaptive Coping													1	.139	-.119	-.060	.127	-.228	-.211	.179	-.151
Dangerous Activities														1	.410 (**)	.317 (**)	.453 (**)	.390 (**)	.223	.617 (**)	.298 (*)
Lack of Pre-meditation														1	.118	.292 (*)	.416 (**)	.034	.272 (*)	-.021	
Urgency															1	.267 (*)	.136	.122	.190	.274 (*)	
Sensation Seeking																1	.050	-.003	.267 (*)	-.006	
Lack of Perseverance																	1	.400 (**)	.083	.205	
Current Depression																		1	.137	.627 (**)	
Current Mania																			1	.190	
Current Anxiety																					1

\* Correlation is significant at the 0.05 level (2-tailed); \*\* Correlation is significant at the 0.01 level (2-tailed).

